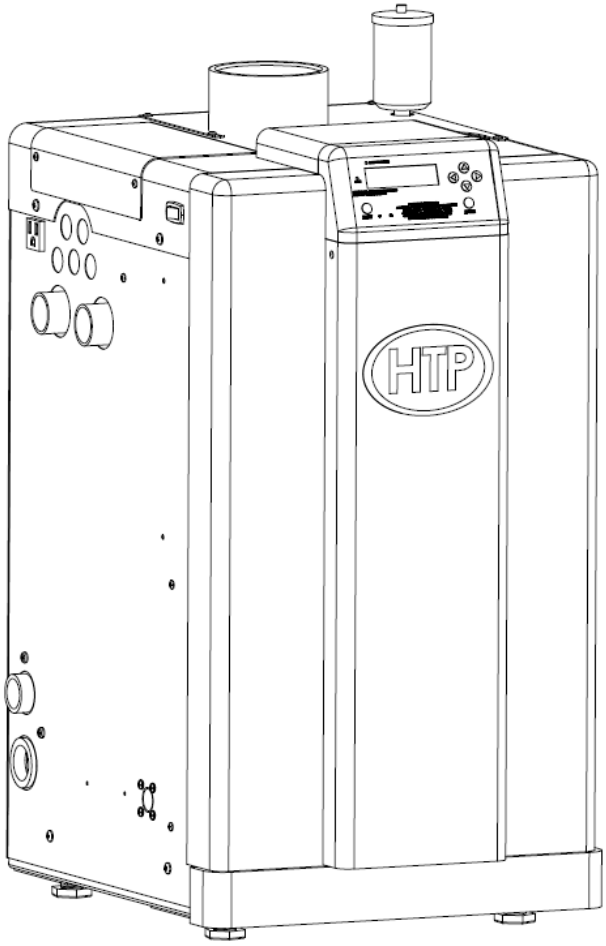
Elite Plus Heating Boiler



INSTALLATION

START-UP

MAINTENANCE

PARTS

Models
ELP-110 / ELP-199

Heat Exchanger Bears the ASME "H" Stamp

⚠ DANGER

This manual must only be used by a qualified heating installer/service technician. Read all instructions in this manual before installing. Perform steps in the order given. Failure to comply could result in substantial property damage, severe personal injury, or death.

NOTICE: *HTP reserves the right to make product changes or updates without notice and will not be held liable for typographical errors in literature.*

NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.

120 Braley Rd. P.O. Box 429 East Freetown, MA 02717-0429 www.htproducts.com
LP-294 REV. 9.2.14

⚠ WARNING

IF THE INFORMATION IN THIS MANUAL IS NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT, CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR LOSS OF LIFE. DO NOT STORE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be provided by a qualified installer, service agency, or the gas supplier.

FOR YOUR SAFETY READ BEFORE OPERATING

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

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

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

WHAT TO DO IF YOU SMELL GAS

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

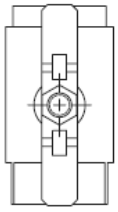
C. Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

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

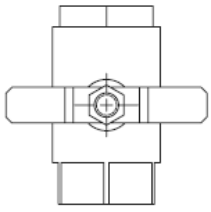
OPERATING INSTRUCTIONS

1. **STOP! Read the safety information above.**
2. **Set the thermostat to lowest setting.**
3. **Turn off all electric power to the appliance.**
4. **This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.**

GAS VALVE ON



GAS VALVE OFF



5. **Remove front cover.**
6. **Turn gas shutoff valve to "off". Handle will be across the piping, do not force.**
7. **Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.**
8. **Turn gas shutoff valve to "on". Handle will be in line with piping.**
9. **Install Front Cover.**
10. **Turn on all electric power to appliance.**
11. **Set thermostat to desired setting.**
12. **If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.**

TO TURN OFF GAS TO APPLIANCE

1. **Set the thermostat to lowest setting.**
2. **Turn off all electric power to the appliance if service is to be performed.**
3. **Remove Front Cover.**
4. **Turn gas shutoff valve to "off". Handle will be across the piping. Do not force.**
5. **Install Front Cover.**

LP-175 Rev. 4 3-11-08

SPECIAL ATTENTION BOXES

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

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

FOREWORD

This manual is intended to be used in conjunction with other literature provided with the boiler. This includes all related control information. It is important that this manual, all other documents included with this system, and additional publications including the National Fuel Gas Code, ANSI Z223.1-2002, be reviewed in their entirety before beginning any work.

Installation should be made in accordance with the regulations of the Authority Having Jurisdiction, local code authorities, and utility companies which pertain to this type of water heating equipment.

Authority Having Jurisdiction (AHJ) – The Authority Having Jurisdiction may be a federal, state, local government, or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department or health department, building official or electrical inspector, or *others having statutory authority*. In some circumstances, the property owner of his/her agent assumes the role, and at government installations, the commanding officer or departmental official may be the AHJ.

NOTE: HTP, Inc. reserves the right to modify product technical specifications and components without prior notice.

FOR THE INSTALLER

⚠ DANGER

This manual must only be used by a qualified heating installer/service technician. Read all instructions in this manual before installing. Perform steps in the order given. Failure to comply could result in substantial property damage, severe personal injury, or death.

This boiler must be installed by qualified and licensed personnel. The installer should be guided by the instructions furnished with the boiler, and with local codes and utility company requirements. In the absence of local codes, preference should be given to the National Fuel Gas Code, ANSI Z223.1-2002.

INSTALLATIONS MUST COMPLY WITH:

Authority Having Jurisdiction, local, state, provincial, and national codes, laws, regulations and ordinances.

The latest version of the National Fuel Gas Code, ANSI Z223.1, from American Gas Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131.

In Canada – CGA No. B149 (latest version), from Canadian Gas Association Laboratories, 55 Scarsdale Road, Don Mills, Ontario, Canada M3B 2R3. Also, Canadian Electrical Code C 22.1, from Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

Code for the installation of Heat Producing Appliances (latest version), from American Insurance Association, 85 John Street, New York, NY 11038.

The latest version of the National Electrical Code, NFPA No. 70.

NOTE: The gas manifold and controls met safe lighting and other performance criteria when the boiler underwent tests specified in ANSI Z21.13 – latest edition.

⚠ WARNING

The hydronic supply and return connections of these products are for installation in closed loop systems ONLY! Use of this product in any manner other than described in this manual may result in premature product failure, substantial property damage, severe personal injury, or death. Damage or failure of this product (or the system in which it is installed) due to unauthorized use **IS NOT COVERED BY WARRANTY**.

IMPORTANT
In accordance with Section 325 (f) (3) of the Energy Policy and Conservation Act, HTP, Inc. has provided this boiler with multiple features designed to save energy by reducing the boiler water temperature as heating load decreases.
These features include:

- **A modulating combustion system that adjusts firing rate based on heat demand.**
- **Adjustment of boiler set point based on inferred heat load as determined by an outdoor sensor. The outdoor sensor is supplied by HTP, Inc. with this boiler.**
- **This boiler does not include a standing pilot.**
- **This boiler is designed and shipped to assure the highest efficiency operation possible. Such high efficiency is achieved by limiting heating circuit water temperature to 140°F when there is no anticipated heat load, based upon the outdoor sensor and the Outdoor Reset Curve (sensor response curve) in the boiler software.**
- **This feature may be over-ridden as described below in specific installations:**
- **The boiler control is equipped with an outdoor sensor override for use with building management systems or in cascaded systems (for systems with total input of 300,000 BTU/hr or greater).**
  See statement below for an important notice on the use of the override.

IMPORTANT
In accordance with Section 325 (f) (3) of the Energy Policy and Conservation Act, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function. THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- **An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.**
- **This boiler is not used for space heating.**
- **This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater.**
- **This boiler is equipped with a tankless coil.**

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PART 1 – GENERAL SAFETY INFORMATION

A. PRECAUTIONS

This boiler is for indoor installations only. Clearance to combustible materials: 0" top, bottom, sides and back. Left side has all boiler mechanical connections. Front must have room for service, 24" recommended. (A combustible door or removable panel is acceptable front clearance.) This boiler has been approved for closet installation. Do not install this boiler directly on carpeting. For installation on combustible flooring. Category IV vent systems only.

⚠ WARNING

INSTALLER – Read all instructions in this manual before installing. Perform steps in the order given.

USER – This manual is for use only by a qualified heating installer/service technician. Have this boiler serviced/inspected by a qualified service technician annually.

FAILURE TO ADHERE TO THE GUIDELINES ON THIS PAGE AND HAVE THIS BOILER SERVICED/INSPECTED ANNUALLY CAN RESULT IN SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.

NOTE: When inquiring about service or troubleshooting, reference the model and serial numbers from the boiler rating label.

NOTE: If the boiler is exposed to the following, do not operate until all corrective steps have been made by a qualified serviceman:

1. FIRE
2. DAMAGE
3. WATER

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

⚠ WARNING

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER. Immediately call a qualified service technician. The appliance MUST BE replaced if it has been submerged. Attempting to operate an appliance that has been submerged could create numerous harmful conditions, such as a potential gas leakage causing a fire and/or explosion, or the release of mold, bacteria, or other harmful particulates into the air. Operating a previously submerged appliance could result in property damage, severe personal injury, or death.

NOTE: Appliance damage due to flood or submersion is considered an Act of God, and IS NOT covered under product warranty.

⚠ WARNING

Be sure to disconnect electrical power before opening boiler cabinet or performing service. Failure to do so could result in an electrical shock that could result in property damage, serious personal injury, or death.

CAUTION

Due to the low water content of the boiler, improper sizing of the boiler with regard to heating system load will result in excessive cycling and accelerated component failure. HTP **DOES NOT** warrant failures cause by improperly sized boiler applications. **DO NOT** oversize the boiler to the system. Modular boiler installations greatly reduce the likelihood of boiler oversizing.

B. IMPROPER COMBUSTION

⚠ WARNING

Do not obstruct the flow of combustion and ventilating air. Adequate air must be provided for safe operation. Failure to keep the vent and combustion air intake clear of ice, snow, or other debris could result in property damage, serious personal injury, or death.

C. GAS

In event of gas supply failure, safety valve discharge, or overheating, do not turn off or disconnect electrical supply to the circulator. Instead, shut off the gas supply at a location external to the boiler.

D. WHEN SERVICING THE BOILER

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow boiler to cool.

⚠ WARNING

Be sure to disconnect electrical power before opening the boiler cabinet. Failure to do so could result in an electrical shock, serious injury or death.

E. BOILER WATER

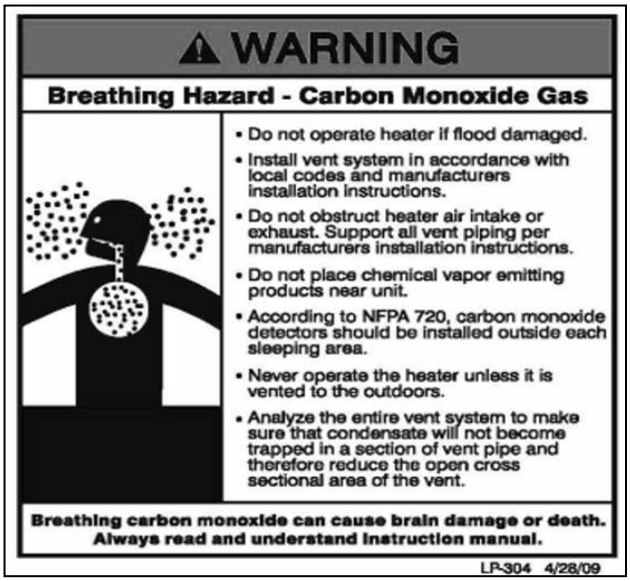
- Do not use petroleum-based cleaning or sealing compounds in a boiler system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.
- Do not use “homemade cures” or “boiler patent medicines”. Substantial property damage, damage to boiler, and/or serious personal injury may result.

- Continual fresh make-up water will reduce boiler life. Mineral buildup reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen by make-up water can cause internal corrosion in system components. Leaks in the boiler or piping must be repaired at once.
- If you have an old system with cast iron radiators, thoroughly flush the system (without boiler connected) to remove sediment. The high-efficiency heat exchanger can be damaged by build-up or corrosion due to sediment.

NOTE: DO NOT add cold make up water to the system when the boiler is hot. Thermal shock can potentially cause cracks in the heat exchanger. Such damage IS NOT covered by warranty.

F. BOILER WATER CHEMISTRY

- Sodium less than 20 mGL.
- Water pH between 6.0 and 8.0.
    - Maintain water pH between 6.0 and 8.0. Check with litmus paper or have it chemically analyzed by water treatment company.
    - If the pH differs from above, consult local water treatment company for treatment needed.
- Hardness less than 7 grains.
    - Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).
- Chlorine concentration less than 100 ppm.
    - Using chlorinated fresh water should be acceptable as levels are typically less than 5 ppm.
    - Do not connect the boiler to directly heat swimming pool or spa water.
    - Do not fill boiler or operate with water containing chlorine in excess of 100 ppm.



NOTE: It is recommended to clean the heat exchanger at least once a year to prevent lime scale buildup. To clean the heat exchanger, follow the procedure in Part 16 of this manual.

Hardness: 7 grains
Chloride levels: 100 ppm
pH levels: 6-8
TDS: 2000 ppm
Sodium: 20 mGL

G. FREEZE PROTECTION FLUIDS

⚠ WARNING

NEVER use any toxic chemical, including automotive, standard glycol antifreeze, or ethylene glycol made for hydronic (non-potable) systems. These chemicals can attack gaskets and seals in water boilers, are poisonous if consumed, and can cause injury or death.

CAUTION

Consider boiler piping and installation when determining boiler location.

NOTE: Damages resulting from incorrect installation or from use of products not approved by HTP, Inc. ARE NOT covered by warranty.

PART 2 – BEFORE YOU START

A. WHAT'S IN THE BOX

Also included with the boiler:

- Temperature and Pressure Gauge
- Pressure Relief Valve
- Indirect Sensor
- Outdoor Sensor
- Intake PVC Tee with Screens
- Exhaust PVC Coupling with Screens
- Outlet Combination Fitting
- Installation Manual
- Warranty

- CSD-1 Form
- H-3 Data Sheet

B. HOW BOILER OPERATES

Elite Plus® condensing technology intelligently delivers highly efficient hydronic heating by adjusting for altitude and fuel (liquid propane or natural gas) without the need for conversion or physical adjustment. Outlined below are the features of the system and how they operate:

Stainless Steel Heat Exchanger - The highly efficient stainless steel heat exchanger is designed to extract all available heat from the supply line before it is exhausted.

Modulating Combustion System - The combustion system will modulate the output of the burner during operation to match system demand and achieve the control set point while in operation. The set point can change by internal or external signals which enhance the overall performance of the system.

Control – The integrated control system monitors the system and regulates mass flow to control boiler output. This allows the boiler to deliver the amount of heat energy required and nothing more.

The control can be set to monitor outdoor temperature through an outdoor sensor to regulate boiler set point. The system can be further enhanced by installing an indirect water heater to provide domestic hot water.

The control can regulate the output of up to sixteen boilers through its cascade system function. The cascade system controls up multiple boilers in such a way that they function as one system. This allows for greater turn down ratios, minimizing downtime and maximizing efficiency.

The cascade system establishes one boiler as the master and the connected boilers as followers. The master requires a sensor providing set point temperature feedback in order to adjust heating input from the connected boilers. Each cascaded boiler will have its own pump to provide maximum flow and control heat exchanger flow rate.

Text Display and Operational LED Light Indicators – The display allows the installer to change system parameters and monitor outputs.

Start Up – Learning Behavior – When the boiler is first powered on, it may have some unsuccessful starts. This happens because the boiler control is learning about the system through its sensors.

Integrated Air Mass Flow Sensor and Modulating Gas Valve – An air mass flow sensor is integrated into the boiler fan. When the fan receives a demand from the control, it engages and automatically adjusts for external influences like air density or system pressure drop.

Burner – Constructed of high grade stainless steel, the burner provides a wide range of firing rates using premixed air and gas fuel.

Heat Load Limit Management – The heat load will automatically adapt during operation because of circumstances like wind, chimney draft, low ionization current, etc. In the same way, the maximum heat load will adapt to too high counter pressure in the exhaust gas pipe or if the gas pressure is too low.

Post Heating and Backflow Prevention in Standby Mode – To prevent overheating, the fan will run at minimum mass flow when the burner is too hot. If the boiler is not running and backflow is detected, the fan will run at minimum mass flow for up to 5 hours after heat demand.

Step Modulation – On receiving a Central Heating demand, the boiler will start at minimum output and gradually increase by steps to provide precise output for even small heating systems.

Spark Ignition – The burner is ignited by applying high voltage through the system spark electrode. This spark ignites mixed gas off of the burner.

Flame Sensing – When the burner is lit, an ionization probe senses the flame.

Supply Water Temperature Sensor – This sensor monitors boiler outlet water temperature (System Supply). The control adjusts the boiler firing rate so the supply temperature will match the set point.

Return Water Temperature Sensor – Monitors boiler return water temperature (System Return).

Flue Sensor – Monitors flue temperature and protects the exhaust gas PVC piping.

Temperature and Pressure Gauge – Allows the user to monitor system temperature and pressure.

Electrical field connections with terminal strips – The electrical cover allows easy access to the line voltage and low voltage terminals strips which are clearly marked to facilitate boiler wiring.

Condensation Collection System – This boiler is a high efficiency appliance, and will produce condensate. The collection system has a float switch to monitor and prevent condensate from backing into the combustion system. Inside the collection system there is a built in trap which seals the combustion system from the connected drain. Condensate should be neutralized to avoid damage to the drainage system or piping.

Outdoor Sensor – The outdoor sensor monitors outdoor temperature and adjusts boiler set point to provide greater efficiency.

Condensate Flue Check System – The check system prevents exhaust from backing into the cabinet.

Test Mode – Allows installer to test combustion or operation of pumps when commissioning system and check pump operation during maintenance and service procedures.

C. OPTIONAL EQUIPMENT

Below is a list of optional equipment available from HTP. These additional options may be purchased through your HTP distributor:

- Wall Mount Bracket (Part # 7450P-211)
- System Sensor (Part # 7250P-324)
- Indirect Tank Sensor (Part # 7250P-325)
- 3" PVC Concentric Vent Kit (Part # KGAVT0601CVT)
- 3" Stainless Steel Outside Termination Vent Kit (V1000)
- 4" Stainless Steel Outside Termination Vent Kit (V2000)
- 3" Polypro Vent Kit (Part # 8400P-001)
- 3" Polypro Pipe (33' length Part # 8400P-002, 49.5' length Part # 8400P-003)
- Condensate Neutralizer (Part # 7450P-212)

NOTE: When using an optional system sensor, pipe insulation must be wrapped around it to improve temperature measurement accuracy and increase overall system efficiency.

PART 3 – PREPARE BOILER LOCATION

CAUTION

Carefully consider installation when determining boiler location. Please read the entire manual before attempting installation. Failure to properly take factors such as boiler venting, piping, condensate removal, and wiring into account before installation could result in wasted time, money, and possible property damage and personal injury.

A. BEFORE LOCATING THE BOILER

⚠ WARNING

Incorrect ambient conditions can lead to damage to the heating system and put safe operation at risk. Ensure that the boiler installation location adheres to the information included in this manual. Failure to do so could result in property damage, serious personal injury, or death.

CAUTION

Failure of boiler or components due to incorrect operating conditions IS NOT covered by product warranty.

1. Installation Area (Mechanical Room) Operating Conditions
   - Ensure ambient temperatures are higher than 32°F/0°C and lower than 104°F/40°C.
   - Prevent the air from becoming contaminated by the products, places, and conditions listed in this manual, Part 3, Section F.
   - Avoid continuously high levels of humidity
   - Never close existing ventilation openings

CAUTION

The service life of the boiler's exposed metallic surfaces, such as the casing, as well as internal surfaces, such as the heat exchanger, are directly influenced by proximity to damp and salty marine environments. In such areas, higher concentration levels of chlorides from sea spray coupled with relative humidity can lead to degradation of the heat exchanger and other boiler components. In these environments, boilers must not be installed using direct vent systems which draw outdoor air for combustion. Such boilers must be installed using room air for combustion. Indoor air will have a much lower relative humidity and, hence, potential corrosion will be minimized.

⚠ WARNING

This boiler is certified for indoor installations only. Do not install the boiler outdoors. Failure to install this boiler indoors could result in substantial property damage, severe personal injury, or death.

2. Check for nearby connections to:
- System water piping
- Venting connections
- Gas supply piping
- Electrical power
- Condensate drain

3. Check area around boiler. Remove any combustible materials, gasoline, and other flammable liquids.

⚠ WARNING

Failure to keep boiler area clear and free of combustible materials, liquids, and vapors can result in substantial property damage, severe personal injury, or death.

4. Gas control system components must be protected from dripping water during operation and service.

5. If the boiler is to replace an existing boiler, check for and correct any existing system problems, such as:
- System leaks
- Location that could cause the system and boiler to freeze and leak.
- Incorrectly-sized expansion tank

6. Clean and flush system when reinstalling a boiler.

NOTE: When installing in a zero clearance location, it may not be possible to read or view some product labeling. It is recommended to make note of the boiler model and serial number.

⚠ WARNING

Do not mount the boiler to a hollow wall. Mount to the studs only. Failure to do so will result in substantial property damage, and could result in severe personal injury or death.

⚠ WARNING

Use extreme care not to drop the boiler or cause bodily injury while lifting or mounting the boiler onto the optional wall mount bracket. Failure to do so will result in property damage, and could result in severe personal injury or death.

B. LEVELING

⚠ CAUTION

In order for the condensate to properly flow out of the collection system, the area where you locate the boiler must be level. The boiler comes equipped with leveling feet. Should you find the floor beneath the boiler is uneven, adjust the leveling feet with a wrench.

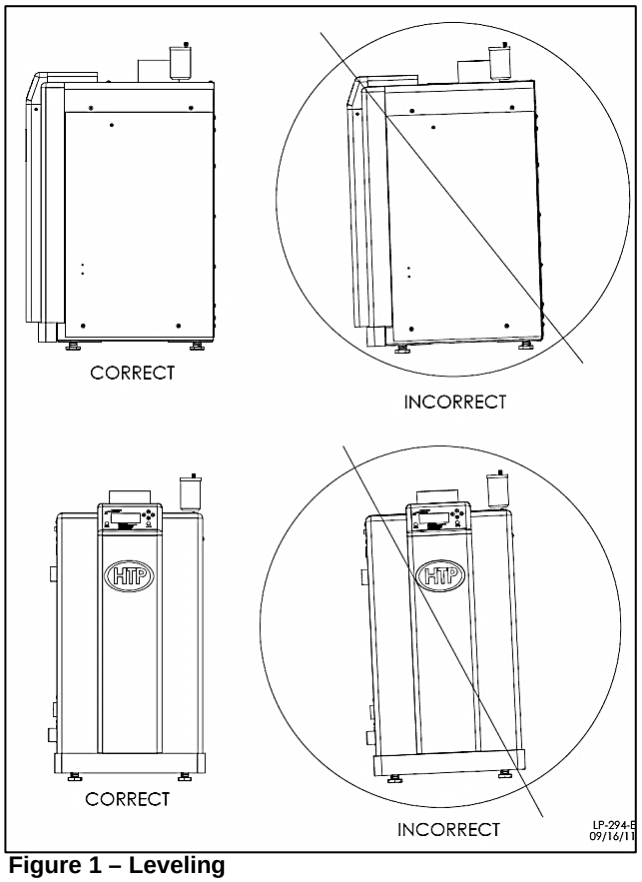


Figure 1 – Leveling

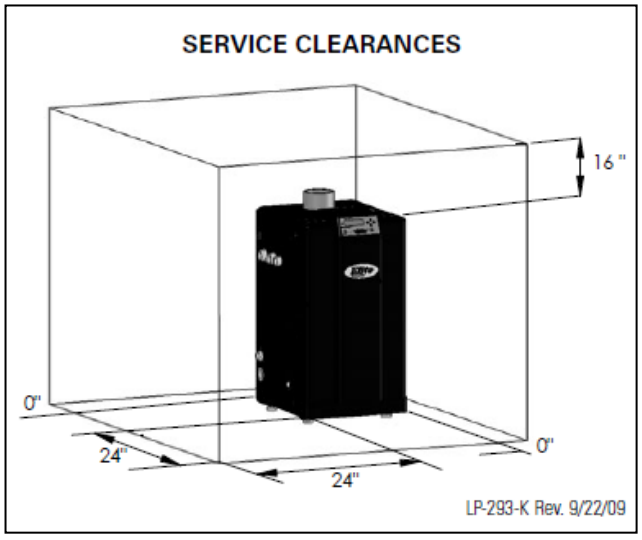


Figure 2 – Recommended Service Clearances

C. CLEARANCES FOR SERVICE ACCESS

See Figure 3 for recommended service clearances. If these minimum clearances are not provided, it may not be possible to service the boiler without removing it from the space.

⚠ WARNING

Space must be provided with combustion/ventilation air openings correctly sized for all other appliances located in the same space as the boiler. The boiler cover must be securely fastened to prevent it from drawing air from the boiler room. This is particularly important if the boiler is in a room with other appliances. Failure to comply with the above could result in substantial property damage, severe personal injury, or death.

MINIMUM CLEARANCES FROM COMBUSTIBLE MATERIALS

- Hot water pipes – at least 1" from combustible materials.
- Exhaust vent pipe – at least 1" from combustible materials.

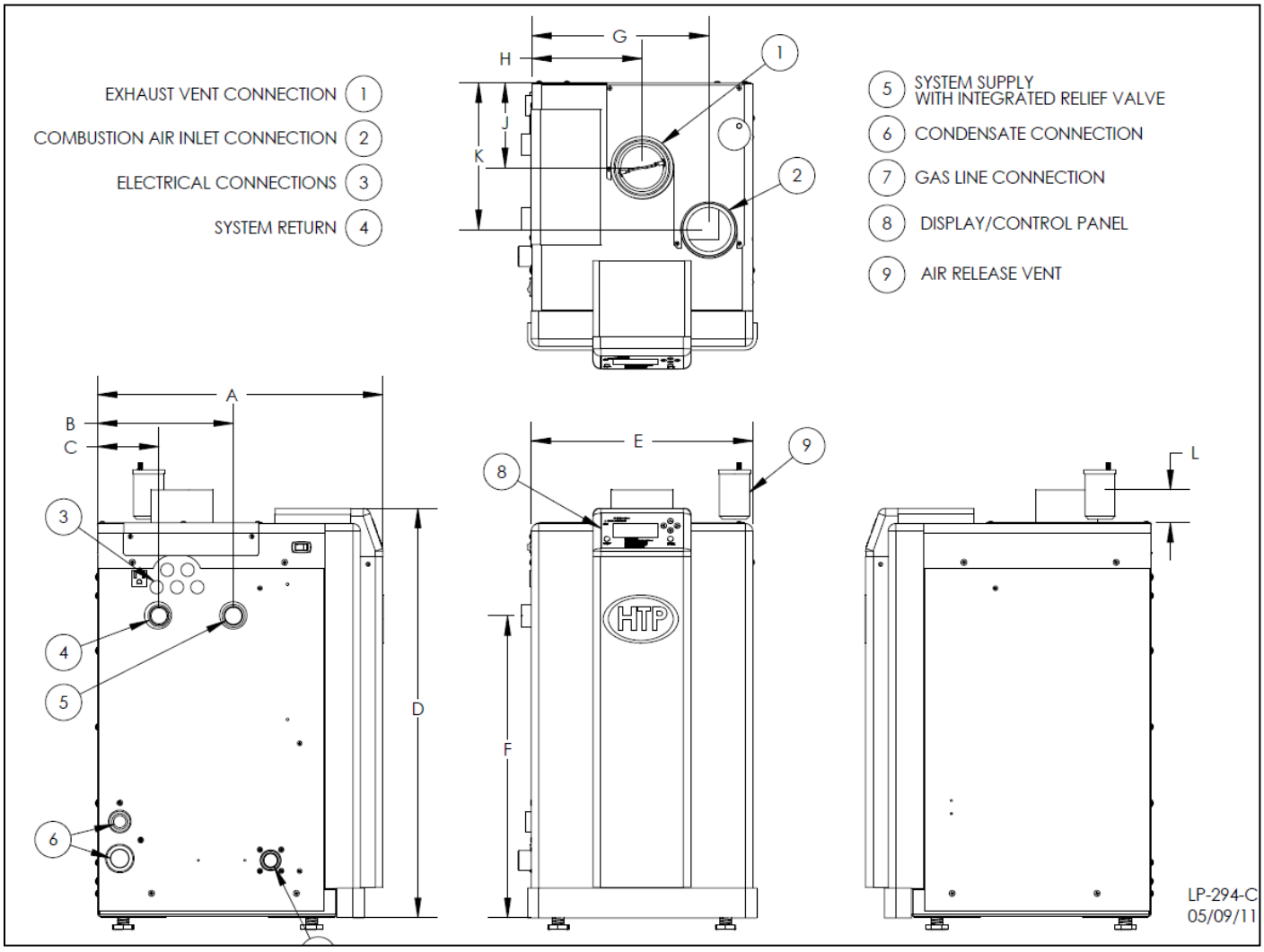


Figure 3 – Specifications and Dimensions Drawing

MODEL*	A	B	C	D	E	F	G	H	J	K	L	SHIPPING WEIGHT
ELP-110	19	9	3	27.3	15	20	11.8	7.4	5.8	10	2.2	113
ELP-199	27	18	6	27.3	15	20	11.8	7.4	4.3	9	2.2	164

Table 1 – Dimensions and Weights

MODEL	BTU/INPUT LOW – HIGH FIRE	DOE HEATING	IBR	SUPPLY / RETURN	EXHAUST / INTAKE	GAS CONNECTION
ELP-110	22,000-110,000	20,200-101,000	88,000	1"	3"	3/4"
ELP-199	44,000-199,000	40,600-203,000	177,000	1"	3"	3/4"

Table 2 - Specifications

D. RESIDENTIAL GARAGE INSTALLATION

If the boiler is located in a residential garage, per ANSI Z223.1:

- Mount the bottom of the boiler a minimum of 18" above the floor of the garage, to ensure the burner and ignition devices are well off the floor.
- Locate or protect the boiler so it cannot be damaged by a moving vehicle.

E. EXHAUST VENT AND INTAKE PIPE

⚠ WARNING

Vents must be properly supported. The boiler exhaust and intake connections are not designed to carry heavy weight. Vent support brackets must be within 1' of the boiler and the balance at 4' intervals. Venting must be readily accessible for visual inspection for the first 3' from the boiler.

The boiler is rated ANSI Z21.13 Category IV (pressurized vent, likely to form condensate in the vent), and requires a special vent system designed for pressurized venting.

You must also install air intake piping from outdoors to the boiler flue adaptor. The resultant installation is categorized as direct vent (sealed combustion).

NOTE: To prevent combustion air contamination, see Table 3 in this section when considering exhaust vent and intake pipe termination.

Exhaust vent and intake pipe may be vented vertically through the roof or out a side wall. Venting methods are detailed in the Venting Section. Do not attempt installation using any other means. Be sure to locate the boiler so exhaust vent and intake piping can be routed through the building and properly terminated. Exhaust vent and intake piping lengths, routing, and termination method must comply with methods and limits given in the venting section.

F. PREVENT COMBUSTION AIR CONTAMINATION

Install intake piping for the boiler as described in the Venting section. Do not terminate exhaust in locations that can allow contamination of intake air.

⚠ WARNING

Ensure that the intake air will not contain any of the contaminants below. For example, do not pipe intake near a swimming pool. Avoid areas subject to exhaust fumes from laundry facilities. These areas always contain contaminants. Contaminated air will damage the boiler, resulting in possible substantial property damage, severe personal injury, or death.

PRODUCTS TO AVOID	AREAS LIKELY TO HAVE CONTAMINANTS
Spray cans containing fluorocarbons	Dry cleaning/laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes/cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric or Muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, laundry detergents, and cleaning solvents	Garages and workshops
Adhesives used to fasten building products	

Table 3

NOTE: DAMAGE TO THE BOILER CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY WARRANTY. (Refer to the limited warranty for complete terms and conditions).

G. REMOVING A BOILER FROM A COMMON VENT SYSTEM

⚠ DANGER

Do not install the boiler into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible substantial property damage, severe personal injury, or death.

⚠ DANGER

Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

When removing an existing boiler, the following steps must be followed.

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

2. Visually inspect the venting system for proper size and horizontal pitch to determine if there is blockage, leakage, corrosion or other deficiencies that could cause an unsafe condition.

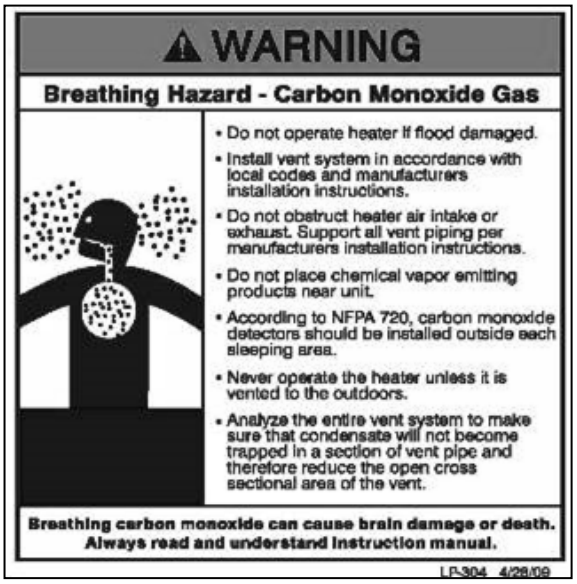


Figure 4 - CO Warning Label

3. If practical, close all building doors, windows and all doors between the common venting system and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.

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

5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.

6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous condition of use.

7. Any improper operation of the common venting system should be corrected so the installation conforms to the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z 223.1.

H. UNCRATING THE BOILER

⚠ WARNING

UNCRATING BOILER – Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

CAUTION

Cold weather handling – If boiler has been stored in a very cold location (below 0^{o}F) before installation, handle with care until the plastic components come to room temperature.

