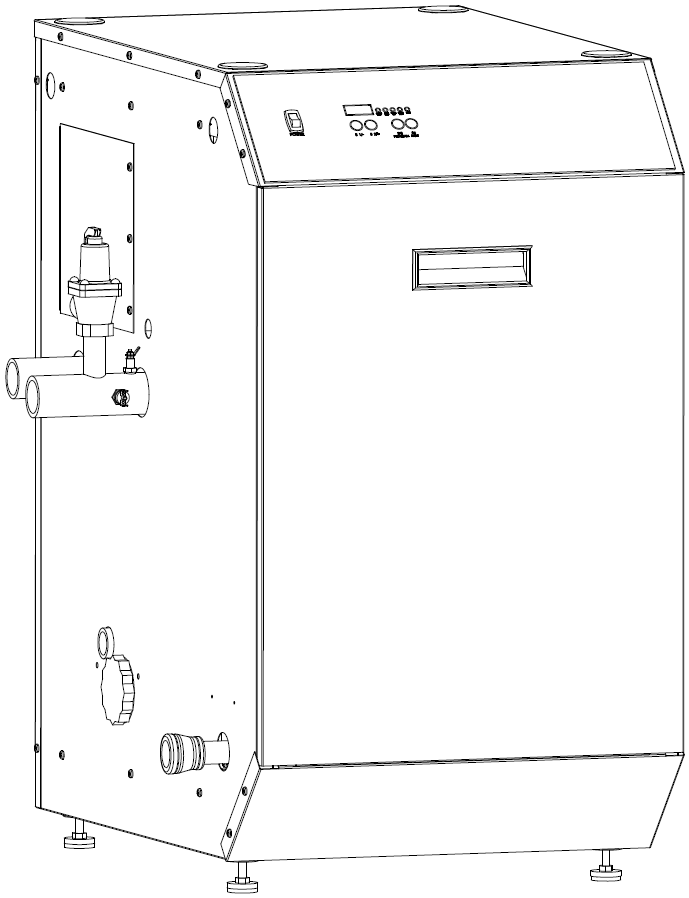
Mod Con



INSTALLATION

START-UP

MAINTENANCE

PARTS

Models
300 / 500 / 850
LP / HL / LPHL

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- 205 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.**

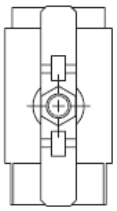
C. Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

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.

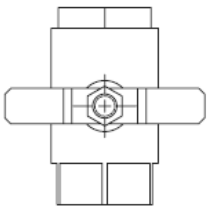
OPERATING INSTRUCTIONS

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 appliance. 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 or 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 appliance 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**.

NOTICE

The CSD-1 ASME Code, Section CW-400 requires that hot water heating and supply boilers have a) a UL 353 temperature control device, b) at least one (1) temperature-actuated control to shut off the fuel supply when system water reaches a preset operating temperature, c) a high temperature limit control that prevents the water temperature from exceeding the maximum allowable temperature by causing a safety shutdown and lockout, and d) its own sensing element and operating switch.

The temperature control system integrated into the 926 control provided with this heating appliance complies with the requirements of CSD-1 Section CW-400 as a temperature operation control. The control monitors the temperature difference between the inlet and the outlet sensor, which is affected by boiler water flow. If this temperature difference exceeds 55°F (typically because of low water flow or very low heat load), the control will reduce the maximum fan speed. If the temperature difference exceeds 60°F, the control will effectively sense there is little or no water flow or heat load and shut the boiler down. The controller will restart automatically once the temperature difference has dropped below 55°F and the minimum off time (anti-cycle time) has expired. In addition, if the control senses that the outlet water temperature has reached 210°F, the boiler is put into a hard lockout and requires manual reset to restart.

TABLE OF CONTENTS

PART 1 – GENERAL SAFETY INFORMATION

A. PRECAUTIONS

This appliance is for indoor installations only. Clearance to combustible materials: 0" top, bottom, sides and back. Front must have room for service, 24" recommended. (A combustible door or removable panel is acceptable front clearance.) This appliance has been approved for closet installation. Do not install this appliance directly on carpeting. This appliance may be installed on combustible flooring. For use with 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. Refer to user's information manual for your reference. 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.

⚠ 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.

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

- FIRE
- DAMAGE
- WATER

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

CAUTION

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

B. GAS

Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to the circulator. Instead, shut off the gas supply at a location external to the appliance.

C. 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.

D. WHEN SERVICING THE BOILER

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

E. BOILER OPERATION

- Do not block flow of combustion or ventilation air to boiler.
- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.
- Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and replace any part of the control system and any gas control that has been under water.

F. BOILER WATER

- Do not use petroleum-based cleaning or sealing compounds in a boiler system. These products may damage gaskets and seals in the system. 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.

G. FREEZE PROTECTION

⚠ 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 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:

- Pressure and Temperature Gauge
- Outdoor Sensor
- Intake PVC Tee with Screens
- Exhaust PVC Coupling with Screens
- Installation Manual
- Warranty
- CSD-1 Form
- H-3 Data Sheet

B. HOW BOILER OPERATES

Mod Con condensing technology intelligently delivers highly efficient hydronic heating while maximizing efficiency by measuring data from the heating system. 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 use the cold return water from the system and extract the last bit of heat before it is exhausted.

Modulating Combustion System - The combustion system will modulate the output of the burner during operation to match the 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 fan speed to control boiler output. This allows the boiler to deliver only the amount of heat energy required and nothing more. The system can be further enhanced by installing with an indirect water heater to provide domestic hot water.

The control can regulate the output of multiple boilers through its cascade system function. The cascade system is capable of connecting up to eight boilers together in such a way that they function as one boiler system. This allows for greater turn down ratios and provides systematic control of the multiple boilers in an installation to minimize downtime and maximize efficiency.

The cascade system works by establishing one boiler as the master and the other connected boilers as followers. The master boiler requires a cascade system sensor and a cascade pump in addition to its own boiler pump. Each of the follower boilers has an individual pump.

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

Gas Valve – Senses suction from the blower, allowing gas to flow only if powered and combustion air is flowing.

All Metal Integrated Venturi – Controls air and gas flow into the burner.

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

Spark Ignition – The burner is ignited by applying high voltage through the system spark electrode. This causes the spark from the electrode to ignite mixed gas from the burner.

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

Return Water Temperature Sensor – This sensor monitors the boiler return water temperature (System Return).

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 wiring of the boiler.

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

Flow Protection – The optional flow switch is designed to protect the boiler in the event of low flow conditions. The boiler control will also monitor flow through the heat exchanger by monitoring the return and supply sensors and will shut down the burner before overheating occurs.

Outdoor Sensor – This sensor monitors outdoor temperature. Data from this sensor is monitored by the control, which adjusts the unit set point to provide greater efficiency.

Indirect Tank Sensor (optional) – Monitors storage tank temperature.

C. OPTIONAL EQUIPMENT

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

- System Sensor (Part # 7250P-324)
- Indirect Tank Sensor (Part # 7250P-325)
- 4” Stainless Steel Outside Termination Vent Kit (V2000)
- 6” Stainless Steel Outside Termination Vent Kit (V3000)
- High and Low Gas Pressure Switch Kit with Manual Reset (Part # 7350P-600)
- U.L. 353 Compliant Low Water Cut-Off Interface Kit with Manual Reset (Part # 7350P-601)
- Alarm System (Part # 7350P-602) (to monitor any failure)
- Stacking Kit (Part # 7350P-603)
- PC Connection Kit (Part # 7250P-320)
- Condensate Neutralizer (Part # 7350P-611)
- Caster Kit (Part # 7350P-604)
- Flow Switch Kit (Part # 7350P-606 for Mod Con 300, Part # 7350P-605 for Mod Con 500/850)

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.

B. LEVELING AND DIMENSIONS

⚠ 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.

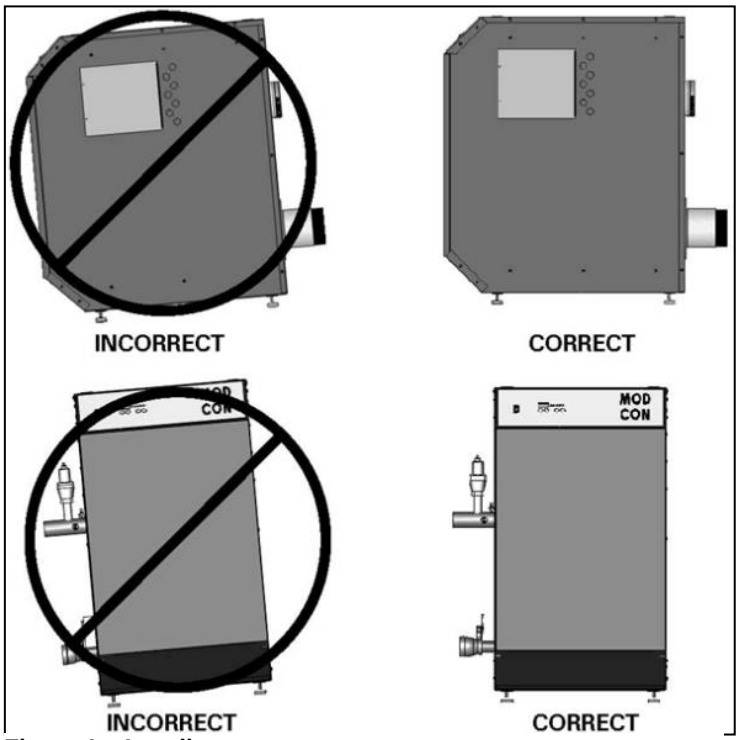
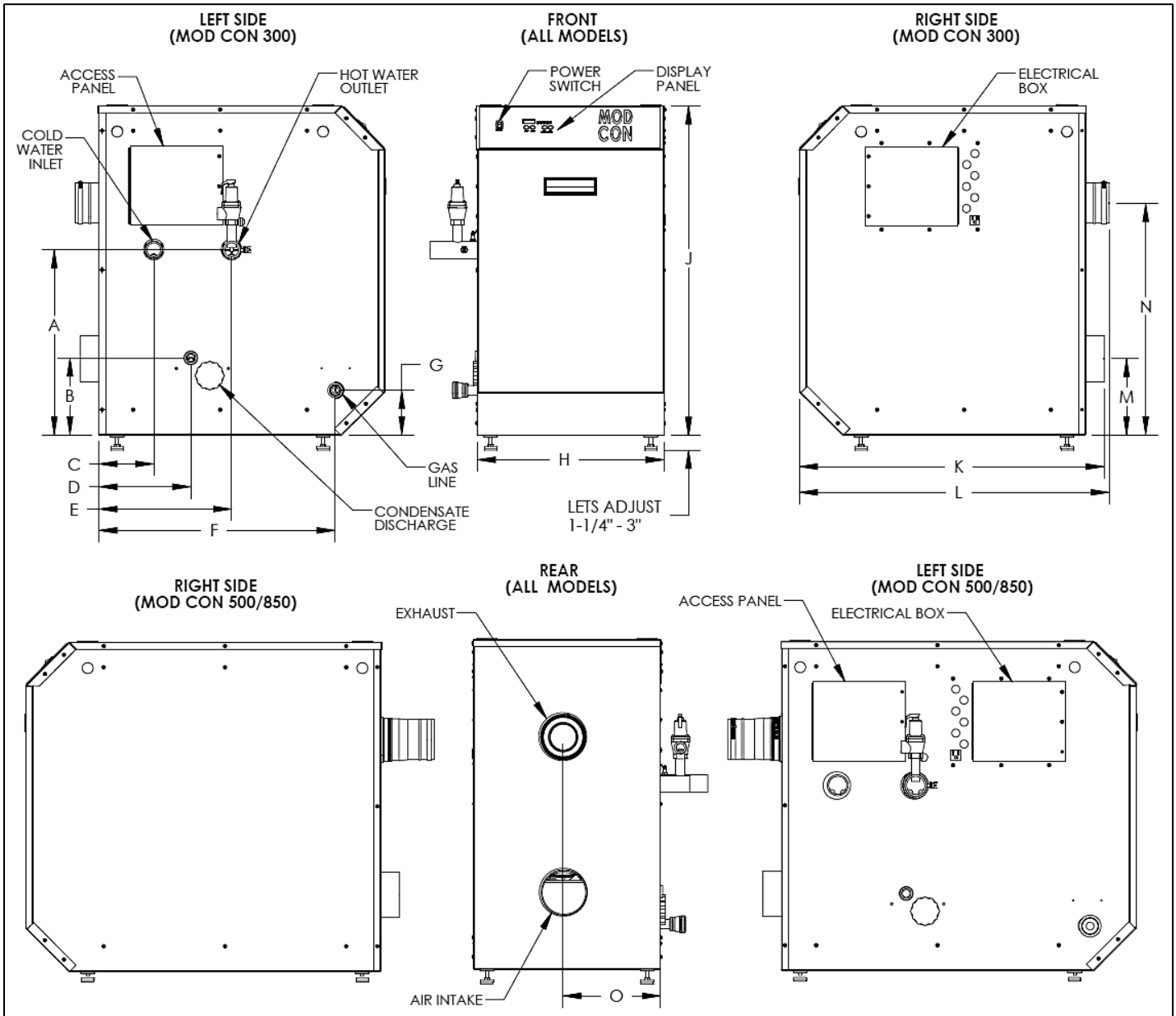


Figure 1 – Leveling



MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	O
MOD CON 300	20"	10-1/4"	6-1/4"	10-1/4"	14-1/2"	26"	5-1/8"	20-1/2"	36"	33-1/2"	36"	8-1/4"	25-1/2"	10-1/2"
MOD CON 500	20"	14-3/4"	6-1/4"	13-1/4"	14-1/2"	33-1/4"	5-1/8"	20-1/2"	36"	40"	43"	8-1/4"	25-1/2"	10-1/2"
MOD CON 850	20"	20"	6-1/4"	16-1/4"	18-3/4"	43-1/2"	20"	20-1/2"	36"	68-3/4"	70-3/4"	8-1/4"	25-1/2"	10-1/2"

NOTE: ALL DIMENSIONS ARE APPROXIMATE AND HEIGHTS DO NOT INCLUDE ADJUSTABLE LEGS.

MODEL	BTU/HR INPUT LOW FIRE	Gross Output BTU/hr	Net I=B=R BTU/hr	Thermal Effieciency	Boiler Water	Supply/Return Connection	Gas Conn.	Vent Dia.	Ship. Wt.	High Fan Speed	Low Fan Speed	Fan Speed at Ignition
MOD CON 300	60,000-301,000	283,000	245,000	94%	2.9	1-1/2"	1-1/4"	4"	410	5500	1250	3000
MOD CON 500	100,000-500,000	470,000	409,000	94%	4.2	2"	1-1/2"	4"	505	6930	1250	3000
MOD CON 850	170,000-850,000	799,000	695,000	94%	5.8	2"	2"	6"	580	5400	1500	3000

LP-205-C
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Figure 2 – Specifications and Dimensions

C. CLEARANCES FOR SERVICE ACCESS

See Figure 3 for recommended service clearances. If you do not provide the minimum clearances shown, it might not be possible to service the boiler without removing it from the space.

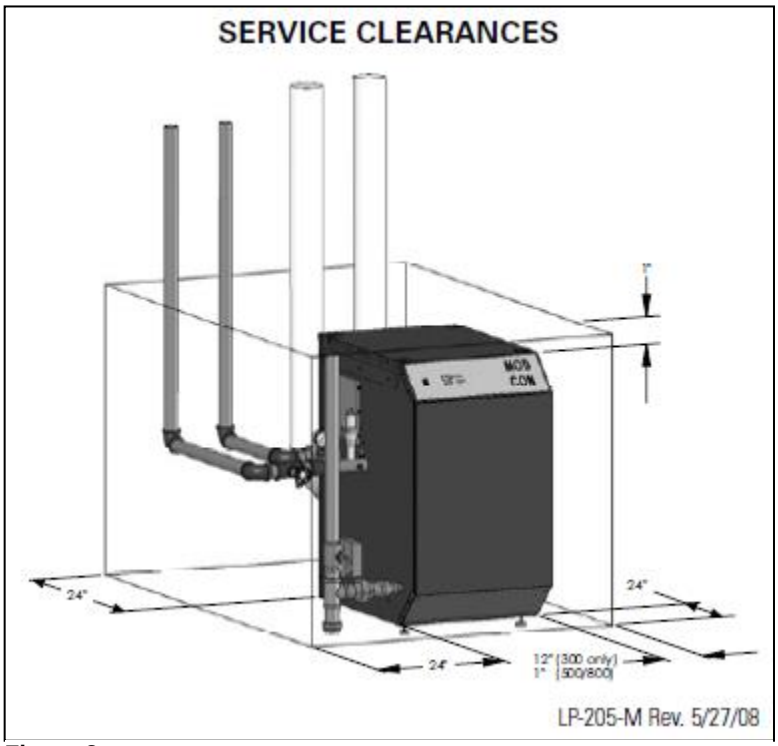


Figure 3

⚠ WARNING

Space must be provided with combustion / ventilation air openings correctly sized for all appliances located in the same space as the boiler. The boiler venting 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 warnings could result in substantial property damage, severe personal injury, or death.

D. RESIDENTIAL GARAGE INSTALLATION

PRECAUTIONS

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.

CAUTION

Check with your local Authority Having Jurisdiction for requirements when installing boiler in a garage. 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.

E. EXHAUST VENT AND INTAKE AIR VENT

⚠ WARNING

Vents must be properly supported. The boiler intake and exhaust 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 1 **in this section when considering exhaust vent and intake air vent termination.**

Intake and exhaust vents must terminate near each other and may be vented vertically through the roof or out a side wall. Intake and exhaust venting methods are detailed in the Venting Section. Do not attempt installation using any other means. Be sure to locate the boiler so intake and exhaust vent piping can be routed through the building and properly terminated. The air intake and exhaust vent piping lengths, routing and termination method must all 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

You must pipe outside air to the boiler intake. Ensure that the intake air will not contain any of the contaminants below. For example, do not pipe intake vent 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 1 – Contaminants

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 boiler. This will cause flue gas spillage or boiler 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.

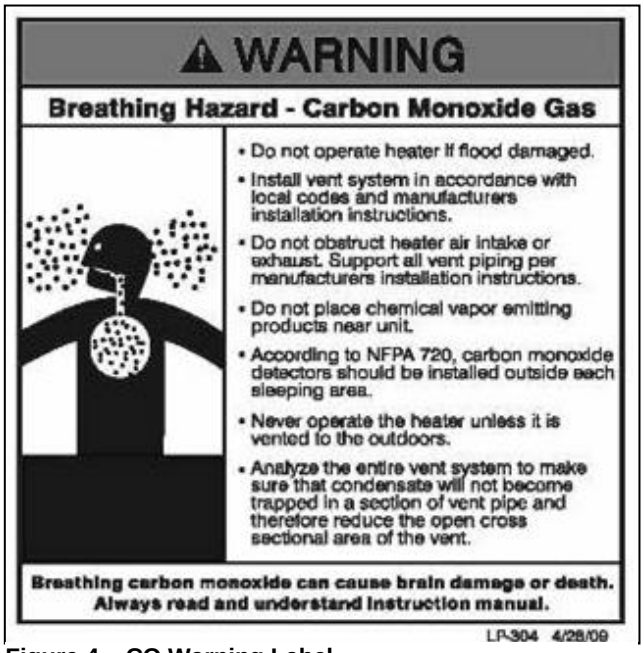


Figure 4 – CO Warning Label

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 AND MOVING BOILER

⚠ WARNING

Uncrating Boiler – Any claims for damage 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°F) before installation, handle with care until the plastic components come to room temperature.

Remove all sides of the shipping crate in order to allow the boiler to be lifted into its installation location. Pick the boiler up by the lift rings to avoid damage to the boiler enclosure. Use either a solid ¾" diameter black iron pipe or lifting straps to lift the boiler off of its shipping crate. The boiler is very heavy. At least two individuals are needed to handle the boiler properly. If the location is not level, adjust the boiler's leveling feet to ensure a level boiler and proper flow of condensate. If surface flooring is rough, care should be taken not to catch the leveling feet and damage the boiler when sliding it into position.

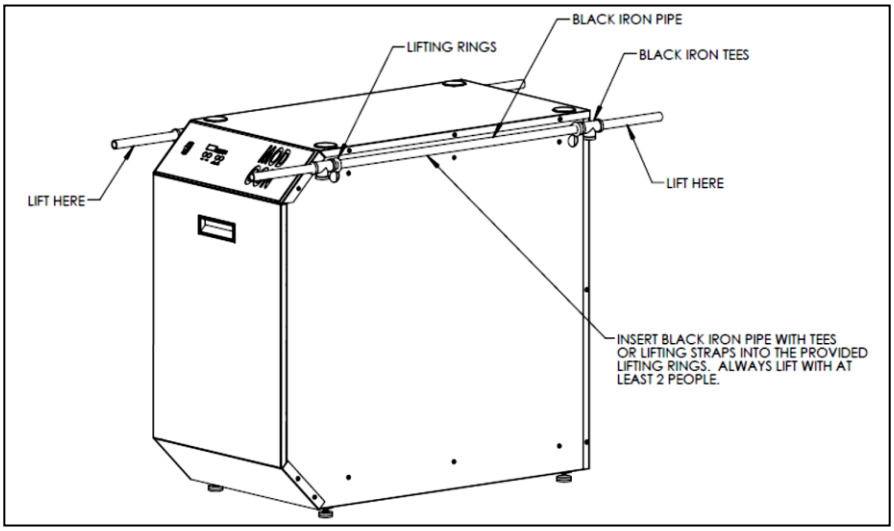


Figure 5 – Lifting Detail

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.

Plumbing of this product should only be done by a qualified, licensed plumber in accordance with all local plumbing codes. The boiler may be connected to a storage tank to supply domestic hot water. HTP offers 60/80/119/175 gallon size storage tanks in either stainless steel or glass-lined construction. These storage tanks can be directly connected to the boiler supply and return connection.

A. GENERAL PIPING INFORMATION

CAUTION

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

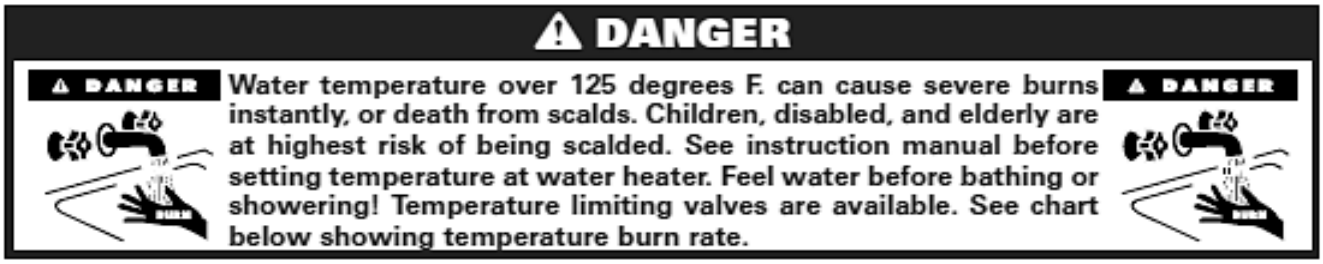
CAUTION

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

CAUTION

The control module uses temperature sensors to provide both high limit protection and modulating temperature control. The control module also provides low water protection by sensing the water level in the heat exchanger. Some codes/jurisdictions may require additional external controls.

B. RELIEF VALVE



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

⚠ 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^{o}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 (see Boiler Piping Details, Part 4, Section G).

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 Boiler Piping Details in this manual, Part 4, Section G.

D. SYSTEM WATER PIPING METHODS

EXPANSION TANK AND MAKE-UP WATER

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

BOILER WATER VOLUME	
300	2.9 Gallons
500	4.2 Gallons
850	5.8 Gallons

Table 2

CAUTION

Undersized expansion tanks cause system water to be lost from the relief valve, causing 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 Details, or following recognized design methods. See expansion tank manufacturer's instructions for details. Always install an expansion tank designed for potable water systems.

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.

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 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.

⚠ 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. 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

The boiler is designed to function in a closed loop hydronic system. The included temperature and pressure gauge 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. 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 the boiler circulator, valves, and other components. Observe 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. This is provided standard on the Mod Con boiler. 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 specifically formulated for this purpose. This glycol must include inhibitors that will prevent it from attacking metallic system components. Make certain that the system fluid is checked for the correct glycol concentration and inhibitor level. The system should be tested at least once a year and as recommended by the producer of the glycol solution. Allowance should be made for the expansion of the glycol solution in the system piping. Example: 50% by volume glycol solution expands 4.8% in volume for the temperature increase from 32^{o}F to 180^{o}F, while water expands 3% over the same temperature rise.

