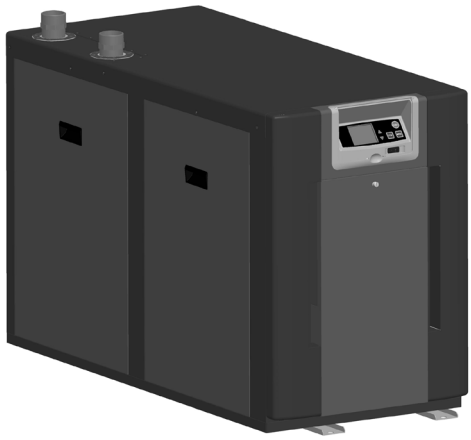
INSTALLATION AND OPERATION MANUAL



XFyre® NINETY PLUS

Models 300A – 850A
Type H and WH

H

⚠WARNING: Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, exposure to hazardous materials*, or loss of life. Review the information in this manual carefully. *This unit contains materials that have been identified as carcinogenic, or possibly carcinogenic, to humans.

FOR YOUR SAFETY: Do not store or use gasoline or other flammable vapors and liquids or other combustible materials in the vicinity of this or any other appliance. To do so may result in an explosion or fire.

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.

This manual should be maintained in legible condition and kept adjacent to the heater or in a safe place for future reference.

Raypak® A Rheem® Company

Effective: 02-26-21
Replaces: 01-15-20
P/N 241480 Rev. 6

Revision 6 reflects the following changes:

Raypak logo updated on front and back pages. Low-lead content text updated on page 6. Ducted Combustion Air updated on page 10. Tables F updated on page 11. Hydrostatic Test updated on page 13. Cold Water Operation updated on page 14. Domestic Hot Water updated on page 19. Gas Supply Connection updated on page 19. Table I updated on page 19. Table L updated on page 21. Heating Sensor Installation updated on page 23. Wiring the Cascade System Communication Bus update on page 25. Appliance Category updated on page 26. Vent Terminal Location and Table M updated on page 27. U.S. Installations updated on page 28. Vertical Venting (Category IV) and Table N updated on page 29. Condensate drain pipe caution added to page 31. Outdoor Installation updated on page 33. Figure 36 updated on page 36. Figure 37 updated on page 37. Table T updated on page 39. Initial Start-up Required Tools updated on page 44. Illustrated Parts List added on page 54-59.

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1. WARNINGS

Pay Attention to These Terms

⚠DANGER	Indicates the presence of immediate hazards which will cause severe personal injury, death or substantial property damage if ignored.
⚠WARNING	Indicates the presence of hazards or unsafe practices which could cause severe personal injury, death or substantial property damage if ignored.
⚠CAUTION	Indicates the presence of hazards or unsafe practices which could cause minor personal injury or product or property damage if ignored.
CAUTION	CAUTION used without the warning alert symbol indicates a potentially hazardous condition which could cause minor personal injury or product or property damage if ignored.
NOTE	Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

⚠DANGER: Make sure the gas on which the boiler will operate is the same type as that specified on the boiler rating plate.

⚠WARNING: Should overheating occur or the gas supply valve fail to shut, do not turn off or disconnect the electrical supply to the boiler. Instead, shut off the gas supply at a location external to the boiler.

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

⚠WARNING: To minimize the possibility of improper operation, serious personal injury, fire, or damage to the heater:

- **Always keep the area around the heater free of combustible materials, gasoline, and other flammable liquids and vapors.**
- **Heater should never be covered or have any blockage to the flow of fresh air to the heater.**

⚠WARNING: Vent connectors serving any other appliances shall not be connected into any portion of mechanical draft systems operating under a positive pressure. If an XFyre heater is installed to replace an existing heater, the vent system MUST be verified to be of the correct size and of one of the Category IV vent materials identified in this manual. If it is NOT, it MUST be replaced.

⚠WARNING: Both natural gas and propane have an odorant added to aid in detecting a gas leak. Some people may not physically be able to smell or recognize this odorant. If you are unsure or unfamiliar with the smell of natural gas or propane, ask your local gas supplier. Other conditions, such as "odorant fade," which causes the odorant to diminish in intensity, can also hide, camouflage, or otherwise make detecting a gas leak by smell more difficult.

⚠WARNING: UL-recognized fuel gas detectors are recommended in all enclosed propane and natural gas applications wherein there is a potential for an explosive mixture of fuel gas to accumulate and their installation should be in accordance with the detector manufacturer's recommendations and/or local laws, rules, regulations, or customs.

⚠WARNING: This appliance produces condensate from the flue products that is acidic and highly corrosive. Raypak recommends the use of a condensate treatment kit (sales option Z-12) to avoid long-term damage to the drainage system and to meet local code requirements.

⚠WARNING: Risk of electrical shock. More than one disconnect switch may be required to de-energize the equipment before servicing.

2. GENERAL SAFETY

⚠CAUTION: Hotter water increases the risk of scalding! There is a hot water scald potential if the thermostat is set too high.

NOTE: When this heater is supplying general purpose hot water for use by individuals, a thermostatically controlled mixing valve for reducing point of use water temperature is recommended to reduce the risk of scald injury. Contact a licensed plumber or the local plumbing authority for further information.

To meet commercial hot water use needs, the high-limit safety control on this water heater will shut off the main gas valve before the outlet temperature reaches 180°F (82°C). However, water temperatures over 125°F (52°C) can cause instant severe burns or death from scalds. When supplying general purpose hot water, the recommended initial setting for the temperature control is 125°F (52°C).

Safety and energy conservation are factors to be considered when setting the water temperature on the thermostat. The most energy-efficient operation will result when the temperature setting is the lowest that satisfies the needs of the application.

Water temperature over 125°F (52°C) can cause instant severe burns or death from scalds. Children, disabled and elderly are at highest risk of being scalded.

- Feel water before bathing or showering.
- Temperature limiting valves are available.

Maximum water temperatures occur just after the heater's burner has shut off. To determine the water temperature being delivered, turn on a hot water faucet and place a thermometer in the hot water stream and read the thermometer.

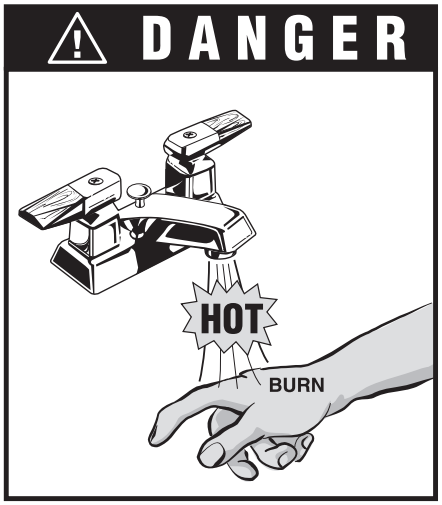
Time/Temperature Relationships in Scalds

The following chart details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

Water Temp	Time to Product Serious Burn
120°F (49°C)	More than 5-minutes
125°F (52°C)	1-1/2 to 2-minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1-1/2 seconds
155°F (68°C)	About 1 second

Table courtesy of the Shriners Burn Institute

Table A. Time to Produce Serious Burns



Water temperature over 125°F can cause instant severe burns or death from scalds.

Children, disabled, and elderly are at highest risk of being scalded.

See instruction manual before setting temperature at water heater.

Feel water before bathing or showering.

Temperature limiting valves are available, see manual.

3. BEFORE INSTALLATION

Raypak strongly recommends that this manual be reviewed thoroughly before installing your XFyre heater. Please review the General Safety information before installing the heater. Factory warranty does not apply to heaters that have been improperly installed or operated. (Refer to the warranty at the back of this manual.) Installation and service must be performed by a qualified installer, service agency or gas supplier. If, after reviewing this manual, you still have questions which this manual does not answer, please contact your local Raypak representative or visit our website at www.raypak.com.

Thank you for purchasing a Raypak product. We hope you will be satisfied with the high quality and durability of our equipment.

Product Receipt

On receipt of your heater it is suggested that you visually check for external damage to the shipping crate. If the crate is damaged, make a note to that effect on the Bill of Lading when signing for the shipment. Next, remove the heater from the shipping packaging. Report any damage to the carrier immediately.

On occasion, items are shipped loose. Be sure that you receive the correct number of packages as indicated on the Bill of Lading.

Claims for shortages and damages must be filed with the carrier by consignee. Permission to return goods must be received from the factory prior to shipping. Goods returned to the factory without an authorized Returned Goods Receipt number will not be accepted. All returned goods are subject to a restocking charge.

When ordering parts, you must specify the model and serial number of the heater. When ordering under warranty conditions, you must also specify the date of installation.

Purchased parts are subject to replacement only under the manufacturer's warranty. Debits for defective replacement parts will not be accepted. Parts will be replaced in kind only per Raypak's standard warranties.

Model Identification

The model identification number and heater serial number are found on the heater rating plate located on the upper rear jacket panel. The model number has the form H7-850A or similar depending on the heater size and configuration. The letter(s) in the first group of characters identifies the application (H = Hydronic Heating, WH = Domestic Hot Water). The number which follows identifies the firing mode (7 = electronic modulation). The second group of characters identifies the size of the heater (three numbers representing the approximate MBTUH input), and, where applicable, a letter indicating the manufacturing series.

Ratings and Certifications

⚠WARNING: Altering any Raypak pressure vessel by installing replacement heat exchangers or any ASME parts not manufactured and/or approved by Raypak will instantly void the ASME and CSA ratings of the vessel and any Raypak warranty on the vessel. Altering the ASME or CSA ratings of the vessel also violates national, state, and local approval codes.

Standards:

- ANSI Z21.13 · CSA 4.9 - latest edition, Gas-Fired Hot Water Boilers
- ANSI Z21.10.3 · CSA 4.3 - latest edition, Gas Water Heaters
- CAN 3.1 - latest edition, Industrial and Commercial Gas-Fired Package Boilers
- SCAQMD Rule 1146.2
- Low-lead content (<.25%) CSA-certified

All Raypak heaters are National Board Registered, and design-certified and tested by the Canadian Standards Association (CSA) for the U.S. and Canada. Each heater is constructed in accordance with Section IV of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code and bears the ASME "H" stamp. This heater also complies with the latest edition of the ASHRAE 90.1 Standard.

Installations at Elevation

Rated inputs are suitable for up to 2000 ft (610 m) elevation without de-rating. Consult your local representative or the factory for installations at altitudes over 2000 ft (610 m) above sea level. No hardware changes are required to the heaters for installations up to 10,000 ft (3049 m) (adjustments may be required).

Component Locations

Model 850 shown. Component locations may vary slightly in smaller models.

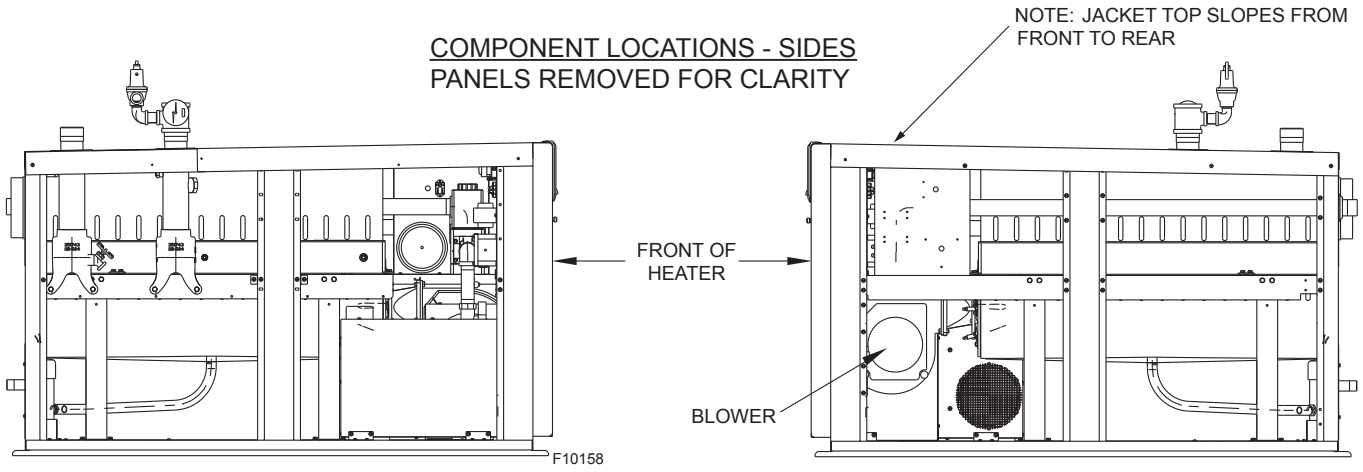


Figure 1. Component Locations — Sides

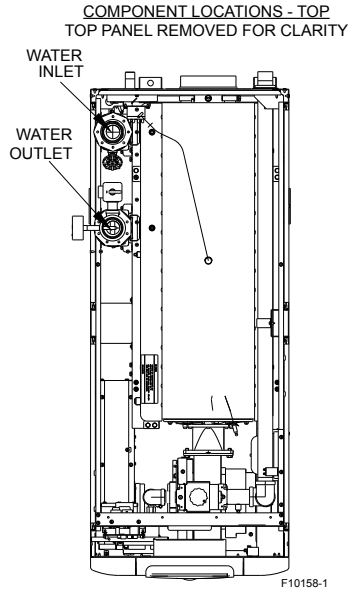


Figure 2. Component Locations — Top

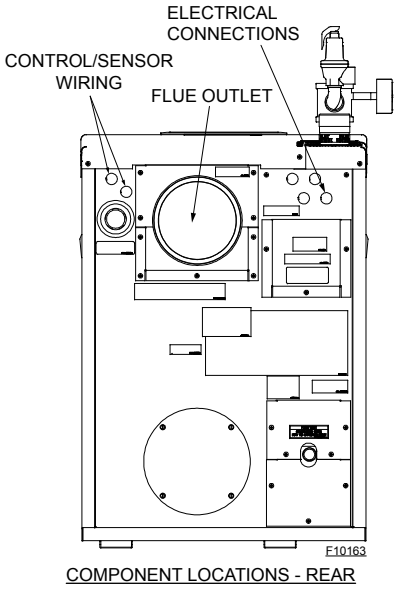


Figure 3. Component Locations — Rear

General Information

Model No.	MBTUH Input		Water conn. (NPT)	Gas conn. (NPT)		Vent Size (inches)	
	Max.	Min.		Nat	Pro	Flue	Intake
300A	300	60	1-1/2"	3/4"	3/4"	4	4
400A	399	80	2"	1"	1"	4	4
500A	500	100	2"	1"	1"	4	4
700A	700	140	2"	1-1/4"	1-1/4"	6	6
850A	850	170	2"	1-1/4"	1-1/4"	6	6

Table B. Basic Data

Model No.	Heater Water Volume gallons (l)
300A	2.9 (11)
400A	3.6 (13.6)
500A	4.2 (15.9)
700A	5.0 (18.9)
850A	5.8 (22)

Table C. Heater Water Volume

4. INSTALLATION

NOTE: The following instructions are intended for simple applications. For more detailed configurations and set-up, consult the VERSA IC® control manual 241493. This manual can be found in the document library at www.raypak.com.

Installation Codes

Installations must follow these codes:

- Local, state, provincial, and national codes, laws, regulations and ordinances
- National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition (NFGC)
- National Electrical Code, ANSI/NFPA 70 - latest edition (NEC)
- Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, (CSD-1) when required
- For Canada only: CAN/CSA B149 Natural Gas and Propane Installation Code and CSA C22.1 C.E.C. Part 1 (C22.1)

Equipment Base

NOTE: The top jacket of the boiler is sloped from front to rear.

CAUTION: The boiler must be mounted on a level base to allow condensate to drain properly from the heat exchanger. The condensate is acidic and highly corrosive.

CAUTION: This boiler should be located in an area where water leakage will not result in damage to the area adjacent to the appliances or to the structure. When such locations cannot be avoided, it is recommended that a suitable catch pan, adequately drained, be installed under the appliance. The pan must not restrict air flow.

The heater must be mounted on a level, structurally sound surface. The heater is approved for installation on a combustible surface but must NEVER be installed on carpeting. Gas-fueled equipment installed in enclosed parking garages must be located at least 18 in. (457 mm) above the floor.

In addition, the heater shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation or service (circulator replacement, control replacement, etc.).

If the heater needs to be secured to the ground, use the holes in the anchoring legs on the heater.

Clearances

Indoor Installations

When installed according to the listed minimum clearances from combustible construction, these heaters can be serviced without removing permanent structural construction around the heater. However, for ease of servicing, we recommend a clearance of at least 24 in. (610 mm) in front, at least 24 in. (610 mm) on the rear and 24 in. (610 mm) above the top of the heater. This will allow the heater to be serviced in its installed location without movement or removal of the heater. See **Figure 4**.

Service clearances less than the minimum may require removal of the heater to service either the heat exchanger or the burner components. In either case, the heater must be installed in a manner that will enable the heater to be serviced without removing any structure around the heater.

Heater Side	Min. Clearances from Combustible Surfaces in (mm)	Minimum Service Clearances in (mm)
Floor*	0	0
Rear	24 (610)	24 (610)
Right Side	0	0
Left Side	0	0
Top	12 (305)	24 (610)
Front	Open	24 (610)
Vent	1 (25)	1 (25)

*DO NOT install on carpeting.

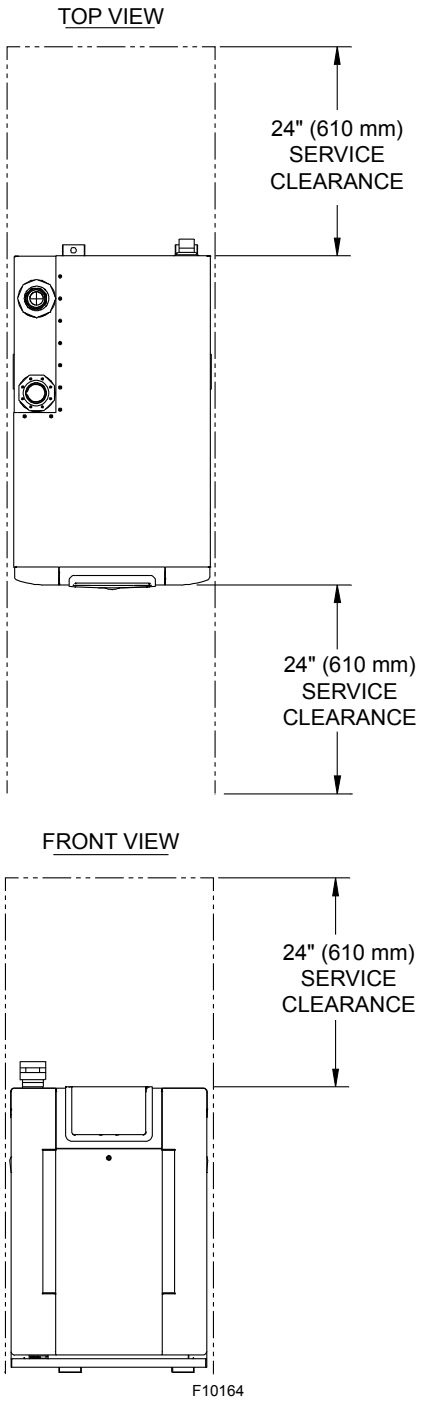
Table D. Clearances — Indoor Installations

Outdoor Installations

These heaters are design-certified for outdoor installation in non-freezing conditions. See **Table E**. Heaters must not be installed under an overhang unless clearances are in accordance with local installation codes and the requirements of the gas supplier. Three sides must be open in the area under the over-hang. Roof water drainage must be diverted away from heaters installed under overhangs.

Heater Side	Min. Clearances from Combustible Surfaces in (mm)	Minimum Service Clearances in (mm)
Rear	24 (610)	24 (610)
Right Side	0	0
Left Side	0	0
Top	Unobstructed	24 (610)
Front	Open	24 (610)
Vent Termination	12 (305)	12 (305)

Table E. Clearances — Outdoor Installations



Venting not shown for clarity. Heater must be vented per instructions in this manual

Figure 4. Minimum Clearances from Combustible Surfaces — Indoor and Outdoor Installations

Combustion and Ventilation Air

NOTE: Use of this boiler in construction areas where fine particulate matter, such as concrete or dry-wall dust, is present may result in damage to the boiler that is not covered by the warranty. If operated in a construction environment, a clean source of combustion air must be provided directly to the boiler.

⚠CAUTION: Combustion air must not be contaminated by corrosive chemical fumes which can damage the boiler and void the warranty.

NOTE: It is recommended that the intake vent be insulated in cold climates to minimize sweating.

Inside Air Contamination

Combustion air can be contaminated by certain vapors in the air which raise the acidity of the condensate. Higher acidity levels attack many materials including stainless steel, which is commonly used in high efficiency systems. The boiler can be supplied with corrosion-resistant, non-metallic intake air vent material. You may, however, choose to use outside combustion air for one or more of these reasons:

1. Installation is in an area containing contaminants listed below which will induce acidic condensation.
2. You want to reduce infiltration into your building through openings around windows and doors.
3. You are using AL29-4C stainless steel vent pipe, which is more corrosion-resistant than standard metallic vent pipe. In extremely contaminated areas, this may also experience deterioration.

Products causing contaminated combustion air:

- spray cans containing chloro/fluorocarbons
- permanent wave solutions
- chlorinated waxes/cleaners
- chlorine-based swimming pool chemicals
- calcium chloride used for thawing
- sodium chloride used for water softening
- refrigerant leaks
- paint or varnish removers
- hydrochloric acid/muriatic acid
- cements and glues
- antistatic fabric softeners used in clothes dryers
- chloride-type bleaches, detergents, and cleaning solvents found in household laundry rooms
- adhesives used to fasten building products
- similar products

Areas where contaminated combustion air commonly exists:

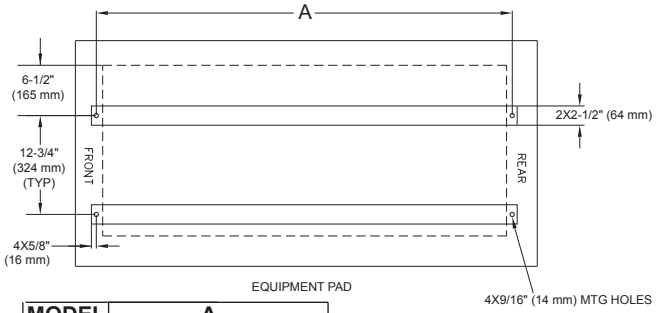
- dry cleaning/laundry areas
- metal fabrication plants
- beauty shops
- refrigeration repair shops
- photo processing plants
- auto body shops
- plastic manufacturing plants
- furniture refinishing areas and establishments
- new building construction
- remodeling areas
- open pit skimmers

Check for areas and products listed above before installing heater. If found:

- remove products permanently, OR
- install Truseal direct vent.

Indoor Units

This heater must be supplied with sufficient quantities of non-contaminated air to support proper combustion and equipment ventilation. Combustion air can be supplied via conventional means where combustion air is drawn from the area immediately surrounding the heater, or via direct vent, where combustion air is drawn directly from outside. All installations must comply with the requirements of the NFGC (U.S.) or B149 (Canada), and all local codes. See **Figure 6** and **Table F.**



MODEL	A
300A	27-9/16" (700 mm)
400A	32-5/16" (821 mm)
500A	36-9/16" (929 mm)
700A	49-5/16" (1253 mm)
850A	53-9/16" (1360 mm)

Figure 5. Anchoring Detail

Combustion Air Filter

This heater is supplied with an integral combustion air filter. This filter will reduce the amount of particulates that pass through the combustion system and heat exchanger but will not protect against chemical inside air contamination. See "Inside Air Contamination" on page 9. The filter must be checked periodically to verify that adequate combustion air is being supplied to the heater. See "Maintenance" on page 51 of this manual for information on checking the filter and establishing service intervals.

Ducted Combustion Air

If outside air is drawn through the intake pipe directly to the unit for combustion:

1. Install the combustion air ducting kit. The air duct will attach directly to the air collar, located on the rear of the heater, using three or four sheet metal screws (not supplied), equally-positioned around the circumference of the duct. See IPL on **page 54** item 17-S, P/N 013275F for models 300A-500A, P/N 013276F for models 700A-800A.
2. Install combustion air duct in accordance with **Figure 28** (horizontal) or **Figure 29** (vertical) of this manual.
3. Ventilation of the space occupied by the heater(s) is recommended and can be provided by an opening(s) for ventilation air at the highest practical point communicating with the outdoors. The total cross-sectional area should be at least 1 in² of free area per 20,000 BTUH (111 mm² per kW) of total input rating of all equipment in the room when the opening is communicating directly with the outdoors or through vertical duct(s). The total cross-sectional area should be at least 1 in² of free area per 10,000 BTUH (222 mm² per kW) of total input rating of all equipment in the room when the opening is communicating with the outdoors.
4. In cold climates, and to mitigate potential freeze-up, Raypak highly recommends the installation of a motorized sealed damper on the air intake to prevent the circulation of cold air through the heater during the non-operating hours.

Truseal™ Combustion Air

CAUTION: Use Truseal combustion air if damaging airborne contaminants are or may be present in the boiler area. See page 9 of this manual regarding air contamination.

NOTE: To ensure proper cooling and ventilation of components, do not block any air openings in the cabinet

The unit will not meet Direct Vent requirements unless the combustion air is ducted to the rear port and the Truseal option is installed. This may be done either at the factory (sales option D-21) or in the field (sales option D-22). Truseal is generally used when damaging contaminants are present in the mechanical room. All ducting must be self-supported.

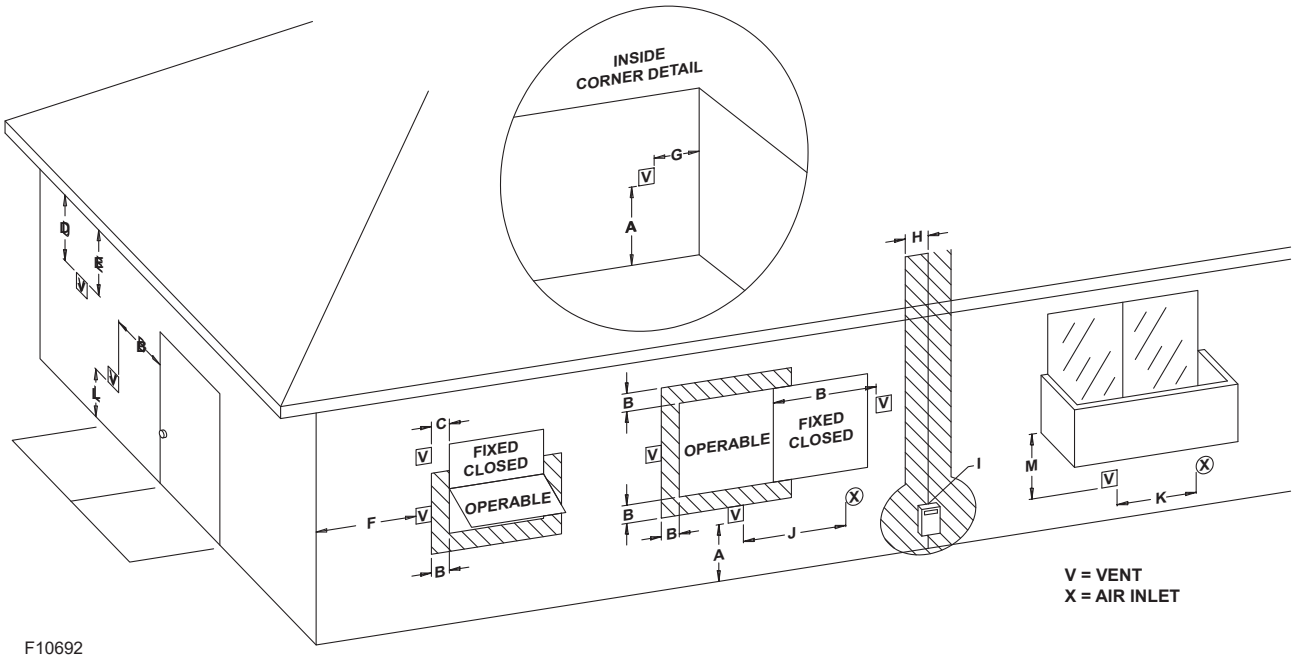


Figure 6. Minimum Clearances from Vent/Air Inlet Terminations – Indoor and Outdoor Installations

		U.S. Installations[1]	Canadian Installations[2]
A	Clearance above grade, veranda, porch, deck, or balcony	1' (30 cm)	1' (30 cm)
B	Clearance to window or door that may be opened	4' (1.2 m) below or to side of opening	3' (91 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2' (61 cm) from the centerline of the terminal	5' (1.5 m)	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	6' (1.83 m)	*
H	Clearance to each side of center line extended above meter/regulator assembly	*	3' (91 cm) within a height 15' above the meter/ regulator assembly
I	Clearance to service regulator vent outlet	*	6' (1.83 m)
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	4' (1.2 m) below or to side of opening; 1' (30 cm) above opening	3' (91 cm)
K	Clearance to mechanical air supply inlet	3' (91 cm) above if within 10' (3 m) horizontally	6' (1.83 m)
L	Do not terminate above paved sidewalk or paved driveway	Slip hazard due to frozen condensate	Slip hazard due to frozen condensate
M	Clearance under veranda, porch, deck or balcony	*	12" (30 cm)[t]

1 In accordance with the current ANSI Z223.1/NFPA 54 National Fuel Gas Code.

2 In accordance with the current CAN/CSA-B149 Installation Codes.

t Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor and top of terminal, and underside of veranda, porch, deck or balcony is greater than 1' (30 cm).