Remove all sides of the shipping crate to allow the boiler to be lifted into its installation location. The boiler is also equipped with leveling feet that can be used to level the boiler properly on an uneven location surface. If surface flooring is rough, take care when sliding boiler into position, as you could catch the leveling feet and damage the boiler.

PART 4 – BOILER PIPING

⚠ WARNING

Failure to follow the instructions in this section WILL VOID the warranty and may result in property damage, serious injury, or death.

CAUTION

Never use dielectric unions or galvanized steel fittings when connecting to a stainless steel storage tank or boiler. Failure to follow this instruction can lead to premature failure of the boiler system. Such failures ARE NOT covered by warranty.

⚠ WARNING

The National Standard Plumbing Code, the National Plumbing Code of Canada, and the Uniform Plumbing Code limit heat transfer fluid pressure to less than the minimum working pressure of the potable water system up to 30 PSI maximum. In addition, heat transfer fluid must be water or another non-toxic fluid having a toxicity of Class 1, as listed in Clinical Toxicology of Commercial Products, 5th Edition. Failure to follow this warning could result in property damage, severe personal injury, or death.

Plumbing of this product should only be done by a qualified, licensed plumber in accordance with all local plumbing codes. The boiler is designed to be connected to an indirect water heater to supply domestic hot water. HTP offers indirect water heaters in a wide range of gallon sizes in either stainless steel or glass-lined construction.

A. GENERAL PIPING INFORMATION

CAUTION

The building piping system must meet or exceed the piping requirements in this manual.

CAUTION

Use two wrenches when tightening water piping at the boiler. Use one wrench to prevent the boiler return or supply line from turning. Failure to prevent piping connections from turning could cause damage to boiler components.

CAUTION

The control module uses temperature sensors to provide both high limit protection and modulating temperature control. The control module may also provide low water protection (through the addition of an optional kit) by sensing the water level in the heat exchanger. An optional flow switch may be installed on the supply of the system to activate the boiler when there is enough flow. Some codes/jurisdictions may require additional external controls.

NOTE: The addition of a high temperature limiting device is important if the boiler is to be connected to a domestic hot water system.

B. RELIEF VALVE

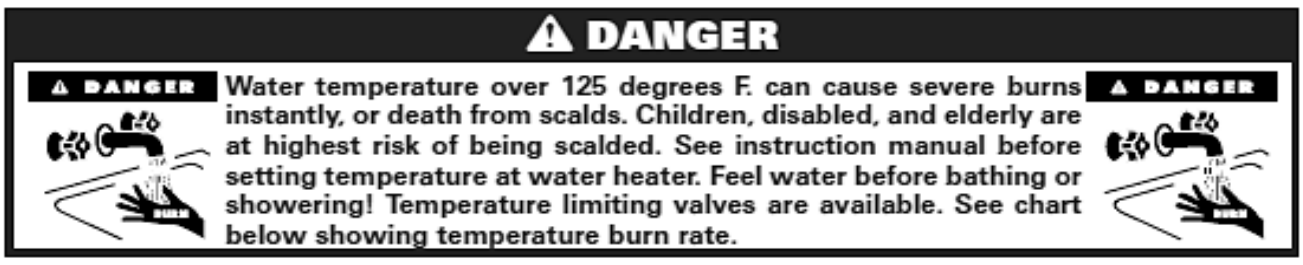
Connect discharge piping to a safe disposal location following the guidelines below.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the relief valve discharge.
- Discharge line must be as short as possible and the same size as the valve discharge connection throughout its entire length.
- Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain, making discharge clearly visible.
- Discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375°F or greater.
- Do not pipe discharge to any location where freezing could occur.
- No shutoff valve may be installed between the relief valve and boiler or in the discharge line. Do not plug or place any obstruction in the discharge line.
- Test the operation of the relief valve after filling and pressurizing the system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.
- Test relief valve at least once annually to ensure the waterway is clear. If valve does not operate, turn the boiler "off" **and call a plumber immediately.**
- Take care whenever operating relief valve to avoid scalding injury or property damage.
- For boilers installed with only a pressure relief valve, the separate storage vessel must have a temperature and pressure relief valve installed. This relief valve shall comply with *Relief Valves for Hot Water Supply Systems, ANSI Z21.22 CSA4.4.*

FAILURE TO COMPLY WITH THE ABOVE GUIDELINES COULD RESULT IN FAILURE OF RELIEF VALVE OPERATION, RESULTING IN POSSIBILITY OF SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.



C. BACKFLOW PREVENTER

Use a backflow preventer specifically designed for hydronic boiler installations. This valve should be installed on the cold water fill supply line per local codes (Part 4, Section G. Piping Details).

CAUTION

All piping methods shown in this manual use primary/secondary connection to the boiler loop. This is to avoid the possibility of inadequate flow through the boiler. For other piping methods, consult your local HTP representative or refer to the detailed piping drawings in this manual.

D. SYSTEM WATER PIPING METHODS

EXPANSION TANK AND MAKE-UP WATER

1. Ensure the expansion tank is sized to correctly handle boiler and system water volume and temperature.

⚠ WARNING

Expansion tanks must be sized according to total system volume. This includes all length of pipe, all fixtures, boilers, etc. Failure to properly size system expansion could result in wasted time, money, and possible property damage, personal injury, or death.

ADDED VOLUME TO SYSTEM BY ELITE PLUS BOILER	
ELP-110	1.7 Gallons
ELP-199	2.6 Gallons

Table 4

CAUTION

Undersized expansion tanks cause system water to be lost from the relief valve and make-up water to be added. Eventual boiler failure can result due to excessive make-up water addition. **SUCH FAILURE IS NOT COVERED BY WARRANTY.**

2. The expansion tank must be located as shown in Part 4, Boiler Piping, or following recognized design methods. See expansion tank manufacturer's instructions for details.

3. Connect the expansion tank to the air separator only if the separator is on the suction side of the circulator. Always install the system fill connection at the same point as the expansion tank connection to the system.

4. Most chilled water systems are piped using a closed type expansion tank.

⚠ CAUTION

DO NOT install automatic air vents on closed type expansion tank systems. Air must remain in the system and return to the tank to provide an air cushion. An automatic air vent would cause air to leave the system, resulting in improper operation of the expansion tank.

DIAPHRAGM (OR BLADDER) EXPANSION TANK

Always install an automatic air vent on top of the air separator to remove residual air from the system.

E. CIRCULATORS

⚠ CAUTION

DO NOT use the boiler circulator in any location other than the ones shown in this manual. The boiler circulator location is selected to ensure adequate flow through the boiler. Failure to comply with this caution could result in unreliable performance and nuisance shutdowns from insufficient flow.

Sizing Space Heat System Piping

1. See Piping Details in this manual, Section G. In all diagrams, the space heating system is isolated from the boiler loop by the primary/secondary connection.

2. Size the piping and components in the space heating system using recognized design methods.

F. HYDRONIC PIPING WITH CIRCULATORS, ZONE VALVES, AND MULTIPLE BOILERS

This boiler is designed to function in a closed loop hydronic system. We have included a temperature and pressure gauge that allows the user to monitor system pressure and outlet temperature from the boiler. It is important to note that the boiler has a minimal amount of pressure drop that must be calculated when sizing the circulators. Unless the system has a closed type expansion tank, each boiler installation must have an air elimination device that will remove air from the system.

Install the boiler so the gas ignition system components are protected from water (dripping, spraying, etc.) Allow clearance for basic service of boiler circulator, valves and other components.

Observe the minimum 1" clearance around all uninsulated hot water pipes when openings around pipes are not protected by non-combustible materials.

On a boiler installed above radiation level, some states and local codes require a low water cut off device, which is an optional part available through HTP (Part # 7450P-225). Check with local codes for additional requirements. If the boiler supplies hot water to heating coils in air handler units, flow control valves or other devices must be installed to prevent gravity circulation of boiler water in the coils during the cooling cycle.

Chilled water medium must be piped in parallel with the boiler. Freeze protection for new or existing systems must use glycol that is specifically formulated for this purpose. Antifreeze must include inhibitors that will prevent the glycol from attacking the metallic system components. Make certain that the system fluid is checked for correct glycol concentration and inhibitor level. The system should be tested at least once a year and as recommended by the glycol solution manufacturer. Allowance should be made for expansion of the glycol solution in system piping. Example: 50% by volume glycol solution expands 4.8% in volume for a temperature increase from 32^{o}F to 180^{o}F, while water expands 3% with the same temperature rise.

G. PIPING DETAILS*

***NOTE:** Systems shown are primary/secondary piping systems. These recommended systems have a primary (boiler) loop, and secondary circuits for heating. The primary loop and secondary circuits have separate circulators. The use of other near boiler piping configurations could result in improper flow rates, leading to inadvertent boiler high limit shutdowns and poor system performance.

CAUTION

Mixing valves are required for the protection of low temperature loops.

NOTE: In piping applications utilizing a single zone, it is recommended that the installer use flow / check valves with weighted seats at or near the boiler to prevent gravity circulation.

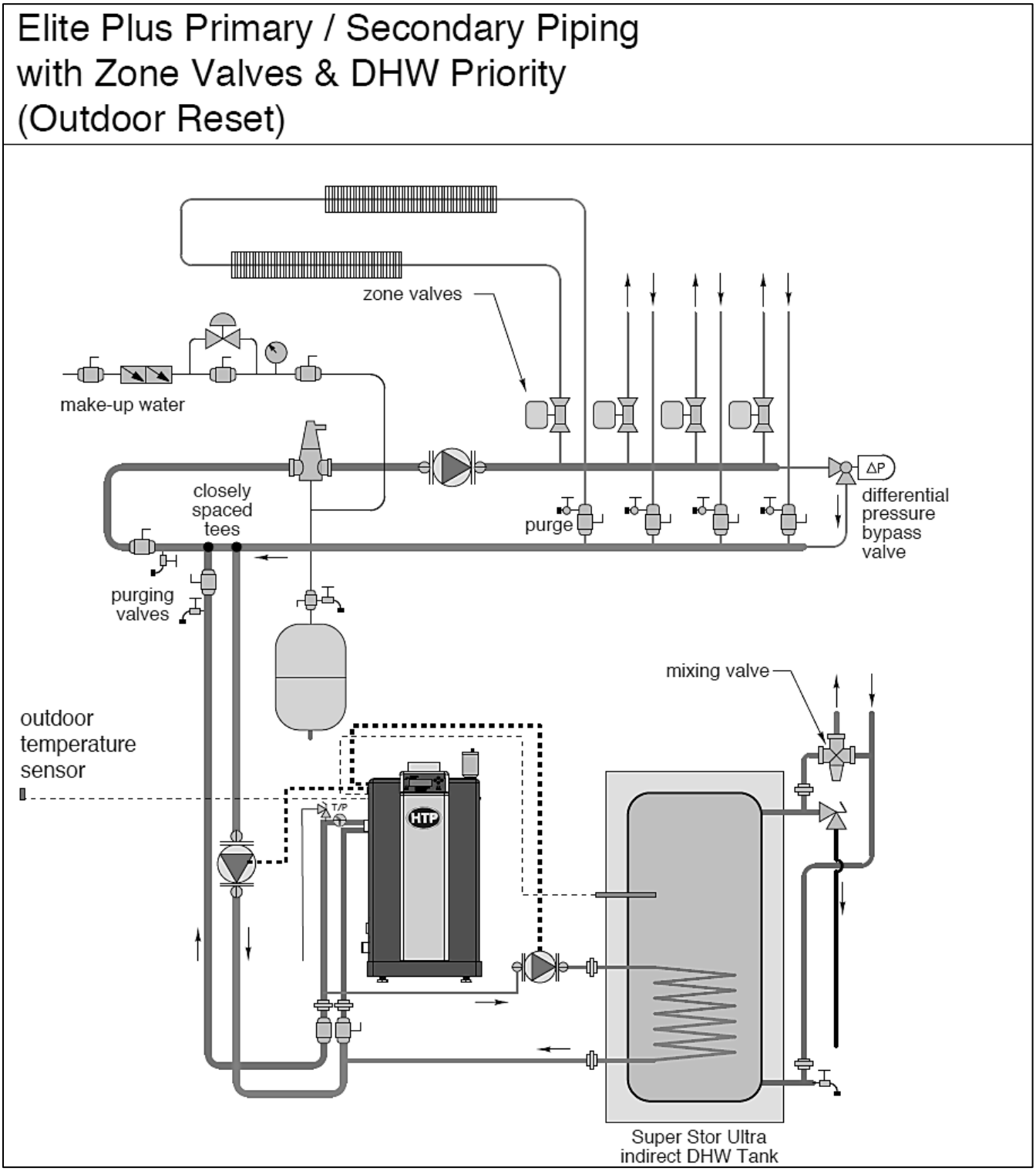


Figure 5 – Single Boiler with Zone Valves, DHW Priority, and Outdoor Reset – Primary/Secondary - NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting a SuperStor indirect water heater is 1"
5. The **minimum** pipe size for connecting an Elite Plus is 1.25"
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with circulator flanges as an alternative.
7. A mixing valve is recommended if the DHW temperature is set above the factory setting of 119^{o}F.
8. Piping shown is Primary/Secondary. System flow (secondary loop) must be greater than the boiler's primary loop flow.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.

Elite Plus Standard Piping with Zone Valves & DHW Priority (Single Temp.)

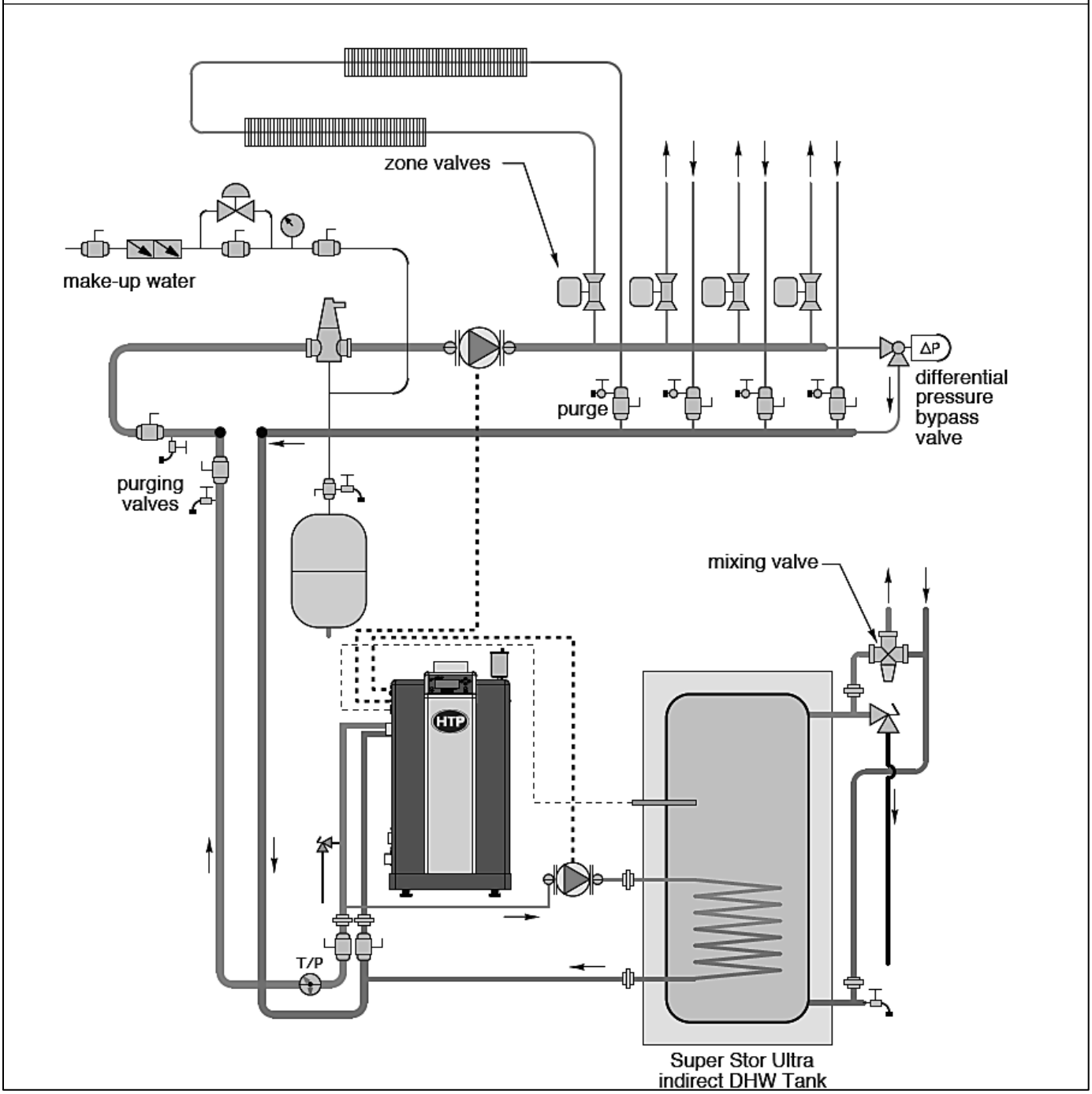


Figure 6 – Single Boiler with Zone Valves and DHW Priority – Single Temperature – Standard Piping

NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting a SuperStor indirect water heater is 1”
5. The **minimum** pipe size for connecting an Elite Plus is 1.25”
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with circulator flanges as an alternative.
7. A mixing valve is recommended if the DHW temperature is set above the factory setting of 119^{o}F.
8. Piping shown is Standard. **VERY IMPORTANT:** Minimum flow rates outlined in the manual must be maintained to minimize short cycling.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.

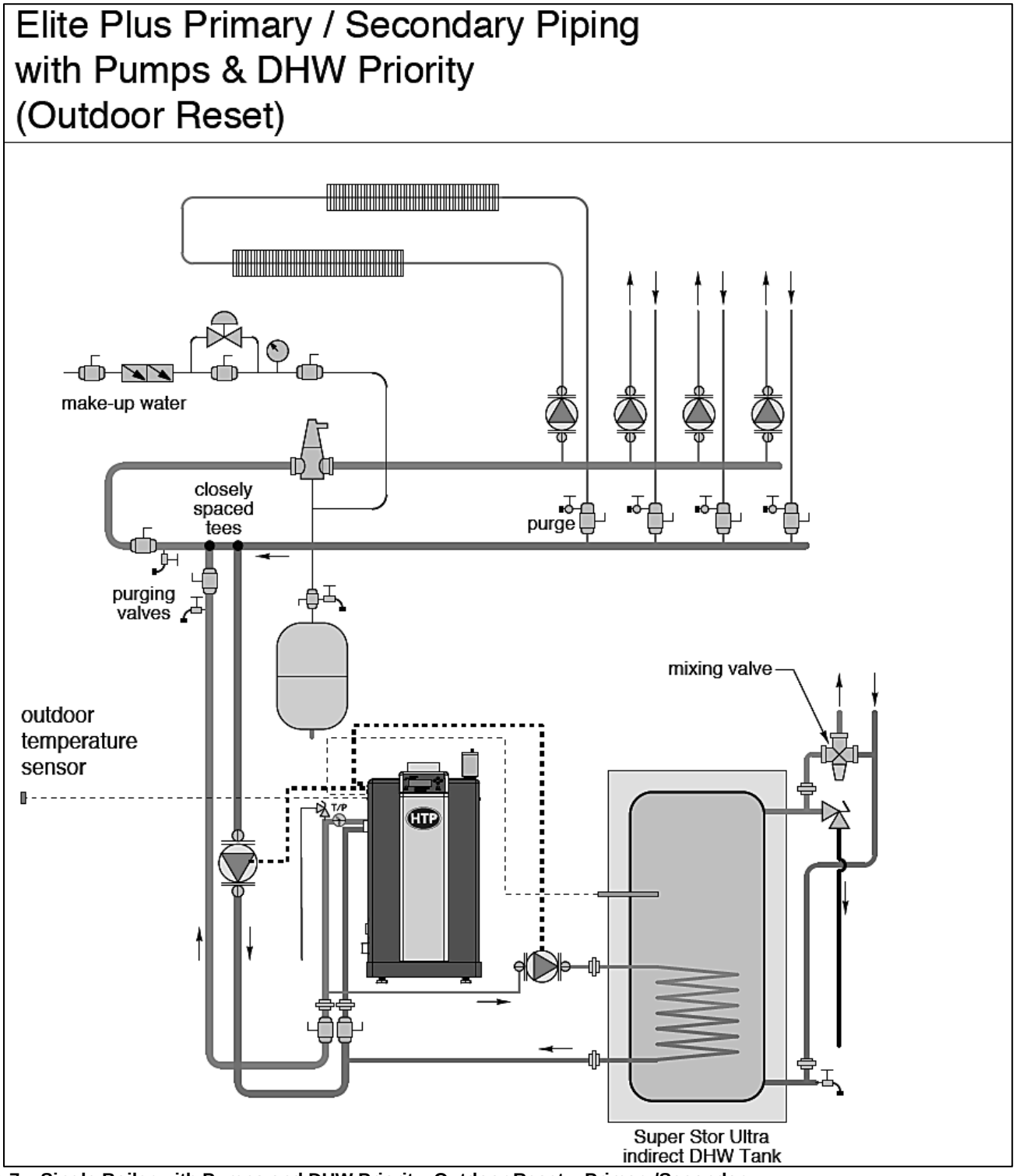


Figure 7 – Single Boiler with Pumps and DHW Priority, Outdoor Reset – Primary/Secondary

NOTES:
1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting a SuperStor indirect water heater is 1”
5. The **minimum** pipe size for connecting an Elite Plus is 1.25”
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with circulator flanges as an alternative.
7. A mixing valve is recommended if the DHW temperature is set above the factory setting of 119^{o}F.
8. Piping shown is Primary/Secondary. System flow (secondary loop) must be greater than the boiler’s primary loop flow.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.

Elite Plus Standard Piping with Pumps & DHW Priority (Single Temp.)

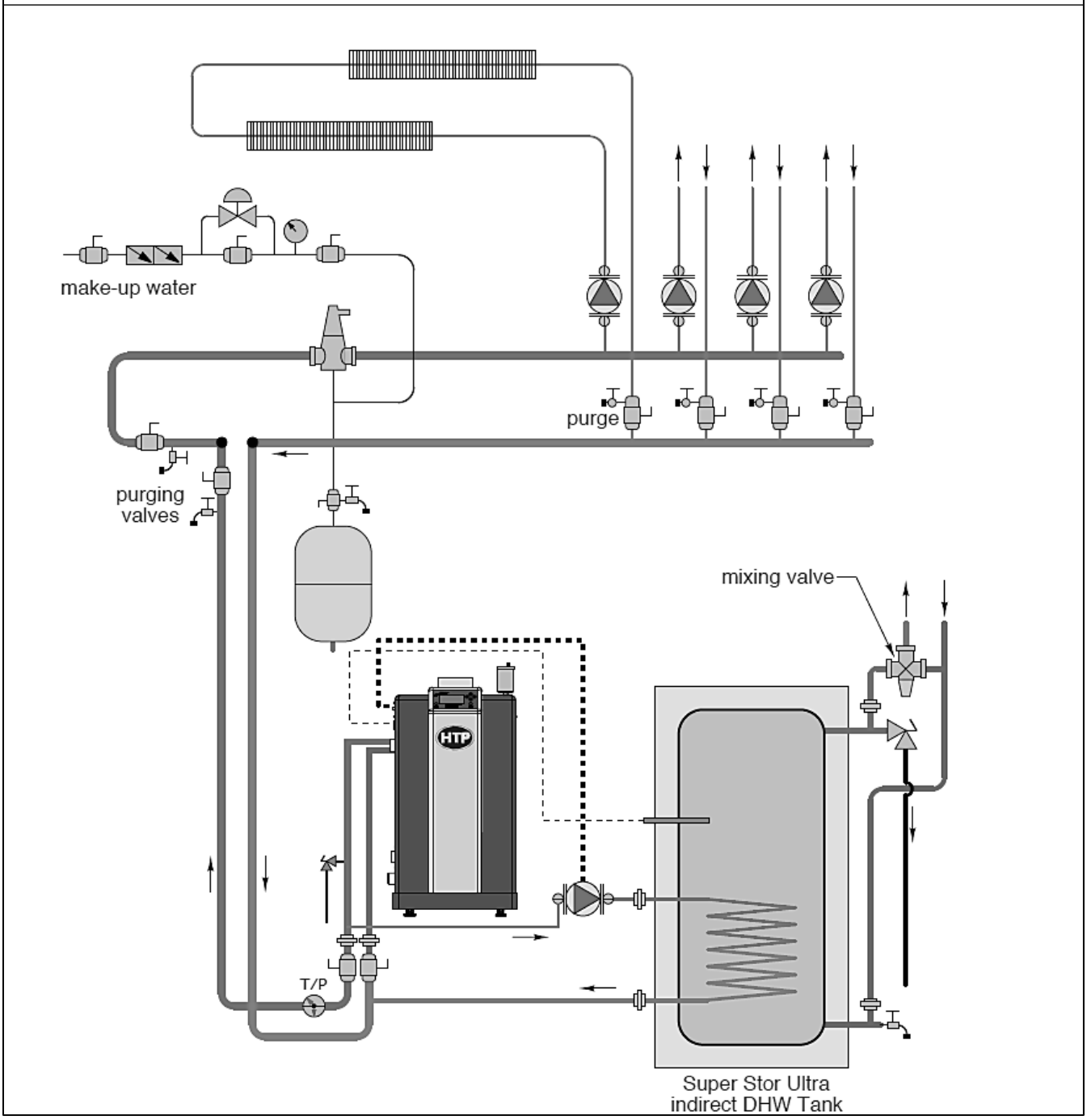


Figure 8 – Single Boiler with Pumps and DHW Priority – Single Temperature – Standard Piping

NOTES:
1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting a SuperStor indirect water heater is 1”
5. The **minimum** pipe size for connecting an Elite Plus is 1.25”
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with circulator flanges as an alternative.
7. A mixing valve is recommended if the DHW temperature is set above the factory setting of 119^{o}F.
8. Piping shown is Primary/Secondary. System flow (secondary loop) must be greater than the boiler’s primary loop flow.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.

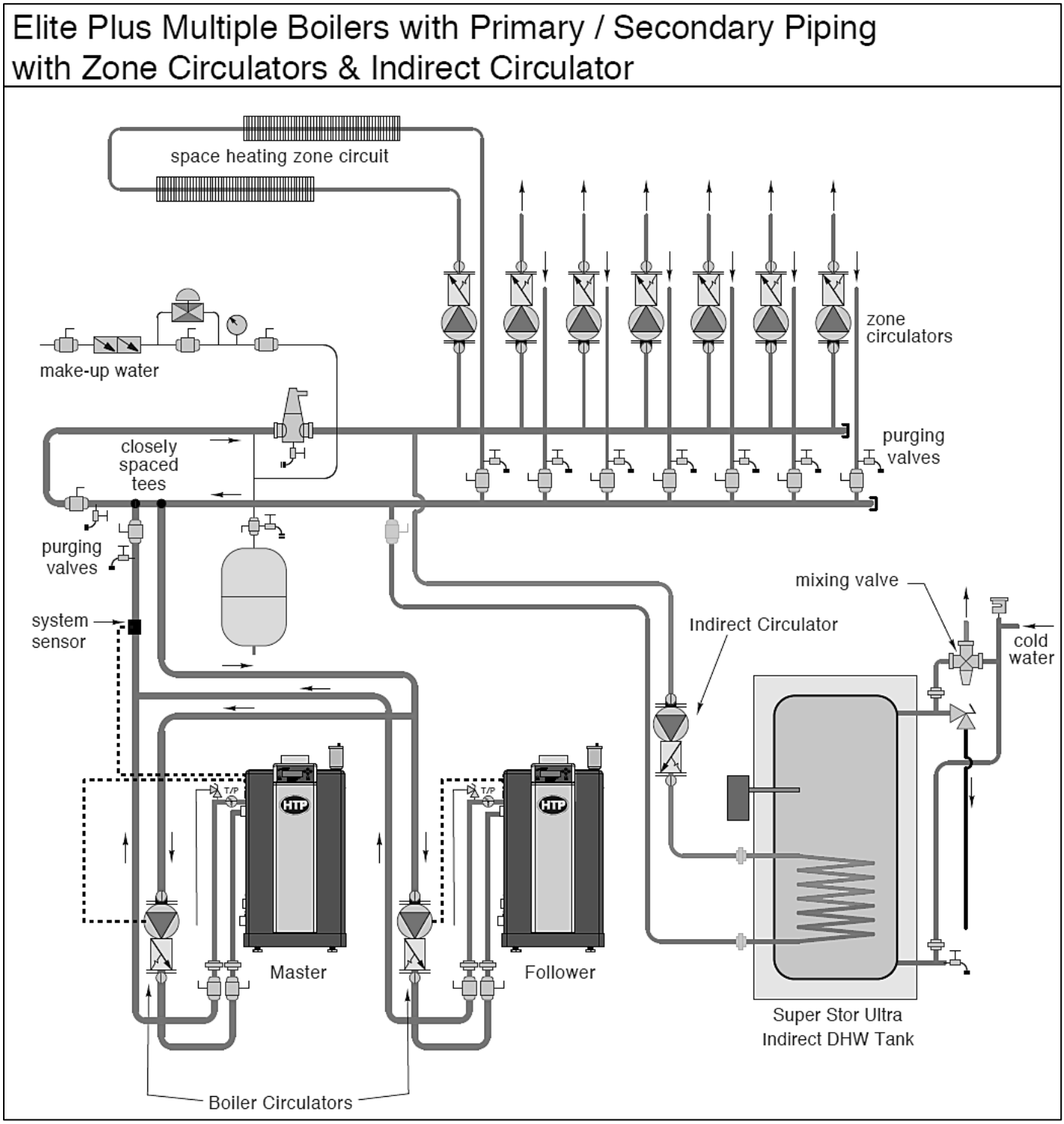


Figure 9 – Multiple Boilers with Primary / Secondary Piping

NOTES:
1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameters center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The **minimum** pipe size for connecting a SuperStor indirect water heater is 1”
5. The **minimum** pipe size for connecting an Elite Plus is 1.25”
6. Circulators are shown with isolation flanges. The alternative is standard flanges with full port ball valves. Purge valves can be used with circulator flanges as an alternative.
7. A mixing valve is recommended if the DHW temperature is set above the factory setting of 119^{o}F.
8. Piping shown is Primary/Secondary. System flow (secondary loop) must be greater than the boiler’s primary loop flow.
9. Install a minimum of 12 diameters of straight pipe upstream of all circulators.

H. PIPING INSTALLATION

⚠ CAUTION

This boiler should not be operated as a potable hot water heater. It should not be used as a direct hot water heating device.

Basic steps are listed below that will guide you through the installation of the boiler.

1. Connect the system return marked “Boiler Return”.

2. Connect the system supply marked “Boiler Supply”.

3. Install a purge and balance valve or shut off valve and drain on the system return to purge air out of each zone.

4. Install a back flow preventer on the cold feed make-up water line.

5. Install a pressure reducing valve on the cold feed make-up water line (15 psi nominal on the system return). This boiler has a maximum working pressure of 160 psi. You may order a higher pressure relief valve kit from the factory. Check temperature and pressure gauge when operating. It should read a minimum pressure of 12 psi.

6. Install a circulator as shown in piping details (this section). Make sure the circulator is properly sized for the system and friction loss.

7. Install an expansion tank on the system supply (see Part 4, Section D for water volume). Consult the expansion tank manufacturer’s instructions for specific information relating to expansion tank installation. Size the expansion tank for the required system volume and capacity.

8. Install an air elimination device on the system supply.

9. Install a drain valve at the lowest point of the system.

NOTE: The boiler cannot be drained completely of water without purging the boiler with an air pressure of 15 psi.

10. The relief valve and temperature and pressure gauge are included in the boiler accessory kit. A pipe discharge line should be installed 6” above the drain in the event of pressure relief. The pipe size must be the same size as the relief valve outlet. **NEVER BLOCK THE OUTLET OF THE SAFETY RELIEF VALVE.**

I. CIRCULATOR SIZING

The heat exchanger has a minimum total water volume that must be taken into account when sizing the circulator. These minimum water volumes are listed in Table 5 below.

MINIMUM BOILER WATER VOLUME	
MODEL	**MINIMUM FLOW (GPM)**
ELP-110	7.3
ELP-199	10

Table 5 – Minimum Heat Exchanger Water Volumes

The heat exchanger has a pressure drop that must be considered in your system design. Refer to Table 6 for pressure drop through the heat exchanger.

HEAT EXCHANGER PRESSURE DROP CHART														
Model	Flow Rate Δ P’													
Flow Rate	7 GPM	8 GPM	9 GPM	10 GPM	11 GPM	12 GPM	13 GPM	14 GPM	15 GPM	16 GPM	17 GPM	18 GPM	19 GPM	20 GPM
ELP-110	12’	15’	17’	22’	25’	33’	*	*	*	*	*	*	*	*
ELP-199	*	*	*	12’	15’	17’	19’	22’	27’	*	*	*	*	*

Table 6 – Pressure Drop *Do not operate boiler at these flow settings as it will damage the heat exchanger or related components.

The chart below represents various system design temperature rise through the boiler along with their respective flows and friction loss to aid in circulator selection.

SYSTEM TEMPERATURE RISE CHART						
Model	20°Δt		25°Δt		30°Δt	
	Ft / Friction	Flow Rate	Ft / Friction	Flow Rate	Ft / Friction	Flow Rate
ELP-110	25’	11 GPM	17’	9.1 GPM	12’	7.3 GPM
ELP-199	27’	15 GPM	17’	12.5 GPM	12’	10 GPM

Table 7 – Temperature Rise Chart

Tables 8 and 9 represent combined flow rates and pipe sizes when using multiple boilers to design the primary circuit manifold system. To size, simply add the number of boilers and the required flow rates for the system design temperature.

Example: (5) ELP-199® boilers with a design of 20°Δt temperature rise with each boiler having an individual flow rate of 22 GPM. To correctly size the manifold feeding these (5) boilers, you would need a pipe size of 4".