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.

CAUTION

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

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

1. Connect the system return marked "Boiler Return".

2. Connect the system supply marked "Boiler Supply".

3. Install purge and balance valve or shut off valve and drain on 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). 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. Consult the 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 unit with an air pressure of 15 PSI.

10. The relief valve is installed at the factory. A pipe discharge line should be installed to discharge 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.**

G. CIRCULATOR SIZING

The boiler heat exchanger does have a pressure drop which must be considered in system design. Refer to the graph in Figure 6 for pressure drop through the boiler heat exchanger.

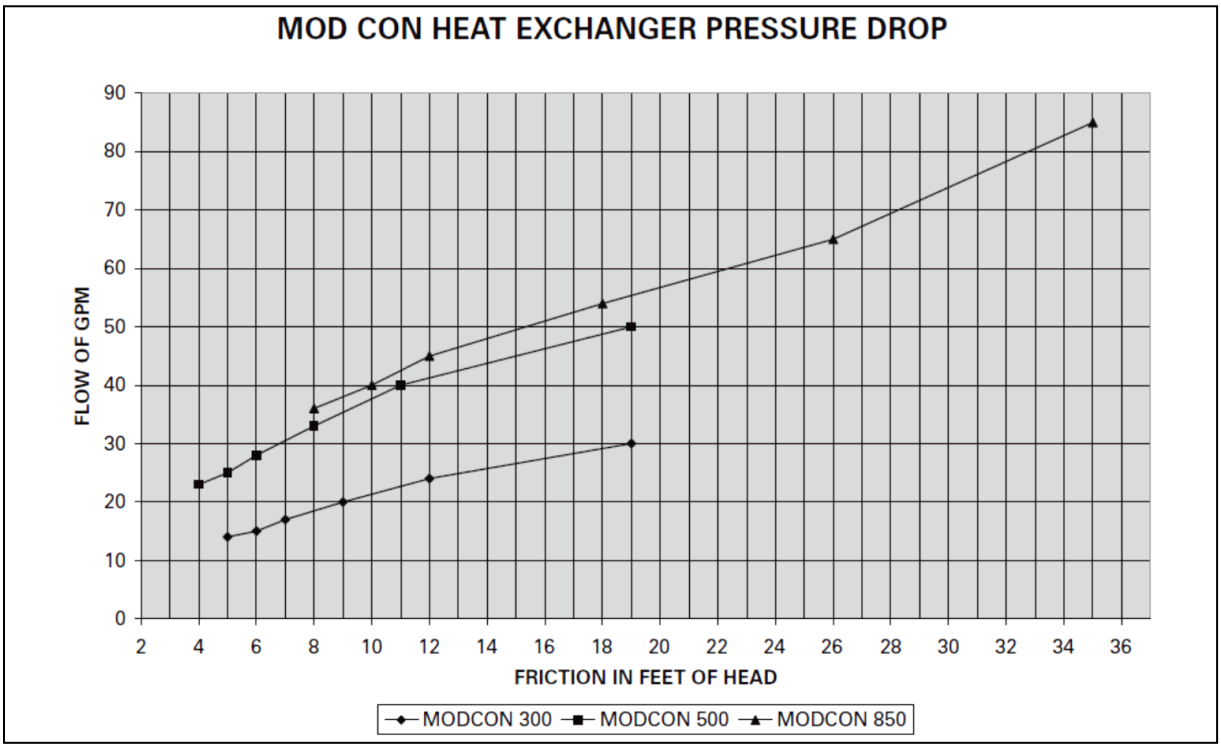


Figure 6 – Heat Exchanger Pressure Drop Chart

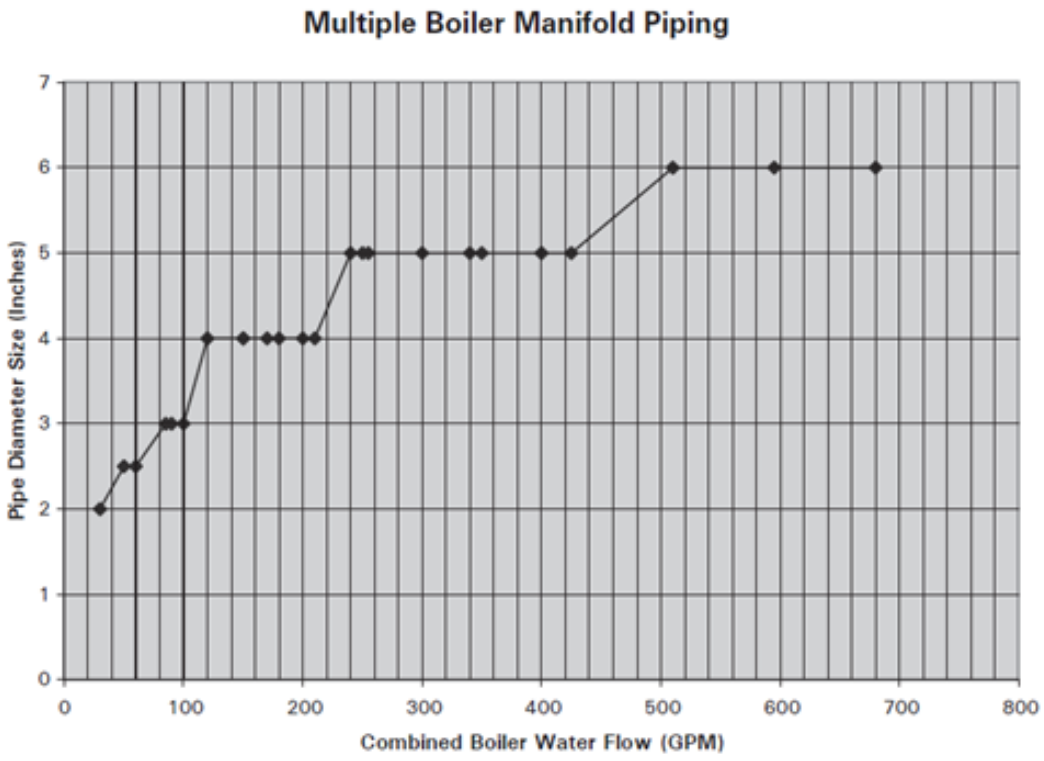
The chart below represents the various system design temperature rise through the boiler, along with respective flows and friction loss which will aid in circulator selection.

SYSTEM TEMPERATURE RISE CHART						
	20°Δt		25°Δt		30°Δt	
Model	Friction Feet	Flow G P M	Friction Feet	Flow G P M	Friction Feet	Flow G P M
Mod Con 300	19′	30	12′	24	9′	20
Mod Con 500	19′	50	11′	40	8′	33
Mod Con 850	35′	85	26′	65	18′	54

Table 3 – Temperature Rise Chart

The chart below represents the combined flow rates and pipe sizes when using multiple boilers to design the manifold system for the primary circuit. To size, simply add up the number of boilers and the required flow rates for the system design temperature.

Example: (5) Mod Con 300 boilers with a design of 30^{0}F temperature rise with each boiler having an individual flow rate of 20 GPM. To correctly size the manifold feeding these boilers, you would need a pipe size of 3".



MULTIPLE BOILER MANIFOLD PIPING

Flow rate	30	50	60	85	90	100	120	150	170	180	200	210	240	250	255	300	340	350	400	425	510	595	680
Pipe Dia.	2"	2½"	2½"	3"	3"	3"	4"	4"	4"	4"	4"	4"	5"	5"	5"	5"	5"	5"	5"	5"	6"	6"	6"

Figure 7 – Multiple Boiler Manifold Piping

H. FILL AND PURGE HEATING SYSTEM

- Attach the hose to balance and purge hose connector or drain valve and run hose to nearest drain.
- Close the other side of the balance and purge valve or the shut off valve after the drain.
- Open first zone balance and purge or drain valve to let water flow out the hose. If zone valves are used, open the valves one at a time manually. (**NOTE:** You should check the valve manufacturer's instructions prior to opening valves manually, so as not to damage the valves.)
- Manually operate fill valve regulator. When water runs out of the hose, you will see a steady stream of water (without bubbles). Close balance and purge valve or drain to stop the water from flowing. Disconnect the hose and connect it to next zone to be purged.
- Repeat this procedure for additional zones (one at a time).

CAUTION

For installation that incorporates standing iron radiation and systems with manual vents at the high points, follow previous section and, starting with the nearest manual air vent, open until water flows out. Then close vent. Repeat 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 is in the automatic position and each zone balance and purge or shut off is in an open position and zone valves are positioned for automatic operation.

I. FREEZE PROTECTION FLUIDS

CAUTION

Use only inhibited 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%.

1. Glycol in hydronic applications is specially formulated for this purpose, and includes 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.

2. The glycol solution should be tested at least once a year and as recommended by the glycol manufacturer.

3. 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 increases 3% over the same temperature rise. Allowances must be made for this expansion in the system design.

4. A 30% mixture of glycol will result in a BTU output loss of 15% with a 5% increase in head against the system circulator.

5. 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.). Carefully figure the additional friction loss in the system as well as the reduction in heat transfer coefficients.

J. ZONING WITH ZONE VALVES

1. Connect the boiler to the system as shown in Boiler Piping Details when zoning with zone valves. 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 the zone valves.

2. Connect DHW (domestic hot water) piping to indirect storage water heater.

K. ZONING WITH CIRCULATORS

1. Connect the boiler to the system when using circulator zoning as shown in Boiler Piping Details. **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.

L. MULTIPLE BOILERS

1. Connect multiple boilers as shown in Boiler Piping Details.

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

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

4. Connect DHW (domestic hot water) piping to indirect storage water heater.

5. The system flow (secondary loop) must be greater than the primary (boiler) loop flow.

CAUTION

Water temperature above 140^{o}F requires the circulator pump to run continuously and water hardness between 5 and 7 grains. Hardness above 7 grains will damage the heat exchanger and shorten the service life of the boiler.

M. BOILER PIPING DETAILS

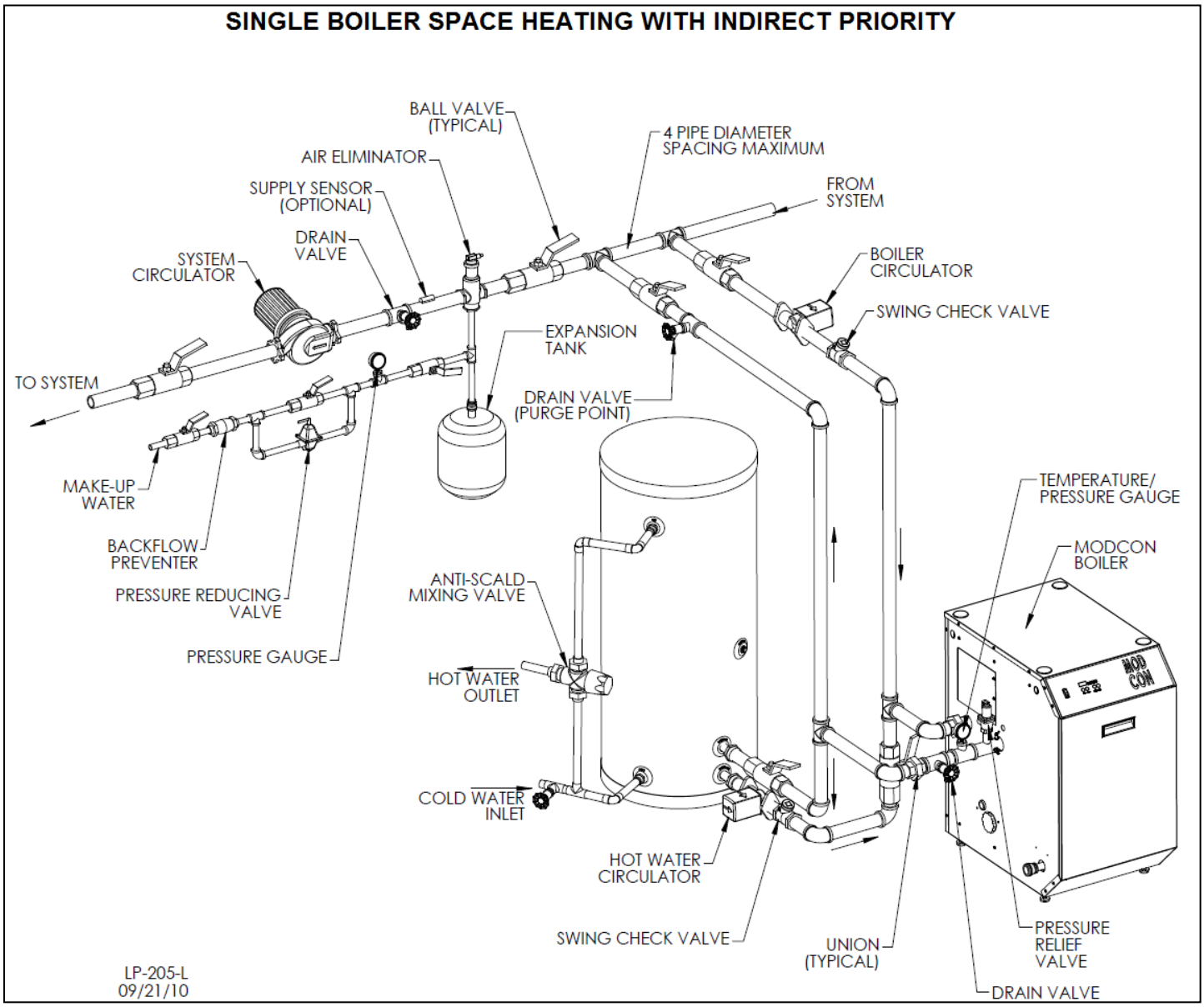


Figure 8 – Single Boiler Space Heating – Indirect Priority

FIGURE NOTES:

1. This drawing is meant to demonstrate system piping concept only.
2. A mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
3. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
4. Install a minimum of 6 diameters of straight pipe up and downstream of all closely spaced tees.
5. Piping shown is Primary/Secondary.
6. The minimum pipe size for connecting an HTP indirect fired water heater is 1".
7. The minimum pipe size for connecting a Mod Con boiler is 1 ½" for the 300 and 2" for the 500 and 850.
8. System flow (Secondary Loop) must be greater than the boiler's Primary Loop flow.
9. Installations must comply with all local codes.
10. In Massachusetts, a vacuum relief valve must be installed on the cold water line per 248 CMR.

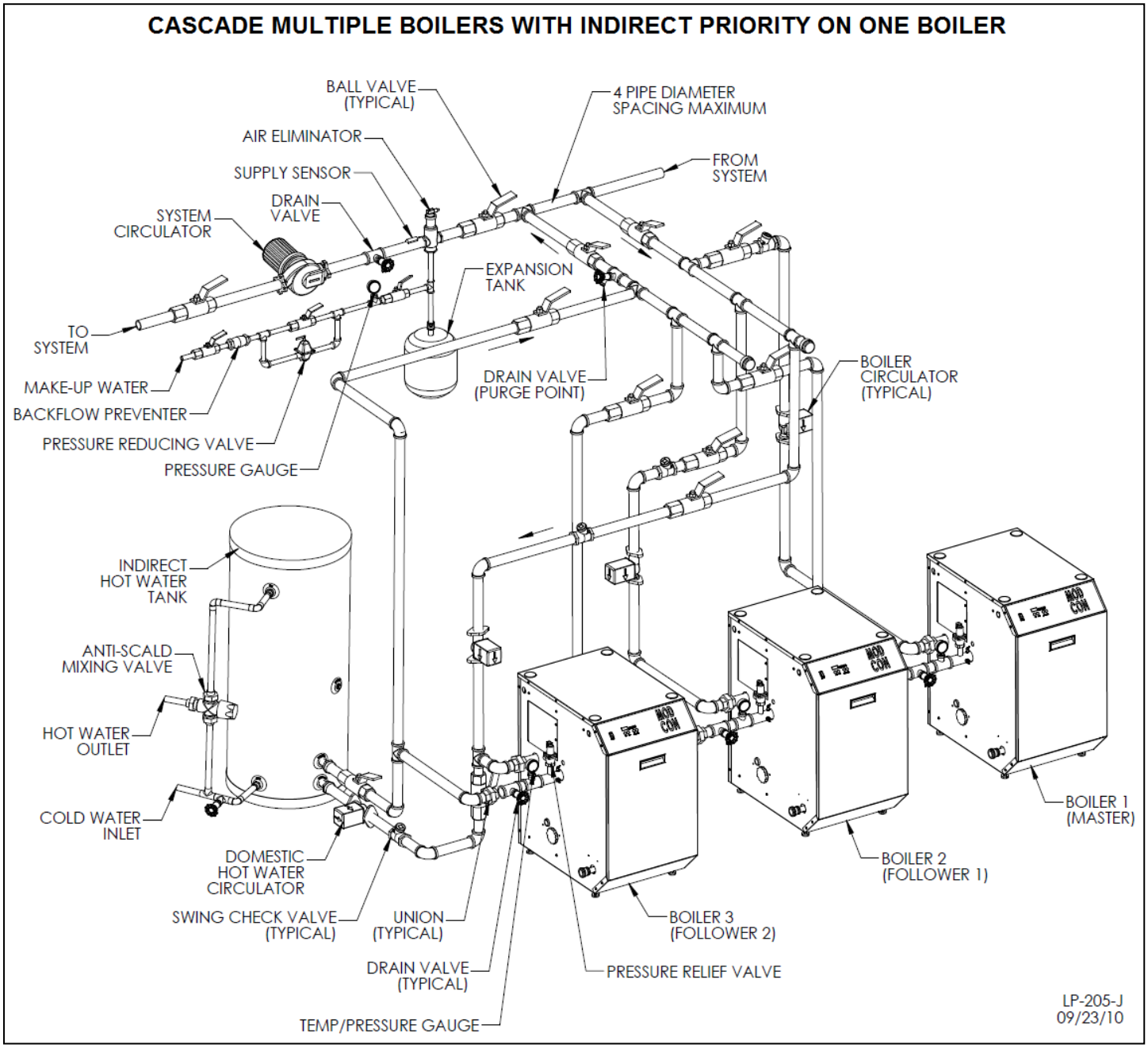


Figure 9 – Cascade Multiple Boilers – Indirect Priority on One

FIGURE NOTES:

1. This drawing is meant to demonstrate system piping concept only.
2. A mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
3. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
4. Piping shown is Primary/Secondary.
5. System flow (Secondary Loop) must be greater than the boiler's Primary Loop flow.
6. Installations must comply with all local codes.
7. In Massachusetts, a vacuum relief valve must be installed on the cold water line per 248 CMR.
8. Reference Multiple Boiler Manifold Piping chart, Part 5, Section H.

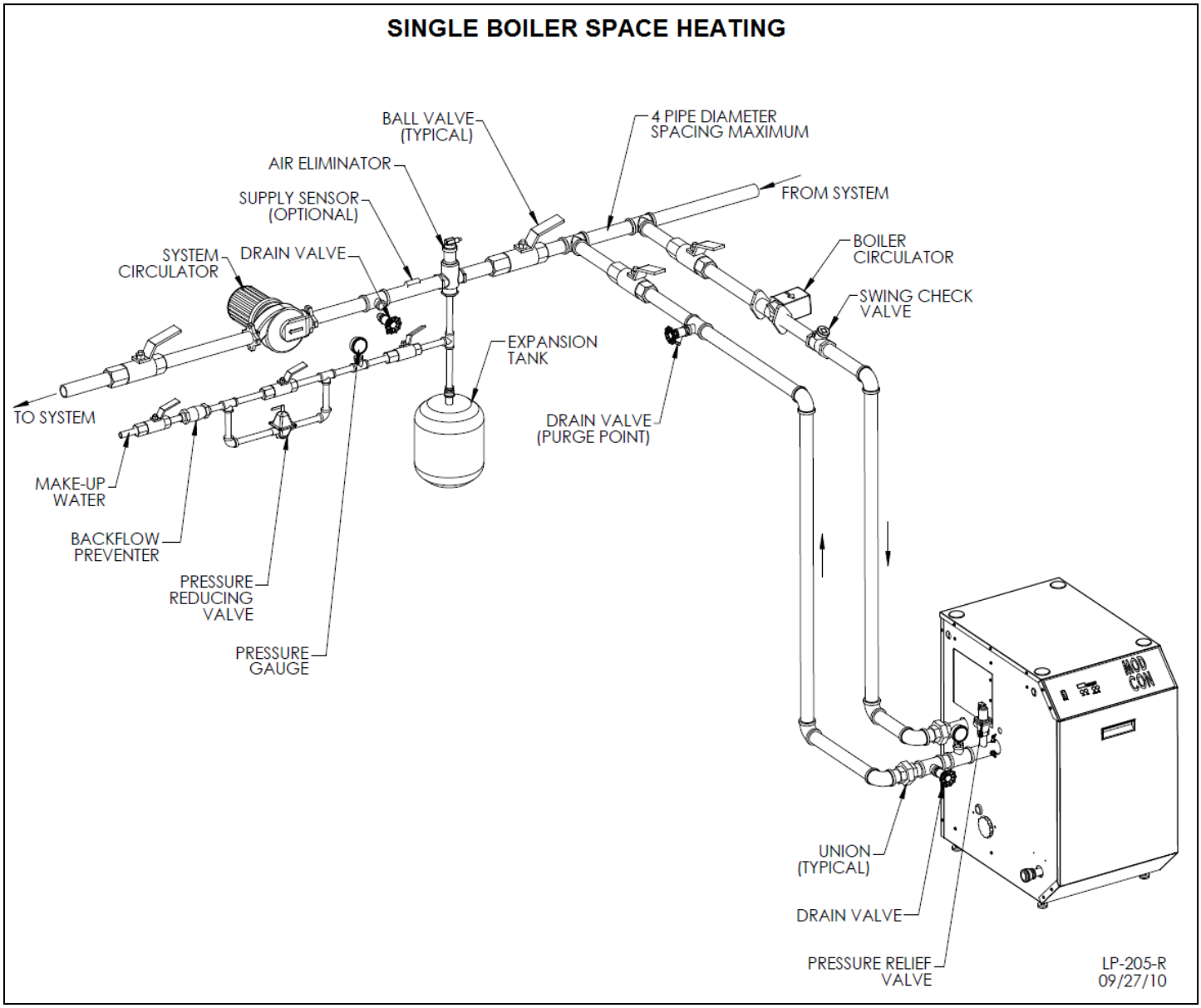


Figure 10 – Single Boiler Space Heating

FIGURE NOTES:
1. This drawing is meant to demonstrate system piping concept only.
2. Installations must comply with all local codes.
3. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
4. Install a minimum of 6 diameters of straight pipe up and downstream of all closely spaced tees.
5. The minimum pipe size for connecting a Mod Con boiler is 1 ½" for the 300 and 2" for the 500 and 850.
6. Piping shown is Primary/Secondary.

