

# MOD CON

A MODEL OF CONSERVATION.

## Installation Manual

- *Installation*
- *Startup*
- *Maintenance*
- *Parts*



CONTROLS



member



### **⚠ WARNING**

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 severe personal injury, death or substantial property damage.

### **NOTICE**

Heat Transfer Products, Inc., reserves the right to make product changes or updates without notice and will not be held liable for typographical errors in literature.

**⚠ WARNING**

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

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

**WHAT TO DO IF YOU SMELL GAS**

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

**FOR YOUR SAFETY READ BEFORE OPERATING**

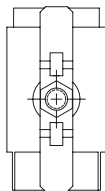
**WARNING: If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.**

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

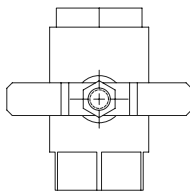
**OPERATING INSTRUCTIONS**

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.
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.

GAS VALVE ON



GAS VALVE OFF



**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.

**CONTENTS**

**Part 1 – Product and Safety Information. . . . . 4-6**

**Part 2 – Before You Start. . . . . 6-7**

    A. What’s In The Box

    B. How The Boiler Operates

    C. Optional Equipment

**Part 3 – Prepare Boiler Location . . . . . 7-12**

    A. Boiler Location Should Be Level

    B. Installations Must Comply With:

    C. Before Locating Boiler

    D. Clearances for Service Access

    E. Residential Garage Installation

    F. Exhaust Vent and Intake Air Vent

    G. Prevent Combustion Air Contamination

    H. When Removing a Boiler from an Existing Common Vent System

**Part 4 – Prepare Boiler. . . . . 12-13**

**Part 5 – Boiler Piping . . . . . 13-23**

    A. Relief Valve

    B. General Piping Information

    C. Backflow Preventer

    D. System Water Piping Methods

    E. Circulators

    F. Hydronic Piping with Circulators, Zone Valves and Multiple Boilers

    G. Boiler Piping Details

    H. Circulator Sizing

    I. Fill and Purge Heating System

    J. Zoning with Zone Valves

    K. Zoning with Circulators

    L. Multiple Boilers

**Part 6 – Venting, Combustion Air & Condensate Removal . . . . . 24-34**

    A. Installing Exhaust Vent and Intake Air Vent

    B. General

    C. Approved Materials for Exhaust Vent and Intake Air Vent

    D. Exhaust Vent and Intake Air Vent Pipe Location

    E. Exhaust Vent and Intake Air Vent Sizing

    F. Longer Vent Runs

    G. Exhaust Vent and Intake Air Pipe Installation

    H. Heater Removal from a Common Vent System

    I. Diagrams for Sidewall Venting

    J. Diagram for Vertical Venting

**Part 7 – Gas Piping. . . . . 35-39**

    A. Gas Connection

    B. Gas Piping

    C. Gas Table

    D. Check Inlet Gas Pressure

    E. Dungs Gas Valve

**CONTENTS (CONT'D)**

**Part 8 – Field Wiring. . . . . 40-48**

- A. Installation Must Comply With
- B. Field Wiring
- C. Line Voltage Wiring for Standard Boiler
- D. Alarm Connections
- E. Low Voltage Connections for Standard Boiler
- F. Thermostat
- G. Outdoor Sensor
- H. Indirect Sensor
- I. Optional 0-10 Volt Building Control Signal
- J. Optional High Gas Pressure Switch
- K. Optional Low Gas Pressure Switch
- L. Optional UL353 Low Water Cutoff Switch
- M. Wiring of Cascade System Communication Bus

**Part 9 – Start Up Preparation . . . . . 49-52**

- A. Check/Control Water Chemistry
- B. Freeze Protection (when used)
- C. Fill and Test Water System
- D. Purge Air from Water System
- E. Check for Gas Leaks
- F. Check Thermostat Circuit(s)
- G. Condensate Removal
- H. Final Checks Before Starting Boiler
- I. Cascade System

**Part 10 – Start-Up Procedure . . . . . 52-54**

- A. Operating Instructions
- B. Adjusting the Set Point
- C. Status Menu
- D. Test Mode

**Part 11 – Start-Up Procedures for the Installer. . . . . 55-57**

- A. Programming for the Installer
- B. Program Access
- C. Program Navigation

**Part 12 – Troubleshooting. . . . . 58-61**

- A. Mod Con Error Code
- B. Boiler Error
- C. Boiler Fault

**Part 13 – Maintenance. . . . . 61-71**

- A. Maintenance Procedures
- B. Combustion Chamber Coil Cleaning Instructions for Mod Con 300/500 Only

Inspection and Maintenance Start-Up Charts

## PART 1: PRODUCT AND SAFETY INFORMATION

### 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 information concerning the product.

#### DEFINITIONS

##### **DANGER**

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

##### **CAUTION**

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

##### **WARNING**

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

##### **CAUTION**

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

This appliance must be installed by qualified and licensed personnel in accordance with local codes, or in the absence of local codes, by the national fuel gas code, ANSI Z223.1-2002. 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. For installation on combustible flooring directly. Category IV vent systems only.

