



FUTERA FUSION SERIES FINNED COPPER GAS BOILERS (MODEL MB) & WATER HEATERS (MODEL MW)

WITH *HeatNet* CONTROL

INSTALLATION & OPERATION MANUAL



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, 1103 kPa 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.

WARNING: Failure to properly vent this unit can cause excessive amounts of carbon monoxide resulting in severe personal injury or death!

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



260 North Elm Street
Westfield, MA 01085
Phone: (413) 568-9571
Fax: (413) 568-9613

7555 Tranmere Drive
Mississauga, Ontario L5S 1L4 Canada
Phone: (905) 670-5888
Fax: (905) 670-5782

www.rbiwaterheaters.com



FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

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.

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BEFORE YOU START

This manual covers the application, installation, operation and maintenance of a Futera Series 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 Futera Series finned copper heating boiler/water heaters have been design certified by CSA 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 CAN1-3.1, Industrial and Commercial Gas Fired Packaged Boilers. Each unit has been constructed and hydrostatically tested for a maximum working pressure of **160 psi, 1103 kPa** 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/NFPA 54-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 CSA B149.1 or .2, Installation Code for Gas Burning Appliances and Equipment.

If installed in the Commonwealth of Massachusetts, you **MUST FOLLOW** the additional instructions contained in RBI's instruction sheet MACODE-3. Which is located in the back of this manual.

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 distributor or contact the RBI Customer Service Department at: 260 North Elm Street, Westfield, MA 01085 for US or 7555 Tranmere Drive, Mississauga ONT L5S 1L4 for Canada. Always include the model and serial numbers from the rating plate of the boiler/water heater in question.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

RATINGS & CAPACITIES

Before undertaking the installation of the Futera Series 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 copper 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. This boiler/water heater is suitable for indoor and outdoor installations. 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.

NOTE: Service clearances are not mandatory, but are recommended to ensure ease of service should it be required.

Table 1

	Clearance to Combustibles		Service Clearance	
	in	mm	in	mm
Top	6	153	30	762
Back	6	153	24	610
Left Side	6	153	24	610
Right Side	6	153	24	610
Front	6	153	30	762

2. An optimum site will be level, central to the piping system, close to a chimney or outside wall 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.

NOTE: The Futera may be installed directly on combustible flooring, but never on carpeting.

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.
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, see “GENERAL VENTING GUIDELINES”.

6. NEVER place this boiler/water heater in a location that would subject it to temperatures at or near freezing, see the “FREEZE PROTECTION” section on page 12.

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/NFPA 54 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/water heater!

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!

CAUTION: If the boiler/water heater is operated while the building is under construction it MUST be protected from wood, concrete, sheet rock and other types of dust. Failure to properly protect the unit from construction dust will damage the unit voiding the warranty!

Buildings will require the installation of a fresh air duct or other means of providing make-up air if the intake air option isn't used. 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 Futera in an environment subjected to a negative pressure unless it is Direct Vented. Failure to comply with this warning can result in excessive levels of carbon monoxide causing severe personal injury or death!

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

All Air From Inside The Building

If the Futera is to be located in a confined space, the minimum clearances listed in Table 1 must be maintained between it and any combustible construction. When installed in a confined space **without the intake air option**, Figures 5, 6 and 7, 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 in², 64,516 mm²** in size. The upper opening must be within **12 in, 305 mm** of, but not less than **3 in, 76 mm** from, the top of the enclosure. The bottom opening must be within **12 in, 305 mm** of, but not less than **3 in, 76 mm** from, the bottom of the enclosure.

All Air From Outside The Building

When installed in a confined space **without utilizing the intake air option** 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 in, 305 mm** of, but not less than **3 in, 76 mm** from, the top of the enclosure. The bottom opening must be within **12 in, 305 mm** of, but not less than **3 in, 76 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 in, 6.4 mm**. If the free area through a louver or grill is not known, ducts should be sized per Table 2.

Canadian installations must comply with CSA B149.1 when **air supply** is provided by natural air flow from the outdoors for **natural draft**, partial fan-assisted, fan-assisted, or power draft-assisted **burners**, there shall be a permanent **air supply** opening(s) having a cross-sectional area of not less than **1 in² per 7,000 Btuh (310 mm² per kW)** up to and including **1 million Btuh**, plus **1 in² per 14,000 Btuh (155 mm² per kW)** in excess of **1 million Btuh**.

Table 2 – Make-up Air Louver Sizing

Input (MBH)	Required Cross Sectional Area					
	1/4 in 6.4 mm Wire Screen		75% Free Area Metal Louvers		25% Free Area Wooden Louvers	
	in ²	cm ²	in ²	cm ²	in ²	cm ²
500	125	806	167	1077	500	3226
750	187	1206	250	1613	750	4839
1000	250	1613	333	2148	1000	6452
1250	313	2019	416	2684	1250	8065
1500	375	2419	500	3226	1500	9677
1750	437	2819	583	3761	1750	11,290
1999	500	3226	667	4303	2000	12,900

Intake Air Option – General Guidelines

This configuration provides combustion air directly to the boiler/water heater's air intake adapter using a dedicated pipe when using the direct vent option. Combustion air can be drawn in horizontally through the same outside wall which terminates the exhaust gases or vertically through the roof, see Figures 1, 2, 3 & 4.

WARNING: Common intake air systems may be used provided the common duct is sized properly. An intake combustion air damper should be installed if the common vent option is used in the intake air pipe of each heater. Improper installation can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

Single wall galvanized smoke pipe, single wall aluminum pipe, flexible aluminum pipe, PVC or CPVC pipe can be used for the intake air pipe. It must be sized per Table 3.

Table 3 - Intake Air Pipe Sizing

Model Size	For Vertical (Up to 60')		For Horizontal (Up To 60')	
	in	mm	in	mm
	500	8	203	6
750	8	203	6	152
1000	8	203	6	152
1250	10	254	8	203
1500	10	254	10	254
1750	12	305	12	305
2000	12	305	12	305

All joints in metal intake air systems must be secured using corrosion resistant fasteners and sealed using a suitable Silicone caulk. If PVC or CPVC is used, the joints must be cleaned with a suitable solvent and connected using a solvent based PVC cement. **The combustion air system MUST be supported by the building structure not the boiler/water heater.**

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

CAUTION: A combustion air damper interlocked with the unit should be installed in the intake air pipe when the infiltration of subfreezing air could occur, otherwise the unit could freeze up voiding the warranty!

Intake Air Option – Vertical Guidelines

The maximum equivalent length for the vertical intake air pipe is **60 ft, 18.3 m**. Each 90° elbow and the intake air terminal are equal to **10 linear ft, 3.0 m** of pipe, see Table 3.

An approved, nonrestrictive intake air terminal must be used. The intake air terminal must terminate as shown in Figure 3. The penetration point in the roof must be properly flashed and sealed.

Intake Air Option – Horizontal Guidelines

The maximum equivalent length for the horizontal intake air pipe is **60 ft, 18.3 m**. Each 90° elbow and the intake air terminal are equal to **10 linear ft, 3.0 m** of pipe. If horizontal runs exceed **5 ft, 1.5 m** they must be supported at **3 ft, 0.9 m** intervals with overhead hangers. The certified intake air terminal from RBI must be used, see Figures 1, 2 and 4.

GENERAL VENTING GUIDELINES

WARNING: The vent installation must be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1/NFPA 54-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!

All vent systems must be fully supported by the building structure and not by the boiler/water heater. Appropriate thimbles and fire-stops must be used where required.

WARNING: Common vent systems must be properly engineered and sized to provide a negative draft of .03 in, 0.8 mm to .1 in, 2.5 mm W.C. at the flue outlet. Common positive pressure vent systems are not to be used. Improper installation can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

VENT SYSTEM OPTIONS

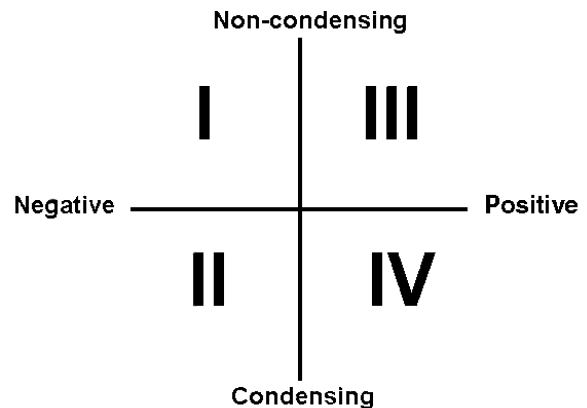
The flue products in the vent system may be cooled below their dew point and form condensate in the flue. The materials used for a **Category IV** vent must be resistant to any corrosive damage from flue gas condensate. The flue from a **Category IV** vent system must have a condensate drain with provisions to properly collect and dispose of any condensate that may occur in the venting system.

The Futera Fusion may be vented the following ways:

- 1) **Direct Vent, Positive Pressure, Category IV** uses a vent system certified to UL 1738 for installations in the United States, ULC S636 for installations in Canada. Combustion air is piped from the outdoors to the blower inlet.
- 2) **Side Wall Vent, Positive Pressure, Category IV** uses a vent system certified to UL 1738 for installations in the United States, ULC S636 for installations in Canada. Combustion air is obtained from the space in which the unit is installed.

NOTE: All venting and combustion air material supplied by installer. All venting materials must be approved for the application. Consult the vent manufacturer's product literature.

ANSI Categorization



NOTE: Must consult factory when venting single or multiple unit(s) over 60 equivalent feet. Mechanical system may be required.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

DIRECT VENT, POSITIVE PRESSURE, CATEGORY IV

In this configuration the boiler/water heater blower is used to push the flue products to the outdoors while drawing combustion air from the outdoors. The Intake Air Option instructions under the “COMBUSTION AIR & VENTILATION” section must be followed! The vent system must be sized per Table 4.

Table 4 – Category IV

Model Size	Pipe Diameter (Up to 60')	
	in	mm
500	5	127
750	5	127
1000	6	152
1250	6	152
1500	8	203
1750	10	254
2000	10	254

Horizontal Direct Vent Systems – Figures 1 & 2

The vent materials used in horizontal vent systems must be certified to UL 1738 for installations in the United States, ULC S636 for installations in Canada. The certified vent terminal from RBI must also be used.

The maximum equivalent length for the horizontal vent pipe is **60 ft, 18.3 m**. Each 90° elbow and the vent terminal are equal to **10 linear ft, 3.0 m** of pipe. If any part of a single wall metal vent system passes through an unheated space, it must be insulated with insulation rated for **400° F, 204°C**. Structural penetrations must be made using approved fire-stops. For best results, horizontal vent systems should be as short and straight as possible.

The vent system must be both gas tight and watertight. All seams and joints in metal pipes must be joined and sealed in accordance with the vent system manufacturer’s instructions.

When horizontal vent runs exceed **5 ft, 1.5 m** they must be supported at **3 ft, 0.9 m** intervals with overhead hangers. The vent system must be pitched down, toward the vent terminal, **1/4 in/ft, 20 mm/m**. If any part of a single wall metal vent system passes through an unheated space it must be insulated with insulation rated for **400°F, 204°C**.

Horizontal vent systems shall terminate at least **4 ft, 1.2 m** below, **4 ft, 1.2 m** horizontally from or **1 ft, 0.30 m** above any door, window or gravity air inlet into any building. It must not terminate less than **4 ft, 1.2 m** horizontally from, and in no case above or below, unless a **4 ft, 1.2 m** horizontal distance is maintained, from electric meters, gas meters, regulators and relief equipment and not less than **7 ft, 2.1 m** above adjacent public walkway. The bottom of the vent terminal(s) shall be located at least **5 ft, 1.5 m** above the air intake terminal(s) unless there is a minimum **5 ft, 1.5 m** horizontal separation between them. Avoid terminal locations likely to be affected by winds, snowdrifts, people and pets. Protect building materials and vegetation from degradation caused by the flue gases.

Vertical Direct Vent Systems – Figure 3

If any part of a single wall metal vent system passes through an unheated space, it must be insulated with insulation rated for **400°F, 204°C**. Structural penetrations must be made using approved fire-stops.

An approved, nonrestrictive vent terminal must be used. The top of a vertical vent system must extend at least **5 1/2 ft, 1.7 m** above the roof surface and maximum snow line that it passes through, **4 ft, 1.2 m** above the intake air terminal, see Figure 3.

In addition the vent system must conform to the dimensions shown in Figure 3. The penetration point in the roof must be properly flashed and sealed.

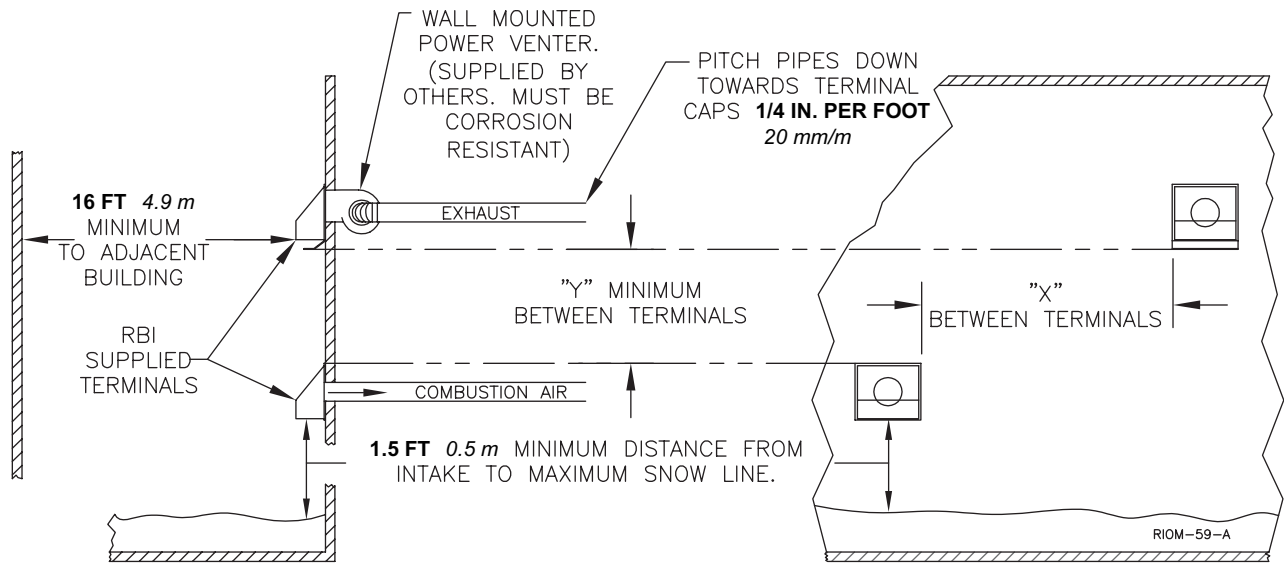
The vent system must be gas tight. All seams and joints in metal pipes must be joined and sealed in accordance with the vent system manufacturer’s instructions.

Combination Direct Vent Systems – Figure 4

The boiler/water heater can be vented vertically with the intake air piped horizontally through an outside wall. Follow the instructions in the Intake Air Option – Horizontal Guidelines on page 5. Also follow the general instructions in the “COMBUSTION AIR & VENTILATION” and “GENERAL VENTING GUIDELINES” sections.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Figure 1– Horizontal Air Intake and Venting for a Single Direct Vent System



When running horizontal combustion air and venting for single or multiple units, exhaust and combustion air terminals must be installed on the same plane (outside wall) in order to prevent pressure differences due to prevailing winds. In cold climates, double-wall or insulated inlet pipe recommended to prevent condensation.

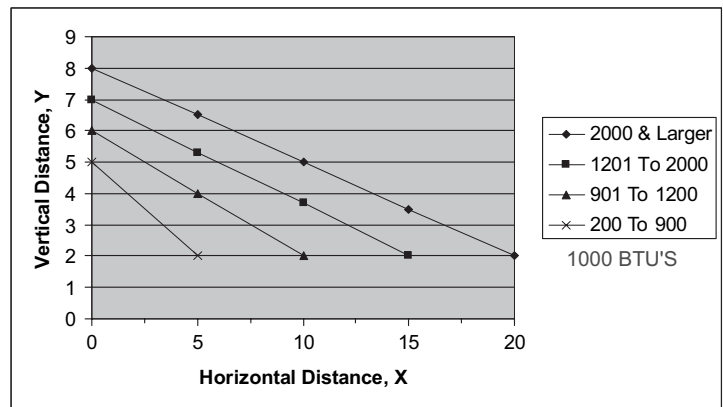
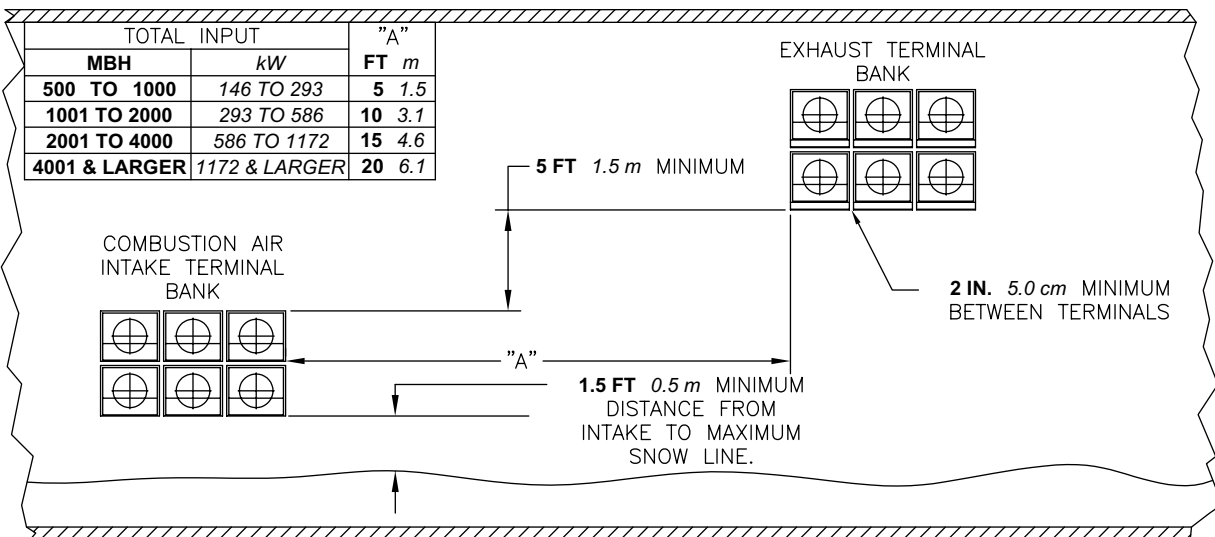


Figure 2 – Horizontal Air Intake and Venting for Multiple Direct Vent Systems



TOTAL INPUT		"A"
MBH	kW	FT m
500 TO 1000	146 TO 293	5 1.5
1001 TO 2000	293 TO 586	10 3.1
2001 TO 4000	586 TO 1172	15 4.6
4001 & LARGER	1172 & LARGER	20 6.1

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Figure 3 - Vertical Air Intake and Venting for Direct Vent System

Note: Locate exhaust terminal downwind to reduce flue gas recirculation.