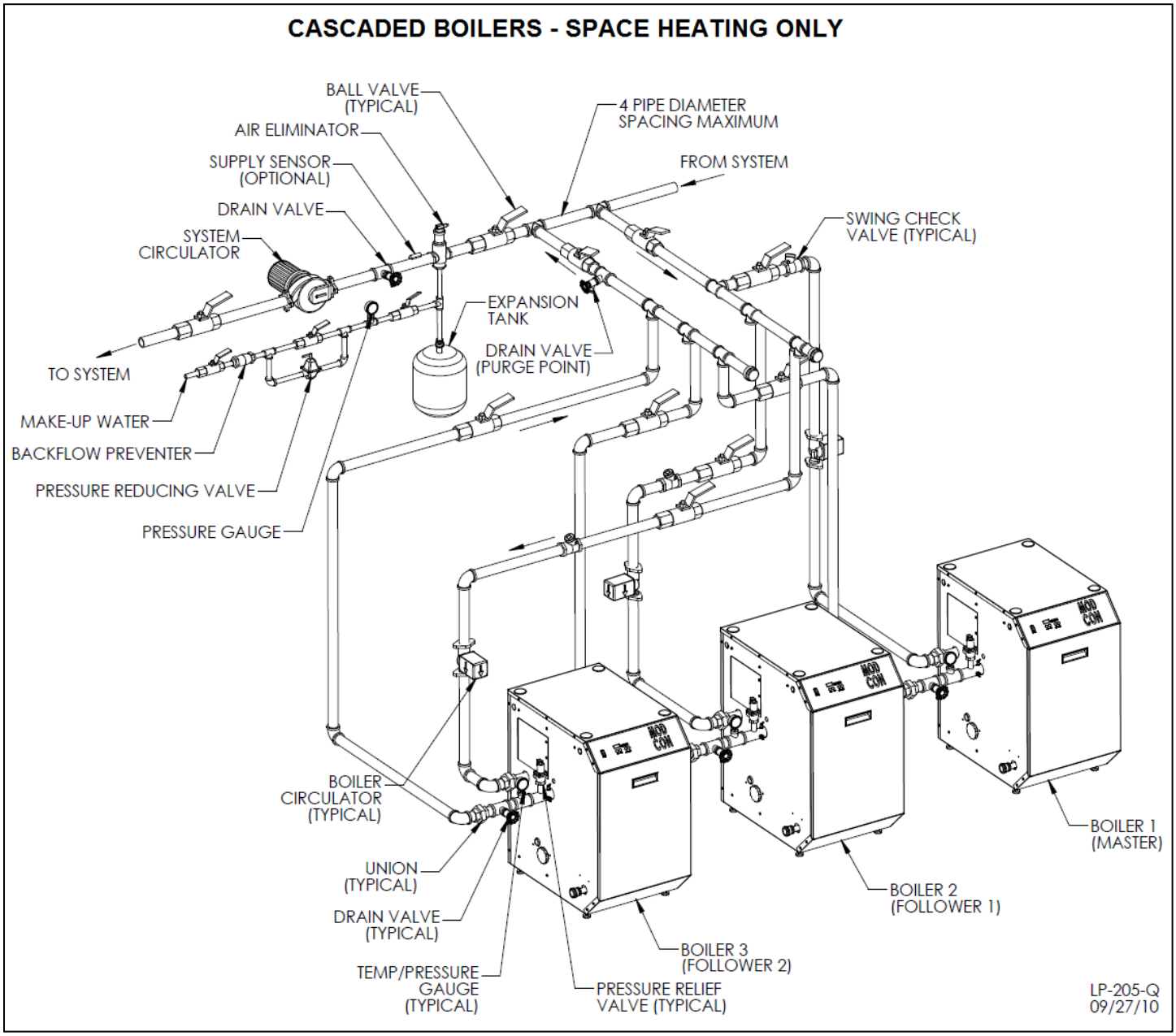


Figure 11 – Cascaded Boilers – Space Heating

FIGURE NOTES:
1. This drawing is meant to demonstrate system piping concept only.
2. Installations must comply with all local codes.
3. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
4. Piping shown is Primary/Secondary.
5. Reference Multiple Boiler Manifold Piping chart, Part 5, Section H.

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 finished combustion air intake and exhaust 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.

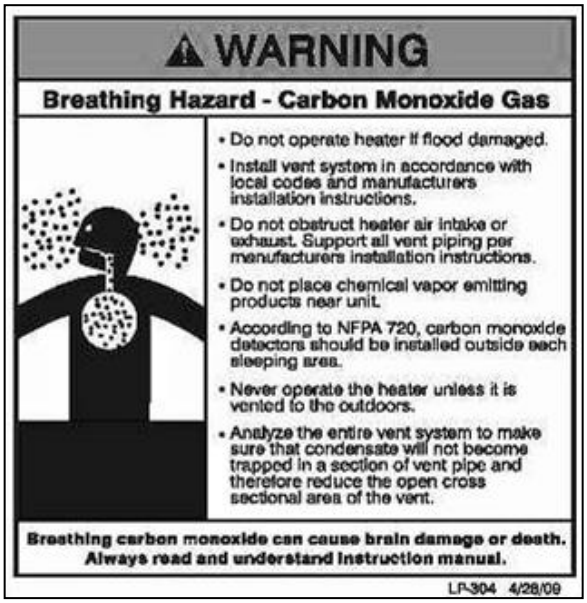
⚠ DANGER

Exhaust and intake air 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.

⚠ DANGER

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



⚠ 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 air 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 AND INTAKE AIR VENTS

APPROVED EXHAUST VENTING AND AIR INLET MATERIAL			
Item	**Material**	**Standards for Installation in:**	
		United States	**Canada**
Exhaust vent or air inlet 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	ULCS636	
	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 4

⚠ DANGER

- The air inlet and exhaust 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 boiler 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 without proper adapters. The vent system could fail, causing leakage of flue products into the living space. Use only the approved pipe and fitting materials, primer and cement, and adapters specifically designed for the material used, as listed in Table 9. 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 boiler 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.

⚠ WARNING

For closet and alcove installations: CPVC, polypropylene, or stainless steel venting material MUST BE USED. Failure to follow 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**.

⚠ DANGER

Use only venting materials approved for use with Category IV appliances installed in accordance with the National Fuel Code. The following materials are approved for use as vent pipe for this boiler. Failure to use approved materials could result in substantial property damage, severe personal injury, or death.

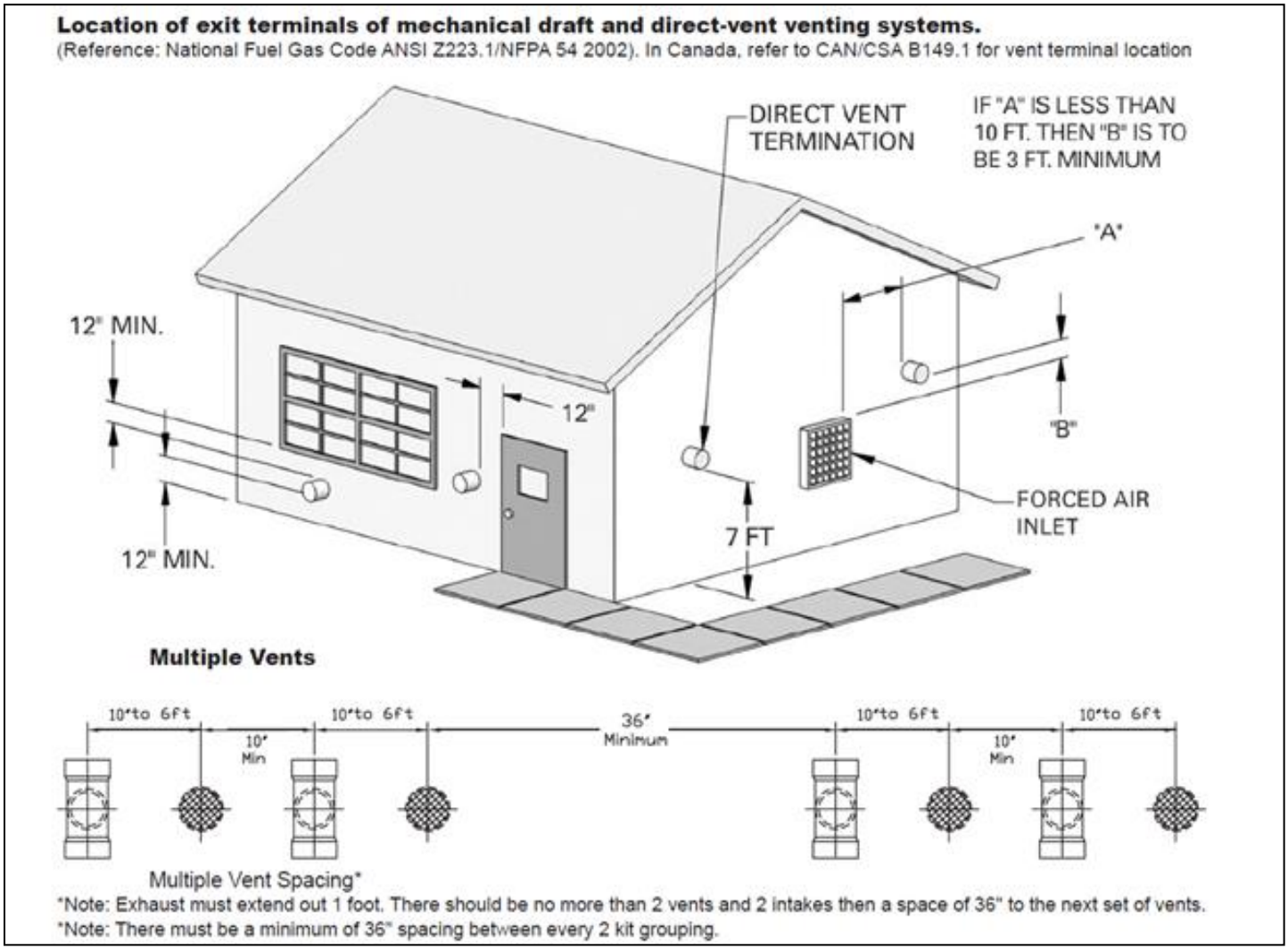


Figure 12

D. EXHAUST VENT AND INTAKE AIR VENT PIPE LOCATION

⚠ WARNING

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

NOTE: SEE ADDITIONAL REQUIREMENTS FOR MASSACHUSETTS IN THE BACK OF THIS MANUAL.

1. Determine exhaust vent location:

- Total length of vent may not exceed the limits specified in the Venting Section, Part 6.
- The vent piping for this boiler is approved for zero clearance to combustible construction.
- See Venting Details within this section of clearances for location of exit terminals of direct-vent venting systems.
- Avoid terminating exhaust vents near shrubs, air conditioners or other objects that will obstruct the exhaust stream.
- 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.
- The boiler 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.
- Provide a minimum of 1 foot distance from any door, operable window, or gravity intake into any building.
- Provide a minimum of 1 foot clearance from the bottom of the exhaust above the expected snow accumulation level. Snow removal may be necessary to maintain clearance.
- 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.
- Do not locate the boiler exhaust over public walkways where condensate could drip and/or freeze and create a nuisance or hazard.

- When adjacent to a public walkway, locate exit terminals at least 7 feet above grade.
- To prevent icicles from forming, do not locate the exhaust directly under roof overhangs.
- Provide 6 feet of clearance from the inside corner of vertical walls, chimneys, etc., as well as horizontal corners created by roof overhangs.

NOTE: In Canada, follow CAN/CGA B149.1-M95 where natural gas fired appliances are used, and CAN/CGA B149.2-M95 where propane fired appliances are used.

2. Determine air intake vent location:

- Provide 1 foot of clearance from the bottom of the intake vent and the level of maximum snow accumulation. Snow removal may be necessary to maintain clearances.
- Do not locate the intake air vent in a parking area where machinery may damage the vent.
- Follow required minimum clearances located in Figure 12.

NOTE: 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.

⚠ WARNING

The building owner is responsible for keeping the exhaust and air 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.

3. Determine location of condensate piping:

This boiler is a high efficiency appliance, and therefore 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 up into the combustion system. There is a ¾" sweat connection provided to connect the outlet of the collection system to a drain or condensate pump (See Table 5 for approved condensate piping material).

APPROVED PLASTIC CONDENSATE PIPING MATERIAL		
MATERIAL	**STANDARDS FOR INSTALLATION IN:**	
	UNITED STATES	**CANADA**
PVC SCHEDULE 40 / 80	ANSI/ASTM D1785	ULC S636

Table 5 – Approved Plastic Condensate Piping Material

NOTE: Check with your local gas company to determine if combustion condensate disposal is permitted in your area. In the state of Massachusetts, condensate must be neutralized before entering a drain.

4. 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 # 7350P-611). The neutralizer kit connects to the drain system and contains marble chips that neutralize the pH level of the water vapor. The neutralizer kit should be checked annually and the marble chips replenished if necessary. When replacing the marble chips, take care to ensure chips are no smaller than ½" to avoid blockage in condensate piping (refer to Figure 13 for piping of the condensate neutralizer.)

CAUTION

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

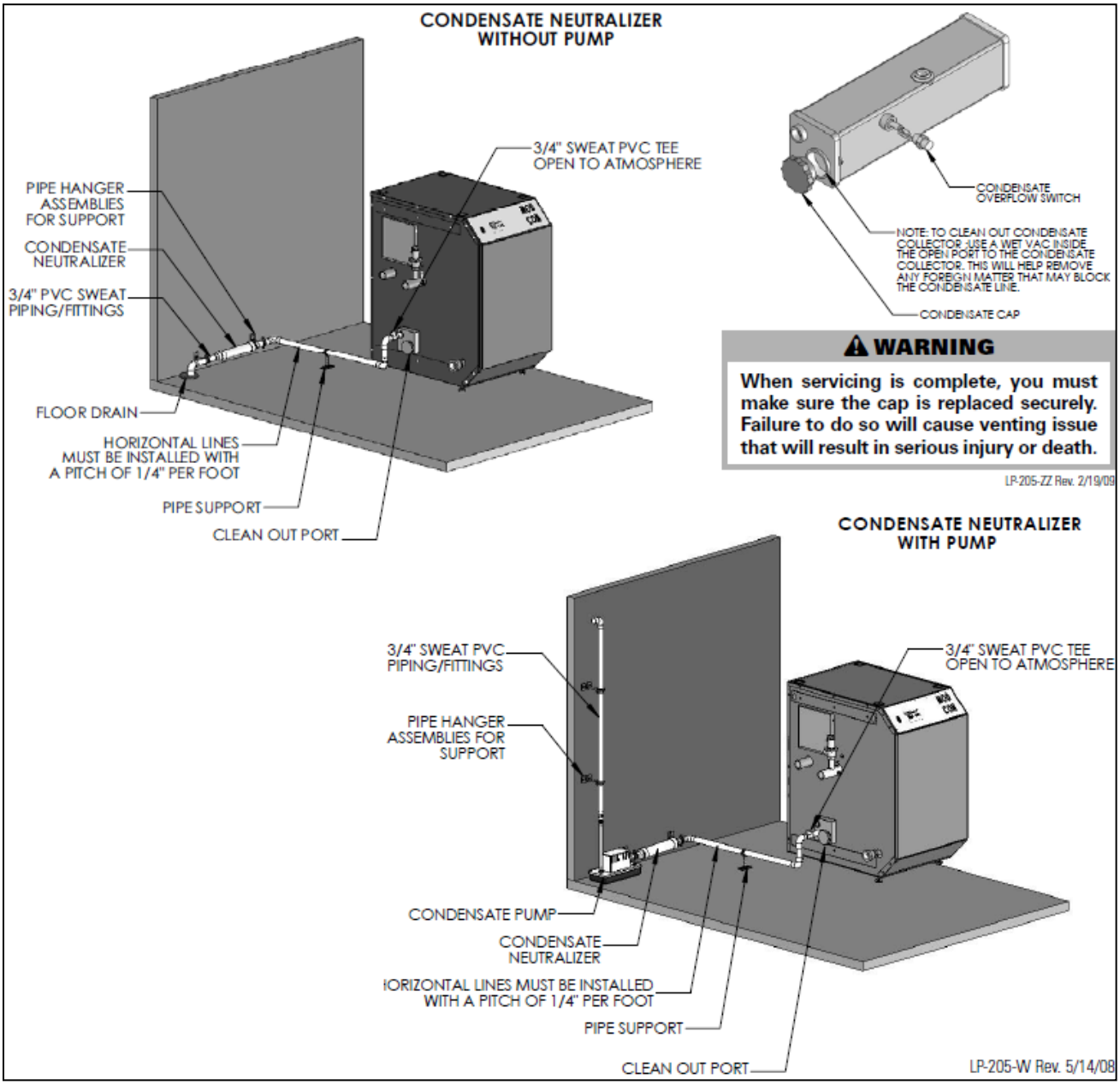


Figure 13 – Condensate Piping NOTE: Blow water into the condensate collector to remove any foreign matter that may block the line.

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.

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.

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 boiler tee, resulting in potential water damage to property.

E. EXHAUST VENT AND INTAKE AIR VENT SIZING

1. The exhaust vent and intake air vent pipes are 4" for the Mod Con 300 and 500 and 6" for the Mod Con 850.

2. The total combined equivalent length of exhaust vent and intake air pipe should not exceed 200 feet.
   a. The equivalent length of friction loss in elbows, tees, and other fittings are listed in Table 6.

FRICTION LOSS EQUIVALENT FOR STAINLESS OR PLASTIC PIPING AND FITTINGS			
FITTING DESCRIPTION	**4"**	**6"**	**8"**
90° elbow short radius	3'	3'	3'
90° elbow long radius	2'	2'	2'
45° elbow	1'	1'	1'
Coupling	0'	0'	0'
Tee (intake only)	0'	0'	0'
V Series Vent Kit	1'	1'	1'
AL20 4C Vent Terminal	1'	1'	1'
Pipe (All Materials)	1'	1'	1'

Table 6 – Friction Loss in Equivalent Feet - *Friction loss for long radius elbow is 1' less.

b. For example: If the exhaust vent has two short 90° elbows and 10 feet of PVC pipe we will calculate: Exhaust Vent Pipe Equivalent Length = (2x3) + 10 = 16 feet.

Further, if the intake air vent pipe has two short 90° elbows, one 45° elbow, and 10 feet of PVC pipe, the following calculation applies: Intake Air Equivalent Length = (2x3) + 1 + 10 = 17 feet.

c. The intake air vent pipe and the exhaust vent are intended to penetrate the same wall or roof of the building.

d. The minimum combined equivalent length is 32 combined equivalent feet – 16 ft intake and 16 ft. exhaust.

F. LONGER VENT RUNS

The maximum combined equivalent length can be extended by equally increasing the diameter of both the exhaust and intake air vent pipes. However, the transitions should begin a minimum of 32 combined equivalent feet from the boiler equally on both the intake and exhaust.

The maximum equivalent length for increased diameter vent pipes is 275 feet, which includes the combined 32 feet from the boiler, 16 ft. (inlet) + 16 ft. (exhaust) = 32 ft. combined with transition total of 245 ft. upsize piping for longer vent runs.

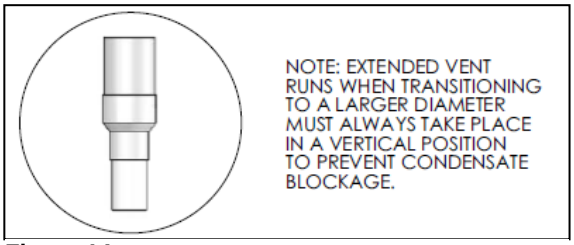


Figure 14

VENT TRANSITION FITTING		
SIZE	**REDUCING COUPLING**	**FINAL VENT SIZE**
4" Venting	6" x 4"	6"
6" Venting	8" x 6"	8"

Table 7 – Vent Transition Fitting

G. EXHAUST VENT AND INTAKE AIR PIPE INSTALLATION

⚠ WARNING

All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into living space.

1. Use only solid PVC or CPVC pipe, or a 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.

H. BOILER REMOVAL FROM A COMMON VENT SYSTEM

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.

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.

NOTE: For Canadian Installations, it is required that Non Metallic Vent Installations conform to ULC S636. Where plastic venting is not allowed, HTP recommends AL294C Stainless Steel Venting be used for Exhaust venting installations and “B” vent for intake air.

I. SIDEWALL VENTING DIAGRAMS

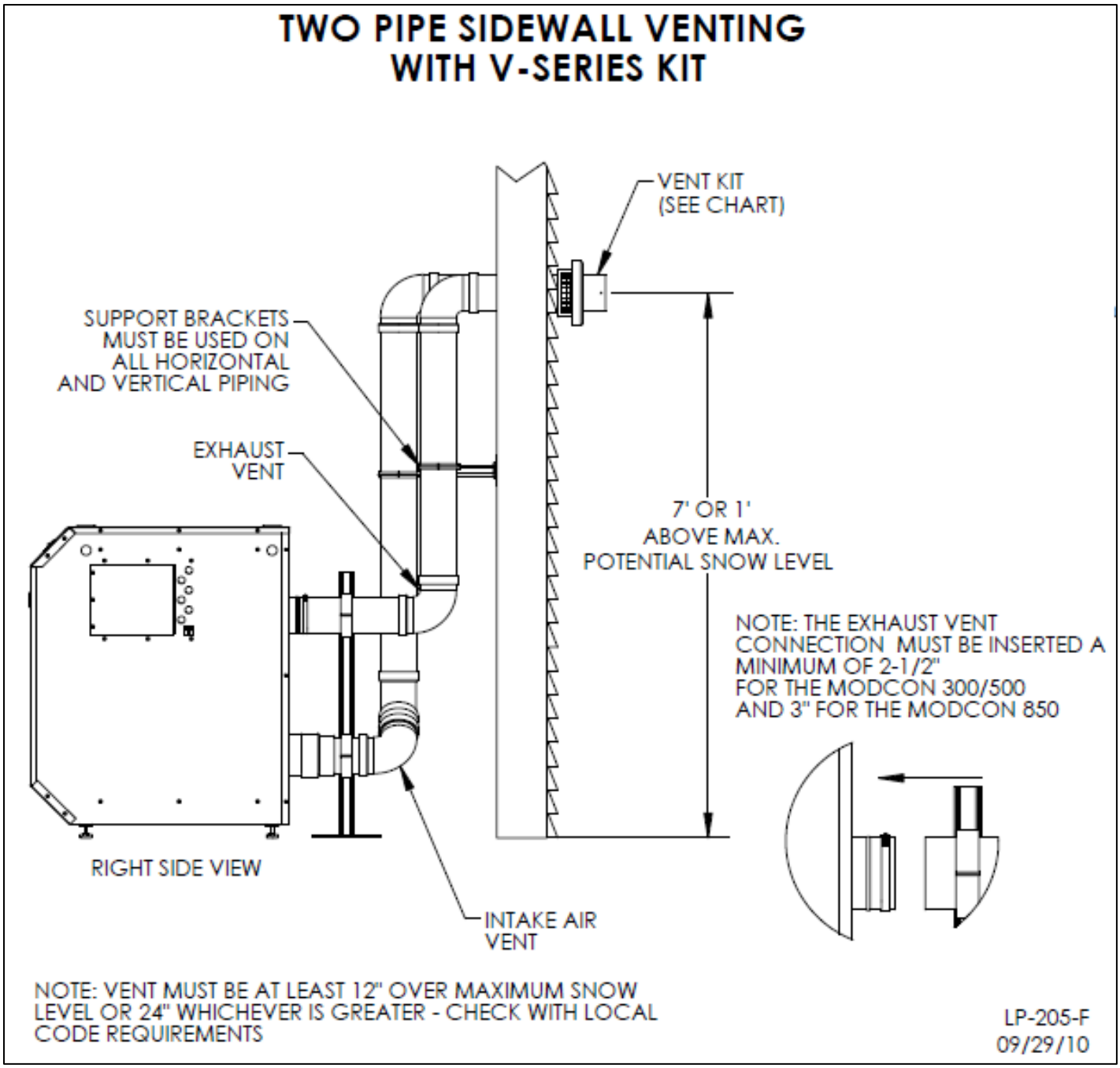


Figure 15 – Sidewall Venting Diagrams

⚠ 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. Exhaust connection insertion depth should be a minimum of 2 ½" for models 300/500 and 3" for 850. When placing support brackets on vent piping, the first bracket must be within 1' of the appliance and the balance at 4' intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