MULTIPLE BOILER MANIFOLD PIPING																					
Flow Rate (GPM)	16	22	24	30	32	33	40	44	45	48	50	55	60	66	75	80	85	88	90	100	110
Pipe Dia. (Inches)	2	2	2	2	2	2½	2½	2½	2½	2½	2½	2½	2½	2½	3	3	3	3	3	3	4

Table 8

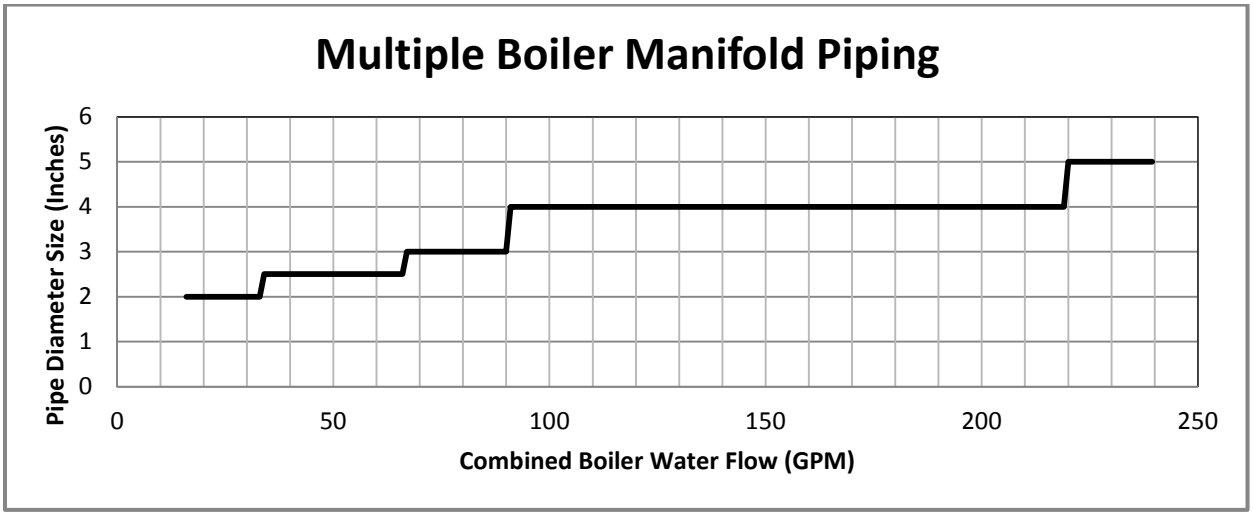


Figure 10

MULTIPLE BOILER MANIFOLD PIPING																				
Flow Rate (GPM)	120	132	150	160	170	179	200	210	239	240	250	255	300	340	350	400	425	510	595	680
Pipe Dia. (In.)	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	6	6	6

Table 9

J. CHECK/CONTROL WATER CHEMISTRY

NOTE: BOILER FAILURE DUE TO IMPROPER WATER CHEMISTRY IS NOT COVERED BY WARRANTY.

Sodium less than 20 mGL

Water pH between 6.0 and 8.0

1. Maintain boiler water pH between 6.0 and 8.0. Check with litmus paper or have chemically analyzed by water treatment company.

2. If pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains

Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chlorine concentration less than 100 ppm

1. Filling with chlorinated fresh water should be acceptable since drinking water chlorine levels are typically less than 5 ppm.

2. Do not use the boiler to directly heat swimming pool or spa water.

3. Do not fill boiler or operate with water containing chlorine in excess of 100 ppm.

Hardness: 7 grains
Chloride levels: 100 ppm
pH levels: 6-8
TDS: 2000 ppm
Sodium: 20 mGL

Clean system to remove sediment*

1. You must thoroughly flush the system (without boiler connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment.

2. For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system.)

3. Flush system until water runs clean and you are sure piping is free of sediment.

***NOTE:** It is recommended you clean heat exchanger at least once a year to prevent lime scale buildup. Follow the maintenance procedure to clean the heat exchanger in the Maintenance Section of this manual.

Test/replace freeze protection fluid
1. For systems using freeze protection fluids, follow fluid manufacturer's instructions to verify inhibitor level and that other fluid characteristics are satisfactory.

2. Freeze protection fluid must be replaced periodically due to degradation of inhibitors over time. Follow all fluid manufacturer instructions.

Piping components

Heating system piping:
Water boiler system piping MUST be sized per technical pipe requirements listed in Table 8 and Table 9. Reducing pipe size can restrict flow rate through the water boiler, causing inadvertent short cycling and poor system performance.

Check valves:
Field supplied. Check valves are recommended for installation as shown in Piping Details.

Water boiler isolation valves:
Field supplied. Full port ball valves are required. Failure to use full port ball valves could result in a restricted flow rate through the water boiler.

Mixing valve:
Field supplied. A mixing valve is recommended when storing domestic hot water above 115°F.

Unions:
Field supplied: Recommended for boiler serviceability. **DO NOT USE DIELECTRIC UNIONS!**
ONLY BRASS, COPPER, OR STAINLESS STEEL.

Pressure relief valve:
Factory supplied on boiler. The pressure relief valve is sized to ASME specifications. Storage tank may require additional relief valves depending on local codes.

MINIMUM PIPE SIZES	
ELP-110	1" NPT or Copper
ELP-199	1 ¼" NPT or Copper

Table 10

K. FILL AND PURGE HEATING SYSTEM

1. Attach the hose to balance and purge hose connector or drain valve and run hose to nearest drain.

2. Close the other side of the balance and purge valve or shut off valve after the drain.

3. Open the first zone balance and purge or drain valve to let water flow out of the hose. If zone valves are used, open the valves one at a time manually.

NOTE: You should check zone valve manufacturer's instructions prior to opening valves manually, so as not to damage the zone valve.

4. Manually operate fill valve regulator. When water runs out of the hose, you will see a steady stream without bubbles. Close the balance and purge valve or drain to stop the water from flowing. Disconnect the hose and connect it to next zone to be purged.

5. Repeat this procedure for additional zones (one at a time).

⚠ CAUTION

For installations that incorporate standing iron radiation and systems with manual vents at the high points, follow the previous section and, starting with the nearest manual air vent, open the vent until water flows out. Then close the vent. Repeat the procedure, working your way toward the furthest air vent. It may be necessary to install a basket strainer in an older system where larger amounts of sediment may be present. Annual cleaning of the strainer may be necessary.

Upon completion, make sure that the fill valve and zone valves are in automatic positions. You must also assure the purge and shut off valves are in open positions.

L. GLYCOL ANTIFREEZE SOLUTIONS

⚠ WARNING

Use only inhibited propylene glycol solutions which are specially formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems. Glycol mixtures should not exceed 50%.

- Glycol in hydronic applications should include inhibitors that prevent the glycol from attacking metallic system components. Make certain that the system fluid is checked for the correct glycol concentration and inhibitor level.
- The glycol solution should be tested at least once a year or as recommended by the glycol manufacturer.
- Anti-freeze solutions expand more than water. For example: A 50% by volume solution expands 4.8% in volume for a temperature increase from 32^{o}F to 180^{o}F, while water expands 3% over the same temperature rise. Allowances must be made in system design for expansion.
- A 30% mixture of glycol will result in a BTU output loss of 15% with a 5% increase in head against the system circulator.
- A 50% mixture of glycol will result in a BTU output loss of 30% with a 50% increase in head against the system circulator.

⚠ CAUTION

It is highly recommended that you carefully follow the glycol manufacturer's recommended concentrations, expansion requirements, and maintenance recommendations (pH additive breakdown, inhibitor reduction, etc.) You must carefully calculate the additional friction loss in the system as well as the reduction in heat transfer coefficients.

M. ZONING WITH ZONE VALVES

1. When zoning with zone valves, connect the boiler to the system as shown in Piping Details, Part 4, Section G. The primary/secondary piping shown ensures the boiler loop will have sufficient flow. It also avoids applying the high head of the boiler circulator to zone valves.

2. Connect DHW (domestic hot water) piping to indirect storage water heater as shown in Piping Details.

N. ZONING WITH CIRCULATORS

1. When using circulator zoning, connect the boiler to the system as shown in Piping Details, Part 4.

NOTE: The boiler circulator cannot be used for a zone. It must only supply the boiler loop.

2. Install a separate circulator for each zone.

3. Connect DHW (domestic hot water) piping to indirect storage water heater as shown in Piping Details.

O. MULTIPLE BOILERS

1. Connect multiple boilers as shown in Piping Details, Part 4.

2. All piping shown is reverse return to assure balanced flow throughout connected boilers.

3. Each connected boiler must have its own circulator pump to assure adequate flow.

4. Ensure a swing check valve is installed on each boiler return pipe.

5. Connect DHW (domestic hot water) piping to indirect storage water heater as shown in Piping Details.

6. The system flow (secondary loop) must be greater than the boiler's primary loop flow.

PART 5 – VENTING, COMBUSTION AIR, AND CONDENSATE REMOVAL

⚠ DANGER

The boiler must be vented as detailed in this Venting Section. Ensure exhaust and intake piping complies with these instructions regarding vent system. Inspect exhaust vent and intake piping thoroughly to ensure all joints are well secured, airtight, and comply with all applicable code requirements, as well as with the instructions provided in this manual. Failure to properly install the vent system will result in property damage, severe personal injury, or death.

A. GENERAL

⚠ DANGER

This boiler is certified as a "Category IV" appliance, and requires a special venting system. The vent system will operate with a positive pressure in the pipe. Exhaust gases must be piped directly outdoors using the vent materials and rules outlined in these instructions. Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure. Follow the venting instructions below carefully. Failure to do so will result in substantial property damage, severe personal injury, or death.

1. Installation should be made in accordance with the regulations of the Authority Having Jurisdiction, local code authorities, and utility companies which pertain to this type of water heating equipment.

2. Install the venting system in accordance with these instructions and with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, CAN/CGA B149, and/or applicable provisions of local building codes.

3. This boiler must be vented with materials, components, and systems listed and approved for Category IV boilers.

⚠ DANGER

Exhaust and intake pipes are to be piped separately. This boiler cannot share a common exhaust or intake with multiple appliances. Failure to follow this instruction will result in substantial property damage, severe personal injury, or death.

NOTE: To avoid contamination often contained in indoor air, it is best to pipe all intake combustion air directly to the outdoors.

NOTE: If exhaust vent pipe system passes through an unheated space, such as an alcove or attic, the space must be heated or the pipe must be insulated. The insulation must have an R value sufficient to prevent freezing of the condensate.

⚠ WARNING

Improper seating of vent pipe gaskets can cause eventual gasket failure and exhaust gas leakage. Ensure the exhaust vent pipe is properly beveled and seated before insertion into the flue adapter. Failure to do so could result in property damage, severe personal injury, or death.

⚠ DANGER

Due to the extreme flammability of most glues, cements, solvents, and primers used to join plastic exhaust and intake pipes, explosive solvent vapors must be cleared from all vent piping before start-up. Avoid using excess cement or primer, as this may pool in the vent pipes. Vent assemblies should be allowed to cure for a period of at least 8 hours before powering a connected appliance. Failure to follow these instructions will result in substantial property damage, severe personal injury, or death. It is the installers' responsibility to understand the hazards associated with explosive solvents and take the necessary precautions to avoid these risks.

B. APPROVED MATERIALS FOR EXHAUST VENT AND INTAKE PIPE

APPROVED EXHAUST VENT AND INTAKE PIPE MATERIAL			
Item	**Material**	**Standards for Installation in:**	
		United States	**Canada**
Exhaust vent or Intake pipe and fittings	PVC schedule 40/80	ANSI/ASTM D1785	PP, CPVC, and PVC venting must be ULC-S636 Certified. IPEX is an approved manufacturer in Canada, supplying vent material listed to ULC-S636.
	PVC-DWV*	ANSI/ASTM D2665*	
	CPVC schedule 40/80	ANSI/ASTM F441	
	Polypropylene	ULC-S636	
	Stainless Steel AL29-4C	Certified for Category IV and direct vent appliance venting	Certified for Category IV and direct vent appliance venting
Pipe cement/primer	PVC	ANSI/ASTM D2564	IPEX System 636 Cements & Primers
	CPVC	ANSI/ASTM F493	

Table 11

⚠ DANGER

- The exhaust and intake components installed with this boiler must be used for near boiler piping BEFORE transitioning to the approved materials listed above. DO NOT REMOVE these installed components. Doing so WILL VOID appliance warranty.
- PVC/CPVC pipe and fittings of the same diameter are considered interchangeable.
- Do NOT use Foam Core Pipe in any portion of the exhaust piping from this boiler.
- DO NOT connect PVC/CPVC to PP without an approved vent connector.
- When installing AL29-4C vent piping, install a PVC-to-stainless adapter at the boiler vent connection, and at the termination when using an HTP PVC termination kit. DO NOT mix AL-29-4C piping from different manufacturers unless using adapters specifically designed for the purpose by the manufacturer.
- *PVC-DWV for air intake applications ONLY.

Failure to follow these directions will result in substantial property damage, severe personal injury, or death.

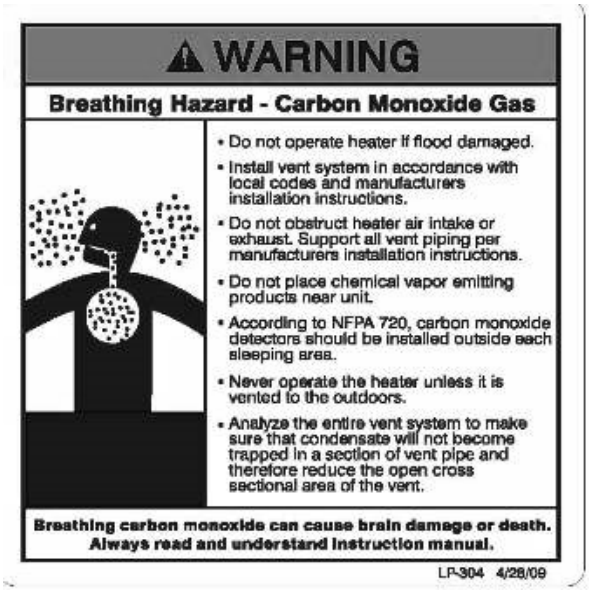
⚠ WARNING

DO NOT mix components from different venting systems. The vent system could fail, causing leakage of flue products into the living space. Use only the approved pipe and fitting materials, and primer and cement specifically designed for the material used, as listed in Table 11. Failure to do so could result in property damage, severe personal injury, or death.

⚠ WARNING

Exhaust vent adaptors are not designed as load-bearing devices, and must not be used to support exhaust vent piping. All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼" per foot back to the appliance to allow drainage of condensate. Failure to properly support vent piping and follow the information in this statement could result in product damage, severe personal injury, or death.

NOTE: The use of double-wall vent or insulated material for the combustion air inlet pipe is recommended in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.



C. REQUIREMENTS FOR INSTALLATION IN CANADA

1. Installations must be made with a vent pipe system certified to ULC-S636. IPEX is an approved vent manufacturer in Canada supplying vent material listed to ULC-S636. Additionally you may use AL29-4C stainless steel venting to comply with Canadian requirements.

2. The first three (3) feet of vent pipe from the boiler flue outlet must be readily accessible for visual inspection.

3. The components of the certified vent system must not be interchanged with other vent systems or unlisted pipe / fittings.

Cellular foam core piping may be used on air inlet piping **only**.

NOTE: The use of double-wall vent or insulated material for the air inlet is recommended in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.

⚠ DANGER

You must not use "B" vent in an exhaust application. "B" vent is for intake applications **ONLY**. Using "B" vent in an exhaust application will result in serious injury or death.

D. EXHAUST VENT AND INTAKE PIPE LOCATION

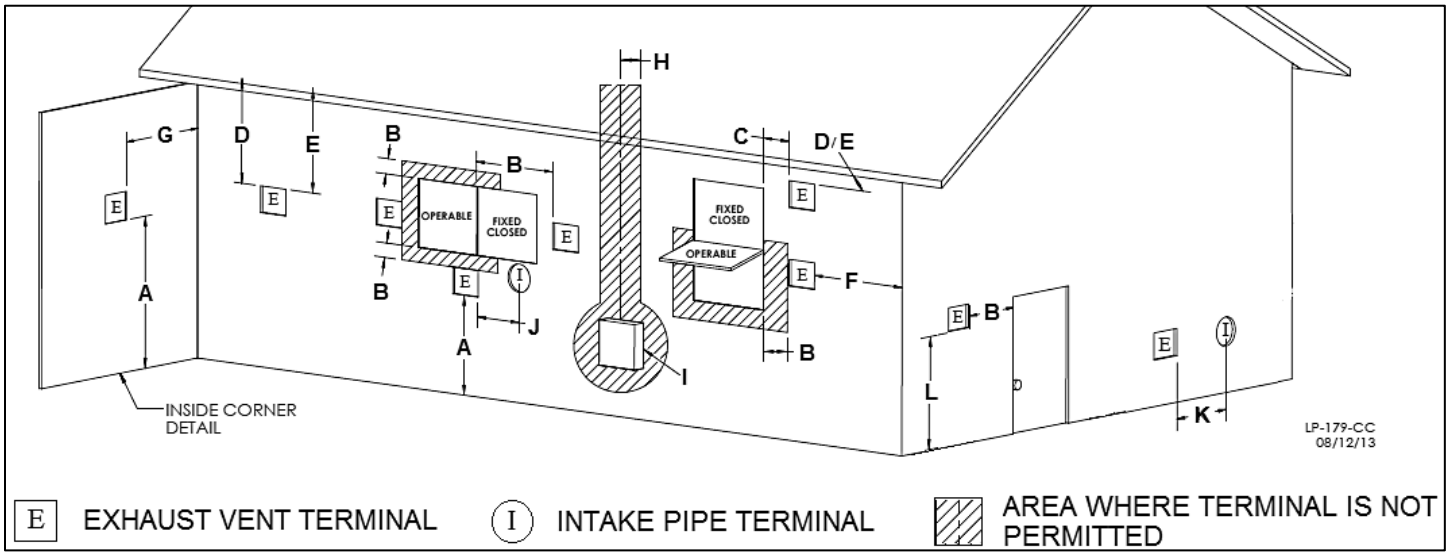


Figure 11 – ANSI Z223.1 / NFPA 54 for US and CAN/CSA B149.1 for Canada – Exit Terminals for Direct-Vent Venting Systems

DETERMINE EXHAUST VENT AND INTAKE PIPE LOCATION – FIGURE 11 NOTES:

A. Provide a minimum of 1 foot clearance from the bottom of the exhaust vent and intake pipe above the expected snow accumulation level. Snow removal may be necessary to maintain clearance.

B. Provide a minimum of 1 foot distance from exhaust vent termination to any door, operable window, or gravity intake into any building.

C. Provide a minimum of 1 foot distance from exhaust vent termination to any permanently closed door or window.

D. Provide a minimum of 4 feet vertical clearance from the exhaust vent to all roof overhangs.

E. Locating exhaust vent termination near roof overhangs will result in the formation of icicles in freezing weather, and could result in blockage of the exhaust vent. To prevent icicles from forming, maintain 4 feet vertical clearance from the exhaust vent to all roof overhangs.

F. Provide 4 feet clearance from the outside corner of vertical walls, chimneys, etc., as well as horizontal corners created by roof overhangs.

G. Provide 6 feet clearance from the inside corner of vertical walls, chimneys, etc., as well as horizontal corners created by roof overhangs.

H. Provide 4 feet clearance from center line within a height of 15 feet above electrical meters, gas meters, gas regulators, relief equipment, exhaust fans and inlets.

I. Provide 4 feet horizontal clearance from electrical meters, gas meters, gas regulators, relief equipment, exhaust fans and inlets. In no case shall the exit terminal be above or below the aforementioned equipment unless the 4 foot horizontal distance is maintained.

J. This water heater vent system shall terminate at least 3 feet (0.9 m) above any forced air intake located within 10 ft (3 m).

NOTE: This does not apply to the combustion air intake of a direct-vent appliance.

K. When venting with a two pipe system, maximum distance between exhaust vent and intake pipe is 6 feet (1.8 m). Minimum distance between exhaust vent and intake pipe on single direct vented appliance is 10” (0.255 m) center-to-center. Minimum distance between exhaust vents and intake pipes on multiple water heaters is 10” (0.255 m) center-to-center.

L. When adjacent to a public walkway, locate exit terminal at least 7 feet above grade.

In addition:

- Total length of vent piping shall not exceed the limits specified in this manual.
- The vent piping for this direct vented appliance is approved for zero clearance to combustible construction.
- The flue products coming from the exhaust vent will create a large plume when the boiler is in operation. Avoid venting in areas that will affect neighboring buildings or be considered objectionable.
- DO NOT locate exhaust vent or intake pipe in a parking area where machinery may damage the pipe.
- DO NOT locate the exhaust vent or intake pipe terminals under a porch, balcony, or veranda.
- Avoid terminating exhaust vents near shrubs, air conditioners, or other objects that will obstruct the exhaust stream.
- DO NOT vent over a public walkway. Condensate could drip or freeze and create a nuisance or hazard.

NOTE: Due to potential moisture build-up, sidewall venting may not be the preferred venting option. Carefully consider venting installation and location to save time and cost.

⚠ WARNING

You must insert the provided exhaust and intake screens at your vent termination to prevent blockage caused by debris or birds.

⚠ WARNING

The building owner is responsible for keeping the exhaust and intake terminations free of snow, ice, or other potential blockages, as well as scheduling routine maintenance. Failure to keep the vent piping terminations clear and properly maintain the boiler could result in property damage, severe personal injury, or death.

⚠ WARNING

For each floor containing bedroom(s), a carbon monoxide detector and alarm shall be placed in the living area outside the bedrooms, as well as in the room that houses the boiler. Detectors and alarms shall comply with NFPA 720 (latest edition). Failure to comply with requirements for detectors and alarms could result in property damage, severe personal injury, or death.

DETERMINE LOCATION OF CONDENSATE PIPING

This boiler is a high efficiency appliance, and produces condensate: a by-product of the combustion process. A condensate collection system with an internal float switch monitors the condensate level to prevent it from backing into the combustion system. There is a ¾" PVC pipe connection provided to connect the outlet of the collection system to a drain or condensate pump.

CONDENSATE NEUTRALIZATION

Condensate from the boiler is slightly acidic with a pH of 3.2 - 4.5. To avoid long term damage to the drainage system and to meet local code requirements, HTP recommends neutralizing the condensate with a Condensate Neutralizer Kit (Part # 7450P-212 for ELP-110/199). The neutralizer kit connects to the drain system and contains limestone chips that neutralize the pH level of the water vapor. The neutralizer kit should be checked annually and the limestone chips replenished if necessary. When replacing the limestone chips, take care to ensure chips are no smaller than ½" to avoid blockage in condensate piping (refer to Figure 12 for piping of the condensate neutralizer.)

CAUTION

When installing a condensate pump, select one approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage.

⚠ WARNING

When servicing is complete, you must make sure the clean out port cap is replaced securely. Failure to do so will cause exhaust gas to leak and will result in serious injury or death.

CAUTION

The condensate line must remain unobstructed, allowing free flow of condensate. If condensate freezes in the line, or if line is obstructed in any other manner, condensate can exit from the tee, resulting in potential water damage to property.

CAUTION

It is very important that condensate piping be no smaller than ¾". Use a tee at the condensate connection with a branch vertically up and open to the atmosphere, so as not to cause vacuum or overpressure that could obstruct the flow of condensate from the boiler. To prevent sagging and maintain pitch, condensate piping should be supported with pipe supports.

NOTE: Blow water into the condensate collector to remove any foreign matter that may block the line.

NOTE: To allow for proper drainage on larger horizontal condensate runs, tubing size may need to increase to 1 inch and a second line vent may be required.

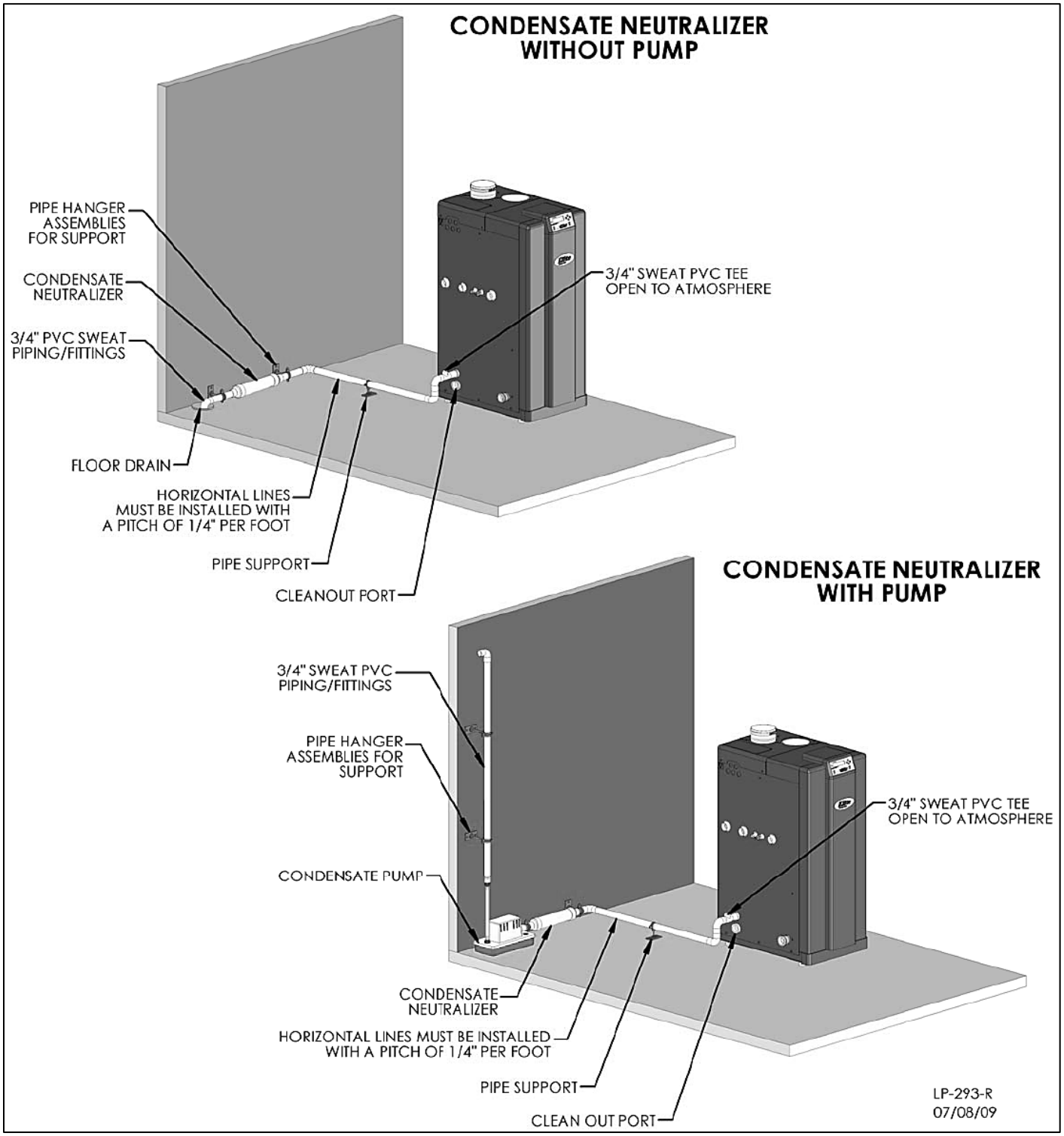


Figure 12 – Condensate Piping

NOTES:

1. Condensate line must be pitched at least 1/4" per foot to properly drain. If this cannot be done, or a very long length of condensate hose is used, you must increase the condensate line to a minimum of 1" ID and place a tee in the line after the condensate neutralizer to properly reduce vacuum lock in the drain line.

2. Plastic pipe should be the only material used for the condensate line. Steel, brass, copper, or other materials will be subject to corrosion or deterioration.

3. NEVER install condensate lines outside. It is very important that the condensate line is not exposed to freezing temperatures or any type of blockage. Damages due to frozen or blocked condensate lines ARE NOT covered by warranty.

4. Support of the condensate line may be necessary to avoid blockage of the condensate flow.

E. EXHAUST VENT AND INTAKE PIPE SIZING

ALTITUDE CONSIDERATIONS			
INSTALLATION ALTITUDE	**TOTAL EQUIVALENT VENT LENGTH (TEL) ALL MODELS**		
	3" VENT DIAMETER	**4" INCREASED VENT DIAMETER**	**2" REDUCED VENT DIAMETER**
LESS THAN 5000 FT.	250 ft. – All Models	275 ft. – All Models	100 ft. – ELP-110*
GREATER THAN 5000 FT.	250 ft. – ELP-110 200 ft. – ELP-199		

Table 12 – Altitude Considerations and Vent Length - *DO NOT REDUCE VENT DIAMETER ON ELP-199 MODELS

1. The exhaust vent and intake pipes are 3" for the ELP-110 and ELP-199.

2. The total equivalent length of exhaust vent and intake pipe should not exceed those detailed in Table 12.
   a. The equivalent length of friction loss in elbows, tees, and other fittings are listed in Table 13.

FRICTION LOSS EQUIVALENT FOR STAINLESS OR PLASTIC PIPING AND FITTINGS		
FITTING DESCRIPTION	**3"**	**4"**
90^{o} elbow short radius	5'	5'
90^{o} elbow long radius	4'	4'
45^{o} elbow	3'	3'
Coupling	0'	0'
Tee (intake only)	0'	0'
Concentric Vent Kit	3'	N/A
V Series Vent Kit	1'	1'
AL20 4C Vent Terminal	1'	1'
Pipe (All Materials)	1'	1'

Table 13 *Friction loss for long radius elbow is 1' less. NOTE: Consult Polypropylene venting instructions for friction loss and pressure drop equivalents.

b. For example: If the exhaust vent is 3" in diameter, and has two short 90^{o} elbows and 10 feet of PVC pipe we will calculate: Exhaust Vent Equivalent Length = (2x5) + 10 = 20 ft.

Further, if the 3" intake pipe has two short 90^{o} elbows, one 45^{o} elbow, and 10 feet of PVC pipe, the following calculation applies: Intake Pipe Equivalent Length = (2x5) + 3 + 10 = 23 ft.

The Exhaust Vent Equivalent Length + Intake Pipe Equivalent Length = Total Equivalent Length. In this example, the Total Equivalent Length is 43 ft.

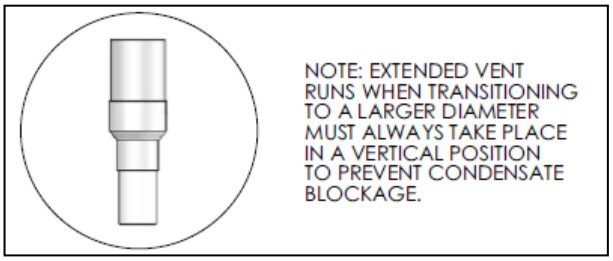


Figure 13 – Extended Run Detail

c. The minimum total equivalent length is 16 feet.

d. The size of venting on the ELP-110 can also be reduced in order to accommodate existing vent sizes. When reducing down to a 2" vent from a 3" vent, the total equivalent length shall not exceed 100 equivalent feet. Vent reduction must begin at the boiler.

CAUTION

Do not reduce vent diameter on the ELP-199. Doing so will result in improper boiler operation, boiler shutdown, and property damage. Such damages ARE NOT covered by product warranty.

F. LONGER VENT RUNS

The maximum total equivalent length can be extended by equally increasing the diameter of both the exhaust vent and intake pipes. However, the transitions should begin a minimum of 16 total equivalent feet from the boiler.

The maximum equivalent length for increased diameter vent pipes is 275 ft, which includes the 16 ft from the boiler with a transition total of 259 ft upsize piping for longer vent runs.

CAUTION

Do not exceed the maximum lengths for increased diameter vent pipes. Excessive length could result in boiler shutdown and property damage.

VENT TRANSITION FITTING		
SIZE	**REDUCING COUPLING**	**FINAL VENT SIZE**
3” Venting	4” x 3”	4”

Table 14

G. EXHAUST VENT AND INTAKE PIPE INSTALLATION

⚠ WARNING

All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into living space. Failure to do so could result in property damage, severe personal injury, or death.

1. Use only solid PVC or CPVC pipe, or a Stainless Steel or Polypropylene vent system, approved for use with Category IV boilers.

FOAM CORE PIPING IS NOT APPROVED FOR EXHAUST APPLICATIONS. Foam core piping may be used on air inlet piping **only**.

2. Remove all burrs and debris from joints and fittings.

3. When using PVC or CPVC pipe, all joints must be properly cleaned, primed, and cemented. Use only cement and primer approved for use with the pipe material. Cement must conform to ASTM D2564 for PVC and ASTM F493 for CPVC pipe. **NOTE: DO NOT CEMENT POLYPROPYLENE PIPE.**

4. Ensure the vent is located where it will not be exposed to prevailing winds.

5. In all roof venting applications, exhaust discharge must point away from the pitch of the roof.

6. To prevent water leakage, install adequate roof flashing where the pipe enters the roof.

7. Do not locate vent over public walkways, driveways, or parking lots. Condensate could drip and freeze, resulting in a slip hazard or damage to vehicles and machinery.

8. Due to potential moisture build-up, sidewall venting may not be the preferred venting option. To save time and cost, carefully consider venting installation and location.

9. Horizontal lengths of exhaust vent must slope back towards the appliance not less than ¼" per foot to allow condensate to drain from the vent pipe.

10. The exhaust vent must terminate where vapors cannot make accidental contact with people or pets, or damage shrubs or plants.

11. In vacant chimney applications, install and seal a rain cap over existing chimney openings.

12. All piping must be fully supported. Use pipe hangers at a minimum of 4 foot intervals to prevent sagging of the pipe where condensate may form.