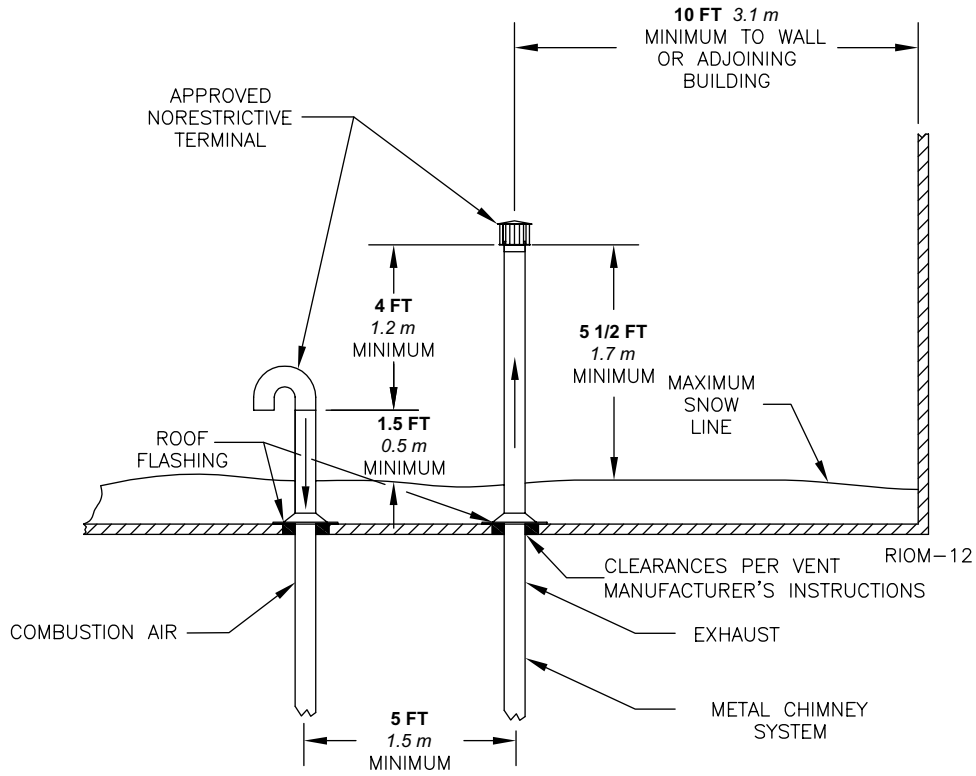
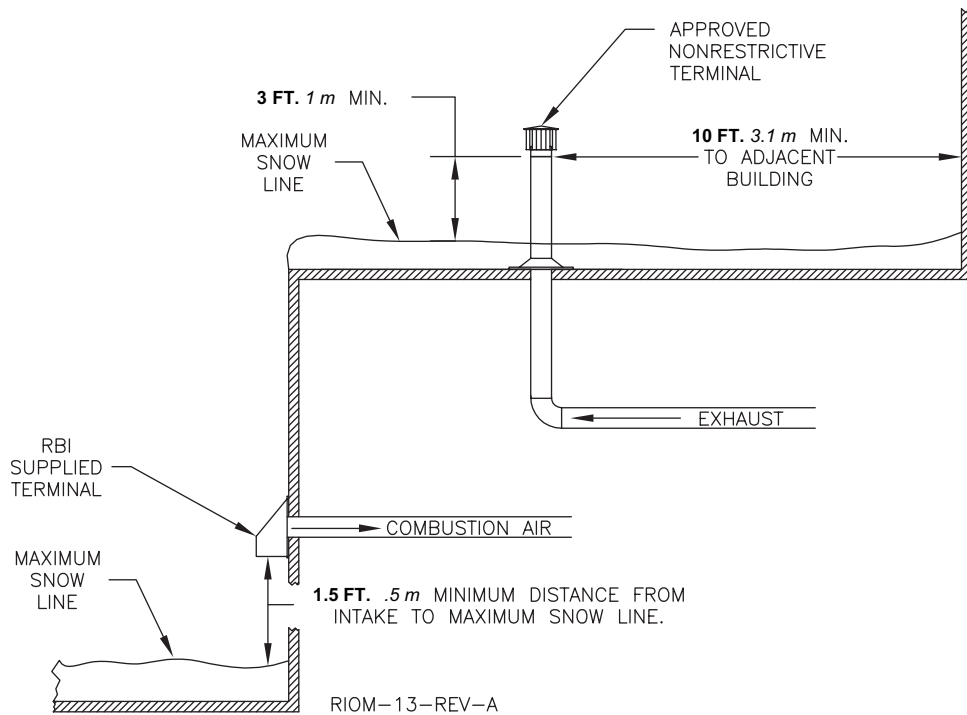


Figure 4 – Combination Direct Vent Systems



FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

SIDE WALL VENT, POSITIVE PRESSURE, CATEGORY IV

In this configuration the boiler/water heater blower is used to push the flue products horizontally to the outdoors, see Figure 5. The air for combustion is taken from the space in which the unit is installed. The applicable instructions under the "COMBUSTION AIR & VENTILATION" section must be followed! The vent guidelines under the Horizontal Direct Vent Systems section must also be followed.

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!

NOTE: When using a listed metal chimney system the chimney system manufacturer's instructions must be followed.

Figure 5 – Side Wall Venting

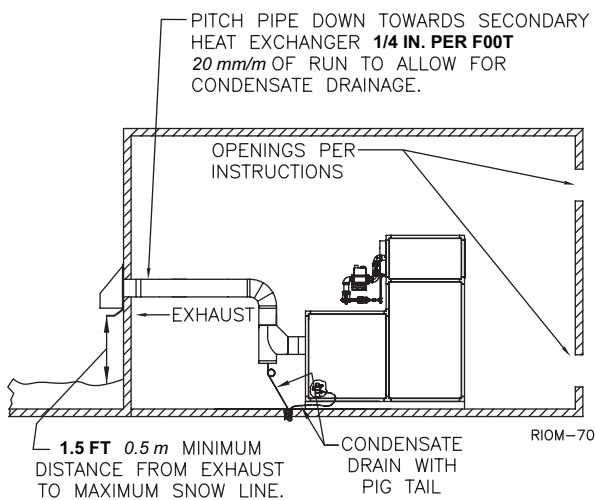
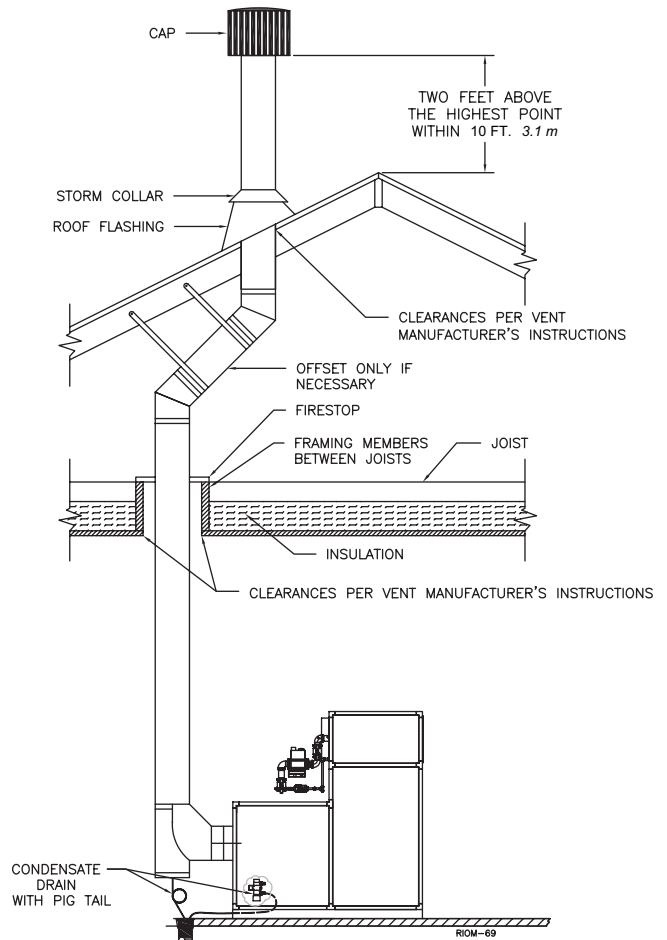


Figure 6 – Vertical Venting
with a Metal Chimney System



FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

OUTDOOR VENTING

When installed outdoors the Futera Fusion must be fitted with the factory supplied outdoor hood, air intake adapter with filter and exhaust terminal, see Figure 7A. Multiple units must be spaced per Figure 7B.

The boiler/heater must be at least **2 ft, .62 m** from any door, window or gravity air inlet into any building and at least **3 ft, 1 m** from any overhang unless local codes dictate differently.

Avoid locations where wind deflection off of adjacent walls, buildings or shrubbery might cause a downdraft. The unit(s) should be located at least **3 ft, 1 m** from structures. Outdoor installations are not recommended in areas where the danger of snow blockage exists.

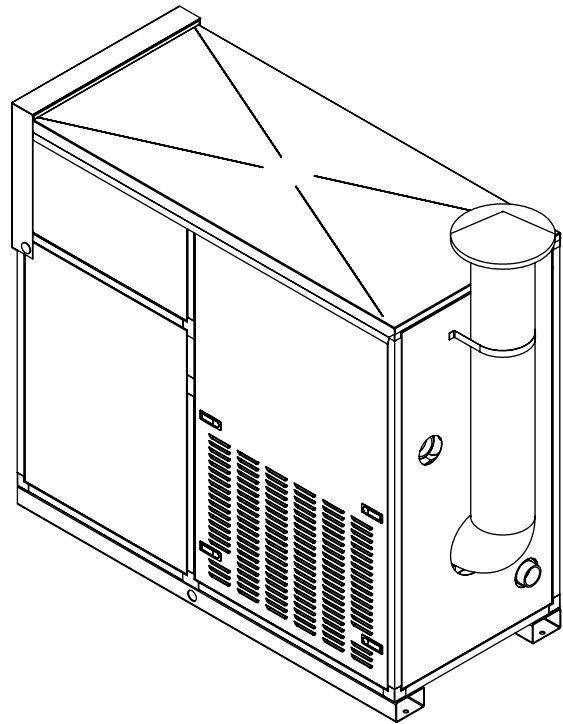
CAUTION: Do not place the boiler/water heater in a location that would subject it to runoff from adjacent buildings or damage may occur voiding the warranty!

Outdoor Installations

WARNING: The Futera Boiler is certified for outside installations in temperate climates only.

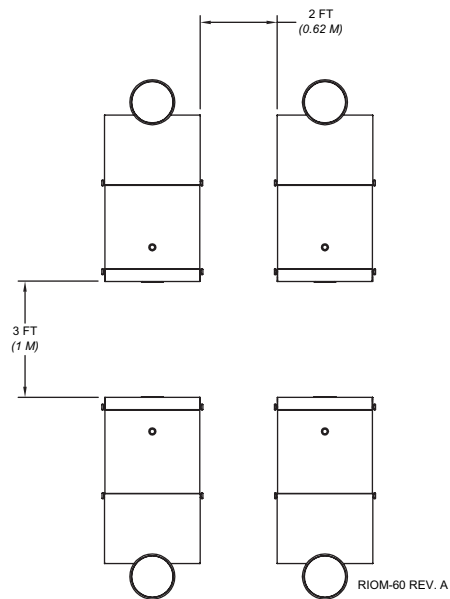
1. The condensate traps located under the secondary heat exchanger and the vent pipe must be wrapped with heat tape to ensure the traps never drop below 32°F.
2. The vent pipe must be insulated to prevent freezing of condensate in the pipe.
3. The boiler and system must be filled with an ethylene glycol/water antifreeze mixture not to exceed 50% glycol by volume.
4. All water piping exposed to low temperatures must be insulated.

Figure 7A – Outdoor Venting



RIOM-86

Figure 7B – Multiple Outdoor Units



RIOM-60 REV. A

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

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 scaling in the copper heat exchanger tubes is NOT covered under the manufacturer's warranty, see Table 7. 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 7.

NOTE: 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.

Freeze Protection

Installations in areas where the danger of freezing exists are not recommended unless proper freeze protection is provided. The following precautions MUST be observed:

1. A continuous flow of water through the unit MUST be maintained! The pump responsible for flow through the boiler/water heater must run continuously!
2. An ethylene glycol/water mixture suitable for the minimum temperature that the unit will be exposed to must be used. The pump must be capable of producing a minimum of 15% more flow and overcoming a 20% increase in head loss. Domestic water systems must be isolated from the water heater by the use of a heat exchanger or other approved method.
3. If the unit must be shut off for any reason the electric, gas and water supplies MUST be shut off and the unit and its pump completely drained.

CAUTION: Improper outdoor installation of this unit can cause boiler failure voiding the manufacturer's warranty!

Condensate Piping

The condensate trap provided with the boiler must be attached to the bottom pan and piped to a suitable floor drain or condensate pump. If a condensate neutralization device is installed, it must be positioned prior to boiler room drain. Condensate fill trap must be maintained with fluid.

Relief Valve

Pipe the discharge of the pressure relief valve as shown in Figure 8.

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 control panel 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 in, 25 mm** 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, 82.7 kPa** must be maintained.

Bleed Air From Boiler

Open the water heater piping bleed valves one at a time, to purge the air trapped in the primary and secondary heat exchangers. Refer to piping drawings (Figures 9 & 11) for bleed locations.

Heating Boiler Piping Connections

The supply and return connections should be sized to suit the system, see Table 6.