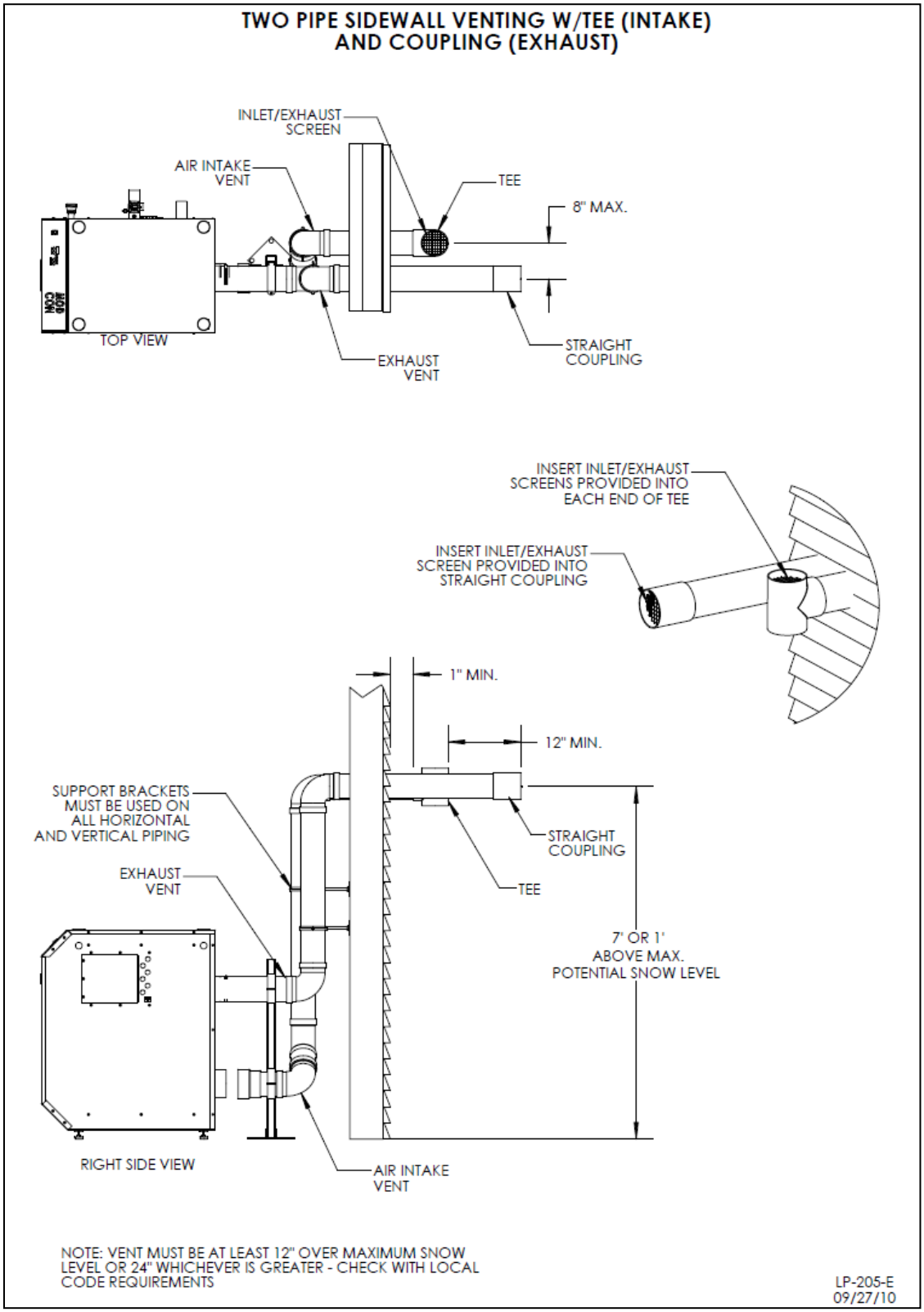


Figure 16 – Sidewall Venting with Tee and Coupling

⚠ 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. Exhaust connection insertion depth should be a minimum of 2 ½" for models 300/500 and 3" for 850. When placing support brackets on vent piping, the first bracket must be within 1' of the appliance and the balance at 4' intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

J. VERTICAL VENTING DIAGRAMS

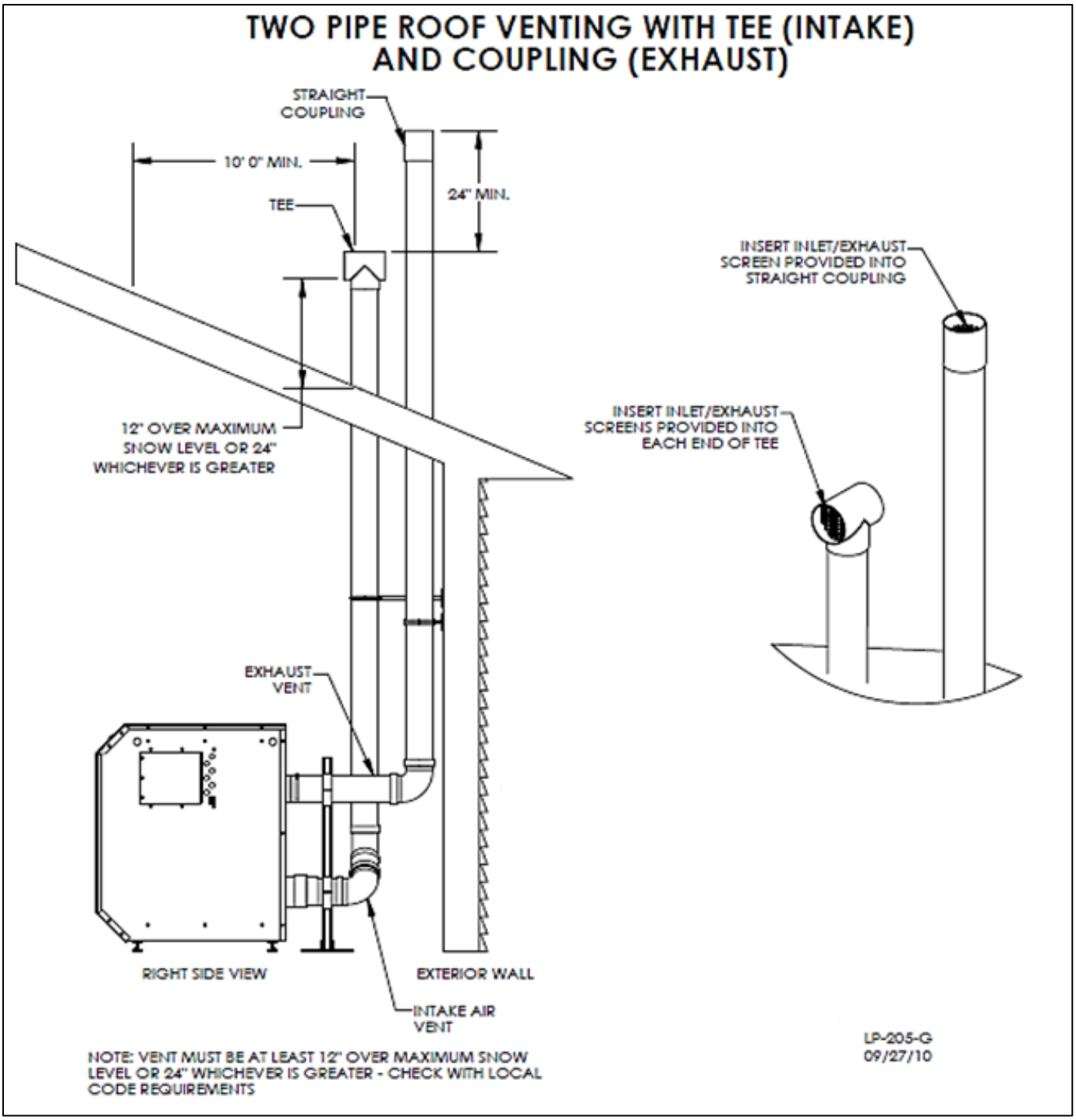


Figure 17 – Two Pipe Roof Venting with Tee and Coupling

⚠ 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. Exhaust connection insertion depth should be a minimum of 2 ½" for models 300/500 and 3" for 850. When placing support brackets on vent piping, the first bracket must be within 1' of the appliance and the balance at 4' intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

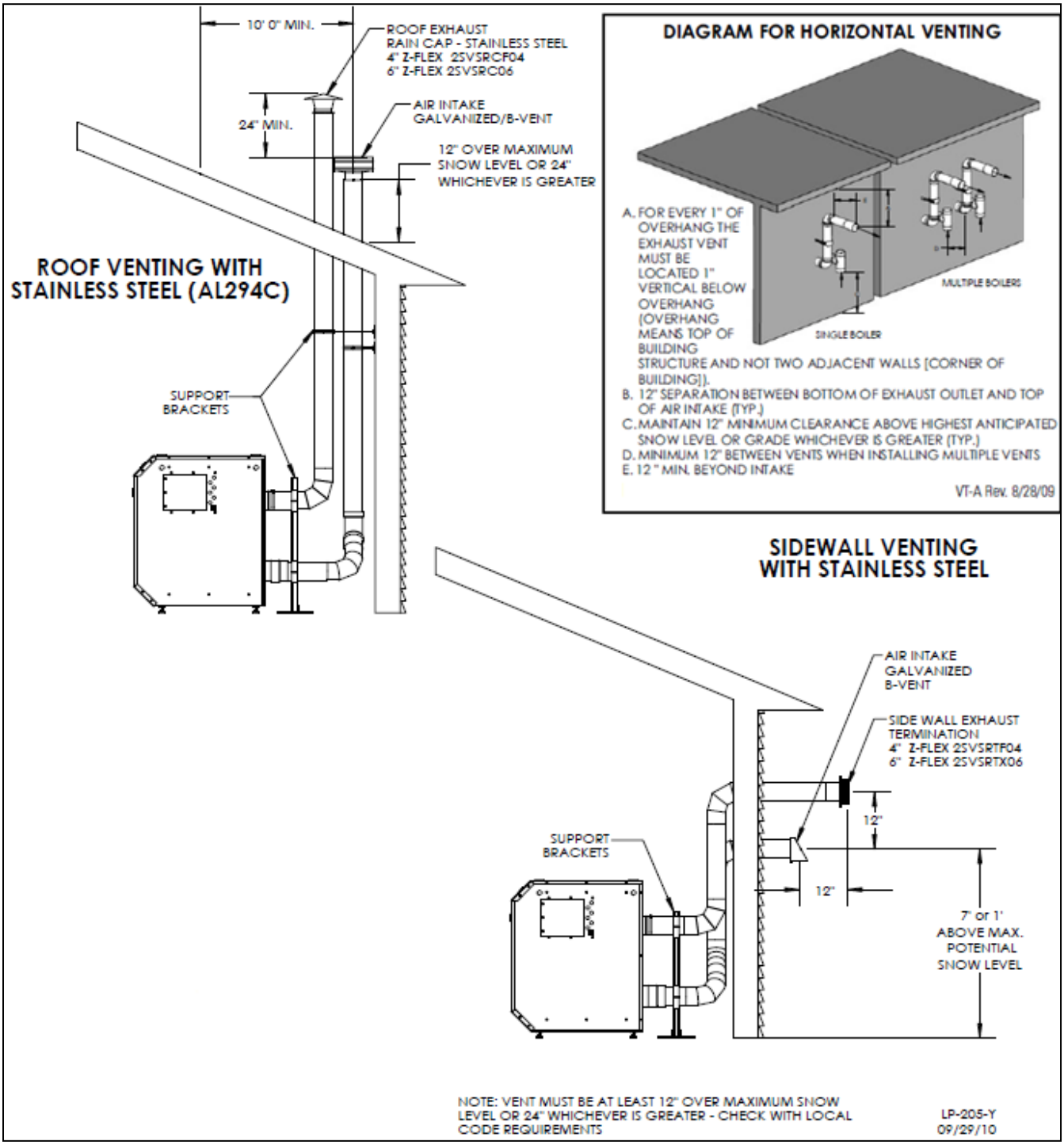


Figure 18 – Roof and Sidewall Venting with Stainless Steel

⚠ WARNING

Take extra precaution to adequately support the weight of vent pipes terminating through the roof. Failure to properly support roof terminated vent piping could result in property damage, serious personal injury, or death due to flue gas leakage.

⚠ 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. Exhaust connection insertion depth should be a minimum of 2 ½" for models 300/500 and 3" for 850. When placing support brackets on vent piping, the first bracket must be within 1' of the appliance and the balance at 4' intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

PART 6 – GAS PIPING

⚠ DANGER

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 14" 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.

⚠ DANGER

It is very important that you are connected to the type of gas noted on the rating plate. “LP” for liquefied petroleum, propane gas, or “NAT” for natural or city gas. You must not do a gas conversion without an approved gas conversion kit. Prior to turning the gas on, all gas connections must be approved by the local gas supplier or utility, in addition to the governing authority.

A gas conversion kit comes with the boiler. Follow the included instructions carefully. Failure to follow gas conversion instructions could result in property damage, serious injury, or death.

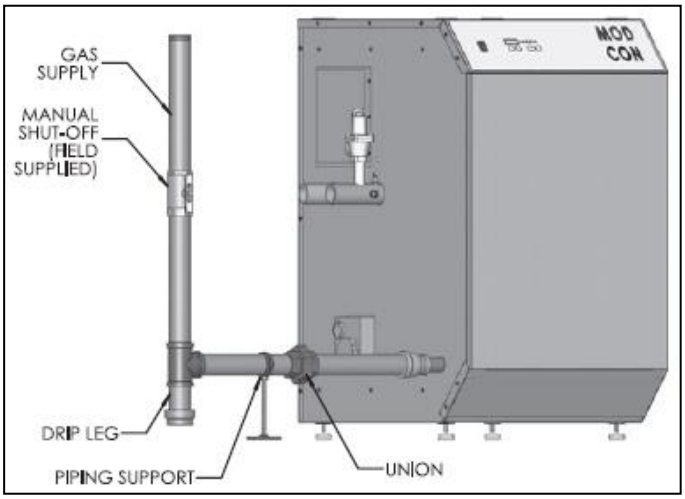


Figure 19 – Gas Connection

⚠ WARNING

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

The gas connection on the boiler is 1-1/4” for the Mod Con 300, 1-1/2” for the Mod Con 500, and 2” for the Mod Con 850. 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 unit supplied connection.

Once all inspections have been performed, the piping must be leak tested. If the leak test requirement is at a higher test pressure than the maximum inlet pressure, you must isolate the boiler from the gas line. To do this, shut the gas off using factory and field-installed gas cocks. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than ½ PSI, 14" w.c. (3.5 kPa), the gas valve must be replaced. Never use an open flame (match, lighter, etc.) to check gas connections.

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 unit 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 unit.

⚠ WARNING

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

CAUTION

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

⚠ 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 could result in substantial property damage, severe personal injury, or death.

CAUTION

Use a two-wrench method when tightening gas piping near the boiler and its piping connection: One wrench to prevent the boiler gas line connection from turning; the second to tighten the adjacent piping. Failure to support the boiler gas piping connection could damage the boiler beyond repair. Such damage IS NOT covered by warranty.

C. GAS TABLE

Refer to Table 8 to size the supply piping to minimize pressure drop between the meter or regulator and unit.

Maximum capacity of pipe in cubic feet of gas per hour for gas pressures of .5 w.c. or less and a pressure drop of .3 inch w.c.

NATURAL GAS SUPPLY PIPING CAPACITY CHART (0.6 specific gravity gas; 0.5" WC pressure drop) *Schedule 40 iron pipe size in nominal inch size								
Boiler Model	**1 Boiler**	**2 Boilers**	**3 Boilers**	**4 Boilers**	**5 Boilers**	**6 Boilers**	**7 Boilers**	**8 Boilers**
Cubic Ft. Hr.	300	600	900	1200	1500	1800	2100	2400
ModCon 300 @ 100' of pipe	1 1/4"	1 1/2"	2"	2 1/2"	2 1/2"	2 1/2"	3"	3"
ModCon 300 @ 250' of pipe	1 1/2"	2"	2 1/2"	3"	3"	3"	4"	4"
Boiler Model	**1 Boiler**	**2 Boilers**	**3 Boilers**	**4 Boilers**	**5 Boilers**	**6 Boilers**	**7 Boilers**	**8 Boilers**
Cubic Ft. Hr.	500	1000	1500	2000	2500	3000	3500	4000
ModCon 500 @ 100' of pipe	1 1/2"	2"	2 1/2"	3"	3"	3"	4"	4"
ModCon 500 @ 250' of pipe	2"	2 1/2"	3"	3"	4"	4"	4"	4"
Boiler Model	**1 Boiler**	**2 Boilers**	**3 Boilers**	**4 Boilers**	**5 Boilers**	**6 Boilers**	**7 Boilers**	**8 Boilers**
Cubic Ft. Hr.	850	1700	2550	3400	4250	5100	5950	6800
ModCon 850 @ 100' of pipe	2"	2 1/2"	3"	4"	4"	4"	4"	5"
ModCon 850 @ 250' of pipe	2 1/2"	3"	4"	4"	5"	5"	5"	5"

Table 8 – Gas Supply Piping Size Chart for Mod Con Boilers

D. 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 unit. 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 unit.

2. Loosen the pressure tap with a small screwdriver. Refer to Figs. 20 and 21 for locations.

3. Each unit 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.

4. Turn on the gas and power up the unit.

5. Put the unit into manual service mode (details on service mode are in the back of this manual). In service 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 the correct action needed to provide proper gas pressure to the unit. If gas pressure is within normal range, proceed to Step 6.

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

⚠ 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.

The gas piping must be sized for the proper flow and length of pipe to avoid pressure drop. The gas meter and regulator must be properly sized for the 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. The gas pressure must remain between 3.5" (.87 kPa) and 14" (3.5 kPa) during stand-by (static) mode and while in operating (dynamic) mode.

If an in-line regulator is used, it must be a minimum of 10 feet 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.

E. GAS VALVE

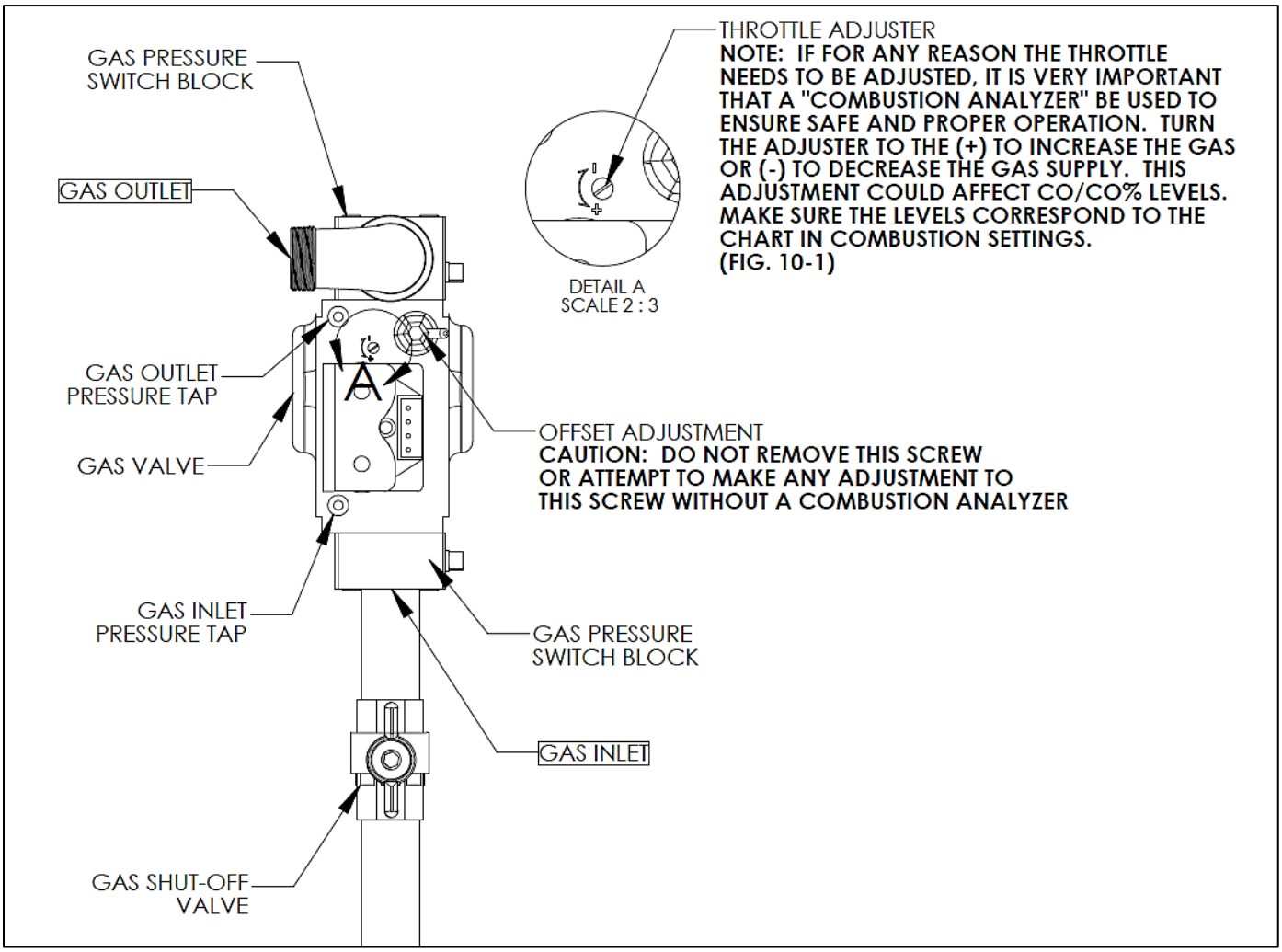


Figure 20 – Mod Con 300/500 Gas Valve

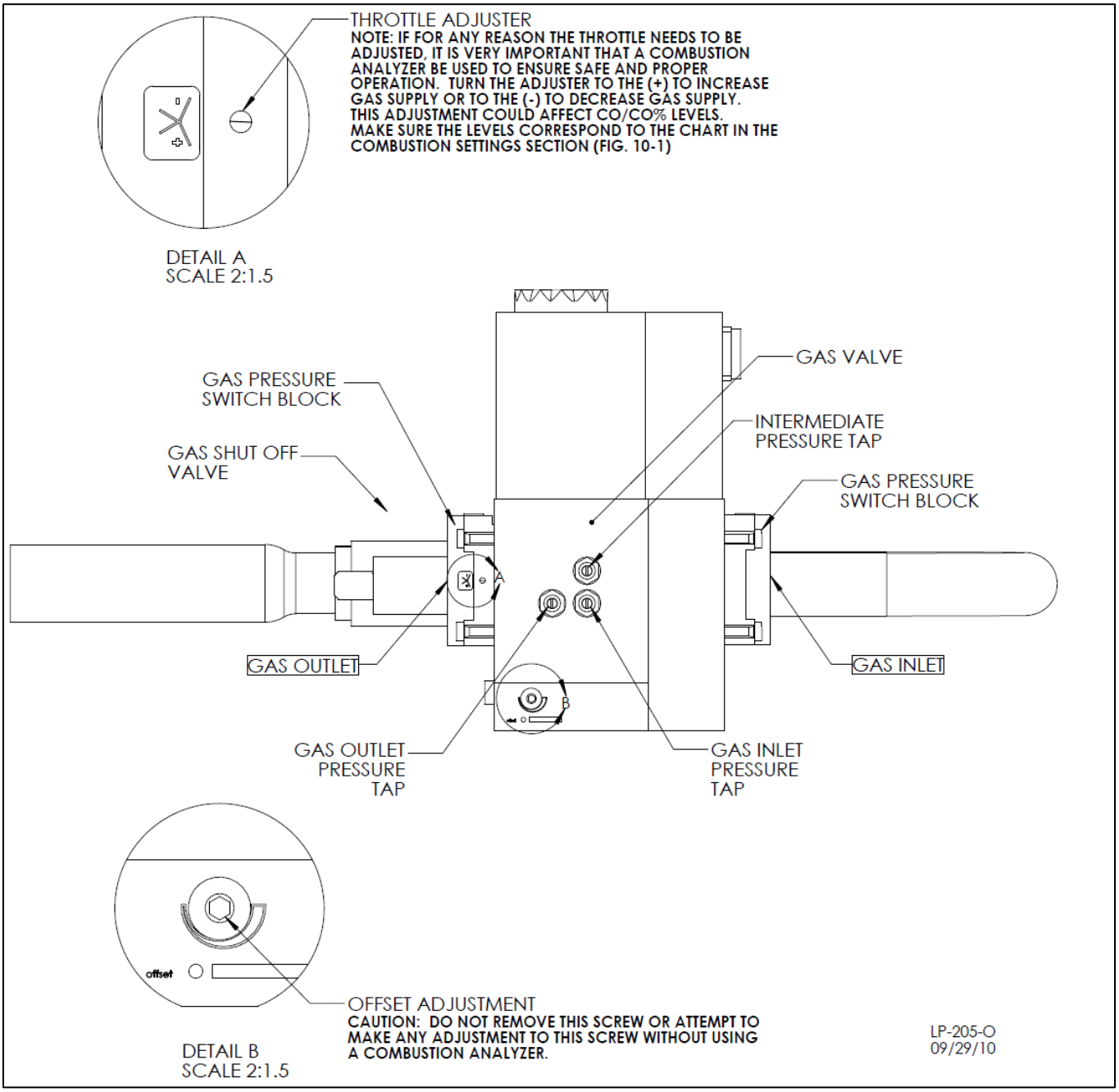


Figure 21 – Mod Con 850 Gas Valve

⚠ DANGER

Do not do a gas conversion on this boiler without an officially approved conversion kit and instructions supplied by HTP. Failure to use a conversion kit when converting the boiler to fire on Natural or LP gas will result in extremely dangerous burner operation, leading to fire, explosion, severe 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 - 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 UL Listed TEW 105° C wire or equivalent. Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – Latest Edition.

⚠ CAUTION

In order to ease future servicing and maintenance, it is advised to label all wires. Wiring errors can cause improper and dangerous operation. Failure to follow these instructions could result in property damage or personal injury.