***** Clearances in accordance with local installation codes and the requirements of the gas supplier.

Table F. Vent/Air Inlet Termination Clearances

Conventional Combustion Air Supply

U.S. Installations

All Air from Inside the Building

The confined space shall be provided with TWO permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for a room large in comparison (NFGC). The total input of all gas utilization equipment installed in the combined space shall be considered in making this determination. **Each opening** shall have a minimum free area of 1 in² per 1,000 BTUH (2,225 mm² per kW) of the total input rating of all gas utilization equipment in the confined space, but not less than 100 in² (645 cm²). One opening shall commence within 12 in. (305 mm) of the top, and one opening shall commence within 12 in. (305 mm) of the bottom of the enclosure. The minimum dimension of air openings shall be not less than 3 in. (76 mm) in any direction.

All Air from Outdoors

CAUTION: All combustion air must be drawn from the air outside of the building; the mechanical equipment room must communicate directly with the outdoors.

The confined space shall communicate with the outdoors in accordance with one of the methods below. The minimum dimension of air openings shall not be less than 3 in. (76 mm) in any direction. Where ducts are used, they shall be of the same cross-sectional area as the net free area of the openings to which they connect.

1. Two permanent openings, one commencing within 12 in. (305 mm) of the top, and one commencing within 12 in. (305 mm) of the bottom of the enclosure, shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.
   a. Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in² per 4,000 BTUH (550 mm² per kW) of total input rating of all equipment in the enclosure.
   b. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in² per 2,000 BTUH (1,100 mm² per kW) of total input rating of all equipment in the enclosure.
2. One permanent opening, commencing within 12 in. (305 mm) of the top of the enclosure, shall be permitted where the equipment has clearances of at least 1 in. (25 mm) from the sides and back and 6 in. (152 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors, and shall have a minimum free area of:
   a. 1 in² per 3,000 BTUH (740 mm² per kW) of the total input rating of all equipment located in the enclosure, and
   b. Not less than the sum of the areas of all vent connectors in the confined space.

⚠WARNING: Do not use the "one permanent opening" method if the equipment room is under negative-pressure conditions.

Canadian Installations

⚠CAUTION: All combustion air must be drawn from the air outside of the building; the mechanical equipment room must communicate directly with the outdoors.

1. Ventilation of the space occupied by the heater shall be provided by an opening(s) for ventilation air at the highest practical point communicating with the outdoors. The total cross-sectional area of such an opening(s) shall be at least 10% of the area required in 2. and 3. (below), but in no case shall the cross-sectional area be less than 10 in² (65 cm²).

⚠WARNING: Make sure that the equipment room is not under negative-pressure conditions.

2. For heaters using a barometric damper in the vent system, there shall be a permanent air supply opening(s) having a cross section area of not less than 1 in² per 7,000 BTUH (320 mm² per kW) up to and including 1 million BTUH, plus 1 in² per 14,000 BTUH (160 mm² per kW) in excess of 1 million BTUH. This opening(s) shall be either located at or ducted to a point not more than 18 in. (457 mm) nor less than 6 in. (152 mm) above the floor level. The duct can also "goose neck" through the roof. The duct is preferred to be straight down and terminated 18 in. (457 mm) from the floor, but not near piping. This air supply opening requirement shall be in addition to the air opening for ventilation air required in 1 (above).
3. For heaters when air supply is provided by natural air flow from outdoors for a power burner and there is no draft regulator, a drafthood or similar flue gas dilution device installed in the same space, in addition to the opening for ventilation air required in 1., there shall be a permanent air supply opening(s) having a total cross-sectional area of not less than 1 in² for each 30,000 BTUH (74 mm² per kW) of total rated input of the burner(s), and the location of the opening(s) shall not interfere with the intended purpose of the opening(s) for ventilation air referred to in 1. This opening(s) can be ducted to a point not more than 18 in. (457 mm) nor less than 6 in. (152 mm) above the floor level. The duct can also "goose neck" through the roof.

The duct is preferred to be straight down 18 in. (457 mm) from the floor, but not near piping.

4. Refer to the B149 Installation Code for additional information.

Water Piping

CAUTION: This boiler requires forced water circulation when the burner is operating. See Table H and Table I for minimum and maximum flow rates and water pump selection. The pump must be interlocked with the boiler to prevent heater operation without water circulation.

NOTE: Minimum pipe size for in/out connections is 1-1/2 NPT for model 300A and 2 NPT for models 400A, 500A, 700A and 850A. Verify proper flow rates and ∆T as instructed in this manual.

NOTE: The continuous inlet water temperature must be no less than 50°F (10°C).

General

⚠WARNING: Pressure relief valve discharge piping must be piped near the floor and close to a drain to eliminate the potential of severe burns. Do not pipe to any area where freezing could occur. Refer to local codes.

The heater should be located so that any water leaks will not cause damage to the adjacent area or structures.

Relief Valve Installation and Piping

⚠WARNING: The pressure relief valve must be installed at the outlet of the boiler. No valve is permitted to be installed between the boiler and the relief valve.

The heater is supplied with a Section IV “HV” stamped relief valve sized for the full input of the unit. The relief valve assembly is shipped loose and must be mounted directly to the heater outlet. No valve shall be installed between the heater and the relief valve. The relief valve shall be mounted with its spindle vertical. See **Figure 1**, **Figure 2** and **Figure 3**. Relief valve discharge piping shall provide no less than the cross sectional area of the relief valve outlet and must be routed to a safe point of discharge. Installation must comply with all national, state and local codes.

Temperature and Pressure Gauge

The temperature and pressure gauge is shipped loose for field installation and must be installed within 12" (305 mm) of the boiler outlet (if possible) in an easily readable location. Installation must comply with ASME Section IV as well as all applicable national, state and local codes.

Hydrostatic Test

Unlike many types of heaters, this heater does not require hydrostatic testing prior to being placed in operation. The heat exchanger is ASME certified for 160 psi (1103 kPa) maximum working pressure. However, Raypak does recommend hydrostatic testing of the piping connections to the heater and the rest of the system prior to operation. This is particularly true for hydronic systems using expensive glycol-based anti-freeze. Raypak recommends conducting the hydrostatic test before connecting gas piping or electrical supply.

Leaks must be repaired at once to prevent damage to the heater. NEVER use petroleum-based stop-leak compounds.

To perform hydrostatic test:

1. Connect fill water supply. With bleed valve open, fill heater with water. When water flows from bleed valve, shut off water. Close bleed valve. Carefully fill the rest of the system, making sure to eliminate any entrapped air by using high-point vents. Close feed valve. Test at standard operating pressure for at least 24 hours.
2. Make sure constant gauge pressure has been maintained throughout test.
3. Check for leaks. Repair if found.

Flushing/Cleaning of System Piping

⚠WARNING: Damage due to internal condensation may occur if the heater inlet water temperature does not exceed 50ºF (10ºC) within 7-minutes of startup.

Many of the chemicals used to perform this function will harm the heat exchanger as well as some gaskets and seals within the unit, causing a non-warrantable failure. When required, Raypak recommends the boiler be isolated from the system piping prior to flushing or cleaning using any cleaning agent.

Cold Water Operation

⚠CAUTION: Damage due to internal condensation may occur if the heater inlet water temperature does not exceed 50ºF (10ºC) within 7-minutes of startup.

Raypak’s Cold Water Protection systems provide functionality to bypass water from the heater discharge to be mixed with the cooler water returning to the heater inlet. This is done to elevate the heater inlet temperature to 50ºF (10ºC) or higher (user-adjustable) within 7-minutes to prevent harmful condensation from forming in the combustion chamber.

This heater must operate with a stable inlet temperature at 50ºF (10ºC) or above. Long periods of operation with temperatures below 50ºF (10ºC) can excessively cool the products of combustion, resulting in collection

of condensate in the heat exchanger and combustion chamber, and significantly reduce the life of the equipment.

The following applications are approved configurations supported by Raypak for CWP systems.

Cold Water Protection: H models - Closed Loop

Closed loop heating systems that will experience extended and/or repeated warm up periods where the inlet water temperature remains below 50ºF (10ºC) lasting more than 7-minutes must have cold water start protection. Known protection methods consist of mixing heated outlet water with the inlet water using a fixed - manual bypass to raise the inlet to 50ºF (10ºC) or higher. Once the system is heated up and has return water temperatures of 50ºF (10ºC) or higher, the mixing of outlet water with inlet water is no longer needed and the bypass can be shut off. If the bypass is not shut off as the system heats up, the outlet temperature may continue to climb and trip the high-limit, thereby shutting down the heater. Thus an automatic valve system, such as a three-way proportional valve to control the bypass should be used. The Integrated VERSA IC control system provides automatic functionality to control a proportional 3-way valve to provide cold water protection for a single unit or multi-unit cascade configuration. For more information regarding this function see VERSA IC control manual 241493.

Cold Water Protection: H and WH models - Open Loop

With open loop systems, typically a variable-flow injection system will be used in lieu of a 3-way proportional valve to provide cold water protection. This is done to avoid wide swings in flow rate to and from the heater that can be experienced with a 3-way valve. This in turn can cause elevated temperature differentials between the heater inlet and outlet which can lead to potential scale formation. For potable water systems requiring low-lead construction there are very few options for a 3-way valve that meets this requirement so the preferred method is an injection loop. An injector pump approach has the added value of being able to adjust very quickly to changes in the system water coming back to the heater. The integrated VERSA IC control system provides functionality to control a single variable flow injection system. For more information see VERSA IC control manual 241493.

Hydronic Heating

Pump Selection

⚠WARNING: Pump motors should NOT be supported by any type of stand or support from above due to possible misalignment of pump and motor.

In order to ensure proper performance of your heater system, you must install a correctly-sized pump. Raypak recommends designing for a ΔT within the range of 15°F to 35°F (8°C to 19°C). For acceptable flow rates for each model see **Table H**. (ΔT is the temperature difference between the inlet and outlet water when the heater is firing at full rate).

Raypak standard pump selection for H models is based on a 30ºF (17ºC) ΔT, and allows for up to 75 equivalent feet (23 m) of tubing between the boiler and the system connections.

Boiler Model	Standard Boiler Pump*	
	Pump	HP
H7-300A	0012	1/8
H7-400A	0012	1/8
H7-500A	1611	1/4
H7-700A	1630	1/2
H7-850A	1630	1/2

* Pump selection based on 30°F (17°C) ΔT with up to 75 eq. ft. (23 m) of tubing.

Table G. Pump Selection

Model No.	20°F (11°C) ΔT		30°F (17°C) ΔT		35°F (19°C) ΔT		Min. Flow			Max. Flow		
	GPM (L/min)	ΔP ft (m)	GPM (L/min)	ΔP ft (m)	GPM (L/min)	ΔP ft (m)	GPM (L/min)	ΔP ft (m)	ΔT °F (°C)	GPM (L/min)	ΔP ft (m)	ΔT °F (°C)
H7-300A	28 (106)	17 (5.2)	19 (72)	8 (2.4)	16 (61)	6 (1.8)	14 (53)	5 (1.5)	39 (22)	36 (136)	28 (8.5)	16 (9)
H7-400A	38 (144)	18 (5.5)	25 (95)	7 (2.1)	21 (79)	5 (1.5)	19 (72)	4 (1.2)	39 (22)	47 (140)	29 (8.8)	16 (9)
H7-500A	47 (178)	16 (4.9)	31 (117)	7 (2.1)	27 (102)	5 (1.5)	24 (91)	4 (1.2)	39 (22)	56 (212)	23 (7.0)	17 (9)
H7-700A	66 (250)	30 (9.1)	44 (167)	13 (4)	38 (144)	9 (2.7)	34 (129)	7 (2.1)	39 (22)	70 (265)	34 (10.4)	19 (11)
H7-850A	80 (303)	40 (12.2)	53 (201)	17 (5.2)	46 (174)	12 (3.7)	41 (155)	10 (3)	39 (22)	80 (303)	40 (12.2)	20 (11)

Notes: Basis for minimum flow is ΔT . Basis for maximum flow is gpm.

Table H. Heater Rates of Flow and Pressure Drops

Feedwater Regulator

Raypak recommends that a feedwater regulator be installed and set at 12 psi (83 kPa) minimum pressure at the highest point of the system. Install a check valve or back flow device upstream of the regulator, with a manual shut-off valve as required by local codes.

Piping

All high points should be vented. A heater installed above radiation level must be provided with a low water cut-off device (sales order option F-10). This heater, when used in connection with a refrigeration system, must be installed so that the chilled medium is piped in parallel with the heater with appropriate valves to prevent the chilled medium from entering the heater.

The piping system of a hot water heater connected to heating coils located in air handling units where they may be exposed to circulating refrigerated air, must be equipped with flow control valves or other automatic means to prevent gravity circulation of the heater water during the cooling cycle. It is highly recommended that the piping be insulated.

Air-Separation/Expansion Tank

All heaters should be equipped with a properly-sized expansion tank and air separator fitting as shown in **Figure 7**.

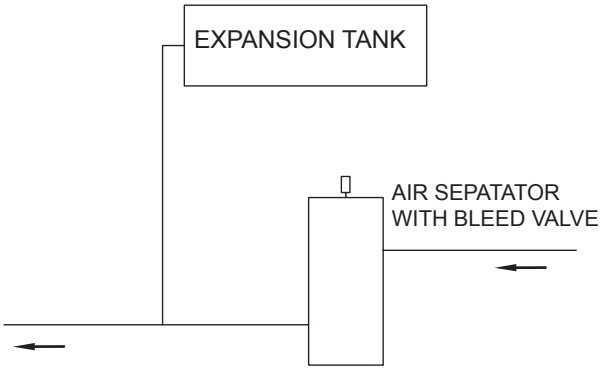


Figure 7. Air-Separation/Expansion Tank

System Sensor Installation

The System Sensor (S3) is required for all selectable mode unless the unit's firing rate will be controlled by an external source such as the Temp Tracker MOD+ Hybrid sequencer (sales option B-36). Proper placement and method of installation are critical for proper operation of the system. See **Figure 8**. The sensor must be installed in a drywell in conjunction with heat conductive compound as shown in the following images. The drywell must be installed no more than 5 equivalent feet (1.5 m) of pipe/ tubing downstream of the de-coupler and installed in such a way that ensures the sensor bulb is in the flow path.

⚠CAUTION: Be careful when installing the drywell not to over-tighten the well as this can damage the well and may prevent the sensor from fitting property.

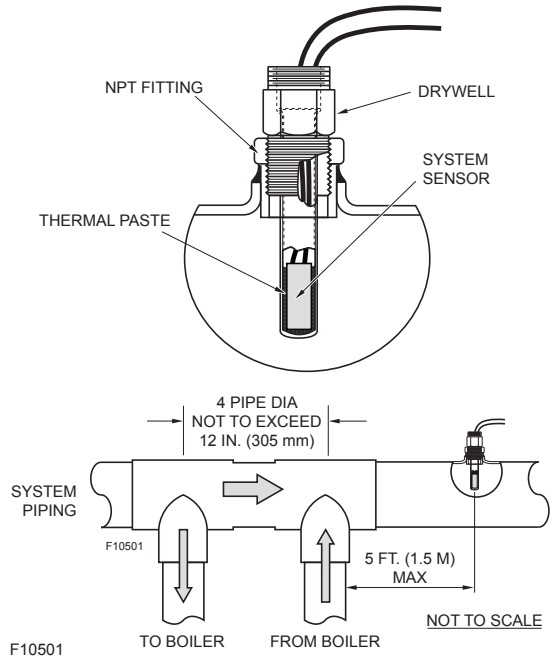


Figure 8. System Sensor Installation

Three-Way Valves

Three-way valves intended to regulate system water temperatures by reducing flow in the boiler should not be used. Raypak heaters are high-recovery, low-mass heaters which are not subject to thermal shock.

Applications and Modes

NOTE: Refer to the VERSA IC control manual 241493 for detailed instructions regarding the various applications supported by the VERSA IC control system.

The VERSA IC Control system is designed for a wide range of applications. The installer/design engineer should refer to the following Modes to determine which best fits the intended application and functionality for the unit being installed.

Type H models of XFyre have three modes available to them to address the various applications the units can be applied to. Type WH units will only have the WH configuration available to them for use with potable water applications when directly connected to a hot water storage tank. For detailed information about applications and modes, see VERSA IC control manual 241493.

Mode 1 (Type H Units Only)

NOTE: Indirect DHW is disabled in MODE 1; use MODE 2 or MODE 3.

NOTE: MODE 1 can also be used for process heating applications in conjunction with a buffer/storage tank when operating temperatures above 150°F (66°C) are required. Care must be given to ensuring water hardness is less than 5 grains per gallon (1.3 grain per liter) to ensure scale free operation. Configure for Manual Differential and set for 3 to 5ºF (2 to 3°C).

This mode selection is for hydronic heating systems with single or multiple boilers (Maximum 4 boilers) in primary/ secondary piping configuration with or without Outdoor Air Reset (S4). See **Figure 9** and. **Figure 10**. The system temperature is controlled by the System sensor (S3). The Boiler Pump (P1) runs during any call for heat. The System Pump (P2) runs whenever the system is enabled for heating and the outdoor air temperature is lower than the warm weather shut down (WWSD) temperature setting (if utilized). The Boiler Pump is delayed "off" as user defined in the BOILER menu, and System Pump is delayed "off" as user defined in the ADJUST menu.

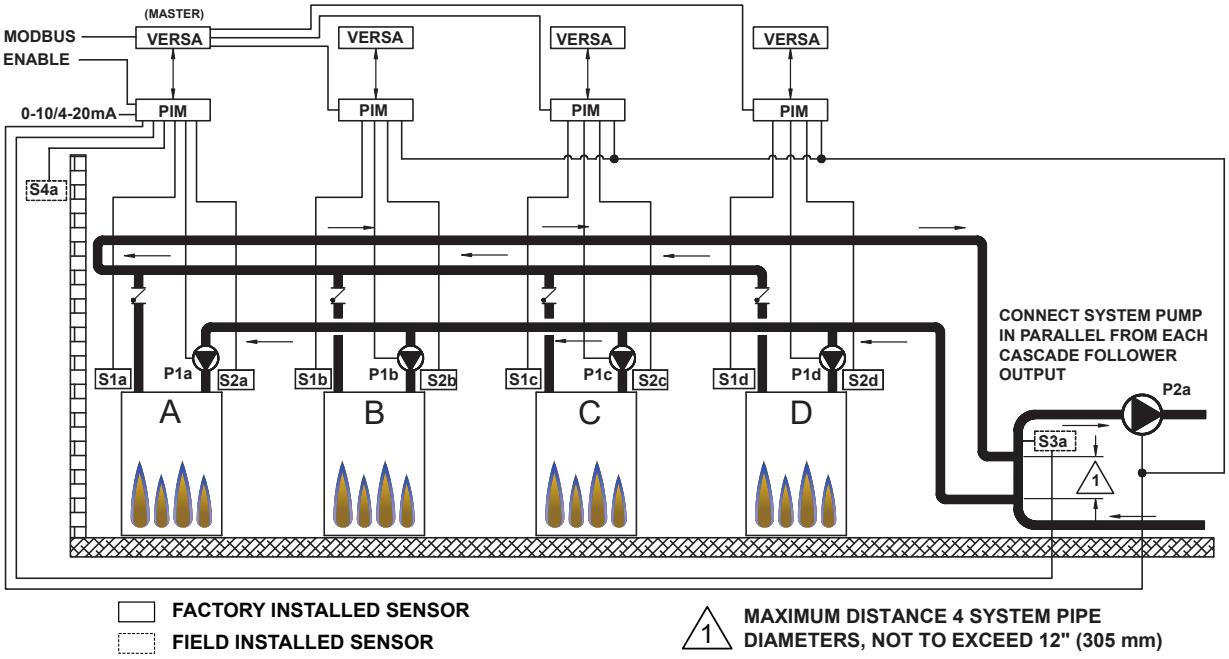


Figure 9. MODE 1 - Hydronic Multi-Boiler

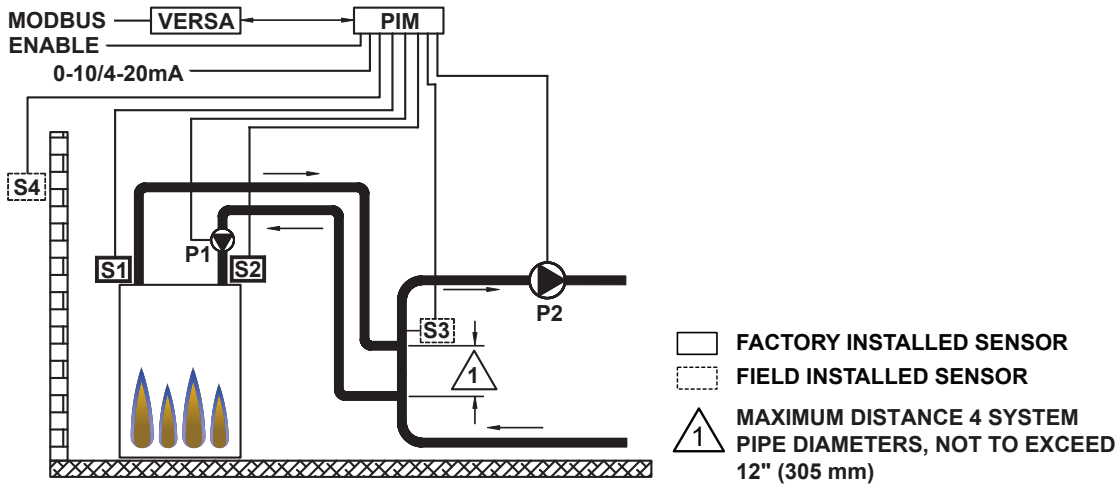


Figure 10. Mode 1 - Single Heater with Primary Secondary Piping

Mode 2 (Type H Units Only)

This mode selection is for hydronic heating systems with single or multiple boilers (Maximum 4 boilers) in primary/secondary piping configuration with or without Outdoor Air Reset (S4) with indirect DHW on the system loop (with or without priority). See **Figure 11**. The system temperature is controlled by the System sensor (S3). The Indirect DHW sensor (S5) determines the indirect call/tank setpoint. The system temperature is boosted to Target Max when using the Indirect DHW sensor (S5) during an indirect call for heat.

Priority mode toggles off the System Pump (P2) when an indirect call for heat is present. The Boiler Pump (P1) runs during any call for heat. The Indirect DHW Pump (P3) runs during an indirect call for heat with no "off" delay. The Boiler Pump (P1) is delayed "off" as user defined in the BOILER menu, and System Pump (P2) is delay "off" as user defined in the ADJUST menu. The System Pump (P2) runs whenever the system is enabled for heating and the outdoor air temperature is lower than the WWSD temperature setting (if utilized) unless an indirect call for heat is present with priority.

Mode 3 (Type H Units Only)

This mode selection is for hydronic heating systems with single or multiple boilers (Maximum 4 boilers) in primary/secondary piping configuration with or without Outdoor Air Reset (S4) with indirect DHW on the boiler loop (with priority). The system temperature is controlled by the Supply sensor (S3) whenever the indirect call for heat is not active. The DHW Supply sensor (S5) determines the indirect call/tank setpoint. During an indirect call for heat the boiler firing rate is determined by the water temperature at the Indirect Supply sensor (S6) and the Target Max setting when using the Indirect DHW sensor (S5). The Boiler Pump (P1) runs during all heat calls regardless of priority. The Indirect DHW Pump (P3) runs during an indirect call for heat with no "off" delay. The Boiler Pump (P1) is delayed "off" as user defined in the BOILER menu, and System Pump (P2) is delay "off" as user defined in the ADJUST menu. The system pump (P2) runs whenever the system is enabled for heating and the outdoor air temperature is lower than the WWSD temperature setting (if utilized) unless an indirect call for heat is present.

NOTE: A Tank Aquastat can be used in lieu of the Indirect DHW Sensor (S5). See the VERSA IC control manual 241493 for additional details.

WH – Direct DHW Configuration

When the unit is ordered as a "WH" configuration the only application available to it is direct DHW with single or multiple heaters (Maximum 4 heaters). The tank temperature is controlled by the System sensor (S3). The Boiler Pump (P1) runs during any call for heat. The System Pump (P2) output is active whenever the system is enabled. The Boiler Pump is delayed "off" after the Tank Target temperature is achieved and as user defined in the BOILER menu.

NOTE: Indirect DHW pump contacts are not active in this configuration.

NOTE: WH units will operate to a maximum tank temperature of 150°F (66°C). For temperatures required above 150°F (66°C) an "H" model boiler must be used and great care must be given to ensuring water hardness is less than 5 grains per gallon (1.3 grain per liter) to ensure scale free operation. MODE 1 should be used and configured for setpoint operation for process heating applications using a Manual Differential set for between 3 and 5ºF (1 to 3°C).