13. Do not use the appliance to support any piping.

14. A screened straight coupling is provided with the appliance for use as an outside exhaust termination.

15. A screened inlet air tee is provided with the appliance to be used as an outside intake termination.

The following information on Table 15 lists optional exhaust/intake terminations available from HTP:

DESCRIPTION	STOCK CODE
3” PVC CONCENTRIC VENT TERMINATION KIT	KGAVT0601CVT
3” STAINLESS STEEL VENT TERMINATION KIT	V1000
4” STAINLESS STEEL VENT TERMINATION KIT	V2000
3” POLYPRO VENT KIT	8400P-001

Table 15

H. SIDEWALL VENTING W/ TEE (INTAKE) AND COUPLING (EXHAUST)

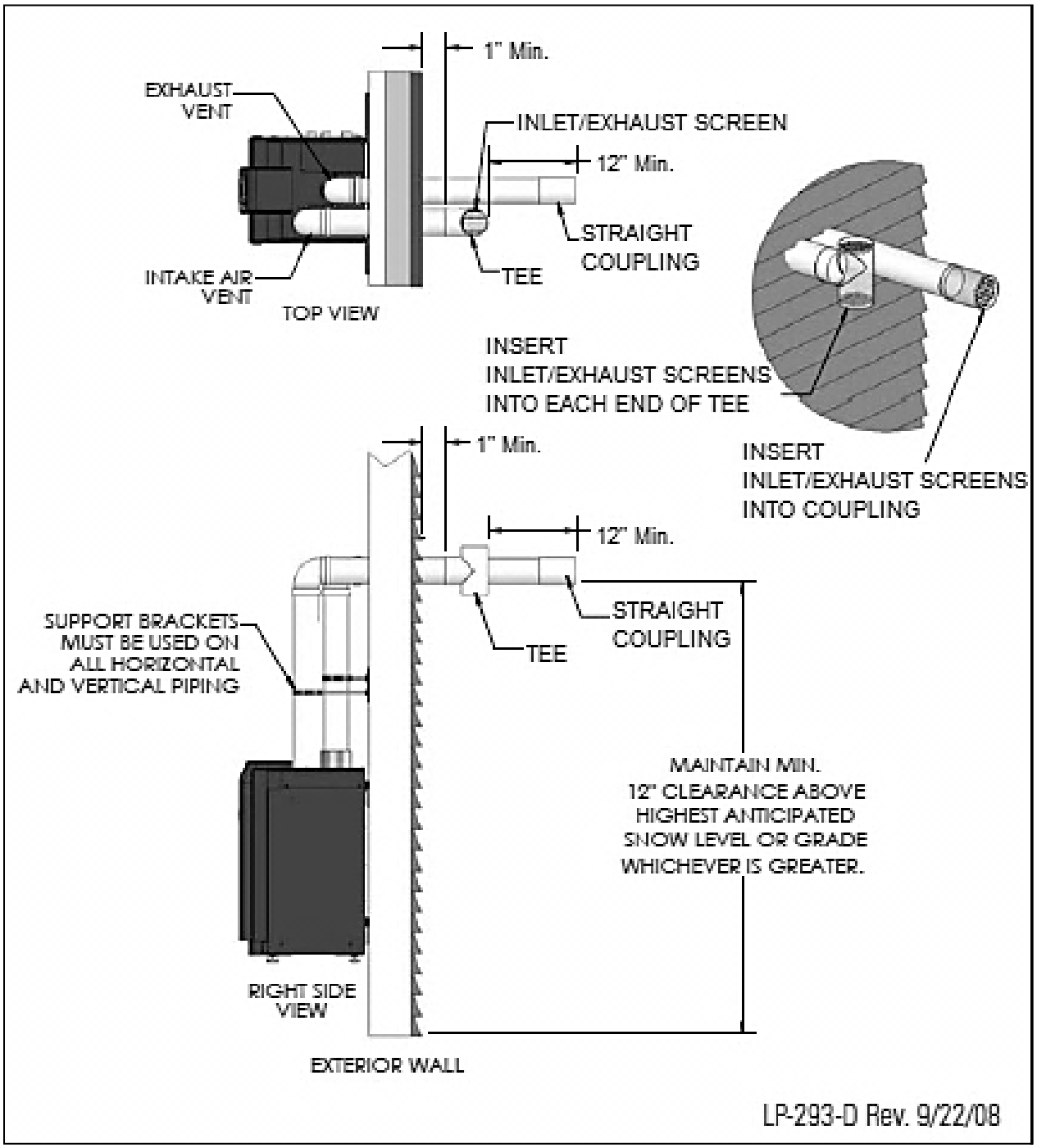


Figure 14 – Sidewall Venting with Tee (Intake) and Coupling (Exhaust) – LP-293-E

NOTE: Vent piping should be 12" over anticipated maximum snow level.

NOTE: Drawing is meant to demonstrate system venting ONLY.

⚠ WARNING

All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼" per foot back to the boiler to allow drainage of condensate. When placing support brackets on vent piping, the first bracket must be within 1 foot of the boiler and the balance at 4 foot intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

I. VERTICAL VENTING W/ TEE (INTAKE) AND COUPLING (EXHAUST)

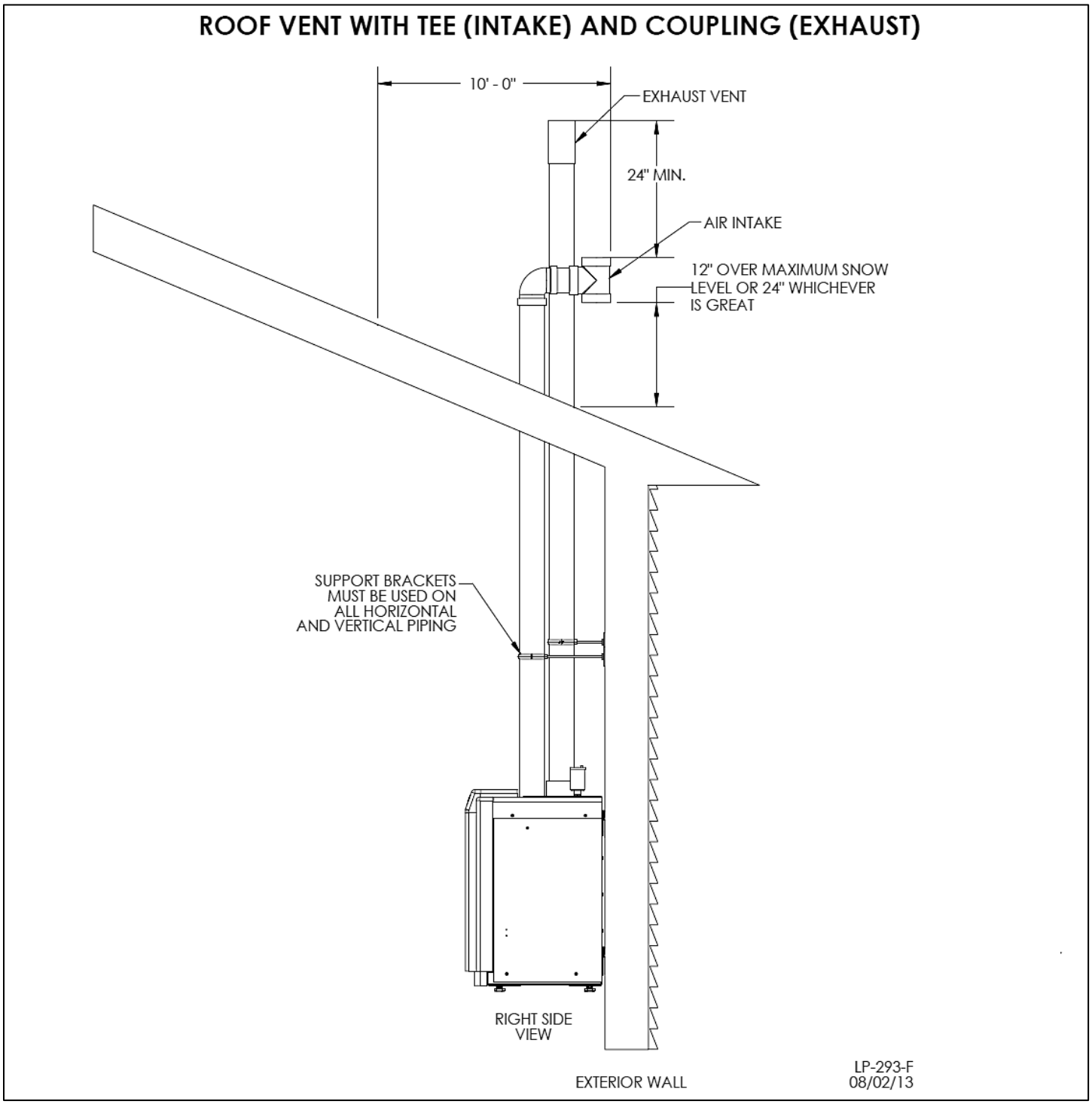


Figure 15 – Vertical Venting - LP-293-F

NOTE: Vent piping should be 12" over anticipated maximum snow level.

NOTE: Drawing is meant to demonstrate system venting ONLY.

⚠ WARNING

All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼" per foot back to the boiler to allow drainage of condensate. When placing support brackets on vent piping, the first bracket must be within 1 foot of the boiler and the balance at 4 foot intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

J. HORIZONTAL VENTING

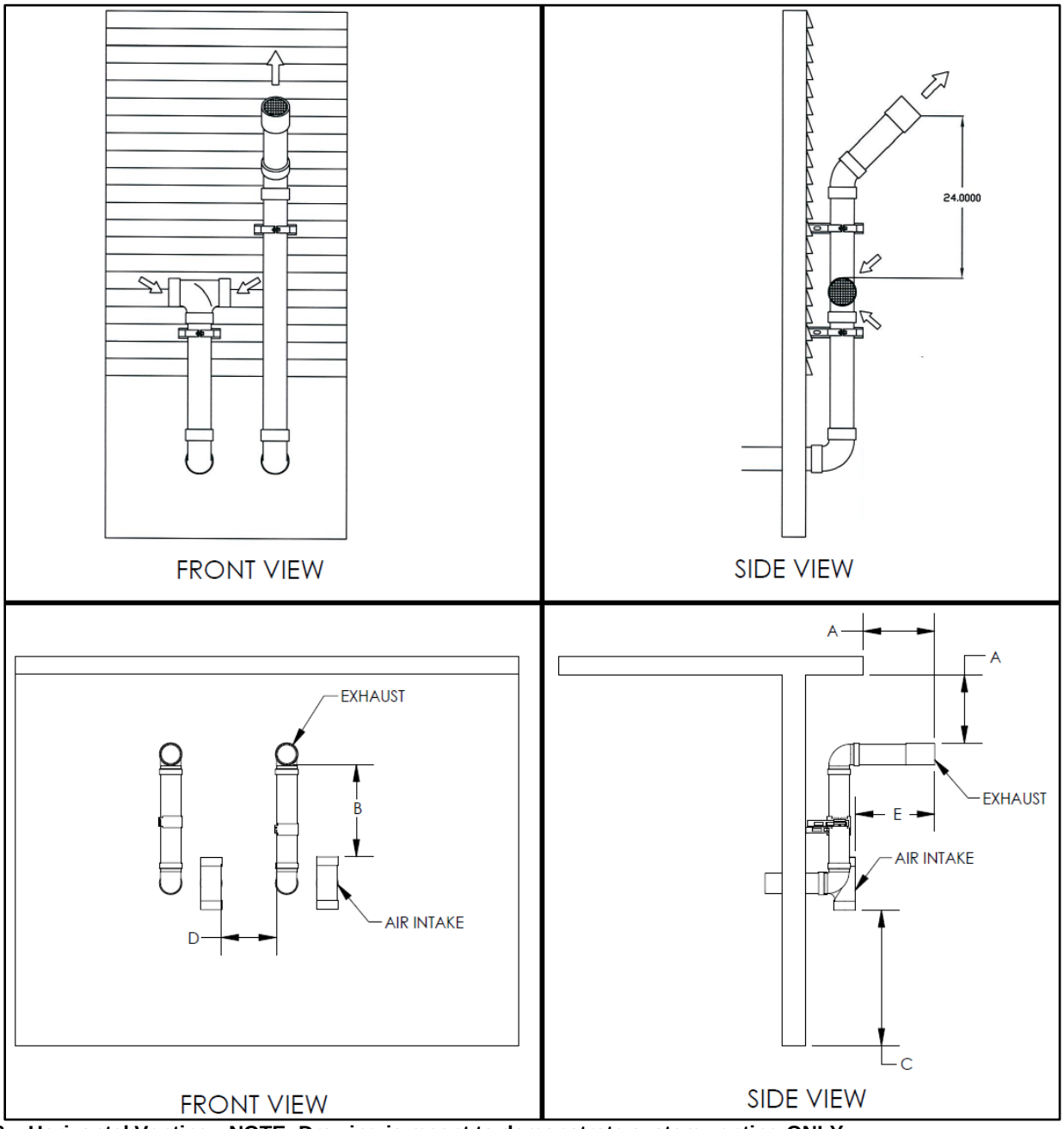


Figure 16 – Horizontal Venting - NOTE: Drawing is meant to demonstrate system venting ONLY.

NOTES:

A. For every 1” of overhang, the exhaust vent must be located 1” vertical below overhang (overhang means top of building structure and not two adjacent walls [corner of building]).
B. Typical installations require 12” minimum separation between bottom of exhaust outlet and top of air intake.
C. Maintain 12” minimum clearance above highest anticipated snow level or grade (whichever is greater).
D. Minimum 12” between vents when installing multiple vents.
E. 12” minimum beyond air intake.

⚠ WARNING

All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼” per foot back to the boiler to allow drainage of condensate. When placing support brackets on vent piping, the first bracket must be within 1 foot of the boiler and the balance at 4 foot intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

K. UNBALANCED FLUE / VERTICAL VENT

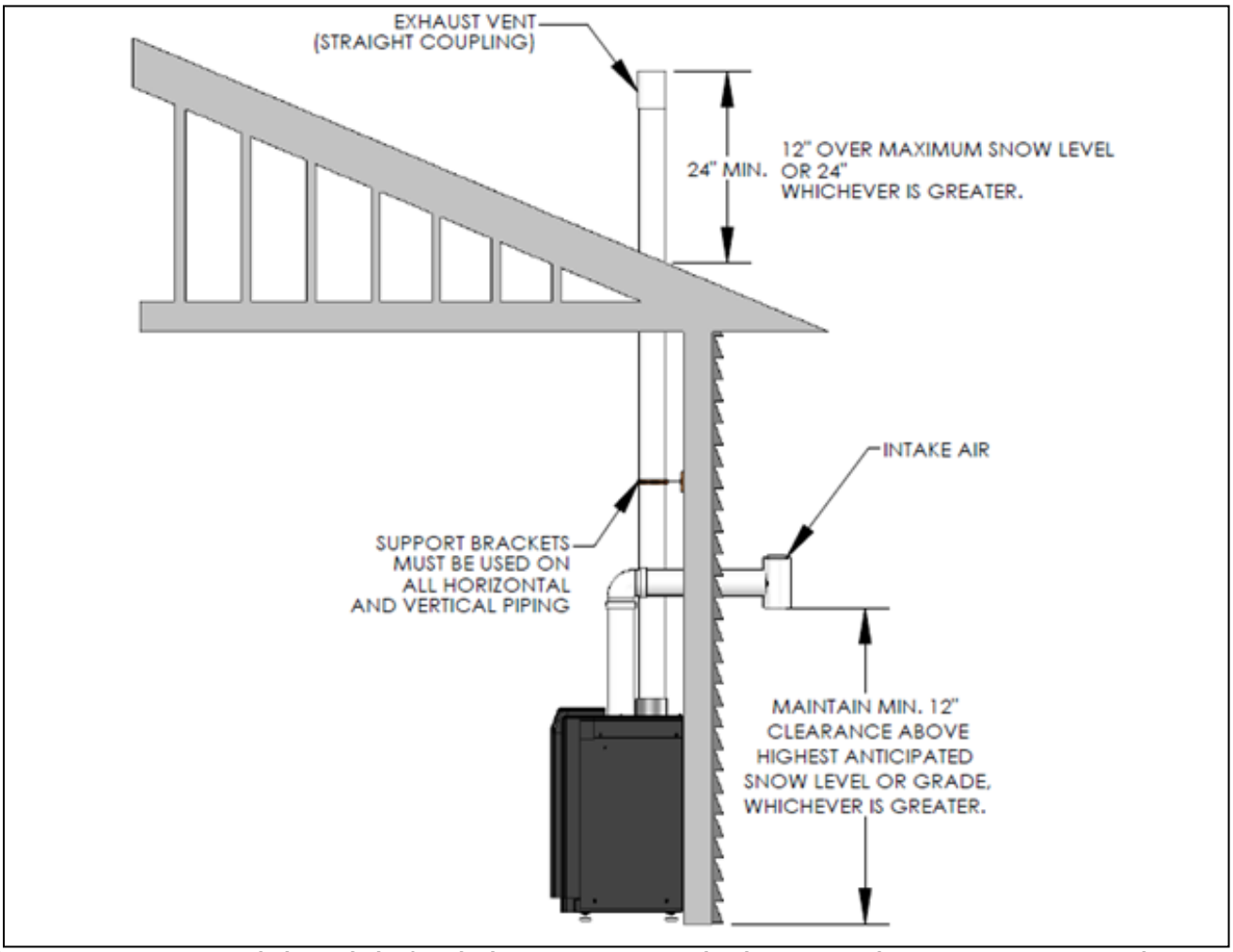


Figure 17 – LP-293-T – Unbalanced Flue/Vertical Vent - NOTE: Drawing is meant to demonstrate system venting ONLY.

⚠ WARNING

All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼" per foot back to the boiler to allow drainage of condensate. When placing support brackets on vent piping, the first bracket must be within 1 foot of the boiler and the balance at 4 foot intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

⚠ WARNING

An unbalanced vent system can be installed ONLY when the exhaust is in a vertical position.

L. VENTING THROUGH AN EXISTING SYSTEM

This boiler may be vented through an existing unused vent system. The inner diameter of the existing vent system is utilized for the combustion air source. Two methods have been approved for such venting: Concentric Venting Through an Existing System and Venting as a Chase.

⚠ DANGER

Do not install the boiler into a common existing vent with any other appliance. This will cause flue gas spillage or boiler malfunction, resulting in substantial property damage, severe personal injury, or death.

CAUTION

Contractors must check state and local codes before installing through an existing vent opening. State and local codes always take precedence over manufacturer's instructions. Failure to check state and local codes before installing through an existing opening could result in property damage and add significantly to installation costs.

1. CONCENTRIC VENTING THROUGH AN EXISTING SYSTEM

NOTE: The following instructions refer only to venting through an existing vent system, and not to venting with HTP's concentric vent kits (2" Part # KGVAT0501CVT, 3" Part # KGAVT0601CVT). Refer to Concentric Vent Kit installation manual (Part # LP-166) for further concentric venting information and instructions.

Concentric venting through an existing system must run vertically through the roof. See Table 16 for proper minimum vent sizing. Use only the approved venting materials specified in Table 11 for piping the system. All instructions listed in Part 5 - Venting, Sections A – G apply. See Figures 18-1 and 18-2 for venting demonstrations.

⚠ DANGER

The upper and lower vent terminations as well as all joints in the venting system must be properly sealed to ensure that all combustion air is drawn properly and exhaust does not leak from the system. Failure to properly seal the venting system will result in property damage, severe personal injury, or death.

NOTES:
A. For every 1" of overhang, the exhaust vent must be located 1" vertical below overhang (overhang means top of building structure and not two adjacent walls [corner of building]).
B. Typical installations require 12" minimum separation between bottom of exhaust outlet and top of air intake.
C. Maintain 12" minimum clearance above highest anticipated snow level or grade (whichever is greater).
D. Minimum 12" between vents when installing multiple vents.
E. 12" minimum beyond air intake.
F. Maintain 12" minimum clearance above highest anticipated snow level or grade (whichever is greater).

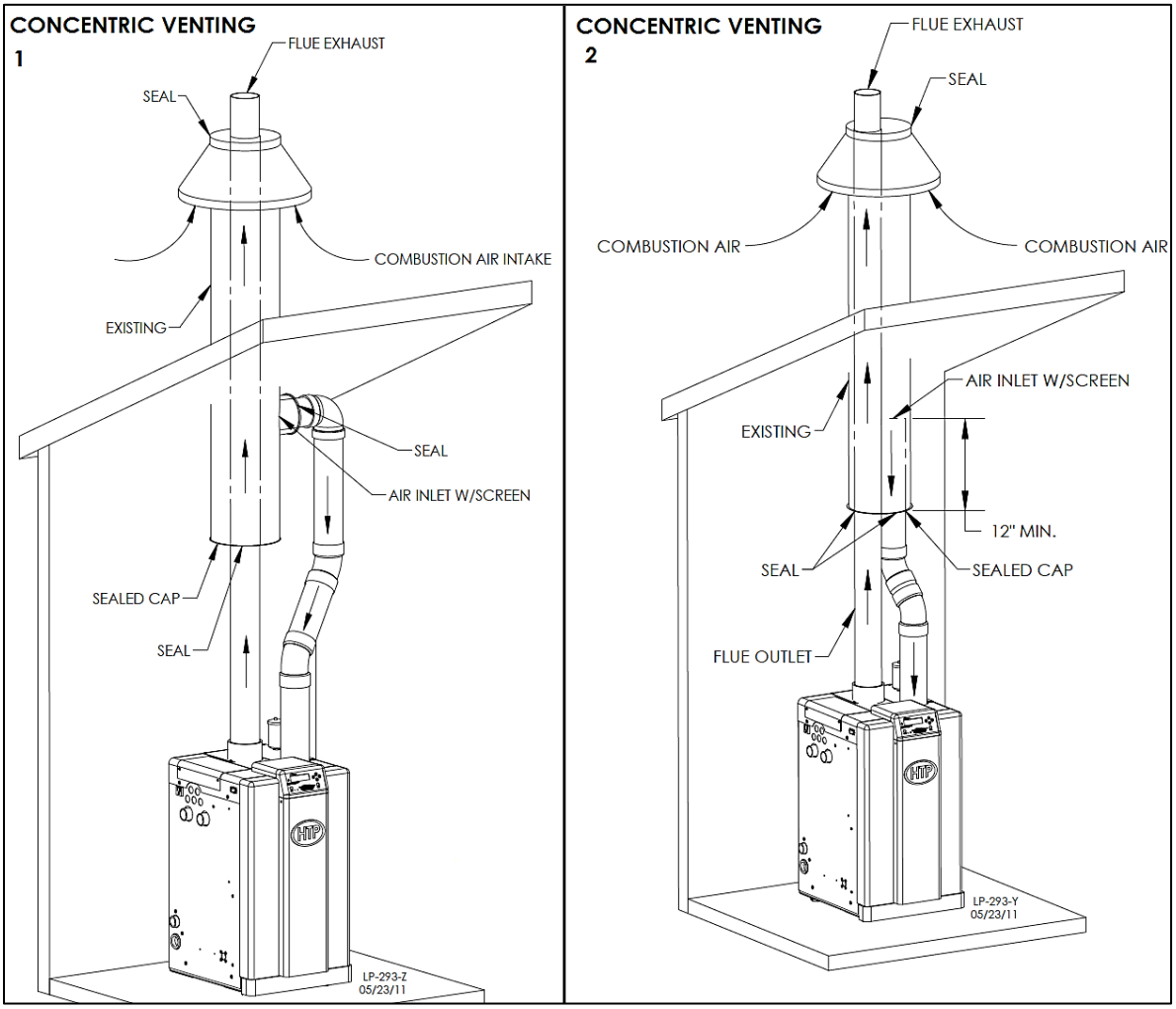


Figure 18 – 1, 18 – 2 Concentric Venting NOTE: Drawing is meant to demonstrate system venting ONLY.

CAUTION

If an existing venting system is converted for use with this boiler, the installer must ensure that the existing venting system is clean and free from particulate contamination that could damage the boiler. Failure to do so could result in property damage and boiler failure. Such failure IS NOT covered under warranty.

VENT / AIR INLET SIZE	MINIMUM EXISTING VENT / CHASE SIZE
2"	4"
3"	5"
4"	7"

Table 16 – Minimum Vent / Chase Sizing

2. VENTING AS A CHASE

When venting as a chase, follow all instructions included in Part 5 – Venting, Sections A – G of this manual, as well as the previous Concentric Venting section. See Figure 19 for chase venting demonstration.

NOTES:

A. For every 1" of overhang, the exhaust vent must be located 1" vertical below overhang (overhang means top of building structure and not two adjacent walls [corner of building]).
B. Typical installations require 12" minimum separation between bottom of exhaust outlet and top of air intake.
C. Maintain 12" minimum clearance above highest anticipated snow level or grade (whichever is greater).
D. Minimum 12" between vents when installing multiple vents.
E. 12" minimum beyond air intake.
F. Maintain 12" minimum clearance above highest anticipated snow level or grade (whichever is greater).

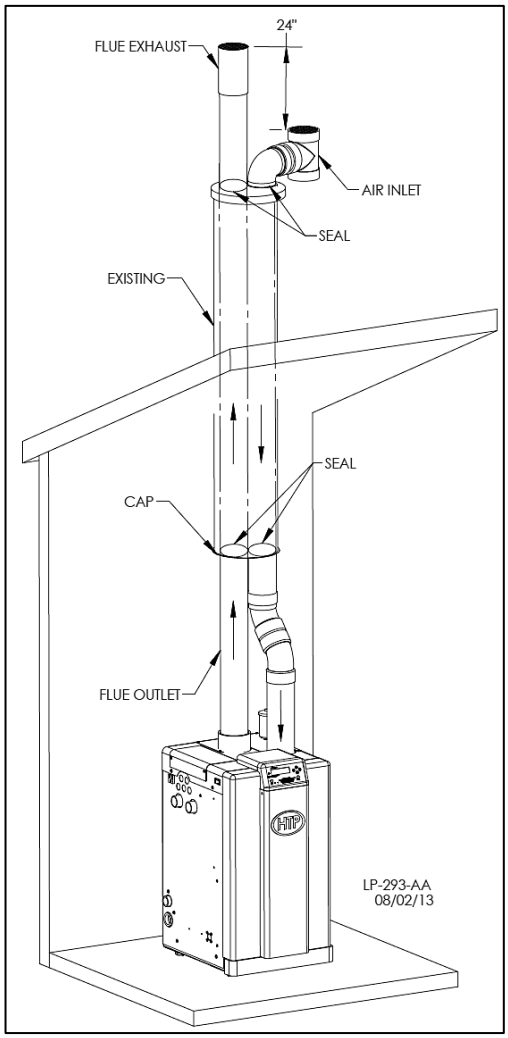


Figure 19 – Venting as a Chase

M. INDOOR COMBUSTION AIR INSTALLATION IN CONFINED OR UNCONFINED SPACE

NOTE: This installation is intended for commercial applications. For residential applications, it is recommended to pipe intake combustion air from the outdoors.

This boiler requires fresh, uncontaminated air for safe operation and must be installed in a mechanical room where there is adequate combustion and ventilating air. **NOTE: To prevent combustion air contamination, see Table 3.**

Combustion air from the indoor space can be used if the space has adequate area or when air is provided through a duct or louver to supply sufficient combustion air based on the boiler input. **Never obstruct the supply of combustion air to the boiler.** If the boiler is installed in areas where indoor air is contaminated (see Table 3) it is imperative that the boiler be installed as direct vent so that all combustion air is taken directly from the outdoors into the boiler intake connection.

Unconfined space is space with volume not less than 50 cubic feet per 1,000 Btu/hour (4.8 cubic meters per kW) of the total input rating of all fuel-burning boilers installed in that space. Rooms connected directly to this space, through openings not furnished with doors, are considered part of the space.

Confined space is space with volume less than 50 cubic feet per 1,000 Btu/hour (4.8 cubic meters per kW) of the total input rating of all fuel-burning boilers installed in that space. Rooms connected directly to this space, through openings not furnished with doors, are considered part of the space.

When drawing combustion air from inside a conventionally constructed building to a confined space located on the same story, such space should be provided with two permanent openings: one located 6" (15 cm) below the space ceiling, the other 6" (15cm) above the space floor. Each opening should have a free area of one square inch per 1,000 Btu/hr (22cm^2/kW) of the total input of all boilers in the space, but not less than 100 square inches (645cm^2).

When drawing combustion air from inside a conventionally constructed building to a confined space located on different stories, such spaces should be considered as communicating spaces when connected with one or more permanent openings in doors or floors having a total minimum free area of two square inches per 1,000 Btu/hr (22cm^2/kW) of the total input of all boilers in the space, but not less than 200 square inches (645cm^2).

If the confined space is within a building of tight construction, air for combustion must be obtained from the outdoors as outlined in the Venting section of this manual.

NOTE: It is always recommended to isolate the boiler installation room from the rest of the building and bring uncontaminated air in from the outside for combustion and ventilation.

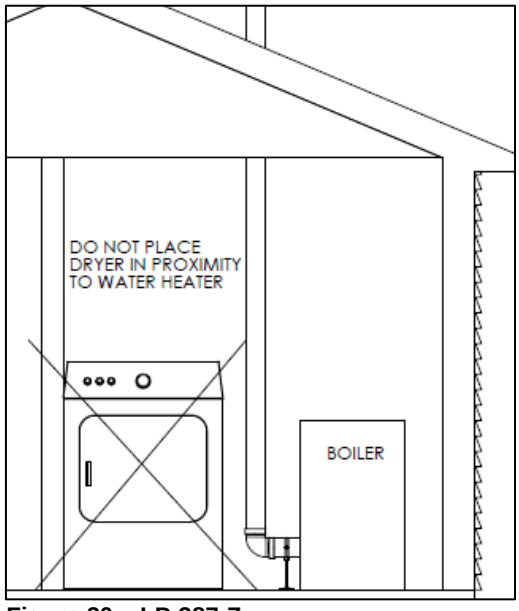


Figure 20 – LP-387-Z

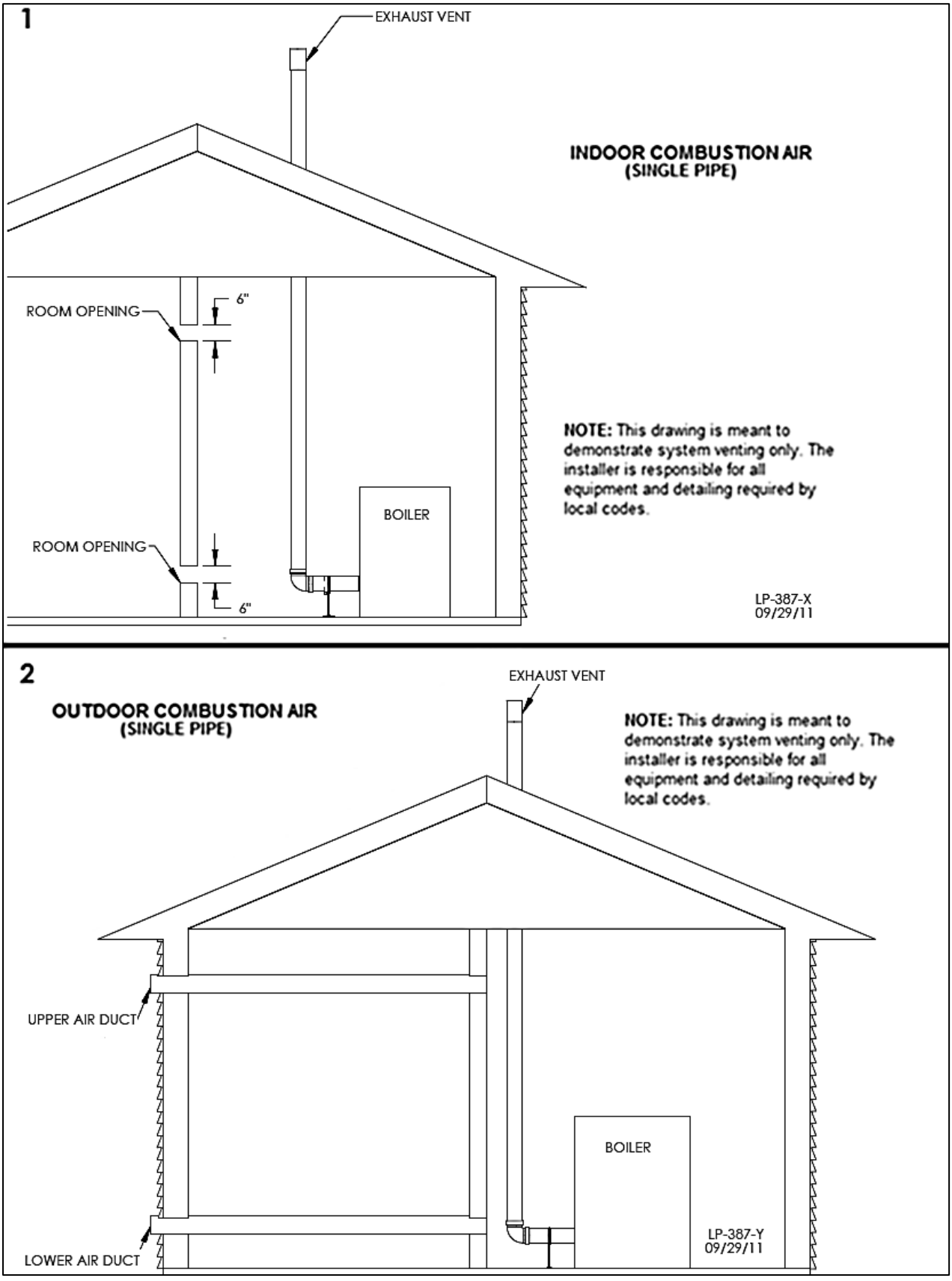


Figure 21 – 1, 21 - 2 NOTE: These drawings are meant to demonstrate system venting only. The installer is responsible for all equipment and detailing required by local codes.

PART 6 – GAS PIPING

⚠ WARNING

FAILURE TO FOLLOW ALL PRECAUTIONS IN THIS SECTION COULD RESULT IN FIRE, EXPLOSION, OR DEATH!

A. GAS CONNECTION

The gas supply shall have a maximum inlet pressure of less than 13" w.c. (3.5 kPa), and a minimum of 3.5" w.c. (.87 kPa). The entire piping system, gas meter and regulator must be sized properly to prevent pressure drop greater than 0.5" (.12 kPa) as stated in the National Fuel Gas Code. This information is listed on the rating label.