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

All connections made to the boiler in the field are done inside the electrical junction box located on the side of the unit. The electrical junction box is located on the right side of the Mod Con 300, and the left side of both the Mod Con 500 and 850. Multiple knockout locations are available to route field wires into and out of the electrical junction box.

The control used in the Mod Con series of boilers is capable of directly controlling 2 pumps when in standard mode and 3 pumps when configured as a cascade master boiler. When configured as a standard unit, each pump output can provide a maximum of 3 amps at 120 volts. If pumps used require more than this amount of power, an external contactor or motor starter is needed. If the boiler is configured as a cascade master, the system pump output is a dry contact output capable of switching 5 amps at 120 volts in addition to the boiler pump and DHW pump outputs sourcing 3 amps each.

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 CAT3 or CAT5 patch cables.

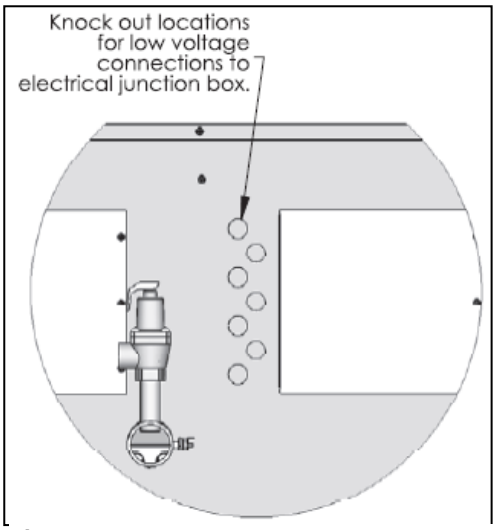


Figure 22

C. LINE VOLTAGE WIRING

NOTE: A termination plug is included in the CAT 3 / CAT 5 Bus Connection Point, labeled J3 in Figure 23. DO NOT REMOVE THIS PLUG! Doing so will affect boiler operation and void warranty.

1. Connect the incoming power wiring to the line voltage terminal strip in the electrical junction box at terminals LINE 120V, Neutral, and Ground (shown in Figure 23).

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

3. Connect the central heating pump to the terminals marked BOILER HOT, BOILER NEUT, and BOILER GRD. The connections shown are suitable for a maximum continuous pump draw of 3 amps at 120 volts. If the pump requires more current or voltage other than the 120 volts supplied, an external motor starter or contactor will be required.

4. If using DHW, connect the domestic hot water pump to the terminals marked DHW HOT, DHW NEUT, DHW GND. The connections shown are suitable for a maximum continuous pump draw of 3 amps at 120 volts. If a pump requires more current or voltage than the 120 volts supplied, an external motor starter or contactor will be required.

D. ALARM CONNECTIONS

The Mod Con control includes a dry contact alarm output. This is an SPDT circuit, rated at 5 amps at 120 volts. This contact can be used to activate an alarm light or bell, or notify a building management system if the boiler goes into a lockout condition. The circuit between the ALARM COM and NC terminals is closed during normal operation and the circuit between ALARM COM and NO is open during normal operation. The connections depicted in Figure 23 show two 120 volt lights connected to the alarm terminals. One light will be on when the boiler is in normal mode and the other light will turn on when the boiler is in lockout mode.

E. LOW VOLTAGE CONNECTIONS FOR STANDARD BOILER

1. All low voltage cables should enter the electrical junction box through the provided knock out holes shown in Figure 22.

2. Connect all low voltage field devices in the low voltage terminal strip located in the electrical junction box (shown in Figure 23).

F. THERMOSTAT

1. Connect the room thermostat to the terminals marked THERMOSTAT in the electrical junction box (shown in Figure 23). Alternately, any dry contact closure across these terminals will cause the boiler to run. Caution should be taken to ensure neither of the terminals becomes connected to ground.

2. Mount the thermostat on an inside wall as centrally 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 Mod Con boiler, the anticipator should be set at .1 amps. If the thermostat is connected to other devices, the anticipator should be set to match the power requirements of the device it is connected to. See the instruction manual of the connected devices for further information.

G. OUTDOOR SENSOR

NOTE: There is no connection required if an outdoor sensor is not used in this installation.

1. If using an outdoor sensor, connect wires for sensor to the terminals marked OUTDOOR SEN (shown in Figure 23) in the electrical junction box. Caution should be used to ensure neither of these terminals becomes connected to ground.

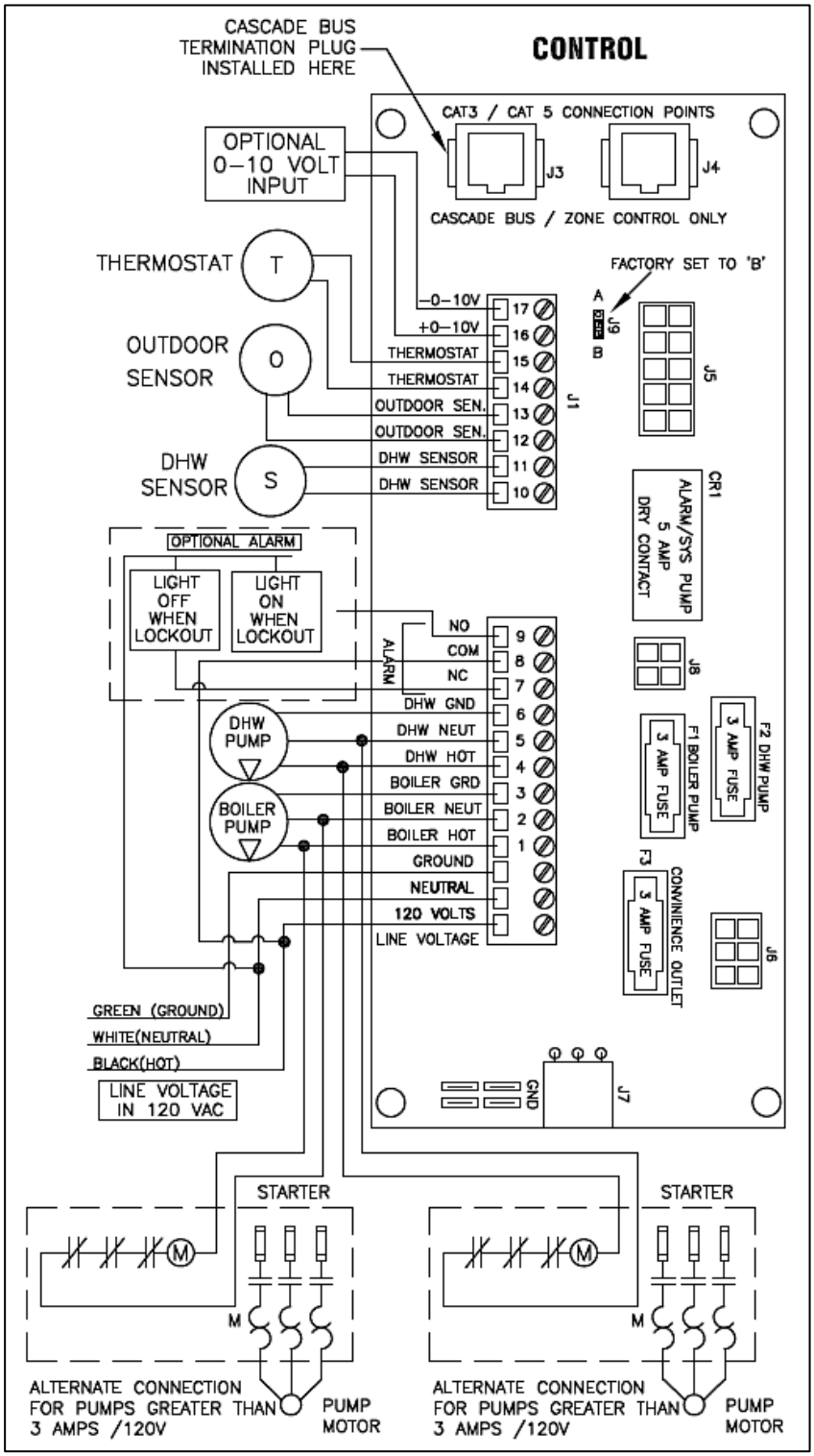


Figure 23 – Boiler Control Wiring

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

3. 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.

H. INDIRECT SENSOR

NOTE: There is no connection required if an indirect water heater is not used in this 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, the control will automatically detect its presence and a demand for heat from the indirect water heater will be generated when the tank temperature falls below the user selected set point by more than the user selected offset. The demand will continue until the sensor measures that the indirect water heater temperature is above the set point.

2. Connect the indirect tank sensor (7250P-325) to the terminals marked DHW SENSOR (shown in Figure 23) in the electrical junction box.

⚠ WARNING

Caution should be used 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.

⚠ 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.

I. OPTIONAL 0-10 VOLT BUILDING CONTROL SIGNAL

1. A signal from a building management system may be connected to the boiler to enable remote control. This signal should be a 0-10 volt positive going DC signal. When this input is enabled using the installer menu, a building control system can be used to control either the set point temperature or the heat output of the boiler. The control interprets the 0-10 volt signal as follows: When the signal is between 0 and 1 volt, the boiler will ignite. As the signal continues to rise towards its maximum of 10 volts, the boiler will increase either in set point temperature or firing rate depending on the setting of parameter 17 in the installer menu. See Part 10 for details on the setting of parameters 16 and 17 for this option.

2. Connect a building management system or other auxiliary control signal to the terminals marked 0-10 VOLT + and 0-10 VOLT – in the electrical junction box (shown in Figure 23). Caution should be used to ensure that the 0-10 VOLT + connection does not become connected to ground.

J. OPTIONAL HIGH GAS PRESSURE SWITCH

1. If an optional high gas pressure switch is used, it should be installed on the outlet side of the gas valve. This is normally closed and will open if the pressure goes above 1.5" w.c. on the outlet side.

2. Locate the two pigtails hanging from the electrical box inside of the boiler cabinet. Remove and discard the jumper plug from one of the unused pigtails.

3. Connect the high gas pressure switch to the pigtail that you removed the jumper plug from.

K. OPTIONAL LOW GAS PRESSURE SWITCH

1. If an optional low gas pressure switch is used, it should be installed on the inlet side of the gas valve. This is normally closed and will open if the pressure goes below 1" w.c. on the inlet side.

2. Locate the two pigtails hanging from the electrical box inside of the boiler cabinet. Remove and discard the jumper plug from one of the unused pigtails.

3. Connect the low gas pressure switch to the pigtail that you removed the jumper plug from.

L. OPTIONAL FLOW SWITCH

NOTE: Follow the more detailed instructions included with the flow switch kit for proper installation steps.

1. Attach the correct flow paddle to the flow switch.

2. Thread brass tee onto outlet nipple using pipe dope. **Make certain the branch points up on horizontal runs.**

3. Thread flow switch into tee using pipe dope. **Make certain the FLOW arrow points in the correct direction**.

4. Disconnect red wire on the low water cut off probe and connect it to the red wire from the wire harness (included in kit).

5. Feed green ground wire into boiler through the wire access.

6. From the front of the boiler, feed the ground wire up into the control box.

7. Once into the control box, attach the green ground to the ground bus connection.

8. Connect red wire from flow switch to boiler wire harness.

9. When installation is complete, power up the boiler and use the control to access installer parameter #20 and change the default value to 2 (see Part 11 in this manual). When done, create a demand and observe boiler function to verify the installation is working properly.

NOTE: Installing the optional flow switch will disable the built-in low water cutoff. If a flow switch and a low water cutoff are necessary for the installation, purchase and install the optional UL353 LWCO (available from HTP, Part # 7350P-601). In this installation, it is recommended to install the flow switch kit first.

M. OPTIONAL UL353 LOW WATER CUT-OFF INTERFACE KIT

1. If an optional UL353 low water cut-off (LWCO) interface kit is used, the control box of the kit should be mounted to the left side of the boiler cabinet near the low water cut-off probe, which is located on the outlet nipple of the boiler.

2. If the optional flow switch is present on the boiler, then the orange wire from the LWCO control box is left unconnected. If the optional flow switch is not installed on or connected to the boiler, remove the wire connected to the low water cut-off probe on the boiler and connect it to the orange wire from the newly mounted LWCO control box.

3. Connect the single red wire from the control box to the low water cut-off probe on the boiler.

4. Route the rest of the wires through the hole provided in the cabinet and down by the main electrical enclosure.

5. Locate the two pigtails hanging from the main electrical enclosure. Select the pigtail which has a white, red, and brown wire in it. If the pigtail is connected to a gas pressure switch, skip to step 7. If this pigtail is not connected to a gas pressure switch, remove the jumper plug from the end of the pigtail and place the jumper plug into the mating connector coming from the LWCO control box.

6. Connect the pigtail to the remaining plug coming from the LWCO control box. Installation is complete.

7. If the pigtail located in step 5 is connected to a gas pressure switch, disconnect it from the gas pressure switch and connect the pigtail to the mating connector coming from the LWCO control box. Connect the gas pressure switch to the remaining connector from the LWCO control box.

N. WIRING OF THE CASCADE SYSTEM COMMUNICATION BUS

1. A Cascade Bus Termination Plug has been installed on the customer connection board of this boiler. The purpose of this plug is to stabilize communication between multiple boilers and reduce electrical “noise”. See Figures 25 and 26 for Cascade Bus Termination Plug installation detail.

2. Use standard CAT3 or CAT5 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.

3. 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 that the maximum length of communication bus cables not exceed 200 feet.

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

5. 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 that 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, there will be no open communication connection ports.

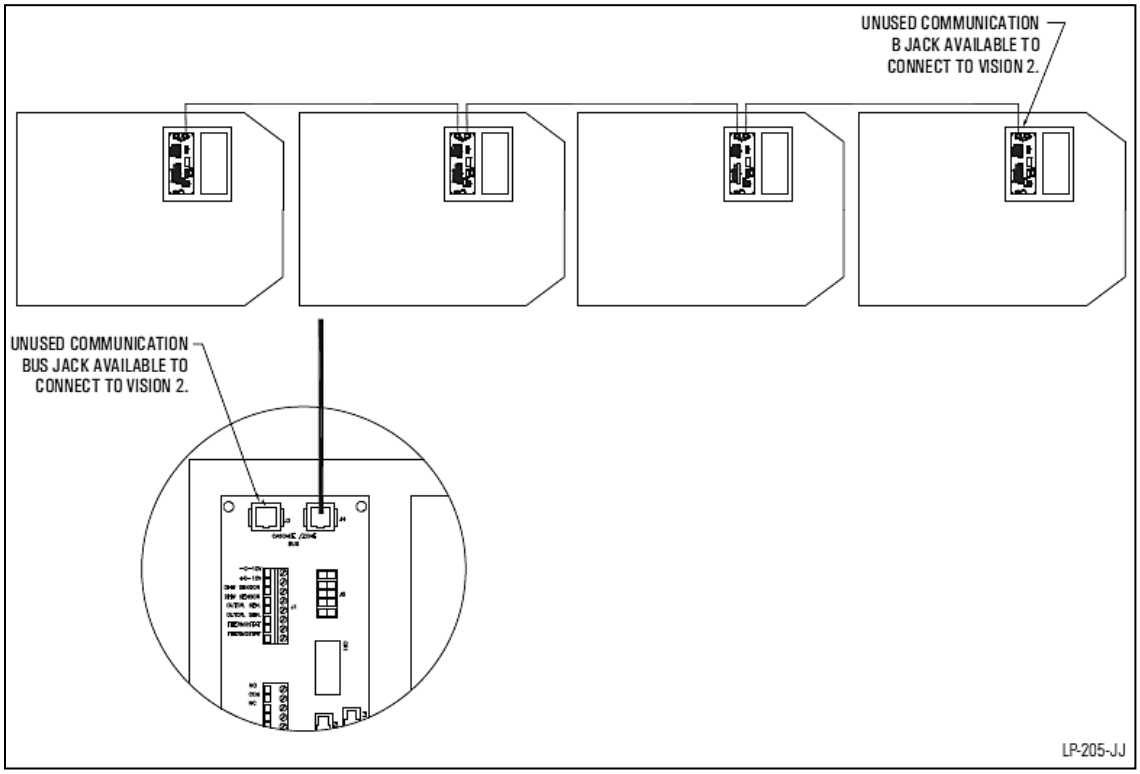


Figure 24

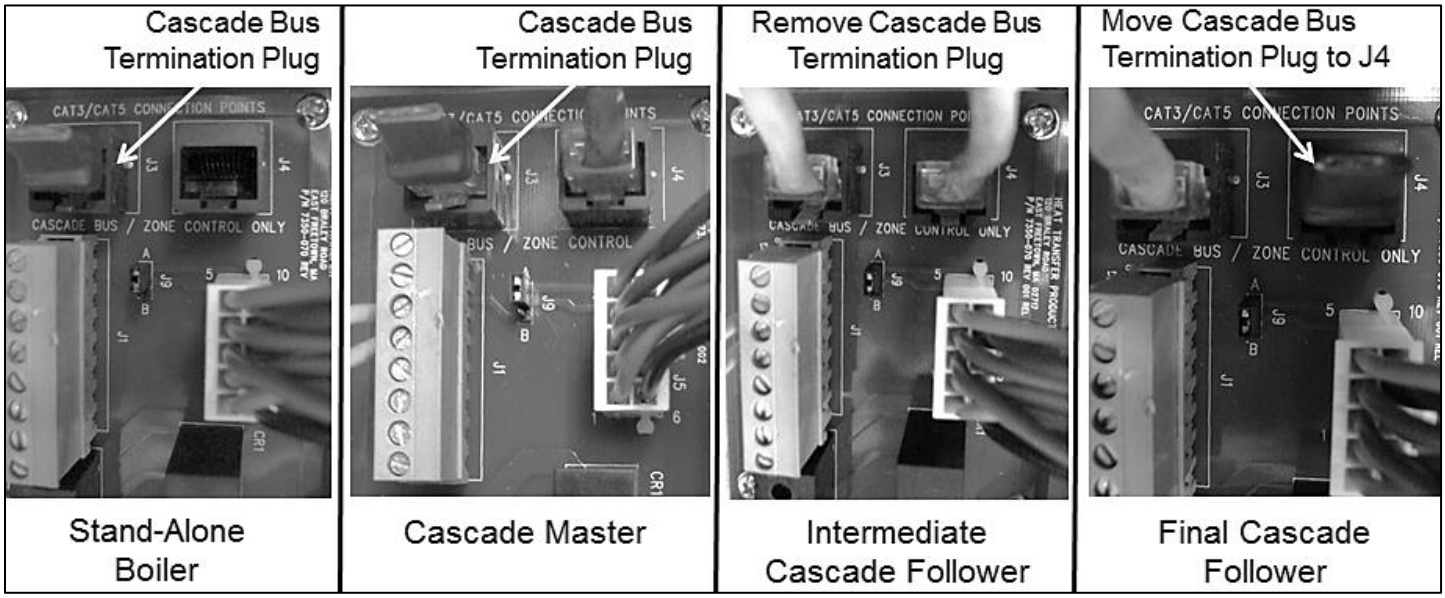


Figure 25 – Cascade Resistor Plug Installation Detail

O. CASCADE MASTER PUMP AND SENSOR WIRING

1. Place the cascade master overlay sticker onto the field connection board on the boiler designated as the cascade master.

2. Connect the system pump hot wire to the terminal marked SYS PUMP.

3. Connect the system pump neutral to the BOILER NEUT terminal and the pump ground wire to the BOILER GND terminal.

4. Connect a jumper wire from the 120 VOLT terminal to the SYS PUMP PWR terminal.

5. Connect the boiler pump to the terminals marked BOILER HOT, BOILER NEUT, and BOILER GND.

6. Connect the system pipe sensor to the terminals marked SYS SENSOR.

7. Connect the outdoor sensor (if used) to the terminals marked OUTDOOR SEN.

8. Connect the signal to start the system to the terminals marked THERMOSTAT.

NOTE: This signal can come from a room thermostat or a dry contact closure. No power of any voltage should be fed into either of these terminals.

NOTE: Place the Cascade Master label (included in shipping envelope) on top of the boiler designated Master.

P. CASCADE FOLLOWER PUMP AND SENSOR WIRING

1. If it is desired to have the boiler control the boiler pump, connect the boiler pump to the BOILER HOT, BOILER NEUT, and BOILER GND terminals.

2. If you are using an indirect fired water tank connected directly to the follower boiler, connect the pump for it to the DHW HOT, DHW NEUT, and DHW GND terminals.

If desired, an alarm bell or light can be connected to the alarm contacts of the follower boiler. The normally closed alarm contact may be used to turn a device off if the boiler goes into lockout mode. The alarm contacts are rated 5 amps at 120 VAC.

To connect an alarm device, connect the power for the device to the ALARM COM terminal. Connect the alarm device hot wire to the ALARM NO terminal. Connect the neutral or return of the alarm device to the neutral or return of the power for the alarm device.

To connect a device that should be powered off during a boiler lockout condition, follow the same instructions as above and use the ALARM NC terminal rather than the ALARM NO terminal.

NOTE: In a cascade system, the alarm output of the boiler addressed as #1 will also be active if the master boiler has a lockout condition. The alarm output of boilers addressed #2-7 will only sound if a lockout condition occurs on that specific boiler.