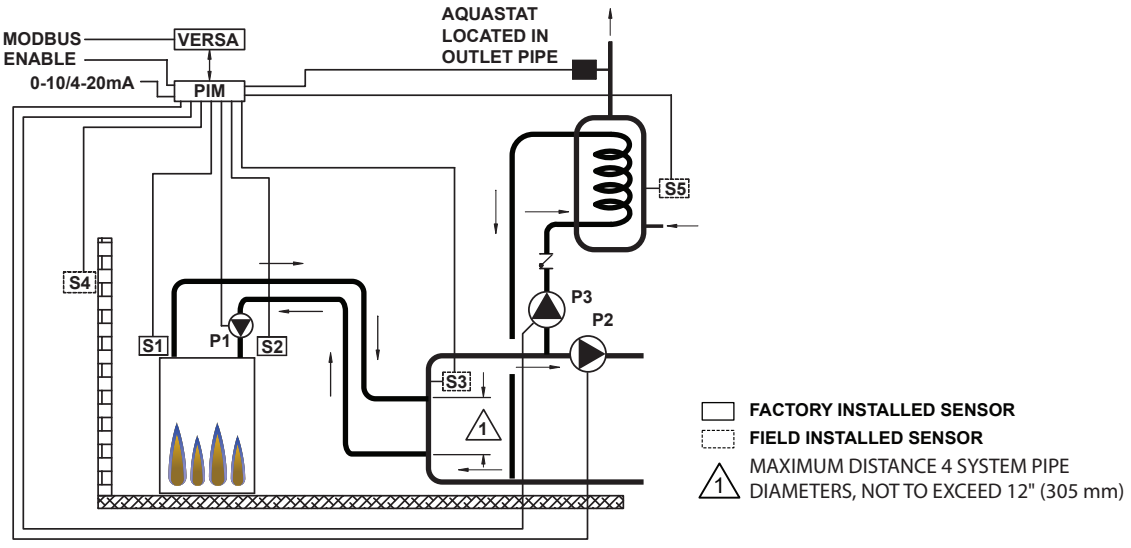


Figure 11. MODE 2 - Single Boiler with Indirect on System Loop

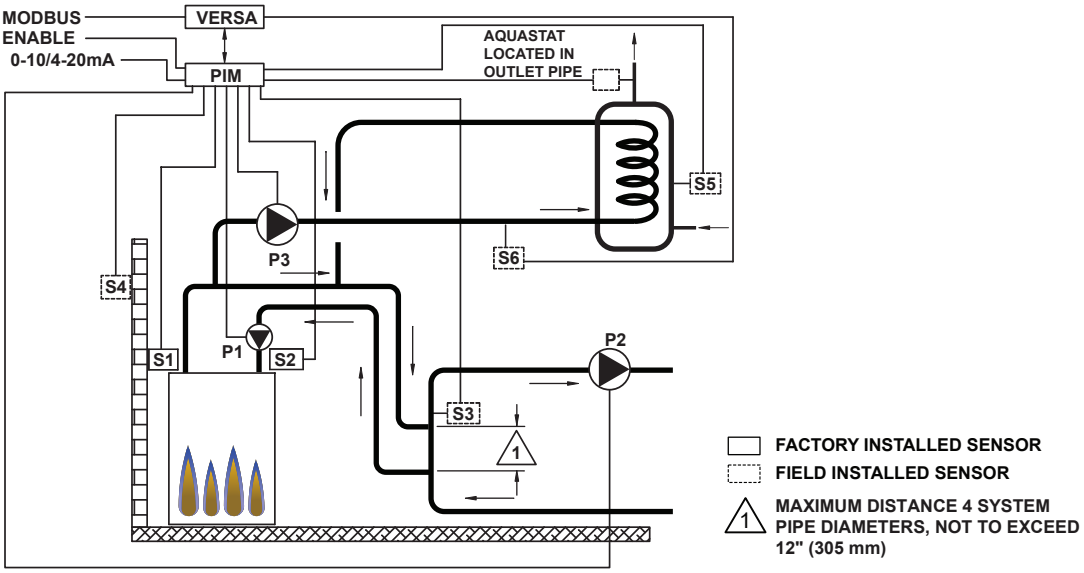


Figure 12. MODE 3 - Single Boiler with Indirect on Boiler Loop

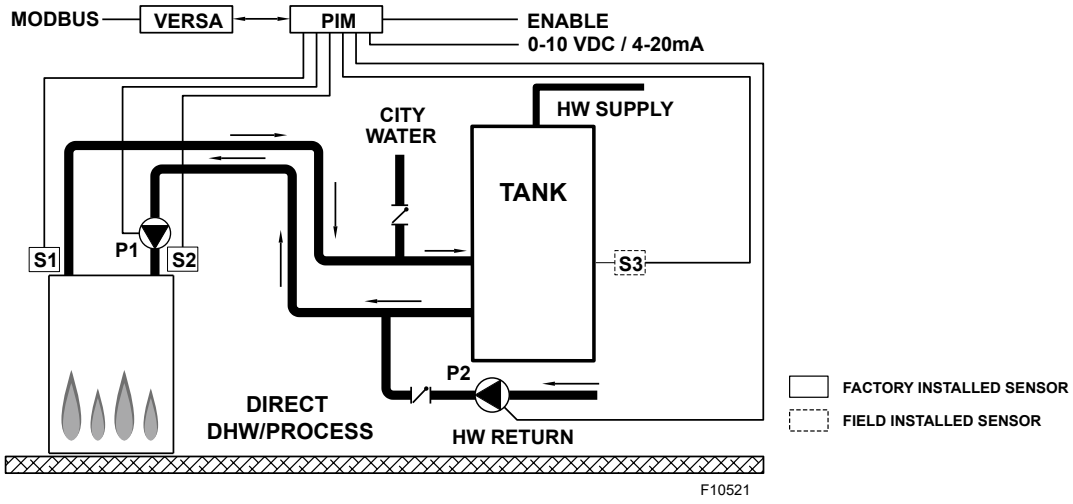


Figure 13. WH Units - Single Water Heater with Tank H Units - Single Boiler with Process Tank

Domestic Hot Water

NOTE: If local codes require a vacuum relief valve, acquire one locally and install per valve manufacturer's instructions.

When designing the water piping system for domestic hot water applications, water hardness should be considered. For the suggested flow rates for soft and medium water see **Table I**. Do not use when hardness exceeds 15 grains per gallon.

Potable Water and Space Heating

When this heater is used for both potable water and space heating, observe the following to ensure proper operation.

1. All piping materials and components connected to the water heater for the space heating application shall be suitable for use with potable water.
2. Toxic chemicals, such as used for boiler treatment, shall not be introduced into the potable water used for space heating.
3. If the heater will be used to supply potable water, it shall not be connected to any heating system or components previously used with a non-potable water heating appliance.
4. When the system requires water for space heating at temperatures higher than 140°F (60°C), a means such as a mixing valve shall be installed to temper the water in order to reduce scald hazard potential.

Gas Supply

⚠DANGER: Make sure the gas on which the heater will operate is the same type as specified on the rating plate.

⚠WARNING: Plumbing between the heater and tank in excess of 75 equivalent feet (23 m) will require custom pump selection. Damage due to low flow may occur and is not a warrantable failure. Consult with your local Raypak representative.

NOTE: The 75 eq. feet (23 m) of tubing typically represents 25 linear feet (7.6 m) of tubing and 50 eq. feet (15 m) of fittings.

Gas piping must have a sediment trap ahead of the heater gas controls, and a manual shut-off valve located outside the heater jacket. See **Figure 14**. It is recommended that a union be installed in the gas supply piping adjacent to the heater for servicing. For maximum gas pipe lengths see **Table K**.

Gas Supply Connection

⚠CAUTION: The heater must be disconnected from the gas supply during any pressure testing of the gas supply system at test pressures in excess of 1/2 psi (3.45 kPa).

⚠CAUTION: Only sealant tape or a pipe compound rated for use with natural and propane gas is recommended. Apply sparingly only on male pipe ends, leaving the two end threads bare.

⚠CAUTION: Support gas supply piping with hangers, not by the heater or its accessories. Make sure the gas piping is protected from physical damage and freezing, where required.

⚠CAUTION: Fuel grades of other than HD-5 Propane or Natural Gas (980-1080 BTU/ft³) will require adjustments, please contact the factory.

Model No.	3–15 grains per gallon				
	Pump	HP	GPM (L/min)	SHL ft (m)	∆T °F (°C)
WH7-300A	1611	1/4	24 (91)	17 (5)	24 (13)
WH7-400A	1630	1/2	38 (144)	20 (6)	20 (11)
WH7-500A	1630	1/2	48 (182)	19 (6)	20 (11)
WH7-700A	1634	1	67 (254)	36 (11)	20 (11)
WH7-850A	1634	1	70 (261)	36(11)	23 (12)

∆T = Temperature rise, °F (°C).

SHL = System head loss, ft (m) (based on heater and tank placed no more than 5 ft (1.5 m) apart and equivalent length of 75 ft (23 m) of tubing and fittings).

GPM = Gallons per minute (L/min), flow rate.

Caution: For scale-free operation with Medium water (5–15 grains per gallon of total hardness), the operating control must NOT be set higher than 140°F (60°C).

Table I. Domestic Water Heater Flow Rate Requirements

The heater must be isolated from the gas supply piping system by closing the upstream manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or greater than 1/2 psi (3.45 kPa). Relieve test pressure in the gas supply line prior to reconnecting the heater and its manual shut-off valve to the gas supply line. **FAILURE TO FOLLOW THIS PROCEDURE MAY DAMAGE THE GAS VALVE**. Over-pressurized gas valves are not covered by warranty. The heater and its gas connections shall be leak-tested before placing the appliance in operation. Use soapy water for leak test. DO NOT use an open flame.

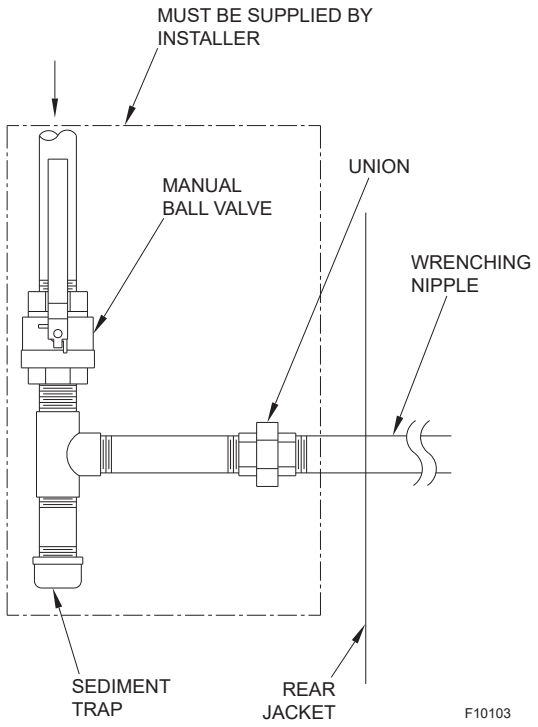


Figure 14. Gas Supply Connection

Gas Supply Pressure

⚠CAUTION: For proper operation, no more than a 30% drop in gas supply pressure from no-load to full-load conditions is acceptable. Under no circumstances should the pressure be outside the listed operational range.

A minimum of 4.0 in. WC upstream gas pressure under full load and a maximum gas supply pressure setpoint of 10.5 in. WC under load and no-load conditions for natural gas. A minimum of 4.0 in. WC upstream gas pressure under full load and a maximum gas supply pressure setpoint of 13.0 in. WC is required for propane gas. The gas pressure regulator(s) supplied on the heater is for low-pressure service. If upstream pressure exceeds 1/2 psi (3.45 kPa) at any time, an intermediate gas pressure regulator, of the lockup type, must be installed. This regulator should be placed a minimum distance of 10 times the pipe diameter upstream of the heater gas controls.

When connecting additional gas utilization equipment to the gas piping system, the existing piping must be checked to determine if it has adequate capacity for the combined load. The gas valve pressure regulator on the heater is nominally preset as noted in **Table J**.

During normal operation, carbon dioxide should be 8.5 to 9.0% at full fire for natural gas and between 9.5 and 10.0% for propane gas. Carbon monoxide should be <150 ppm.

Model No.	Manifold Pressure (in. WC)	
	Natural Gas	Propane Gas
	High	High
300A	-1.0 ± .1	-1.0 ± .1
400A	-1.5 ± .1	-1.6 ± .1
500A	-1.2 ± .1	-1.3 ± .1
700A	-1.4 ± .1	-1.0 ± .1
850A	-1.7 ± .2	-3.4 ± .2

Table J. Manifold Gas Pressure Settings

Model No.	3/4" NPT		1" NPT		1-1/4" NPT		1-1/2" NPT		2" NPT	
	NAT	PRO	NAT	PRO	NAT	PRO	NAT	PRO	NAT	PRO
300A	15	30	45	100	175	400	390			
400A			30	70	120	275	270	414		
500A			15	40	65	150	150	350		
700A					42	96	96	220	310	795
850A					25	55	55	125	175	450

Natural Gas – 1,000 BTU/ft3, 0.60 specific gravity at 0.5 in. WC pressure drop.

Propane Gas – 2,500 BTU/ft3, 1.53 specific gravity at 0.6 in. WC pressure drop.

Table K. Maximum Equivalent Gas Pipe Length

Electrical Power Connections

Installations must follow these codes:

- National Electrical Code and any other national, state, provincial or local codes or regulations having jurisdiction.
- Safety wiring must be NEC Class 1.
- Heater must be electrically grounded as required by the NEC.
- In Canada, CSA C22. 1 C.E.C. Part 1.

The XFyre 300A–850A heaters are wired for 120 VAC single-phase 60 Hz power. Consult the wiring diagram shipped with the heater. Before starting the heater, check to ensure proper voltage to the heater and pump(s). A larger circuit breaker may be needed for pumps larger than 1/4 hp.

The boiler pump (up to 1 hp) and the indirect DHW pump (up to ¼ hp) get their power supply directly from the heater power supply (connections are located in the rear wiring box). The system pump relay is rated for pilot duty only. XFyre heaters may power up to 2 pumps directly. Install a circuit breaker sized sufficiently for both the heater and the pump(s). An indirect DHW pump larger than ¼ hp or 5A must use a separate power supply and run the power through an external field supplied pump contactor. Use appropriately-sized wire as defined by NEC, CSA and/or local codes. All primary wiring should be 125% of minimum rating. The indirect and system pumps outputs are fuse-protected.

If any of the original wire as supplied with the heater must be replaced, it must be replaced with 105°C wire or its equivalent.

All 120 VAC field wiring connections to the XFyre heater are made inside the rear wiring box as shown in **Figure 16**. Low voltage wiring is connected to the VERSA control board and the Platform Ignition Module at the front of the unit. Sensors, enable/disable contacts, (optional) 0-10VDC control wiring, and cascade connections are wired into the VERSA and PIM field wiring plugs. See "WIRING DIAGRAM" on page 43.

Model No.	120VAC, 1-PH, 60Hz					
	H7 - Boiler			WH7 - Water Heater		
	Pump Model	HP	Amps	Pump Model	HP	Amps
300A	0012	1/8	1.3	1611	1/4	5.7
400A	0012	1/8	1.3	1630	1/2	6.9
500A	1611	1/4	5.7	1630	1/2	6.9
700A	1630	1/2	6.9	1634	1	14
850A	1630	1/2	6.9	1634	1	14

Table L. Standard Pump Sizes and Amperages

Check the Power Source

⚠WARNING: Using a multi-meter, check the following voltages at the circuit breaker panel prior to connecting any equipment. Make sure proper polarity is followed and house ground is proven.

Check the power source:

- AC = 108 VAC Minimum, 132 VAC MAX
- AB = 108 VAC Minimum, 132 VAC MAX
- BC = <1 VAC Maximum

Making the Electrical Connections

NOTE: A grounding electrode conductor shall be used to connect the equipment grounding conductors, the equipment enclosures, and the grounded service conductor to the grounding electrode.

NOTE: Minimum 18 AWG, 105°C, stranded wire must be used for all low voltage (less than 30 volts) external connections to the unit. Solid conductors should not be used because they can cause excessive tension on contact points. Install conduit as appropriate. All high voltage wires must be the same size (105°C, stranded wire) as the ones on the unit or larger.

Refer to **Figure 15** though **Figure 19**.

1. Verify that circuit breaker is properly-sized by referring to heater rating plate. A dedicated circuit breaker should be provided and sized for the heater and all pumps powered through the heater.
2. Turn off all power to the heater. Verify that power has been turned off by testing with a multi-meter prior to working with any electrical connections or components at the J-box inside the heater.
3. Observe proper wire colors while making electrical connections. Many electronic controls are polarity sensitive. Components damaged by improper electrical installation are not covered by warranty.
4. Provide overload protection and a disconnect means for equipment serviceability as required by local and state code.
5. Install heater controls, thermostats, or building management systems in accordance with the applicable manufacturers' instructions.
6. Conduit shall not be used as the earth ground.

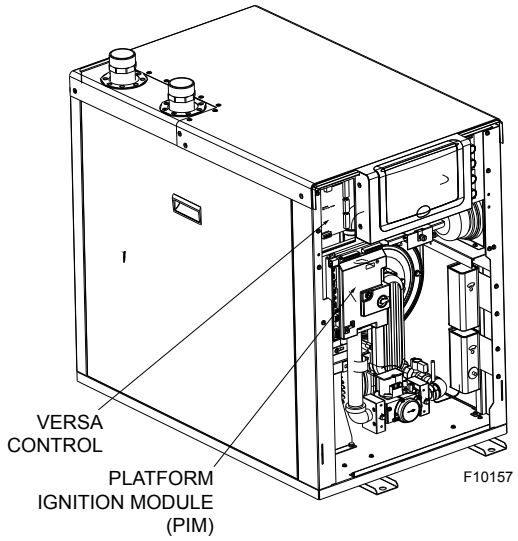


Figure 15. Front Wiring Locations

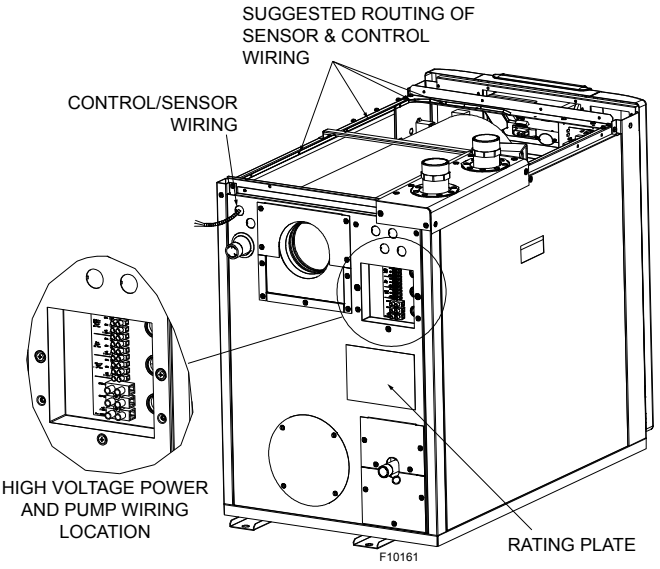


Figure 16. Rear Wiring Locations

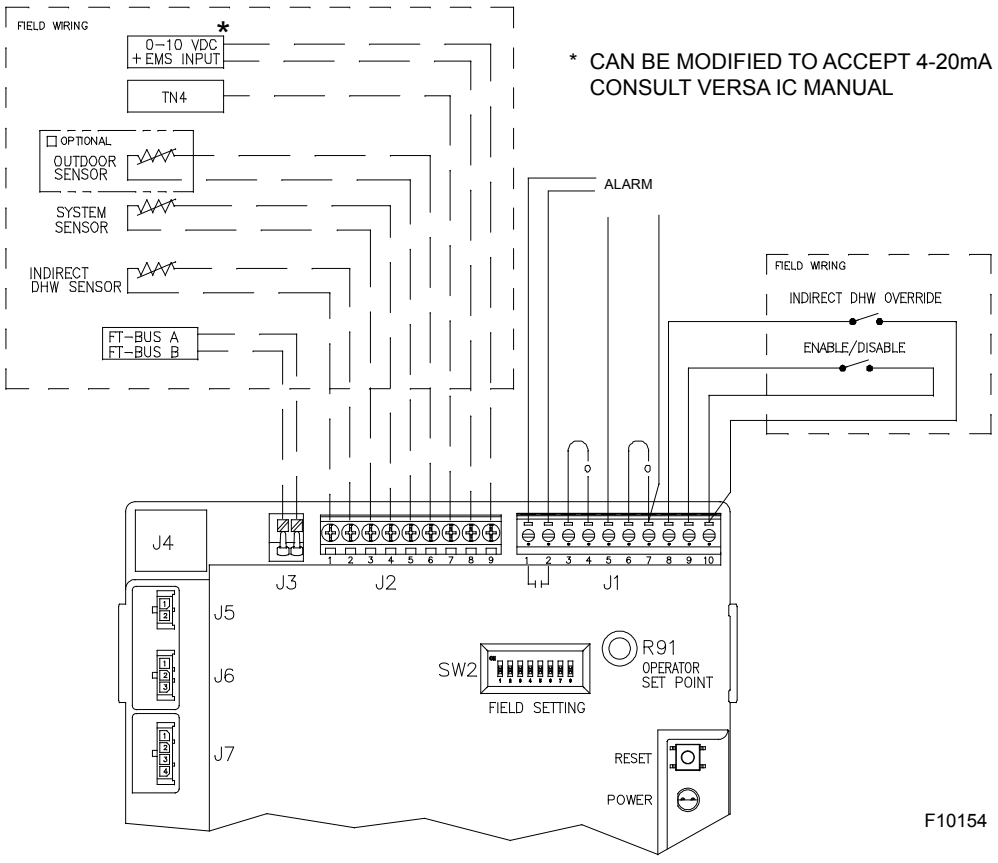


Figure 17. XFyre Single Heater Control

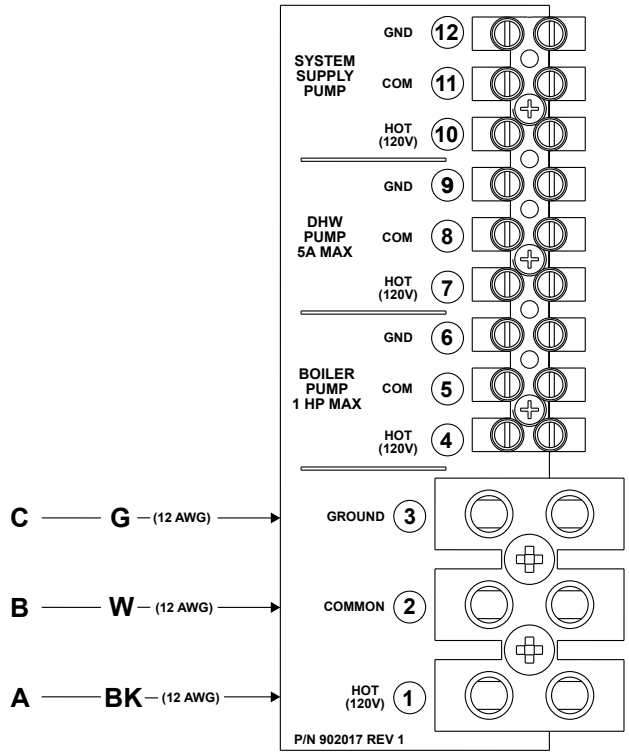


Figure 18. Wiring Connections

Field Wiring Connections

⚠DANGER: SHOCK HAZARD

⚠CAUTION: Wiring errors can cause improper and dangerous operation. See the wiring diagram in this manual. Verify proper operation after servicing.

Make sure electrical power to the heater is disconnected to avoid potential serious injury or damage to components.

Wiring the Thermostat

Connect the Enable/Disable terminals to the PIM. See **Figure 17**. Alternately, any dry contact closure (including a remote thermostat) across these terminals will enable the XFyre unit to run. Caution should be used to ensure neither of the terminals becomes connected to ground.

Heating Sensor Installation

NOTE: If the System Sensor (S3) can not sense the correct water temperature, the VERSA IC will not provide comfortable heat levels.

⚠WARNING: Use only the System and Outdoor Air sensors included with the control.

1. Only use the System sensor provided with the unit.
2. The sensor wires can be extended up to 500 ft (152 m) using a stranded 2-conductor cable.
3. Do not run sensor wires in conduit with line voltage wiring.
4. Install a 3/8" ID 1/2 NPT immersion well.
5. If installing the system sensor on the supply, insert the sensor in a well with heat paste no more than 5 ft (1.5 m) past the boiler loop outlet on the common supply header, but before any major takeoffs. The sensor must be located where it sees the output of all the boiler stages. If a boiler is piped so that the sensor does not see its output. The VERSA IC will not sequence the boilers correctly.

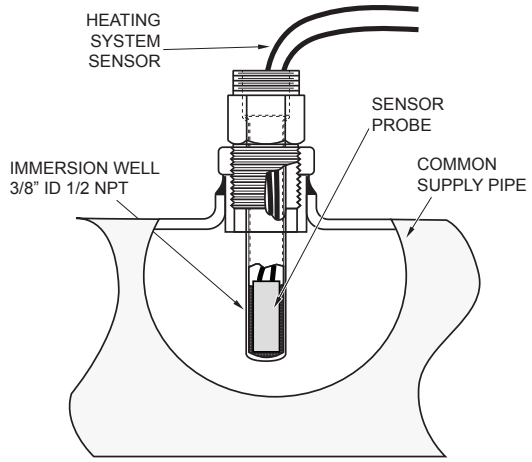


Figure 19. System Sensor (S3)

Wiring the Outdoor Sensor

1. There is no connection required if an outdoor sensor is not used in this installation.
2. If using an Outdoor Sensor, connect the sensor wires to the terminals marked OUTDOOR SENSOR. See "WIRING DIAGRAM" on page 43. Caution should be used to ensure neither of these terminals becomes connected to ground.
3. Use a minimum 18 AWG wire for runs of up to 150 ft (45.7 m).
4. Mount the outdoor sensor on an exterior surface of the building, preferably on the north side in an area that will not be affected by direct sunlight and that will be exposed to varying weather conditions.

Wiring the Indirect Sensor

NOTE: Alternately, a thermostat contact closure can be used in lieu of the sensor for indirect operation. Connect the thermostat to the terminals marked IND REMOTE THERMOSTAT.

⚠CAUTION: Sensor and control wiring must NOT be run in conduit or chases with line voltage.

1. There is no indirect sensor connection required if an indirect water heater is not used in the installation.
2. When the Indirect DHW call for heat is active, the PIM communicates this to the VERSA. The VERSA calculates the optimal operation and sends the firing rate and pump output requests to the PIM so it can activate the Indirect DHW pump and Boiler pump if needed. If an optional Indirect DHW sensor is connected to J2-1 and J2-2 the PIM will pass this signal to the VERSA. This allows the VERSA to optimize the Indirect DHW demand to maintain the Indirect DHW setpoint. The Indirect DHW thermostat switch closure is not required when using the Indirect DHW sensor. If a VERSA is not present the PIM shall activate the Indirect DHW pump whenever the Indirect DHW call is active. The Boiler pump may also be activated based on the Indirect DHW piping configuration setting.
3. Connect the indirect tank sensor to the terminals marked INDIRECT DHW SENSOR. See Wiring Diagram, **page 43**. Caution should be used to ensure neither of these terminals becomes connected to ground. When using an indirect DHW sensor to control tank temperature, contact closure is required across the indirect DHW override connections. To ensure proper operation during “limp along” mode set PIM operator dial to be equal to DHW Target temperature condition from occurring. See VERSA IC control manual 241493.

Wiring the Optional 0–10 Volt Building Control Signal

1. A signal from an energy management system may be connected to the XFyre boiler. This signal should be a 0-10 volt positive DC signal, and an energy management system can be used to control either the setpoint temperature or the firing rate of the XFyre boiler.
2. To enable this remote control function, set DIP switch 5 to the UP position on the PIM. DIP switch 5 Toggles between an EMS (UP) signal or a demand signal from the VERSA (DOWN). DIP switch 2 on the PIM toggles between a Direct Drive (UP) input and a Target Temperature (DOWN) setpoint.
3. For a 4-20mA application, refer to the VERSA IC control manual.
4. Connect an Energy Management system or other auxiliary control signal to the terminals marked 0-10V (+ /-) on the PIM. See **Figure 17**. Caution should be used to ensure that the +0-10V connection does not create a short to ground.

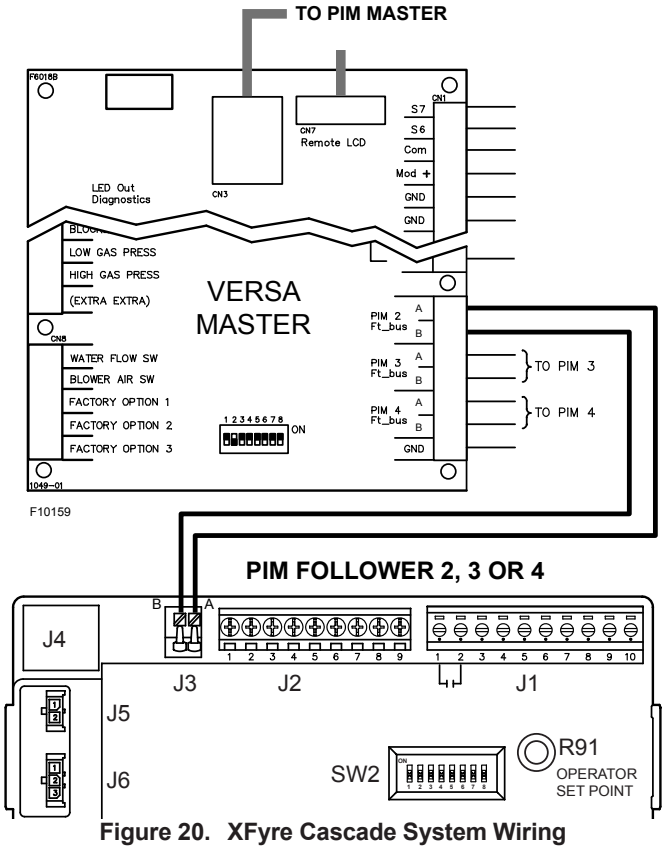


Figure 20. XFyre Cascade System Wiring

Wiring the Cascade System Communication Bus

1. Designate the primary boiler as the master boiler/ boiler1 by leaving DIP switch 2 on the VERSA in the ON position. All other VERSA controls require DIP switch 2 to be toggled OFF, designating them as followers. Follower VERSA's are ignored by their corresponding PIM's. Use standard 18 AWG wire to connect the master VERSA to the PIM on the followers. A total of 3 followers can be connected to the VERSA on the master. For systems requiring more than 4 connected boilers, an external sequencer such as the Raypak Temp Tracker Mod+ Hybrid can be used.
2. It is recommended that the shortest length cable possible be used to reach between the boilers. Do not run unprotected cables across the floor or where they will become wet or damaged. Do not run communication cables parallel with, or close to or against, high voltage (120 volt or greater) wiring. Raypak recommends that the total maximum length of each set of communication bus cables not exceed 200 ft (61 m).
3. Route the FT_BUS wires from the front along the top rails and out the back of the cabinets as shown in **Figure 20**.
4. Connect the FT_BUS wires to the PIM by pressing down on the slots with a small screwdriver and then inserting the wires into the holes. See **Figure 21**.