⚠ WARNING

The gas valve and blower will not support the weight of gas piping. Do not attempt to support the weight of piping with the boiler or its accessories. Failure to follow this warning could result in gas leakage, substantial property damage, severe personal injury, or death.

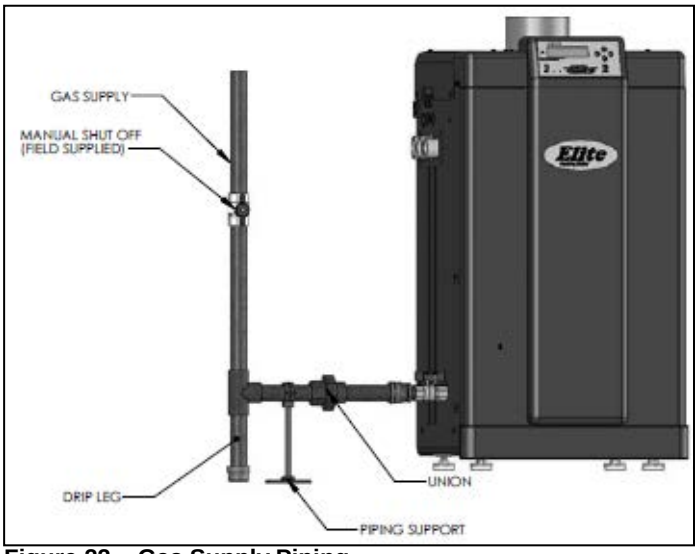


Figure 22 – Gas Supply Piping

The gas connection for the ELP-110 and ELP-199 is 3/4". It is mandatory that this fitting is used for connection to a field fabricated drip leg as shown in the illustration above per the National Fuel Gas Code. You must ensure that the entire gas line to the connection at the boiler is no smaller than the supplied connection.

Once all inspections have been performed, the piping must be leak tested. If the leak test requirement is a higher test pressure than the maximum inlet pressure, you must isolate the boiler from the gas line. In order to do this, shut the gas off using factory and field-installed gas cocks. This will prevent high pressure. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than ½ PSI, 13" w.c. (3.23 kPa), the gas valve must be replaced. Never use an open flame (match, lighter, etc.) to check gas connections.

Gas Table

(Nominal Iron Pipe Size (inches)	Internal Diameter (inches)	Length of Pipe (Feet) 10	20	30	40	50	60	70	
3/4	.824	278	190	152	130	115	105	96	BTU'S
1	1.049	520	350	285	245	215	195	180	PER
1 1/4	1.380	1,050	730	590	500	440	400	370	HOUR
1 1/2	1.610	1,600	1,100	890	760	670	610	560	x1,000

(Nominal Iron Pipe Size (inches)	Internal Diameter (inches)	Length of Pipe (Feet) 80	90	100	125	150	175	200	
3/4	.824	90	84	79	72	64	59	55	BTU'S
1	1.049	170	160	150	130	120	110	100	PER
1 1/4	1.380	350	320	305	275	250	225	210	HOUR
1 1/2	1.610	530	490	460	410	380	350	320	x1,000

Table 17 – Gas Table – Pipe Size / BTUs per hour

B. GAS PIPING

1. Run the gas supply line in accordance with all applicable codes.

2. Locate and install manual shutoff valves in accordance with state and local requirements.

3. In Canada, the manual shutoff must be identified by the installing contractor.

4. It is important to support gas piping as the boiler is not designed to structurally support a large amount of weight.

5. Purge all gas lines thoroughly to avoid start up issues with air in the lines.

6. Sealing compound must be approved for gas connections. Care must be taken when applying compound to prevent blockage or obstruction of gas flow which may affect the operation of the boiler.

⚠ WARNING

Failure to apply pipe sealing compound as detailed above could result in substantial property damage, severe personal injury, or death.

⚠ WARNING

Never use an open flame (match or lighter) to check for gas leaks. Use a soapy solution to test connection. Failure to use a soapy solution test or check gas connection for leaks can result in substantial property damage, severe personal injury, or death.

CAUTION

Use two wrenches when tightening gas piping at the boiler: One to prevent the boiler gas line from turning. Failure to prevent the boiler gas connection from turning could result in damage to gas line components, substantial property damage, severe personal injury, or death.

CAUTION

CSA or UL listed flexible gas connections can be used when installing the boiler. Flexible gas connections have different capacities and must be sized correctly for boiler firing rates. Consult with the flex line supplier to assure line size is adequate. Follow local codes for proper installation and service requirements.

C. CHECK INLET GAS PRESSURE

The gas valve is equipped with an inlet gas pressure tap that can be used to measure the gas pressure to the boiler. To check gas pressure, perform the steps listed below:

1. **IMPORTANT!** Before you connect to the inlet pressure, shut off the gas and electrical power to boiler.

2. Loosen the pressure tap with a small screwdriver. Refer to Figure 23 for location.

3. Each boiler is equipped with a needle valve that will accept a 5/16 ID hose to connect to a digital manometer or liquid gauge to measure incoming pressure from 0-35" w.c. See Figure 23.

4. Turn on the gas and power up the boiler. Open all radiators to ensure full heat load.

5. Put the boiler into Installer Menu Test Mode (details on Test Mode are in Part 10). In Test Mode, monitor pressure to assure it does not drop below 1 inch from its idle reading. If gas pressure is out of range or pressure drop is excessive, contact the gas utility, gas supplier, qualified installer, or service agency to determine correct action that is needed to provide proper gas pressure to the boiler. If Gas Pressure is within normal range proceed to Step 6.

6. Exit test mode, then turn power off and shut off gas supply at the manual gas valve before disconnecting the hose from the gas monitoring device. Tighten screw on the pressure tap and turn gas on. Check for leaks with soapy solution. Bubbles will appear on the pipe to indicate a leak is present.

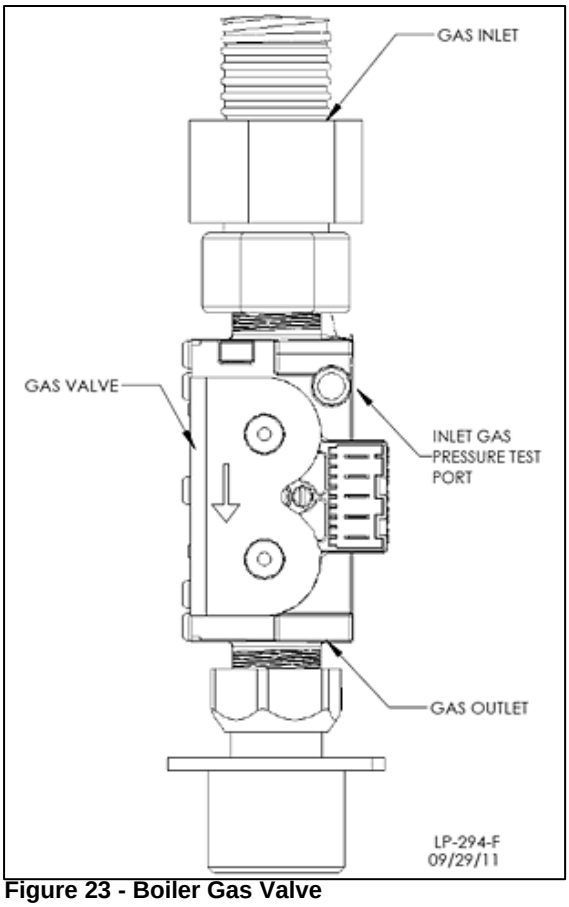


Figure 23 - Boiler Gas Valve

⚠ WARNING

Ensure the pressure tap screw is properly tightened to prevent gas leaks. Failure to do so could cause substantial property damage, severe personal injury, or death.

Gas piping must be sized for proper flow and length of pipe to avoid pressure drop. The gas meter and regulator must be properly sized for total gas load. If you experience a pressure drop greater than 1" w.c. (.87 kPa), the meter, regulator or gas line may be undersized or in need of service. You can attach a manometer to the incoming gas drip leg after removing the cap. Gas pressure must remain between 3.5" (.87 kPa) and 13" (3.23 kPa) during stand-by (static) mode and while in operating (dynamic) mode.

If an in-line regulator is used, it must be installed a minimum of 10 ft from the boiler. It is very important that the gas line is properly purged by the gas supplier or utility. Failure to properly purge the lines, or improper line sizing, will result in ignition failure. This problem is especially noticeable in NEW LP installations and empty tank situations. This situation can also occur when a utility company shuts off service to an area to provide maintenance to their lines. This gas valve must not be replaced with a conventional gas valve under any circumstances.

⚠ WARNING

DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure and requires no field adjustment. Attempts by the installer to adjust or measure the gas valve outlet pressure could result in damage to the valve and cause substantial property damage, severe personal injury, or death.

⚠ WARNING

Ensure that the high gas pressure regulator is as least 6 – 10 feet upstream of the boiler. Failure to do so could result in substantial property damage, severe personal injury, or death.

⚠ WARNING

Strain on the gas valve and fittings may result in vibration, premature component failure and gas leakage, and result in fire, explosion, property damage, severe personal injury, or death.

⚠ WARNING

Adjustments to the throttle screw or offset may only be made by a qualified gas technician using a calibrated combustion analyzer capable of measuring CO_2 and CO. Failure to follow this instruction could result in fire, explosion, property damage, severe personal injury, or death.

PART 7 – FIELD WIRING

⚠ WARNING

To avoid electrical shock, turn off all power to the appliance prior to opening an electrical box within the unit. Ensure the power remains off while any wiring connections are being made. Failure to follow these instructions could result in component or product failure, serious injury, or death. Such product failure IS NOT covered by warranty.

⚠ WARNING

ELECTRICAL SHOCK HAZARD - For your safety, turn off electrical power supply at service entrance panel before making any electrical connections. Failure to do so can result in severe personal injury or death.

CAUTION

Wiring must be N.E.C. Class 1. If original wiring supplied with the boiler must be replaced, use only AWM/TEW 105 ^{o}C wire or equivalent. Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – Latest Edition. Follow all local codes.

⚠ CAUTION

To ease future service and maintenance, label all wires. Wiring errors can cause improper and dangerous operation, and result in substantial property damage, severe personal injury, or death.

A. INSTALLATION MUST COMPLY WITH:

1. National Electrical Code and any other national, state, provincial or local codes or regulations.

2. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

B. FIELD WIRING TERMINATIONS

All connections made to the boiler in the field are done inside the electrical junction box located on the left side of the boiler. Multiple knockout locations are available to route field wires into and out of the electrical junction box.

C. FIELD WIRING

The control used in the boiler is capable of directly controlling 3 pumps – General, CH, and DHW. Total pump output current available for the pumps cannot exceed 3 amps at 120 volts. If a pump requires more than this amount of power, an external contactor or motor starter is needed. The system pump output is capable of switching 0.5 amps at 120 volts, in addition to the boiler and DHW pumps described above.

The electrical junction box has separate, clearly marked terminal strips for line voltage and low voltage wiring. Special jacks are provided for trouble-free cascade system wiring using standard “Straight Through” CAT3 or CAT5 patch cables.

D. LINE VOLTAGE WIRING FOR STANDARD BOILER

1. Connect incoming power wiring to the line voltage terminal strip in the electrical junction box at terminals 120V, Neutral, Ground (shown in Figure 27).

2. A line voltage fused disconnect switch may be required, externally mounted and connected according to local codes that may apply.

3. Connect the boiler pump as shown in Figure 27 to the terminals marked 1 – (HOT), 2 – (NEUT), and 3 – (GND). The connections shown are suitable for a maximum continuous pump draw of 4 amps at 120 volts. If the pump requires more current or voltage than the 120 volts supplied, an external motor starter or contactor will be required.

4. Connect the DHW pump (if used) as shown in Figure 27 to the terminals marked 4 – (HOT), 5 – (NEUT), and 6 – (GND). The connections are suitable for a maximum continuous pump draw of 4 amps at 120 volts. If the pump requires more current or voltage than the 120 volts supplied, an external motor starter or contactor will be required.

NOTE: The combined current draw of the boiler and CH pump cannot exceed 4 amps. If more than 4 amps total or a voltage other than 120 volts is required, it will be necessary to use an external motor starter or contactor.

5. Connect the system pump (if used) as shown in Figure 27 to the terminals marked 9 – (HOT), 2 – (NEUT), and 3 – (GND). Connect the power supply for the system pump to the terminal marked 8. This is often accomplished by placing a jumper wire from the terminal marked 120V (HOT) to the terminal marked 8. The connections shown are suitable for a maximum continuous pump draw of 5 amps at 120 volts. If the pump requires more current or voltage than the 120 volts supplied, an external motor starter or contactor will be required.

E. ALARM CONNECTIONS

An optional Interface Module is available that provides a dry contact alarm output (normally open).

F. LOW VOLTAGE CONNECTIONS FOR STANDARD BOILER

1. All low voltage cables should enter the electrical junction box through the provided knock out holes as shown at right.

2. Connect all low voltage field devices to the low voltage terminal strip located in the electrical junction box.

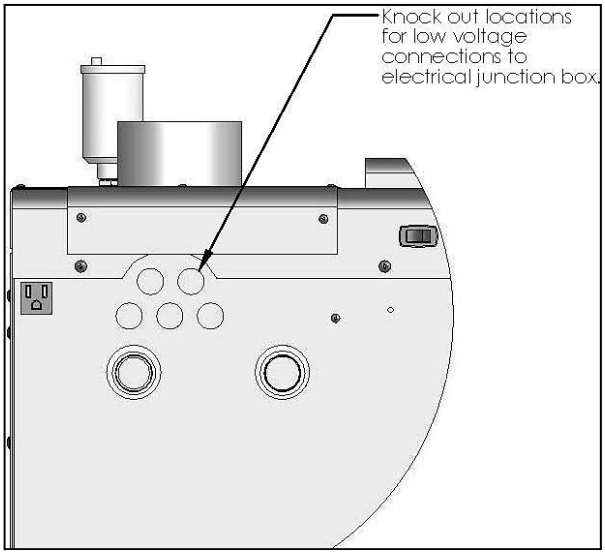


Figure 24 – Knockout Locations

G. THERMOSTAT

1. Connect the room thermostat to the terminals marked THERMOSTAT (14 and 15) in the electrical junction box (see Figure 27). Alternately, any dry contact closure across these terminals will cause the boiler to run. Take caution to ensure neither of the terminals becomes connected to ground. Neither of these connections can become grounded at any time. If an external transformer is used, such as when powering zone valves, care must be taken to ensure, a) that the transformer is on the same circuit that supplies power to the boiler, and b) that the connections are connected with the correct polarity.

If an external transformer is used and boiler runs continuously after wiring to the thermostat terminals, reverse the 2 wires on the thermostat terminals to correct the problem.

2. Mount the thermostat on an inside wall as central as possible to the area being heated, but away from drafts or heat producing devices such as television sets that could influence the ability of the thermostat to measure room temperature.

3. If the thermostat is equipped with an anticipator and it is connected directly to the boiler, the anticipator should be set at .1 amps. If the thermostat is connected to other device(s), the anticipator should be set to match the power requirements of the device(s). See the instruction manual of the connected device(s) for further information.

NOTE: On cascaded systems, wire the thermostat signal ONLY to the Master boiler.

CAUTION

When a powered transformer circuit exists in the installation location, the polarity of the thermostat connection may result in constant circulation or operation. Reversal of the thermostat connections will correct this issue.

H. OUTDOOR SENSOR

There is no connection required if an outdoor sensor is not used in the installation.

1. Use minimum 22 AWG wire for runs of 100 feet or less and minimum 18 AWG wire for runs up to 150 feet.

2. 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 will be exposed to varying weather conditions. NOTE: For correct mounting procedures, follow instructions provided with the sensor.

3. Connect the sensor to terminals 12 and 13, as shown in Figure 27.

NOTE: For correct mounting procedures, follow instructions provided with the sensor.

NOTE: If sensor wires are located in an area with sources of potential electromagnetic interference (EMI), the sensor wires should be shielded, or the wires routed in a grounded metal conduit. If using shielded cable, the shielding should be connected to the common ground of the boiler.

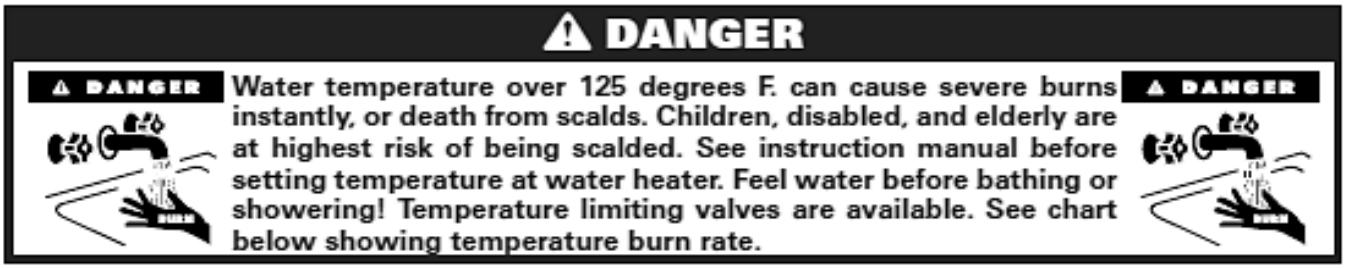
I. INDIRECT SENSOR

There is no connection required if an indirect water heater is not used in the installation.

1. The boiler will operate an indirect fired water heater with either a thermostat type aquastat installed in the indirect tank or an HTP 7250P-325 tank sensor. When a tank sensor is used, a demand for heat from the indirect water heater will be generated when tank temperature falls below the user set point by more than the user selectable offset. The demand will continue until the sensor measures that indirect water heater temperature is above the set point.

⚠ WARNING

Failure to use the correct sensor may result in tank temperature being either above or below set point, and could result in decreased performance, substantial property damage, or heightened risk of injuries due to scalds.



2. Connect the indirect sensor (7250P-325) to the terminals marked DHW SENSOR (10 and 11) (shown in Figure 27) in the electrical junction box.

⚠ WARNING

Take caution to ensure neither of these terminals becomes connected to ground.

NOTE: If sensor wires are located in an area with sources of potential electromagnetic interference (EMI), the sensor wires should be shielded, or the wires routed in a grounded metal conduit. If using shielded cable, the shielding should be connected to the common ground of the boiler.

J. OPTIONAL 0-10 VOLT BUILDING CONTROL SIGNAL

An optional Interface Module is available that provides a connection point for a 0 – 10 volt input.

K. SYSTEM SENSOR (CASCADE MASTER BOILER ONLY)

1. The system sensor must be installed on the piping at a point after the supply of all cascaded boilers is mixed together.

2. Connect the system sensor (7250P-324) to the terminals marked SYSTEM SENSOR (16 and 17) shown in Figure 27 in the cascade master electrical junction box.

L. WIRING OF CASCADE SYSTEM COMMUNICATION BUS

1. Use standard CAT3 or CAT5 “Straight Through” computer network patch cables to connect the communication bus between each of the boilers. These cables are readily available at any office supply, computer, electronic, department or discount home supply store in varying lengths. If you possess the skills you can also construct custom length cables.

2. It is recommended to use the shortest length cable that will reach between the boilers and create a neat installation. Do not run unprotected cables across the floor where they may become wet or damaged. Avoid running communication cables parallel and close to or against high voltage (120 volt or greater) wiring. HTP recommends the maximum length of communication bus cables not exceed 200 ft.

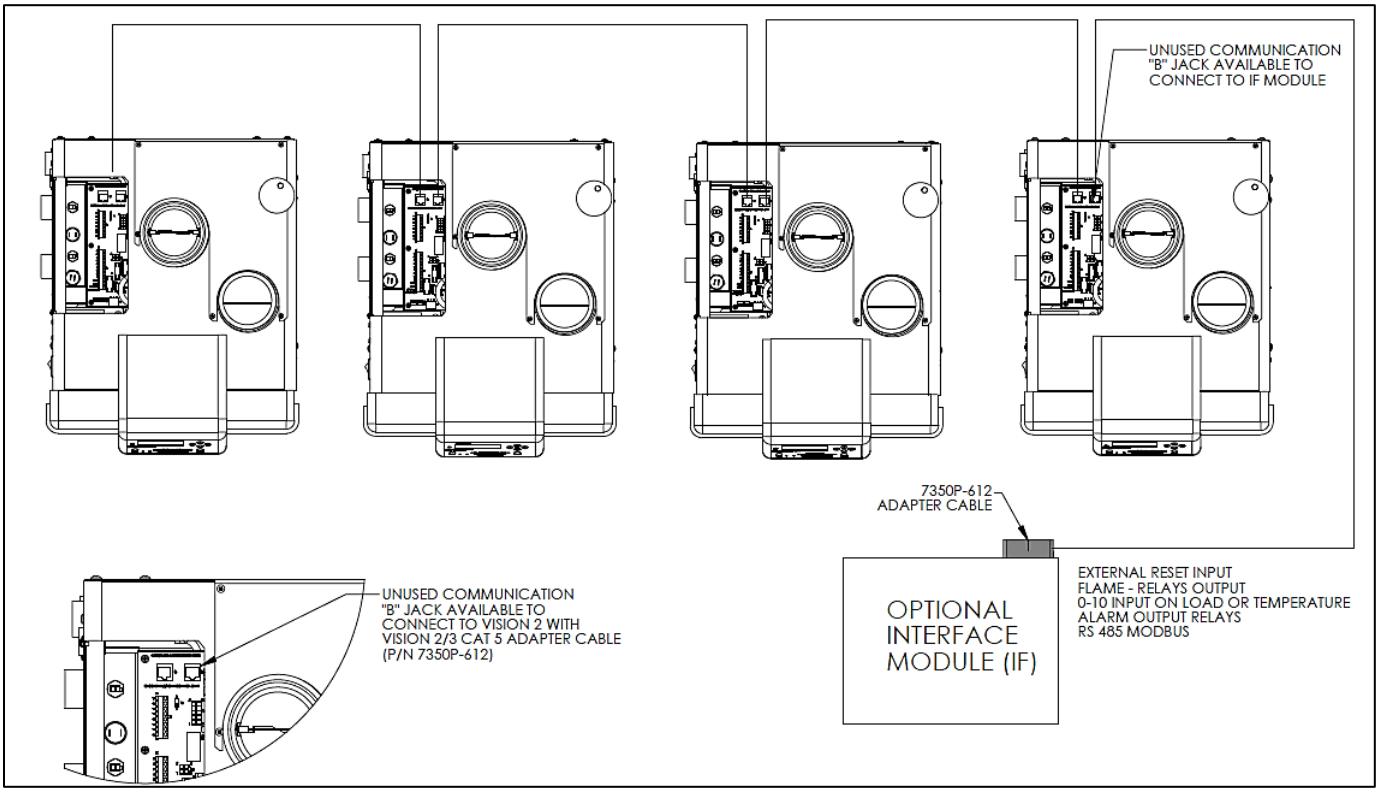


Figure 25 – Daisy Chain Wiring Configuration, with Optional Interface Module – LP-294-L

3. Route the communication cables through one of the knockouts in the cabinet.

4. Connect the boilers in a daisy chain configuration as shown below. It is best to wire the boilers using the shortest wire runs rather than trying to wire them in the order they are addressed. The communication bus jacks on the customer connection panel are interchangeable so you can use either one or both in any order to connect the cable. If you have connected the boilers to each other properly, two of the boilers will have one open connection port on them.

5. It is important to set the bus master switch on the control board to the ON (left) position on the master boiler, and to be sure that the switch is set to OFF (right) on the follower boilers and the Interface Module (if used) so there will be no adverse operation of the communication bus. The factory default position is ON.

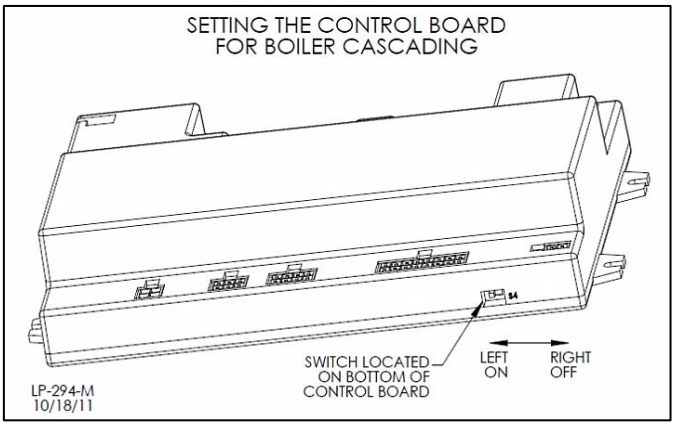


Figure 26 - Setting the Control Board for Cascading

M. CASCADE MASTER AND FOLLOWER WIRING

1. Wiring for the Cascade Master is accomplished in the same way as a single boiler, with one exception: The bus communication switch must be flipped to the ON (left) position on the Master. See Figure 26. Connect the system pump hot wire to the terminal marked SYS PUMP.

2. The Follower is wired in the same way as the Master, with two notable exceptions:
a. Pumps and sensors are connected to the Cascade Master ONLY.
b. The bus communication switch on Follower boilers must be set to the OFF (right) position to prevent bus communication interference.

NOTE: The cascaded system will not operate properly if the bus communication switches are set wrong.

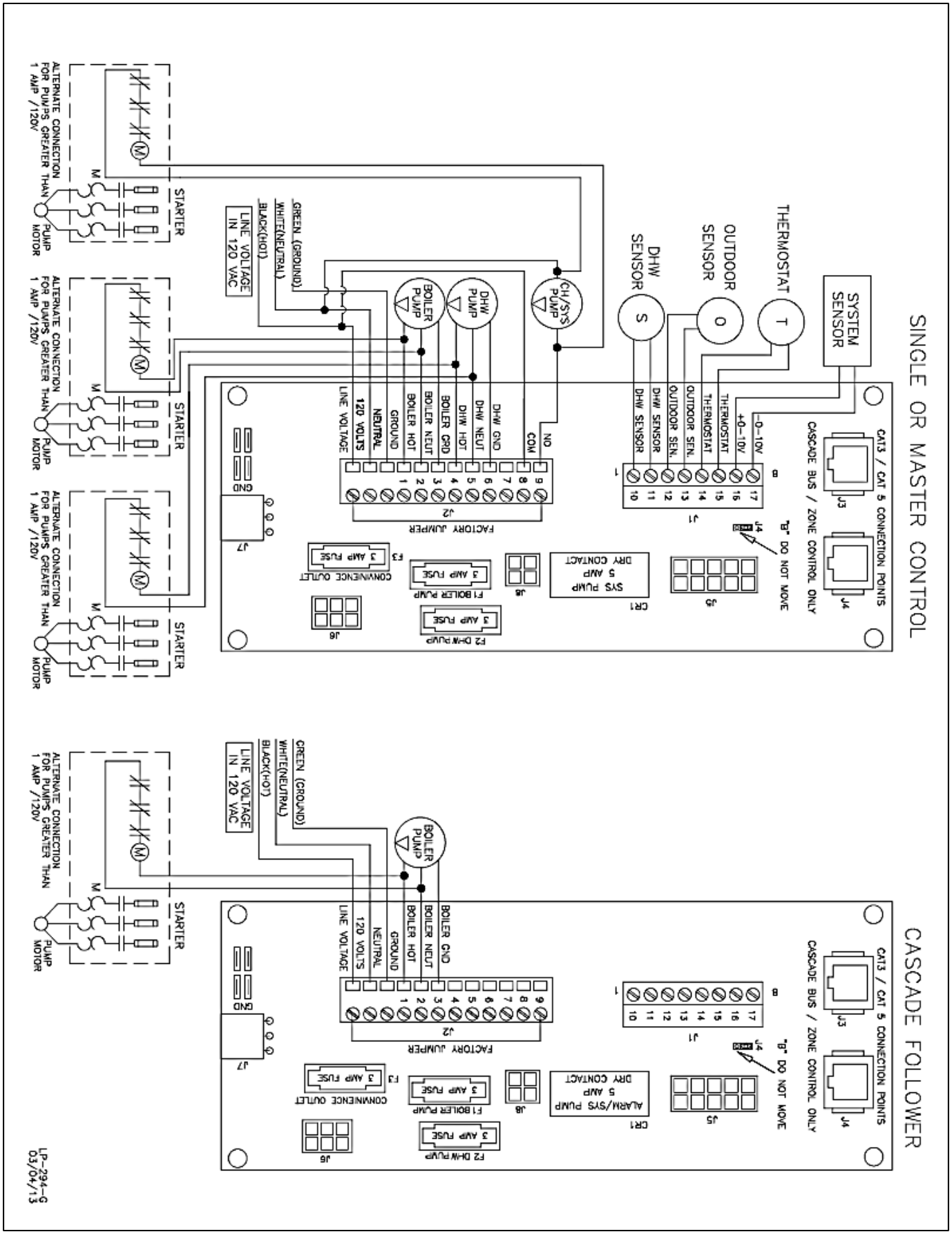


Figure 27 – Single or Cascade Master and Cascade Follower Controls

ELITE PLUS 110 & 199 BOILER INTERNAL CONNECTION DIAGRAM

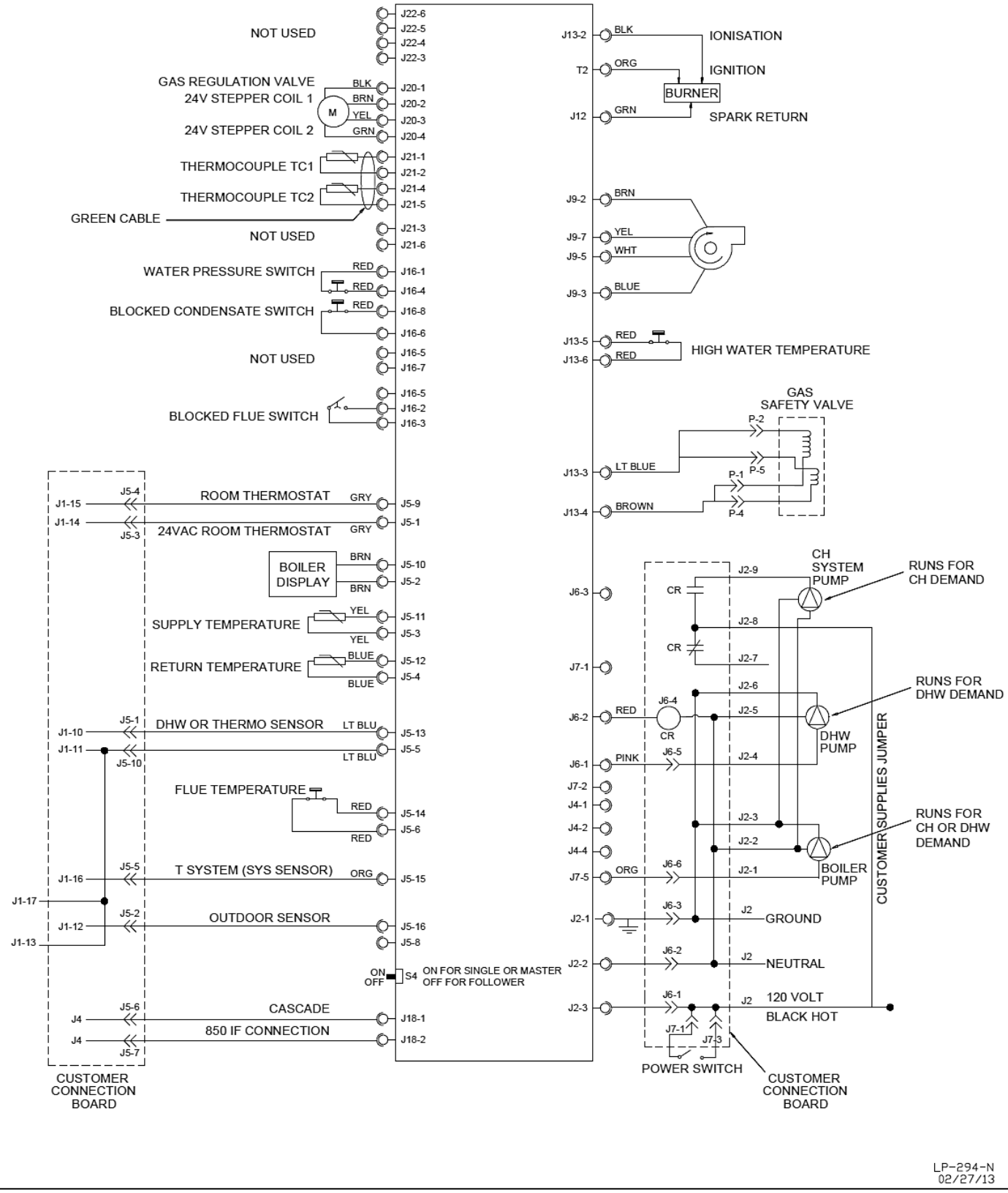


Figure 28

PART 8 – START-UP PREPARATION

⚠ WARNING

Thoroughly clean and flush any system that has used glycol before installing the boiler. Provide the customer with a material safety data sheet (MSDS) on the fluid used.

A. CHECK / CONTROL WATER CHEMISTRY

CAUTION

Chemical imbalance of your water can cause severe damage to your boiler and associated equipment, and may also affect efficiency. You may have to have your water quality professionally analyzed to determine whether you need to install a water softener. It is important that the water chemistry on both the domestic hot water and central heating sides are checked before installing the boiler, as water quality will affect the reliability of the system. Outlined below are those water quality parameters which need to be met in order for the system to operate efficiently for many years. **Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH or other imbalance IS NOT covered by the warranty.**

To assure good extended service life, it is recommended to test water quality prior to installation. Listed below are some guidelines.

⚠ WARNING

Do not use petroleum-based cleaning or sealing compounds in the boiler system. Damage to elastomer seals and gaskets in the system could occur, resulting in substantial property damage.

Water pH between 6.0 and 8.0
1. Maintain boiler water pH between 6.0 and 8.0. Check with litmus paper or have it chemically analyzed by a water treatment company.