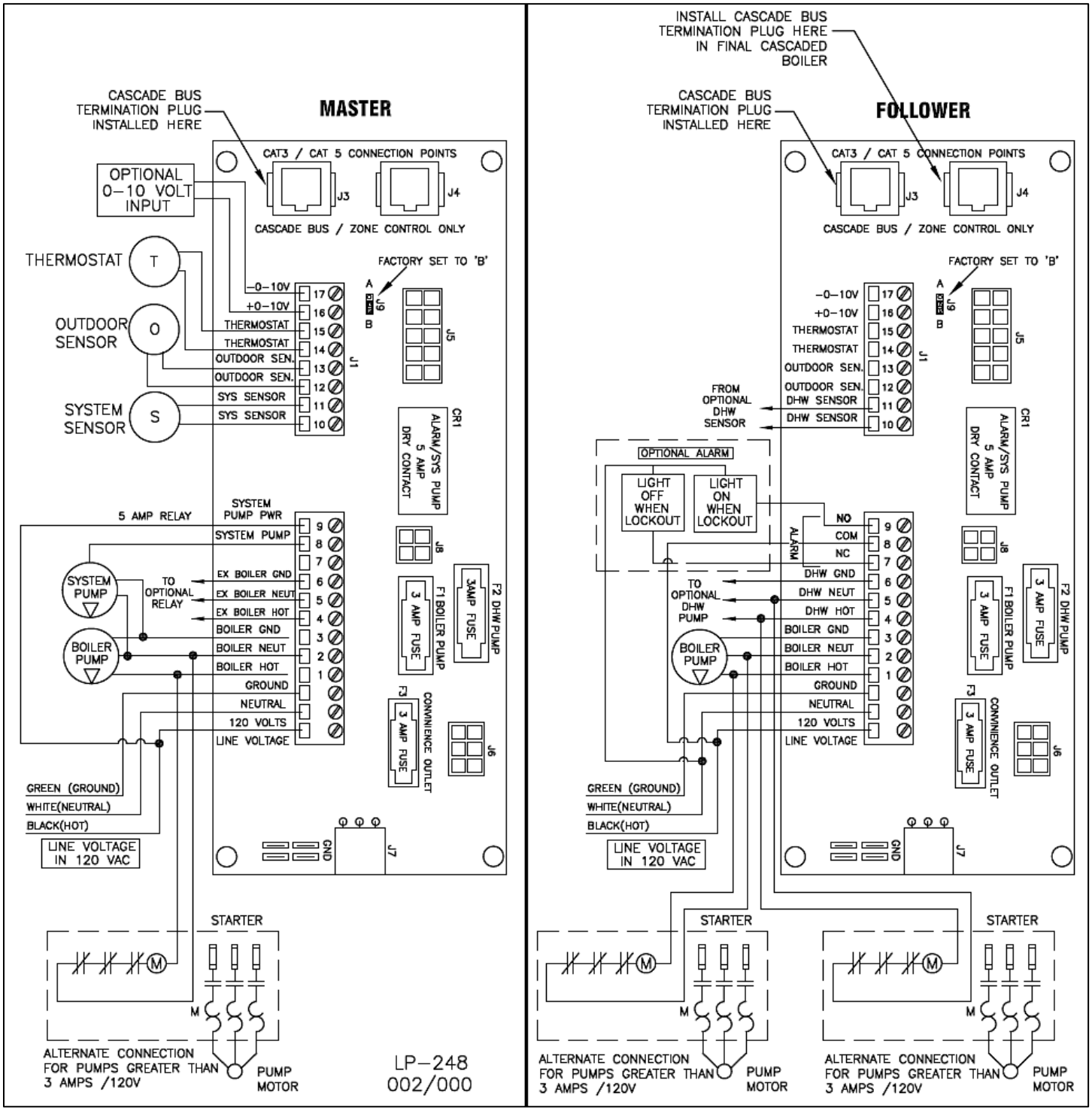


Figure 26 – Mod Con Cascade Master and Follower Wiring

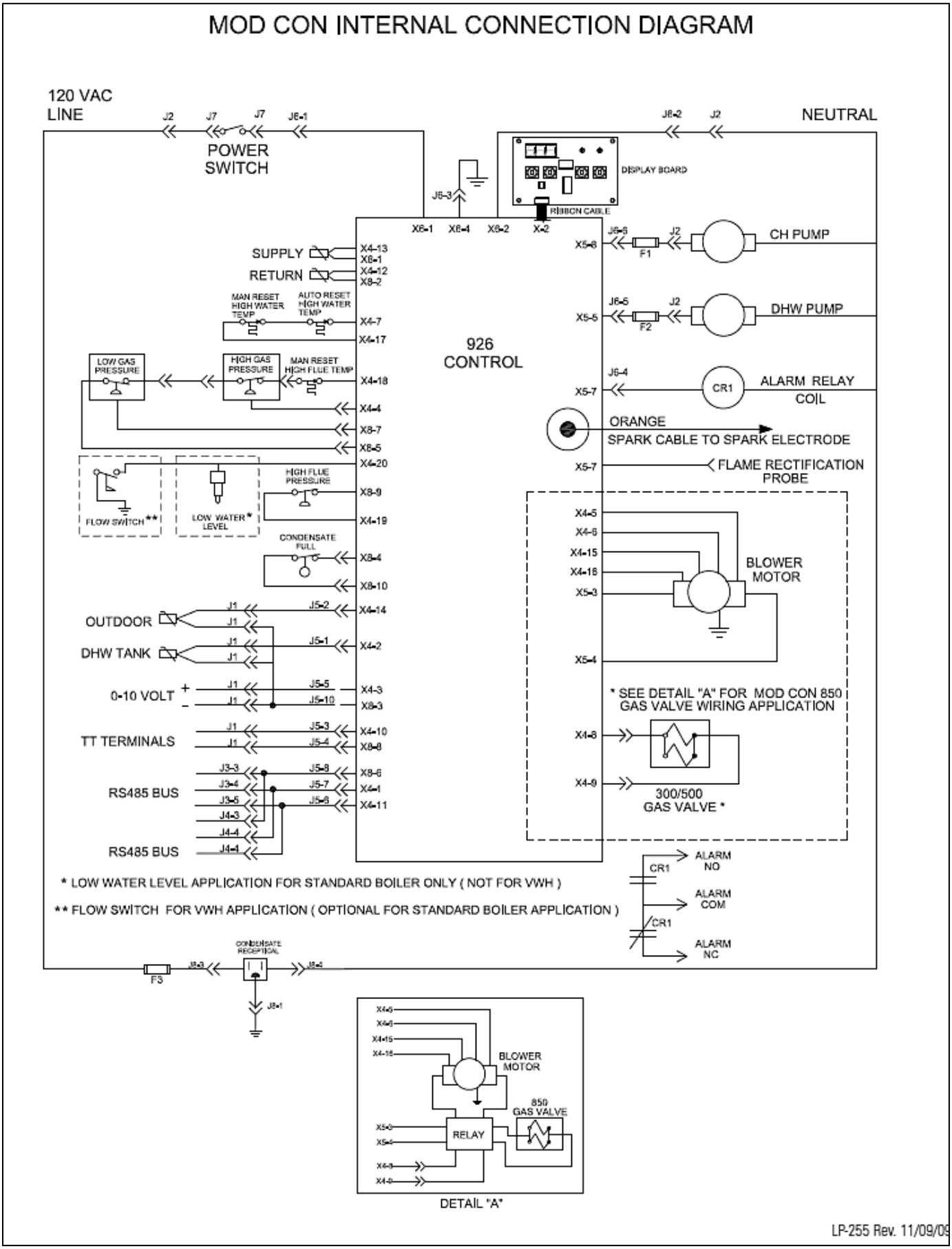


Figure 27 – Mod Con Internal Connection Diagram

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.**

It is recommended that you test your 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. Do not connect the boiler to directly heat a swimming pool or spa water.

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

Clean system to remove sediment
1. You must thoroughly flush the system (without the 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 valve 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/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's instructions.

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

B. FREEZE PROTECTION (WHEN USED)

⚠ WARNING

NEVER use automotive or standard glycol antifreeze, or ethylene glycol made for hydronic systems. Use only freeze-protection fluids certified by fluid manufacturer as suitable for use with stainless steel boilers, verified in fluid manufacturer's literature. Thoroughly clean and flush any system that has used glycol before installing the new boiler. Provide boiler owner with a material safety data sheet (MSDS) on the fluid used.

1. Determine freeze protection fluid quantity using total system water content following fluid manufacturer's instructions. Remember to include expansion tank water content.

2. Local codes may require back flow preventer or actual disconnect from the 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

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

⚠ 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.

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

3. Fill to 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 160psig.

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

CAUTION

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 heat exchanger, and causing heat exchanger failure. Such failure IS NOT covered by warranty.

5. 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 to purge the system of air to avoid damage to the boiler.

D. PURGE AIR FROM WATER SYSTEM

1. Purge air from system:
   a. Connect a hose to the purge valve and route hose to an area where water can drain and be seen.
   b. Close the boiler or system isolation valve between the purge valve and fill connection to the system.
   c. Close zone isolation valves.
   d. Open quick-fill valve on cold water makeup line.
   e. Open purge valve.
   f. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the air. Run until no noticeable air flow is present. Close the zone isolation valves and proceed with the next zone. Follow this procedure until all zones are purged.
   g. Close the quick-fill water valve and purge valve and remove the hose. Open all isolation valves. Watch the system pressure rise to correct cold-fill pressure. It is recommended that you put the pumps into manual operation to assist in purging the circuits.
   h. Disconnect the wires that are connected to the THERMOSTAT terminals of the customer connection board. Apply power to the boiler. The display will show the temperature of the water in the boiler. Press the {S1} and {S3} keys simultaneously and hold for 1 second. The display will begin alternating between SEP and CH and the central heating pump will come on. If you then press {S2}, the central heating pump will shut off, the display will begin alternating between SEP and DH, and the DHW pump will come on. If the boiler is set up as the cascade master and you press the {S2} key again, the DHW pump will shut off, the display will begin alternating between SEP and Sh, and the system pump will come on. By using the {S1} and {S2} keys in this manner, you can toggle between running each pump in the system as required to help bleed out all entrapped air. Some

good indicators that air is removed include the absence of gurgling noises in the pipes and pump operation becoming very quiet. Pressing {S1} and {S2} together at any time will return the boiler control to normal operation.
i. After the system has operated for 30 minutes, eliminate any residual air by using the manual air vents located throughout the system.
j. If purge valves are not installed in the system, open manual air vents in the system one at a time beginning with the lowest floor. Close vent when water squirts out. Repeat with remaining vents.
k. Refill to correct pressure.

E. 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 BOILERS ONLY – Propane suppliers mix 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.

F. CHECK THERMOSTAT CIRCUIT(S)

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 the 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 reading 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 boiler low voltage terminal strip. Allow the boiler to cycle.

G. CONDENSATE REMOVAL

1. The boiler is a high efficiency condensing boiler. Therefore, the unit 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 neutralizer, if required by local authorities, can be made up of lime crystals, marble or phosphate chips that will neutralize the condensate. This may be done by the installer or you may purchase a condensate neutralizer from HTP (7350-025).

2. The boiler is equipped with a ¾ FPT 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 (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 a 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.

H. FINAL CHECKS BEFORE STARTING BOILER

1. Read Startup Procedures within this manual for proper steps to start boiler. (See Startup Report 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. Fill condensate trap with water.

4. Verify electrical connections are correct and securely attached.

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

I. CASCADE SYSTEM

If the boiler is used in a stand-alone configuration, skip this section.

Programming the Master Boiler:

1. Make sure there is no demand for heat. The boiler cannot be programmed if there is a demand for heat.

2. Apply power to the boiler.

3. Enter the Installer Menu following instructions in Part 11 of this manual.

4. Verify that parameter 15 is set to 0. This makes the master boiler address 0. **NOTE:** The master boiler MUST be addressed as 0.

5. Change parameter 23 from 0 to 1. This makes it the master boiler.

6. Exit the installer menu.

NOTE: The temperature set point of the master boiler must match the follower boiler set point in order for the system to operate properly.

Follower Boilers:

READ THE NOTES BELOW BEFORE PROGRAMMING FOLLOWER BOILERS

- The boiler addressed as 1 will share its alarm output with the master boiler.
- If one of the follower boilers has an indirect fired water heater connected to it, the address of this boiler must be 2 or greater.
- It is recommended but not necessary to address boilers in the order that they are wired.
- No two boilers can have the same address.
- It is not required to use all consecutive address numbers. For example, in a 2 boiler with an indirect connected to the follower, the follower address would be 2 (address 1 not used).

1. Make sure there is no demand for heat. Boilers cannot be programmed if there is a demand for heat.

2. Apply power to the follower boiler you are working on.

3. Enter the installer menu following instructions in Part 10 of this manual.

4. Set parameter 15 to 1 for the first follower, 2 for the second follower, etc., depending on the boiler you are programming.

5. Verify that parameter 23 is set to 0. This makes the boiler a follower.

6. Exit the installer menu.

NOTE: The temperature set point of the follower must match the master boiler set point in order for the system to operate properly.

PART 9 – START-UP PROCEDURE

⚠ 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.

A. OPERATING INSTRUCTIONS

Remove boiler cover. If you smell gas, **STOP**. Follow listed safety instructions. If you do not smell gas, follow the next steps.

1. Turn on all electrical power to the boiler.

2. If desired, adjust the temperature set point of the boiler. The factory default setting is 180°F. If changes are necessary, follow "Adjusting the Set Point" in this section.

3. On the initial start-up of this boiler, you may note a lock-out code of F01. This is a low gas pressure switch lock-out from the factory-installed low inlet gas pressure switch (located on the left in the 500 and on the right in the 850). You will also see a yellow LED illuminated under the cover of the inlet gas pressure switch. Once the gas is turned on, reset the gas pressure switch by **FIRMLY** pressing on top of the plastic cover over the red reset button. You will note that the yellow LED has gone out. Press and hold the {S4} key on the control panel for 4 seconds to begin normal operation.

4. Set the thermostat to the desired setting.

5. If the appliance fails to start, refer to Troubleshooting, Part 11.

B. ADJUSTING THE SET POINT

NOTE: Before you can change the temperature from the factory setting of 180°F, make sure none of the thermostats are calling for heat. The controller will not memorize a program setting while in a heating cycle.

To adjust the temperature of the boiler:

- Press the {S3/Program} key for three seconds until you see a flashing "C" alternating to "180" (this number is the factory set point of 180°F).

To change the temperature set point:

- Press the {S1/-} key to decrease temperature (temperature can go as low as 50°F).
- Press {S2/+} to increase temperature (temperature can go as high as 190°F).

To access additional setting options:

- Press {S3} to advance to each parameter listed in the Table 9.

	Function	Display
Press {S3} once	Boiler Temperature Set Point	C
Press {S3} twice	Boiler Differential Set Point	Ch
Press {S3} three times	Indirect Temperature Set Point	D
Press {S3} four times	Indirect Differential Set Point	DH
Press {S3} five times	Temperature Measurement Units	f

Table 9 – Additional Setting Options

To decrease or increase values, press {S1} to decrease and {S2} to increase. Changes are directly stored and the display returns to normal mode after one minute.

C. STATUS MENU

Installers are also able to check the current status of the boiler parameters by pressing {S4/Reset} for 3 seconds. Once activated, the display will show d1 alternating value of the actual supply temperature. To change the next function value, the user can press {S1} (alternating down to previous function value) or press {S4} (alternating up to the next value). Actual values are displayed for each function.

Listed below are the values which can be displayed. These values cannot be changed. To exit this menu, press {S3} to resume normal operation.

To toggle between values press {S1} to go down and {S4} to go up.

Function	Value
|d1|	Actual temperature from supply sensor
Function	**Value**
|d2|	Actual temperature from return sensor
|d3|	Indirect temperature will be displayed if an indirect fired water heater and a 7250P-325 sensor is connected. If a mechanical control is used, the control will display 0 for closed and 1 for open. If a DHW tank is not connected, the display will read 0. **NOTE:** If unit is set up as master, the system sensor will be visible.
|d4|	320 Not used.
|d5|	Actual temperature from the outdoor sensor if connected NC.
|d6|	Actual fan speed multiplied by 10 (Example: If fan speed displayed is **|410|** RPM x 10 = 4100 actual fan speed)
|d7|	Actual ionization current read from flame rectification probe
|d8|	Actual status of the central heating circulator - Off = **|0|**, On = **|1|**.
|d9|	Actual status of the indirect fired circulator - Off = **|0|**, On = **|1|**.
|d10|	Actual status of bus communication **|co|** = connected, **|nc|** = not connected
|d11|	Central heating set point
|d12|	Power on hours in thousands (display will not read until 100 hrs). Example: Display number x 1000 = Power on hours.
|d13|	Total central heat hours in thousands (display will not read until 100 hrs). Example: Display number x 1000 = Power on hours.
|d14|	Total domestic hot water hours in thousands (display will not read until 100 hrs.) Example: Display number x 1000 = Power on hours.
|d15|	Passed ignition attempts in thousands (display will not read until 100 ignition attempts). Example: Display number x 1000 = ignition attempts. Display showing 12.3 x 1000 = 12300 ignition attempts.
|d16|	This function only becomes active when boiler is set as the Master. It allows the user to monitor the system pump connected to the Master Boiler and the connected boilers (Followers) in a multiple boiler installation. Each boiler firing output percentage is displayed. To toggle between values, press {S1} to go down and {S4} to go up. The first function you will see is: **System Pump** - (**0** = Off, **1** = On) **|P0| - Master Boiler** - Alternating (0-100 Percentage firing rate) **|P1| - Follower Boiler #1** – Alternating (0-100 Percentage firing rate) **|P2| - Follower Boiler #2** – Alternating (0-100 Percentage firing rate) **|P3| - Follower Boiler #3** – Alternating (0-100 Percentage firing rate) **|P4| - Follower Boiler #4** – Alternating (0-100 Percentage firing rate) **|P5| - Follower Boiler #5** – Alternating (0-100 Percentage firing rate) **|P6| - Follower Boiler #6** – Alternating (0-100 Percentage firing rate) **|P7| - Follower Boiler #7** – Alternating (0-100 Percentage firing rate **NOTE:** If you toggle beyond parameters of connected boilers, the display will go into the next function value.

Table 10 – Boiler Status Menu

D. TEST MODE

This function is intended to simplify the gas valve adjustment. Listed below are the recommended limits on each boiler and combustion settings. Automatic modulation does not take place when the controller is in test mode, only temperature limitation based on the boiler central heating set point. The user can increase or decrease the fan speed by pressing either {S1/-} or {S2/+}.

To activate test mode, press the {S2/+} and {S3/Program} keys together for 1 second. Once activated, you will see in the display {Ser} and the actual fan speed. The measurement of the combustion levels should always be taken at the highest and lowest fan speeds. After 20 minutes, test mode stops automatically. To exit test mode, press {S1/-} and {S2/+} together for 1 second.

COMBUSTION SETTINGS ON ALL MODELS				
	Natural Gas		Propane LP	
Fan Speed	low	high	low	High
Carbon Monoxide (CO%)	0 – 20 ppm	70 – 135 ppm	0 – 20 ppm	80 – 150 ppm
Carbon Dioxide (CO_2%)	8 ½ - 9 ½%	8 ½ - 9 ½%	9 ½ - 10 ½%	9 ½ - 10 ½%

Table 11 – Combustion Settings on All Models

MOD CON FAN SPEEDS			
MODEL	**IGNITION**	**MIN**	**MAX**
300	3000	1250	5500
500	3000	1250	6930
850	3000	1500	5400

Table 12 – Fan Speeds

PART 10 – START-UP PROCEDURES FOR THE INSTALLER

A. PROGRAMMING FOR THE INSTALLER

This section describes each parameter the installer can access to customize the settings of the boiler for a particular installation. These system limits should not be changed by the user. For future reference, it is important to document your settings within this manual after you program the system parameters.

B. PROGRAM ACCESS

To start, press and hold {S3} and {S4} simultaneously for three seconds. You will notice the display change to |000|. Then, press and hold {S1} until you see |925|. (If you go past |925|, you can use {S2} to decrease the number.) This is the pass code. To confirm that the pass code is correct, press and hold the {S3} key for 1 second. If the pass code is entered incorrectly, the controller program function will cancel and return to normal operation. If the code is entered correctly, the control will switch off the gas valve and purge fan while showing a solid - - - in the display. The display will then show a |1| alternating to |de|. This first function verifies that the control is configured as a boiler.

C. PROGRAM NAVIGATION

Next you will have to press the {S3} key to move through each function. To increase or decrease a value, you will need to press either {S1} or {S2} to change the default values. If there is no key action for 1 minute, the display returns to normal operation. Changes are effective immediately but not directly stored until the {S4} key is pressed down for 3 seconds then the new values are stored. Listed below are the varieties of functions the installer can program.

CAUTION
The boiler cannot be programmed while there is a call for heat.

NOTE: See Figure 28 to set outdoor reset curve.

DEFAULT FUNCTION	VALUE	DESCRIPTION
1	|de|	N/A (no change allowed)
2	149°F	N/A (no change allowed)
3	180°F	Allows the installer to set the maximum domestic water heater delivery temperature. Range: 95°F to 185°F
4	36°F	N/A (no change allowed)
5	7°F	Allows the installer to change the differential temperature (dh) in the indirect fired water heater (does not apply if used with mechanical control) Range: 1°F to 18°F

6	0 min.	Changes the indirect circulator post purge time once the sensor is satisfied. (**NOTE:** Post purge time should be set no greater than 5 minutes.) Range: 0 to 10 minutes
7	68°F	Outdoor temperature that will disable central heating (warm weather shutdown) Range: 41°F to 122°F
DEFAULT FUNCTION	**VALUE**	**DESCRIPTION**
*8	5°F	Changes the minimum outside design temperature Range: -49°F to 32°F
*9	180°F	Changes the design supply water temperature based on the minimum outside design temperature range Range: 77°F to 190°F
*10	68°F	Allows the installer to change the maximum outside design temperature for central heating. Range: 95°F to 32°F
*11	95°F	Changes the design supply water temperature from the boiler based on the maximum outside design temperature Range: 32°F to 190°F
12	68°F	Sets the lowest temperature for central heating. Range: 32°F to 190°F
13	0 min.	Changes the central heating circulator post purge time once the thermostat is satisfied. Range: 0 to 10 minutes
14	30 min.	Sets the maximum run time for the indirect fired water heater and the minimum run time for central heating. Range: 0 to 60 minutes
15	0	Bus address (Cascade 8 Boiler Max) (0 = master 1 – 7 = follower) **NOTE:** Never address boiler with number 8. Range: 0 to 8.
16	0	Allows the installer to connect a 0-10 volt directly from Building Management System. To activate, change value to 2. WARNING: Values 1 and 3 are not to be programmed into the board. Range: 0 - 3.
17	0	Controls the function of the 0-10 volt input 0 = boiler temperature, 1 = boiler power
18	1	Step Modulation – regulates the burner output in 6 steps in one-minute intervals. This reduces short cycling. 1 = on, 0 = off
19	180°F	Indirect boiler set point (flow) Range: 119°F to 180°F
20	3	Low water cut-off. Do not change. 0 = none, 1 = water pressure switch, 2 = flow switch, 3 = low water cut-off (default)
21	0	Sets the control to display FOU error. If outdoor sensor is open or shorted, FOU error does not prevent the boiler from running. 0 = No FOU displayed. 1 = FOU displayed.
22	100%	This parameter can be adjusted to lower the maximum boiler output. Default = 100%. Ex: 500 boiler setting at 80% will go to 400,000 BTU/hr max rather than 500,000 BTU/hr. Range: 50 – 100%.
23	0	Cascade configuration (Default 0). Change this to 1 if the boiler is a cascade master.
24	24	Sets how many power on hours will go by before the priority appliance will be rotated in the cascade system. Range: 0 - 240
25	0	N/A must be at 0.
26	---	System pump freeze protection. Default – disabled. Use this function on a cascade master to activate the system pump if the outdoor temperature drops below the set value. Use the {S2} key to increase from the default disabled upward to the desired temperature. Range: --- disabled to 104°F
27	0	Parameter set on 0 then E03 will be displayed if system sensor fails. Parameter set on 1, no code will be displayed if system sensor fails. 0 = E03, 1 = no code displayed.
28	0	Parameter set on 0 = Frost protection active. Parameter set on 1 = Frost protection disabled.
29	0	Parameter set on 0 = Normal DHW modulation Parameter set on 1 = DHW will begin modulation on low rather than high fire

30	0	Parameter set on 0 = There will be no extra boiler on the Cascade Master. Parameter greater than 0 = Percentage of the cascade output that will turn on the auxiliary boiler.
31	0	N/A (do not change)

Table 13

***Central Heating Curve Function**
The central heating demand is detected when the room thermostat closes. When an outside sensor is also connected, the supply temperature will depend on the factory default central heating curve, which is sufficient for most applications.

To set your custom heat curve, you will have to set the following parameters. Use the graphs in Figure 28 to plot the curve.

1. Minimum outside design temperature: **Function 8**.

2. Design supply water temperature at the minimum design outside temperature: **Function 9**.

3. Maximum outside design temperature: **Function 10**.

4. Design supply water temperature at the maximum outside temperature: **Function 11**.

NOTE: The user can adjust the heat curve down by adjusting the central heating temperature to a lower setting.

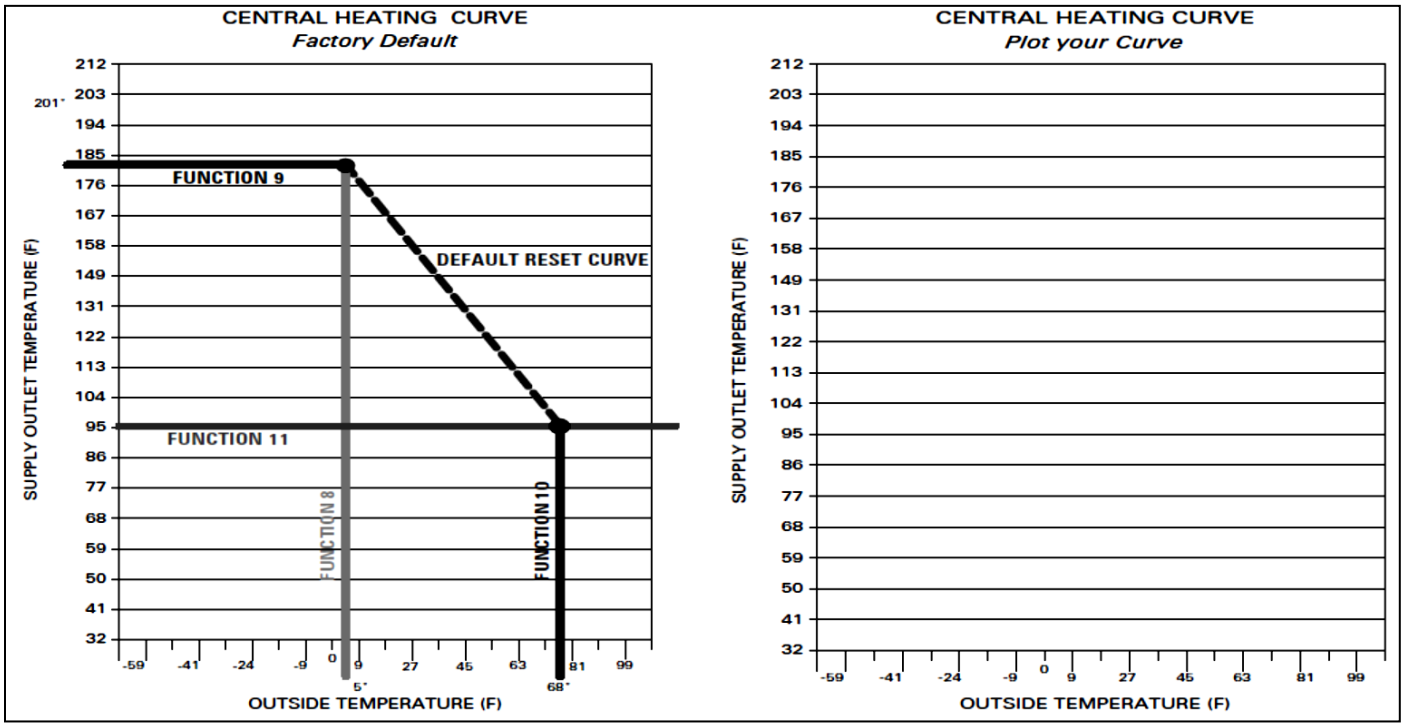


Figure 28

CONTROL PROGRAM REFERENCE CHART					
Function	Default Setting	Programmed Setting	Function	Default Setting	Programmed Setting
1	de	No change allowed	17	0	
2	149°F	No change allowed	18	1	
3	180°F		19	180°F	
4	36°F	No change allowed	20	3	
5	7°F		21	0	
6	0 minutes		22	100%	
7	68°F		23	0	
8	5°F		24	24 hrs.	
9	180°F		25	0	No change allowed
10	68°F		26	– – –	
11	95°F		27	0	
12	68°F		28	0	
13	0 minutes		29	0	
14	30 minutes		30	0	
15	0		31	N/A	Do not change
16	0				

Table 14

PART 11 – TROUBLESHOOTING

A. ERROR CODE

If any of the sensors detect an abnormal condition or an internal component fails during the operation of the boiler, the display may show an error code. This 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, or it may 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, requiring the maintenance person to manually reset the control by pressing the S4/RESET key for more than 1 second. Typically, if the display has a code beginning with F followed by 2 numbers, the boiler is locked out. If the display has a 3 letter code, the fault is the result of a temporary condition.