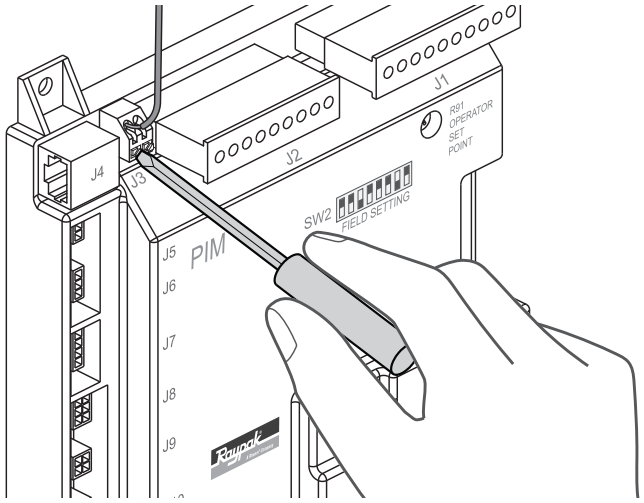


Figure 21. FT_BUS Wire Connection

Cascade System Pump and Sensor Wiring

NOTE: This dry contacts closure can come from a room thermostat or a remote relay. No power of any kind should be applied to either of these terminals.

1. On the boiler designated as the Master, connect the system pump wiring to the terminal block at the rear of the unit. Connect to terminals 10, 11, and 12. See **Figure 22**. The output is rated for pilot duty only (2A maximum).
2. Connect the boiler pump wires to the terminal block at the rear of their unit. Connect to terminals 4, 5, and 6. See **Figure 22**.
3. Connect the system supply sensor to terminals 3 and 4 on the J2 connector located on the Master PIM. See **Figure 20**.
4. Connect the Outdoor sensor (if used) to terminals 5 and 6 on the J2 connector located on the Master PIM. See **Figure 20**.
5. Connect the Enable/Disable wiring to terminals 9 and 10 on the J1 connector located on the Master PIM. See **Figure 20**. This connection must be provided through dry contacts closure.

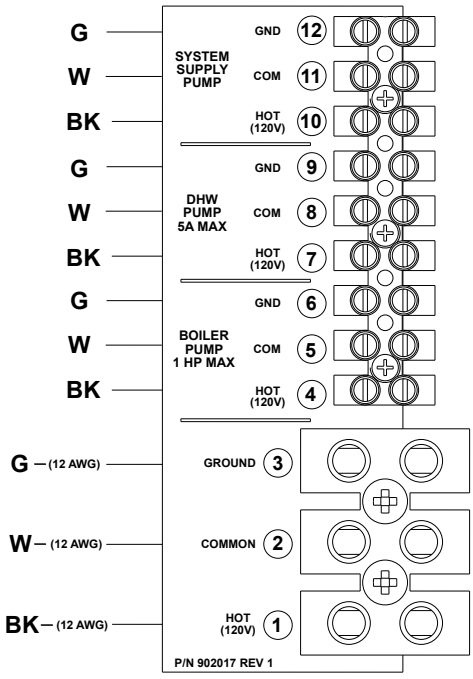


Figure 22. XFyre Cascade Master Pumps

Cascade Follower Pump and Sensor Wiring

1. Once the primary boiler has been identified, additional boilers will be designated as follower boilers. Ensure DIP switch 2 on each follower VERSA is set to the OFF/Down position. See **Figure 20**.
2. For each follower boiler, connect the boiler pump wires to the terminal block at the rear of each unit. Connect to terminals 4, 5, and 6. See **Figure 23**.
3. For Cascade configurations, the System pump and DHW pump Follower outputs must be connected in parallel in order to support operation during “Limp Along” mode. For detailed wiring instructions see VERSA IC control manual 241493.

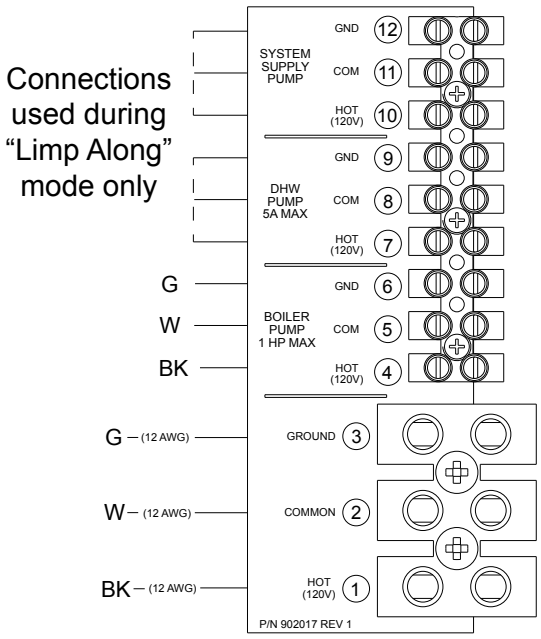


Figure 23. VERSA Follower

Modbus BMS Communication

The VERSA IC control is equipped as standard with a communications port for connectivity to building automation via Modbus protocol. Refer to the VERSA IC control manual 241493 for further information.

Alarm Connection

An alarm bell or light may be connected to the alarm contacts on the boiler PIM. The Alarm Contacts are 3A rated dry contacts on a normally-open relay that close during fault or lockout conditions, and the maximum voltage across the contacts is 30 VAC or 30 VDC. Connections are made at J1 pins 1 and 2.

In a cascade system, in the event of an alarm condition at one or more units, all alarm contacts within the cascade will be energized indicating a fault condition.

Venting

⚠CAUTION: Proper installation of flue venting is critical for the safe and efficient operation of the boiler.

Appliance Categories

⚠WARNING: Contact the manufacturer of the vent material if there is any question about the appliance categorization and suitability of a vent material for application on a Category IV vent system. Using improper venting materials can result in personal injury, death or property damage.

NOTE: For additional information on appliance categorization, see the ANSI Z21.13 Standard and the NFGC (U.S.), or B149 (Canada), or applicable provisions of local building codes.

Heaters are divided into four categories based on the pressure produced in the exhaust and the likelihood of condensate production in the vent.

Category I – A heater which operates with a non-positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category II – A heater which operates with a non-positive vent static pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

Category III – A heater which operates with a positive vent pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category IV – A heater which operates with a positive vent pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

For appliance category requirements, see **Table M**.

⚠WARNING: Do not use foam core or cellular core PVC/CPVC pipe for venting.

⚠WARNING: DO NOT insulate PVC or CPVC vent pipe.

⚠CAUTION: When using stainless steel vent in a climate where freezing may occur, a double wall vent pipe must be used.

⚠CAUTION: The inlet water temperature to the XFyre must not exceed 170ºF (77ºC) at any firing rate to use the PVC venting option. The venting system must conform to local codes and/or the current National Fuel Gas Code ANSI Z223.1/NFPA 54. The system setpoint must not exceed 180ºF (82ºC).

XFyre WH models are approved for use with PVC/CPVC venting on all model sizes. XFyre H models 300A, 400A and 500A are also approved for use with PVC/CPVC venting while models 700A and 850A must use stainless steel or polypropylene venting due to the ability to operate at temperature exceeding the rating of the plastic material.

Use only PVC or CPVC vent material (in Canada, ULC-S636 approved plastic material must be used) or special gas vent pipes listed for use with Category IV gas burning heaters, such as the AL29-4C stainless steel vents offered by Heat Fab Inc. (800-772-0739), Protech System, Inc. (800-766-3473), Z-Flex (800-654-5600) or American Metal Product (800-423-4270). Pipe joints must be positively sealed. Follow the vent manufacturer's installation instructions carefully.

Centrotherm polypropylene vent material is also approved to be used on XFyre products. A vent adapter (sales option D-33) must be used to ensure a proper seal of the flue and condensate. The vent adapter kit supplied by Raypak includes a higher temperature rated vent limit.

All applicable units ship PVC-ready. An adapter must be installed if using any other vent material.

Vent installation shall be in accordance with Part 7, Venting of Equipment, of the NFGC, ANSI Z223.1/NFPA 54, Section 7, Venting Systems and Air Supply for Appliances, of the B149 Code, or applicable provisions of the local building codes.

Support of Vent Stack

The weight of the vent stack or chimney must not rest on the heater vent connection. Support must be provided in compliance with applicable codes. The vent should also be installed to maintain proper clearances from combustible materials. Use insulated vent pipe spacers where the vent passes through combustible roofs and walls.

When using PVC or CPVC venting on models 300A, 400A and 500A, insert the vent pipe 3-5 inches (76-127 mm) into the flue outlet and provide rigid support to the vent, so that it will not shift laterally.

Vent Terminal Location

⚠WARNING: Condensate is acidic and highly corrosive.

NOTE: Ensure adequate clearances to allow annual inspection of the venting system.

NOTE: During winter months check the vent cap and make sure no blockage occurs from build-up of snow or ice.

1. Condensate can freeze on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition.
2. Give special attention to the location of the vent termination to avoid possibility of property damage or personal injury.
3. Gases may form a white vapor plume in winter. The plume could obstruct a window view if the termination is installed near windows.
4. The bottom of the vent terminal and the air intake shall be located at least 12 in. (305 mm) above grade, including normal snow line.
5. Single-wall Category IV metal vent pipe shall not be used outdoors in cold climates for venting gas-fired equipment without insulation.
6. Through-the-wall vents for Category IV appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment.
7. Locate and guard vent termination to prevent accidental contact by people or pets.
8. DO NOT terminate vent in window well, stairwell, alcove, courtyard or other recessed area.
9. DO NOT terminate above any door, window, or gravity air intake. Condensate can freeze, causing ice formations.

Combustion Air Supply	Exhaust Configuration	Heater Venting Category	Certified Vent Materials	Combustion Air Inlet Material
From Inside Building (Non-Direct Venting)	Vertical Venting	IV	(Canada Only: ULC-S636 PVC and CPVC) Stainless Steel, AL29-4C, Sch 40 PVC or CPVC Polypropylene*	
	Horizontal Through-the-Wall Venting			
From Outside Building (Direct Venting)	Vertical Venting			Galvanized Steel, PVC, ABS, CPVC Stainless Steel
	Horizontal Through-the-Wall Venting			

* Only Centrotherm polypropylene is approved for the XFyre product. PVC/CPVC and Polypropylene are approved for all WH models and models 300A, 400A and 500A. H models 700A and 850A must be vented using UL listed stainless steel or polypropylene venting.

Table M. Venting Category Requirements

10. Locate or guard vent to prevent condensate from damaging exterior finishes. Use a 300-series stainless steel backing plate against brick or masonry surfaces.
11. DO NOT extend exposed vent pipe outside of building beyond the minimum distance required for the vent termination. Condensate could freeze and block vent pipe.

U.S. Installations

Refer to the latest edition of the National Fuel Gas Code.

⚠WARNING: The Commonwealth of Massachusetts requires that sidewall vented heaters, installed in every dwelling, building or structure used in whole or in part for residential purposes, be installed using special provisions as outlined on page 60 of this manual.

Vent termination requirements are as follows:

1. Vent must terminate at least 4 ft (1.2 m) below, or 4 ft (1.2 m) horizontally from any door, window or gravity air inlet to the building.
2. The vent must not be less than 7 ft (2.1 m) above grade when located adjacent to public walkways.
3. Terminate vent at least 3 ft (.9 m) above any forced air inlet located within 10 ft (3 m).
4. Vent must terminate at least 4 ft (1.2 m) horizontally, and in no case above or below unless 4 ft (1.2 m) horizontal distance is maintained, from electric meters, gas meters, regulators, and relief equipment.
5. Terminate vent at least 6 ft (1.8 m) away from adjacent walls.
6. DO NOT terminate vent closer than 5 ft (1.5 m) below roof overhang.
7. The vent terminal requires a 12 in. (305 mm) vent terminal clearance from the wall.
8. Terminate vent at least 1 ft (305 mm) above grade, including normal snow line.
9. Multiple direct vent installations require a 4 ft (1.2 m) clearance between the ends of vent caps located on the same horizontal plane. See **Figure 24**.

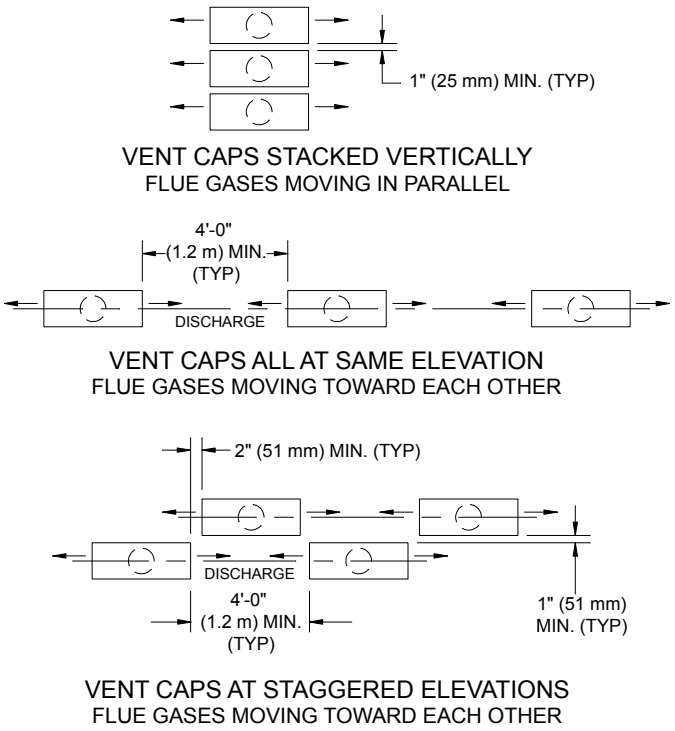


Figure 24. Vent Cap Configurations

Installations in Canada

Refer to latest edition of the B149 Installation Code.

A vent shall not terminate:

1. Directly above a paved sidewalk or driveway which is located between two single-family dwellings and serves both dwellings.
2. Less than 7 ft (2.1 m) above a paved sidewalk or paved driveway located on public property.
3. Within 6 ft (1.8 m) of a mechanical air supply inlet to any building.
4. Above a meter/regulator assembly within 3 ft (.9 m) horizontally of the vertical centerline of the regulator.
5. Within 6 ft (1.8 m) of any gas service regulator vent outlet.
6. Less than 1 ft (305 mm) above grade level.
7. Within 3 ft (.9 m) of a window or door which can be opened in any building, any non-mechanical air supply inlet to any building or the combustion air inlet of any other appliance.
8. Underneath a veranda, porch or deck, unless the veranda, porch or deck is fully open on a minimum of two sides beneath the floor, and the distance between the top of the vent termination and the underside of the veranda, porch or deck is greater than 1 ft (305 mm).

Venting Installation Tips

Support piping:

- horizontal runs—at least every 5 ft (1.5 m)
- vertical runs—use braces
- under or near elbows

Venting Configurations

For heaters connected to gas vents or chimneys, vent installations shall be in accordance with the NFGC (U.S.), or B149 (Canada), or applicable provisions of local building codes.

Vertical Venting (Category IV)

⚠CAUTION: This venting system requires the installation of a condensate drain in the vent piping per the vent manufacturer's instructions. Failure to install a condensate drain in the venting system will void all warranties on this boiler. Condensate is acidic and highly corrosive

NOTE: A vent adapter (field-supplied) may be required to connect the Category IV vent to the boiler.

⚠CAUTION: The condensate drain line must not be allowed to freeze. Take appropriate measures.

Installation

The maximum and minimum venting length for this Category IV appliance shall be determined per the NFGC (U.S.) or B149 (Canada). See **Table N** and **Figure 25**.

The minimum flue pipe diameter for conventional venting is: 4 in. (102 mm) for Models 300A, 400A and 500A, and 6 in. (152 mm) for Models 700A and 850A.

The connection from the appliance vent to the stack must be as direct as possible and shall be the same diameter as the vent outlet. The horizontal breaching of a vent must have an upward slope of not less than 1/4 inch per linear foot (21 mm per m) from the heater to the vent terminal. The horizontal portions of the vent shall also be supported for the design and weight of the material employed to maintain clearances and to prevent physical damage or separation of joints.

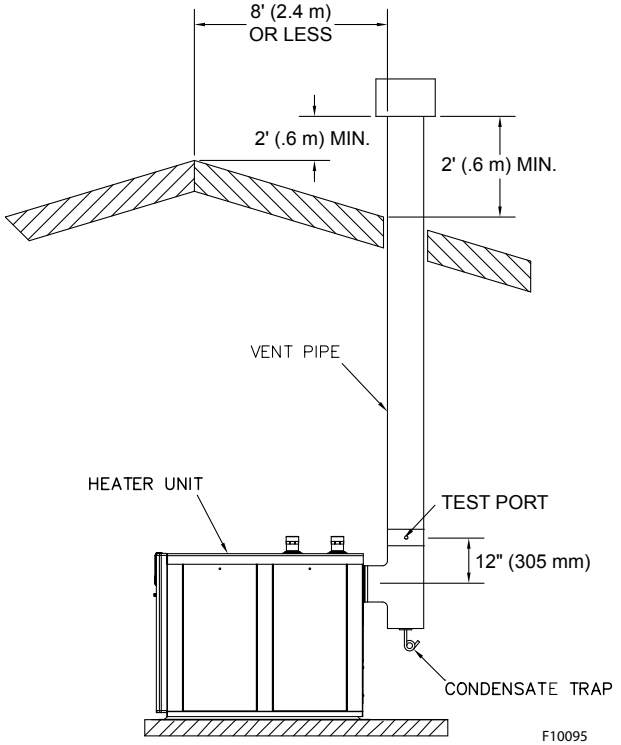


Figure 25. Vertical Venting

Model No.	Certified Vent Material		Vent and Intake Air Vent Size (in.)	Equivalent Vent Length (ft)		Combustion Air Intake Pipe Material	Vertical Air Inlet Max. Length* (ft)
	WH	H		Min.	Max.		
300A	(Canada Only: ULC-S636 PVC and CPVC) Stainless Steel, AL29-4C, ANSI/ASTM D1785 Sch 40 PVC, ANSI/ASTM F441 Sch 40 CPVC, Polypropylene**	(Canada Only: ULC-S636 PVC and CPVC) Stainless Steel, AL29-4C, ANSI/ASTM D1785 Sch 40 PVC, ANSI/ASTM F441 Sch 40 CPVC, Polypropylene**	4	0	100	Galvanized Steel, PVC, ABS, CPVC, Stainless Steel	100
400A							
500A							
700A		UL Listed Stainless Steel, AL29-4C or Centrotherm polypropylene	6				
850A							

1 Vent lengths are based on a lateral length of 2 ft (610 mm). Refer to the latest edition of the NFGC for further details.

* Subtract 10 ft (3 m) per elbow. Max. 4 elbows.

** Only Centrotherm polypropylene is certified for the XFyre product.

Table N. Category IV Vertical Vent and Ducted Combustion Air

NOTE: When using PVC "T" vent termination, insert the two round stainless mesh screens provided with the unit into the tee.

NOTE: When using Centrotherm Polypropylene "T" vent termination, insert two Centrotherm termination screens into the discharge end of the tee.

⚠CAUTION: A listed vent cap terminal suitable for connection to the Cat IV vent materials, adequately sized, must be used to evacuate the flue products from the boilers.

⚠CAUTION: A listed vent cap terminal suitable for connection to the Cat IV vent materials, adequately sized, must be used to evacuate the flue products from the boilers.

Termination

The vent terminal should be vertical and should terminate outside the building at least 2 ft (610 mm) above the highest point of the roof that is within 8 ft (2.4 m). The vent cap should have a minimum clearance of 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) electric meters, gas meters, regulators and relief equipment.

The distance of the vent terminal from adjacent public walkways, adjacent buildings, open windows and building openings must be consistent with the NFGC (U.S.) or B149 (Canada). Vents supported only by flashing and extending above the roof more than 5 ft (1.5 m) should be securely guyed or braced to withstand snow and wind loads.

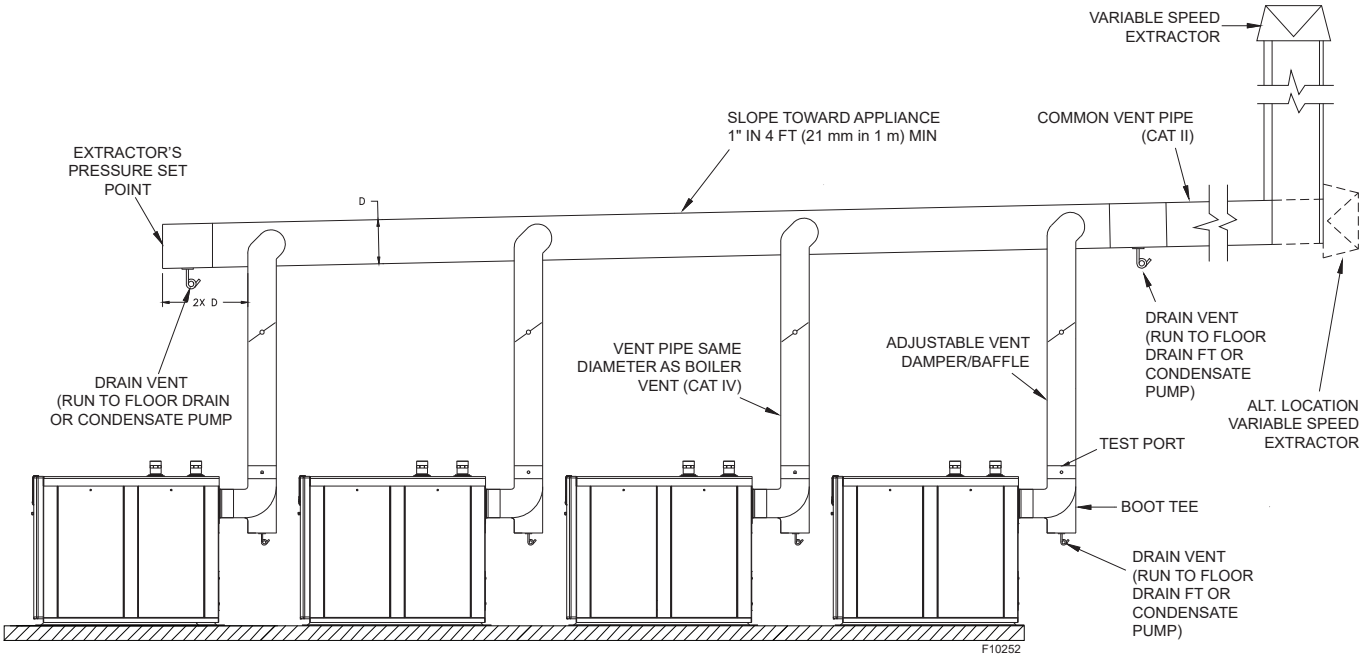
Common Venting

⚠WARNING: Vent connectors serving any other appliances shall not be connected into any portion of mechanical draft systems operating under a positive pressure. If an XFyre is installed to replace an existing unit, the vent system MUST be verified to be of the correct size and of Category IV AL29-4C vent material, approved PVC/CPVC construction, or Centrotherm polypropylene (in Canada, ULC-S636 approved plastic materials must be used). If it is NOT, it MUST be replaced.

⚠WARNING: An extractor is required when multiple heaters are vented through a common vent pipe. The extractor must operate when one or more units are firing.

Raypak does not support common venting under positive pressure. Variable-speed extractor fan must be used to draw the stack to negative pressure. See **Figure 26**.

The NFGC does not address sizing guidelines for the common venting of multiple Category IV heaters. This is covered in the NFGC under "Engineered Vent Systems". For volumes of flue products at full fire for the calculation of appropriate vent and extractor sizing for common venting see **Table O**.



Note: Heaters rotated to show venting connections. An extractor is required for this configuration.

Figure 26. Typical Common Venting

Horizontal Through-the-Wall Direct Venting (Category IV)

⚠CAUTION: This venting system requires the installation of a condensate drain in the vent piping per the vent manufacturer's instructions. Failure to install a condensate drain in the venting system will void all warranties on this boiler.

NOTE: Vent and intake piping must be supported so that the weight of the venting is not transferred to the unit. Horizontal runs of vent and intake piping must be supported to prevent sagging.

NOTE: While a drain connection is required in the vent of all XFyre installations, the drain can be accomplished in several different ways. The figures in this manual show the drain in a vent tee, however, this can also be accomplished using an inline collector for condensing stacks or an inline vertical or horizontal collector available from several of the listed vent manufacturers.

NOTE: For extractor sizing, typical CO2 levels are 8.5% for natural gas and 9.5% for propane gas and flue temperatures of less than 220°F (104°C).

⚠WARNING: Condensate is acidic and highly corrosive.

⚠CAUTION: The condensate drain line must not be allowed to freeze. Take appropriate measures.

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation:

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

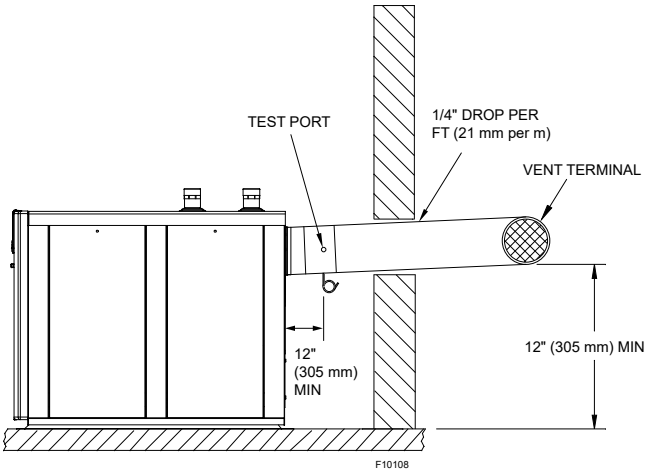
b. Visually inspect the venting system for proper size and horizontal pitch and make sure there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

c. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

Model No.	Vent Size (inches)	Volume of Flue Products (CFM)
300A	4	90
400A		120
500A		150
700A	6	210
850A		250

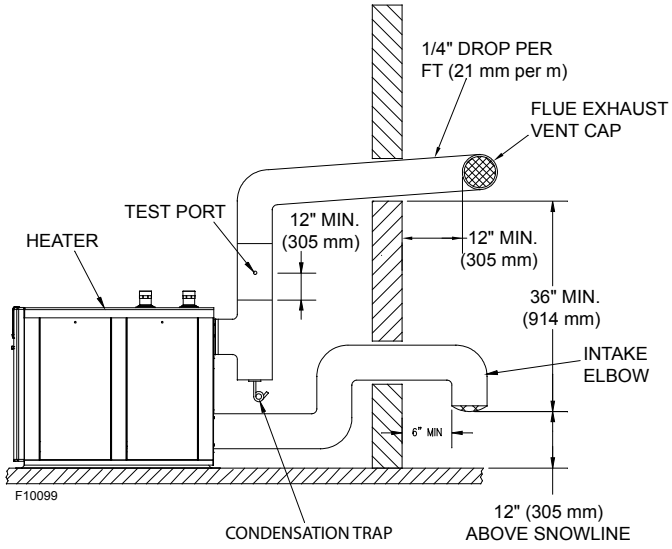
Data for 100% firing rate.

Table O. Volume of Flue Products Data



Refer to **Table F** and local codes.

Figure 27. Horizontal Through-the-Wall Venting



Refer to **Table F** and local codes.

Figure 28. Horizontal Through-the-Wall Direct Venting

Installation

⚠WARNING: No substitutions of flue pipe or vent cap material are allowed. Such substitutions would jeopardize the safety and health of inhabitants.