2. If the pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains

Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chlorine concentration less than 100 ppm
1. Using chlorinated fresh water should be acceptable since drinking water chlorine levels are typically less than 5 ppm.

2. Do not connect the boiler to directly heat a swimming pool or spa water.

3. Do not fill boiler or operate with water containing chlorine in excess of 100 ppm.

Hardness: 7 grains
Chloride levels: 100 ppm
pH levels: 6-8
TDS: 2000 ppm
Sodium: 20 mGL

Clean system to remove sediment
1. You must thoroughly flush the system (without boiler connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment build up.

2. For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system).

3. Flush system until water runs clean and you are sure piping is free of sediment.

Test freeze protection fluid
1. For systems using freeze protection fluids, follow fluid manufacturer's instructions to verify inhibitor level and that other fluid characteristics are satisfactory.

2. Freeze protection fluid must be replaced periodically due to degradation of inhibitors over time. Follow all fluid manufacturer instructions.

B. FREEZE PROTECTION (WHEN USED)

1. Following fluid manufacturer instructions, determine the freeze protection fluid quantity using total system water content. Remember to include expansion tank water content.

⚠ WARNING

NEVER use automotive or standard glycol antifreeze. Do not use ethylene glycol made for hydronic systems. Use only generally recognized as safe freeze prevention fluids certified by fluid manufacturer as suitable for use with stainless steel boilers, verified in the fluid manufacturer literature.

Thoroughly clean and flush any system that has used glycol before installing the new boiler. Provide the owner with a Material Safety Data Sheet (MSDS) on the fluid used.

2. Local codes may require a back flow preventer or actual disconnect from city water supply.

3. When using freeze protection fluid with automatic fill, install a water meter to monitor water makeup. Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.

C. FILL AND TEST WATER SYSTEM

⚠ WARNING

Ensure the boiler is full of water before firing the burner. Failure to do so will damage the boiler. Such damage IS NOT covered by warranty, and could result in property damage, severe personal injury, or death.

1. Fill the system only after ensuring the water meets the requirements of this manual.

2. Close the manual and automatic air vents and boiler drain valve.

3. Fill to the correct system pressure. Correct pressure will vary with each application.
   a. Typical cold water fill pressure for a residential system is 12 psi.
   b. Pressure will rise when boiler is turned on and system water temperature increases. Operating pressure must never exceed the relief valve pressure setting.

4. At initial fill and during boiler startup and testing, check system thoroughly for any leaks. Repair all leaks before proceeding further.

5. Run pumps in System Test. Check for leaks.

⚠ WARNING

Eliminate all system leaks. Continual fresh make-up water will reduce boiler life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating the heat exchanger, and causing heat exchanger failure.

6. The system may have residual substances that could affect water chemistry. After the system has been filled and leak tested, verify that water pH and chlorine concentrations are acceptable by sample testing.

⚠ CAUTION

It is important that you purge the system of air to avoid damage to the boiler.

D. CHECK FOR GAS LEAKS

⚠ WARNING

Before starting the boiler, and during initial operation, smell near the floor and around the boiler for gas odorant or any unusual odor. Remove boiler front door and smell interior of boiler enclosure. Do not proceed with startup if there is any indication of a gas leak. Repair any leaks at once.

⚠ WARNING

PROPANE USE ONLY – Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas.

NOTE: When checking for gas leaks with leakage spray, use only approved chloride free leakage sprays. Use of chloride leakage sprays will result in damage to the boiler. Such damage is not covered by warranty.

⚠ WARNING

If you discover any evidence of a gas leak, shut down the boiler at once. Find the leak source with a bubble test and repair immediately. Do not start the boiler again until the leak is repaired. Failure to comply could result in substantial property damage, severe personal injury, or death.

E. CHECK THERMOSTAT CIRCUITS

1. Disconnect the two external wires connected to the boiler thermostat terminals (low voltage terminal strip).

2. Connect a voltmeter across these two incoming wires with power applied to thermostat circuits. Close each thermostat, zone valve and relay in the external circuit one at a time and check the voltmeter reading across the incoming wires.

3. There should NEVER be a voltage reading.

4. If a voltage does occur under any condition, check and correct the external wiring. (This is a common problem when using 3-wire zone valves.)

5. Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires to the boiler low voltage terminal strip.

CAUTION

When a powered transformer circuit exists in the installation location, the polarity of the thermostat connection may result in constant circulation or operation. Reversal of the thermostat connections will correct this issue.

6. Allow the boiler to cycle.

F. CONDENSATE REMOVAL

1. The boiler is a high efficiency condensing boiler, and the boiler has a condensate drain. Condensate fluid is nothing more than water vapor, derived from combustion products, similar to that produced by an automobile when it is initially started.

Condensation is slightly acidic (typically with a pH of 3 to 5) and must be piped with the correct materials. Never pipe the condensate using steel, copper, brass or other materials that will be subject to corrosion. Plastic PVC or CPVC pipe are the only approved materials.

A condensate filter, if required by local authorities, can be made up of lime crystals, limestone or phosphate chips that will neutralize the condensate. This may be done by the installer or you may purchase a condensate neutralizer from HTP (Part # 7450P-212).

2. The boiler is equipped with a ¾ female socket weld fitting connection that must be piped to a local drain. It is very important that the condensate line is sloped downward away from the boiler to a suitable inside drain. If the condensate outlet on the boiler is lower than the drain, you must use a condensate removal pump, available from HTP (Part # 554200). This pump is equipped with two leads that can be connected to an alarm or another type of warning device to alert the user of condensate overflow, which, if not corrected, could cause property damage.

3. If a long horizontal run is used, it may be necessary to create a vent in the horizontal run to prevent a vacuum lock in the condensate line.

4. Do not expose the condensate to freezing temperatures.

5. It is very important you support the condensation line to assure proper drainage.

G. FINAL CHECKS BEFORE STARTING BOILER

1. Read Startup Procedures within this manual for proper steps to start boiler. (Use Startup Report in this manual to record steps for future reference.)

2. Verify the boiler and system are full of water and all system components are correctly set for operation.

3. Ensure condensate trap is full of water. Fill condensate trap by pouring three cups of water into the exhaust opening of the boiler before the exhaust pipe is connected.

4. Verify electrical connections are correct and securely attached.

5. Inspect exhaust vent and intake piping for signs of deterioration from corrosion, physical damage or sagging. Verify exhaust vent and intake piping are intact and correctly installed per Venting Section, (Part 6) and local code.

H. CASCADE SYSTEM

1. If a single boiler is installed, skip this section.

2. Programming the Master Boiler:
   a. Make sure there is no demand for heat being supplied to the boiler (e.g. open thermostat).
   b. Set the bus master switch to the ON (left) position (factory default) on the master boiler and be sure the switch is set to OFF (right) on all followers (and the Interface Module, if used). This will ensure correct operation of the cascade bus.
   c. Apply power to the boiler.
   d. Enter the Installer Menu, Boiler Config, to set the address (Part 12, Section B of this manual).
   e. Set the cascade address function to 1.
   NOTE: The Master Boiler MUST be addressed as 1.
   f. Exit the Installer Menu.
3. Programming Follower Boilers:

NOTE: READ THE NOTES BELOW BEFORE PROGRAMMING FOLLOWER BOILERS

- It is recommended but not necessary to address boilers in the order that they are wired.
- No two boilers can have the same address.

a. Make sure there is no demand for heat being supplied to the master boiler (e.g. open thermostat).
b. Ensure the bus master switch is set to OFF (right).
c. Apply power to the follower boiler you are working on.
d. Enter the Installer Menu, Boiler Config, to set the address (Part 12, Section B of this manual).
e. Set cascade address to 2 for the second boiler, 3 for the third boiler, etc.
e. Exit the Installer Menu.

PART 9 – CONTROL AND DISPLAY OVERVIEW

⚠ WARNING

FOR YOUR OWN SAFETY READ BEFORE OPERATING

1. This boiler does not have pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

2. BEFORE OPERATING: smell all around the boiler area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any boiler.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- If you cannot reach your gas supplier, call the fire department.
- Turn off gas shutoff valve (located outside of the boiler) so that the handle is crosswise to the gas pipe. If the handle will not turn by hand, don't try to force or repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

4. 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 that has been damaged.

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

Failure to follow these instructions could result in property damage, serious personal injury, or death.

⚠ WARNING

If you discover any evidence of a gas leak, shut down the boiler at once. Find the leak source with a bubble test and repair immediately. Do not start the boiler again until the leak is repaired. Failure to comply could result in substantial property damage, severe personal injury, or death.

A. CONTROL OVERVIEW

The control is one of the primary safety devices of the boiler. It monitors the boiler safety sensors to assure safe and efficient operation, and has the capability to lock out and halt boiler operation when a fault or error is detected.

Also, the control has many features associated with hydronic design. By properly customizing boiler operating parameters, the installer can provide safe, efficient heating and domestic hot water to the end user.

B. MENU STRUCTURE

After the display has established communication with the main board, the installer will be able to use the display to navigate through the boiler menu structure. That structure is summarized in Figure 29.

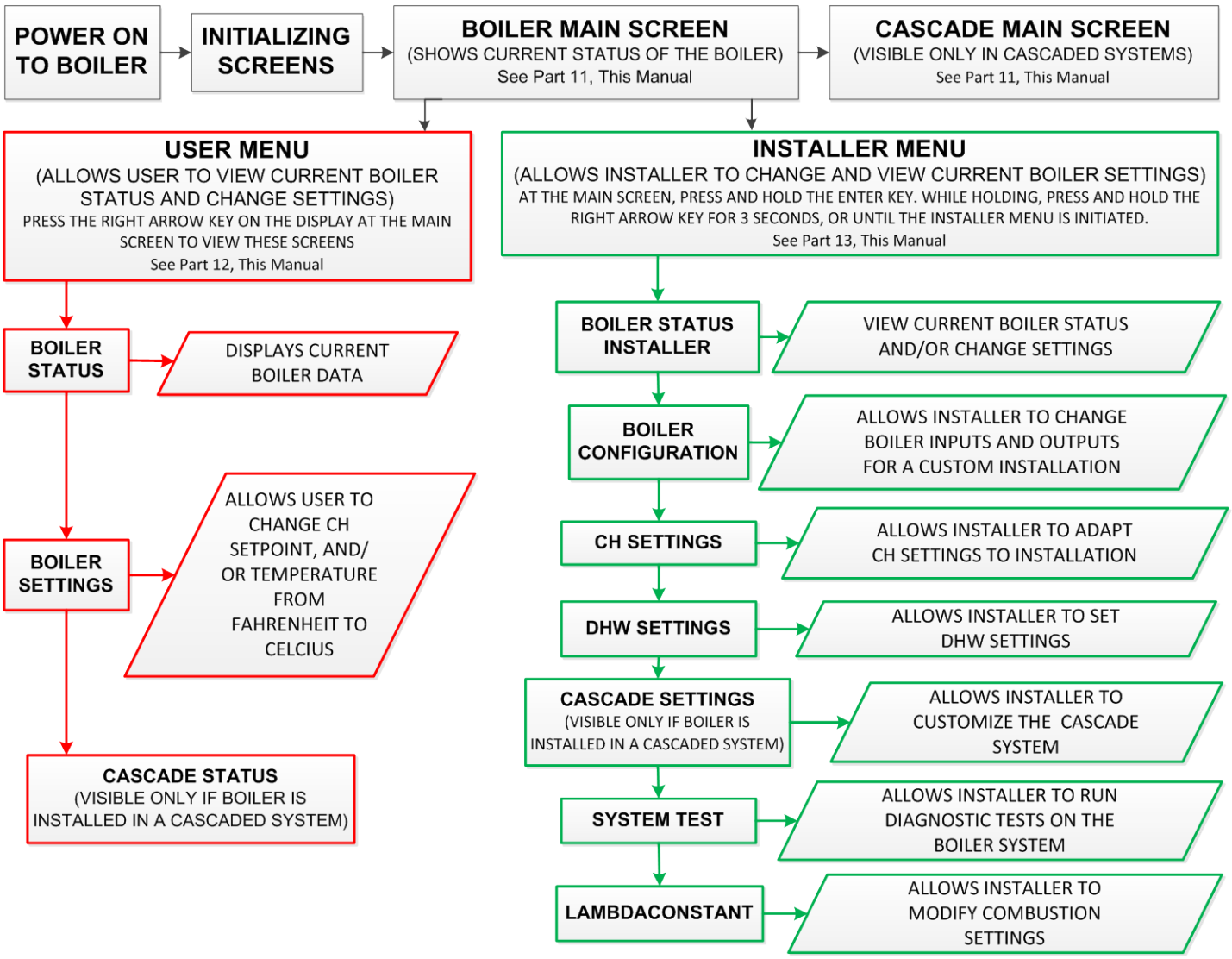


Figure 29 – Menu Structure

C. NAVIGATION OF THE DISPLAY

The control features a four line LCD display to provide informative messages about the operation of the boiler. Six navigation and operation keys allow the user/installer to view and adjust many boiler operating parameters. Two LED lights inform and alert the user/installer to Cascade status and possible operating issues.

The following describes how to navigate control parameters using the display.

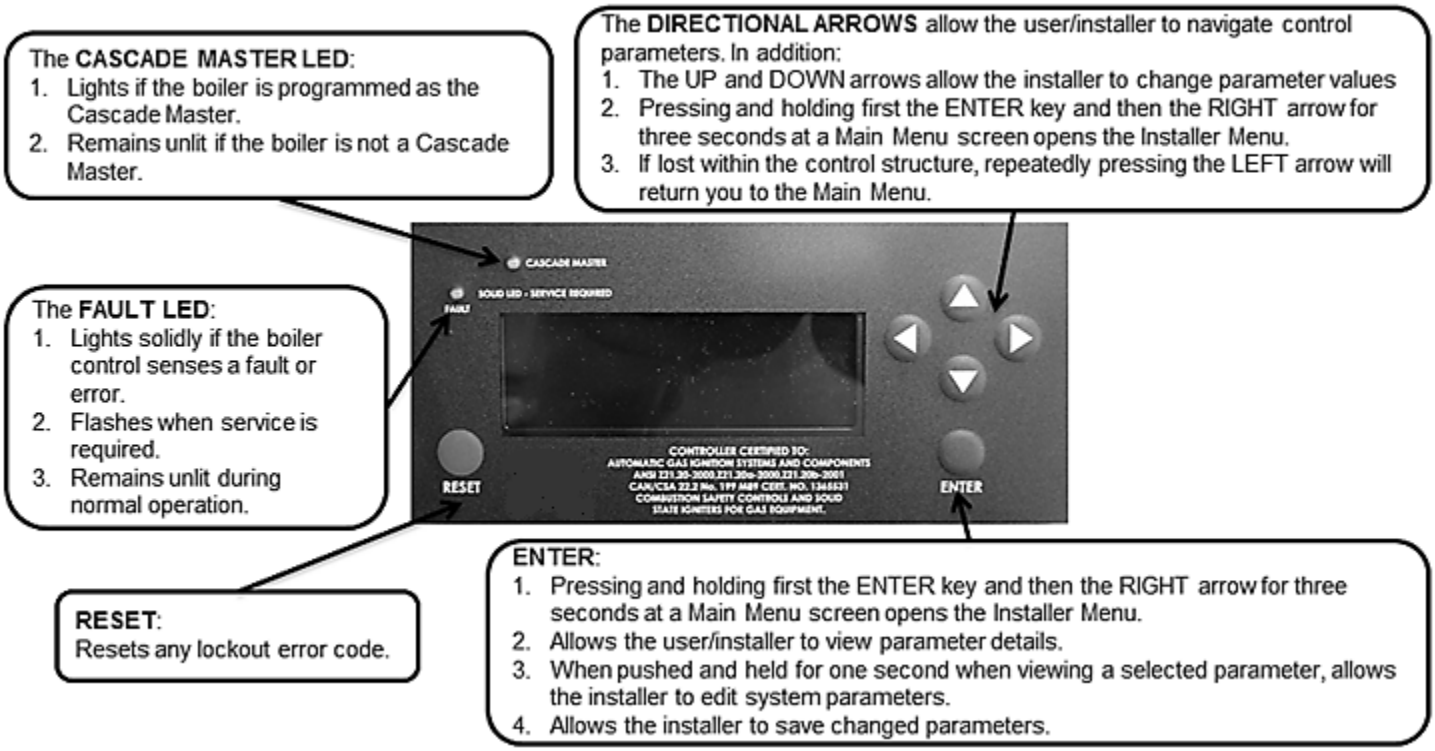


Figure 30 – Display Navigation Summary

DISPLAY KEY DETAILS

To enable editing, navigate to the desired parameter and hold down the **ENTER** key for one second. When the **ENTER** key is released, the parameter value will begin to blink. The parameter can now be changed using the ▼▲ **ARROW** keys. After the desired value is displayed, press the **ENTER** key for 1 second to lock the new value of the function in. The value will then stop blinking.

ARROW KEYS – The ▼▲ ◄ ► arrow keys are used to navigate between the different menus and parameters.

◄ ► keys are also used in programming modes to change between the programmable functions, and shift from menu to menu. Also, the ► key, when pressed and held in conjunction with the **ENTER** key for three seconds, opens the Installer Menu. If you are lost in the control structure, pressing the ◄ key repeatedly will return you to the Main Menu.

▼▲ are used to navigate between the various parameters displayed in each menu. In addition, after the function is enabled for editing by pushing the **ENTER** key, the ▼▲ keys are used to adjust the value upward or downward to the desired amount. It is recommended you use the Menu Maps in this manual and the detailed menu instructions printed in this section to help in menu navigation.

To enter the Installer Menu, press the ◄ key until you reach the Main Menu. Press and hold the **ENTER** key at one of the Main Screens. While holding **ENTER**, press and hold the ► key. After three seconds, the Installer Menu will open.

NOTE: The Installer Menu cannot be opened from the User Menu.

If you get lost in the control structure, press the ◄ key. Pressing the ◄ key twice from the Installer Menu will return you to the Main Menu.

D. START-UP INSTRUCTIONS

Before operating the boiler, it is important to remove the cover and verify that the gas line and water lines are connected and that there are no leaks. If you smell gas, STOP. Follow the safety instructions listed at the beginning of this section. If you do not smell gas, follow the next steps.

1. Turn down the thermostats before applying power to the boiler. If 0–10 volt or other inputs are used, make sure that they are set so there is no call for heat while programming.

2. Turn on the power to the boiler or boilers if a cascade system is used.

NOTE: To avoid any start-up issues, purge the system of air and review and appropriately set the following settings and parameters at first power up.

E. INITIALIZING SCREENS

Once the boiler is powered, the control display will illuminate and these initialization screens will appear.

SCREEN	DESCRIPTION
HTP, Inc. ---connecting--- VERSION [XXXX]	This screen appears directly after turning the power on, and tells the installer that the control is attempting to connect to the main board. Version [XXXX] refers to the software version of the display, and is apt to change.
HTP, Inc. LambdaConstant --Initializing-- VERSION [XXXX]	This screen appears during the first communication cycles between the control and the main board. Version [XXXX] refers to the software version of the display, and is apt to change.
Standby: No Demand 85°F	This screen appears after the first communication cycles between the control and the main board. The boiler is in standby mode, as there is no demand. The supply water temperature is displayed. This number is apt to change.
HTP, Inc. no con. to mainboard VERSION [XXXX]	This screen appears if the control has not established communication with the main board after 60 seconds. Reset the system by disconnecting the power. If communication is not established after power is reconnected, there may be a problem with the control or main board, and both may need to be replaced.

Table 18 – Initializing Screens and Descriptions

PART 10 – CONTROL MAIN SCREENS

The following contains descriptions of Main Screens that can be viewed after the control has connected to the main board. If the boiler is in a stand-alone system, related screens will be found in Section A. If the boiler is the cascade master, related screens will be found in Section B.

NOTE: The Installer Menu can only be accessed from the Main Screen.

A. STAND-ALONE BOILER MAIN SCREENS

SCREEN	DESCRIPTION	
STANDBY: NO DEMAND 160°F	This screen shows the boiler in standby, and the actual supply temperature. There are no active outputs.	
Active outputs of control are:	**F** - Flame **P** - Pump for CH or general pump **B** - Blower **S** - Spark	**G** - Gas valve **D** - DHW Pump or 3 WV **L** – Limited Modulation
FPBSG CENTRAL HEATING 100% 160°F	This screen displays operation status (modulation range and actual supply temperature) and active outputs of the control. In this particular screen, the boiler is fulfilling a central heating demand at 100% power. The supply temperature is 160°F.	
FPBSGD DOMESTIC HOT WATER 100% 160°F	In this screen, the boiler is fulfilling a domestic hot water demand at 100% power. The supply temperature is 160°F.	
LOCKOUT ALARM A## error description	This screen indicates a lockout error. Manual reset is required. The error description will alternate with “Call service number” and “telephone number” of service technician.	
PB BLOCKING ERROR E## error description	This screen indicates a temporary blocking error that will reset automatically once the condition is corrected. The error description will alternate with “Call service number” and “telephone number” of service technician.	

SYSTEM TEST Burning Ion 60 uA Sup. 160°F FPBSG Ret. 160°F	This screen is only shown during Test Mode, activated in the Installer Menu. It displays the operation status, ionization current, supply and return temperature, and active control outputs.

Table 19 – Stand-Alone Boiler Main Screens

B. CASCADE MASTER MAIN SCREENS

NOTE: The following screens appear only if the boiler is the master in a cascaded system.

SCREEN	DESCRIPTION
CASCADE XX RUNNING STANDBY System 160°F ⇩	This display is visible at cascaded boilers. XX refers to the number of running boilers in the system. For example, if there are 8 boilers running in a 9 boiler cascaded system, the XX number will be 8. This screen shows the boiler in standby, and the actual system temperature. There are no active outputs.
Pressing the ▼ key brings up the main screen of the master boiler.	
CASCADE XX RUNNING CENTRAL HEATING System 160°F ⇩	This display is visible at the cascade master. XX refers to the number of running boilers. This screen shows the boiler is fulfilling a central heating demand, and the actual system temperature.
Pressing the ▼ key brings up the main screen of the master boiler. Pressing ▲ returns to the previous screen.	
CASCADE XX RUNNING DOMESTIC HOT WATER System 160°F ⇩	This display is visible at the cascade master. XX refers to the number of running boilers. In this screen, the boiler is fulfilling a domestic hot water demand. The system temperature is 160°F.
Pressing the ▼ key brings up the main screen of the master boiler. Pressing ▲ returns to the previous screen.	
CASCADE XX RUNNING STANDBY LOCKOUT AT NO. ## System 160°F ⇩	This display is visible at the cascade master, and indicates an error. XX refers to the number of running boilers. ## stands for boiler address. Manual reset is required. Analyze error at the particular boiler. The error description will alternate with “Call service number” and “telephone number” of service technician. The system temperature is 160°F.
Pressing the ▼ key brings up the main screen of the master boiler “1” (along with the error). Pressing ▲ returns to the previous screen.	
CASCADE XX RUNNING STANDBY BLOCKING AT NO. ## System 160°F ⇩	This display is visible at the cascade master, and indicates an error. XX refers to the number of running boilers. ## stands for boiler address. This screen indicates a temporary blocking error that will reset automatically once the condition is corrected. Analyze error at the particular boiler. The error description will alternate with “Call service number” and “telephone number” of service technician. The system temperature is 160°F.
Pressing the ▼ key brings up the main screen of the master boiler “1” (along with the error). Pressing ▲ returns to the previous screen.	
CASCADE XX RUNNING SYSTEM FREEZE PROTECTION System 160°F ⇩	This display is visible at the cascade master. XX refers to the number of running boilers. This screen indicates that freeze protection is active. The system temperature is 160°F.
Pressing the ▼ key brings up the main screen of the master boiler. Pressing ▲ returns to the previous screen. **NOTE:** The following screens refer to Fixed Mode. Fixed Mode supplies a fixed supply temperature and turns all boilers on during incidents of communication problems or if the system sensor fails.	
CASCADE XX RUNNING TEMP FIXED MODE System 160°F ⇩	This display is visible at the cascade master. XX refers to the number of running boilers. This screen indicates that fixed mode is active. All cascaded boilers operate at a fixed set point. The system temperature is 160°F.
Pressing the ▼ key brings up the main screen of the master boiler “1” (along with the error). Pressing ▲ returns to the previous screen.	
CASCADE XX RUNNING TEMP FIXED MODE LOCKOUT AT NO. ## System 160°F ⇩	This display is visible at the cascade master. XX refers to the number of running boilers. This screen indicates that fixed mode is active, and there is a lockout error at cascaded boiler no. ##. Manual reset is required. Analyze the error at the particular boiler. All cascaded boilers operate at a fixed set point. The system temperature is 160°F.
Pressing the ▼ key brings up the main screen of the master boiler “1” (along with the error). Pressing ▲ returns to the previous screen.	
CASCADE XX RUNNING TEMP FIXED MODE BLOCKING AT NO. ## System 160°F	This display is visible at the cascade master. XX refers to the number of running boilers. This screen indicates that fixed mode is active, and there is a blocking error at cascaded boiler no. ##. The boiler will reset automatically once the condition is corrected. Analyze the error at the particular boiler. All cascaded boilers operate at a fixed set point. The system temperature is 160°F.
Pressing the ▼ key brings up the main menu of the master boiler “1” (along with the error). Pressing ▲ returns to the previous screen.	

Table 20 – Cascade Main Screens

PART 11 – USER MENU SCREENS

The User Menu is intended to provide basic system information and allow temperature adjustments within the parameters configured by the installer. To enter the User Menu, press the ▶ key at the Main Screen. Use the ▼▲ keys to scroll through the options. Use ▶ to view, ▼and ▲ to scroll through the screens, and press and hold **ENTER** for one second to access and change Boiler Settings. If no keys are pressed for 3 minutes, the control will return to the Main Screen.

A. DESCRIPTION OF THE USER MENU

SCREEN	DESCRIPTION
MENU > Boiler Status Boiler Settings Cascade Status	Boiler Status screens show different boiler operating values. Boiler Settings are settings that can be altered by the user. Cascade Status screens describe cascade values. This option will only appear if cascading is active.

Table 21 – User Menu

B. BOILER STATUS SCREENS

Press the ▶ key when the > icon is in line with Boiler Status, and a series of Boiler Status options can be accessed. These options and corresponding screens are as follows.

SCREEN	DESCRIPTION
BOILER STATUS Supply set. 160°F Supply act. 160°F Return act. 130°F ⇩	This screen shows the current supply setpoint, along with current supply and return actual temperature readings. There are no active outputs.
Pressing the ▼ key allows the User to view more data.	
BOILER STATUS ⇧ DHW set. xxxx160°F DHW act. xxxx160°F ⇩	This screen shows DHW setpoint. xxxx will read STAT when a thermostat is configured. This is DHW actual. xxxx will read STAT OPEN or STAT CLSD when a thermostat is configured. When a DHW sensor is configured but not connected, it will read SENS OPEN.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
BOILER STATUS ⇧ System 150°F Flue Gas 170°F Outdoor 60°F ⇩	The first line shows the system sensor reading. If a system sensor is not connected, NC will be shown. In case of a shortcut, 0 ohm will be displayed. The second line shows the flue gas reading. When configured as SWITCH, OPEN or CLSD is shown. When configured as SENSOR, NC means not connected. If shortcut, 0 ohm will display. The final line displays the outdoor temperature reading. If an outdoor sensor is not connected, NC is shown. If shortcut, 0 ohm.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
BOILER STATUS ⇧ General Pump OFF CH-Pump OFF DHW-Pump OFF ⇩	This screen shows the running status of all system pumps, and will display ON or OFF.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
BOILER STATUS ⇧ TC1 set. 1020°F TC1 act. 1020°F TC2 act. 1020°F⇩	This screen describes LambdaConstant values. TC1 set. refers to calculated burner target temperature.TC1 act. refers to actual burner temperature at the TC1 thermocouple. TC2 act. refers to actual burner temperature at the TC2 thermocouple.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
BOILER STATUS ⇧ MF set. 16.22g/s MF act. 16.22g/s GV offs. -120hstep⇩	This screen describes LambdaConstant values. MF set. Refers to calculated mass flow target, depending on heat load. MF act. shows actual mass flow. GV offs. Refers to the gas regulation-valve offset (plus or minus) and indicates gas pressure stability.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
BOILER STATUS ⇧ Fan Speed 5600 rpm GV act. 650 hstep FlameIon. 9.0 uA	This screen shows actual fan speed, actual gas valve position, and actual ionization current in uA.
Press the ▲ key to return to the previous screen.	

Table 22 – User Menu - Boiler Status Screens

C. BOILER SETTINGS SCREENS

At the initial User Menu screen, use the ▼▲ keys to put the > icon in line with Boiler Settings. Press ▶ to access a series of Boiler Settings options. Use ▶ to view, ▼and ▲ to scroll through the screens, and press and hold **ENTER** for one second to access and change Boiler Settings. If no keys are pressed for 3 minutes, the control will return to the Main Screen.

SCREEN	DESCRIPTION
BOILER SETTINGS Central Heating Setpoint Outdoor Reset 180°F ⇩	This screen shows the current Central Heating setpoint. In a Cascaded System, "CH-Cascade" is displayed. "Outdoor Reset" is shown only in CH-mode 1 or 2 is used. "Outdoor Reset" indicates that the Central Heating setpoint cannot be changed. When "Outdoor Reset" is not used, the installer can adjust the central heating setpoint. The factory installed default setpoint is 180°F. Range: 104 – 200°F.
Pressing the ▼ key allows the User to view and/or adjust more data.	
BOILER SETTINGS ⇧ DHW-Store Setpoint 119°F⇩	This screen is visible in DHW Modes 1 and 2 ONLY, and shows storage tank temperature setpoint when an indirect sensor is used. The factory installed default setpoint is 119°F. Range: 104 – 160°F.
Pressing the ▼ or ▲ keys allows the User to view and/or adjust more data or return to the previous screen.	
BOILER SETTINGS ⇧ DHW-Instantaneous Setpoint 135°F⇩	If you see this screen, your boiler is set in the wrong DHW mode. The boiler will only operate properly in DHW Modes 1 and 2. See Part 12, Section D to change the DHW settings to one of these options.
Pressing the ▼ or ▲ keys allows the User to view and/or adjust more data or return to the previous screen.	
BOILER SETTINGS ⇧ Change of Temperature Units Fahrenheit °F	This screen allows the user to change temperature measurement units. Factory default is "Fahrenheit °F". Options are "Celsius °C" and "Fahrenheit °F".
Press the ▲ key to return to the previous screen.	

Table 23 – User Menu - Boiler Settings Screens

D. CASCADE STATUS

If the boiler is used in a cascading system, press ▶ when the › icon is in line with Cascade Status at the User Menu to access a series of options. These options and corresponding screens are described below.

SCREEN	DESCRIPTION
CASCADE STATUS System set. 120°F System act. 120°F System Pump _ON⇩	This screen shows the current system setpoint, actual system temperature, and indicates if the system pump is "ON" or "OFF".
Pressing the ▼ key allows the User to view more data.	
CASCADE STATUS ⇧ Boiler 1 :xxx% ›3 :xxx% 2 :xxx% 4 :xxx% ⇩	This screen shows the modulation range of boilers 1 – 4 in the cascade system. The first boiler in the rotation is marked with an › icon on the left. The modulation range "xxx" of each boiler is shown. Up to 16 boilers can work in a cascaded system of multiple boilers.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
CASCADE STATUS ⇧ Boiler 5 :xxx% 7 :xxx% 6 :xxx% 8 :xxx% ⇩	This screen shows the modulation range of boilers 5 – 8 in the cascade system. The first boiler in the rotation is marked with an › icon on the left. The modulation range "xxx" of each boiler is shown. Up to 16 boilers can work in a cascaded system of multiple boilers.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
CASCADE STATUS ⇧ Boiler 9 :xxx% 11:xxx% 10:xxx% 12:xxx% ⇩	This screen shows the modulation range of boilers 9 – 12 in the cascade system. The first boiler in the rotation is marked with an › icon on the left. The modulation range "xxx" of each boiler is shown. Up to 16 boilers can work in a cascaded system of multiple boilers.
Pressing the ▼ or ▲ keys allows the User to view more data or return to the previous screen.	
CASCADE STATUS ⇧ Boiler 13:xxx% 15:xxx% 14:xxx% 16:xxx%	This screen shows the modulation range of boilers 13 – 16 in the cascade system. The first boiler in the rotation is marked with an › icon on the left. The modulation range "xxx" of each boiler is shown. Up to 16 boilers can work in a cascaded system of multiple boilers.
Press the ▲ key to return to the previous screen.	

Table 24 – User Menu – Cascade Status Screens

PART 12 – INSTALLER MENU SCREENS

The Installer Menu allows the installer to view current system status and adjust boiler settings for the system design.

To enter the Installer Menu, first go to the Main Screen. You must be at the Main Screen to enter the Installer Menu. Once there, press and hold the **ENTER** key. While holding **ENTER**, press and hold the ▶ key. After a period of three seconds, the Installer Menu will open. To leave the Installer Menu, press the ◀ key.

Use the ▼▲ keys to scroll through the options. Use the ▶ key to view. Press **ENTER** to select a value. When the value is flashing, press the ▼ key to decrease, and ▲ key to increase the value. Press **ENTER** again to save the value. If no keys are pressed for 3 minutes, the control will return to the Main Screen. See Part 11 for a description of all Installer Menu options.

A. BOILER STATUS INSTALLER

After selecting "Boiler Status Inst." at the Installer Menu screen, the following options are available.