Table 6 – Supply & Return Pipe Sizing

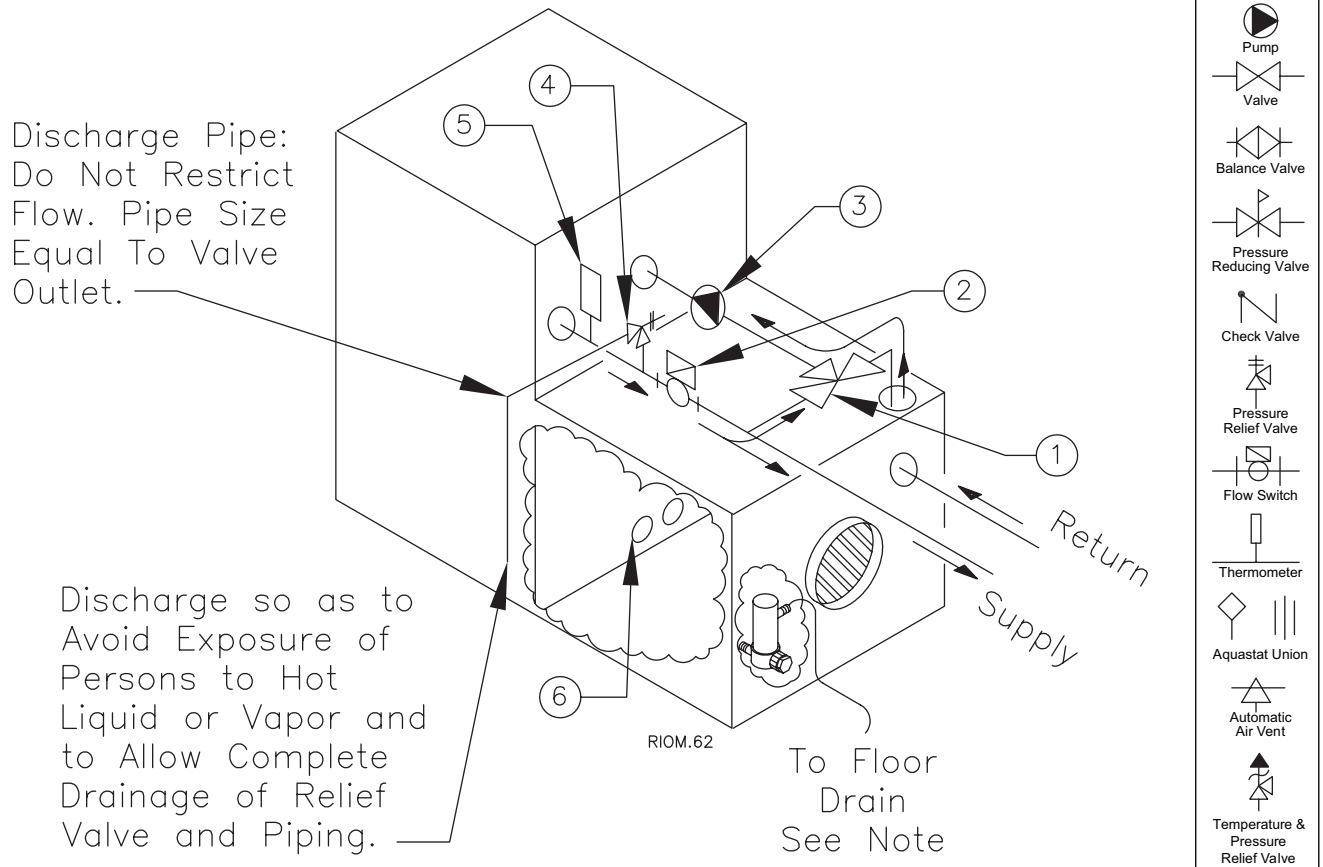
Model Size	Supply Size	Return Size
500 thru 1000	2" NPT	2" NPT
1250 thru 2000	2 1/2" NPT	2 1/2" NPT

Pump Requirements

This low mass boiler requires a continuous minimum water flow for proper operation. The boiler pump is sized to overcome the head loss of the boiler and the near piping in order to achieve the required temperature rise. Table 7 provides the heat exchanger pressure drop and temperature rise figures. The temperature rise across the boiler must never exceed **35°F, 19.4°C**. The adjustable pump delay turns the pump on each time the burner fires and runs the pump for 20 to 600 seconds after the call for heat is satisfied.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Figure 8 – Futera Fusion Piping



NOTE:
Fill condensate drain trap with water or approved anti-freeze solution prior to start-up.

Item Number	Description
1	3-Way Valve
2	Flow Switch
3	Circulator
4	Pressure Relief Valve
5	T&P Gauge
6	Primary Heat Exchanger Drain Valves
7	Condensate Drain Trap

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

CAUTION: A temperature rise outside of the range listed in Table 7 indicates that the flow rate through the heat exchanger is incorrect which will damage the heat exchanger voiding the warranty! The maximum allowable temperature rise is 35°F, 19.4°C.

The maximum allowable flow rate through a Futera Fusion boiler is 97 GPM, 6.1 L/s on 500 through 1000 models and 136 GPM, 8.6 L/s for 1250 through 2000 models. The Cupro-Nickel heat exchanger allows for 108 GPM, 6.8 L/s on 500 through 1000 models and 151 GPM, 9.5 L/s on 1250 through 2000 models.

Table 7 - Temperature Rise Table

		$\Delta T = 15^{\circ}\text{F}$		$\Delta T = 8.3^{\circ}\text{C}$	
Model Number	Flow Rate GPM	Total Loss* Ft	Flow Rate L/s	Total Loss* kPa	
500	58.0	8.8	3.7	26.3	
		$\Delta T = 20^{\circ}\text{F}$		$\Delta T = 11.1^{\circ}\text{C}$	
Model Number	Flow Rate GPM	Total Loss* Ft	Flow Rate L/s	Total Loss* kPa	
750	65.3	10.5	4.1	31.4	
1250	108.8	11.6	6.9	34.7	
		$\Delta T = 25^{\circ}\text{F}$		$\Delta T = 13.9^{\circ}\text{C}$	
Model Number	Flow Rate GPM	Total Loss* Ft	Flow Rate L/s	Total Loss* kPa	
750	52.2	7.7	3.3	23.0	
1250	87.0	8.2	5.5	24.4	
1500	104.4	11.6	6.6	34.7	
1750	121.8	14.7	7.7	43.9	
		$\Delta T = 30^{\circ}\text{F}$		$\Delta T = 16.7^{\circ}\text{C}$	
Model Number	Flow Rate GPM	Total Loss* Ft	Flow Rate L/s	Total Loss* kPa	
1000	58.0	9.5	3.7	28.4	
1500	87.0	8.5	5.5	25.4	
1750	101.5	10.6	6.4	31.7	
2000	116.0	13.8	7.3	41.2	

*Includes primary, secondary, mixing valve and piping.

Low Water Cutoff

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

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

Expansion Tank & Air Separator

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. An air scoop and automatic air vent must also be installed to eliminate air trapped in the system.

Primary/Secondary Piping

Figure 9 shows a typical primary/secondary piping system. Boilers connected to heating systems using zone valves, zone pumps, or systems that have excessive flow rates must be isolated from these systems to protect the boiler.

Multiple Boiler Systems

Systems using multiple boilers can also be installed using a primary/secondary manifold system, Figure 11.

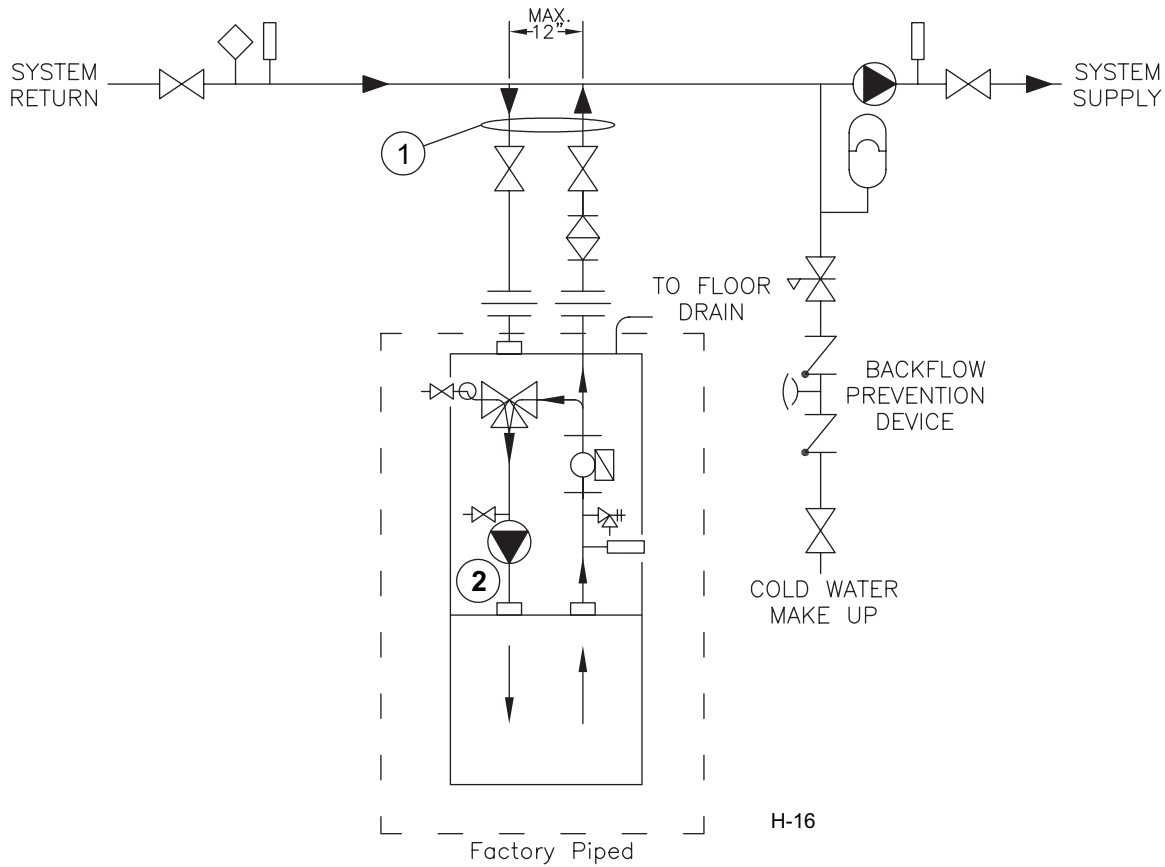
Piping For Use With Cooling Units

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.

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.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Figure 9 - Typical Primary/Secondary, Low Temperature Piping System
(See Notes)



	Pump
	Valve
	Balance Valve
	Pressure Reducing Valve
	Check Valve
	Pressure Relief Valve
	Flow Switch
	Thermometer
	Aquistat Union
	Automatic Air Vent
	Temperature & Pressure Relief Valve
	Vacuum Relief Valve
	Drain Valve (Typ.)
	3-Way Mixing Valve

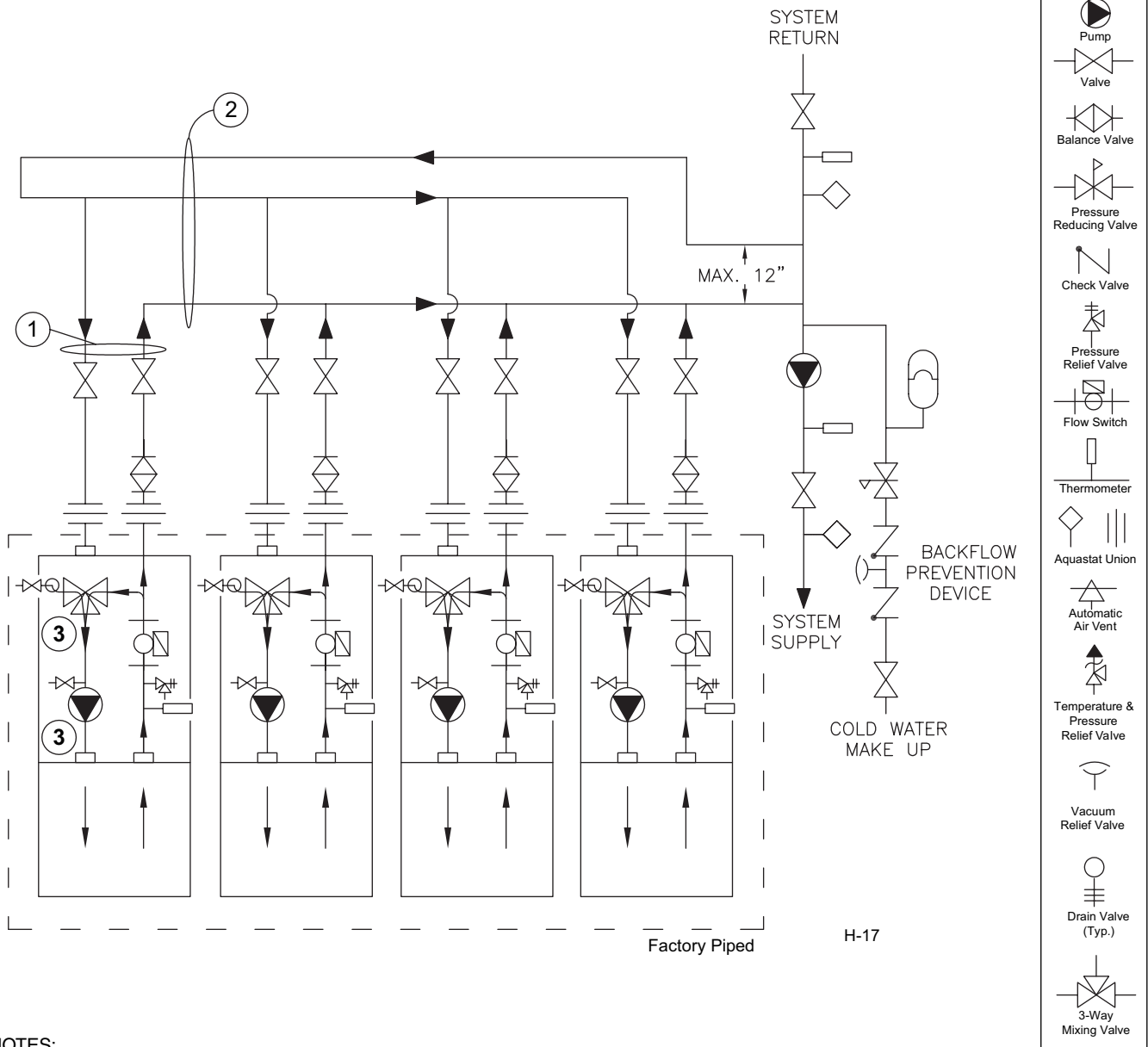
NOTES:

1. Boiler circuit piping must be sized large enough to handle maximum flow through unit.
2. **Boiler and pump purging required. Air must be purged from 3-way valve after the boiler is filled. Use purge valves provided. Purge valve may be located on pump flange. On multiple boiler installations the flow switch may fail due to trapped air. See manual for procedure.**
3. All boilers furnished with factory mounted outlet water temperature gauge.

Notice: These drawings show suggested piping configuration and valving. Check with local codes and ordinances for specific requirements.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Figure 11 - Multiple Boiler Piping (See notes)



NOTES:

1. Boiler circuit piping must be sized large enough to handle maximum flow through each unit.
2. System loop pipe diameter must be sized large enough to handle maximum flow through all units.
3. **Boiler and pump purging required. Air must be purged from 3-way valve after the boiler is filled. Use purge valves provided. Purge valve may be located on pump flange. On multiple boiler installations the flow switch may fail due to trapped air. See manual for procedure.**
4. All boilers furnished with factory mounted outlet water temperature gauge.
5. Condensate lines on each unit should be connected for a floor drain.

Notice: These drawings show suggested piping configuration and valving. Check with local codes and ordinances for specific requirements.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

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. No toxic chemicals, such as those used for boiler treatment, are to be introduced into the 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.

Bleed Air From Water Heater

Open the water heater piping bleed valves one at a time, to purge the air trapped in the primary and secondary heat exchangers. Refer to piping drawings (Figures 9 & 11) for bleed locations.

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. See Table 8.

CAUTION: The maximum allowable flow rate through a Futera Fusion water heater is 97 GPM, 6.1 L/s on 500 through 1000 models and 136 GPM, 8.9 L/s for 1250 through 2000 models. The cupro-nickel heat exchanger allows for 108 GPM, 6.8 L/s on 500 through 1000 models and 151 GPM, 9.5 L/s on 1250 through 2000 models.

RBI water heaters are designed to run scale free. Due to the extreme variables of water conditions world wide it is necessary to consider pH values and water hardness in relationship to scaling. It is crucial to consider these two variables when making heat exchanger and pump selections. If local water conditions are extreme, follow the guidelines in the Heat Exchanger Selection Table (Table 8). Scale free operation can be achieved by using water with a hardness between 8 and 18 and by maintaining the pH between 5 and 9. Follow the conditions listed under NORMAL in the table. In some areas of the country additional precautions must be observed due to unusual characteristics of the local water supply. Call the nearest RBI representative for details.

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 proper velocity through the water heater must be maintained in accordance with Table 7 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 7 the flow rate is too low. Scaling and softening of the heat exchanger will occur. **The temperature rise across the water heater must never exceed 35°F, 19.4°C.**

Storage Tank Thermostatic Mixing Valve

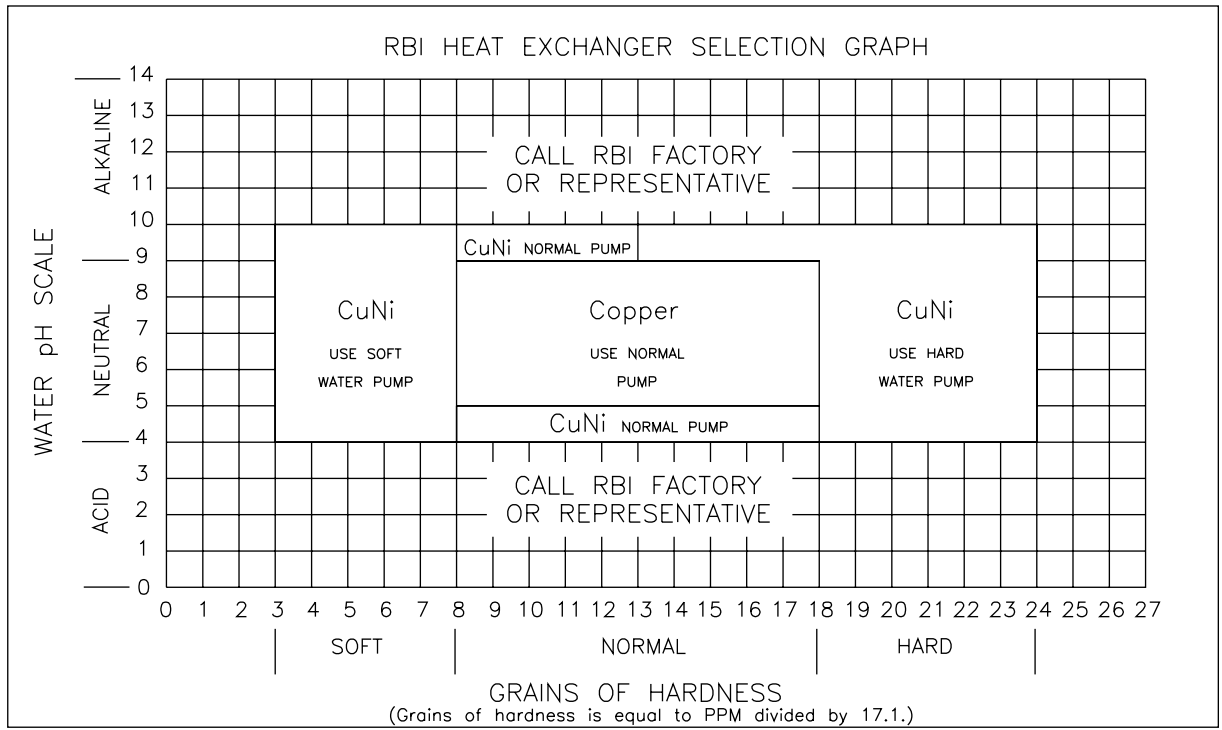
Water can be stored at temperatures above 140°F, 60°C provided that a thermostatically controlled mixing valve is used to temper the hot water to an acceptable temperature before it's supplied for domestic use.