These installations utilize the heater-mounted blower to draw combustion air and to vent the combustion products to the outdoors. The combustion air intake and the vent are installed horizontally through the wall to the outdoors. Adequate ventilation air must be supplied to the equipment room in accordance with the NFGC (U.S.) or B149 (Canada).

The total length of the horizontal through-the-wall direct vent system should not exceed 200 equivalent ft (61 m) in length. If combined vent/intake run exceeds 200 equivalent ft (61 m), an appropriately sized variable-speed extractor must be used. Each elbow used is equal to 10 ft (3 m) of straight pipe with a maximum of 4 elbows each on the air intake and vent.

The vent cap is not considered in the overall length of the venting system.

The vent must be installed to prevent flue gas leakage.

Care must be taken during assembly to ensure that all joints are sealed properly and are airtight. The vent must be installed to prevent the potential accumulation of condensate in the vent pipes. It is required that:

1. The vent must be installed with condensate drains as directed by the vent manufacturer.
2. The vent must be installed with a slight upward slope of not less than 1/4 inch per foot (21 mm per m) of horizontal run to the vent terminal.

Termination

The vent cap MUST be installed on the exterior of the building. The vent cap cannot be installed in a well or below grade. The vent cap must be installed at least 1 ft (305 mm) above ground level and above normal snow levels.

The vent cap MUST NOT be installed with any combustion air inlet directly above a vent cap. This vertical spacing would allow the flue products from the vent cap to be pulled into the combustion air intake installed above.

This type of installation can cause non-warrantable problems with components and poor operation of the boiler due to the recirculation of flue products. Multiple vent caps installed in the same horizontal plane must have a 4 ft (1.2 m) clearance from the side of one vent cap to the side of the adjacent vent cap(s).

Combustion air supplied from outdoors must be free of particulate and chemical contaminants. To avoid a blocked flue condition, keep the vent cap clear of snow, ice, leaves, debris, etc.

Direct Vent—Vertical

Installation

These installations utilize the heater-mounted blower to draw combustion air from outdoors and vent combustion products to the outdoors.

The total length of air supply pipe cannot exceed the distances listed in **Table N**. Each elbow used is equal to 10 ft (3 m) of straight pipe. This will allow installation in any arrangement that does not exceed the lengths shown in **Table N**. See **Figure 29**.

The vent cap is not considered in the overall length of the venting system.

Care must be taken during assembly that all joints are sealed properly and are airtight.

The vent must be installed to prevent the potential accumulation of condensate in the vent pipes. It is required that:

1. The vent must be installed with a condensate drain as directed by the vent manufacturer.
2. The vent must be installed with a slight upward slope of not more than 1/4 inch per foot (21 mm per m) of horizontal run to the vent terminal.

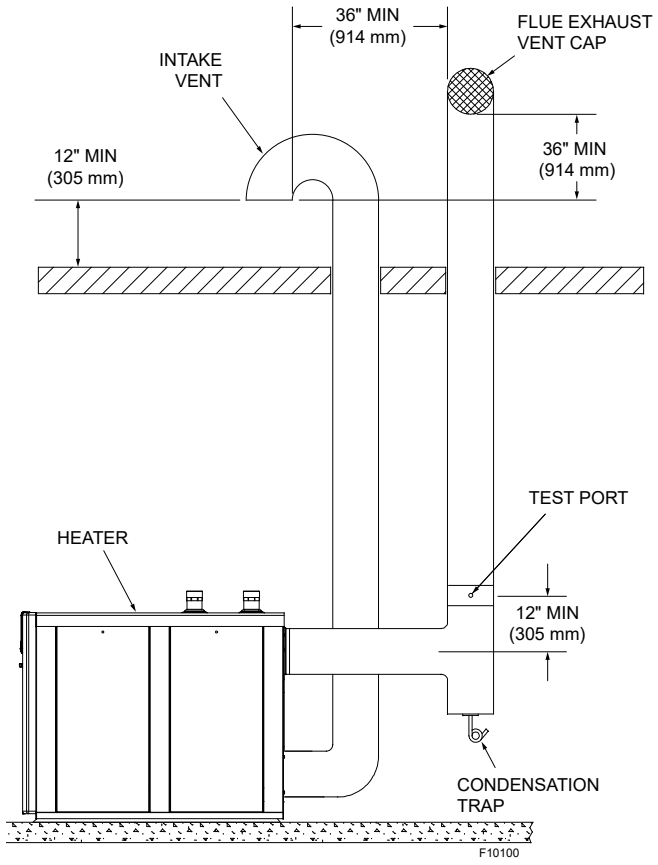


Figure 29. Direct Vent - Vertical

Model No.	Size (in.)	Approved Intakes	Approved Plastic Terminals	Approved SS Terminals
300A	4	PVC 90° Elbow, Sch 40 Galvanized 90° Elbow, SS 90° Elbow, ABS 90° Elbow	4" PVC/CPVC Tee Sch 40*, Centrotherm Polypropylene	FasNSeal FSTT4, Z-Vent 2SVSTTF04
400A				
500A				
700A	6		6" PVC/CPVC Tee Sch 40*, Centrotherm Polypropylene	FasNSeal FSTT6, Heat Fab 9690TEE
850A				

*Must be ULC-S636 materials in Canada.

Table P. Horizontal Vent and Air Intake Terminals

Termination

The vent cap MUST be installed on the exterior of the building. The vent cap cannot be installed in a well or below grade. The vent cap must be installed at least 1 ft (305 mm) above ground level and above normal snow levels.

The vent cap MUST NOT be installed with any combustion air inlet directly above a vent cap. This vertical spacing would allow the flue products from the vent cap to be pulled into the combustion air intake installed above.

This type of installation can cause non-warrantable problems with components and poor operation of the boiler due to the recirculation of flue products. Multiple vent caps installed in the same horizontal plane must have a 4 ft (1.2 m) clearance from the side of one vent cap to the side of the adjacent vent cap(s).

Combustion air supplied from outdoors must be free of particulate and chemical contaminants. To avoid a blocked flue condition, keep the vent cap clear of snow, ice, leaves, debris, etc.

Condensate Management

The condensate must be drained properly to protect the appliance and drainage system. The condensate from the boiler is acidic. Its pH is between 3.2 and 4.5. Raypak recommends treating the condensate with a Condensate treatment kit (sales option Z-12). The treatment kit is connected to the drain system to raise the pH level of the condensate. The kit may be added to avoid long-term damage to the drainage system and to meet local code requirements. The pH of the effluent entering a sanitary drain must be 5.0 or higher.

Vent pipe condensate drains are also required for installation of the XFyre. Follow vent manufacturer instructions for location of condensate drains in the vent. The vent condensate should also be routed through a treatment kit, as required by local code requirements.

The treatment kit must be sized to the condensate generated by the appliance and the vent. The possible max volume of condensate produced is 1 GPH per 100,000 BTUH input. Design the drain system accordingly.

Outdoor Installation

⚠CAUTION: In general, the condensate piping from the appliance must have a downward slope of 1/4" per horizontal ft (21 mm per m). Condensate drain traps must be primed with water to prevent gas flue leaks. Treatment systems should be checked at least once per year, and the chips should be replenished as necessary. When replacing the chips, they should be no smaller than 3/4" (19 mm) to avoid blockage in the condensate piping. Fig. 30 is a guide only. Follow the manufacturer's instructions for the installation of the treatment kit and condensate drains.

⚠CAUTION: Condensate drain must not be allowed to freeze.

XFyre heaters are certified for outdoor operation in non-freezing conditions only. Freezing conditions may cause condensate to freeze in the condensate drain line and trap, causing the unit to shut down from a blocked condensate drain. Take appropriate measures. Additionally, components of the condensate management system may be damaged by the ice formation. Units installed in freezing climates for seasonal use must be winterized to avoid freeze damage to the heater.

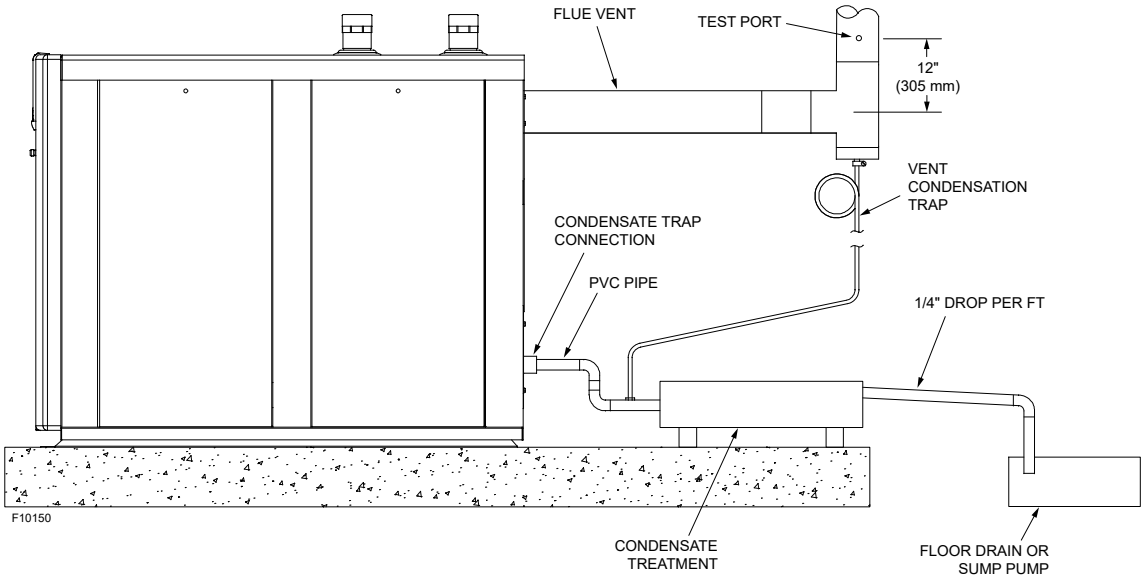


Figure 30. Guide for Condensate Piping

Outdoor models must be vented with listed vent material per the following instructions and installed with the optional factory-supplied outdoor vent kit. A special vent terminal (sales option D-11) is provided in accordance with CSA requirements. This must be installed as illustrated in **Figure 31**.

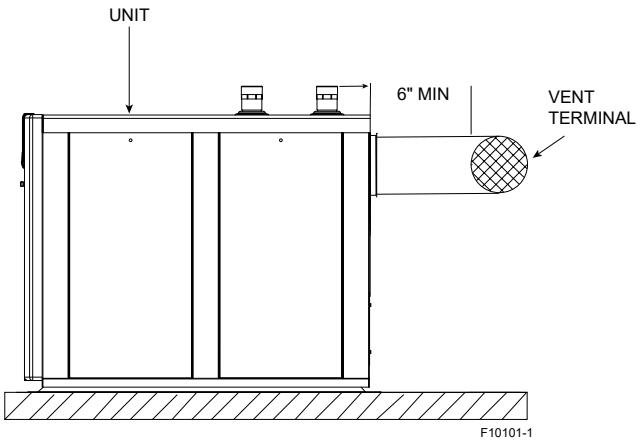


Figure 31. Outdoor Venting

Care must be taken when locating the unit outdoors, because the flue gases discharged from the vent cap can condense as they leave the cap. Improper location can result in damage to adjacent structures or building finish. For maximum efficiency and safety, the following precautions must be observed:

1. Outdoor models must be installed outdoors and must use the outdoor vent cap available from the manufacturer (sales order option D-11), or a material listed in **Table Q**.
2. Periodically check venting system. The unit's venting areas must never be obstructed in any way and minimum clearances must be observed to prevent restriction of combustion and ventilation air. Keep area clear and free of combustible and flammable materials.
3. Do not locate adjacent to any window, door, walkway, or gravity air intake. The vent must be located a minimum of 4 ft (1.2 m) horizontally from such areas.
4. Install above grade level and above normal snow levels.
5. Vent terminal must be at least 3 ft (.9 m) above any forced air inlet located within 10 ft (3 m).
6. Adjacent brick or masonry surfaces must be protected to prevent condensate from damaging exterior finishes. Use a 300-series stainless steel backing plate against brick or masonry surfaces.

Model No.	Size (in.)	Approved Terminations	
		WH	H
300A	4	ANSI/ ASTMD1785 PVC Tee Sch 40* ANSI/ASTM F441 PVC Tee Sch 40* Centrotherm Polypropylene Tee FasNSeal FSTT SS Tee Z-Vent 2SVSTTF SS Tee	ANSI/ASTMD1785 PVC Tee Sch 40* ANSI/ASTM F441 PVC Tee Sch 40* Centrotherm Polypropylene Tee FasNSeal FSTTa SS Tee Z-Vent 2SVSTTF04 SS Tee
400A			
500A			
700A	6		FasNSeal FSTT6 SS Tee Z-Vent 2SVSTTF06 SS Tee
850A			

*Must be ULC-S636 materials in Canada.

Table Q. Outdoor Vent Terminals

Freeze Protection

NOTE: Condensate can freeze on the vent terminal. Frozen condensate on the vent terminal can result in a blocked flue condition.

NOTE: The vent cap must be listed and approved by the boiler manufacturer in accordance with its listing (sales order option D-11), or Table Q.

To enable freeze protection, DIP switch position 7 (on the PIM) must be turned on (UP position). This is the default position.

If the water temperature drops below 45°F (7°C) on the Outlet or Inlet sensors, the Boiler pump is enabled. The pump is turned off when both the Inlet and Outlet temperatures rise above 50°F (10°C).

If either the Outlet or Inlet temperature drops below 38°F (3°C), the VERSA starts the burner at the minimum firing rate. The burner cycle will terminate when both the Inlet and Outlet temperatures rise above 42°F (6°C).

5. CONTROLS

⚠WARNING: Installation, adjustment and service of controls, including timing of various operating functions, must be performed by a qualified installer, service agency or the gas supplier. Failure to do so may result in control damage, malfunction, property damage, personal injury, or death.

⚠WARNING: Turn off power to the boiler before installing, adjusting or servicing any controls. Failure to do so may result in board damage, malfunction, property damage, personal injury, or death.

⚠CAUTION: This appliance has provisions to be connected to more than one supply source. To reduce the risk of electric shock, disconnect all such connections before servicing.

⚠CAUTION: Risk of electric shock: More than one disconnect switch may be required to de-energize the equipment before servicing.

Ignition Control Functions

NOTE: Ignition modules are common for all model sizes. However, model-specific operating parameters are defined by their respective ID cards.

When there is a call for heat, and all safeties are closed, then the combustion air blower starts to purge air from the combustion chamber. After the pre-purge, the igniter is energized. The standard ignition module will lock-out after failing to light 3 times during a call for heat. To reset the lock-out, press and release the RESET button located on the user interface. The control will automatically reset after 1 hour. When in lock-out the control will run the blower through a post-purge cycle.

The single-try ignition module (part of the CSD-1 option) will attempt to light only one time before lock-out occurs. To reset the lock-out, press and release the RESET button located on the user interface.

Turning off the power to the heater WILL NOT reset the single-try ignition module.

High-Limit — Manual-Reset

The heater is equipped with a fixed-setting manual-reset high-limit temperature device as standard and it may have an additional optional adjustable manual-reset high temperature device.

Standard

The fixed-setting manual-reset high-limit is built into the PIM, it utilizes a dual-element sensor located on the outlet. See **Figure 32**. To reset a high-limit lock-out, press and release the RESET button located on the user interface.

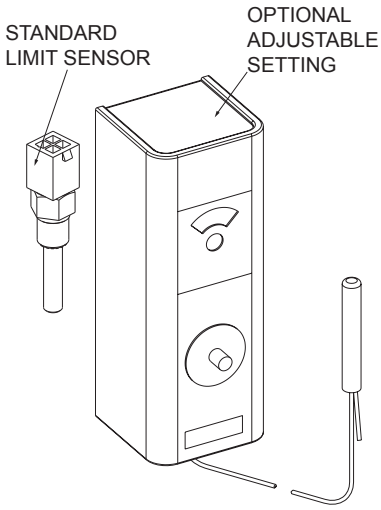


Figure 32. High-Limit (Manual Reset)

Optional

The Optional adjustable-setting manual-reset high-limit is located behind the front panel. To reset a high-limit lockout, press the reset button on the adjustable manual-reset limit as well as the reset button located on the user interface.

High-Limit — Auto-Reset (Optional)

NOTE: Adjustable limits must be set higher than the expected outlet temperature of the unit during normal operation, to prevent short cycling and nuisance trips.

The heater may be equipped with a fixed auto-reset high -limit temperature device and/or an adjustable auto-reset high-limit temperature device. The optional auto-reset high-limit is located on the brass outlet adapter inside the unit, and the adjustable auto-reset high-limit is located inside and behind the front panel.

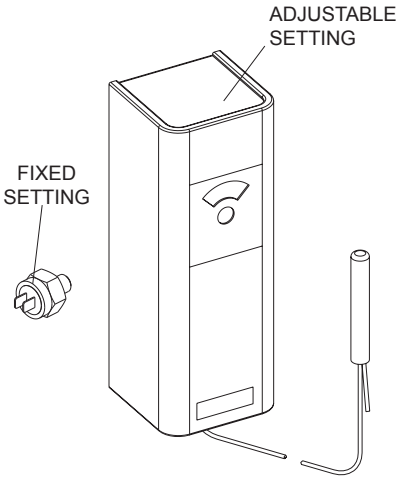


Figure 33. High-Limit (Auto-Reset)

Flow Switch

This standard, dual-purpose control shuts off the boiler in case of pump failure or low water flow. The flow switch ships mounted and wired.

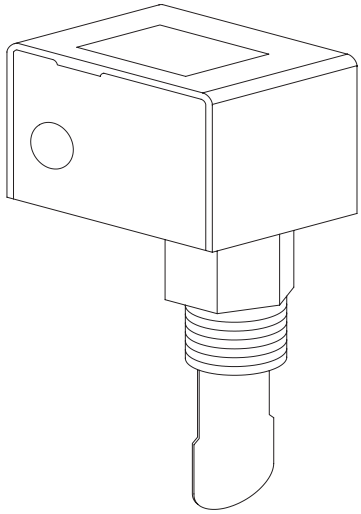


Figure 34. Flow Switch

Flue Temperature Limit

The heater is equipped with a fixed setting manual-reset high-limit temperature device on the vent, for use with non-metallic vent material. The high temperature limit is located inside the unit near the vent adapter. The VERSA monitors the limit and displays any fault associated with the limit on the user interface. To reset the limit, access it and press down on the red button.

Units provided with a PVC vent connector are also provided with a limit rated for PVC vent material. A higher rated limit is provided when using Centrotherm polypropylene venting. The limit is removed when using Category IV stainless steel venting.

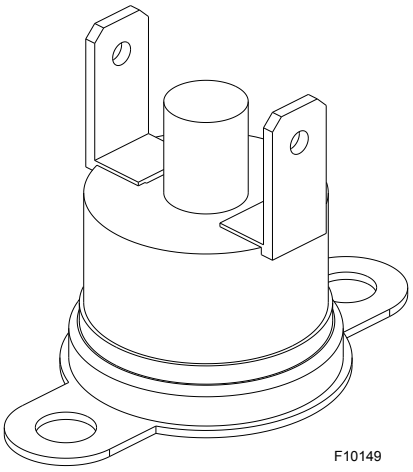


Figure 35. Flue Temperature Limit

Low Water Cut-Off (Optional)

The low water cut-off (sales option F-10) automatically shuts down the burner whenever water level drops below the level of the sensing probe. A 5-second time delay prevents premature lockout due to temporary conditions such as power fluctuations or air pockets.

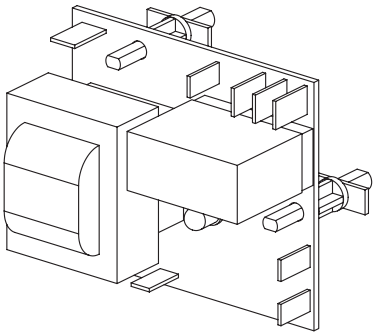


Figure 36. Low Water Cut-Off Board

High and Low Gas Pressure Switches (Optional)

The low gas pressure switch connection (sales option S1/S2) mounts upstream of the gas valve (on the inlet flange to the gas valve) and is accessible through the removable access panels on the front or top of the boiler to reset the gas pressure switch, as necessary. It is used to ensure that sufficient gas pressure is present for proper valve/regulator performance. The low gas pressure switch automatically shuts down the boiler if the inlet gas supply drops below the factory setting of 3.0 in. WC for natural gas or propane gas.

The high gas pressure switch connection (sales option S1/S2) mounts down-stream of the gas valve. Special ports are located on the backside of the gas valve and are accessible from the front or top of the boiler (to reset the gas pressure switch), as necessary. If the gas pressure regulator in the valve fails, the high gas pressure switch automatically shuts down the burner. The high gas pressure switch is set at a manifold pressure of 3.0" WC for natural gas, or propane gas.

Operation of either the High or Low Gas Pressure Switch will turn on an LED inside the switch housing. Push the top of the plastic switch housing as shown in **Figure 37** to reset a tripped pressure switch. The LED will go out when the switch is reset.

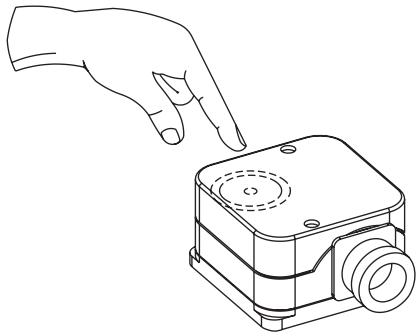


Figure 37. High/Low Gas Pressure Switch

Blocked Vent Switch

The heater is equipped with a blocked vent pressure switch to prevent the operation of the boiler when a significant amount of air flow is blocked at the vent. The switch is located at the left rear of the unit.

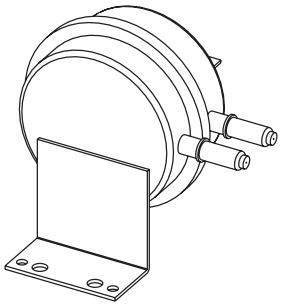


Figure 38. Blocked Vent Switch

Condensate Float Switch

The heater is equipped with a condensate float switch to prevent operation when the condensate water level is too high. The heater shutting down from the condensate float switch is indicative of a blocked drain or problem with the condensate management system. The condensate float switch is located inside at the left rear of the heater, and can be accessed through the back panel.

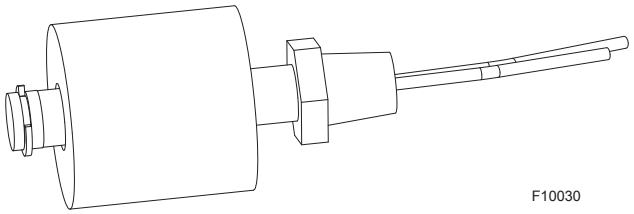


Figure 39. Condensate Float Switch

Thermal Fuse

The heater is equipped with a thermal fuse located at the back of the combustion chamber. The thermal fuse shuts down the boiler if the temperature within the combustion chamber becomes excessive. If the boiler shuts down due to the thermal fuse, call your local representative or the factory. A qualified service technician must evaluate the condition of the combustion chamber before replacing the fuse.

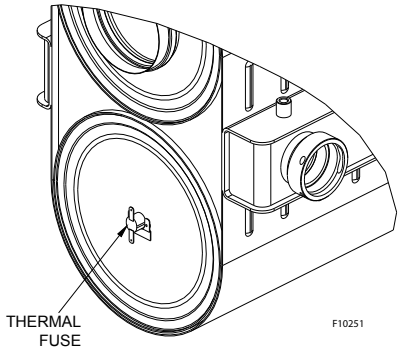


Figure 40. Thermal Fuse

Burner Door Limit

The heater is equipped with a fixed-setting manual-reset high-limit temperature device on the burner door. The limit is an additional safety that shuts down the boiler if the temperature within the combustion chamber becomes excessive. If the boiler shuts down due to the burner door limit, call your local representative or the factory. A qualified service technician must evaluate the condition of the combustion chamber before resetting the limit.

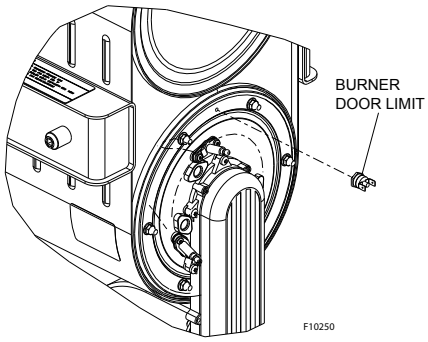


Figure 41. Burner Door Limit

Operating Instructions

Remove the front door. If you smell gas, STOP. Follow listed safety instructions. If you do not smell gas, follow the next steps.

1. Turn on all electric power to appliance.
2. Adjust the temperature setpoint of the XFyre as desired. The factory default setting is 180°F (82°C) for H models and 125°F (52°C) for WH models. If changes are necessary follow “Adjusting The XFyre Setpoint” in this section.
3. On the initial start-up of units with gas pressure switches, the control user interface will display GAS PRESS. This is a low gas pressure switch lock-out from the factory-installed low gas pressure switch. You will also see a yellow LED illuminated under the cover of the low gas pressure switch. Once the gas is turned on, reset the gas pressure switch by FIRMLY pressing on top of the plastic cover over the red reset button. The yellow LED will go out after the switch has been reset. Press and release the RESET key on the control panel to begin normal operation.
4. The unit requires closure across the enable/disable to operate.
5. If the appliance fails to start, refer to the Troubleshooting section of this manual.

User Interface

The user interface consists of several Menu options. Press the MENU button to scroll through the different menus in the interface. Press the ITEM button to scroll through available items within a selected menu. And, the UP and DOWN buttons allow for setting changes to items in the ADJUST menu. Refer to Fig. 42 for display and key locations.

For detailed descriptions of the various screens, consult the VERSA IC control manual 241493.

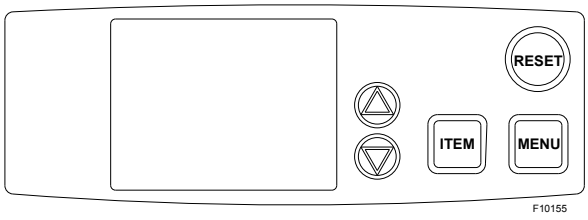


Figure 42. User Interface

Adjusting the XFyre Setpoint

To adjust the setpoint on the XFyre:

Use the MENU key to scroll to the ADJUST menu, then use the ITEM key to scroll to the SETPOINT item. Adjust the Setpoint using the UP and DOWN arrow keys. Minimum is 50°F (10°C), Maximum is the PIM value, and the default is 180°F (82°C) for H models and 125°F (52°C) for WH models.

View Menu

The VIEW menu is the default menu, see **Table R**. It displays sensor temperatures, the modulation rate of the blower, heater cascade status, pump operation and CFH information. Some of the items displayed are mode specific and are only observable when its corresponding mode is active.

Setup Menu

To change settings use the MENU key to scroll to the ADJUST menu. The ADJUST menu allows the installer to make adjustments to items shown in **Table S**.

Refer to the VERSA IC control manual 241493 for detailed setup instructions.

Boiler View Menu

The Boiler View displays various items regarding ignition, temperature monitoring, and modulation rates. As well as software and hardware information. See **Table T**.

Monitor Menu

The Monitor Menu records and displays critical Boiler information, such as, Cycle times, Run times, and Maximum/Minimum temperature readings, depending on the setup. See **Table U**.

Toolbox Menu

The Toolbox Menu logs all error codes from the VERSA and PIM, as well as other functions. Up to 15 error codes can be logged. See **Table V**.