B. BOILER ERROR

When an error condition occurs, the controller will display an error code on the display module. These error codes and several suggested corrective actions are included in Table 15.

C. BOILER FAULT

1. When a fault condition occurs, the controller will illuminate the red “fault” indication light and display a fault code. The alarm output will also be activated. Most fault conditions will also cause the CH pump to run in an attempt to cool the boiler.

2. Note the fault code and refer to Table 16 for an explanation of the fault code along with several suggestions for corrective actions.

3. Press the reset key to clear the fault and resume operation. Be sure to observe the operation of the unit for a period of time to assure correct operation and no recurrence of fault codes.

⚠ 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 the boiler water, be certain that:

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

⚠ 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 appliance 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 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.

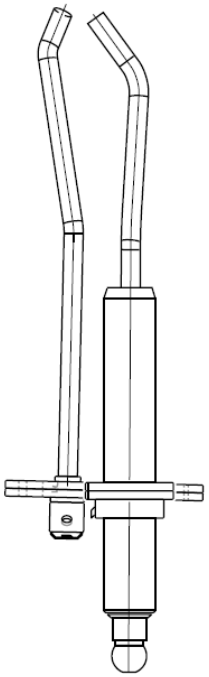
926 CONTROL BOARD ERROR CODES		
CODE	**DESCRIPTION**	**CORRECTIVE ACTION**
FOU	Outside sensor shorted or temperature less than -40 degrees F.	Inspect wiring from outside sensor for damage or shorted connections. Repair as necessary. Measure resistance of outdoor sensor and compare to resistance chart. If not within range of chart, shorted or open, replace sensor.
E19	Line voltage frequency out of range.	Inspect power wiring to appliance and repair as necessary. If connected to line voltage, notify power company. If connected to an alternate power source, such as a generator or inverter, make sure line voltage frequency supplied by the device is 60 Hz.
FLU	Blocked Vent Pressure Switch	1. Check the flue vent to be sure it is not blocked or damaged. 2. Check the switch wiring by applying a jumper in place of the switch. If the code clears with the jumper in place, REPLACE the flue switch and connect the wires to the new switch BEFORE running the boiler. WARNING: Do not use jumper to remedy this error. Faulty switches MUST be replaced. Failure to do so could result in serious injury or death.
LEO	Water Level in Boiler is Low	1. Check boiler feed water system to be sure it is supplying make-up water to the boiler system. 2. Be sure all air is bled from system. 3. Check for leaks in boiler and system piping and repair as necessary. 4. Inspect low level switch and wiring for damage and repair if necessary.
LOU	24 Volt Low	1. Check line voltage. Must be between 100 – 128 volts. 2. If available, connect a PC and, using HTP service software, check the 24v supply display in the lower left corner of the screen. The number displayed here must be greater than 128 and should be greater than 250. Use this as a troubleshooting guide as you follow the steps below. 3. Remove 10 pin Molex connector from customer connection board. If LOU clears, then the problem is with external sensor wiring. Examine external sensor wiring for shorts to ground, repairing as necessary. If LOU code is still present and the heater is so equipped, disconnect high gas pressure switch, then low gas pressure switch, then UL 353 low water cutoff in this order, one at a time, to see if LOU code clears. Replace faulty part. Check low voltage wire harness in heater for shorts to ground. 4. If LOU only occurs when burner tries to light, check gas valve for excessive current draw. 5. If LOU is present with the low voltage harness disconnected from the 926 control board, replace the 926 control board.
E03	System sensor failure (Cascade Master only)	1. Check wiring to system sensor. Repair as necessary. 2. Check sensor resistance. Compare to the resistance table in this manual. Replace if not correct.
FL	Low water flow (Users with optional flow switch only).	1. Check to see if boiler circulator is functioning. Repair as necessary. 2. Be sure water is flowing in the system. Check for valves that should be open, plugged filter screens, etc. 3. Check flow switch and wiring. Repair as necessary.

Table 15

926 Control Board FAULT		
Codes	**Description**	**Remedy**
F00	High temperature limit exceeded	1. Check circulation pump operation. 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermistor to the supply thermistor. 3. Check thermistor reading on supply thermistor. Replace switch if faulty. 4. Disconnect the two wires from the thermostat terminals and connect the wires together. Depress the S4/Reset button. If the fault clears, the problem is outside the boiler.

F01	ECO circuit 2 Vent temperature High Gas Pressure (if equipped) Low gas pressure (if equipped) Low level (if equipped with UL353 LWCO) Thermal Fuse (if equipped)	1. If the boiler is equipped with High and/or Low gas pressure switches, examine the yellow LED lights on each switch. If lit, correct the gas supply problem associated with the switch. Then, reset the switch by pressing on the cover of the switch over the red button. Pressing the button requires a firm push. Finally, press the RESET button on the front panel of the boiler to reset the boiler control. 2. If the boiler has a UL353 LWCO, check to see if the red LED on the LWCO control box is illuminated. If so, correct the low water condition and press the reset button on the LWCO control box to reset it. The LED should change to green. Finally, press the reset button on the front panel of the boiler to reset the boiler control. 3.Check the flue for obstructions or any sign of damage, especially signs of excessive heat. Repair as necessary. Push red reset button on flue temperature switch located on the flue inside the rear access door of the boiler. **NOTE:** Switch temperature must be less than 90°F to reset. Run the boiler and check the flue temperature. If the flue temperature is within specs and the switch trips, replace the switch. If the flue temperature is excessive, check and adjust the combustion controls on the boiler. If problem persists, inspect the target wall in the combustion chamber and replace it if cracked or damaged. 4. If the boiler is equipped with a Thermal Fuse, ensure all wiring to and from the thermal fuse is secure and intact. Next, check for continuity across the thermal fuse with an ohmmeter. If the ohmmeter registers as open, the thermal fuse needs to be replaced. **NOTE:** Before replacing a thermal fuse, remove the gas valve, blower, and burner assembly and inspect the heat exchanger and target wall for damage. This is a VERY IMPORTANT procedure, as the heat exchanger may be damaged and need to be replaced, and should only be performed by a qualified, highly experienced service technician.
F02	Interrupted or shorted supply (outlet) thermistor.	1. Check the electrical connection to the appropriate thermistor. Verify 5 VDC by checking in Molex connector. If not 5 VDC, check harness. If harness is OK, replace control. **NOTE:** Boiler will reset automatically. Verify thermistor values by referencing chart in this manual. 2. If connection is okay, replace thermistor.
F03	Interrupted or shorted return (inlet) thermistor.	
F05	Supply (outlet) temperature sensor exceeds 230°F.	1. Check circulation pump operation. 2. Assure there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermistor to the supply thermistor. 3. Check direction of flow on boiler circulator (see PIPING DETAILS in this manual). 4. Troubleshoot thermistor by following steps in F02.
F06	Return (inlet) temperature sensor exceeds 230°F.	
F09	No flame detected – Boiler will make three attempts at ignition before the control goes into this lockout condition.	1. Watch the igniter through the observation window provided. 2. If there is no spark, check the spark electrode for the proper ¼" gap. 3. Remove any corrosion from the spark electrode and flame rectifier probe. 4. If there is a spark but no flame, check the gas supply to the boiler. 5. If there is a flame, check the flame sensor. 6. Check any flue blockage or condensate blocks.
F10	Loss of flame signal – The heater will relight 4 times before the control goes into this lockout condition. Will reset in 1 hour.	1. Monitor the gas pressure to the unit while in operation. 2. Assure that the flame is stable when lit. 3. Check to see if the green light on the display module is out while the heater is running. 4. If the green light doesn't come on or goes off during operation check the flame signal on the status menu. 5. If the signal reads less than 1 microampere, clean the flame rectifier probe. 6. If the flame rectifier probe continues to read low, replace it. 7. Check the stability of the flame rectification signal. If the signal is unstable, you may need to replace the burner gasket.
F11	False flame signal – The boiler will lock out if it senses a flame signal when there should be none present.	1. Look into window. If there is flame, turn the gas off to the unit at the service valve and replace gas valve. 2. If the flame signal is present and there is no flame, replace the flame rectification probe. 3. If the flame signal is not present after turning off the gas supply, check the gas valve electrical connection. 4. Remove the gas valve and check for obstruction in the valve seat or replace the gas valve. 5. Turn the gas on at the service valve after corrective action is taken. 6. Check for condensate backup. Condensate backup can damage the refractory wall. If the wall falls against the rectifier probe, it may conduct the signal to ground, giving a false reading.
F13	Combustion fan speed incorrect – The boiler will lock out if it senses that the fan speed is less than 70% or greater than 130% of expected rate for more than 60 seconds.	1. Check the combustion air fan wiring. 2. Check the 24 VAC signal by measuring from any connected safety to ground. A low voltage situation may cause a "false" error code. 2. Replace the combustion air fan. 3. Replace the control board.
F20	Condensate cup is full	1. Check condensate lines for obstructions. 2. Check float switch in condensate reservoir. 3. Check wiring from condensate reservoir to 926 control and repair as necessary.
pp	Parameters programmed	Press {S4} reset for at least 1 second.
F31	Program parameter error	Control must be re-programmed. If programming does not solve problem, control must be replaced.

Table 16



NOTE: If receiving an F09 fault code, check the gap spacing between points on the electrode by holding two quarters together and sliding them through the gap. There should be a slight resistance.

Resistance Tables

Outdoor Sensor (7250P-319)	
Outside Temperature (°F)	Resistance (ohms)
–22	171800
–13	129800
–4	98930
5	76020
14	58880
23	45950
32	36130
41	28600
50	22800
59	18300
68	14770
77	12000
86	9804
95	8054
104	6652
113	5522

System/Pipe Sensor 7250P-324	
Boiler Sensor (7250P-667) / Indirect Tank Sensor (7250P-325)	
Water Temperature (°F)	Resistance (ohms)
32	32550
41	25340
50	19870
59	15700
68	12490
77	10000
86	8059
95	6535
104	5330
113	4372
122	3605
131	2989
140	2490
149	2084
158	1753
167	1481
176	1256
185	1070
194	915
203	786
212	667

Figure 29

PART 12 – MAINTENANCE

CAUTION

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

⚠ WARNING

Allowing the appliance 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 appliance failure, property damage, personal injury, or death. Such product failures ARE NOT covered under warranty.

The appliance 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.

A. MAINTENANCE PROCEDURES

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

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

- a nylon, stainless steel, or brass brush (not steel)
- lime scale removing solution, approved for use with stainless steel
- gloves and eye protection

1. Shut down the boiler by using the following steps:
   a. Close the gas valve, shut down the unit, and wait for the unit to be cool to the touch.
   b. Disconnect the condensate piping from the outside connection, (not from the boiler side), so flow from condensate reservoir can be observed.
   c. Disconnect electrical connections from the gas valve, spark electrode and flame rectification probe and combustion blower.
   d. Remove the (4) screws on the aluminum ¾" NPT connector on the right side of the gas valve.
   e. Disconnect the wiring connected to the combustion blower motor.
   f. Remove the (6) 10MM nuts from the burner plate assembly.

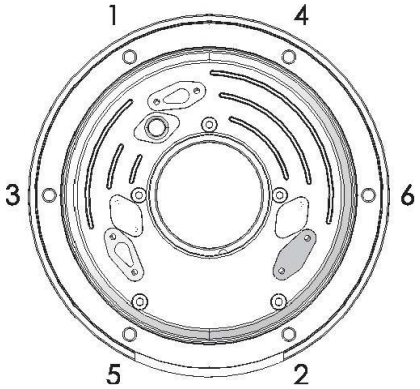


Figure 30

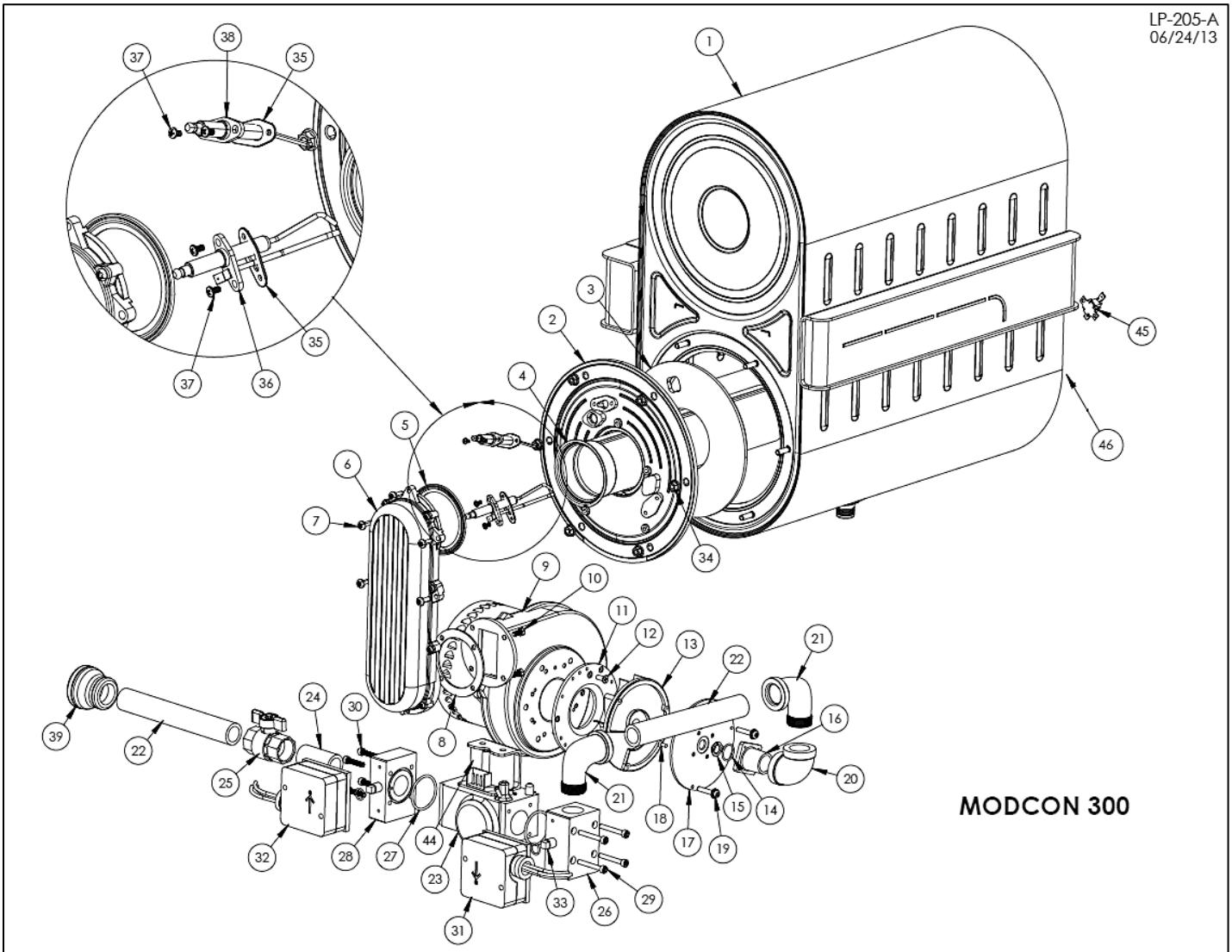
   g. Pull the entire burner plate assembly with blower still attached towards you, while removing or pushing aside any wiring to allow the removal of the assembly.

2. Using a spray bottle filled with lime remover, spray liberally on the coils, making sure the solution penetrates and funnels down through the condensate system. If the condensate system is blocked, let chemical penetrate for at least 15 minutes, or until condensate 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 unit wet). Flush the combustion chamber with fresh water until it runs clear from the condensate. At this point, the boiler should be ready to be re-assembled.
   a. Inspect gaskets.
   b. Re-install the burner assembly.

c. Replace and tighten the (6) 10 mm nuts to the burner plate using staggered tightening sequence (see detail).
d. Re-connect all wiring connections.
e. Inspect the gas valve to assure the O-ring is in place.
f. Replace the (4) screws on the aluminum connector on the gas valve. Turn the gas back on. **(IMPORTANT: CHECK FOR GAS LEAKS BEFORE TURNING THE APPLIANCE ON!)**
g. Turn the boiler power back on and create a demand on the boiler. When boiler is lit, observe condensate flow from the boiler. Be sure the boiler is operating properly.
h. Re-connect the condensate piping to the outside condensate connection.



Item No	Replacement Part #	Description
1	7350P-005	300,000 BTU MOD CON MODULE
2	7350P-016	BURNER DOOR
3	7350P-018	BURNER DOOR REFRACTORY
4	7350P-031	BURNER - GCFI
5	7500P-074	BURNER MOUNTING GASKET
6	7250P-687	AIR CHANNEL
7	7250P-206	M5 X 14MM TORX SCREWS - AIR CHANNEL
8	7500P-075	GASKET - AIR CHANNEL/BLOWER
9	7350P-159	COMBUSTION BLOWER
10	7350P-119	M5 X 12MM HEX HEAD SCREW
11	7250P-711	FAN ADAPTER PLATE
12	N/A	M5 X 8MM FLAT HEAD PHILLIPS SCREW
13	7250P-712	SWIRL PLATE 16MM
14	7350P-121-3	GAS INJECTOR PLATE O-RING
15	7350P-121-4	GAS INJECTOR
16	7350P-121-2	3/4" NPT ADAPTER
17	7350P-121-1	GAS INJECTOR PLATE
18	7350P-121-5	M4 X 10MM FLAT HEAD SLOTTED SCREW
19	7350P-617	M4 X 35MM SCREW
20	7350P-083	3/4" NPT ELBOW, SCH. 40
21	7350P-084	3/4" M x 3/4" F NPT STREET ELBOW
22	7350P-074	3/4" NPT X 7" NIPPLE - PHOSPHATE COATED
23	7350P-033	GAS VALVE

Item No	Replacement Part #	Description
24	7350P-102	3/4"NPT x 2" NIPPLE - PHOSPHATE COATED
25	7350P-079	3/4" GAS BALL VALVE
26	7350P-091	GAS PRESSURE SWITCH BLOCK - RIGHT
27	7350P-077	SILICONE O-RING #127 - GAS PRESSURE SWITCH BLOCK TO GAS VALVE
28	7350P-075	GAS PRESSURE SWITCH BLOCK - LEFT
29	7350P-111	10-32 X 1-1/2" SS SOCKET CAP SCREW - PRESSURE SWITCH BLOCK
30	7250p-061	M5 X 25MM SOCKET HEAD CAP SCREW
31	7350P-035	HIGH PRESSURE GAS SWITCH w/O-RING (OPTIONAL)
32	7350P-036	LOW PRESSURE GAS SWITCH w/O-RING (OPTIONAL)
33	7350P-078	1/8-27" NPT PLUG - GAS PRESSURE SWITCH BLOCK
34	7500P-067	NUT M6 - BURNER DOOR
35	7250P-005	GASKET - PROBE/ELECTRODE
36	7350P-020	SPARK ELECTRODE
37	7250P-069	M4 X 8MM CHEESE HEAD PHILLIPS
38	7350P-022	FLAME RECTIFICATION PROBE (w/GASKET)
39	7350P-122	3/4" X 1-1/4" NPT REDUCING COUPLING BLK. IRON
40	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING
41	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32 (w/O-RING)
42	7250P-150	BLOCKED VENT PRESSURE SWITCH
43	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12"
44	7350P-627	24VAC GAS VALVE COIL KIT
45	7350P-626	THERMAL FUSE
46	7250P-162	CERAMIC REFRACTORY (LOCATED INSIDE END OF MODULE)