The mixing valve **MUST** be set to prevent a scald injury from occurring, see the caution against scalding.

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.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Table 8 - Futera Fusion Heat Exchanger Selection Graph



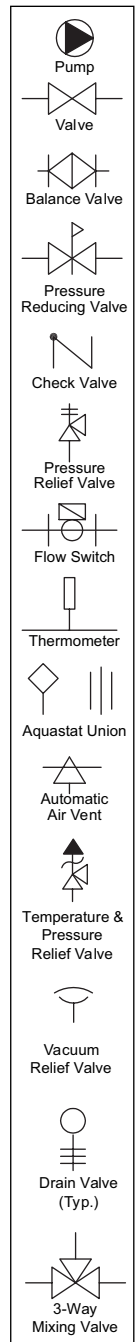
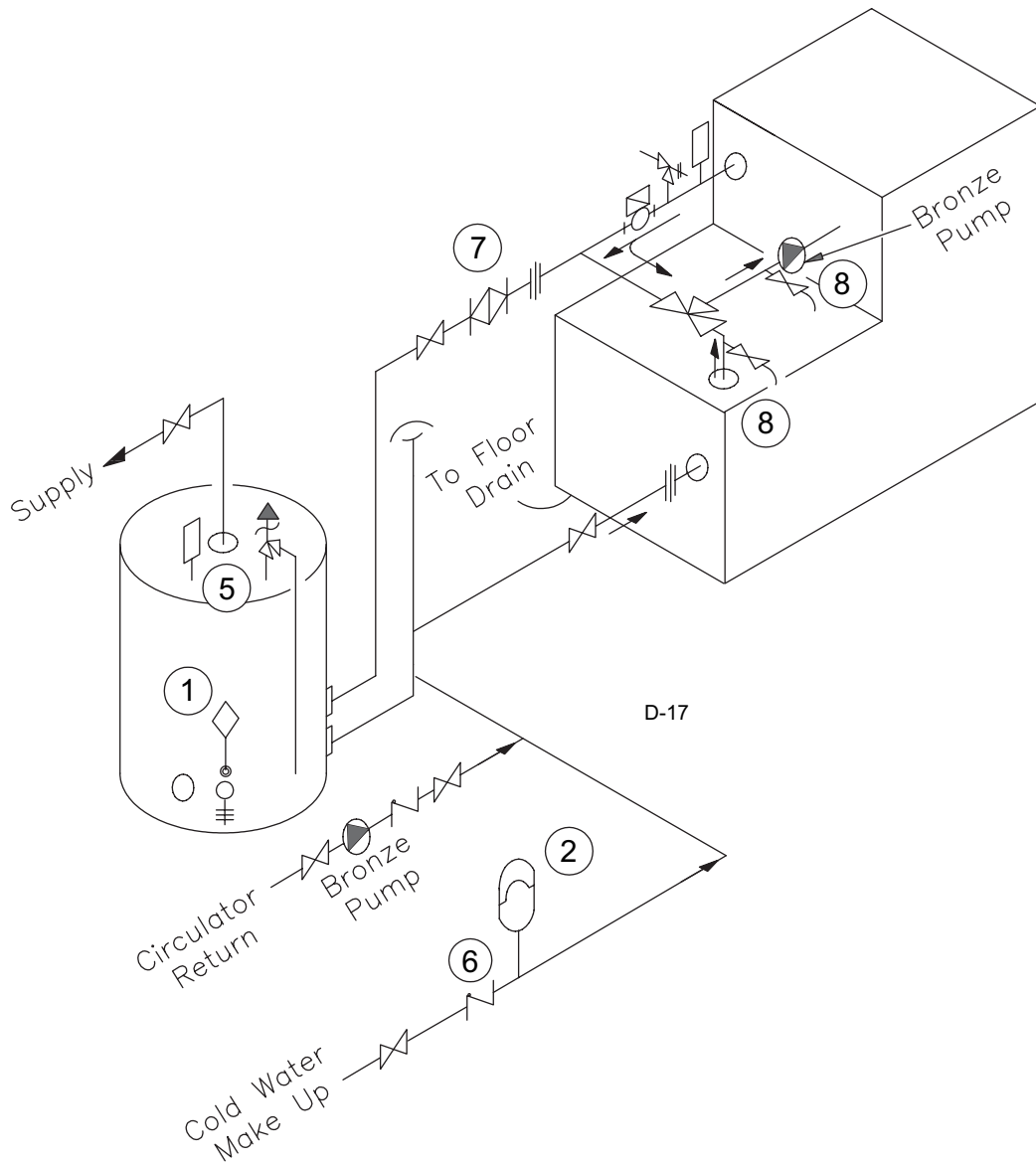
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For hard/soft water pump selection, must consult factory.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Figure 12 - Typical Water Heating Piping (CW Models Only)

(See Notes)



NOTES:

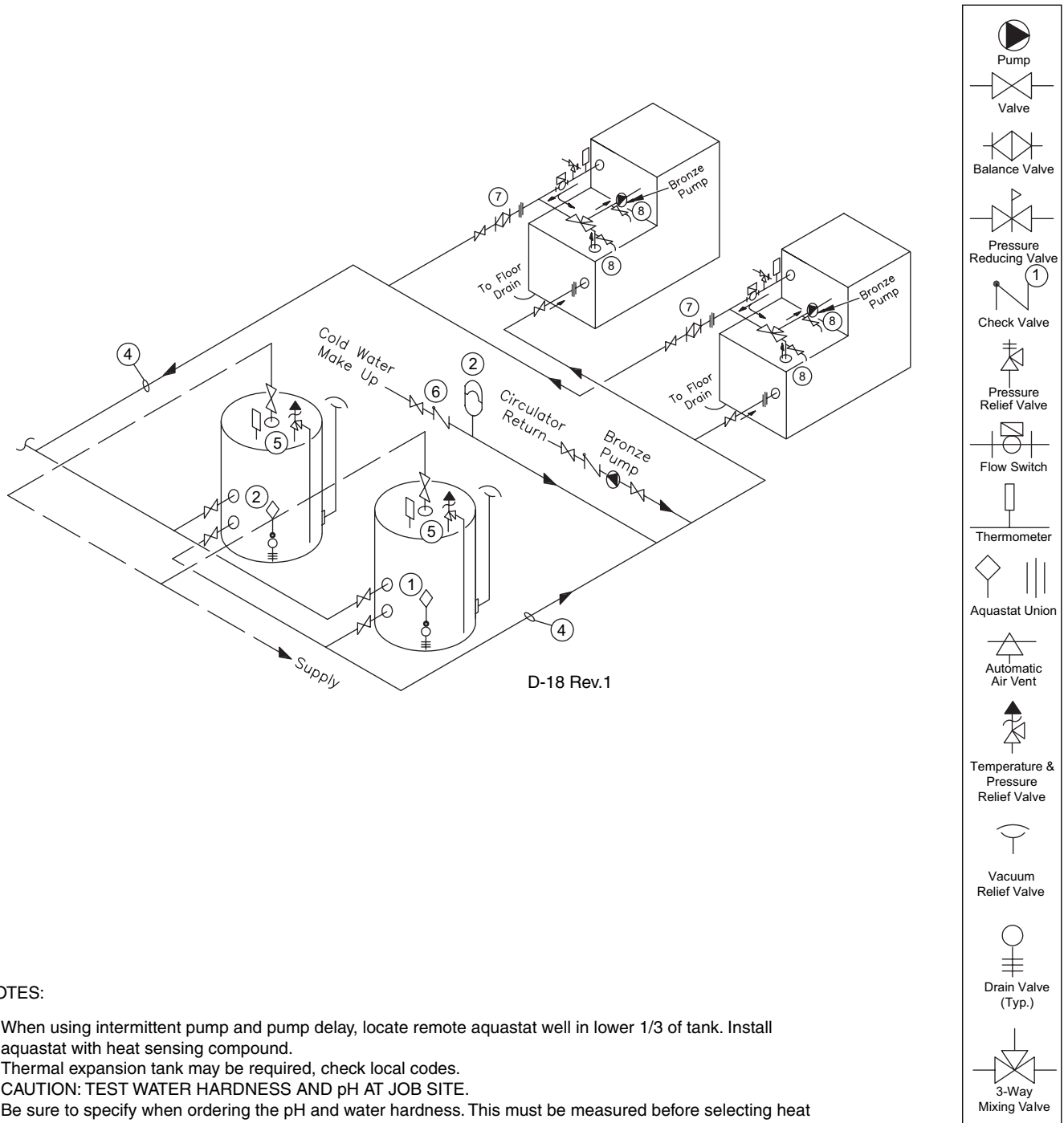
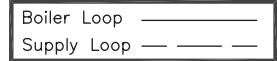
1. When using intermittent pump and pump delay, locate remote aquastat well in lower 1/3 of tank. Install aquastat with heat sensing compound.
2. Thermal expansion tank may be required, check local codes.
3. **CAUTION: MEASURE WATER HARDNESS AND pH AT JOB SITE.**
Be sure to specify when ordering the pH and water hardness. This must be measured before selecting heat exchanger and pump. Consult the Heat Exchanger Graph before making selection.
4. Common piping must be sized for maximum combined heater flow.
5. Hot water tanks should be equipped with a combination temperature & pressure relief valve.
6. MA Code requires an 1/8" hole in check valve to compensate for thermal expansion.
7. Use balance valve to set the temperature rise through the boiler. (Delta T)
8. **Boiler and pump purging required. Air must be purged from 3-way valve after the boiler is filled. Use purge valves provided. Purge valve may be located on pump flange. On multiple boiler installations the flow switch may fail due to trapped air. See manual procedure.**

Notice: These drawings show suggested piping configuration and valving. Check with local codes and ordinances for specific requirements.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Figure 13 - Multiple Water Heating Piping (CW Models Only)
(See Notes)

LEGEND:



NOTES:

1. When using intermittent pump and pump delay, locate remote aquastat well in lower 1/3 of tank. Install aquastat with heat sensing compound.
2. Thermal expansion tank may be required, check local codes.
3. CAUTION: TEST WATER HARDNESS AND pH AT JOB SITE.
Be sure to specify when ordering the pH and water hardness. This must be measured before selecting heat exchanger and pump. Consult the Heat Exchanger Graph before making selection.
4. Common piping must be sized for maximum combined heater flow.
5. Hot water tanks should be equipped with a combination temperature & pressure relief valve.
6. MA Code requires an 1/8" hole in check valve to compensate for thermal expansion.
7. Use balance valve to set the temperature rise through the boiler. (Delta T)
8. **Boiler and pump purging required. Air must be purged from 3-way valve after boiler is filled. Use purge valves provided. Purge valve may be located on pump flange. On multiple boiler installations the flow switch may fail due to trapped air. See manual procedure.**

Notice: These drawings show suggested piping configuration and valving. Check with local codes and ordinances for specific requirements.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

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. Gas supply piping must be in accordance with the National Fuel 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. Failure to comply with this warning can result in extensive property damage, severe personal injury or death!

The Futera Fusion comes 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 your RBI representative to resolve the problem.

NOTE: A minimum gas supply pressure of 2 in, 51 mm, W.C. natural or propane and maximum 14 in, 356 mm W.C.. natural or propane, must be available at the safety shutoff valve inlet with the unit(s) operating.

Table 9 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 9 should be used in conjunction with Table 10 to ensure that the gas supply piping has the capacity to meet the demand.

Figure 14 depicts the proper way to connect the boiler/ water heater to the gas supply piping. The manual shut-off valve **MUST** be installed in the supply piping. It should be installed **5 ft, 1.5 m** above the floor where required by local codes. Provide a sediment trap at the bottom of the vertical section of the gas supply pipe upstream of the gas controls.

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 14 – Gas Supply Piping

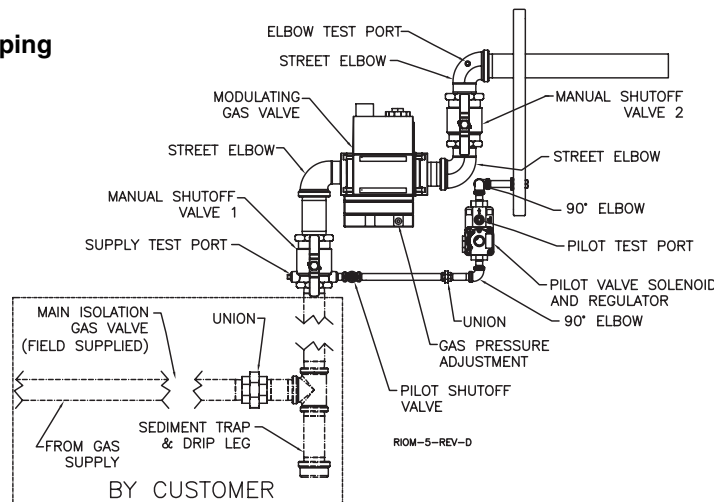


Table 9 – Gas Pipe Capacity

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	1270	1120	1000	890	770	630

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 10 – Equivalent Pipe Length Chart

Nominal Iron Pipe Size, (in)	Type of pipe fitting			
	90° Elbow	Tee ¹	Gate Valve ²	Gas Cock ²
Equivalent 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

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

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/NFPA 54. Main Dungs gas valve supplied with boiler/water heater does not require external venting.

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.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

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 its manual shut off valve, see Figure 14. 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 or 20 amp circuit breaker for the boiler/water heater and pump, see Table 11. A properly rated 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.

Table 11 - Futera III Electrical Requirements

Futera III Model	Recommended Circuit Breaker (Amps)	*Running Amps
MB/MW 500	15	3.9
MB/MW 750 - 1000	15	6.0
MB/MW 1250 - 2000	20	11.4

*Use separate circuit breaker that is properly sized for pump and pump contactor.

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. Use appropriate wiring materials for units installed outdoors. The wire size must be compatible with the total amp draw of the circuit.

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

GENERAL 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 (Fill System)

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, 82.7 kPa** system pressure is maintained at the highest point in the system piping. If a make-up water pump is used adjust it to maintain a minimum **12 psig, 82.7 kPa** system pressure.

Open the boiler piping bleed valves one at a time, to purge the air trapped in the primary and secondary heat exchanger. Refer to piping drawings (Figures 9 & 11) for bleed locations.

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 "OPERATING INSTRUCTIONS" section. Run the boiler for at least an hour. The system pump(s) and all radiation units 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 days of operation.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

OPERATING 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.

DANGER: Propane gas may not always be detected by smell. Propane gas is heavier than air and can collect in low areas.

Propane gas can ignite or explode if an ignition source is present and result in death, serious injury and property damage!

FOR YOUR SAFETY

- Have only qualified licensed professionals install, service and maintain this appliance and your gas system in accordance with all applicable codes.
- If you suspect a leak:
 1. Have everyone leave the building immediately.
 2. Do not attempt to light any appliance.
 3. Do not touch any electrical or electronic switches in the building.
 4. Do not use any phone in the building.
 5. Call your gas supplier from a phone outside of the building.
 6. 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.

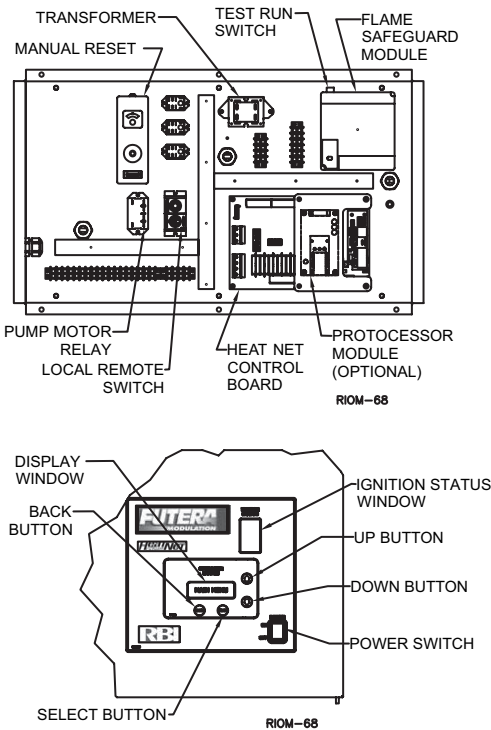
Operating Instructions

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 to off and disable any outside (BMS) call for heat.
3. Turn off all electric power to the appliance.
4. Close main isolation gas valve (field supplied), Figure 14.
5. Purge the gas piping up to the manual valve ahead of the main gas control of air. When the bleeding is complete, check all gas joints up to the gas valve for leaks.
6. Wait five (5) minutes to clear out any gas.
7. Install a fitting at the supply test port and connect a manometer having a minimum range of **20 in, 508 mm WC** to it, Figure 14.
8. Remove the 1/8" pipe plug from the pilot test port and connect a manometer having a minimum range of **6 in, 154 mm WC** to it.
9. Open the main isolation gas valve (field supplied), Figure 14.
10. Place the "Remote/Local" switch to Remote inside control cabinet, Figure 15.
11. Turn the power switch on the front of the boiler to "on". It will light up when the power is on. If all interlocks are properly closed, the display will say "Standby", Figure 15.
12. Create a min input demand by jumping the TI terminals on HeatNet control board, Figure 16.
13. The boiler will begin the start sequence.
14. When the main display reads "PILOT RUNNING" and the flame current is 5 VDC, switch the Honeywell 7800 to the "test" position, Figure 15. This will hold the Honeywell 7800 in its ignition state.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

15. Adjust the pilot pressure per the CHECKING, ADJUSTMENT & OPERATION section.
16. Remove the demand from the 7800 control by opening the TI terminals, allowing the boiler to stop.