Item	Application	Description
OUTDOOR	H MODE 1, 2, 3	Outdoor air temperature, available when TARGET = RSET in ADJUST menu
Target	H MODE 1, 2, 3	Current target temperature, available when TARGET = SETP in ADJUST menu (Default), (EMS /MODB)
SUPPLY	H MODE 1, 2, 3	Current system supply temperature
IND SUPPLY	H MODE 3	Current temperature being supplied to the indirect system
Boil OUTLET	All	Current boiler outlet temperature
Boil INLET	All	Current boiler inlet temperature
Boil ΔT	All	Current temperature difference between boiler outlet and boiler inlet
DHW SUPPLY	H MODE 2, 3	Current indirect DHW supply temperature
TANK DHW	WH	Current tank temperature
BOILER STATUS	All	IDLE, PREP, IGN, MOD RATE %, POST, SOFT

Table R. View Menu

Item	Application	Range	Description	Default
TARGET	H MODE 1, 2, 3	RSET <> SETP	RSET = Outdoor Reset, SETP =Setpoint	SETP
TANK SETP	WH	OFF, 50°F (10°C) to 150°F (66°C)	Tank setpoint temperature	125°F (52 °C)
TANK DIFF	WH	2°F (-17°C) to 10°F (-12°C)	Tank Differential temperature	3
MODE	H MODE 1, 2, 3	1, 2, 3	Piping and application configuration	1
SETPOINT	H MODE 1, 2, 3	50°F (10°C) to 192ºF (89°C)	Boiler target temperature while a heat demand is present for setpoint operation	180°F (82°C)
OUT START	H MODE 1, 2, 3	35°F (2°C) to 85°F (29°C)	Outdoor starting temperature - outdoor reset	70°F (21°C)
OUT DESIGN	H MODE 1, 2, 3	-60°F (-51°C) to 45°F (7°C)	Outdoor design temperature - outdoor reset	10°F (-12°C)
Boil START	H MODE 1, 2, 3	35°F (2°C) to 150°F (66°C)	Starting boiler target temperature when the outdoor temperature is at outdoor start - outdoor reset	70°F (21°C)
Boil DESIGN	H MODE 1, 2, 3	70°F (21°C) to 200°F (93°C)	Design boiler target temperature when the outdoor temperature is at outdoor design - outdoor reset	180°F (82°C)
TARGET MAX	H MODE 1, 2, 3	100°F (38°C) to PIM value*	Maximum target system temperature	220°F (104°C)
TARGET MIN	H MODE 1, 2, 3	OFF, 50°F (10°C) to 190°F (88°C)	Minimum target system temperature	50°F (10°C)
TARGET DIFF	H MODE 1, 2, 3	2°F (-17°C) to 42°F (6°C)	Differential for target system temperature	10°F (-12°C)
IND SENSOR	H MODE 1, 2, 3	OFF <> ON	Selects whether a DHW sensor is used for indirect DHW tank	OFF
IND SETP	H MODE 2, 3	OFF, 50°F (10°C) to 180°F (82°C)	Target indirect DHW temperature (IND Sensor = ON, to enable this setting)	140ºF (60°C)
DHW DIFF	H MODE 2, 3	2°F (-17°C) to 10°F (-12°C)	Differential for the target indirect DHW tank temperature, requires IND Sensor = ON	6°F (-14°C)
IND SUPPLY	H MODE 2, 3	OFF, 50°F (10 °C) to PIM value*	Target boiler temperature for the DHW heat exchanger during indirect DHW operation, requires IND Sensor = OFF	180°F (82°C)
DHW PRIORITY	H MODE 2	OFF <> ON	Selects whether or not Indirect DHW priority is active during indirect DHW operation	OFF
PRI OVR	H MODE 2, 3	Au, 0:10hr to 2:00hr	Sets the length of the indirect DHW priority override time	1:00hr
SYS PURGE	All	OFF, 0:20min to 20:00min	Sets the length of the system pump purge	20 seconds
MIX TYPE	H/WH MIX	H (BOIL <> PLNT) WH(1 <> 2)	Selects the type of control depending on pipe configuration for CWP	H BOIL WH 2
MIX TARGET	H/WH MIX	50ºF (10 °C) to 140ºF (60ºC)	Inlet target temperature	120ºF (49°C)
MIX LOCK	H/WH MIX	ON <> OFF	The equipment will trigger a warning when “MIX Target” is not reached within 7-minutes. MIX LOCK = ON, Alarm and lockout, MIX LOCK = OFF; Alarm only	OFF
MIX TRIM	H/WH MIX	-5 to 5	This adjustment is for various types and sizes of units as well as various actuator motor speeds and types supplied by Raypak	0
MIX SPEED	H/WH MIX	FAST <> MED <> SLOW	This setting defines speed of response	MED
MIX INV	H/WH MIX	ON <> OFF	This option is related to the use of spring return actuators with a proportional valve	OFF
WWSD	H MODE 1, 2, 3	40°F (4°C) to 100°F (38°C)	The system warm weather shutdown temperature - outdoor reset, requires TARGET = RSET	70°F (21°C)
UNITS	All	deg F <> deg C	Show units using icons in display	deg F
MODBUS	All	OFF <> MNTR <> TEMP <> RATE	ModBus Operating Mode: Off, Monitor, Temp Control, Rate Control	MNTR
ADDRESS	All	1 to 247	ModBus slave address	1
DATA TYPE	All	RTU <> ASCI	Modbus data type	RTU
BAUD RATE	All	2400 <> 9600 <> 19K2 <> 57K6 <> 115K		19K2
PARITY	All	NONE <> EVEN <> ODD		EVEN

Table S. Adjust Menu

Item	Display Range	User Settings	When is it Displayed	Description
BOILER 1	ON <> OFF		FT_Bus 1 is connected	Enables Boiler for operation
BOILER 2	ON <> OFF		FT_Bus 2 is connected	Enables Boiler for cascade operation
BOILER 3	ON <> OFF		FT_Bus 3 is connected	Enables Boiler for cascade operation
BOILER 4	ON <> OFF		FT_Bus 4 is connected	Enables Boiler for cascade operation
IGNITION	IDLE PREP, IGN, BURN, POST, HARD, SOFT	N/A	Always	IDLE=no CFH PREP=pre-purge or inter-purge between trials for ignition IGN=trial for ignition BURN=burner operating POST=post purge HARD=a hard lockout fault has occurred requiring manual-reset (Ignition Lockout or manual high-limit) and SOFT=a soft lockout fault has occurred which interrupts the heating cycle (any safety other than ignition or manual high-limit). The CFH will resume after the soft lockout fault has been corrected and a 15-min. waiting period has expired.
VENT WALL	---, 22ºF (-6ºC) to 266ºF (108ºC)	N/A	Always, model dependent	Current Vent temperature
LIMIT TEMP	---, 22ºF (-6ºC) to 266ºF (108ºC)	N/A	Always	Current Outlet - Limit temperature
EMS VDC	0.0 to 10.0	N/A	Always	Current EMS signal in Volts DC
FIRE RATE	0 - 100%	N/A	Always	PIM firing rate
SPEED X 1000	0.0 to 20.0	N/A	PIM Identity Modulating	Blower speed in revolutions per minute (rpm) x 1000
OUTLET MAX	20ºF (-7ºC) to 40ºF (4ºC)		PIM Identity H	Defines max outlet temperature offset above target setpoint (press and hold up and down arrows for 3 seconds to enable adjustment)
OPERATOR	70ºF (21ºC) to 210ºF (99ºC)		Always	Operator Potentiometer setting on PIM
DIFF	2ºF (-17ºC) to 42ºF (6ºC)	N/A	PIM Differential DIP set to Auto	Current auto differential - Fixed by PIM
Pump post	OFF, 0:20 to 10:00 min.		PIM DIP = purge	Sets the length of the boiler pump purge
FLAME CUR	0 - 25	N/A	Always	Flame current in micro-amps (µA)
MASS	1 <> 2		Always	Thermal mass recovery
IDENTITY	H, WH, P	N/A	Always	Identifies the unit as boiler, water heater or pool heater
IGN TYPE	1STG, 2STG, MOD	N/A	Always	PIM Board type
ID CARD	0 - 255	N/A	Always	Identifies Raypak Identity Card
SW ID	0 - 65535	N/A	Always	PIM Software identification number
ERROR CODE	0 - 255	N/A	Always	LATEST ERROR CODE

Table T. Boiler View Menu

Item	Application	Description
RUN TIME Burner 1	All	Burner run time (hours). Press UP/DOWN for 1 sec to clear.
Cycles Burner	All	Number of burner cycles. Press UP/DOWN for 1 sec to clear.
RUN TIME Boiler pump	All	Boiler pump run time (hours). Press UP/DOWN for 1 sec to clear.
RUN TIME System pump	All	System pump run time (hours). Press UP/DOWN for 1 sec to clear.
RUN TIME DHW pump	H MODE 2, 3	DHW pump run time (hours). Press UP/DOWN for 1 sec to clear.
OUTLET HI	All	Records the highest boiler outlet temperature. Press UP/DOWN for 1 sec to clear.
OUTLET LO	All	Records the lowest boiler outlet temperature. Press UP/DOWN for 1 sec to clear.
INLET HI	All	Records the highest boiler inlet temperature. Press UP/DOWN for 1 sec to clear.
INLET LO	All	Records the lowest boiler outlet temperature. Press UP/DOWN for 1 sec to clear.
DELTA T	All	Captures the highest Delta T temperature recorded. Press UP/DOWN for 3 sec to clear.
OUTDOOR HI	H MODE 1, 2, 3	Records the highest outdoor temperature. Press UP/DOWN for 1 sec to clear.
OUTDOOR LO	H MODE 1, 2, 3	Records the lowest outdoor temperature. Press UP/DOWN for 1 sec to clear.
SYSTEM HI	All	Records the highest supply temperature. Press UP/DOWN for 1 sec to clear.
SYSTEM LO	All	Records the lowest supply temperature. Press UP/DOWN for 1 sec to clear.
IND HI	H MODE 1, 2, 3	Records the highest Indirect supply temperature. Press UP/DOWN for 1 sec to clear.
IND LO	H MODE 1, 2, 3	Records the lowest Indirect supply temperature. Press UP/DOWN for 1 sec to clear.
TANK HI	WH	Records the highest tank temperature. Press UP/DOWN for 1 sec to clear.
TANK LO	WH	Records the lowest tank temperature. Press UP/DOWN for 1 sec to clear.

Table U. Monitor Menu

Item	Description
Lookup Active Error	Look up and display the active error info.
USER TEST	Select ON to start the function. The setting returns to default after the test is run. See **page 44** for details.
MAX HEAT	Select ON to start the function. The setting will time out to OFF after 24 hours or can be set to OFF again by the user. See VERSA IC control manual for details.
P/N 104901	Software number of the Raypak VERSA IC.
DEFAULTS	Resets to factory settings. Press UP and DOWN for 1 second to show CLR and load factory defaults to all settings. This will also clear all history.
HISTORY lookup logged error	Displayed when an error code is present. 1 indicates the most recent error code. Press UP and DOWN for 1 second to clear the error logs.

Table V. Toolbox Menu

Outdoor Reset Concept

The Temperature controller can change the System Set Point based on outdoor temperature (Outdoor Reset). The temperature controller varies the temperature of the circulating heating water in response to changes in the outdoor temperature. The heating water temperature is controlled through the modulation and/or sequencing of the cascade.

The Temperature controller can also control the system circulating pump with an adjustable Outdoor Cutoff. When the outdoor temperature is above the Outdoor Cutoff, the pump is turned off and no heating water is circulated through the system. When the outdoor temperature drops below the Outdoor Cutoff, the system pump relay is activated and the heating water circulates through the system. The temperature of the heating water is controlled by the Reset Ratio, Water Offset, and changes with the outdoor temperature.

Reset Ratio/Outdoor Reset

When a building is being heated, heat escapes through the walls, doors, and windows to the colder outside air. The colder the outside temperature, the more heat escapes. If you can input heat into the building at the same rate that it is lost out of the building, then the building temperatures will remain constant. The Reset Ratio is an adjustment that lets you achieve this equilibrium between heat input and heat loss.

The starting point for most systems is the 1.00 (OD):1.00 (SYS) (Outdoor Temperature: Heating Water Temperature) ratio. This means that for every degree the outdoor temperature drops, the temperature of the heating water will increase one degree. With the VERSA, both ends of the slope are adjustable. It is factory set at 70°F (21°C) water temperature (Boil START) at 70°F (21°C) outdoor air (OUT START), and 180°F (82°C) water temperature (Boil DESIGN) at 10°F (-12°C) outdoor air (OUT DESIGN).

Each building has different heat loss characteristics. A very well insulated building will not lose much heat to the outside air, and may need a Reset Ratio of 2.00 (OD):1.00 (SYS) (Outdoor: Water). This means the outdoor temperature would have to drop 2 degrees to increase the water temperature 1 degree. On the other hand, a poorly insulated building may need a Reset Ratio of 1.00 (OD):2.00 (SYS). This means that for each degree the outdoor temperature dropped the water temperature will increase 2 degrees. The VERSA control Reset Ratio allows for full customization to match any buildings heat loss characteristics.

A heating curve that relies not only on Outdoor temperature but also on the type of radiation will improve heat comfort. The user can fine tune these adjustments based on the specific building need.

Reset Ratio Settings

The controller uses the four following settings to determine the reset ratio:

1. Heater Start (**Boil START**). The Boil START temperature is the theoretical heater supply water temperature that the heating system requires when the outdoor air temperature equals the OUT START temperature setting. The Boil START is typically set to the desired building temperature.
2. Outdoor Start (**OUT START**). The OUT START temperature is the outdoor temperature at which the control provides the Boil START water temperature to the system. The OUT START is typically set to the desired building temperature.
3. Outdoor Design (**OUT DESIGN**). The OUT START is the outdoor temperature that is typical coldest annual temperature where the building is located. This temperature is used when completing heat loss calculation for the building.
4. Heater Design (**Boil DESIGN**). The Boil DESIGN temperature is the water temperature required to heat the heater zones when the outdoor air is as cold as the OUT DESIGN temperature.

Warm Weather Shut Down (WWSD)

When the outdoor air temperature rises above the WWSD setting, the control turns on the WWSD segment in the display. When the control is in the Warm Weather Shut Down, the Dem 1 segment is displayed if there is a heat demand. However, the control does not operate the heater to satisfy this demand. The control continues to respond to DHW demands.

Reset Ratio

The controller uses the following four settings to calculate the Reset Ratio (RR). For example, when using the default values, the RR is:

$$\text{RESET RATIO} = \frac{(\text{OUTDOOR START} - \text{OUTDOOR DESIGN})}{(\text{BOILER DESIGN} - \text{BOILER START})}$$

RR = (70 - 10) / (180 - 70) = 0.55
Therefore, the RR is 0.55:1 (Outdoor : Water).

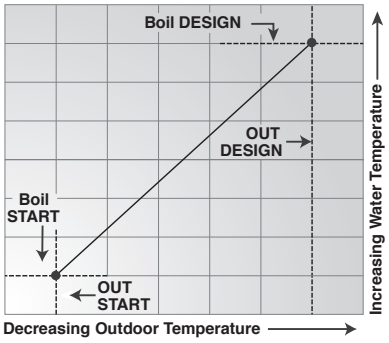
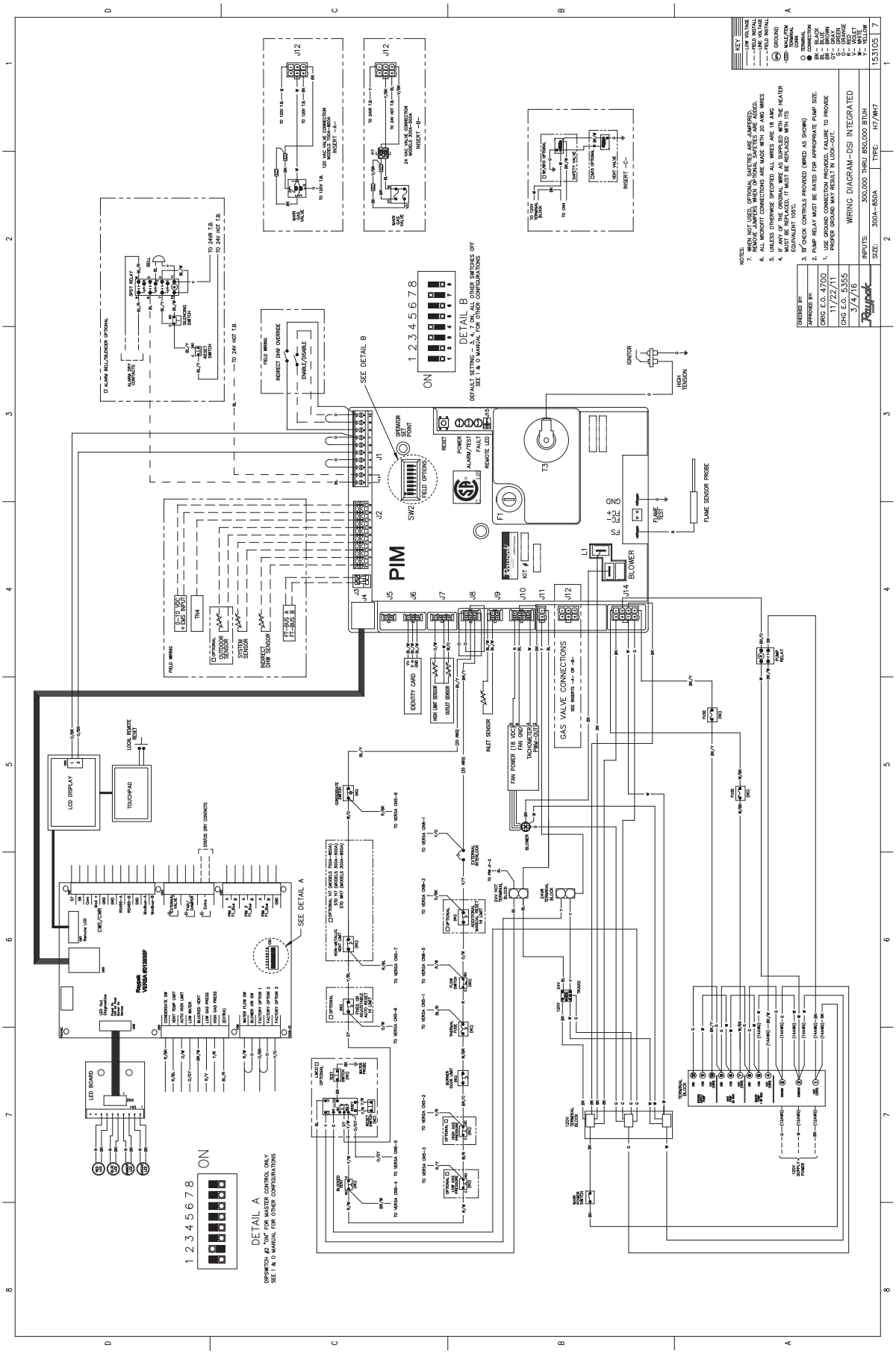


Figure 43. Reset Ratio

NOTE: The wiring diagrams in this manual show all standard options. Refer to the large wiring diagram provided with your heater for options installed on your specific unit(s).

6. WIRING DIAGRAM



7. START-UP

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

Pre Start-up

Filling System (Heating Boilers)

Fill system with water. Purge all air from the system. Lower system pressure. Open valves for normal system operation, and fill system through feed pressure. Manually open air vent on the compression tank until water appears, then close vent.

Air Purge (Domestic Hot Water Heaters)

CAUTION: An air vent should be installed at the highest point in the system for proper operation. If water piping is located higher than the boiler, it should be relocated to the highest point in the installed system.

Purge all air from system before lighting heater. This can be normally accomplished by opening a down-stream valve.

Venting System Inspection

1. Check all vent pipe connections and flue pipe material.
2. Make sure vent terminations are installed per code and are clear of all debris or blockage.

For Your Safety

This appliance has a direct spark igniter. It is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.

BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell near the floor because some gas is heavier than air and will settle on the floor.

What To Do If You Smell Gas:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any telephone in your building.
- Immediately call your gas supplier from a neighbor's telephone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Use only your hand to close the gas supply shutoff valve outside the heater. Never use tools. If the knob will not turn by hand, do not try to repair it, call a qualified service technician. Forced or attempted repair may result in a fire or explosion.
- Do not use this appliance if any part has been under water, immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
- Check around unit for debris and remove combustible products, i.e. gasoline, etc.

Pre Start-up Check

1. Verify the heater is filled with water.
2. Check system piping for leaks. If found, repair immediately.
3. Vent air from system. Air in system can interfere with water circulation.
4. Purge air from gas line to boiler.

Initial Start-up

Required tools

- (1) 12-0-12 (24" scale) U-tube manometer
- (2) 6-0-6 (12" scale) U-tube manometer
- Screwdrivers (assorted sizes and shapes)
- (1) Crescent wrench (8" or 10")
- (1) Multi-meter
- Flue gas analyzer (calibrated)

(Metric Allen wrenches will be required for servicing the gas valve, but not during start-up)

Preparation

Check Power Supply

⚠WARNING: Do not turn on gas at this time.

With multi-meter at incoming power, check voltage between:

- Hot - Common (≈120 VAC)
- Hot - Ground (≈120 VAC)
- Common - Ground (< 1 VAC)

Attach Manometers to Measure Pressures

NOTE: Digital manometers are not recommended.

⚠WARNING: If Common - Ground is > 1 VAC, STOP: Contact electrician to correct ground failure. Failure to do this may burn out 120V-24V transformer, or may cause other safety control damage or failure.

NOTE: While attaching manometers, any cap or bleedle valves removed should be retained for reinstallation later.

1. Turn off main gas shutoff valve.
2. On the 700A and 850A models, remove plugs “A” and “B,” and install 1/8" NPT fittings to allow measurement of the gas pressure.
3. Attach a 12" scale manometer to the upstream fitting on the gas supply pipe to the heater (Measure point “A” in Fig. 44, field-supplied on the 700A and 850A).

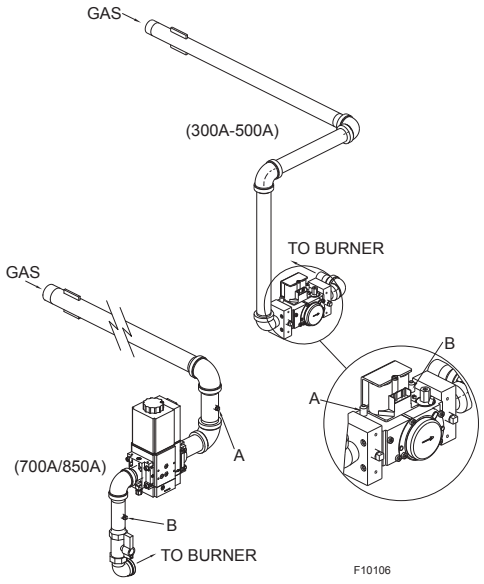


Figure 44. Gas Pressure Measurement Locations

4. Attach a 12" scale manometer to the downstream fitting on the gas manifold (Measure point “B” in Fig. 44, field-supplied on the 700A and 850A).
5. Attach a 12" scale manometer between the Swirler and Gas valve on the air hose tee. See **Figure 45**. Pull the black cap to connect the manometer.

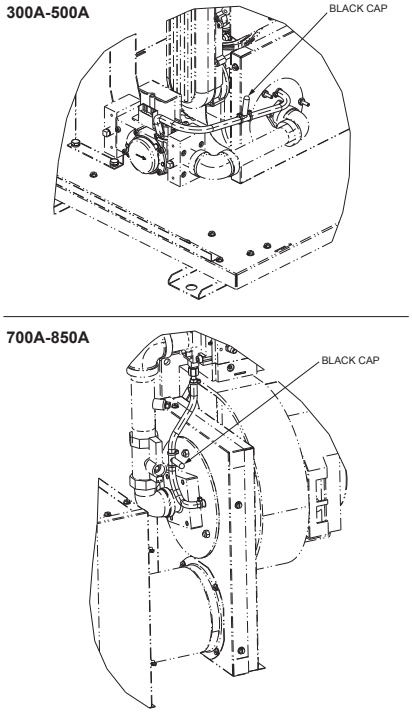


Figure 45. Pressure Vent Switch Assemblies

Check Gas Supply Pressure

1. Slowly turn on main gas shut-off valve.
2. Read the gas supply pressure from the manometer; minimum supply pressure for natural gas is 4.0 in. WC, recommended supply is 7.0 in. WC, minimum supply pressure for propane gas is 4.0 in. WC, recommended supply is 11.0 in. WC (dynamic readings, full fire input).
3. If the gas pressure is greater than 14.0 in. WC, turn off the main gas shut-off valve.

Start-Up

1. Turn power on.
2. Turn on the boiler. Approximately 10 seconds after the blower starts, the igniter should start to spark (observable through the observation port located at the front, bottom of the boiler) and the gas valve will open. Look into the sight glass located at the bottom of the front panel to check igniter operation.
3. The boiler ignites at 3000 RPM (as indicated on the LCD display of the user interface).
4. This boiler is equipped with a standard three-try ignition module, it will try for ignition up to three times before going into lockout. If the boiler is equipped with the optional single-try ignition module (sales option C-6), it will try for ignition one time before going into lockout.
5. Wait until the controller indicates 100% on the firing rate display screen. This may take several minutes.

Blower Check

1. Note the high fire air intake pressure on the swirler and compare to **Table W**. Excessively high pressures indicate an obstruction in the air intake or undersized/ too long air intake ducting. With a clean air filter in place, record the intake air pressure setting on the start-up checklist. Replace the filter when the intake air pressure increases by –0.5 in. WC from the reading recorded on the start-up checklist.

Model	High Fire (in. WC)	Tolerance (in. WC)
300A	-1.0	± 0.2
400A	-1.6	± 0.2
500A	-1.3	± 0.2
700A	-0.8	± 0.2
850A	-1.3	± 0.2

Table W. Air Intake Pressures with Clean Filters Installed

2. The desired combustion CO2 is between 8.5% and 9.0% for natural gas, and between 9.5% and 10.0% for propane with CO less than 150 ppm. Combustion should be checked at high and low fire (Max. and Min. fan speed).

Manifold Check

CAUTION: Special manifold and air settings may be required.

1. Check manifold gas pressure at the manifold pressure tap (connection "B" in **page 45**). This pressure should read per the values in **Table X** for natural and propane gas.
2. If the pressure reading differs by more than ± 0.2 in. WC, **STOP – Call the factory for directions on what to do next**!

Model No.	Natural Gas High Fire (in. WC)	Propane Gas High Fire (in. WC)
300A	-1.0 ± .1	-1.0 ± .1
400A	-1.5 ± .1	-1.6 ± .1
500A	-1.2 ± .1	-1.3 ± .1
700A	-1.4 ± .1	-1.0 ± .1
850A	-1.7 ± .2	-3.4 ± .2

Table X. XFyre Manifold Pressures

User Test

- Set DIP #1 on the VERSA IC control to "ON". Set USER TEST = ON in the 'Tool Box' Menu to start the user test function. See **Table Y**.
- USER TEST is displayed in the Title Field.
- UP keystrokes are used to advance through the user test.
- The Boil MIN/MAX steps for burner operation are only run for enabled boilers.
- Local Heat/DHW/EMS demands must be present for burner operation.
- On the first press of the Up button, the test step is held and "HOLD" is flashed at 1Hz.
- On the second press of the Up button, the test step is incremented.
- If boiler outlet temp reaches the PIM Hi-Limit, the boiler will be ramped down to keep the temp in a safe range.
- Press of the Up button from Boiler Max will End the User Test function.

Number Field	Output Action
SYS	System Pump relay turns on.
DHW	DHW Pump relay turns on.
PMP 1	System and Boiler Pump relays turn on.
Boil 1	Ignite Boiler Burner.
Min 1	Hold Boiler at Min Fire.
Max 1	Ramp Boiler to Max Fire and hold.

Table Y. User Test Fields

Safety Inspection

1. Check all thermostats and high-limit settings.
2. During the following safety checks leave manometers hooked up, check and record.
3. If other gas-fired appliances in the room are on the same gas main, check all pressures on the XFyre with all other equipment running.
4. Check thermostats for ON-OFF operation.
5. Check high-limits for ON-OFF operation.
6. While in operation, check flow switch operation.
7. Check the low gas pressure switch (if provided). (For proper adjustment, use the attached manometers, if available, to set pressure. The scales on the switch are approximate only.) Low gas pressure switch (if provided) must be set at 3.0 in. WC for natural gas and propane gas.
8. Make sure that the high gas pressure switch (if provided) is set to 3.0 in. WC for both natural gas and propane gas.

Finishing

1. Record all data on the "Start-up Checklist" located at the back of this manual.
2. Disconnect the manometers and reconnect the cap on the air intake and reinsert or close the sealing screws into the bleedle valves.
3. Start-up is complete and the boiler should be operating properly.

Follow-Up

Safety checks must be recorded as performed. Turn boiler on. After main burner ignition:

1. Check manometer for proper readings. Specifically note the change in air intake pressure. Replace the filter if necessary. See **Table W**.
2. Cycle unit several times and re-check readings.
3. Remove all manometers and replace caps and screws.
4. Check for gas leaks.