SCREEN	DESCRIPTION
BOILER STATUS INST. Fan Actual 16.22g/s Low power 2.2g/s⇩	This screen shows the current actual mass flow and actual recorded mass flow at low power.
Pressing the ▼ key allows the Installer to view more data.	
BOILER STATUS INST. ⇧ Fan Ignition 23.60g/s HiPower 16.22g/s⇩	This screen shows the actual mass flow needed for ignition and the actual recorded mass flow at high power.
Pressing the ▼ or ▲ keys allows the Installer to view more data or return to the previous screen.	
BOILER STATUS INST. ⇧ Flame Ionization 9.0uA Loss xxxxx ⇩	This screen displays the actual ionization current and number of flame losses after flame recognition.
Pressing the ▼ or ▲ keys allows the Installer to view more data or return to the previous screen.	
BOILER STATUS INST. ⇧ Ignition Attempts With flame xxxxx No flame xxxxx ⇩	This screen details the number of times the flame appeared during an ignition cycle, and where the boiler restarted due to weak gas quality of low gas pressure.
Pressing the ▼ or ▲ keys allows the Installer to view more data or return to the previous screen.	
BOILER STATUS INST. ⇧ Run time CH xxxxxxxhr DHW xxxxxxxhr⇩	This screen shows the total boiler run time for central heating and domestic hot water in hours.
Pressing the ▼ or ▲ keys allows the Installer to view more data or return to the previous screen.	
BOILER STATUS INST. ⇧ Run time pwrON xxxxxxxdays Service xxxxdays⇩	This screen shows the run time in days for total power on and the amount of time until next service, as set by the service reminder. **NOTE:** Take care not to set the service reminder for a holiday.
Pressing the ▼ or ▲ keys allows the Installer to view more data or return to the previous screen.	
BOILER STATUS ⇧ Fan Speed 5600 rpm GV act. 650 hstep FlameIon. 9.0 uA	This screen shows actual fan speed, actual gas valve position, and actual ionization current in uA.
Pressing the ▼ or ▲ keys allows the Installer to view more data or return to the previous screen.	
ERRORhist No.## E##⇧ error description Block. zz hrs ago⇨ ⇩	This screen displays the last 16 errors. No. ## is the number error on the list. E## indicates a blocking error code. An error description is shown, as well as the time that has passed between now and the error code. Pressing the ▶ key displays the interval between errors ("yyhrs after No.zz"). The first error appears twice in the list (min, hrs, day, wk). Scrolling through all last 16 errors is possible by pressing the ▶ key.
Pressing the ▼ or ▲ keys allows the Installer to view more data or return to the previous screen. Pressing the ◀ key leaves Error history and returns to the Installer Menu.	
ERRORhist No.## A##⇧ error description Lock. zz hrs ago⇨	This screen displays the last 16 errors. No. ## is the number error on the list. A## indicates a lockout error code. An error description is shown, as well as the time that has passed between now and the error code. Pressing the ▶ key displays the interval between errors ("yyhrs after No.zz"). The first error appears twice in the list (min, hrs, day, wk). Scrolling through all last 16 errors is possible by pressing the ▶ key.
Pressing the ▲ key allows the Installer to return to the previous screen. Pressing the ◀ key leaves Error history and returns to the Installer Menu.	

Table 25 – Installer Menu – Boiler Status Inst. Screens

B. BOILER CONFIGURATION

After selecting “Boiler Config” at the Installer Menu screen, the following options are available.

SCREEN	DESCRIPTION
BOILER CONFIG Address Selection Boiler Address 0⇩	Allows Installer to choose a boiler address and set up a cascading system. Selecting “0” = no cascading system, “1” = managing boiler, “2 – 16” = follower boilers. Factory default is “0”. Range is 0 – 16. After setting Cascade Master address, wait about a minute for the “Cascade Master” LED to light.
Pressing the ▼ key allows the Installer to view and/or adjust more data.	
BOILER CONFIG ⇧ Pump Mode 2 Manifold with CH DHW and Gen. pump ⇩	Pump mode can be chosen by selecting the corresponding number. Pump modes are displayed during selection in 2 lines. Options: **0** = CH and DHW pump **1** = General pump with 3 WV (not used) **2** = Manifold with CH Gen and DHW pump (not used) **3** = Manifold with Gen pump and 3WV (not used) **4** = Manifold with Sys Pump DHW ext (not used)
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen. **The following setting must only be changed if the BCU or display is replaced.**	
BOILER CONFIG ⇧ Appliance Type Model _1⇩	The Appliance Type of Display and Burner Control Unit must be compatible. Ensure the correct burner and blower are installed with the boiler. **Model 1** = Refers to 110 kBTU boiler **Model 2** = Refers to 199 kBTU boiler Default depends on the boiler.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ Service Reminder >STATUS ON Reminder 365 days⇩	This screen allows the installer to set a fixed time period until the service reminder appears. This option can be switched ON or OFF. When changing the number of days, the reminder is initialized and restarted. Default setting is ON and 365 days. Range: On or Off, 0 – 365 days.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ Telefone Number for Service of Installer ⇩	The installer can set a telephone number to appear when service is necessary. Default value is “of installer” when all are blank. All numbers “()*+,-./0..9 and blank” can be scrolled with the arrow keys. Pressing the ◀ key cancels all changes. **ENTER** confirms. **RESET** changes any value back to “blank”, or when “blank”, goes to “0” for faster editing.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ THERMISTOR TYPE >Outdoor NTC 12k All Others NTC 10k⇩	This screen allows the installer to switch temperature sensor types from “NTC 10k” and “NTC 12k”. Options: NTC 10k and NTC 12k.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen. **The following screens describe optional sensors and switches that can be installed to customize the installation.**	
BOILER CONFIG ⇧ Connector Input J16 1-4 LowWaterCO⇩	This screen shows a connector input at the burner control unit. Options: Disabled = No input connected. LowWaterCO = A low water cut-off (NC) is connected. DHW FlowSW = Domestic hot water flow switch with plate heat exchanger. CH FlowSW = Flow switch for central heating. Factory default is LowWaterCO.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ Connector Input J16 2-3 Flue Pr SW⇩	This screen shows a connector input at the burner control unit. Options: Disabled = No input connected. Air FlowSW = An air flow switch (NO) is connected. Flue PrSW – A flue pressure switch (NC) is connected. Factory default is Flue PrSW.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ Connector Input J16 6-7 Disabled⇩	This screen shows a connector input at the burner control unit. Options: Disabled = No input connected. Gas PrSW = A gas pressure switch is connected. Water PrSw = A water pressure switch is connected. DHW Rotary = A rotary sensor for DHW with plate heat exchanger is connected. Factory default is Disabled.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ Conn. Input J16 1-8 Blocked Drain Enabled⇩	This screen shows a connector input for a blocked drain sensor. Options: Disabled = No input connected. Enabled = Blocked drain switch is enabled. J16 1 – J16 – 6 = ground. Factory default is Enabled.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ Conn. Input J5 6-14 Flue Gas Switch⇩	This screen shows a connector input for a flue gas screen. Options: Switch = Switch connected. Sensor = Sensor is enabled. Factory default is Switch.

Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen. (**NOTE:** This is the final normal Boiler Configuration screen. The following are for Cascaded systems only.)	
BOILER CONFIG ⇧ Permit Boiler Fixed mode YES⇩	This screen describes what the boiler will do in an emergency situation, e.g. when the communication between boilers is lost. For example: This setting could be used in a 4 boiler system to enable only 2 boilers to run in emergency mode, preventing overshoots. Options: YES = The boiler continues to operate at the central heating fixed setpoint. NO = In emergency situations, this boiler is switched off. Factory default is YES.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
BOILER CONFIG ⇧ Minimum Power 1	This screen is for Service purposes ONLY, and allows the installer to increase the minimum power of the boiler from 1 to 30, where 1 represents the minimum heat load. Factory default is 1. Range: 1 – 30.
Pressing the ▲ key allows the Installer to return to the previous screen.	

Table 26 – Installer Menu – Boiler Config Screens

C. CENTRAL HEATING SETTINGS

NOTE: These settings are not selectable in cascade mode at dependent boilers.

SCREEN	DESCRIPTION
CH SETTINGS CH mode 1 CH with thermostat and outdoor reset ⇩	Allows Installer to choose between different central heating modes. Options: **0** = CH with thermostat **1** = CH with thermostat and outdoor reset (This is the factory default) **2** = CH outdoor reset and T-night offset of –18°F supply temperature (done by a timer connected at the RT-Input with a potential free contact) **3** = CH with permanent heat demand **4** = CH with analog input for T-supply (for both single and cascaded boilers) **5** = CH with analog input for mod-rate (single boiler only) **6** = CH with hydro-air unit (single boiler only). Factory default is 1.
Pressing the ▼ key allows the Installer to view and/or adjust more data.	
CH SETTINGS ⇧ Central heating Differential 10°F⇩	This screen allows the installer to set the central heating differential. Options: **(1)** = The Differential to the setpoint for starting the boiler can be modified here. Default: 10°F. Range: 2 – 27°F. **(2)** For CH-mode 6, the values are different, and depend on set point. The CH mode selected will determine the default.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ Reset Curve Design Outdoor 5°F Boiler 180°F⇩	Allows the installer to set the upper point for the outdoor reset curve. At a specified low outdoor temperature, a certain boiler supply temperature must be reached. Default is 5°F outdoor, 180°F boiler. Range: 22 – 77°F, 61 – 200°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ R.CurveMildWeather Outdoor _68°F Boiler 95°F⇩	Allows the installer to set the lower point for the outdoor reset curve. At a specified mild outdoor temperature, a certain boiler supply temperature must be reached. Default is 68°F outdoor, 95°F boiler. Range: 36 – 85°F, 36 – 121°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ Mild Weather Switch off Temp. _68°F⇩	Allows the installer to set a higher outdoor temperature that will disable central heating during summer months. Default is 68°F. Range: 36 – 95°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ CH Boost Function Temp.Offs. _10°F BoostTime _20 min⇩	Allows the installer to increase the supply temperature if the heat demand is not satisfied within a certain boost time. Default is 10°F offset, with a boost time of 20 minutes. Range: 0 – 36°F, 1 – 120 minutes.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ Reset Curve Limits Boiler Min 95°F Boiler Max 180°F⇩	Allows the installer to set limits for the outdoor reset curve by adjusting minimum and maximum boiler supply temperature. Default is 95°F minimum boiler temperature, 180°F maximum. Range: 40 – 180°F, 81 – 200°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ Anti-Cycling Time _3min End T-Diff _29°F⇩	Allows the installer to set the boiler anti-cycling time and temperature differential. This prevents temperature overshoot at small heat demand. It ends when the temperature difference to the setpoint is higher than the set temperature value and the set time has elapsed. Default is 3 minutes, 29°F differential. Range: 10 – 900 minutes, 1 – 36°F.

Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ Step Down Modulation ON⇩	Allows the installer to avoid fast overshoot of temperatures by sending the boiler into low fire after ignition and increasing power via step modulation until the boiler eventually fires at maximum power. This function can be switched ON and OFF. Default is ON.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ CH Pump Post Pump Time _0sec⇩	The installer can set the central heating pump running time after the burner stops. This helps distribute hot water from the heat exchanger into the heat distribution system. 10 second steps are enabled. Default setting is 0 seconds. Range: 10 – 900 seconds.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ General Pump Post Pump Time _0sec⇩	The installer can set the general pump running time after the burner stops. This helps distribute hot water from the heat exchanger into the heat distribution system. 10 second steps are enabled. Default setting is 0 seconds. Range: 10 – 900 seconds.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CH SETTINGS ⇧ Maximum Power Central Heating 100	The installer can reduce the maximum power of the boiler. This power-saving option is optimal for well-insulated buildings. Factory default is 100%. Range: 50 – 100%
Pressing the ▲ key allows the Installer to return to the previous screen.	

Table 27 – Installer Menu – CH Settings Screens

D. DOMESTIC HOT WATER SETTINGS

In cascaded systems, these menus are selectable at the cascade master or at DHW-dedicated boilers ONLY.

SCREEN	DESCRIPTION
DHW SETTINGS DHW mode 1 DHW store with sensor ⇩	Allows Installer to choose between different DHW heating modes. **0** = No DHW (only central heating) **1** = DHW store with sensor **2** = DHW store with thermostat **3** = Instant. DHW with FlowSW DHW-T-Sens. (not used) **4** = Instant. DHW with DHW-T-Sens. (not used) **5** = Instant. DHW with DHW-T + FlowSens. (not used) Factory default is 0.
Pressing the ▼ key allows the Installer to view and/or adjust more data.	
BOILER SETTINGS ⇧ DHW-Store Differential _7°F⇩	This screen is visible in DHW mode 1 & 2 ONLY. The differential to the storage tank setpoint can be modified here. The default is 7°F. Range: 4 – 27°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
DHW SETTINGS ⇧ CH/DHW Priority >Switch DHW-Prio Time 30min⇩	Allows the installer to switch the CH/DHW priority to different modes to prioritize CH operation when a DHW tank is not fully loaded. Options: Time = Priority changes after time. CH-Prio = Central heating always takes priority. DHW-Prio = Domestic hot water always takes priority. Defaults are Time, and 30 minutes. Range: 1 – 60 Minutes.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
DHW SETTINGS ⇧ DHW Pump Post Pump Time _0sec	Time the domestic hot water pump operates after the burner stops. Default is 0 seconds. Range: 0 – 120 seconds.
Pressing the ▲ key allows the Installer to return to the previous screen.	

Table 28 – Installer Menu – CH Settings Screens

E. CASCADE SETTINGS

These options are available ONLY in cascaded systems at the master boiler.

SCREEN	DESCRIPTION
CASCADE SETTINGS Emergency Setpoint 113°F⇩	In case of errors in the cascading system, each boiler operates at its own emergency setpoint. These setpoints must be set separately for each boiler by the installer. Default is 113°F. Range: 68 – 149°F
Pressing the ▼ key allows the Installer to view and/or adjust more data.	

CASCADE SETTINGS ⇧ Start Differential to System Setpoint 9°F⇩	Allows the installer to set the system setpoint differential. Default is 9°F. Range: 1 – 15°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Stop Differential to System Setpoint 5°F⇩	Prevents the system from overshooting temperatures by stopping all boilers once the stop differential is met. Default is 5°F. Range: 1 – 15°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Next Boiler Start Delay time _3min⇩	If the system setpoint temperature (minus start differential) is not reached, or the first boiler has too high a modulation range, the next boiler is started after a certain delay time. Default is 3 minutes. Range: 1 – 15 minutes.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Last Boiler Stop Delay time _3min⇩	If the boilers operate at the minimum switching rate and the system setpoint temperature is too high, this option determines when the last boiler will stop. Default is 3 minutes. Range: 1 – 15 minutes.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Max increased Boiler Offset 10°F⇩	Maximum boiler offset temperature above the system setpoint used by the intelligent PID cascading controller to meet system setpoint. Default is 10°F. Range: 0 – 36°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Min decreased Boiler Offset 20°F⇩	Minimum boiler offset temperature below the system setpoint used by the intelligent PID cascading controller to meet system setpoint. Default is 20°F. Range: 0 – 36°F.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Delay Factor for Boiler Offset 2⇩	Time factor is multiplied with “next boiler start delay time” and determines when the intelligent PID cascading controller becomes active. Default is 2. 0 = Disabled.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Next Boiler Start Rate 80⇩	When this modulation range is reached by one or more boilers, the next boiler is started after the “next boiler start delay time”. Default is 80. Range: 10 – 100.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Last Boiler Stop Rate 40⇩	When this modulation range is reached by one or more boilers, the last boiler is stopped after the “last boiler stop delay time”. Default is 30. Range: 10 – 100.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Boiler Rotation Interval 1 day⇩	The first boiler is changed after the rotation interval “1 – 5 days”. If set to “0” no rotation occurs. If one boiler is dedicated to DHW, it will always be the last boiler in the rotation interval. Default is 1 day. Range: 0 – 30 days.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ Boilers for DHW Boiler Address All⇩	This option is used to select boilers dedicated to DHW. Options: ALL = CH and DHW are connected in parallel 2 – 16 = Certain boilers are dedicated to DHW Default is ALL. Range: All, 1 – 16.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
CASCADE SETTINGS ⇧ System Pump Post Pump Time 30sec	Selects the time the system pump will run after burner stop. Default is 30 seconds. Range: 1 – 90 seconds.
Pressing the ▲ key allows the Installer to return to the previous screen.	

Table 29 – Installer Menu – Cascade Settings Screens

F. SYSTEM TEST

All functions of Test Mode are stopped after 30 minutes if not stopped manually. In cascade mode, the boiler address must be set to "0" before activating the system test.

SCREEN	DESCRIPTION
SYSTEM TEST Set Test Power Off⇩	Options: **Off** = Boiler runs in normal operation **Low Power** = Boiler runs at minimum modulation range which can be influenced by the load adaptation **Ignit Power** = Boiler runs at ignition modulation range **High Power** = Boiler runs at maximum modulation range which can be influenced by the load adaptation.
Pressing the ▼ key allows the Installer to view more data.	
SYSTEM TEST ⇧ >General Pump Off CH-Pump Off DHW-Pump Off	This allows the installer to test system pumps. Options: **Off** = Pumps run controlled by the boiler **On** = Pumps start running in test mode Either the CH-Pump/3WV or the DHW-Pump/3WV run at the same time. In this option, it is also possible to switch a 3WV in CH or DHW position.
Press the ▲ key to view return to the previous screen.	

Table 30 – Installer Menu – System Test Screens

G. LAMBDA CONSTANT

These settings should only be modified by qualified personnel.

SCREEN	DESCRIPTION
LambdaConstant Gas Type Selection NG⇩	Allows the installer to select gas supply. Options: **NG** = Natural gas, Methane **LPG** = Liquid Pressurized Gas, Propane, Butane Default is NG.
Pressing the ▼ key allows the Installer to view and/or adjust more data.	
LambdaConstant ⇧ Min. Mass Flow Temp. Deviation _0K⇩	Allows the installer to adjust CO_2 at low power. Before making any adjustment, it is recommended to run the boiler in system test at low power. If the CO_2 is not within specification, use this parameter to adjust while measuring the CO_2. The default value is 0. Increasing this value will increase CO_2. Decreasing the value will decrease the CO_2. **NOTE:** The range is -128 to +128. Change the value a small amount at a time to avoid wide swings in CO_2 measurements.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
LambdaConstant ⇧ Max. Mass Flow Temp. Deviation _0K⇩	Allows the installer to adjust CO_2 at high power. Before making any adjustment, it is recommended to run the boiler in system test at high power. If the CO_2 is not within specification, use this parameter to adjust while measuring the CO_2. The default value is 0. Increasing this value will increase CO_2. Decreasing the value will decrease the CO_2. **NOTE:** The range is -128 to +128. Change the value a small amount at a time to avoid wide swings in the CO_2.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
LambdaConstant ⇧ Prepurge Initial Speed 3460rpm⇩	The prepurge fan speed is measured during the first three complete heat demand cycles on the boiler. The average fan speed is stored and displayed here. The default value is 0. The number 0 is displayed before 3 successful heat demands are completed.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
LambdaConstant ⇧ Prepurge Actual Speed 3420rpm⇩	This is the prepurge fan speed of the last ignition. If this speed is not close to the Prepurge Initial Speed displayed in the screen above, an "MF deviation Error" occurs. This error signals a significant change in the air inlet, flue system, or possible heat exchanger blockage.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
LambdaConstant ⇧ Prepurge Initial Speed Reset please Switch off 0rpm	After checking the boiler, air intake, and flue system for blockage or other failure and measuring the CO_2 values at low and high power, the installer can reset the Prepurge Initial Speed. To reset the prepurge initial speed: 1. Press **ENTER**. The RPM number will begin to blink. 2. Press the ▼ key. The RPM number will go to 0. 3. Press **ENTER** again and the 0 RPM will stop blinking. 4. Turn boiler power off and wait 30 seconds. 5. Turn boiler power on again for the reset to occur.

Table 31 – LambdaConstant Screens

COMBUSTION SETTINGS ON ALL MODELS						
	Natural Gas			Propane LP		
Fan Speed	Low	Ignition	High	Low	Ignition	High
Carbon Monoxide PPM	5 – 50	60 - 100	< 150	5 – 50	60 - 100	< 150
Carbon Dioxide (CO_2)	8 - 10%	8 ½ - 10 ½%		8 ½ - 10 ½%	9 - 10 ½%	9 - 11%

Table 32

PART 13 – START-UP PROCEDURE

A. INSTALLER MENU

Once the boiler has established communication, advance to the Installer Menu. The Installer Menu allows the installer to access the pump purge capability of the boiler, and configure installations.

NOTE: The boiler is shipped to run in a single central heating configuration on natural gas as default.

To enter the Installer Menu, first go to the Main Screen. Once at a Main Screen, press and hold the **ENTER** key. Then press and hold the ▶ key. After a period of three seconds, the Installer Menu will open. To leave the Installer Menu, press the ◀ key.

Use the ▼▲ keys to scroll through the options. Press **ENTER** to view. Press **ENTER** to select a value. When the value is flashing, press the ▼ key to decrease and ▲ key to increase the value. Press **ENTER** again to save the value.

If no keys are pressed for 3 minutes, the control will return to the Main Screen.

INSTALLER MENU	
SCREEN This screen has been extended to show all Installer Menu prompts.	**DESCRIPTION**
INSTALLER MENU > Boiler Status Inst. Boiler Config CH-Settings ⇩ DHW-Settings Cascade Settings System Test LambdaConstant	Use the ▼▲ keys to scroll through these prompts. **Boiler Status Inst.** – Displays in-depth boiler information. **Boiler Config** – Use this parameter to set boiler inputs and outputs for a custom installation. **CH-Settings** – Used to adapt CH (central heating) for the installation and outdoor reset parameters. **DHW-Settings** – Used to set DHW (domestic hot water) for the installation. **Cascade Settings** – When set as a cascaded system, used to custom adapt the system to the installation (only selectable in a cascaded system). **System Test** – Enables the installer to run diagnostic tests on the boiler at certain heat loads and pump operations. **Lambda Constant** – Allows modification of gas to air ratio controller values.

Table 33 – Installer Menu

B. PURGING AIR FROM THE WATER SYSTEM

Unless another method is used, trapped air can be purged using the Installer Menu to circulate water through the system pumps.

To use the Installer Menu to purge water from the system: Scroll with the ▼ key to System Test. Push the ▶ key to enter System Test. Scroll down one screen to the Pump Menu.

SCREEN	DESCRIPTION
SYSTEM TEST ⇧ >General Pump Off CH-Pump Off DHW-Pump Off	Options: **Off** - Pumps run controlled by the boiler **On** - Pumps start running in test mode Either the CH-Pump or the DHW-Pump run at the same time in CH or DHW position.

Table 34 – Purging Air

1. To purge air, scroll with the ▼ or ▲ keys to the desired pump.
2. Push the **ENTER** key to select the pump, followed by ▲ to turn the pump or pumps Off or On.
3. Circulate the water until air has been completely purged from the system.

C. SELECTING THE GAS TYPE AND PREPURGE INITIAL FAN SPEED

1. GAS TYPE

Once all air is purged, select the Gas Type by pushing the ◀ key to leave System Test and return to the Installer Menu. Scroll down to the Lambda Constant Menu. Use the ▶ key to enter the menu.

(**NOTE:** Gas Type selection is necessary only if LP gas is used. Natural gas is the system default.)

LAMBDA CONSTANT MENU

These settings should only be modified by qualified personnel.

SCREEN	DESCRIPTION
LambdaConstant Gas Type Selection NG⇩	Options: **NG** - Natural gas, Methane **LPG** - Liquid Propane Gas Default is NG.

Table 35 – Selecting the Gas Type

1. To change Gas Type, press the **ENTER** key at this screen. Once Gas Type blinks, push the ▼ or ▲ keys to the appropriate gas.
2. Push the **ENTER** button to make your selection.
3. After changing the gas type, measure the CO_2 and ensure it reads within allowed range of the specified gas type (see Table 32 for appropriate CO_2 levels).

2. PREPURGE INITIAL FAN SPEED

If the boiler is installed at high altitude or has a long flue and / or air intake, the Prepurge Initial Fan Speed may need to be reset. In the Lambda Constant menu, navigate to the Prepurge Initial Speed screen. If the RPM number shown here is 0, there is nothing further to do. If the number is something other than 0, refer to the Prepurge Initial Speed Reset screen detailed below to reset the prepurge fan speed.

Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
LambdaConstant ⇧ Prepurge Initial Speed 3460rpm⇩	The prepurge fan speed is measured during the first three complete heat demand cycles on the boiler. The average fan speed is stored and displayed here. The default value is 0. The number 0 is displayed before 3 successful heat demands are completed.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
LambdaConstant ⇧ Prepurge Actual Speed 3420rpm⇩	This is the prepurge fan speed of the last ignition. If this speed is not close to the Prepurge Initial Speed displayed in the screen above, an “MF deviation Error” occurs. This error signals a significant change in the air inlet, flue system, or possible heat exchanger blockage.
Pressing the ▼ or ▲ keys allows the Installer to view and/or adjust more data or return to the previous screen.	
LambdaConstant ⇧ Prepurge Initial Speed Reset please Switch off 0rpm	After checking the boiler, air intake, and flue system for blockage or other failure and measuring the CO_2 values at low and high power, the installer can reset the Prepurge Initial Speed. To reset the prepurge initial speed: 1. Press **ENTER**. The RPM number will begin to blink. 2. Press the ▼ key. The RPM number will go to 0. 3. Press **ENTER** again and the 0 RPM will stop blinking. 4. Turn boiler power off and wait 30 seconds. 5. Turn boiler power on again for the reset to occur.

Table 36 – Prepurge Initial Fan Speed

D. MODIFYING THE BOILER CONFIG, CH-SETTINGS, AND DHW-SETTINGS

1. BOILER CONFIG MENU

Once the gas type is selected, push the ◄ key to leave LambdaConstant and return to the Installer Menu. Scroll to Boiler Config. Use the ► key to enter the menu.

To change values, press **ENTER** until the value starts blinking. Use the ▲ or ▲ keys to change the value. Once the appropriate selection is made, hold the **ENTER** button until the value stops blinking to save the selection.

SCREEN	DESCRIPTION
BOILER CONFIG Address Selection Boiler Address _0 ⇩	The Boiler Address defaults to **0** – Single Boiler without Cascading System. Other selections are as follows: **1** - Master Boiler **2 – 16** - Follower Boilers. **NOTE:** After setting, it may be a minute until the “Cascade Master” LED lights or turns off.
Once the address is selected, use the ▼ key to scroll to Pump Mode.	

BOILER CONFIG ⇧ Pump Mode 2 Manifold with CH DHW and Gen. pump ⇩	Pump modes are displayed during selection in 2 lines. Options: **0** - CH and DHW pump **1** - General pump with 3 WV **2** - Manifold with CH Gen and DHW pump **3** - Manifold with Gen pump and 3WV **4** - Manifold with Sys Pump DHW ext Default is **2**.

Table 37 – Boiler Config Quick Start-Up

2. CENTRAL HEATING SETTINGS

Return to the Installer Menu by pushing the ◀ key. Enter the CH Settings Menu by pushing ▼ once, then ▶. To change values, press **ENTER** until the value starts blinking. Use the ▲ or ▲ keys to change the value. Once the appropriate selection is made, hold the **ENTER** button until the value stops blinking to save the selection.

SCREEN	DESCRIPTION
CH SETTINGS CH mode 1 CH with Thermostat and Outdoor Reset ⇩	The CH Mode is set default to **0** – Single Boiler with Room Thermostat and Outdoor Reset, but can be changed to a value appropriate for the installation. Options: **0** = CH with thermostat **1** = CH with thermostat and outdoor reset **2** = CH outdoor reset and T-night offset (done by a timer) – The boiler operates on readings from the outdoor sensor in this mode. **3** = CH with permanent heat demand – The boiler is always operating. **4** = CH with analog input for T-supply (for both single and cascaded boilers) (requires 0-10 V input, available on optional Interface Module) **5** = CH with analog input for mod-rate (single boiler only) (requires 0-10 V input, available on optional Interface Module) **6** = CH with hydro-air unit (single boiler only) – The boiler does not step modulate in this mode, and operates with a more aggressive PID.
After selecting the CH Mode, press the ▼ key once to modify the CH Differential.	
CH SETTINGS ⇧ Central heating Differential 10°F⇩	The CH Differential is the + and – bandwidth for the CH Setpoint (the CH Setpoint is accessed in the User Menu). Options: **(1)** - The Differential to the setpoint for starting the boiler can be modified here. Default: 10°F. Range: 2 – 27°F. **(2)** - For CH-mode 6, the values are different, and depend on set point. The CH mode selected will determine the default.

Table 38 – CH Settings Quick Start-Up

3. DHW SETTINGS

Return to the Installer Menu by pushing the ◀ key. Enter the DHW Settings Menu by pushing ▼ once, then ▶.

The DHW Mode is set default to **0**, or No DHW, but can be changed to a value appropriate for the installation.

Several domestic hot water modes can be selected. To change values, press **ENTER** until the value starts blinking. Use the ▲ or ▲ keys to change the value. Once the appropriate selection is made, hold the **ENTER** button until the value stops blinking to save the selection.

SCREEN	DESCRIPTION
DHW SETTINGS DHW mode 1 Manifold with CH DHW and Gen. pump ⇩	**0** - No DHW (only central heating) **1** - DHW store with sensor **2** - DHW store with thermostat **3** - Instant. DHW with FlowSW DHW-T-Sens. (not used) **4** - Instant. DHW with DHW-T-Sens. (not used) **5** - Instant. DHW with DHW-T + FlowSens. (not used)
Once DHW Mode is confirmed, push ▼ to set the DHW-Store Differential.	
BOILER SETTINGS ⇧ DHW-Store Differential –7°F⇩	The DHW-Store Differential is the + and – differential for the DHW Setpoint (the DHW Setpoint is accessed in the User Menu). **NOTE:** This screen is visible in DHW mode 1 & 2 ONLY. The differential to the storage tank setpoint can be set here. The default is 7°F. Range: 1 – 36°F.
Once the DHW-Store Differential is set, push the ▼ key to set the CH/DHW Priority.	

DHW SETTINGS ⇧ CH/DHW Priority >Switch DHW-Prio Time 30min⇩	CH/DHW Priority sets the heating priority of the boiler. The following options can be selected: **Time** - Priority changes after time. **CH-Prio** - Central heating always takes priority. **DHW-Prio** - Domestic hot water always takes priority. Defaults is DHW-Prio, and 30 minutes. Range: 1 – 60 Minutes.

Table 39 – DHW Settings Quick Start-Up

Once the CH/DHW Priority is set, press **ENTER** to save. Press the ◄ key to exit the Installer Menu return to the User Menu.

E. USER MENU BOILER SETTINGS

To view Boiler Settings: At the Main Screen, you can enter the User Menu by pressing the ► key. At the initial User Menu screen, press the **ENTER** key when the > icon is in line with Boiler Settings, and a series of Boiler Settings options can be accessed. These options and corresponding screens are described below.

SCREEN	DESCRIPTION
BOILER SETTINGS Central Heating Setpoint Outdoor Reset 180°F ⇩	In a cascaded system, “CH-Cascade” is shown. OutdoorReset is only shown when CH-mode 1 or 2 is used. This indicates that the setpoint cannot be changed. When not used, the installer can set the setpoint for central heating.
Pressing the ▼ key allows the User to view more data.	
BOILER SETTINGS ⇧ DHW-Store Setpoint 119°F⇩	Visible in DHW mode 1 and 2. Displays the storage tank temperature setpoint if an indirect sensor is used. The factory installed default setpoint is 119°F. Range: 104 – 160°F.

Table 40 – User Menu - Boiler Settings – Quick Start-Up

F. CASCADE FOLLOWER MAIN SCREENS

To view Cascade Follower Main Screens: Press the ◄ key to return to the Main Menu

SCREEN	DESCRIPTION
BOILER ## ⇧ STANDBY: NO DEMAND 160°F	This display is visible at single and cascaded boilers. “BOILER ##” will only appear in cascaded systems. ## stands for boiler address. Press the ▼ key at the cascade master to view the outputs of cascade followers. In this screen the boiler is in standby. There are no active outputs.
FPBSG BOILER ## ⇧ CENTRAL HEATING 100% 160°F	This screen displays operation status (modulation range and actual supply temperature) and active outputs of the control. “BOILER ##” will only appear in cascaded systems. ## stands for boiler address. Press the ▼ key at the cascade master to view the outputs of cascade followers. Active outputs of control are: **F** – Flame **B** – Blower **G** - Gas valve **L** – Limited Modulation **P** - Pump for CH or general pump **S** - Spark **D** - DHW Pump or 3 WV

Table 41 – Boiler Main Screens – Quick Start-Up

PART 14 – TROUBLESHOOTING

⚠ WARNING

When servicing or replacing any components of this boiler, be certain that:

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

⚠ DANGER

When servicing or replacing components that are in direct contact with boiler 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 disconnected.

⚠ WARNING

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER. Immediately call a qualified service technician. The appliance MUST BE replaced if it has been submerged. Attempting to operate an appliance that has been submerged could create numerous harmful conditions, such as a potential gas leakage causing a fire and/or explosion, or the release of mold, bacteria, or other harmful particulates into the air. Operating a previously submerged appliance could result in property damage, severe personal injury, or death.

NOTE: Appliance damage due to flood or submersion is considered an Act of God, and IS NOT covered under product warranty.

⚠ CAUTION

This boiler has wire function labels on all internal wiring. Observe the position of each wire before removing it. Wiring errors may cause improper and dangerous operation. Verify proper operation after servicing.

⚠ 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.

A. BOILER ERROR CODES

The display may show an error message and error code if any of the sensors detect an abnormal condition or an internal component fails during the operation of the boiler, and the condition lasts longer than one second.

This message and code may be the result of a temporary condition, in which case the display will revert to its normal readout when the condition is corrected. This is known as a “Blocking” error, and will be indicated as such on the display with the letter “E”.

The code may also be the result of a condition that the controller has evaluated as not safe to restart the boiler. In this case, the boiler control will be locked out, the red FAULT light will be lit, and the message “LOCKOUT” will be displayed on the display readout, along with the letter “A”. In the case of a “LOCKOUT” error, the boiler will not start until a qualified technician has repaired the boiler and pressed the RESET button for more than 1 second.

IMPORTANT NOTE: If you see error messages on your display readout, call a technician immediately, since the message may indicate a more serious problem will occur soon.

B. USER INTERFACE DISPLAY

NOTE: If flame goes out after proper ignition and the boiler displays an error after too many flame failures, check the appliance type.