Figure 15 - HeatNet Control Panel



17. Close main isolation gas valve (field supplied), Figure 14.
18. Remove the manometer fitting from the pilot test port and replace the plug. Place monitor tube on to elbow test port located down stream of main gas valve, Figure 14.
19. Switch the Honeywell 7800 back to “run”.
20. Create a min (TI) input demand as before. The boiler will begin the start sequence.
21. Monitor the flame current on the 7800. No flame current should be detected and the 7800 should lock out. If flame current is detected at any time up to the 7800 locking out, the 120V wiring on the ignition transformer must be reversed and the test run again to insure that no flame is detected.

22. Open main isolation gas valve (field supplied).
23. Reset the Honeywell 7800. The boiler will start and will run at minimum input rate.
24. **Setting the low fire:** Allow the low fire to settle out for a few minutes and observe the combustion reading. Refer to “Combustion Reading” table for proper combustion readings and elbow pressure, Table 12.

The low fire O₂-CO₂ can be adjusted in the field by opening the low fire adjustment door located on the forward facing side of the main gas valve. Inserting an allen wrench and rotating the allen screw clockwise will increase the CO₂ and lower the O₂, rotating counter clockwise will decrease the CO₂ and increase the O₂. **DO NOT LEAVE THE BURNER IN AN INFRARED STATE.** A few random speckles of red are fine, but large concentrations of spots or large areas of red are not. If large amounts of red concentrations are observed, verify combustion readings.

25. Jumper the “AA” terminals located on the HeatNet control board. The boiler input will rise to its maximum input, “Run 100%”, see Figure 16.
26. Allow the boiler to reach steady state and verify supply gas pressure and check input rates as explained in the “Gas Supply Piping” section. Also, refer to “Combustion Reading” table for proper combustion readings and elbow pressure, Table 12.
27. Remove jumper “AA” and allow boiler to settle into minimum input. Observe the combustion readings and make any final adjustments. When finished remove jumper on terminals “T1”, see Figure 16 and replace test ports to normal state.
28. Boiler allows for many modes of operation and control methods. Reference the “Control HeatNet IOM” and the “Control-Programming Examples” for instruction.

Table 12 - Combustion Readings

	Natural Fuel	Propane Fuel
CO ₂ %	8.0 - 8.5 (33%)	9.4 - 9.9 (33%)
	8.3 - 8.8 (100%)	9.7 - 10.3 (100%)
O ₂ %	6.6 - 5.8 (33%)	6.6 - 5.8 (33%)
	6.2 - 5.2 (100%)	6.2 - 5.2 (100%)

WARNING: Improper wiring of the ignition transformer can result in an explosion causing extensive property damage, severe personal injury or death!

*For factory set gas manifold (elbow) pressures see label on inner cabinet door.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

INSTRUCTIONS DE MISE EN MARCHÉ

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 détecter 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 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 to its lowest setting.
2. Turn off all electric power to the boiler 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.

SEQUENCE OF OPERATION

NO DEMAND

Standby

1. The boiler is idle with no interlocks in the fault condition.

DEMAND

Pre-Purge

1. The blower operates at purge RPM. The water flow interlock must 'make' within 15 seconds after the demand signal is initiated.
2. The Honeywell 7800 starts a 10 second purge delay once the air prove switch contacts close.

Pilot Run - %Input

1. The blower operates at minimum ignition setting. See the calibration section in the "HeatNet Control-IOM" to enter the calibration menus.
2. The ignition transformer is energized. The pilot solenoid valve opens for the 10 second pilot ignition trial.

Main Run %Input

1. The main gas valve opens.
2. The ignition transformer is de-energized.
3. The pilot solenoid valve closes.
4. The blower stays at the minimum input setting for 3 seconds then operates at demand % input. See the calibration section in the "HeatNet Control-IOM" to enter the calibration menus.

NO DEMAND

Post-Purge

1. The main gas valve closes.
2. The blower operates at purge RPM for 10 seconds.
3. The boiler is idle with no interlocks in the fault condition.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

CHECKING & ADJUSTMENTS

Spark Gap

With the main and pilot gas manual valves in the closed position energize the unit. Observe the trial for ignition to confirm that the spark is strong and continuous. If not check and adjust the spark gap as shown in Figures 17 & 18.

Figure 17 – Spark Gap

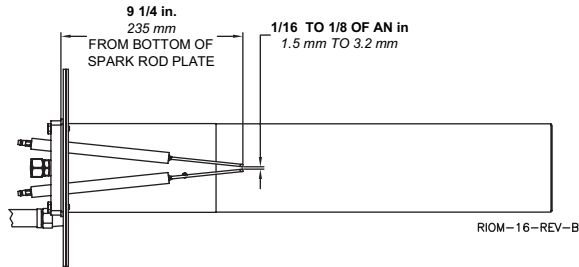
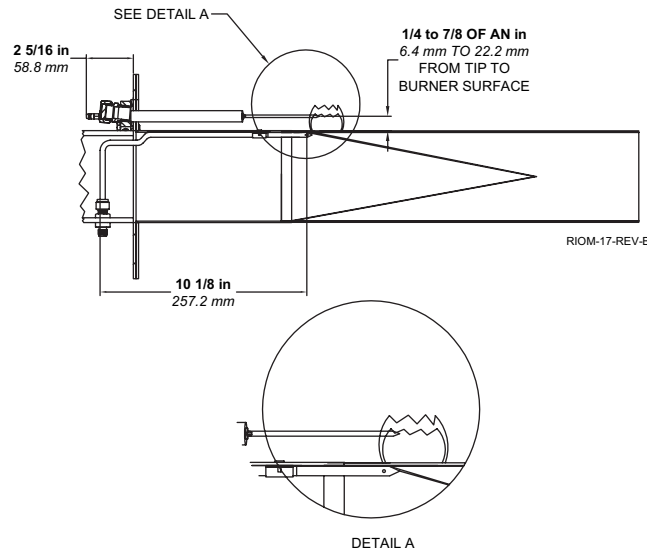


Figure 18 – Spark Rod Position and Pilot Flame



Pilot Adjustment

The pilot pressure has been factory set at 2" and shouldn't need adjustment. To check the pilot pressure close the manual main shut-off valve 2 and the pilot gas shut-off valve, Figure 14. Remove the 1/8" pipe plug from the pilot tee and connect a manometer having a minimum range of 6 in, 152 mm WC to it. Open the pilot gas shut-off valve. With the unit powered, generate a call for heat. When the prepurge is complete the ignition/pilot trial will begin. At this point put the Honeywell RM7800 test switch in the test position. The control will hold in the ignition/pilot sequence allowing you to check the pressure.

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 pressure and counterclockwise to decrease it.
3. Replace the pressure regulator adjustment screw cap.

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

WARNING: The air damper adjustments must only be made by a trained technician using a combustion analyzer! Improper adjustment can result in excessive levels of carbon monoxide or an explosion resulting in severe personal injury or death!

Required Gas Pressure

Provide gas supply pressure at inlet to boiler gas train as follows:

	LP	Nat
Minimum (in W.C.)	2	2
Maximum (in W.C.)	14	14

Measure pressure when the boiler is firing at full rate. Low gas pressure could indicate undersized gas line or insufficient gas supply.

"Static and operating gas pressure required at the gas valve inlet is between 2" W.C. and 14" W.C. for natural gas and 2" W.C. and 14" W.C. propane. If the gas pressure is above this limit, a lock-up style regulator suitable for dead end service such as an Equimeter or Fisher must be installed to prevent increase (creep) of gas pressure when the units are not operating. This pressure regulator (supplied by others) may be installed at the service entrance to each unit or a "master" regulator sized to handle multiple units may be utilized. Consult local gas utility or regulator manufacturer for recommendations to meet specific job site requirements."

Input Rate, Natural Gas

Gas appliances are rated based on sea level operation with no adjustment required at elevations up to 2000 ft, 610 m. At elevations above 2000 ft, 610 m input ratings should be reduced by 4% for each 1000 ft, 305 m.

Check the input rate as follows:

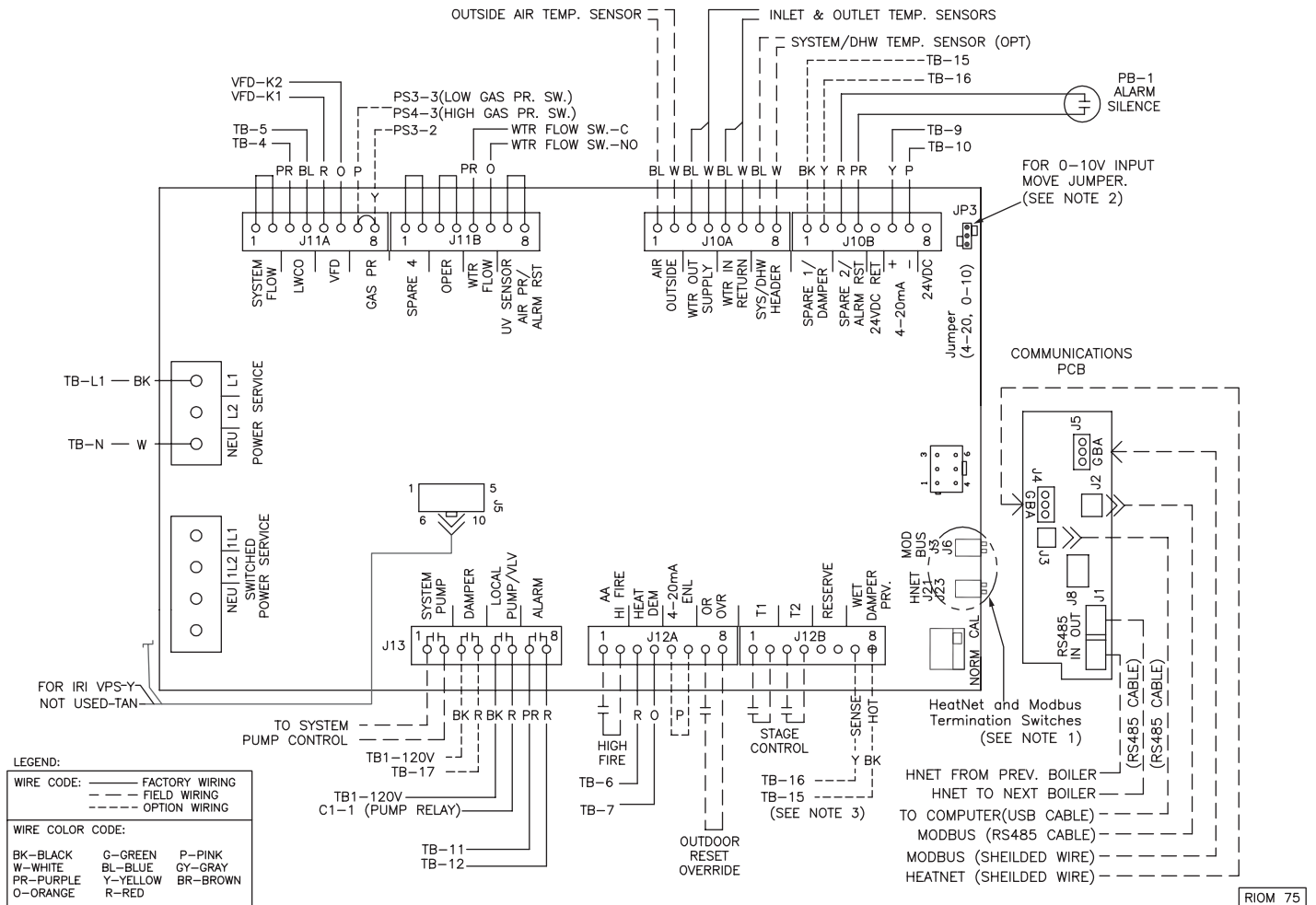
1. Turn off all other gas appliances that use the same gas meter as the boiler/water heater.
2. Call your gas supplier and ask for the heating value of the gas.
3. Start the boiler/water heater and let it run for 15 minutes.
4. Using the gas meter and a stopwatch, clock the time that it takes to burn 10 ft³, 0.28 m³ of gas and divide this time by 10.
5. Insert the heating value and the time, in seconds, into the formula below.
6. Input = (heating value, Btu/hr)(3600)/(time, seconds)
7. If the computed rate deviates by more than 5% from the rated input value of the unit, consult factory.

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 boiler!

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

RBI Field Wiring To HeatNet Board

Figure 16

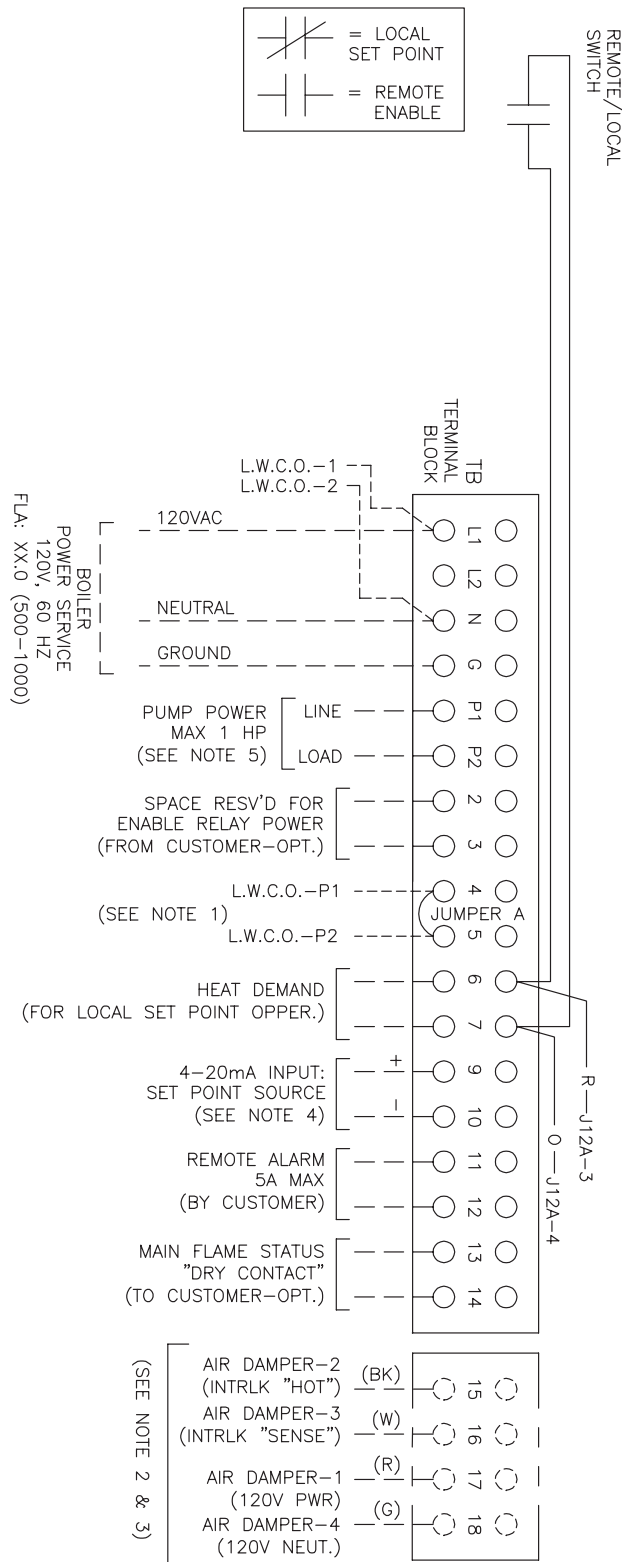


NOTES:

- For master/member systems depress the dip switches J21 and J23 to the “on” position. For the “on” position press the switch down and in towards the board. This needs to be done on the master and the last member to terminate the communication network. For all other member boilers the dip switches will remain in the off position.
- Dip switches J3 and J6 need to be placed in the on position to terminate a modbus communication network when used.
- 0-10V signals can be used in place of 4-20mA input by changing the position of the jumper “JP3”. This jumper is located at the inboard end of the communication PCB.
- Terminal 7 on J12B is the wet prove “sense” terminal. Terminal 8 on J12B is the wet prove “hot” terminal.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

RBI HeatNet Field Wiring To Terminal Block



NOTES:

1. Remove jumper "A" when using a low water cutoff interlock.
2. For multiple boilers utilizing a single combustion air damper or system pump controlled by the master boiler consult factory or obtain publication RIOM-76 for wiring details.
3. For single boilers or multiple boilers with individual dampers connect the end proving switch to main terminal block 15 and 16. Terminals 17 and 18 provide 120V power.
4. There are two ways that a 4-20mA signal can be used to control HeatNet equipped boilers.