Post Start-Up Check

Check off steps as completed:

1. Verify that the boiler and heat distribution units or storage tank are filled with water.
2. Confirm that the automatic air vent (if used) was opened two full turns during the venting procedure.
3. Verify that air has been purged from the system.
4. Verify that air has been purged from the gas piping, and that the piping has been checked for leaks.
5. Confirm that the proper start-up procedures were followed.
6. Inspect burner to verify flame.
7. Test safety controls: If boiler is equipped with a low water cut-off or additional safety controls, test for operation as outlined by manufacturer. Burner should be operating and should go off when controls are tested. When safety devices are restored, burners should re-ignite after pre-purge time delay.
8. Check to see that the high-limit control is set above the design temperature requirements of the system. For multiple zones: Check to make sure the flow is adjusted as required in each zone.
9. Check that the boiler is cycled with the thermostat. Raise the setting on the thermostat to the highest setting and verify that the boiler goes through the normal start-up cycle. Reduce to the lowest setting and verify that the boiler goes off.
10. Observe several operating cycles for proper operation.
11. Set the boiler thermostat to desired temperature.
12. Review all instructions shipped with this boiler with owner or maintenance person, return to envelope and give to owner or place the instructions inside front panel on boiler.

8. OPERATION

Lighting Instructions

1. Before lighting, make sure you have read all of the safety information in this manual.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Turn on main manual gas valve field-installed near gas inlet connection on back of boiler.
6. Wait 5-minutes to clear out any gas. Then smell for gas, especially near the floor. If you then smell gas, STOP! Follow the steps in the safety information on the front cover of this manual. If you do not smell gas, go to next step.
7. Turn on all electrical power to the appliance.
8. Set thermostat to desired setting. The appliance will operate. The igniter will spark after the pre-purge time delay (15 seconds). The main valve should open. System will try for ignition up to three times (one time on optional single-try ignition module). If flame is not sensed, lockout will commence.
9. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.
10. If boiler fails to start, verify the following:
    a. There are no loose connections or that the service switch is off.
    b. High temperature limit switch or manual-reset high-limit is not tripped.
    c. Thermostat is set above water temperature.
    d. Gas is on at the meter and the boiler.
    e. Incoming dynamic gas pressure to the gas valve is NOT less than 4.0 in. WC for natural gas or propane gas.

To Turn Off Gas To Appliance

1. Shut off manual gas valve field installed near gas inlet connection on back of boiler.
2. Set the thermostat to lowest setting.
3. Turn off all electrical power to the appliance if service is to be performed.

9. TROUBLESHOOTING

⚠DANGER: When servicing or replacing components that are in direct contact with the water, be certain that:

- **There is no pressure in the boiler. (Pull the release on the relief valve. Do not depend on the pressure gauge reading).**
- **The boiler water is not hot.**
- **The electrical power is off.**

⚠WARNING: When servicing or replacing any components of this unit be certain that:

- **The gas is off.**
- **All electrical power is disconnected.**

⚠WARNING: Do not use this appliance if any part has been under water. Improper or dangerous operation may result. Contact a qualified service technician to inspect the boiler and to repair or replace any part of the boiler that has been under water prior to placing the boiler back in operation.

⚠CAUTION: Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing. See wiring diagram.

⚠CAUTION: If overheating occurs or the gas supply fails to shut off, do not turn off electrical power to the circulating pump. This may aggravate the problem and increase the likelihood of boiler damage. Instead, shut off the gas supply to the boiler at the gas service valve.

XFyre Error Codes

If any of the sensors detect an abnormal condition or an internal component fails during the operation of the XFyre, the display may show an error code. This code may either be the result of a temporary condition in which case the display will revert to its normal readout when the condition is corrected, or it may be the result of a condition that the controller has evaluated as not safe to restart the unit. In this case, the unit control will be locked out, requiring the maintenance person to manually reset the control by pressing and releasing the RESET key.

Heater Errors

When an error condition occurs, the controller will display an error code on the display module. These error codes and several suggested corrective actions are included in the XFyre Fault Text section on the following page.

Heater Faults

1. When a fault condition occurs, the controller will flash a red light on the PIM and display the error code on the user interface. The alarm output will also be activated. Most fault conditions will also cause the boiler pump to run in an attempt to cool the unit.
2. Note the error code, either through the flash code on the PIM and/or from the Toolbox menu on the user interface, and reference the explanation of the fault along with troubleshooting steps in the XFyre fault text section.
3. Press and release the RESET key to clear the fault on the user interface and resume operation. Be sure to observe the operation of the unit for a period of time to ensure correct operation and no reoccurrence of fault code(s).

XFyre Fault Text

Error Display

If there is an active error, then it is displayed as the first item in the Toolbox Menu and it is the default display for the control until the error is resolved. See **Table Z.**

LED Error Code Listing

Active errors detected are indicated by LED lights on the PIM. See **Table AA**.

Error Item	Description and Troubleshooting
OUTLET SEN	Check the outlet water sensor and its wiring.
LIMIT SEN	Check the high-limit sensor and its wiring.
INLET SEN	Check the inlet sensor and its wiring.
GAS PRESS	Check PIM wiring.
IGNITION	Reset control, push and release RESET button
LIMIT TRIP	Boiler temperature tripped the high-limit.
FLAME	False flame detected. Shut off gas supply, recycle power.
ID CARD	Identity card, check ID card and wiring.
IGN CTRL	Internal control fault. Reset power, replace control.
DELTA T	Temperature difference between the inlet and outlet exceeded the setpoint. Check water flow.
LOW 24VAC	Low 24 VAC power. Check power supply wiring and transformer.
BLOW SPEED	Blower speed out of range. Check blower wiring and blower.

Table Z. Error Display

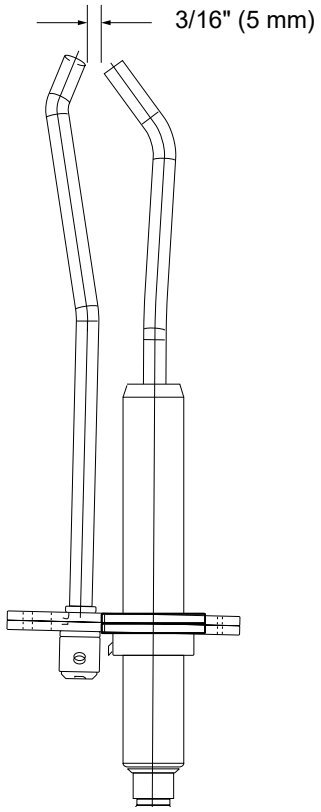
Error Mode	Error Mode	Recommended Troubleshooting
Normal Operation	Red LED OFF	
ID Card Fault	Red LED Steady ON, Green Power LED OFF	Check that the proper ID Card is securely connected. Perform a power and system reset.
Internal Control Fault	Red LED Steady ON	Perform a power and system reset. If fault remains, replace the PIM.
	Red LED - 1 Flash	N/A
False Flame Error	Red LED - 2 Flashes	Check for proper gas valve closure. Clean burner and electrodes.
Ignition Lockout Fault	Red LED - 3 Flashes	Check the gas supply. Check transformer. Check igniters. Check wiring. Press rset button on PIM/membrane switch. Recycle power.
	Red LED - 4 Flashes	N/A
Low Voltage Fault	Red LED - 5 Flashes	Check the 24VAC input voltage - the voltage must be above 18.0 VAC for proper operation. Replace transformer as necessary.
	Red LED - 6 Flashes	N/A
Hi-Limit Fault	Red LED - 7 Flashes	Check for proper water flow. Check hi-limit setting and outlet sensor.
Sensor Fault	Red LED - 8 Flashes	See the VERSA IC Control for fault identification. Check sensor and wiring.
	Red LED - 9 Flashes	Check wiring at J8, pins 1 and 3 for loose or missing jumper.
Water Pressure Fault	Red LED - 10 Flashes	Check system piping for leaks. Check water pressure switch (if equipped) and connections. Check wiring on PIM at J1, pins 6 and 7 for loose or missing jumper.
Blower Speed Fault	Red LED - 11 Flashes	Verify the tachometer signal connections at the blower and terminals J5 on the PIM. Confirm power to boiler is at or above minimum required.
	Red LED - 12 Flashes	Check wiring on PIM at J1, pins 3 and 4 for loose or missing jumper.
Hi-Temperature Delta Fault	Red LED - 13 Flashes	Check pump's operation. Confirm proper water flow across heat exchanger (Delta T).
Ft_bus Communications Fault	Red LED - 14 Flashes	Verify that the VERSA IC Control is connected and operating properly. Check the cable between the PIM and the VERSA IC Control.
Safety Circuit Fault	Red LED - 15 Flashes	Check the VERSA IC for fault indication and troubleshooting information.

Table AA. PIM LED Error Codes

Sensor Resistance Values

Water Sensor / Outdoor Sensor	
Water Temperature °F (°C)	**Resistance (ohms)**
32 (0)	32550
41 (5)	25340
50 (10)	19870
59 (15)	15700
68 (20)	12490
77 (25)	10000
86 (30)	8059
95 (35)	6535
104 (40)	5330
113 (45)	4372
122 (50)	3605
131 (55)	2989
140 (60)	2490
149 (65)	2084
158 (70)	1753
167 (75)	1481
176 (80)	1256
185 (85)	1070
194 (90)	915
203 (95)	786
212 (100)	667

Table AB. Sensor Resistance Values



NOTE: If receiving a NO FLAME, check the gap spacing between the points on the electrode by using either a 3/16 drill bit or a key between the gap. There should be no resistance.

Figure 46. Direct Spark Igniter

10. MAINTENANCE

Suggested Minimum Maintenance Schedule

Regular service by a qualified service agency and maintenance must be performed to ensure maximum operating efficiency.

Maintenance as outlined below may be performed by the owner.

Daily

1. Check that the area where the boiler is installed is free from combustible materials, gasoline, and other flammable vapors and liquids.
2. Check for and remove any obstruction to the flow of combustion or ventilation air to boiler.

Monthly

1. Check for piping leaks around pumps, mixing valves, relief valves, and other fittings. If found, repair at once. DO NOT use petroleum-based stop-leak compounds.
2. Visually inspect burner flame.
3. Visually inspect venting system for proper function, deterioration or leakage.
4. Visually inspect for proper operation of the condensate drains in the venting, and the internal condensate trap. Clean trap as necessary. If leaks are observed, repair at once.
5. Check air vents for leakage.

Yearly (Beginning Of Each Heating Season)

Schedule annual service call by qualified service agency.

1. Visually check top of vent for soot. Call service person to clean. Some sediment at bottom of vent is normal.
2. Visually inspect venting system for proper function, deterioration or leakage. Ensure that condensate drain is inspected and ensure that condensate is being directed to appropriate condensate management system or drain, as required by local codes.
3. Check that area is free from combustible materials, gasoline, and other flammable vapors and liquids.
4. Check for and remove any obstruction to the flow of combustion or ventilation air to boiler.
5. Follow pre-start-up check in the Start-up section.
6. Visually inspect burner flame. It should be light blue at full input. Remove and visually inspect direct spark igniter and sensor for damage, cracking or debris build-up.
7. Check operation of safety devices. Refer to manufacturers' instructions.
8. Follow oil-lubricating instructions on pump (if required). Over-oiling will damage pump. Water-lubricated circulators do not need oiling.
9. To avoid potential of severe burn, DO NOT REST HANDS ON OR GRASP PIPES. Use a light touch; return piping will heat up quickly.
10. Check blower and blower motor.
11. Check for piping leaks around pumps, relief valves and other fittings. Repair, if found. DO NOT use petroleum-based stop-leak.

Periodically

1. Check relief valve. Refer to manufacturer's instructions on valve.
2. Test low water cut-off (if equipped). Refer to manufacturer's instructions.

Preventive Maintenance Schedule

The following procedures are recommended and are good practice for all XFyre installations.

Daily

1. Check gauges, monitors and indicators.
2. Check instrument and equipment settings. See “"Post Start-Up Check".
3. Check burner flame. (Should see light blue flame at full input rate).

Weekly

For low-pressure boilers, test low-water cut-off device. (With boiler in pre-purge, depress the low water cut-off test button. Appliance should shut-off and ignition fault light should come on. Depress reset button on front of heater control panel to reset).

Monthly

1. Check flue, vent, stack, or dampers.
2. Test intake air pressure. See **Table W**. Replace the filter when the intake air pressure increases by –0.5 in. WC from the reading recorded on the start-up checklist.
3. Test high and low gas pressure interlocks (if equipped). See "Safety Inspection".

Semi-Annually

1. Recalibrate all indicating and recording gauges.
2. Check flame failure detection system components.
3. Check firing rate control by checking the manifold pressure. See "Manifold Check".
4. Check piping and wiring of all interlocks and shut-off valves.

Annually

1. Test flame failure detection system.
2. Test high-limit and operating temperature. See "Post Start-Up Check".
3. Check flame sensor.
4. Conduct a combustion test at high and low fire. Carbon dioxide should be 8.5 to 9.0% at full fire for natural gas, and between 9.5 to 10.0% for propane gas. Carbon monoxide should be <150 ppm.
5. Check valve coil for 60 cycle hum or buzz. Check for leaks at all valve fittings using a soapy water solution (while unit is operating). Test other operating parts of all safety shut-off and control valves and increase or decrease settings (depending on the type of control) until the safety circuit opens. Reset to original setting after each device is tested.
6. Perform leakage test on gas valves, if required by local codes.
7. Inspect and clean burner using shop air.
8. Clean the combustion chamber coil, using the procedure on the following page.

As Required

1. Recondition or replace low water cut-off device (if equipped).
2. Check drip leg and gas strainers.
3. Check flame failure detection system. See "Post Start-Up Check". Verify high and low fire flame signal, compare to start-up data.
4. Check igniter. Clean and verify spark gap. See **Figure 46**.
5. Check fan speed and manifold pressure. See "Blower Check" and "Manifold Check".
6. Test safety/safety relief valves in accordance with ASME Heater and Pressure Vessel Code Section IV.

⚠WARNING: The combustion chamber insulation in this product contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded that "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group1)":

Avoid breathing dust and contact with skin and eyes.

- **Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH website at**

  http://www.cdc.gov/niosh/homepage.html.

  NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.
- **Wear long-sleeved, loose fitting clothing, gloves, and eye protection.**

- **Apply enough water to the combustion chamber lining to prevent dust.**
- **Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.**

NIOSH stated First Aid:

Eye: Irrigate immediately

Breathing: Fresh air.

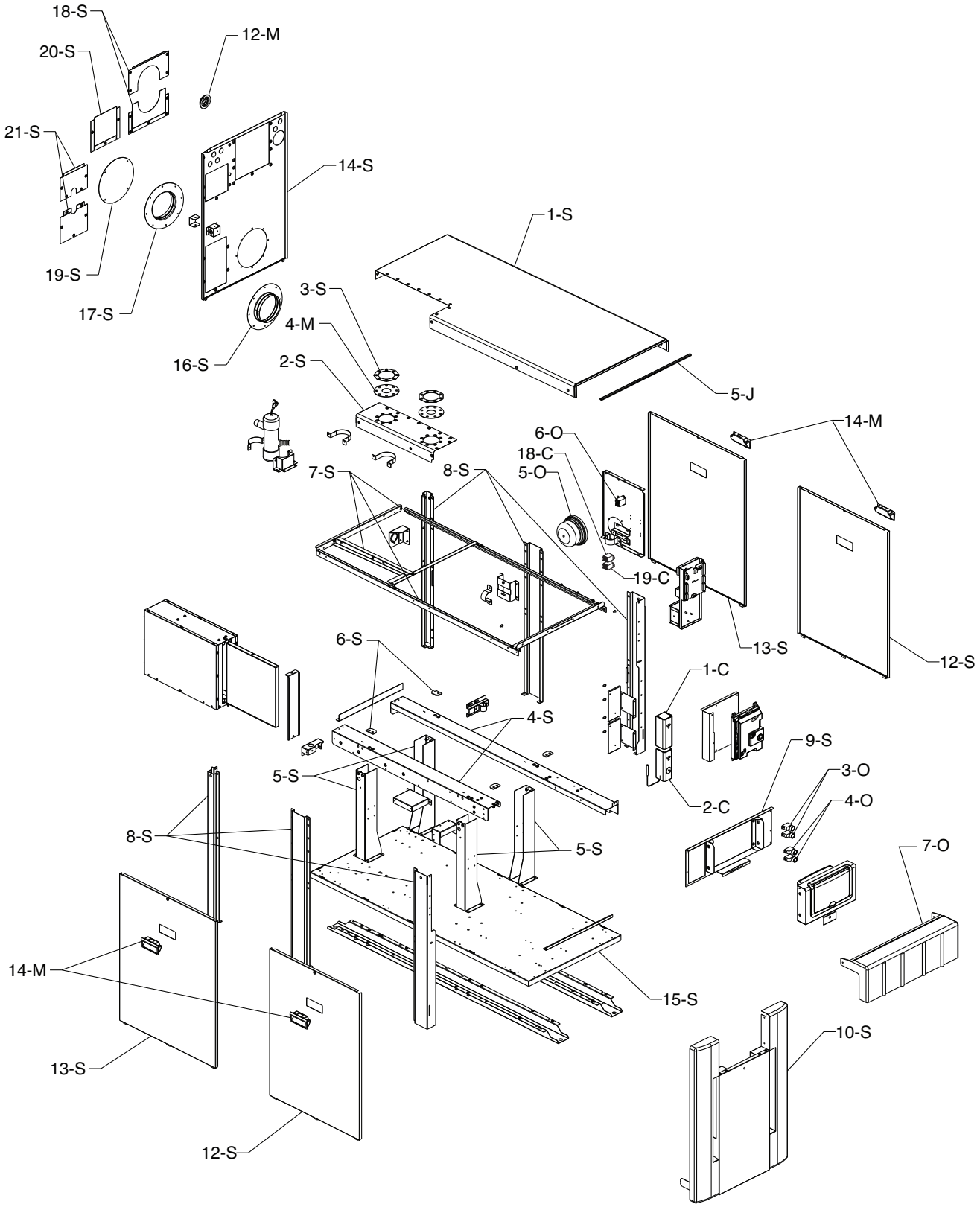
Combustion Chamber Coil Cleaning Instructions

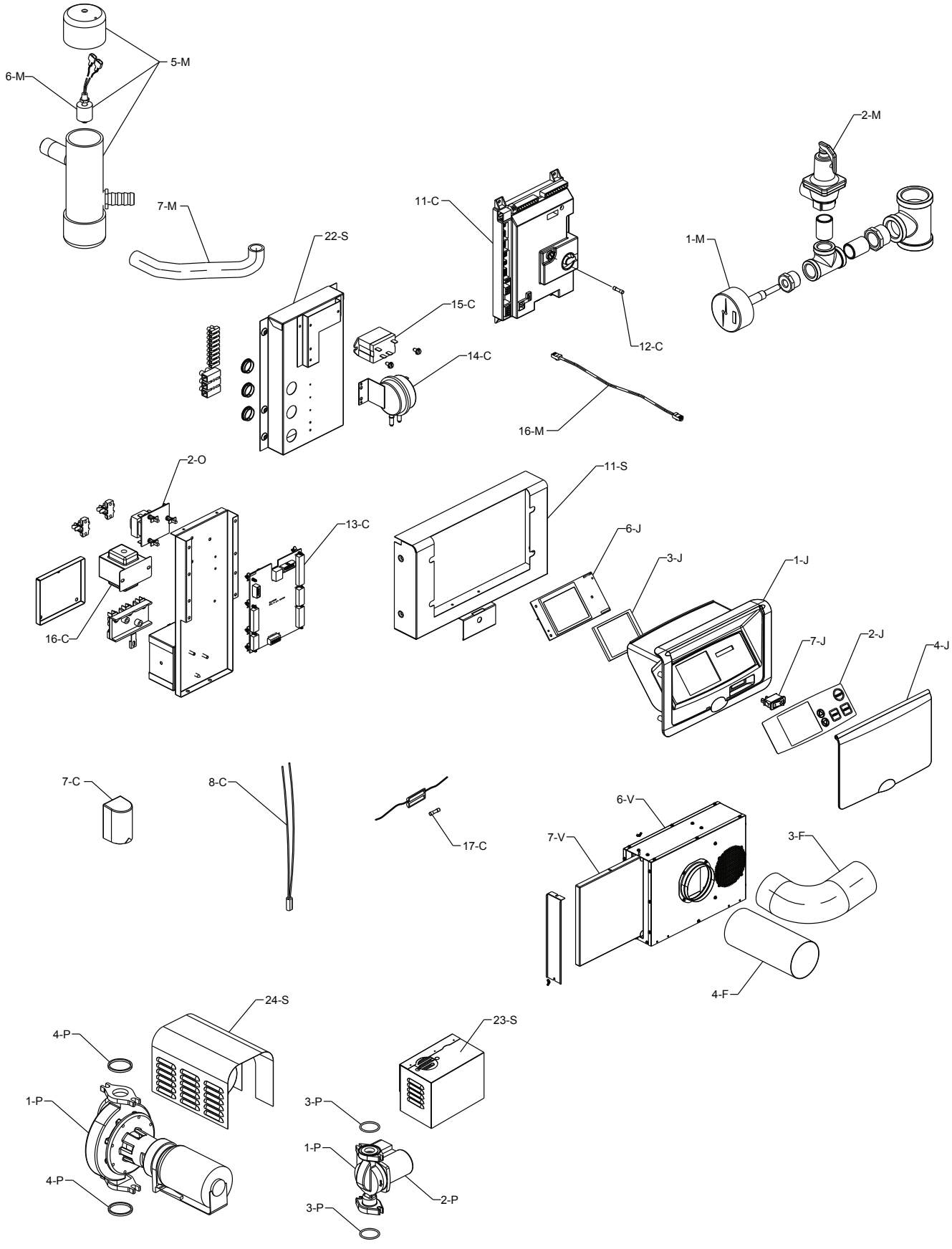
Before beginning this procedure, you must have on hand the following items:

- a nylon, stainless steel or brass brush (not steel)
- "Rydlyme" (recommended for best results) or "CLR"
- Gloves, eye protection

1. Shut down the XFyre boiler by using the following steps:
   a. Close the gas valve, shut down the unit and wait for the unit to be cool to the touch.
   b. Disconnect the condensate piping from the outside connection, (not from the XFyre boiler side), so the flow from condensate reservoir can be observed.
   c. Disconnect electrical connections from the gas valve, spark electrode and flame rectification probe and combustion blower.
   d. Remove the (4) screws on the aluminum 3/4" NPT connector on the right side of the gas valve.
   e. Disconnect the wiring connected to the combustion blower motor.
   f. Remove the six 10mm nuts from the burner plate assembly.
   g. Remove the valve/blower/burner assembly from the heat exchanger.
2. Using a spray bottle filled with the recommended product "RYDLYME" or "CLR", spray liberally on the coils, making sure the solution penetrates and funnels down through the condensate system. If the condensate system is blocked, let the chemical penetrate for at least 15-minutes or until it drains.
3. Use the nylon, stainless steel or brass brush (do not use steel) to scrub coils to remove any buildup, then vacuum the debris from the coils. Be sure to follow the precautions listed for working with ceramic fibers.
4. Spray the coils with clear water, making sure to confine the spray to the area being cleaned (DO NOT get the back ceramic wall of the unit wet). Flush the combustion chamber with fresh water until clear water runs from the condensate drain. At this point, the XFyre should be ready to be re-assembled.
   a. Inspect gaskets.
   b. Re-install the burner assembly.

11. ILLUSTRATED PARTS LIST

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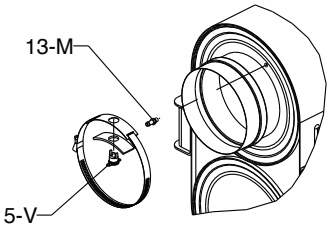
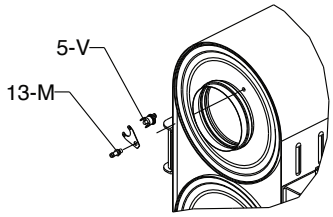
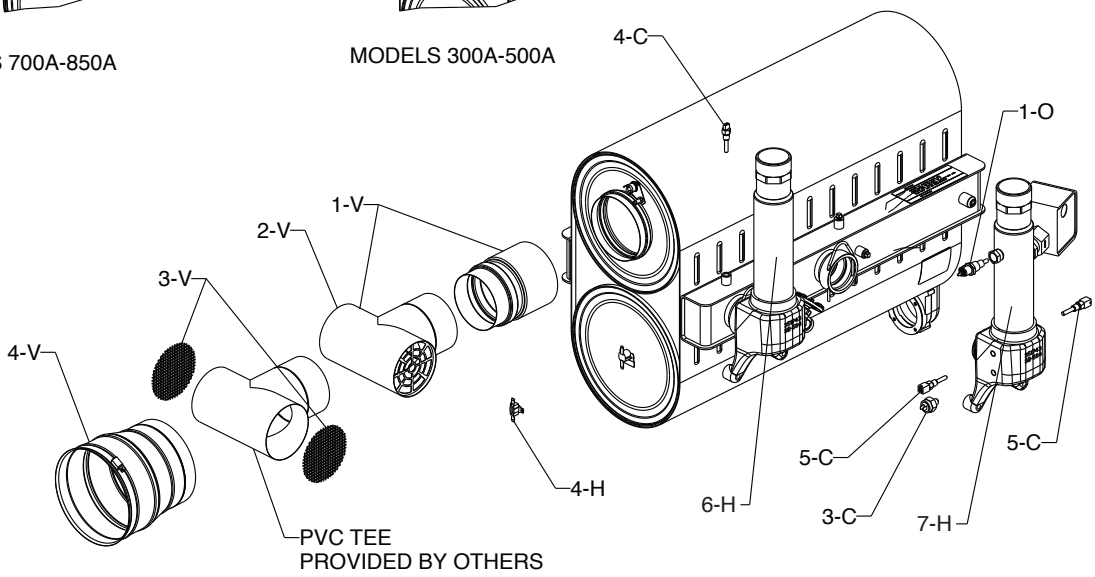
HEAT TRANSFER DETAIL