1. LOCKOUT ERROR CODES

DISPLAY CODE	ERROR	INT. CODE	DESCRIPTION	POSSIBLE SOLUTION
A01	IGNIT_ERROR	1	Five unsuccessful ignition attempts in a row	Check ionization and spark electrode. Check gas pressure. Check plugs at gas valve and stepper motor.
A05	GV Relay Error	2	Failure detected in the GV Relay	Check gas valve plug and windings – resistance. If correct, exchange BCU.
A05	GV Relay not open error	3	Failure detected in the GV Relay	BCU must be exchanged.
A05	GV Relay not closing error	4	Failure detected in the GV Relay	Check gas valve plug and windings – resistance. If correct, exchange BCU.
A06	Safety relay error	5	Failure detected in the Safety Relay	
A06	Safety relay open error	6	Failure detected in the Safety Relay	BCU must be exchanged.
A06	Safety relay closed error	7	Failure detected in the Safety Relay	Check gas valve plug and windings – resistance. If correct, exchange BCU.
A00	Blocking too long error	11	Control had a blocking error for more than 20 hours in a row.	Reset the boiler and repair the blocking error.*
A08	Fan error	12	Fan MF deviation for more than 60 sec. to target MF.	Check exhaust gas piping. Exchange fan.*
A09	Ram error	13	Internal software error	Exchange BCU.
A10	Wrong eeprom signature	14	Contents of e2prom is not up-to-date	Reload the E2Prom if possible, otherwise exchange BCU.
A11	X ram error	15	Internal software error	Exchange BCU.
A12	E2prom error	16	No communication with E2prom	Reload the E2Prom if possible, otherwise exchange BCU.
A12	E2prom error safety C	17	Wrong safety parameters in E2prom	
A12	E2prom error Calibration table	18	Wrong calibration table parameters	

A13	State error	19	Internal software error	Exchange BCU.
A14	Rom error	20	Internal software error	
A14	Rom error C	21	Internal software error	
A15	Air sw not open	22	Air pressure switch not working	Check air switch, hose to air switch (water), and wiring to BCU. Check Menu settings.
A16	15MS XRL error	23	3 timing errors	Reset.
A17	Air sw not closed	24	Air pressure switch not working	Check air switch, hose to air switch (water), and wiring to BCU. Check Menu settings.
A18	Max Temp. Error	25	External overheat protection is activated	Check overheat sensor, wiring, supply settings, and supply controller settings.
A19	Stack error	26	Internal software error	Exchange BCU.
A20	Flame out too late	27	Flame still present 10 sec. after closing the gas valve	Check position of ionization pin, clean surface of ionization pin, Check the gas valve tightness.
A21	False Flame	28	Flame is detected before ignition	Check the gas connection and gas valve. Check position of ionization pin. Reset. If error is not corrected, exchange BCU.
A22	20MS XRL error	29	Internal software error	Reset the boiler.
A23	41MS XRL error	30	Internal software error	
A24	Too many flame failures	31	Ten times flame loss during one demand	Check the gas connection. Check ionization wiring, pin, and position. Check gas pressure.
A25	Flow switch not closed	32	Flow switch not working / No flow	Check the flow switch.
A26	Flow switch not open	33	Flow switch not working / No flow	
A27	Flag byte integrity	34	Internal software error	Exchange BCU.
A28	AD Hi cpl.	35	Internal software error	
A29	AD Lo cpl.	36	Internal software error	
A30	Register error	37	Internal software error	
A30	CPSM Error	37	Internal software error	

Table 42 – Lockout Error Codes

2. BLOCKING ERROR CODES

DISPLAY CODE	ERROR	INT. CODE	DESCRIPTION	POSSIBLE SOLUTION
E31	REFHI TOO LO	50	Internal hardware error	Check Field Connection Board on shortcuts, otherwise exchange BCU.
E32	REFHI TOO HI	51		
E33	REFLO TOO LO	52		
E34	REFLO TOO HI	53		
E35	FALSE FLAME	54	Flame is detected in a state in which no flame is allowed to be seen	Check the gas connection and gas valve. Check position of ionization pin. Reset. If error is not corrected, exchange BCU.
E36	WATER LEVEL DETECT	55	Low water level detected	Check the water pressure and sensor. (N/A)
E36	WATER LEVEL MEAS	56	Low water level measurement error	
E36	LOW WATER CUTOFF	57	Low water sensor error	
E37	LOW WATER PRESSURE	58	Low water pressure error	
E38	WATER PRESSURE SENSOR	59	Low water pressure depending on BCU settings	Check the water pressure and sensor. (N/A). Check menu setting.
E39	FLUE GAS ERROR	60	Flue gas temperature error	Check the flue switch or sensor. Check wiring. Check heat exchanger.
E41	BLOCKED DRAIN	62	Blocked drain switch is active	Check and clean condensate trap and condensate piping.
E43	WD FREQ ERROR	64	Not a correct frequency signal or no communication with the WD	Check the supply voltage and frequency. Exchange BCU.
E44	PHASE ERROR	65	Hot neutral reversed	Line not connected correctly.
E45	NET FREQ ERROR	66	Net frequency error detected.	Check the supply voltage and frequency. Exchange BCU.
E46	FAULTY EARTH ERROR	67	Faulty earth connection	Check the earth connections of the boiler and BCU.
E47	WD COMM ERROR	68	Watchdog communication error	Exchange the BCU.
E51	SUPPLY OPEN	72	Supply sensor open	Check the supply sensor and connection.

E52	RETURN OPEN	73	Return sensor open	Check the return sensor and connection.
E55	DHW OPEN	76	DHW sensor open	Check the sensor and connection.
E59	SUPPLY SHORTED	80	Supply sensor shorted	Check the supply sensor and connection.
E60	RETURN SHORTED	81	Return sensor shorted	Check the return sensor and connection.
E63	DHW SHORTED	84	DHW sensor shorted	Check the sensor and connection.
E65	FLUE SHORTED	86	Flue sensor shorted	Check the flue gas pipe. Check the sensor and connection.
E66	RESET BUTTON	87	Reset button error	Check the display and its connection.
E72	APPLIANCE SELECTION	93	Appliance selection error	Ensure the correct fan and burner are installed in the boiler. Go to the installer menu and select the correct appliance type.
E38	GAS PRESSURE ERROR	107	Gas too low depending on BCU settings	Check the gas pressure and external gas valves. Check the external gas pressure switch. Check menu setting.
E97	FLUE BLOCK ERROR	108	Flue gas pressure error	Check flue pressure switch, hose to flue pressure switch (water), and wiring to BCU

Table 43 – Blocking Error Codes

3. LAMBDACONSTANT LOCKOUT CODES

DISPLAY CODE	ERROR	INT. CODE	DESCRIPTION	POSSIBLE SOLUTION
A02	Thermocouple error	8	Thermocouple temperature failure	Check the thermocouples and the connector. TC1 green-red <10 ohm, TC2 yellow-white < 10 ohm. Exchange the burner.
A03	Combustion error	9	Wrong combustion detected	Check gas type selection in Menu, check thermocouples and the connector. Check CO2 and 2 point calibration.
A07	Flue block error	10	Flue block detected	Check inlet of fresh air and flue gas piping for dirt and condensate.
A30	C PSM error	37	Internal software error	Reset. Exchange the BCU.
A82	Plausi T1_1 error	38	Fan Plausi error	Exchange the fan.
A83	Plausi T1_2 error	39	Fan Plausi error	
A84	Plausi T2_1 error	40	Fan Plausi error	
A85	Plausi T3 error	41	Fan Plausi error	
A86	Plausi T2_1 error	42	Fan Plausi error	
A87	Plausi T3_1 error	43	Fan Plausi error	
A30	Register error	44	Internal software error	Reset. Exchange the BCU.

Table 44 – LambdaConstant Lockout Codes

4. LAMBDACONSTANT BLOCKING CODES

DISPLAY CODE	ERROR	INT. CODE	DESCRIPTION	POSSIBLE SOLUTION
E73	Fan error no massflow	94	Fan delivers no massflow to BCU	Check the connection between BCU and fan. Exchange fan or BCU.
E74	Fan error Target MF too high	95	Target MF is too high for the fan	Wrong fan type is mounted. Wrong appliance type is selected.
E75	Fan error Target MF too low	96	Target MF is too low for the fan	
E76	Fan error No comm.	97	No communication with fan	Check the connection between BCU and fan. Exchange fan or BCU.
E77	Fan error No read Cal Table	98	Fan calibration table cannot be read correctly from the fan by the BCU	Check the connection between BCU and fan (loose contacts). Exchange fan or BCU.
E78	Fan error MF calc	99	Mass flow calculation fails	Exchange the fan.
E79	Fan error others	100	Undefined fan errors	
E80	Fan plausibility error	101	Plausibility check fails	Check the connection between BCU and fan. Exchange the fan.
E81	Fan comm. CRC fail	102	Fan communication CRC failure	
E88	Mass flow comm. error	103	Mass flow sensor error	Exchange the fan.
E89	Mass flow deviation error	104	Mass flow deviation error	Check inlet of fresh air. Clean flue gas piping. Clean fan inlet. Measure CO_2 afterward. Ensure appliance type is set properly.

Table 45 – LambdaConstant Blocking Codes

DISPLAY CODE	ERROR	INT. CODE	DESCRIPTION	POSSIBLE SOLUTION
No Code	Flame goes off at down modulation after good ignition	No Code	Ionization is not high enough	Check appliance type settings. Check ionization pin position. Clean pin. Check gas pressure during modulation. Check air pressure chart peak at low fire.

Table 46 – Error without Displayed Code

Resistance Tables

Outdoor Sensor (7250P-319)			Supply Temperature Sensor (7250P-324)	
Outside Temperature (^{o}F)	Resistance (ohms)		Boiler Sensor (7250P-667)	Indirect Sensor (7250P-325)
-22	171800		Outside Temperature (^{o}F)	Resistance (ohms)
-13	129800		32	32550
-4	98930		41	25340
5	76020		50	19870
14	58880		59	15700
23	45950		68	12490
32	36130		77	10000
41	28600		86	8059
50	22800		95	6535
59	18300		104	5330
68	14770		113	4372
77	12000		122	3605
86	9804		131	2989
95	8054		140	2490
104	6652		149	2084
113	5522		158	1753
			167	1481
			176	1256
			185	1070
			194	915
			203	786
			212	667

Table 47 – Resistance Tables

PART 15 – MAINTENANCE

A. MAINTENANCE PROCEDURES

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is operating safely and efficiently. The owner should make necessary arrangements with a qualified heating contractor for periodic maintenance of the boiler. The installer must also inform the owner that a lack of proper care and maintenance of the boiler may result in a hazardous condition.

⚠ WARNING

BEFORE EACH HEATING SEASON a trained and qualified service technician should perform the inspections as per the boiler inspection and maintenance schedule in the back of the manual. Failure to do so could result in death or serious injury.

⚠ 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, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)."

- **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 job site conditions. Current NIOSH recommendations can be found on the NIOSH website: 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.**

B. COMBUSTION CHAMBER COIL CLEANING INSTRUCTIONS FOR BOILER

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

- a nylon, stainless steel or brass brush (not steel)
- an FDA approved liquid lime scale remover, in a spray bottle
- gloves and eye protection

1. Shut down the Boiler by using the following steps:

a. Turn off power to the boiler. Close the gas valve. Turn down the thermostat, or disconnect the thermostat connection from the low voltage terminal strip. Wait for the boiler to be cool to the touch.

b. Disconnect the condensate piping from the outside connection, (not from the Boiler side), so flow from condensate reservoir can be observed.

c. Disconnect electrical connections from the gas valve, spark electrode, flame rectification probe, and two wire leads to the combustion blower.

d. Disconnect the wire harness connected to the combustion blower motor. Disconnect the green thermocouple wire from the control board, located near the blower outlet to the combustion system.

e. Use an adjustable wrench to loosen and remove the gas flex line from the burner.

f. Remove the (6) 10MM nuts from the burner plate assembly.

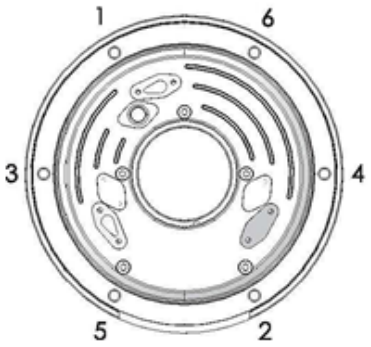


Figure 31

g. Gently pull the entire burner plate assembly with blower attached towards you, while removing or pushing aside any wiring to allow the removal of the assembly.

h. Disconnect the wire harness from the bottom of the blower to completely release the burner assembly.

NOTE: This will be easier to accomplish after the burner assembly is loose.

2. Using a spray bottle filled with the FDA approved lime scale remover or water, 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 solution penetrate for at least 15 minutes or until it drains.

3. Use the nylon, stainless steel or brass brush (do not use steel) and scrub coils to remove any buildup. Then vacuum the debris from the coils.

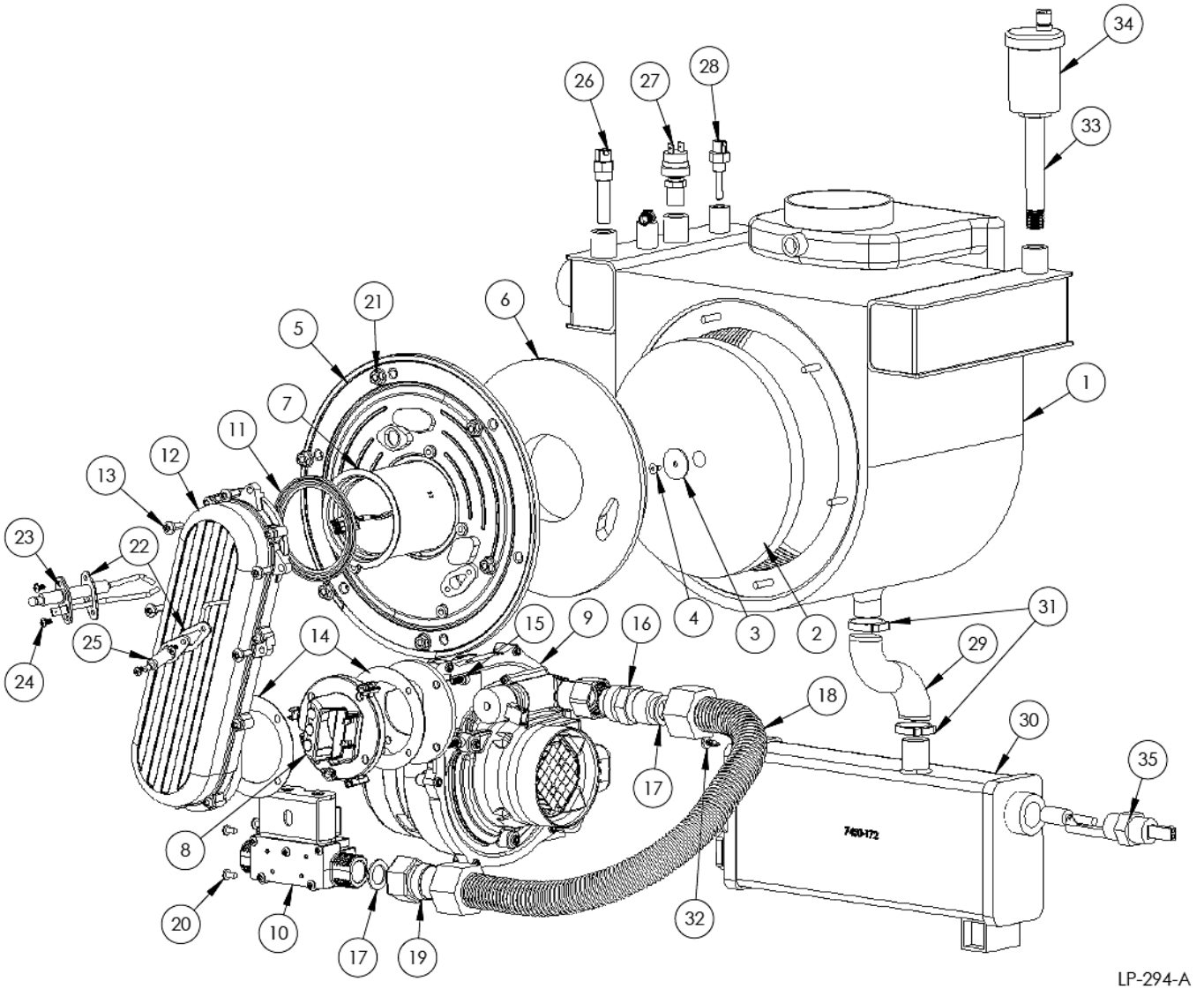
4. Spray the coils with clear water, making sure to confine the spray to the area being cleaned (Try to avoid getting the back ceramic wall of the boiler wet). Flush the combustion chamber with fresh water until it runs clear from the condensate line. At this point, the boiler should be ready to be re-assembled.

a. Inspect gaskets.
b. Gently slide the burner assembly into the heat exchanger. Reattach the wire harness to the blower.
NOTE: This will be easier to accomplish before the burner assembly is fully reinstalled.
c. Re-install the burner assembly.
d. Replace and tighten the (6) 10MM nuts to the burner plate using staggered tightening sequence. (See Figure 31 for detail.)
d. Re-connect the gas flex hose with an adjustable wrench. Ensure the O-ring is in place.
e. Reconnect electrical connections from the gas valve, spark electrode, flame rectification probe, and combustion blower.
f. Reconnect the wire harness to the combustion blower motor. Reconnect the green thermocouple wire to the control board.
f. Turn the gas back on. (IMPORTANT: CHECK ALL CONNECTIONS FOR GAS LEAKS!)
g. Restore power to the boiler.
h. Disconnect the White/Black/Red/Blue PWM connector feed to the fan. The fan will run at high speed to dry the combustion chamber out. It is recommended to wait 5 minutes before reconnecting the wire connector.
i. Reconnect condensate piping to the outside condensate connection.
j. Reconnect the thermostat wire leads, or turn up the thermostat to create a demand on the boiler. When boiler is lit, observe operation and condensate flow from the boiler. Double check for any combustion or gas leaks.

If the boiler is operating properly, condensate is flowing normally, and the installation is leak free, combustion coil cleaning is complete.

⚠ WARNING

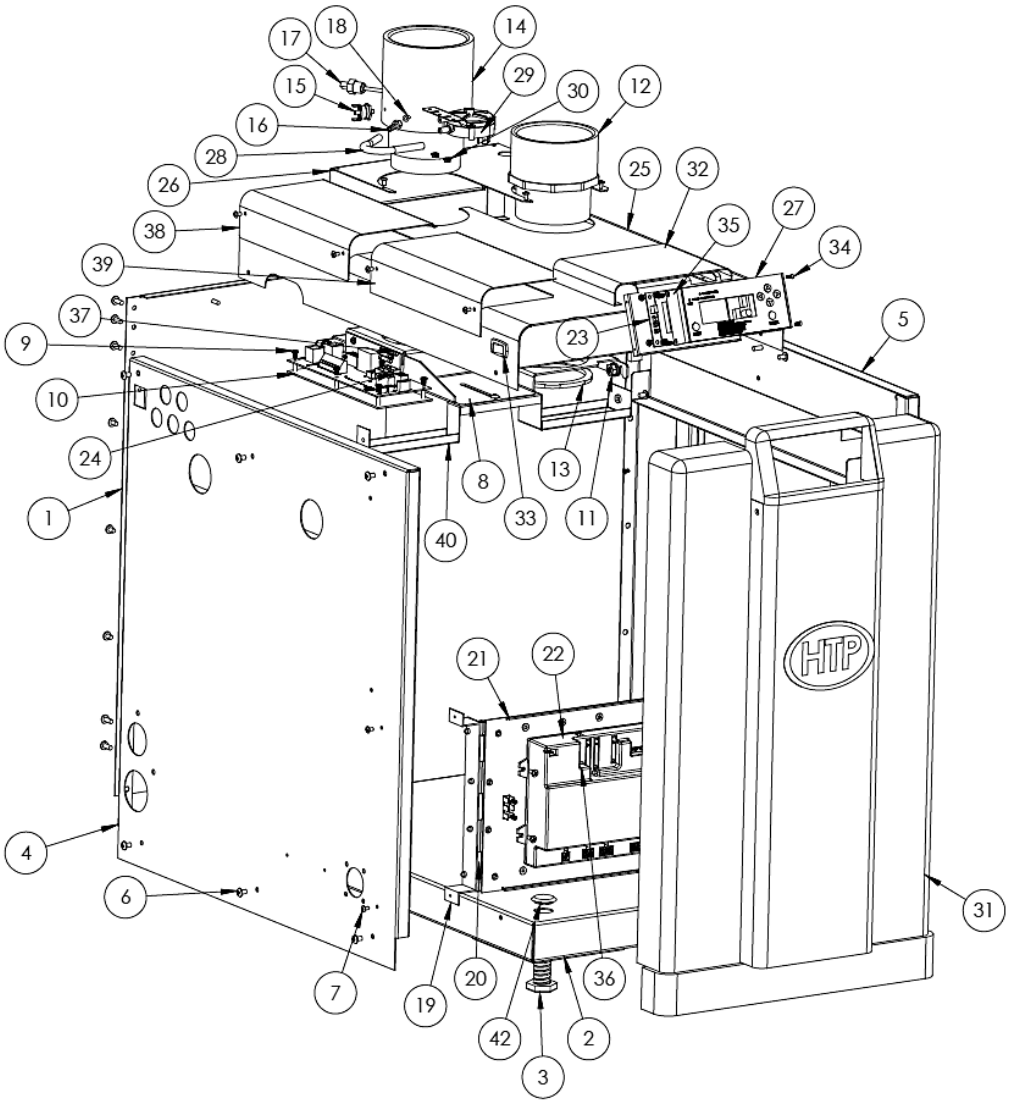
Do not use solvents to clean any of the burner components. The components could be damaged, resulting in unreliable or unsafe operation. Failure to do so could result in death or serious injury.



ITEM#	ELP-110	ELP-199	Description
1	7450P-002	7450P-004	BOILER MODULE
2	7250P-160	7250P-160	CERAMIC TARGET WALL
3	7500P-109	7500P-109	M4 FLAT WASHER
4	7250P-704	7250P-704	M4 X 8 FLAT HEAD SCREW
5	7450P-300	7450P-300	BURNER DOOR
6	7450P-005	7450P-005	BURNER DOOR REFRACTORY
7	7450P-264	7450P-265	BURNER
8	7450P-266	7450P-268	BLOWER FLANGE (w/CABLE BUSHING) (INCLUDES FLANGE FLAP FOR ELP-110 ONLY)
9	7450P-260	7450P-261	COMBUSTION BLOWER
10	7450P-267	7450P-267	GAS VALVE
11	7500P-074	7500P-074	GASKET - BURNER
12	7450P-008	7450P-007	AIR CHANNEL
13	7250P-206	7250P-206	M5 X 14MM TORX SCREWS - AIR CHANNEL
14	7500P-075	7500P-075	GASKET - AIR CHANNEL/BLOWER
15	7250P-478	7250P-478	M5 X 12MM SOCKET CAP SCREW
16	7450P-138	7450P-138	3/4 FLARE X 3/4 BSPP FITTING
17	7450P-115	7450P-115	WASHER - FLEX GAS LINE FITTING
18	7100P-244	7100P-244	3/4" X 18" FLEX GAS LINE

ITEM#	ELP-110	ELP-199	DESCRIPTION
19	7450P-253	7450P-253	RETAINING NUT
20	7450P-182	7450P-182	8-32 X 5/16 PAN HEAD SCREW
21	7500P-067	7500P-067	M6 NUT - BURNER DOOR
22	7250P-005	7250P-005	GASKET - PROBE/ELECTRODE
23	7450P-230	7450P-230	SPARK ELECTRODE (W/GASKET)
24	7250P-069	7250P-069	SCREW M4 X 8MM - PROBE/ELECTRODE
25	7450P-231	7450P-231	FLAME RECTIFICATION PROBE (W/GASKET)
26	7250P-667	7250P-667	THERMISTOR
27	7250P-096	7250P-096	WATER PRESSURE SWITCH - NPTF THREAD
28	7450P-192	7450P-192	THERMISTOR/WATER TEMP SWITCH
29	7450P-185	7500P-057	CONDENSATE HOSE
30	7450P-702	7450P-702	CONDENSATE COLLECTOR ASSY
31	7250P-210	7250P-210	HOSE CLAMP
32	7350P-063	7350P-063	#10 X 1/2" SELF TAPPING SCREW - CONDENSATE
33	7450P-199	7450P-199	1/4" NPT NIPPLE
34	7450P-197	7450P-197	AIR RELEASE VENT
35	7350P-167	7350P-167	CONDENSATE OVERFLOW SWITCH

Figure 32



ITEM #	ELP-110	ELP-199	DESCRIPTION
1	7450P-039	7450P-039	JACKET - REAR
2	7450P-055	7450P-038	JACKET - BOTTOM
3	7450P-121	7450P-121	LEVELING FEET
4	7450P-059	7450P-036	JACKET - LEFT SIDE
5	7450P-123	7450P-037	JACKET - RIGHT SIDE
6	7450P-080	7450P-080	10-32 X 5/16 PAN HEAD SCREW - JACKET
7	7450P-081	7450P-081	6-32 X 1/4 PAN HEAD SCREW - ACCESSORIES
8	7450P-074	7450P-074	AIR/EXHAUST SUPPORT PLATE
9	7500P-115	7500P-115	6-32 X 1/4 PAN HEAD SCREW - ELECTRONIC BOARDS
10	7450P-178	7450P-178	FIELD CONNECTION BOARD PLATE
11	7450P-088	7450P-088	8-32 FLANGED NUT - AIR EXHAUST PLATE
12	7450P-030	7450P-030	AIR INLET ADAPTER
13	7450P-032	7450P-032	AIR INLET CONNECTOR NUT
14	7450P-201	7450P-201	EXHAUST ADAPTER
15	7250P-739	7250P-739	ECO FLUE SWITCH - 160 DEGREES
16	7250P-154	7250P-154	S.S. BARBED FITTING - 1/4 HOSE X 10-32
17	7450P-026	7450P-026	FLUE THERMISTOR
18	7250P-152	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING
19	7450P-079	7450P-079	HINGE BRACKET
20	7450P-091	7450P-091	HINGE
21	7450P-278	7450P-278	CONTROL BOARD DOOR

ITEM#	ELP-110	ELP-199	DESCRIPTION
22	7450P-262	7450P-262	CONTROL BOARD
23	7450P-263	7450P-263	DISPLAY BOARD
24	7350P-070	7350P-070	FIELD CONNECTION BOARD
25	7450P-040	7450P-042	JACKET - TOP COVER FRONT
26	7450P-072	7450P-099	JACKET - TOP COVER BACK
27	7450P-170	7450P-170	MEMBRANE TOUCHPAD
28	7000P-805	7000P-805	PLASTIC TUBING - 3/16 OD - PRESSURE SWITCH
29	7250P-150	7250P-150	PRESSURE SWITCH
30	7450P-142	7450P-142	6-32 FLANGED NUT - PRESSURE SWITCH
31	7450P-047	7450P-047	JACKET - FRONT COVER ASSY
32	7450P-050	7450P-050	JACKET - TOP COVER INSERT
33	7500P-087	7500P-087	POWER SWITCH
34	7450P-092	7450P-092	6-32 FLAT HEAD SCREW - ACCESSORIES
35	7450P-019	7450P-019	MEMBRANE SWITCH BRACKET
36	N/A	N/A	FUSE - CONTROL BOARD - 5 AMPS
37	7350P-129	7350P-129	FUSE - CONNECTION BOARD - 3.15 AMPS
38	7450P-160	7450P-160	FIELD CONNECTION BOARD COVER
39	N/A	7450P-061	BOILER ACCESS COVER
40	7450P-076	7450P-076	MODULE HOLD-DOWN STRAP
41	7450P-701	7450P-700	WIRING HARNESS (NOT SHOWN)
42	7450P-226	7450P-226	7/8 HOLE PLUG

Figure 33 – LP-294-B

BOILER START-UP REPORT

LIGHT OFF ACTIVITIES			DATE COMPLETED _____			
1) Fill the heating system	Check all piping and gas connections, verify all are tight					
	Pressurize system (12-15 PSI)		____ PSI			
	Add water to prime condensate cup					
	What percentage of propylene glycol is installed in the system (0-50%)?		____ %			
	Verify near boiler piping is properly supported					
2) Check gas pipe	Leak test using locally approved methods (consult jurisdictional code book)					
	Check incoming gas pressure (3.5" to 14" W.C.)		____ in w.c.	Static		
	What is the "drop" on light off (No more than 1" W.C.)?		____ in w.c.	Dynamic		
3) Check combustion	Check carbon dioxide content		____% CO2	High Fire	____% CO2	Low Fire
4) Verify system operation	Turn up thermostat to verify wiring connections	TC1	____ uA High power	____ uA Ignition Power		____ uA Low power
		TC2				
5) Record ionization current	Check uA reading in System Test, Part 12, Section F		____ uA High power	____ uA Ignition Power		____ uA Low power
6) Record system settings	Record heating curve		____	____	____	____
7) Indirect water heater	Verify safety and operation of the indirect water heater, record settings		____ DHW tank setpoint		____	
Notes:						

Table 48

MAINTENANCE REPORT

CAUTION

In unusually dirty or dusty conditions, care must be taken to keep boiler cabinet door in place at all times. Failure to do so VOIDS WARRANTY!

⚠ WARNING

Allowing the boiler to operate with a dirty combustion chamber will hurt operation. Failure to clean the heat exchanger as needed by the installation location could result in boiler failure, property damage, personal injury, or death. Such product failures ARE NOT covered under warranty.

The boiler requires minimal periodic maintenance under normal conditions. However, in unusually dirty or dusty conditions, periodic vacuuming of the cover to maintain visibility of the display and indicators is recommended.

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is operating safely and efficiently. The owner should make necessary arrangements with a qualified heating contractor for periodic maintenance of the boiler. Installer must also inform the owner that the lack of proper care and maintenance of the boiler may result in a hazardous condition.

INSPECTION ACTIVITIES		DATE LAST COMPLETED			
PIPING		1st YEAR	2nd YEAR	3rd YEAR	4th YEAR*
Near boiler piping	Check boiler and system piping for any sign of leakage. Continual fresh make-up water will reduce boiler life. Leaking pipes could cause property damage. Make sure all piping is properly supported.				

Vent	Check condition of all vent pipes and joints. Ensure all vent piping is properly supported. Check for obstructions at exhaust and intake termination points.				
Gas	Check Gas piping, test for leaks and signs of aging. Make sure all pipes are properly supported.				
SYSTEM					
Visual	Do a full visual inspection of all system components.				
Functional	Test all functions of the system (Heat, Safeties)				
Temperatures	Verify safe settings on boiler or Anti-Scald Valve				
Temperatures	Verify programmed temperature settings				
ELECTRICAL					
Connections	Check wire connections. Make sure they are tight.				
Smoke and CO detector	Verify devices are installed and working properly. Change batteries if necessary.				
Circuit Breakers	Check to see that the circuit breaker is clearly labeled. Exercise circuit breaker.				
CHAMBER/BURNER					
Combustion Chamber	Check burner tube and combustion chamber coils. Clean according to maintenance section of manual. Vacuum combustion chamber.				
Spark Electrode	Clean. Set gap at ¼".				
Flame Probe	Clean. Check ionization in uA (in System Test, Part 12, Section F). Record high fire and low fire.				
CONDENSATE					
Neutralizer	Check condensate neutralizer. Replace if necessary.				
Condensate hose	Disconnect condensate hose. Clean out dirt. Fill with water to level of outlet and re-install. (NOTE: Verify the flow of condensate, making sure that the hose is properly connected during final inspection.)				
GAS					
Pressure	Measure incoming gas pressure (3.5" to 14" W.C.)				
Pressure Drop	Measure drop in pressure on light off (no more than 1" W.C.)				
Check gas pipe for leaks	Check piping for leaks. Verify that all are properly supported.				
COMBUSTION					
CO/CO2 Levels	Check CO and CO2 levels in Exhaust (See Part 12, G). Record at high and low fire.				
SAFETIES					
ECO (Energy Cut Out)	Check continuity on Flue and Water ECO. Replace if corroded.				
Water Pressure Switch	Check operation. Check for signs of leakage. Replace if corroded.				
Thermistors	Check wiring. Verify through ohms reading.				
FINAL INSPECTION					
Check list	Verify that you have completed entire check list. WARNING: FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.				
Homeowner	Review what you have done with the homeowner.				

Table 49 - *Continue annual maintenance beyond the 4th year as required.

ADDITIONAL INSTALLATION REQUIREMENTS FOR THE COMMONWEALTH OF MASSACHUSETTS

In the Commonwealth of Massachusetts, the installer or service agent shall be a plumber or gas fitter licensed by the Commonwealth.

When installed in the Commonwealth of Massachusetts or where applicable state codes may apply; the unit shall be installed with a CO detector per the requirements listed below.

5.08: Modifications to NFPA-54, Chapter 10

(1) Revise NFPA-54 section 10.5.4.2 by adding a second exception as follows:

Existing chimneys shall be permitted to have their use continued when a gas conversion burner is installed, and shall be equipped with a manually reset device that will automatically shut off the gas to the burner in the event of a sustained back-draft.

(2) Revise 10.8.3 by adding the following additional requirements:

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

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the service 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 cannot 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.

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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 Approval 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.

MAINTENANCE NOTES

HTP CUSTOMER INSTALLATION RECORD FORM

The following form should be completed by the installer for you to keep as a record of the installation in case of a warranty claim. After reading the important notes at the bottom of the page, please also sign this document.

Customer's Name:	
Installation Address:	
Date of Installation:	
Installer's Code/Name:	
Product Serial Number(s):	
Comments:	
Installer's Phone Number:	
Signed by Installer:	
Signed by Customer:	

IMPORTANT NOTES:

In the case that the system has any problems, please call the installer. If you are unable to make contact, or are unhappy with the response, please contact your HTP Sales Representative.

Distributor/Dealer: Please insert contact details.