Method 1

A 4-20mA signal can be used to directly modulate each boiler from a remote panel or building management system. On multiple boiler installations, there is no communication between boilers, no HeatNet system sensor; therefore no master/member relationship exists.
(Use Menu: Setup: Setpoints: Setpoint Source: Auto)

Method 2

A 4-20mA signal can be used to change the setpoint temperature the HeatNet is maintaining. This can be used on single or multiple boilers with a master/member relationship. (Use Menu: Setup: Setpoints: Setpoint Source: 4-20, then set the parameters for the temperature and boiler start point.)

5. Pump contractor is rated for 1 hp single phase. For larger or 3-phase pumps consult factory wiring diagrams.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

CONTROL DESCRIPTION

Low Water Cutoff

If the boiler is to be installed above radiation or if required by other codes or regulations, install a low water cutoff in appropriate piping. Wire the switch to the "Interlock" contacts as illustrated on "Field Wiring" schematic. Ensure that the low water cutoff device(s) will function properly.

Operating Control

The preferred control setting for potable hot water is **130°F, 54°C**. The operating control should be set to the lowest setting that will satisfy the consumer's needs.

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

High Limit (Aquastat)

The high limit is located in the top control area of the boiler/water heater. A remote capillary bulb is run to a well on the outlet side of the supply header. The high limit can be reset by depressing the red button.

The water heater high limit should be set a minimum of **20°F, 11°C** higher than the operating control. Refer to the HOT WATER SUPPLY section for the proper supply water temperature.

Flow Switch

A flow switch is provided in the water outlet piping to prevent the boiler/water heater from firing without adequate water flow through the heat exchanger.

DIAGNOSTICS

The Futera Fusion has a display that indicates the sequence of operation. The display will also list faults should the unit fail to operate. An explanation of each status message and fault can be located in HeatNet Programming Manual under status screen fault display section.

STATUS SCREEN FAULT DISPLAY

There are numerous interlock switches and software limits that are detected. Each of these, when tripped will produce a display message, an audible beeping, and an alarm relay closure. The fault is displayed first, then after a second, the time the fault occurred is displayed. This cycle will keep occurring until the fault is cleared. These faults are:

HIGH LIMIT: When the high limit aquastat trips the following message is displayed:

FAULT HIGH LIMIT	SYSTEM SET 160°F
---------------------	-------------------------

FAULT 10/27 9:16	SYSTEM SET 160°F
---------------------	-------------------------

The high limit interlock breaks power to the ignition control (shutting it off) and effectively removes any chance of the gas valve receiving power. The Futera Fusion series control will remain powered to display the fault, latch the alarm relay/audible beeper, and to access the log. The interlock is located on J5, HIGH LIMIT.

INTERLOCK SPARE 3: This is a reserved interlock input that is normally jumpered at the factory, but can have a remote interlock connected as a field install. The interlock is located on J11A, SPARE 3.

FAULT INTERLOCK SPARE 3	SYSTEM SET 160°F
----------------------------	-------------------------

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

LOW WATER CUTOFF: If there is a low water condition reported by the low water cutoff switch this fault is displayed. Check that there is water flow and water in the boiler. There is a reset switch located on the LWCO box. The interlock connection is located on J11A, LWCO.

FAULT	SYSTEM SET
LOW WATER CUTOFF	160°F

FLOW SWITCH ERROR: Once the Futera Fusion series boiler receives a call for heat, it closes the circulator pump relay. It then waits 10 seconds to prove flow. If there is no flow, the flow switch alarm will be set. Every 10 seconds the circulator pump relay will cycle ON for 10 seconds and then OFF for 10 seconds to try and establish flow. The interlock connection is located on J11B, WTR FLW.

FAULT	SYSTEM SET
WATER FLOW SWITCH	160°F

VAR FREQ DRIVE: The variable frequency drive, which controls the blower, reports this fault in the event of over current or other conditions that would cause it to shut down. If this is the case, check the fault indicators on the VFD. The interlock is located on J11A, VFD.

FAULT	SYSTEM SET
VAR FREQ DRIVE	160°F

IGNITION CTRL ALARM: The ignition control alarm is displayed if the ignition control detects a fault. This could be a flame failure, air proving switch, or other fault associated with the ignition control. When this fault occurs, you will need to refer to the ignition control for the reason.

FAULT	SYSTEM SET
IGNITION CTRL ALARM	160°F

GAS PRESSURE: The optional gas pressure switches (high pressure and low pressure) are connected in series, so if either trip, a fault will be reported here. A reset switch is located on the gas pressure switches. The interlock is located on J11A, GAS PR.

FAULT	SYSTEM SET
GAS PRESSURE	160°F

IRI ALARM: The optional IRI alarm is the alarm from the gas valve. If this alarm is set check the gas valve.

FAULT	SYSTEM SET
IRI ALARM	160°F

INTERLOCK SPARE 4: This is also a spare interlock (similar to INTERLOCK SPARE 3) for future expansion or use as a field interlock. The interlock is located on J11B, SPARE 4.

FAULT	SYSTEM SET
INTERLOCK SPARE 4	160°F

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

COMBUST AIR DAMPER: If the combustion air damper has been selected for use (MASTER BOILER, AUX FUNCTIONS), and the proof switch does not make, this fault will be displayed.

When the combustion air damper is used, the master's BOILER3/DAMPER relay contacts at J13 are closed. These should be wired to the combustion air damper or preferably an isolation relay. The prove switch on the combustion air damper must be wired to J10B, SPARE 1.

FAULT COMBUSTION AIR DAMPER	SYSTEM SET 160°F
--------------------------------	---------------------

When the master boiler receives a call for heat and needs to start a boiler, the BOILER3/DAMPER relay K5 closes. At the same time, the boiler is started, fires, and continues to fire. If the combustion air damper does not prove within the proof time specified in the combustion air damper menu, the boiler will shut down and display the fault. The fault on the Master boiler can be cleared by removing the call for heat on the master boiler and fixing the combustion air damper problem. A combustion damper fault on a Member boiler can only be cleared by power cycling.

The Master boiler controls a system damper and Member boilers control their own respective dampers. When the call for heat is removed, the damper will remain open for 30 seconds before closing. This allows for post purge cycles to complete.

OPEN *** SENSOR:** If the open sensor fault is displayed, the sensor in the position reported was originally detected, but has since opened. The boiler will shut down on any OPEN sensor.

FAULT OPEN OUTSIDE SENSOR	SYSTEM SET 160°F
------------------------------	---------------------

SHORTED *** SENSOR:** If the shorted sensor fault is displayed, the sensor in the position reported was originally detected, but has since shorted. The boiler will shut down on any SHORTED sensor.

FAULT SHORTED OUTSIDE SENSOR	SYSTEM SET 160°F
---------------------------------	---------------------

DELTA TEMP > 40°F: If the temperature across the heat exchanger rises above the maximum designated temperature for the Futera Fusion model boiler, a warning or fault will be displayed. This protection is required to prevent damage to the heat exchanger in the event high differential temperatures are encountered. The fault or warning condition may be changed in the AUX FUNCTIONS menu under ALARM TYPE. The default condition is WARNING with LIM->HALF RATE = YES.

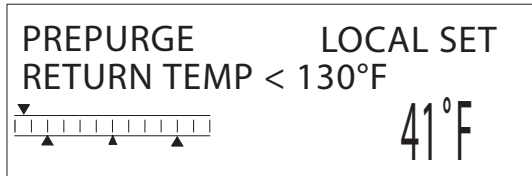
When this condition exists and the ALARM TYPE is set to WARNING and LIM-> HALF RATE, the boiler is limited to 1/2 it's input rate. So, if the boiler is trying to fire at 80%, the rate is limited to 40% until the temperature across the heat exchanger falls at least 10°F below the maximum designated temperature for the Futera Fusion boiler model. In this case: 40°F - 10°F = 30°F.

If the ALARM TYPE is set to FAULT, the boiler will display the FAULT message and this condition will be treated as an interlock, thus shutting down the boiler until the Delta Temp drops 10°F below the maximum designated temperature.

1/2 INPUT DELTA TEMP > 40°F	LOCAL SET 41°F
--------------------------------	-------------------

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

RETURNTEMP < 130°F: If the Return Inlet temperature is less than 130°F this warning will be displayed. This warning does not affect operation and does not set the alarm relay. A log entry is made to aide in diagnosing why this may be occurring. Condensing will occur with return temperatures below 130°F and a shortened heat exchanger life will occur.



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 must be cleaned and inspected at least once a year and before each heating season. Make sure that the burner and ignition components are free from dust, soot, dirt, corrosion or other deposits that would impair the boiler/water heater 's performance. Refer to Figure 20 for component identification.

CAUTION: Improper burner servicing can result in premature burner failure voiding the warranty!

Burner Removal

1. Close the manual shutoff valves in the gas supply line and turn off electrical power to the boiler/water heater.
2. Remove the jacket top panel.
3. Disconnect the wires to the fan and remove the four bolts that secure the fan to the transition piece.
4. Remove wires from the spark rods and remove the UV sense from the transition piece.
5. Disconnect the compression nut at the back of the transition piece to remove pilot gas tubing.
6. Remove the four nuts holding the transition piece to the heat exchanger.
7. Lift and remove the transition piece and burner together from the boiler/water heater, taking care not to damage the spark rods and or their alignment.

8. Disconnect the compression nut from the inside of the transition piece.
9. Remove the transition piece, taking care not to damage the spark rods and or their alignment.

Heat Exchanger Inspection

1. Close the manual shutoff valves in the gas supply lines and turn off electrical power to the boiler/water heater.
2. Remove burner following the instructions in the **Burner Removal** section.
3. Remove the front jacket panel and combustion chamber door.
4. Inspect the inside and outside of the heat exchanger for signs of damage, sooting or corrosion.
5. 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 and the problem resolved before the boiler/water heater is returned to service.
6. If there are no signs of damage, sooting or corrosion, reassemble the unit following the previous steps in reverse order.
7. A badly corroded or damaged heat exchanger must be replaced, see the **Heat Exchanger Repair & Replacement** section.

Heat Exchanger Cleaning

1. Close the shut off valves in the inlet and outlet piping. On heating systems close the system fill valve and 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 eight bolts on the rear pipe enclosure panel.
4. Remove the front jacket panel and combustion chamber door.
5. Slide the heat exchanger out of the unit.
6. Remove the "V" baffle straps and "V" baffles.
7. Thoroughly clean the heat exchanger with water from a high-pressure hose. Use a soft bristle brush if necessary.
8. Replace the cleaned heat exchanger and other components in the reverse order of their removal.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Heat Exchanger Repair & Replacement

1. A leaking or otherwise damaged tube(s) can be replaced as outlined in steps 2 through 8.
2. Remove the heat exchanger from the boiler/water heater as outlined in the **Heat Exchanger Cleaning** section.
3. Remove the pipe plugs from the inlet/outlet and return headers opposite from the ends of the tube(s) being replaced.
4. Carefully cut the damaged tube(s) in half, taking care not to damage the adjacent tubes and remove.
5. Install and swage/expand in place the new tube(s).
6. Replace the pipe plugs using a suitable thread sealant on each one.
7. Sagging or distorted heat exchanger tubes are an indication of low water flow through the system. A damaged heat exchanger must be replaced and the condition that caused the damage resolved before the boiler/water heater is returned to service.
8. Replace the heat exchanger and other components in the reverse order of their removal.

Air Intake & Vent System

Thoroughly inspect the air intake and vent systems for any signs of blockage, corrosion or leakage. Immediately replace any unsound vent system piping. Inspect the air filter and wash with warm water and soap if dirty.

Controls

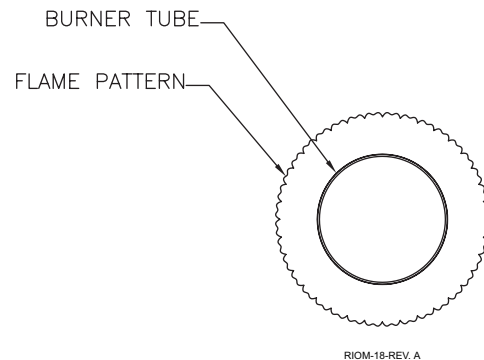
Use the "GENERAL OPERATION" and "CHECKING AND ADJUSTMENTS" sections of this manual for reference.

1. Check the 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. If not, replace them.
3. The flow switch contacts must be open when water flow is not present.

4. 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!
5. The aquastat high limit controls the maximum water temperature in the boiler. 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**, for boilers and **210°F, 99°C** for water heaters. The aquastat high limit cannot be repaired. If it fails to function properly, replace it.
6. Visually check the pilot and main burner flames to ensure proper operation, see Figures 18 & 19.

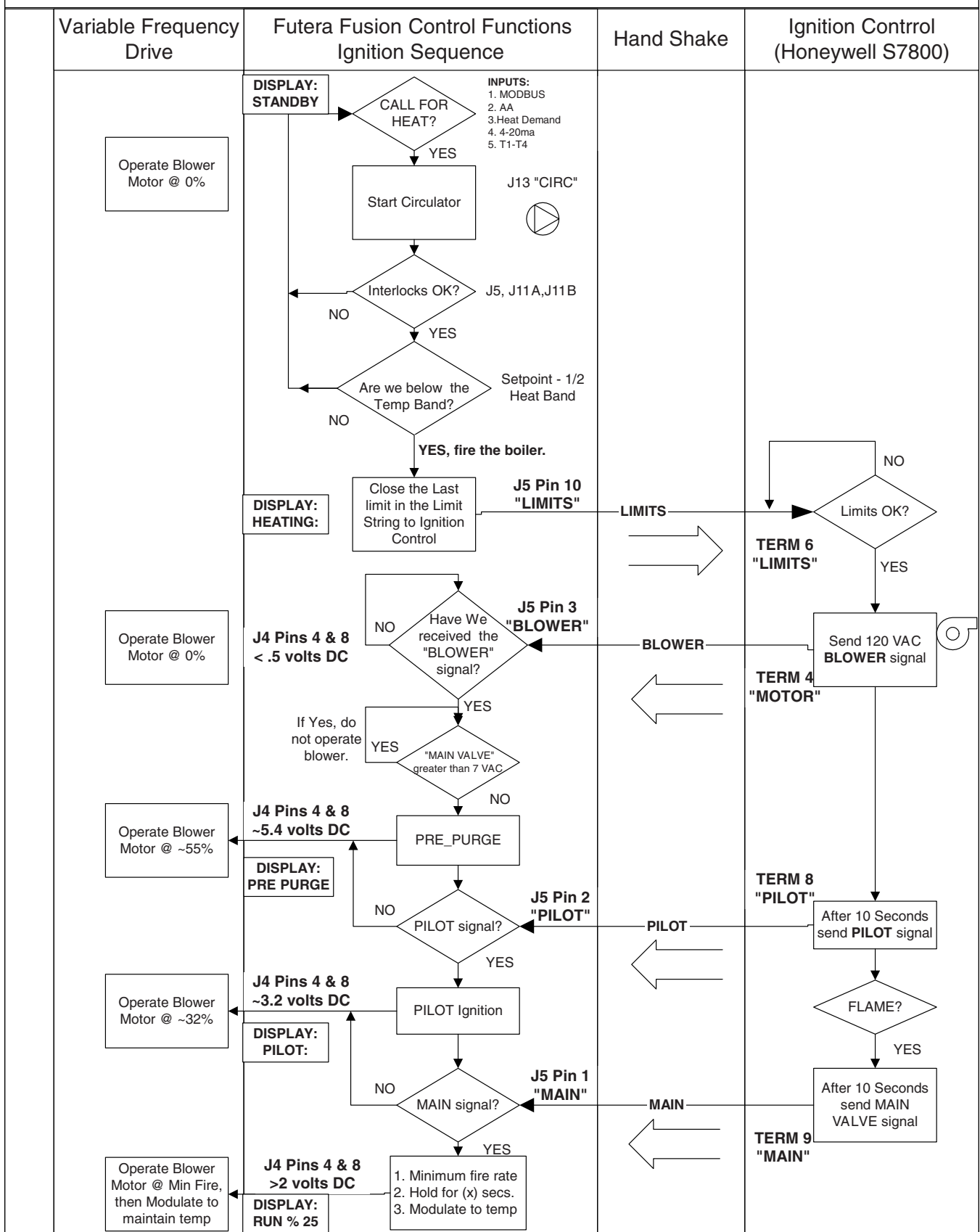
WARNING: A yellow, floating flame indicates a lack of combustion air. Do not operate the boiler/water heater until the problem is solved or severe personal injury or death may occur!