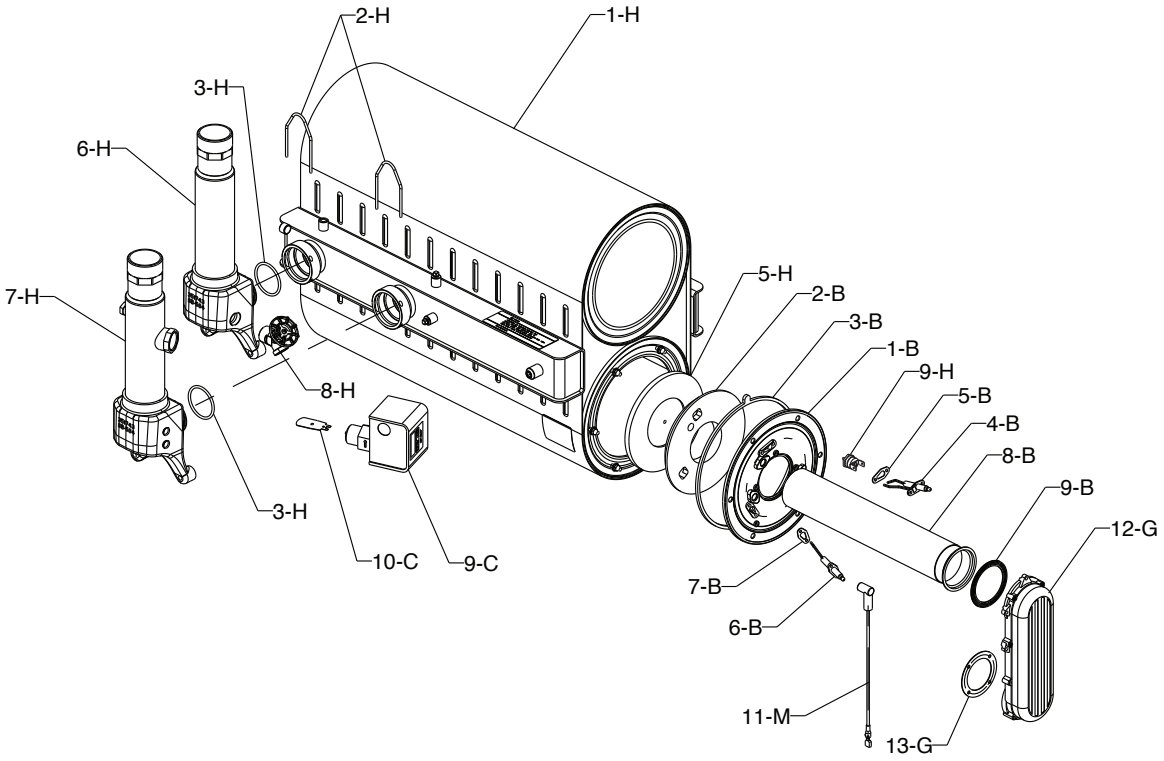


MODELS 700A-850A

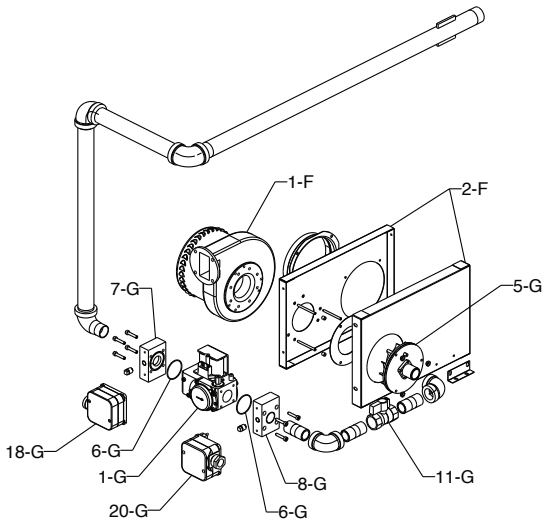


MODELS 300A-500A

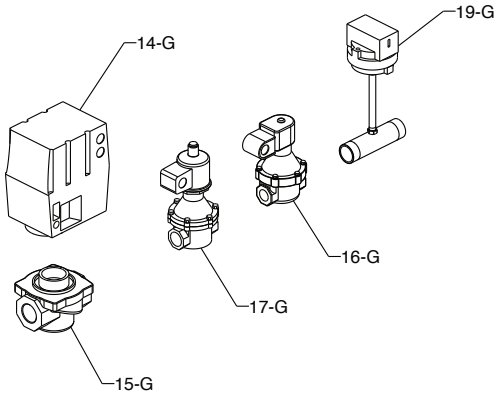




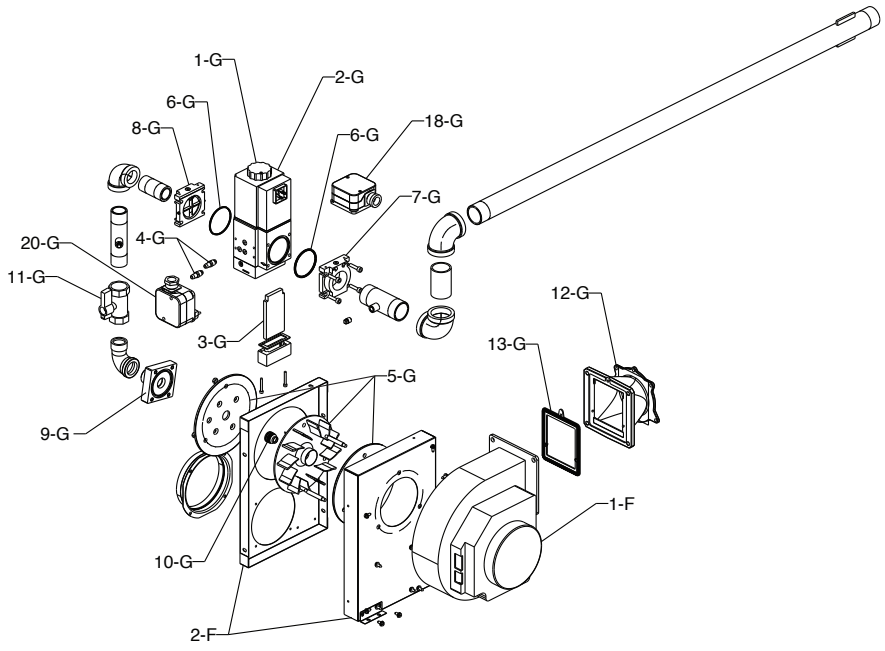
GAS TRAIN & BURNER DETAIL



MODELS 300A-500A



COMMON TO ALL MODELS



MODELS 700A-850A

CALL OUT	DESCRIPTION	300A	400A	500A	700A	850A
B	**BURNER ASSEMBLY**					
1-B	Burner Door (Includes 2-B, 3-B & 9-B)	013158F	013158F	013158F	013159F	013159F
2-B	Refractory Burner Door	N/A	N/A	N/A	N/A	N/A
3-B	Door Seal Gaskets	013162F	013162F	013162F	013174F	013174F
4-B	Flame Sensor Probe	013163F	013163F	013163F	013164F	013164F
5-B	Flame Sensor Gasket	013168F	013168F	013168F	013168F	013168F
6-B	Igniter	013166F	013166F	013166F	013167F	013167F
7-B	Igniter Gasket	013168F	013168F	013168F	013168F	013168F
8-B	Burner	013169F	013169F	013169F	013445F	013445F
9-B	Burner Seal Gasket	013171F	013171F	013171F	013172F	013172F
C	**CONTROLS**					
1-C	Auto Reset Adjustable High Limit 180F Max	006445F	006445F	006445F	006445F	006445F
	Auto Reset Adjustable High Limit 200F Max	012546F	012546F	012546F	012546F	012546F
2-C	Manual Reset Adjustable High Limit 180F	009554F	009554F	009554F	009554F	009554F
	Manual Reset Adjustable High Limit 200F	008081F	008081F	008081F	008081F	008081F
3-C	Auto Reset Fixed High Limit 200F	013474F	013474F	013474F	013474F	013474F
4-C	Inlet Sensor (2 Wire)	013175F	013175F	013175F	013175F	013175F
5-C	Outlet Sensor (4 Wire)	013932F	013932F	013932F	013932F	013932F
7-C	Sensor Outdoor Air B-32	010786F	010786F	010786F	010786F	010786F
8-C	Sensor Water 10K	010787F	010787F	010787F	010787F	010787F
9-C	Flow Switch	007142F	007142F	007142F	007142F	007142F
10-C	Flow Switch Paddle (Taco)	010026F	010026F	010026F	010026F	010026F
11-C	PIM (Platform Ignition Module) Multi Try	013933F	013933F	013933F	013933F	013933F
	PIM (Platform Ignition Module) Single Try CSD-1	013934F	013934F	013934F	013934F	013934F
12-C	Fuse 5 Amp (Fast Acting)	013971F	013971F	013971F	013971F	013971F
13-C	PC Board VERSA IC	013935F	013935F	013935F	013935F	013935F
14-C	Blocked Vent Pressure Switch	011862F	011862F	011862F	011862F	011862F
15-C	Pump Relay 120Vac	008977F	008977F	008977F	008977F	008977F
16-C	Transformer 50 VA	006533F	006533F	006533F	006533F	006533F
17-C	Fuse 5 Amp (Pump) (Slow Blow)	013972F	013972F	013972F	013972F	013972F
18-C	Relay DPDT 24V NO/NC	011720F	011720F	011720F	011720F	011720F
19-C	Relay DPDT 120V NO/NC	013243F	013243F	013243F	013243F	013243F
J	**CONTROLS (Up Front)**					
1-J	Control Bezel	013936F	013936F	013936F	013936F	013936F
2-J	Switch/Decal Membrane	013937F	013937F	013937F	013937F	013937F
3-J	Gasket LCD Window Gasket	013938F	013938F	013938F	013938F	013938F
4-J	Control Bezel Cover	009487F	009487F	009487F	009487F	009487F
5-J	Gasket Insulation	013190F	013190F	013190F	013190F	013190F
6-J	LCD Display PC Board	013939F	013939F	013939F	013939F	013939F
7-J	On/Off Switch	009493F	009493F	009493F	009493F	009493F
F	**FAN**					
1-F	Blower Combustion Air	013195F	013195F	013195F	013196F	013196F
2-F	Plenum Assembly	013940F	014721F	013941F	014022F	014022F
3-F	Hose Duct 4" (TruSeal)	007417F	N/A	N/A	N/A	N/A
	Hose Duct 5" (TruSeal)	N/A	014023F	014023F	N/A	N/A
	Hose Duct 6" (TruSeal)	N/A	N/A	N/A	007418F	007418F
4-F	Hose Duct 4" (Plastic)	013424F	N/A	N/A	N/A	N/A
	Hose Duct 5" (Plastic)	N/A	014023F	014023F	014023F	014023F
G	**GAS TRAIN**					
1-G	Valve Gas Modulating 24V	013942F	013942F	013942F	N/A	N/A
	Valve Gas Modulating 120V	N/A	N/A	N/A	013200F	013200F
2-G	Valve Coil 120V	N/A	N/A	N/A	013201F	013201F
3-G	Inlet Gas Filter	N/A	N/A	N/A	012294F	012294F
4-G	Bleedle Valve G1/8 BSP	N/A	N/A	N/A	015400F	015400F
5-G	Swirler	013968F	013968F	013968F	011888F	011888F
6-G	O-rings (Includes Gas Valve and Adapter O-rings)	N/A	N/A	N/A	012440F	012440F
7-G	Adapter Gas Valve 3/4" Inlet (Includes O-rings)	013204F	013204F	013204F	N/A	N/A
	Adapter Gas Valve 1-1/4" Inlet	N/A	N/A	N/A	011916F	011916F
8-G	Adapter Gas Valve 3/4"Outlet (Includes O-rings)	013204F	013204F	013204F	N/A	N/A
	Adapter Gas Valve 1" Outlet Flow Control	N/A	N/A	N/A	013206F	013206F
9-G	Adapter Swirl Plate	N/A	N/A	N/A	012298F	012298F
10-G	Nozzle Natural Gas	013943F	013944F	N/A	013207F	013207F
	Nozzle Propane Gas	013943F	013944F	N/A	012308F	012299F
11-G	Valve Gas Ball (WOG)	013208F	013208F	013208F	013209F	013209F
12-G	Air/Gas Plenum	013210F	013210F	013210F	013211F	013211F
13-G	Gasket Plenum Seal	013212F	013212F	013212F	013213F	013213F
14-G	Motorized Safety Shut Off Actuator M-1(Optional)	011908F	011908F	011908F	011908F	011908F
15-G	Gas Valve Body M1 (Optional)	014014F	014014F	014014F	014015F	014015F
16-G	Solenoid Safety Shut Off Valve M-10 (Optional)	012125F	011909F	011909F	011909F	011909F
17-G	Vent Valve Gas M-15 (Optional)	011913F	011913F	011913F	011913F	011913F
18-G	Switch Low Gas Pressure (Optional)	011770F	011770F	011770F	011770F	011770F
19-G	Switch Low Gas Pressure w/M-1 or M-10 (Optional)	007187F	007187F	007187F	007187F	007187F
20-G	Switch High Gas Pressure (Optional)	011771F	011771F	011771F	011771F	011771F
H	**HEAT TRANSFER**					
1-H	Heat Engine (Complete with Burner and Sensors)	013218F	013450F	013219F	013451F	013220F
2-H	Water Connection Retainer Clip	013221F	013222F	013222F	013222F	013222F
3-H	Header O-Ring (2 PCS)	013223F	013224F	013224F	013224F	013224F
4-H	Thermal Cut-Off Fuse (CONSULT FACTORY)	013945F	013945F	013945F	013945F	013945F
5-H	Rear Refractory Target Wall	013226F	013226F	013226F	013226F	013226F
6-H	Plumbing Assy Inlet					
	Units manufactured prior to 5/1/17	013227F	013973F	013973F	013973F	013973F
	Units manufactured from 5/1/17	016998F	013973F	013973F	013973F	013973F
7-H	Plumbing Assy Outlet					
	Units manufactured prior to 5/1/17	013229F	015058F	013974F	013974F	013974F
	Units manufactured from 5/1/17	016999F	015058F	013974F	013974F	013974F
8-H	Drain Valve	013475F	013475F	013475F	013475F	013475F
9-H	Combustion Chamber Manual Reset Safety Limit	015023F	015023F	015023F	015023F	015023F

CALL OUT	DESCRIPTION	300A	400A	500A	700A	850A
M	**MISCELLANEOUS COMPONENTS**					
1-M	T & P Gauge 0-90 PSI	007205F	007205F	007205F	007205F	007205F
	T & P Gauge 0-200 PSI	007399F	007399F	007399F	007399F	007399F
2-M	PRV 30 PSI	007470F	007217F	007217F	007218F	007218F
	PRV 45 PSI	007220F	007220F	007220F	007346F	007346F
	PRV 60 PSI	007222F	007222F	007222F	007222F	007222F
	PRV 75 PSI	007223F	007223F	007223F	007223F	007223F
	PRV 125 PSI	007224F	007224F	007224F	007224F	007224F
	PRV 150 PSI	007225F	007225F	007225F	007225F	007225F
3-M	RTV Sealant 2.8 oz (Not Shown)	008924F	008924F	008924F	008924F	008924F
	RTV Sealant 10 oz (Not Shown)	005755F	005755F	005755F	005755F	005755F
4-M	Water Connection Seal Gasket					
	Units manufactured prior to 5/1/17	013232F	013233F	013233F	013233F	013233F
	Units manufactured from 5/1/17	013233F	013233F	013233F	013233F	013233F
5-M	Condensate Trap	013946F	013946F	013946F	013946F	013946F
6-M	Condensate Float Switch NC	013947F	013947F	013947F	013947F	013947F
7-M	Condensate Hose	013948F	013948F	013948F	013948F	013948F
8-M	Condensate Management (Not Shown)	012664	012664	012664	012664	012664
9-M	Touch-up Paint					
	Green	750125	750125	750125	750125	750125
	Cool Dark Gray	750256	750256	750256	750256	750256
10-M	Wire Harness Cabinet (Not Shown)	013949F	013949F	013949F	013950F	013950F
11-M	Spark Cable High Tension Harness	013951F	013951F	013951F	013952F	013952F
15-M	Bell & Alarm Harness	015540F	015540F	015540F	015540F	015540F
16-M	Versa IC Communication Cable	015556F	015556F	015556F	015556F	015556F
17-M	Identification Card Harness	017036F	017036F	017036F	017037F	017037F
12-M	Gas Manifold Grommet	010778F	010778F	010778F	010779F	010779F
13-M	Barbed Sample Connector	013433F	013433F	013433F	013433F	013433F
14-M	Plastic Handle	012681F	012681F	012681F	012681F	012681F
O	**OPTIONS**					
1-O	Remote Sensor (LWCO)	013238F	013238F	013238F	013238F	013238F
2-O	Control PC Board (LWCO)	007157F	007157F	007157F	007157F	007157F
3-O	Test / Reset Switch (LWCO)	005641F	005641F	005641F	005641F	005641F
4-O	Silencer/Reset Switch (Alarm)	005641F	005641F	005641F	005641F	005641F
5-O	Alarm Bell 24V 4"	005643F	005643F	005643F	005643F	005643F
6-O	Relay 3PDT 24 VAC (Alarm) (Not Shown)	014717F	014717F	014717F	014717F	014717F
7-O	Outdoor Weathershield	016254	016254	016254	016254	016254
P	**PUMPS**					
1-P	Pump Inline BR Soft	008746	008746	016477F	007347F	007347F
	Pump Inline BR Medium	007226F	007347F	007347F	007350F	007350F
	Pump Inline CIBF Soft	008745	008745	016478F	007353F	007353F
2-P	Pump Cartridge 0012	016480F	016480F	N/A	N/A	N/A
3-P	Pump Flange Gasket 0012	008747F	008747F	N/A	N/A	N/A
4-P	Pump Flange Gasket 1611	008749F	008749F	008749F	008749F	008749F
S	**SHEET METAL**					
1-S	Jacket Top	014024F	014025F	014026F	014027F	014028F
2-S	Inlet/Outlet Cover Panel					
	Units manufactured prior to 5/1/17	014029F	014030F	014031F	014032F	014033F
	Units manufactured from 5/1/17	017000F	014030F	014031F	014032F	014033F
3-S	Water Connection Gasket Retainer					
	Units manufactured prior to 5/1/17	013250F	013251F	013251F	013251F	013251F
	Units manufactured from 5/1/17	013251F	013251F	013251F	013251F	013251F
4-S	Heat Engine Supports Horizontal	013953F	013954F	013955F	013975F	013976F
5-S	Heat Engine Supports Vertical	013956F	013956F	013255F	013256F	013256F
6-S	Heat Engine Retainer Brackets	013257F	013257F	013257F	013257F	013257F
7-S	Upper Cabinet Supports	013258F	013458F	013259F	013459F	013260F
8-S	Vertical Cabinet Supports	014044F	014044F	014044F	014045F	014045F
9-S	Upper Front Cabinet Support	013957F	013957F	013957F	013957F	013957F
10-S	Door Assy	013264F	013264F	013264F	013264F	013264F
11-S	Control Bezel Mtg Panel w/LCD Display	013265F	013265F	013265F	013265F	013265F
12-S	Jacket Side Panel	014034F	014035F	014036F	013461F	013268F
13-S	Jacket Side Panel Rear	N/A	N/A	N/A	014037F	014038F
14-S	Jacket Rear Panel					
	Units manufactured prior to 10/1/13	013958F	013958F	013958F	013959F	013959F
	Units manufactured from 10/1/13	014465F	014465F	014465F	014464F	014464F
15-S	Base Assembly	013960F	013961F	013962F	014039F	014040F
16-S	Intake Air Flange Inside (TruSeal)	013275F	014041F	014041F	013276F	013276F
17-S	Intake Air Flange Outside (TruSeal)	013275F	013275F	013275F	013276F	013276F
18-S	Access Panel Flue Exhaust	013277F	013277F	013277F	013278F	013278F
19-S	Access Panel Intake Air	013279F	013279F	013279F	013279F	013279F
20-S	Access Panel Wiring Box	013280F	013280F	013280F	013280F	013280F
21-S	Access Panel Condensate Drain	013281F	013281F	013281F	013281F	013281F
22-S	Rear Wiring Box	013963F	013963F	013963F	013963F	013963F
23-S	Pump Cover (Taco 0012)	012986F	012986F	N/A	N/A	N/A
24-S	Pump Cover (Taco 1600 Series)	012987F	012987F	012987F	012987F	012987F
V	**VENTING**					
1-V	Outdoor Vent Termination Tee (Stainless Steel)	013108	013108	013108	013109	013109
2-V	Vent Tee Horizontal or Vertical Venting for Indoor Units (Stainless Steel)	013108	013108	013108	013111	013111
3-V	Vent Termination Screen For Plastic Vent Tee	013283F	013283F	013283F	013284F	013284F
4-V	Flue Exhaust Adapter					
	PVC Venting WH7	N/A	N/A	N/A	013285F	013285F
	PVC Venting H7	N/A	N/A	N/A	016143	016143
	Polypropylene Venting WH7	013929	013929	013929	013930	013930
	Polypropylene Venting H7	013929	013929	013929	016143	016143
	Stainless Steel Venting	013286F	013286F	013286F	N/A	N/A
5-V	Vent Limit Switch Manual Reset					
	PVC Venting WH7	013428F	013428F	013428F	013429F	013429F
	PVC Venting H7	013428F	013428F	013428F	016143	016143
	Polypropylene Venting WH7	014043F	014043F	014043F	014043F	014043F
	Polypropylene Venting H7	014043F	014043F	014043F	016143	016143
6-V	Intake Air Filter Box	013964F	013965F	013965F	014042F	014042F
7-V	Air Filter Media	013290F	012553F	012553F	012553F	012553F
8-V	Outlet Gasket 4" Flue (Not Shown)	017113F	017113F	017113F	017113F	017113F
9-V	Outlet Gasket 5" Flue (Not Shown)	017114F	017114F	017114F	017114F	017114F

12. IMPORTANT INSTRUCTIONS FOR THE COMMONWEALTH OF MASSACHUSETTS

The Commonwealth of Massachusetts requires compliance with regulation 248 CMR 4.00 and 5.00 for installation of through – the – wall vented gas appliances as follows:

(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.

(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.

GAS PRESSURE SUPERVISION

The Commonwealth of Massachusetts requires listed high and low gas pressure switches (manual-reset) for any model with a maximum firing input greater than 1,000,000 Btu/Hr in accordance with 248 CMR 7.04(11)(d).

A gas pressure regulator (field supplied) is required in the gas train ahead of the heater, for heaters having input rates greater than 1,000,000 Btu/Hr, in accordance with 248 CMR 7.04 Figure 3B requirements.

START-UP CHECKLIST FOR THE XFYRE

This start-up checklist is to be completely filled out by the service technician starting up the Raypak Boiler or Heater for the first time. All information may be used for warranty purposes and to ensure that the installation is correct. Additionally this form will be used to record all equipment operation functions and required settings.

GAS SUPPLY DATA

Regulator Model & Size	_____ / _____CFH
Gas Line Size (in room)	_____In. NPT
Length of Gas Line	_____Eq Ft
Low Gas Pressure Setting	_____In. WC
High Gas Pressure Setting	_____In. WC
Gas Shut-Off Valve Type (Ball, Lube cock)	_____
Sediment Trap	_____Y/N
Port	_____Std_____Full

VISUAL INSPECTION OF COMPONENTS

Verify inspection was done and condition of components are in good working order with a "yes"

Wiring Harness	_____ Y/N
Burner/s (flame)	_____ Y/N
Refractory (visual)	_____ Y/N
Remote flame sense	_____ Y/N
Covers in place for outdoor	_____ Y/N

VENTING

Vent Size: _____	Stack Height:_____
Category: _____	sketch vent on reverse side ***
Vent Material:	_____
Vent Termination Type:	_____
Combustion Air Openings:	Low _____ in2
Ventilation air	High _____ in2

CLEARANCES

Front Clearance	_____In.
Right Side Clearance	_____In.
Left Side Clearance	_____In.
Rear Clearance	_____In.
Overhead Clearance	_____In.

ELECTRICAL

Voltage Supply (VAC)	No Load_____ Load_____
Voltage -24 VAC	_____VAC
Voltage Com to Ground	_____VAC
Auto High Limit Setting	_____deg F
Manual Reset High Limit Setting	_____deg F
Operating Control Setting	_____deg F

Sketch plumbing on reverse side

WATER SUPPLY

Flow Rate in GPM or Delta T *Measure flow rate at full fire*	_____If Avail
Pump Off Delay setting	_____Minutes
Low Water Cutoff	_____Test
Number of Tanks and Size	Qty____ _____Gallons
Plumbing Size	_____
Pump Size: _____**(boiler)**	Pump HP: _____
Impeller trim_____	Pump Model_____
Louvers _____	Screens_____

EMISSIONS SETTINGS AND TEST INFORMATION

Nominal Factory Recommended Settings

	High	Low		
Air Intake Pressure	_____	N/A	In. WC	See manual or card tag
Supply Gas Pressure	_____	_____	In. WC	See manual or card tag
Verify stable pressure static & dynamic condition				
Manifold Gas Pressure	_____	_____	In. WC	See manual or card tag

The following measurements must be obtained with a Combustion Analyzer.

NOX	_____	_____PPM	Less than 20 PPM (If required by Certifying Agency)
CO	_____	_____PPM	Less than 150 PPM
CO2	_____	_____%	See manual

Model Number: _____ Serial Number: _____

*** Note: draw venting with details, such as extractors, barometric dampers, blast dampers or draft inducers

Site Altitude Above Sea Level _____Ft.

Job Name _____

Address _____

Physical Location of Boiler: Indoors_____; Outdoors_____; Ground Level_____; Roof_____; Below Grade_____

Mechanical Contractor / Installer _____

Date and Time of Start-up _____Print Name and Signature of Start-up Technician_____

Information must be faxed to: (805) 278-5496 in order to ensure warranty consideration Attn: Service Manager

LIMITED PARTS WARRANTY
XFYRE – TYPE H and WH
MODELS 300A-850A

SCOPE
Raypak, Inc. ("Raypak") warrants to the original owner that all parts of this heater which are actually manufactured by Raypak will be free from failure under normal use and service for the specified warranty periods and subject to the conditions set forth in this Warranty. Labor charges and other costs for parts removal or reinstallation, shipping and transportation are not covered by this Warranty but are the owner's responsibility.

HEAT EXCHANGER WARRANTY

Space Heating (Closed Loop System)
Ten (10) year limited warranty from date of heater installation. This warranty applies only to boilers utilized in closed loop heating systems and hot water supply boilers that have been properly installed based upon manufacturer's installation instructions.

Year of Claim	0-5	6	7	8	9
Percentage to be paid by purchaser	0 %	20%	40%	60%	80%

Thermal Shock Warranty
Twenty (20) years from date of heater installation against "Thermal Shock" (excluded, however, if caused by heater operation at large changes exceeding 150°F between the water temperature at intake and heater temperature, or operating at heater temperatures exceeding 215°F).

ANY OTHER PART MANUFACTURED BY RAYPAK
One (1) year warranty from date of heater installation, or eighteen (18) months from date of factory shipment based on Raypak's records, whichever comes first.

SATISFACTORY PROOF OF INSTALLATION DATE, SUCH AS INSTALLER INVOICE, IS REQUIRED. THIS WARRANTY WILL BE VOID IF THE HEATER RATING PLATE IS ALTERED OR REMOVED.

ADDITIONAL WARRANTY EXCLUSIONS
This warranty does not cover failures or malfunctions resulting from:
1. Failure to properly install, operate or maintain the heater in accordance with our printed instructions provided;
2. Abuse, alteration, accident, fire, flood and the like;
3. Sediment or lime build-up, freezing, or other conditions causing inadequate water circulation;
4. High velocity flow exceeding heater design rates;
5. Failure of connected system devices, such as pump or controller;
6. Use of non-factory authorized accessories or other components in conjunction with the heater system;
7. Failing to eliminate air from, or replenish water in, the connected water system;
8. Chemical contamination of combustion air or use of chemical additives to water.

PARTS REPLACEMENT
Under this Warranty, Raypak will furnish a replacement for any failed part. The failed part must first be returned to Raypak if requested, with transportation charges prepaid, and all applicable warranty conditions found satisfied. The replacement part will be warranted for only the unexpired portion of the original warranty. Raypak makes no warranty whatsoever on parts not manufactured by it, but Raypak will apply any such warranty as may be provided to it by the parts manufacturer.

TO MAKE WARRANTY CLAIM
Promptly notify the original installer, supplying the model and serial numbers of the unit, date of installation and description of the problem. The installer must then notify his Raypak distributor for instructions regarding the claim. If either is not available, contact Service Manager, Raypak, Inc., 2151 Eastman Avenue, Oxnard, CA 93030 or call (805) 278-5300. In all cases proper authorization must first be received from Raypak before replacement of any part.

EXCLUSIVE WARRANTY - LIMITATION OF LIABILITY
This is the only warranty given by Raypak. No one is authorized to make any other warranties on Raypak's behalf. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. RAYPAK'S SOLE LIABILITY AND THE SOLE REMEDY AGAINST RAYPAK WITH RESPECT TO DEFECTIVE PARTS SHALL BE AS PROVIDED IN THIS WARRANTY. IT IS AGREED THAT RAYPAK SHALL HAVE NO LIABILITY, WHETHER UNDER THIS WARRANTY, OR IN CONTRACT, TORT, NEGLIGENCE OR OTHERWISE, FOR ANY SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGE, INCLUDING DAMAGE FROM WATER LEAKAGE. Some states do not allow limitations on how long an implied warranty lasts, or for the exclusion of incidental or consequential damages. So the above limitation or exclusion may not apply to you.

This Limited Warranty gives you specific legal rights. You may also have other rights which may vary from state to state. We suggest that you complete the information below and retain this certificate in the event warranty service is needed. Reasonable proof of the effective date of the warranty (date of installation) must be presented; otherwise, the effective date will be based on the date of manufacture plus thirty (30) days.

Original Owner	Model Number
	Serial Number
Mailing Address	Date of Installation
City State Zip Code	Installation Site
Daytime Telephone Number	Contractor/Installer

RAYPAK, INC • 2151 Eastman Avenue • Oxnard, CA 93030-9786 • (805) 278-5300 • Fax (800) 872-9725 • www.raypak.com

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Raypak, Inc., 2151 Eastman Avenue, Oxnard, CA 93030 (805) 278-5300 Fax (805) 278-5468