Figure 31

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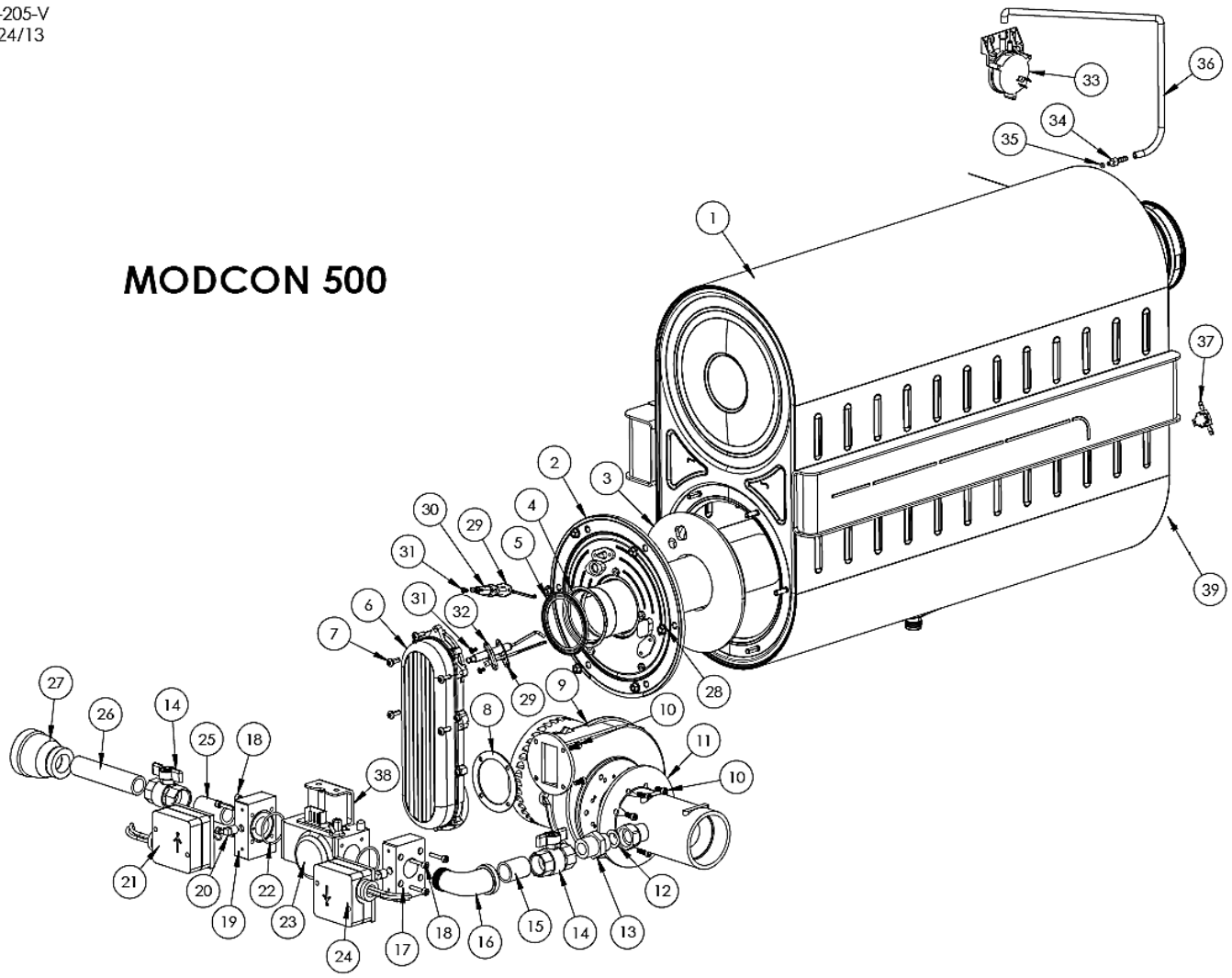
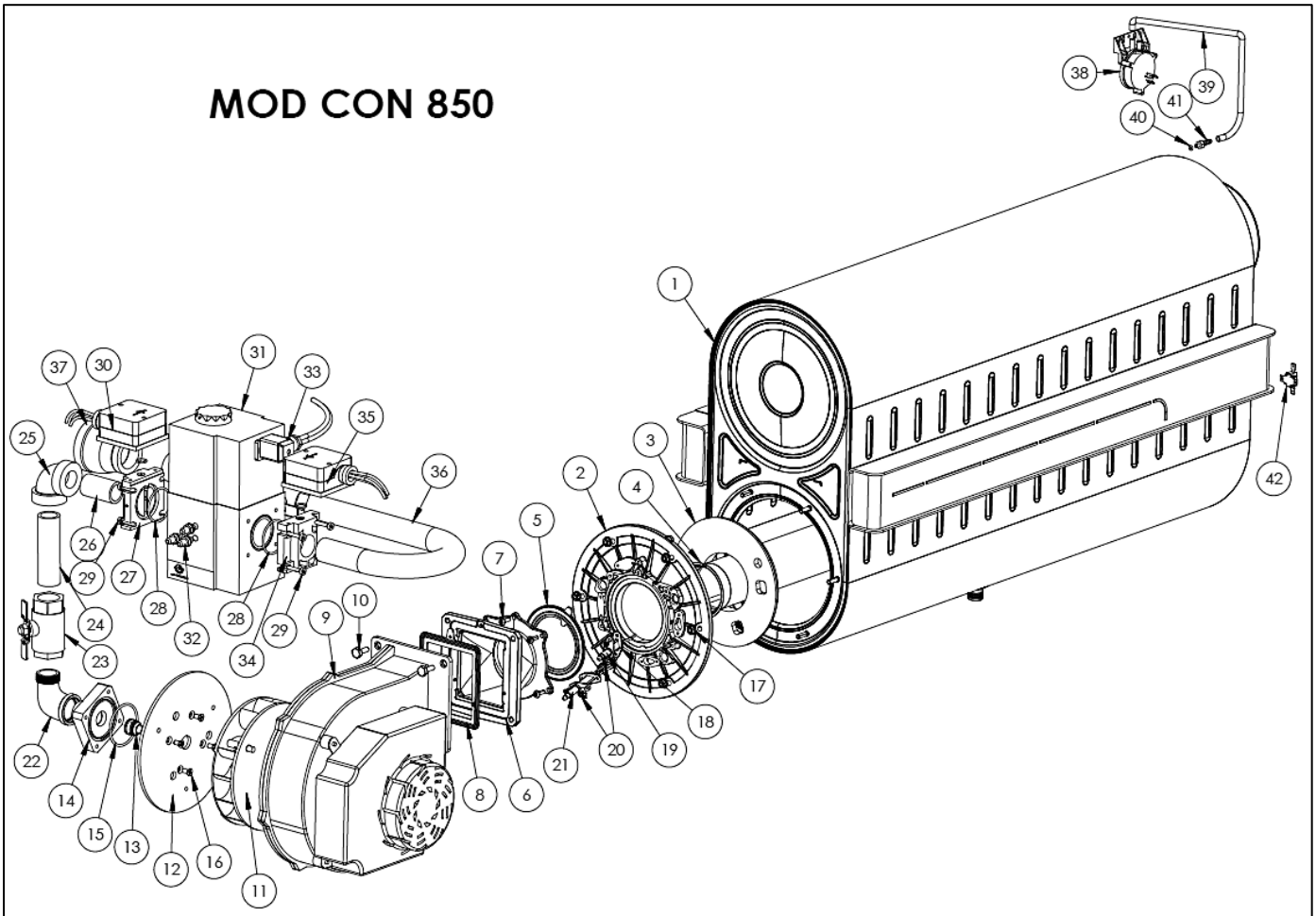
6/24/13



Item No	Replacement Part #	Descriptioin
1	7350P-006	500,000 BTU MODCON MODULE
2	7350P-016	BURNER DOOR
3	7350P-018	BURNER DOOR REFRACTORY
4	7350P-031	BURNER - GCFI
5	7500P-074	BURNER MOUNTING GASKET
6	7250P-687	AIR CHANNEL
7	7250P-206	M5 X 14MM TORX SCREWS - AIR CHANNEL
8	7500P-075	GASKET - AIR CHANNEL/BLOWER
9	7350P-159	COMBUSTION BLOWER
10	7250P-478	M5 X 12MM ALLEN CAP SCREW - BLOWER
11	7350P-630	AIR/GAS MIXER ASSEMBLY
12	7450P-115	WASHER - AIR/GAS MIXER
13	7450P-119	3/4 NPT X 3/4 BSPP ADAPTER
14	7350P-079	3/4" GAS BALL VALVE
15	7350P-101	3/4 NPT X CLOSE NIPPLE - PHOSPHATE COATED
16	7350P-084	3/4 M X 3/4 F NPT STREET ELBOW
17	7350P-075	GAS PRESSURE SWITCH BLOCK (LEFT)
18	7250P-061	M5 X 25MM SS SOCKET CAP SCREWS - SWITCH BLOCK
19	7350P-076	GAS PRESSURE SWITCH BLOCK (RIGHT)
20	7350P-078	1/8-27 NPT PLUG - SWITCH BLOCK

Item No	Replacement Part #	Description
21	7350P-036	LOW PRESSURE GAS SWITCH w/O-RING (OPTIONAL)
22	7350P-077	SILICONE O-RING #127 - SWITCH BLOCK
23	7350P-033	GAS VALVE
24	7350P-035	HIGH PRESSURE GAS SWITCH w/O-RING (OPTIONAL)
25	7350P-102	3/4" NPT X 2" NIPPLE - PHOSPHATE COATED
26	7350P-081	3/4" NPT X 4-1/2" NIPPLE - PHOSPHATE COATED
27	7350P-110	3/4" X 1-1/2" NPT REDUCING COUPLING BLACK IRON
28	7500P-067	M6 NUT - BURNER DOOR
29	7250P-005	GASKET - PROBE/ELECTRODE
30	7350P-022	FLAME RECTIFICATOIN PROBE (w/GASKET)
31	7250P-069	M4 X 8MM S.S. SCREW - PROBES
32	7350P-020	SPARK ELECTRODE (w/GASKET)
33	7250P-150	BLOCKED VENT PRESSURE SWITCH
34	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32
35	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING
36	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12" LONG
37	7350P-626	THERMAL FUSE
38	7350P-627	24 VAC GAS VALVE COIL KIT
39	7250P-162	CERAMIC REFRACTORY (LOCATED INSIDE END OF MODULE)

Figure 32



Item No	Replacement Part #	Description
1	7350P-007	850,000 BTU MOD CON MODULE
2	N/A	BURNER DOOR 80MM
3	7350P-019	BURNER DOOR REFRACTORY
4	7350P-631	BURNER KIT (includes items 2, 3, 4, 5, 6, 7, 8, 17 and 18)
5	7350P-028	GASKET - BURNER
6	7350P-029	AIR/GAS CHANNEL - CONICAL
7	7350P-030	SCREW - AIR CHANNEL TO BURNER DOOR
8	7350P-064	INTERFACE GASKET - AIR CHANNEL/BLOWER
9	7350P-038	COMBUSTION BLOWER
10	7350P-093	M8 X 20MM HEX HEAD BOLT - BLOWER
11	7350P-034-1	SWIRL PLATE (includes PLATE)
12	N/A	MOUNTING PLATE
13	7350P-034-4	12MM GAS INJECTOR
14	7350P-034-2	BLOWER ADAPTER FLANGE (includes O-RING,SCREWS)
15	N/A	O-RING - BLOWER ADAPTER FLANGE
16	N/A	M6 X 25MM FLAT HEAD SCREW - ADAPTER FLANGE
17	7500P-067	NUT M6 - BURNER DOOR
18	7250P-005	GASKET - PROBE/ELECTRODE
19	7350P-023	FLAME RECTIFICATION PROBE (includes item #18)
20	7250P-069	M4 X 8MM CHEESE HEAD PHILLIPS

Item No	Replacement Part #	Description
21	7350P-021	SPARK ELECTRODE (includes item #18)
22	7350P-096	1" X 1" STREET ELBOW
23	7350P-099	1" GAS BALL VALVE
24	7350P-097	1" NPT X 4" NIPPLE - PHOSPHATE COATED
25	7350P-095	1" NPT 90 DEGREE ELBOW
26	7350P-098	1" NPT X 3" NIPPLE - PHOSPHATE COATED
27	7350P-034-3	MAXIMUM FLOW RESTRICTOR FLANGE
28	N/A	O-RING - FLANGE
29	N/A	M6 X 25MM SCREWS - FLANGE
30	7350P-035	HIGH PRESSURE GAS SWITCH w/O-RING (OPTIONAL)
31	7350P-034	GAS VALVE (includes O-RING, SCREWS)
32	7350P-034-6	AIR ADJUSTMENT PORT
33	7350P-034-8	HIRSCHMAN CONNECTOR
34	7350P-034-5	1" NPT FLANGE
35	7350P-036	LOW PRESSURE GAS SWITCH w/O-RING (OPTIONAL)
36	7350P-082	GAS PIPE ASSY W/SHUT-OFF 1-1/4 IPS X 1 IPS
37	7350P-109	1-1/4" - 2" REDUCING COUPLING
38	7250P-150	BLOCKED VENT PRESSURE SWITCH
39	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12"
40	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING
41	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32
42	7350P-626	THERMAL FUSE

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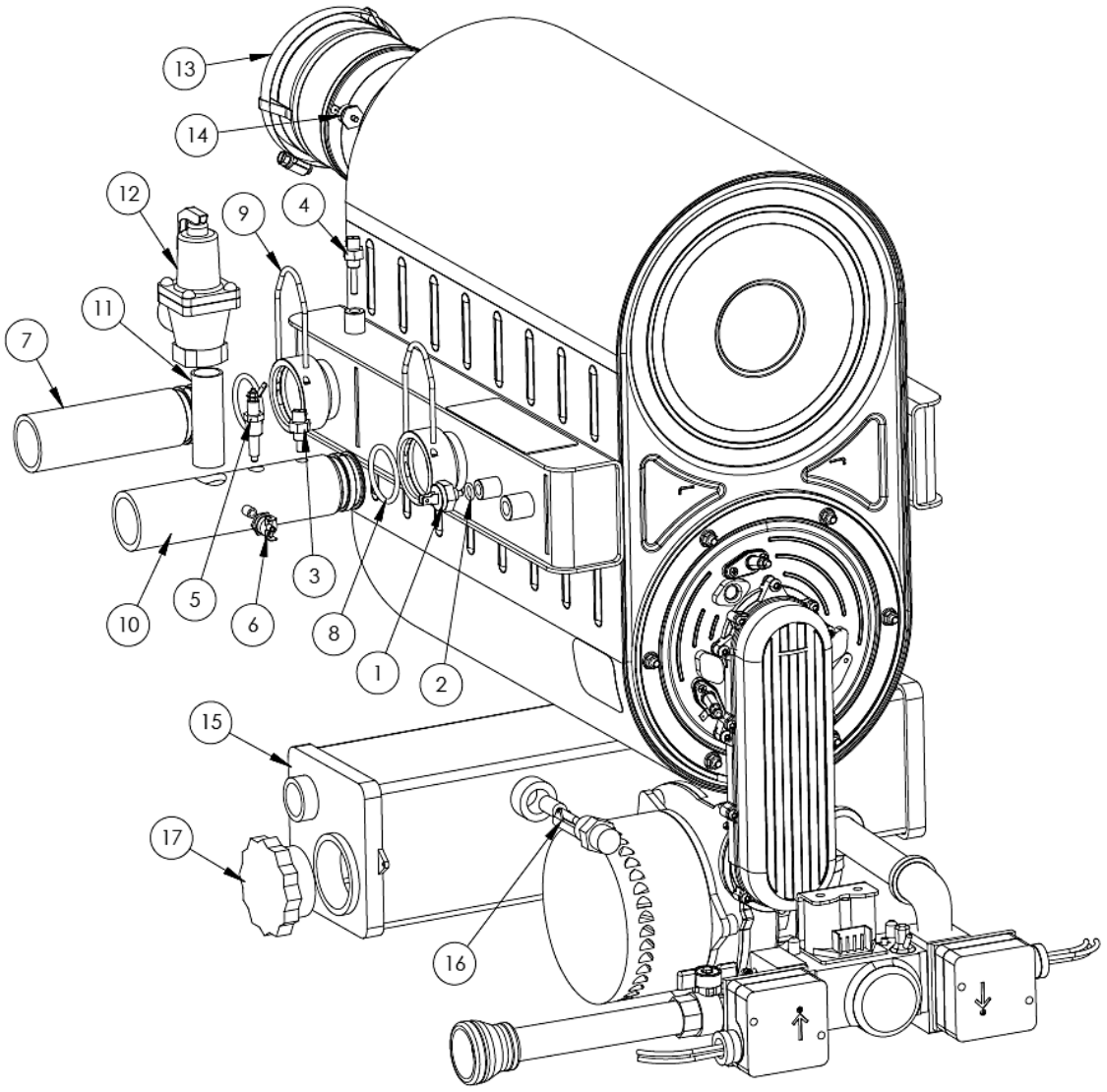
Figure 33 – NOTE: Ceramic Refractory Part # 7250P-162



Item No	MOD CON 300	MOD CON 500	MOD CON 850	Description
1	7500P-033	7500P-033	7500P-033	ECO HIGH LIMIT SENSOR (w/O-RING)
2	7500P-100	7500P-100	7500P-100	O-RING - ECO HIGH LIMIT SENSOR
3	7250P-059	7250P-059	7250P-059	THERMISTOR - SYSTEM SUPPLY
4	7250P-667	7250P-667	7250P-667	THERMISTOR
5	7350P-089	7350P-089	7350P-089	LOW WATER CUT-OFF PROBE
6	7500P-002	7500P-002	7500P-002	ECO SWITCH - 190 DEGREES
7	7350P-003	7350P-004	7350P-004	1-1/2" INLET NIPPLE (w/O-RING)(300 only) 2" INLET/NIPPLE (w/O-RING)
8	7350P-071	7350P-072	7350P-072	O-RING - INLET/OUTLET NIPPLE
9	7350P-014	7350P-015	7350P-015	1-1/2" INLET/OUTLET NIPPLE CLIP (300 only) 2" INLET/OUTLET NIPPLE CLIP
10	7350P-001	7350P-002	7350P-002	1-1/2" OUTLET NIPPLE (w/O-RING)(300 only) 2" OUTLET NIPPLE (w/O-RING)
11	SN1018	SN1018	SN1018	3/4" NPT X 3" NIPPLE - BRASS
12	7350P-223	7350P-223	7350P-223	75# RELIEF VALVE - 3/4" NPT
13	7350P-219	7350P-219	7350P-220	VENT ADAPTER
14	7250P-739	7250P-739	7250P-739	FLUE ECO SWITCH - 160 DEGREES
15	7350P-613	7350P-613	7350P-613	CONDENSATE COLLECTOR BODY
16	7350P-167	7350P-167	7350P-167	CONDENSATE OVERFLOW SWITCH
17	7350P-113	7350P-113	7350P-113	2" PVC PLUG

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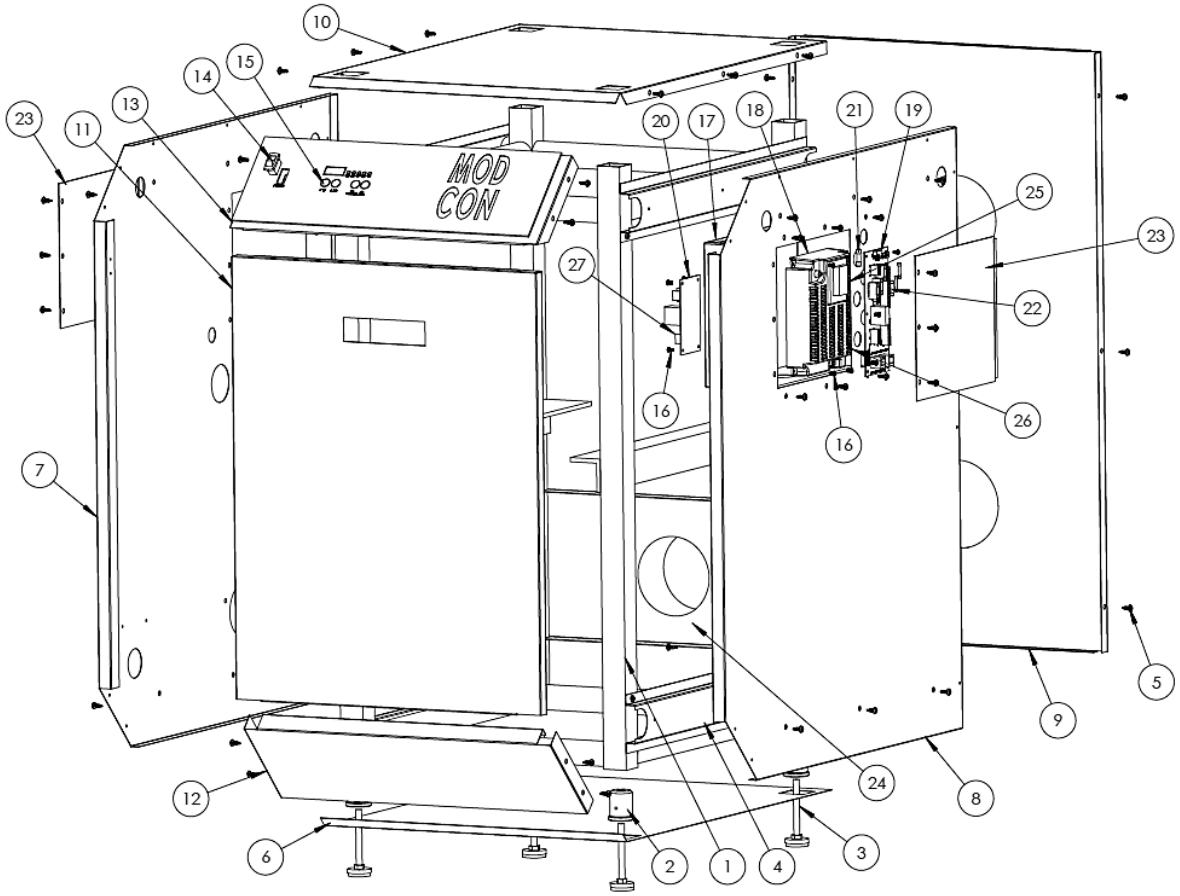
Figure 34 – LP-205-H



Item No	MOD CON 300	MOD CON 500	MOD CON 850	Description
1	7350P-039	7350P-040	7350P-041	MOD CON FRAME
2	7350P-092	7250P-092	7350P-092	LEVELING FOOT SUPPORT
3	7250P-673	7250P-673	7250P-673	LEVELING FEET KIT
4	7350P-067	7250P-068	7250P-069	JACKET MOUNTING BRACKET
5	7350P-063	7350P-063	7350P-063	#10 x 1/2" SELF TAPPING SCREW
6	7350P-059	7350P-060	7350P-061	JACKET - BOTTOM (w/SCREWS)
7	7350P-053	7350P-055	7350P-057	JACKET - LEFT SIDE (w/SCREWS)
8	7350P-054	7350P-056	7350P-058	JACKET - RIGHT SIDE (w/SCREWS)
9	7350P-049	7350P-049	7350P-126	JACKET - REAR (w/SCREWS)
10	7350P-050	7350P-051	7350P-052	JACKET - TOP (w/SCREWS)
11	7350P-047	7350P-047	7350P-047	JACKET - FRONT (w/SCREWS)
12	7350P-048	7350P-048	7350P-048	JACKET - LOWER FRONT (w/SCREWS)
13	7350P-046	7350P-046	7350P-046	JACKET - UPPER FRONT (w/MOD CON LABEL, SCREWS)
14	7500P-087	7500P-087	7500P-087	POWER SWITCH
15	7350P-009	7350P-009	7350P-009	926 DISPLAY PANEL w/RIBBON CABLE
16	7500P-115	7500P-115	7500P-115	6-32 X 1/4" PAN HEAD SCREW - ELECTRONIC BOARDS
17	7350P-042	7350P-042	7350P-042	ELECTRICAL BOX
18	7350P-008	7350P-008	7350P-008	926 CONTROL BOARD
19	7350P-070	7350P-070	7350P-070	FIELD CONNECTION BOARD
20	7250P-580	N/A	7250P-580	RELAY BOARD - 399M/MODCON850
21	7250P-378	7250P-378	7250P-378	FUSE - CONTROL BOARD - 6.3 AMPS
22	7350P-129	7350P-129	7350P-129	FUSE - CONNECTION BOARD - 3.15 AMPS
23	7350P-062	7350P-062	7350P-062	ELECTRICAL BOX/ACCESS PANEL COVER
24	7350P-103	7350P-103	7350P-104	AIR INLET BRACKET
25	7350P-025	7350P-026	7350P-043	120V WIRING HARNESS (LOCATION)
26	7350P-139	7350P-140	7350P-138	LOW VOLTAGE WIRING HARNESS (LOCATION)
27	N/A	N/A	7350P-012	BLOWER WIRING HARNESS (LOCATION)

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Figure 35

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				
	Percentage of glycol in system (0-50%)	____%			
	Verify near heater 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 and adjust (if necessary) carbon dioxide content	____% CO2	High Fire	____% CO2	Low Fire
	Check and adjust (if necessary) carbon monoxide content	____ppm CO	High Fire	____ ppm CO	Low Fire
4) Verify system operation	Turn up aquastat on storage tank to verify wiring connections				
5) Record ionization current	Check uA reading at d7 on the status menu (see start-up section)	____ uA	High Fire	____ uA	Low Fire
6) Indirect water heater	Verify safety and operation of the indirect water heater, record settings	____de	____dh		
7) Convert the heater	If necessary, convert the heater to the proper gas type				
	Locate the stickers in the appropriate locations on the heater				
	Verify combustion settings after gas conversion, Carbon Dioxide	____% CO2	High Fire	____% CO2	Low Fire
	Verify combustion settings after gas conversion, Carbon Monoxide	____ppm CO	High Fire	____ppm CO	Low Fire
	Mail in the conversion registration				
8) System Setting	Verify system settings	___ de	___ dh		
Notes:					

Table 17

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 heater piping	Check heater and system piping for any sign of leakage; make sure they are properly supported.				
Vent	Check condition of all vent pipes and joints. Check for any obstructions at intake and exhaust termination points. Check clearances (see Venting Section for further details).				
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 heater 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.				
Switch and Plug	Verify ON/OFF switch and convenience plug are both functional				
CHAMBER/BURNER					
Combustion Chamber	Check burner tube and combustion chamber coils. Clean according to maintenance section of manual. Vacuum combustion chamber. Replace any gaskets that show signs of damage.				
Spark Electrode	Clean. Set gap at ¼".				
Flame Probe	Clean. Check ionization in uA (d7 on status menu in Start-up Procedures). Record high fire and low fire.				
CONDENSATE					
Neutralizer	Clean out condensate neutralizer. Use wet/dry vacuum. Check for all potential obstruction issues. Replenish marble chips or lime crystals if needed (no smaller than ¾"). Refill system with water. WARNING: You must verify flow of condensate and make sure the cap is connected properly before leaving boiler unattended.				
Condensate system	1. Check entire condensate system to make sure there are no obstructions in flow. 2. Make sure the condensate pump is working properly, verify all connections.				
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 CO_2 levels in Exhaust (See Start-up Procedures for ranges). Record at high and low fire.				
SAFETIES					
ECO (Energy Cut Out)	Check continuity on Flue and Water ECO. 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 18 - *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.

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:

Customer: Please only sign after the installer has reviewed the installation, safety, proper operation and maintenance of the system. In the case that the system has any problems, please call the installer. If you are unable to make contact, please contact your HTP Sales Representative.

Distributor/Dealer: Please insert contact details.