Figure 19 - Main Burner Flame



FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Futera Fusion Series "HeatNet Control" Troubleshooting (Firing the Futera Fusion Boiler)

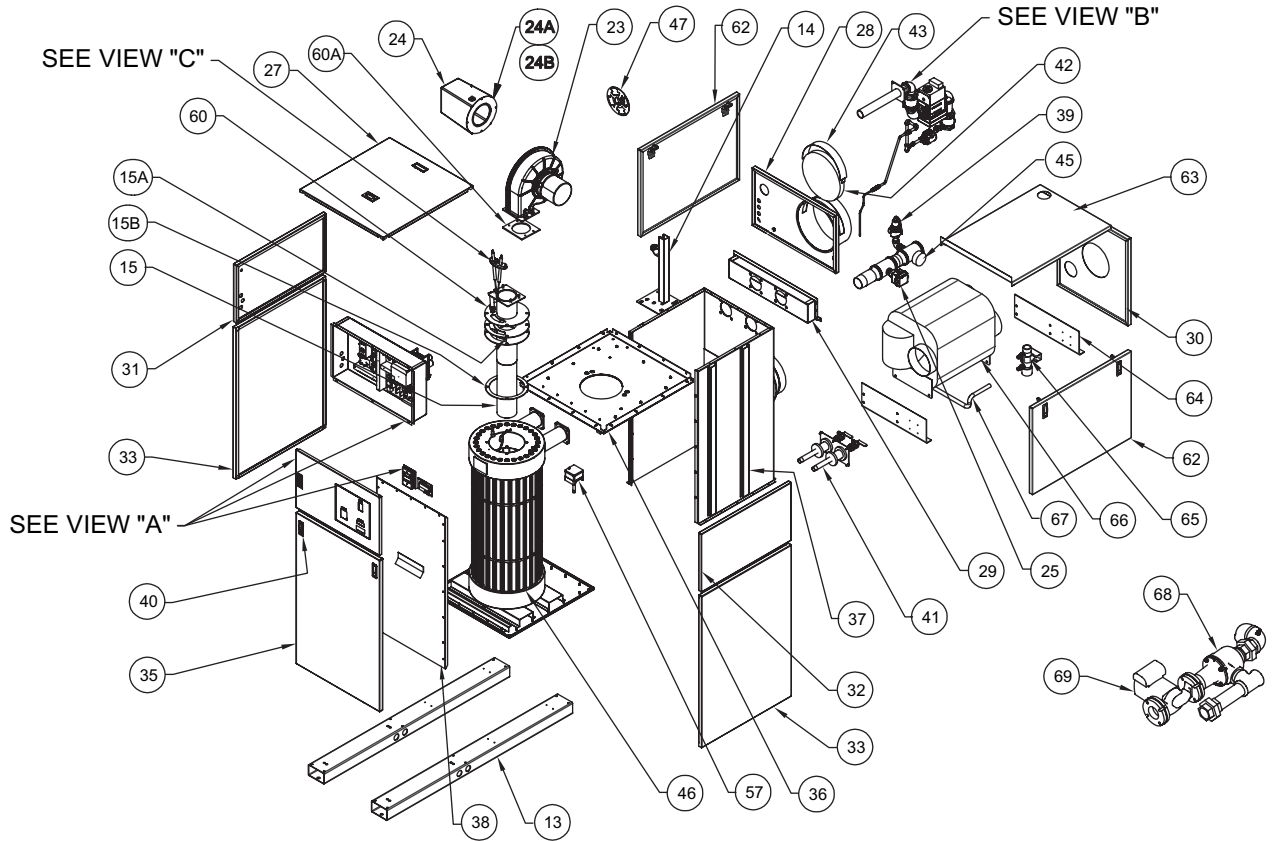


FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

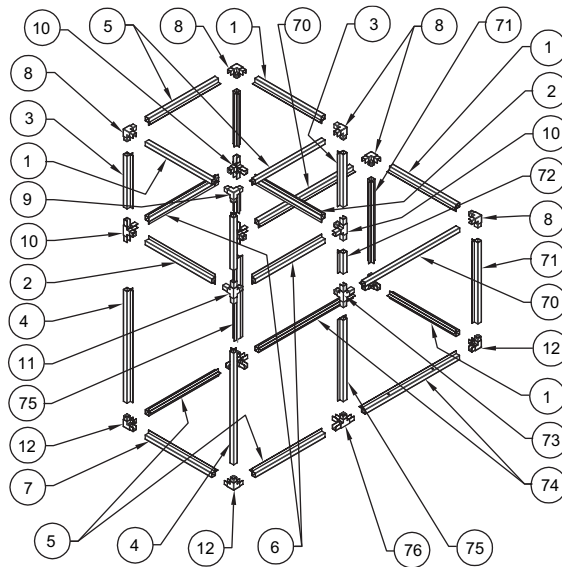
Troubleshooting A Startup				
	Symptom	Identify Source	Check	Action
1.	An Interlock is tripped.	<p>1. Is it a 24 VAC Interlock?</p> <p>2. Is it a 120 VAC Interlock/ Alarm?</p> <p>3. Internal Alarms</p>	<p>1. All 24 VAC Interlocks are located on J11A and J11B. Examples of 24 VAC Interlocks:</p> <ol style="list-style-type: none"> 1. SPARE3 2. Variable Frequency Drive(VFD) 3. Low Water Cutoff(LWCO), 4. Gas Pressure 5. Spare 4 6. Operator OPLIM 7. Water Flow 8. Air Pressure from UV Sensor. <p>2. All 120 VAC interlocks/Alarms are located on J5. These include:</p> <ol style="list-style-type: none"> 1. FLAME SAFE ALARM (Ignition CTRL ALARM) 2. Valve Alarm (IRI ALARM) 3. XS_FACTORY (Reserved) 4. HIGH LIMIT <p>1. OPEN SENSOR</p> <p>2. SHORTED SENSOR</p> <p>3. COMBUSTION AIR DAMPER</p>	<p>1. Use a multimeter and check for 24 VAC on J11A, J11B to identify which interlock has tripped. Reset the Interlock or check for disconnected wiring or shorts.</p> <p>The Air Pressure from UV Sensor interlock if displayed will allow the boiler to function, but it needs to be functional while the boiler is running for it to clear.</p> <p>1. Use a multimeter on J5 to check for 120 VAC on these interlocks (except the HIGH LIMIT). The High Limit Interlock is displayed when there is no 120 VAC, since the HIGH LIMIT breaks the 120VAC to the Ignition Control.</p> <p>NOTE: Stray Voltages Greater than 8 VAC and less than 18 VAC on these interlocks can cause intermittent operation. If this is the case, check for back fed voltages from field wiring.</p> <p>Check sensor voltages at J10A and J10B. The Temperature sensor inputs should be between 0 VDC and 5 VDC measured across the sensor. Example: At 77 F, the voltage would read 2.5 VDC.</p> <p>The combustion air damper prove switch must be wired across SPARE 1 and must be a "DRY" contact. Do not apply a voltage to this input, the input supplies it's own voltage/current.</p>
2.	Proceed to Operation Manual or Programming examples manual for more details and problem resolution.			

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

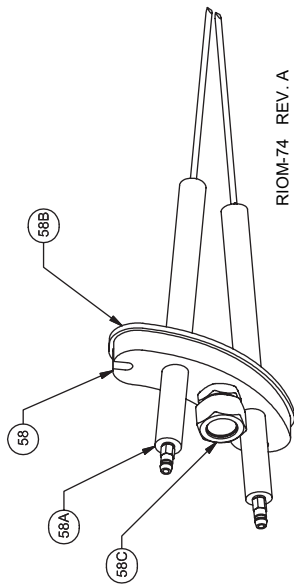
Figure 20 - Repair Parts



RIOM-72

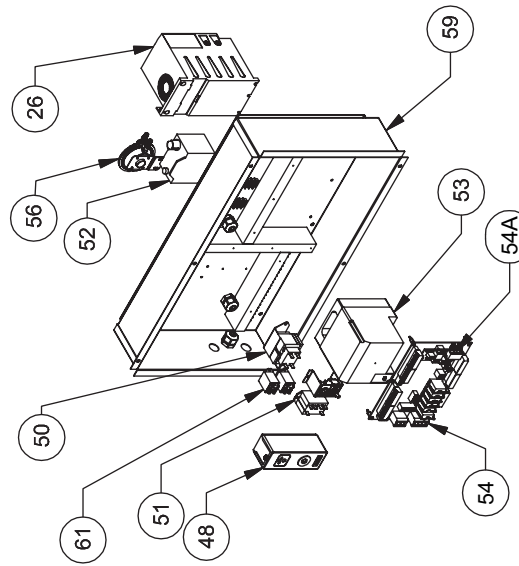


FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS



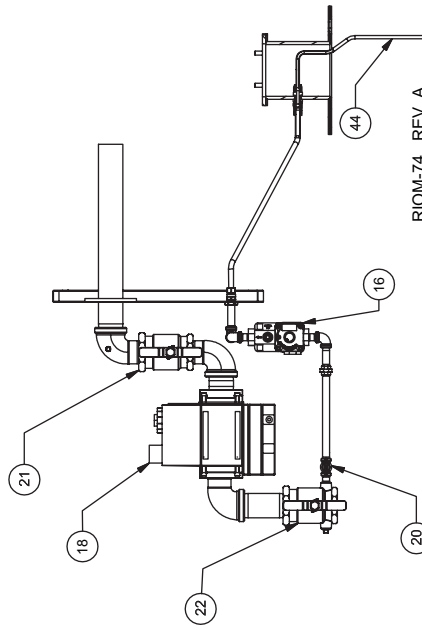
RIOM-74 REV. A

VIEW: C



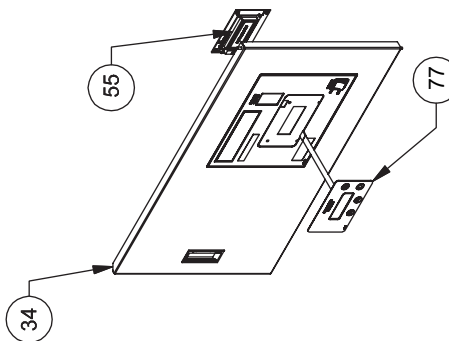
RIOM-74 REV. A

VIEW: A



RIOM-74 REV. A

VIEW: B
ROTATED VIEW



FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Futera Fusion Model Size with Item Quantities Below									
Ref #	Name of Part	Part #	500	750	1000	1250	1500	1750	2000
1	Top/Bottom X Profile	04-0523	5	5	5				
		04-0524				5	5	5	5
2	Middle X Profile	04-0525	2	2	2				
		04-0526				2	2	2	2
3	Top Y Profile	04-0530	4	4	4	4	4	4	4
4	Bottom Y Profile	04-0531	2						
		04-0532		2					
		04-0533			2				
		04-0534				2			
		04-0535					2		
		04-0536						2	
		04-0537							
5	Top/Bottom Z Profile	04-0538	4	4	4				
		04-0539				4	4	4	4
6	Middle Z Profile	04-0540	2	2	2				
		04-0541				2	2	2	2
7	Bottom/Front X Profile	04-0527	1	1	1				
		04-0528				1	1	1	1
8	Frame Corner	20-0053	5	5	5	5	5	5	5
9	Frame Corner	04-0543	1	1	1	1	1	1	1
10	Crosses	20-0054		3	3	3	3	3	3
11	Drilled Crosses	04-0544	1	1	1	1	1	1	1
12	Bottom Corner	04-0542	6	6	6	6	6	6	6
13	Base Legs	04-1073	2	2	2				
		04-1074				2	2	2	2
14	Gas Train Support Bracket Assembly	70-2343	1	1	1				
		70-2344				1	1	1	1
15	Burner/Pilot Orifice Assembly	70-2529	1						
		70-2530		1					
		70-2531			1				
		70-2532				1			
		70-2533					1		
		70-2534						1	
		70-2535							1
15a	Transition Gasket	06-0026	1	1	1				
		06-0027				1	1	1	1
15b	Burner Gasket	06-0011	1	1	1				
		06-0012				1	1	1	1
16	Solenoid Valve w/Regulator, NG	11-0372	1	1	1	1	1	1	1
	Solenoid Valve w/Regulator, LP	11-0374	1	1	1	1	1	1	1
18	Gas Valve, DMV-SE	11-0211	1	1	1	1	1	1	1
NS	Flange 1"	11-0212	2	2					
NS	Flange 1 1/4"	11-0213			2	2	2		
NS	Flange 1 1/2"	11-0214						2	2
NS	Orifice Gasket	06-0023	1	1					
		06-0022			1	1	1	1	1
NS	Orifice Plate	03-2911	1						
		03-2912		1					
		03-2913			1				
		03-2914				1			
		03-2915					1		
		03-2916						1	
		03-2917							1
NS	Firing Valve 3/4"	11-0461	1	1	1	1	1	1	1
NS	Manual Pilot Valve	11-0031	1	1	1	1	1	1	1
20	Ball Valve	11-0395	1	1	1	1	1	1	1
21	Firing Valve, 1"	11-0456	1	1					
	Firing Valve, 1 1/4"	11-0457			1	1	1		
	Firing Valve, 1 1/2"	11-0458						1	1

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Futera Fusion Model Size with Item Quantities Below									
Ref #	Name of Part	Part #	500	750	1000	1250	1500	1750	2000
22	A Valve, 1"	11-0465	1	1					
	A Valve, 1 1/4"	11-0466			1	1	1		
	A Valve, 1 1/2"	11-0467						1	1
23	Blower, Fasco 7043	12-0016	1	1	1				
	Blower, Fasco 7035	12-0017				1	1	1	1
NS	Air Orifice	14-0099	1	1	1	1	1	1	1
24	Mixing Box	70-2307	1	1	1				
		70-2308				1	1	1	1
25	Flow Switch	14-0203	1	1	1	1	1	1	1
	Flow Switch (Outdoor)	14-0205	1	1	1	1	1	1	1
	Flow Switch (Potter)	14-0201	1	1	1	1	1	1	1
	Flow Switch (Outdoor Potter)	14-0202	1	1	1	1	1	1	1
NS	2" Outlet Adapter	01-0042	1	1	1				
	2 1/2" Outlet Adapter	01-0043				1	1	1	1
26	Frequency Drive	15-0231	1	1	1	1	1	1	1
27	Jacket Top Panel	70-2412	1	1	1				
		70-2413				1	1	1	1
28	Upper Rear Panel	70-2414	1	1	1				
		70-2415				1	1	1	1
29	Rear Pipe Enclosure Assembly	70-2333	1	1	1				
		70-2334				1	1	1	1
30	Lower Rear Jacket Panel	03-3111	1						
		03-3112		1					
		03-3113			1				
		03-3114				1			
		03-3115					1		
		03-3116						1	
		03-3117							1
31	Upper Left Jacket Panel	03-2831	1	1	1				
		03-2832				1	1	1	1
32	Upper Right Jacket Panel	03-2833	1	1	1				
		03-2834				1	1	1	1
33	Lower Left & Right Jacket Panel	03-2835	2						
		03-2836		2					
		03-2837			2				
		03-2838				2			
		03-2839					2		
		03-2840						2	
		03-2841							2
34	Upper Front Jacket Panel (HeatNet)	70-2446							
		70-2447							
	Handle	20-0044	1	1	1	1	1	1	1
35	Lower Front Jacket Panel	70-2365	1						
		70-2366		1					
		70-2367			1				
		70-2368				1			
		70-2369					1		
		70-2370						1	
36	Combustion Chamber Top Panel	70-2356	1	1	1				
		70-2357				1	1	1	1
	Manning Glass Insulation (per square foot)	05-0104	3	3	3	3	3	3	3

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Futura Fusion Model Size with Item Quantities Below									
Ref #	Name of Part	Part #	500	750	1000	1250	1500	1750	2000
37	Combustion Chamber Rear/Side Panel	70-2319	1						
		70-2320		1					
		70-2321			1				
		70-2322				1			
		70-2323					1		
		70-2324						1	
		70-2325							1
	Manning Glass Insulation (per square foot)	05-0104	10	12	14	16	16	16	18
38	Combustion Chamber Door Assembly	70-2358	1						
		70-2359		1					
		70-2360			1				
		70-2361				1			
		70-2362					1		
		70-2363						1	
		70-2364							
	Manning Glass Insulation (per square foot)	05-0104	6	6	7	7	7	8	8
39	Pressure Relief Valve 50#	30-0360	1	1	1				
	Pressure Relief Valve 50#	30-0374				1			
	Pressure Relief Valve 50#	30-0379					1	1	1
	Pressure Relief Valve 125#	30-0364	1	1	1	1	1	1	1
40	Latch	20-0046	2	2	2	2	2	2	2
41	Drain Valve Assembly (CB)	70-2561	1	1	1				
		70-2562				1	1	1	1
	Drain Valve Assembly (CW)	70-2563	1	1	1				
		70-2564				1	1	1	1
42	Air Filter	09-0489	1	1	1				
		09-0498				1	1		
		09-0499						1	1
44	Pilot Tube Assembly	70-9024	1	1	1				
		70-9024.1				1	1		
		70-9025						1	1
NS	Pilot Train Assembly, NG	70-9026.1	1	1	1	1	1	1	1
	Pilot Train Assembly, LP	70-9027.1	1	1	1	1	1	1	1
45	Tridicator 30 - 60 psi	13-0308	1	1	1	1	1	1	1
	Tridicator 75 - 160 psi	13-0305	1	1	1	1	1	1	1
46	Heat Exchanger (Copper)	70-2186	1						
		70-2187		1					
		70-2188			1				
		70-2189				1			
		70-2190					1		
		70-2191						1	
		70-2192							1
	Heat Exchanger (Cupronickel)	70-2193	1						
		70-2194		1					
		70-2195			1				
		70-2196				1			
		70-2197					1		
		70-2198						1	
		70-2199							1
47	Air Damper Assembly	70-2352	1	1	1				
		70-2353				1	1		
		70-2354						1	1
48	High Limit, L4008E, (CB)	14-0112	1	1	1	1	1	1	1
	High Limit, L4008E, (CW)	14-0105	1	1	1	1	1	1	1
NS	Operator, T6031A (pool heater)	14-0003	1	1	1	1	1	1	1
NS	Thermometer Well, 3/8 x 2	13-0102	2	2	2	2	2	2	2
NS	High Limit Well, 3/8 x 3	13-0104	2	2	2	2	2	2	2
NS	Tekmar MPA Control	14-0322	1	1	1	1	1	1	1
	(prior to 1107) (Outdoor Reset Only)	14-0324	1	1	1	1	1	1	1
NS	10K Temperature Sensor	14-0325	3	3	3	3	3	3	3

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Futera Fusion Model Size with Item Quantities Below										
Ref #	Name of Part	Part #	500	750	1000	1250	1500	1750	2000	
50	Transformer, 40 VA	15-0002	1	1	1	1	1	1	1	
NS	Pump Contactor (C1, C2)	15-0118	1	1	1	1	1	1	1	
NS	Pump Contactor 3PH	15-0111	1	1	1	1	1	1	1	
51	Purge Timer, ST7800	16-0007	1	1	1	1	1	1	1	
52	Spark Generator, Q652B	16-0008	1	1	1	1	1	1	1	
53	Flame Safeguard, RM7897C	16-0024	1	1	1	1	1	1	1	
NS	Keyboard Display Module, S7800A	16-0010	1	1	1	1	1	1	1	
54	Main Board (HeatNet)	16-0029	1	1	1	1	1	1	1	
54a	Communication Board	40-0089	1	1	1	1	1	1	1	
NS	Ferrite Clamp	16-0032	1	1	1	1	1	1	1	
55	Display Board (HeatNet)	40-0088	1	1	1	1	1	1	1	
NS	Ribbon Cable 30"	40-0115	1	1	1	1	1	1	1	
NS	Power Switch	48-0013	1	1	1	1	1	1	1	
NS	Toggle Switch	48-0010	1	1	1	1	1	1	1	
56	Air Pressure Switch	11-0416	1	1	1	1	1	1	1	
57	Blocked Flue Switch	11-0411	1	1	1	1	1	1	1	
NS	Low Gas Pressure Switch (Manual Reset)	11-0414	1	1	1	1	1	1	1	
NS	High Gas Pressure Switch (Manual Reset)	11-0411	1	1	1	1	1	1	1	
NS	Terminal Block 6P	48-0157	1	1	1	1	1	1	1	
NS	Terminal Block 4P	48-0161	1	1	1	1	1	1	1	
NS	Resistor Assembly	70-9001	1	1	1	1	1	1	1	
NS	Mini Peeper, C7027A	16-0009	1	1	1	1	1	1	1	
NS	UV Amplifier, R7849A	16-0006	1	1	1	1	1	1	1	
NS	Base, Q7800A	16-0003	1	1	1	1	1	1	1	
NS	Ignition Cable	44-0056	1	1	1	1	1	1	1	
58	Pilot/Flame Rod Kit	70-2303	1	1	1					
		70-2304				1	1	1	1	
58a	Electrode	16-0333	2	2	2	2	2	2	2	
58b	Electrode Gasket	06-0024	1	1	1					
		06-0025				1	1	1	1	
58c	View Port Assembly	70-2205	1	1	1	1	1	1	1	
59	Control Box Panel	70-2372	1	1	1					
		70-2374				1	1	1	1	
NS	Harness Transformer	40-0120	1	1	1	1	1	1	1	
	Harness VFD	40-0124	1	1	1	1	1	1	1	
	Harness RM7800	40-0125	1	1	1	1	1	1	1	
	Harness On/Off Switch	40-0126	1	1	1	1	1	1	1	
	Harness Remote Local Switch	40-0127	1	1	1	1	1	1	1	
	Harness Alarm Switch	40-0128	1	1	1	1	1	1	1	
60	Transition Assembly	70-2305	1	1	1					
		70-2306				1	1	1	1	
60a	Gasket	06-0043	1	1	1					
		06-0044				1	1	1	1	
61	Pump Contactor Relay	15-0118	1	1	1	2	2	2	2	
62	Left & Right Side Jacket Panel Extension	70-4072	2							
		70-4073		2						
		70-4074				2				
		70-4075					2			
		70-4076						2		
		70-4077							2	
		70-4078								2
63	Jacket Top Panel Extension	03-3125	1	1	1					
		03-3108				1	1			
		03-3109						1	1	
		03-3110								
64	Economizer Mounting Bracket	03-3118	2	2						
		03-3119			2					
		03-3120				2	2	2	2	

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

Futera Fusion Model Size with Item Quantities Below										
Ref #	Name of Part	Part #	500	750	1000	1250	1500	1750	2000	
65	Condensate Drain Assembly	70-4001	1	1	1	1	1	1	1	
66	Economizer	12-2001	1	1	1					
		12-2002				1	1			
		12-2003						1	1	
67	Condensate Hose (ft)	62-0301	3	3	3	3	3	3	3	
68	Thermostatic Valve (CB) 2" Cast Iron	13-0201	1	1	1					
	Thermostatic Valve (CB) 2 1/2" Cast Iron	13-0202				1	1	1	1	
	Thermostatic Valve (CW) 2" Bronze	13-0203	1	1	1					
	Thermostatic Valve (CW) 2 1/2" Bronze	13-0204				1	1	1	1	
69	Pump	(see pump selection chart in Trade Price Book)								
70	Top Horizontal Frame Extension Profile	04-1069	2	2	2					
		04-1071				2	2	2	2	
71	Vertical Frame Extension Profile	04-1055	2							
		04-1056		2						
		04-1057			2					
		04-1058				2				
		04-1059					2			
		04-1060						2		
		04-1061							2	
72	Vertical Center Frame Extension Profile	04-1052	2	2	2					
		04-1053				2	2			
		04-1054						2	2	
73	Frame Cross 4 Way Rear	04-1021	2	2	2	2	2	2	2	
74	Bottom Horizontal Frame Extension Profile	04-1072	2	2	2					
		04-1070				2	2	2	2	
75	Vertical Center Extension Profile	04-1062	2							
		04-1063		2						
		04-1064			2					
		04-1065				2				
		04-1066					2			
		04-1067						2		
		04-1068							2	
76	Frame Cross 4 Way Bottom	04-1020	2	2	2	2	2	2	2	
NS	Drain Valve Gaskets	06-0083	1	1	1					
	Drain Valve Gaskets	06-0084				1	1	1	1	
NS	Stainless Steel Wipes	66-0050	1	1	1	1	1	1	1	
NS	Rating Plate	82-0054	1	1	1	1	1	1	1	
NS	Futera Fusion Overlay (HeatNet)	82-0313	1	1	1	1	1	1	1	
	Futera Fusion Overlay	82-0195	1	1	1	1	1	1	1	
77	Keypad Overlay	82-0189	1	1	1	1	1	1	1	
NS	Paint	66-0013	1	1	1	1	1	1	1	
NS	Silicone	66-0151	1	1	1	1	1	1	1	
NS	Vent Termination Hood 7"	09-0140	1	1	1					
	Vent Termination Hood 8"	09-0113				1	1			
	Vent Termination Hood 10"	09-0115						1	1	
NS	Air Intake Hood 6"	09-0102	1	1	1					
	Air Intake Hood 8"	09-0103				1				
	Air Intake Hood 10"	09-0104					1			
	Air Intake Hood 12"	09-0105						1	1	

FUTERA III / FUSION START UP SHEET



DATE:	JOB NAME:
TECHNICIAN:	LOCATION:
COMPANY:	MODEL
PHONE NUMBER:	SERIAL #:

PRE-START UP CHECK LIST

- | | |
|--|--|
| <input type="checkbox"/> NO VISUAL DAMAGE TO UNIT | <input type="checkbox"/> INLET AIR FILTER INSTALLED AND CLEAN |
| <input type="checkbox"/> PIPING PROPERLY CONNECTED | <input type="checkbox"/> PROPER SERVICE CLEARANCE PROVIDED |
| <input type="checkbox"/> BOILER CIRCULATOR WIRED | <input type="checkbox"/> PUMP RUNNING, HEAT EXCHANGER FULL |
| <input type="checkbox"/> VENT/STACK CONNECTED | <input type="checkbox"/> GAS LINES PURGED, NO LEAKS, NO MISSING TEST PLUGS |

BOILER START UP SEQUENCE

Note: Locate the AA terminals in the bottom-right of the electrical panel on the control relay board and the min-hold switch located on the display board. Also locate the gas pressure tapping upstream of the main gas valve.

1. Cycle boiler and hold at trial for pilot ignition.
2. Set pressure to 2 - 2.5" W.C. (Flame signal should read 5.0 V DC)
3. Cycle boiler to main flame trial for ignition.
4. Place boiler to min hold (jumper T1 terminals for min input). Check for stable flame.
5. Record combustion and elbow pressure. (Reference factory start-up sticker)
6. Release boiler from min hold to run. (Jumper AA terminals for 100% input)
7. Record combustion and elbow pressure. (Reference factory start-up sticker)
8. Check all combustion results using a calibrated flue gas analyzer.
9. Remove jumper at terminals "AA" then make any final adjustments on low fire.
10. Remove jumper at terminals T1 and release boiler to RUN mode.

FUTERA FUSION INSTALLATION AND OPERATION INSTRUCTIONS

COMBUSTION ANALYSIS	LOW FIRE	100% FIRE
GAS PRESSURE (IN. W.C.) AT ELBOW TEST PORT	(IN. W.C.)	(IN. W.C.)
CO ₂		
O ₂		
CO (PPM)		
NET STACK TEMP.		

SAFETY TESTS CHECKLIST

- | | | |
|---|-------------------------------------|--|
| <input type="checkbox"/> FLOW SWITCH | <input type="checkbox"/> AIR SWITCH | <input type="checkbox"/> FLAME SAFEGUARD |
| <input type="checkbox"/> LOW WATER CUTOFF | <input type="checkbox"/> HIGH-LIMIT | |

COMMISSIONING THE BOILER/WATER HEATER

<input type="checkbox"/> UNIT CYCLED MIN. OF 15 TIMES <input type="checkbox"/> CUSTOMER INSTRUCTED <input type="checkbox"/> ALL COVERS REPLACED <input type="checkbox"/> CUSTOMER GIVEN MANUAL <input type="checkbox"/> TARGET TEMP. SET PER CUSTOMER COMMISSIONED BY: _____ <div style="text-align: right; margin-right: 50px;">(SIGNATURE)</div> DATE: _____	THE DELTA T BETWEEN THE HEATERS INLET AND OUTLET IS CRITICAL TO PROPER FLOW. BEFORE YOU LEAVE THE JOBSITE, YOU MUST RECORD THE DELTA T. THIS READING SHOULD NOT EXCEED 35 DEG F, 19.4 DEG C, OR BE LOWER THAN 20 DEG F, 11.1 DEG C. <div style="text-align: center; margin-bottom: 10px;"> <input style="width: 60px; height: 20px; border: 1px solid black;" type="text"/> DELTA T </div>
---	---

ADDITIONAL NOTES AND COMMENTS

WORKSHEET

Setup Menu				
Boilers				
# of Boilers				
Lead Stage				
Heat Band	°			
Setpoints				
Local Setpoint	°			
Operate Limit	°			
Op Lim Band	°			
Setpoint Source				
Outdoor Air Reset	°			
OA Reset				
OA Setpoint	°			
Override Reset				
Set OA Setpoints				
Water Temp At High OA Temp	°			
Water Temp At Low OA Temp	°			
PUMP OPTIONS				
<i>System Pump</i>				
Post Purge Time				
Always Enabled				
Summer Pump Jog				
<i>Local Pump</i>				
Delta Temp Enab				
Delta Temp	°			
Post Prge Time	S			
Always Enabled				
<i>Pump Valve Option</i>				
Remains On:				
Night Setback				
Setback Entry	1	2	3	4
Entry Is				
Setback	°	°	°	°
Setback Time				
Start Day				
Time				
End Day				
Time				
Options				
Temp Scale	°			
Key Click				
Skip Password				
Brightness	%			

Log/ Runtime				
Run Hours				
Data Log Entry				
Size				
Boiler Cycles				
Aux Functions				
Combust Air Damper				
In Use?				
Output Relay #				
Proof Time				
System Clock				

Advanced Setup								
Distributed Ctrl								
Control								
H-Net Master								
Local Address								
Console Address								
Modular Boiler Set								
Add Boiler Delay								
Shed Boiler Delay								
Modulate Delay Time								
Mod Max – Last Fire			%					
Stop Band Offseet			°					
Boiler Start Time								
Modulation PID								
(P)roportional =								
(I)ntegral =								
(D)erivative =								
Band			°					
Firing Mode								
Master First								
Sensors								
Sensor #	Outside	Supply	Return	Header	5	6	7	8
Type								
Password								
Communications								
Modem Installed								
Load Defaults								
System								

NOTICE!

Commonwealth of Massachusetts Installation Requirements

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

1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
 - a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
 - b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
2. **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
3. **SIGNAGE.** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".
4. **INSPECTION.** The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

WARNING: Improper venting can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

NOTICE!

Commonwealth of Massachusetts Installation Requirements

In the Commonwealth of Massachusetts, the installation must be performed by a licensed plumber or gas fitter.

(b) Exemptions

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

1. The equipment listed in Chapter 10 entitled “Equipment Not Required To Be Vented” in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM PROVIDED.

When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.

When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies “special venting systems”, the following requirements shall be satisfied by the manufacturer:

1. The referenced “special venting system” instructions shall be included with the appliance or equipment installation instructions; and
2. The “special venting systems” shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

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

WARNING: Improper venting can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

LIMITED WARRANTY

Boilers/Water Heaters Industrial, Commercial and Other Non-Residential Use

The "Manufacturer" warrants to the original owner at the original installation site that the heat exchanger of the Industrial, Commercial, and other Non-Residential Use Boiler (the "Product") will be free from defects in material or workmanship for ten (10) years from the date of installation. Additional twenty one (21) year thermal shock warranty on heat exchanger. If upon examination by the Manufacturer the Product is shown to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective. All other RBI supplied Boiler/Water Heater parts are warranted against defects in material and workmanship for one (1) year from date of installation or 18 months from date of shipment from RBI.

The "Manufacturer" warrants to the original owner at the original installation site that the heat exchanger of the Industrial, Commercial, and other Non-Residential Use Water Heater (the "Product") will be free from defects in material or workmanship for five (5) years from the date of installation. Additional twenty one (21) year thermal warranty on heat exchanger. If upon examination by the Manufacturer the Product is shown to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective. All other RBI supplied Boiler/Water Heater parts are warranted against defects in material and workmanship for one (1) year from date of installation or 18 months from date of shipment from RBI.

This limited warranty does not apply:

- (a) if the Product has been subjected to misuse or neglect, has been accidentally or intentionally damaged, has not been installed, maintained or operated in accordance with the furnished written instructions, or has been altered or modified in any way.

These include but not limited to:

- Excessive water hardness causing a lime build-up in the heat exchanger tubes is not a fault of the equipment and is not covered under the manufacturer's warranty.
 - Excessive pitting and erosion on the inside of the heat exchanger tubes caused by high water velocity through the tubes and is not covered by the manufacturer's warranty. (See Installation Instructions for proper pump performance.)
 - Chemical corrosion, no corrosive chemical (freon, dry cleaning chemicals, degreasing liquids, chlorine or any chemicals that produce hydrochloric acid) can be present in the boiler room as it rapidly destroys the heating equipment and voids the warranty.
 - All copper fin boilers should not operate with a return water temperature less than 110°F, 43°C atmospheric combustion, 125°F, 52°C fan assist combustion. If a lower temperature is required, an external bypass should be installed to prevent condensation. The manufacturer's warranty does not cover damage done by condensation.
- (b) to any expenses, including labor or material, incurred during removal or reinstallation of the the Product or parts thereof.
- (c) to damage as a result of settlement, distortion, collapse, or cracking of any foundation area, beams or pipes surrounding the Product.
- (d) to any workmanship of any installer of the Product; or to Products installed outside the continental United States or Canada.

This limited warranty is conditional upon:

- (a) shipment, to the Manufacturer, of that part of the Product thought to be defective. Goods can only be returned with prior written approval from the Manufacturer. All returns must be freight prepaid.
- (b) determination in the reasonable opinion of the Manufacturer that there exists a defect in material or workmanship.

Repair or replacement of any part under this Limited Warranty shall not extend the duration of the warranty with respect to such repaired or replaced part beyond the stated warranty period.

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, AND ALL SUCH OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS LIMITED WARRANTY. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE IN ANY WAY FOR ANY CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OF ANY NATURE WHATSOEVER, OR FOR ANY AMOUNTS IN EXCESS OF THE SELLING PRICE OF THE PRODUCT OR ANY PARTS THEREOF FOUND TO BE DEFECTIVE. THIS LIMITED WARRANTY GIVES THE ORIGINAL OWNER OF THE PRODUCT SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY BY EACH JURISDICTION.



260 North Elm Street
Westfield, MA 01085
Phone: (413) 568-9571
Fax: (413) 568-9613

7555 Tranmere Drive
Mississauga, Ontario L5S 1L4 Canada
Phone: (905) 670-5888
Fax: (905) 670-5782

www.rbiwaterheaters.com