**PART 1: PRODUCT AND SAFETY INFORMATION (CONT'D)****⚠ WARNING**

**Installer** — Read all instructions in this manual, and Mod Con Venting section, 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.

**User** — Have this boiler serviced/inspected by a qualified service technician annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

**⚠ WARNING**

Failure to adhere to the guidelines on this page can result in severe personal injury, death or substantial property damage.

**⚠ WARNING****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.

**CAUTION**

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

**BEFORE INSTALLING****WHEN SERVICING BOILER**

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

**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 to replace any part of the control system and any gas control that has been under water.

**BOILER WATER**

- 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. HTP recommends a suction strainer in this type of system.
- Do not use petroleum-based cleaning or sealing compounds in boiler system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.
- Do not use "homemade cures" or "boiler patent medicines." Substantial property damage, damage to boiler, and/or serious personal injury

**PART 1: PRODUCT AND SAFETY INFORMATION (CONT'D)**

may result.

- Continual fresh make-up water will reduce boiler life. Mineral buildup in the heat exchanger reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen carried in by make-up water can cause internal corrosion in system components. Leaks in boiler or piping must be repaired at once to prevent make-up water.

**FREEZE PROTECTION FLUIDS**

**⚠ CAUTION**

**NEVER use automotive or standard glycol antifreeze, ethylene glycol made for hydronic systems. Use only inhibited propylene glycol solutions, which are specifically formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems.**

**CAUTION**

**Consider piping and installation when determining boiler location.**

**PART 2: BEFORE YOU START**

**A. WHAT'S IN THE BOX**

Also included with the Mod Con are:

- Pressure and Temperature Gauge
- Outdoor Sensor
- Installation Manual
- Warranty
- CSD-1 Form
- H-3 Data Sheet

**B. HOW BOILER OPERATES**

Mod/Con Condensing Technology is an intelligent system that delivers highly efficient hydronic heating, while maximizing efficiency by measuring the data parameters of your heating system. Outlined below are the features of the system and how they operate:

1. **Stainless Steel Heat Exchanger** – The highly efficient Mod/Con 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.
2. **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.

3. **Control** – The integrated control system monitors the system and regulates the fan speed to control the boilers output. This allows the boiler to only deliver the amount of heated energy required and nothing more. This control can be set up to monitor outdoor temperature through an outdoor sensor to regulate the set point of the boiler. The system can be further enhanced by connecting up to 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 will have a cascade system sensor and a cascade pump connected to it in addition to its own boiler pump. The follower boilers will

## PART 2: BEFORE YOU START (CONT'D)

have their own individual pump connected to each follower boiler.

4. **System Display and Operation Led light Indicators** – The display allows the user to change the system parameters and monitor the system outputs. Led light indicators monitor operation through illumination of Indirect Pump – Boiler Pump – System Pump – Flame On – System Fault.
5. **Gas Valve** – The gas valve senses suction from the blower allowing gas to flow only if the gas valve is powered and combustion air is flowing.
6. **Swirl Plate or Integrated Venturi** – Controls the air and gas flow into the burner.
7. **Burner** – Constructed of high grade stainless steel, the burner uses premixed air gas and provides a wide range of firing rates.
8. **Spark Ignition** – The burner is ignited by applying a high voltage through the system spark electrode. This causes the spark from the electrode to ignite the mixed gas off of the burner.
9. **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.
10. **Return Water Temperature Sensor** – This sensor monitors the boiler return water temperature (System Return). The control adjusts the boiler firing depending on how close the return water temperature is to the supply water temperature.
11. **Temperature and Pressure Gauge** – Allows the user to monitor the system temperature and pressure.
12. **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.

13. **Condensation Collection System** – This boiler is a high efficiency appliance, therefore the boiler will produce condensate. The collection system has a float switch to monitor the condensation level to prevent condensation from backing up into the combustion system. Inside the collection system there is a built in trap to seal the combustion system to the connected drain. This condensate should be neutralized to avoid damage to the drainage system or piping.
14. **Outdoor Sensor** – The outdoor sensor will monitor the outdoor temperature and adjust the unit's set point to provide greater efficiency.

### C. OPTIONAL EQUIPMENT

Below is the list of optional equipment available for Mod Con Boiler.

- System Sensor (Part # 7250P-324)
- Indirect Sensor (Part # 7250P-325)
- 4" Stainless Steel Outside Termination Vent Kit (V3000)
- 6" Stainless Steel Outside Termination Vent Kit (V4000)
- 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 # 7350P-320)
- Boiler Caster Kit (Part # 7350P-404)
- Mod Con Condensate Neutralizer (Part # 7350P-611)

These additional options may be purchased through your HTP Distributor.

## PART 3: PREPARE BOILER LOCATION

### A. BOILER LOCATION SHOULD BE LEVEL

Before considering the Boiler location, there are

many factors that have to be addressed that are covered in detail in this installation manual. Please read the entire manual as it could save



**PART 3: PREPARE BOILER LOCATION (CONT'D)**

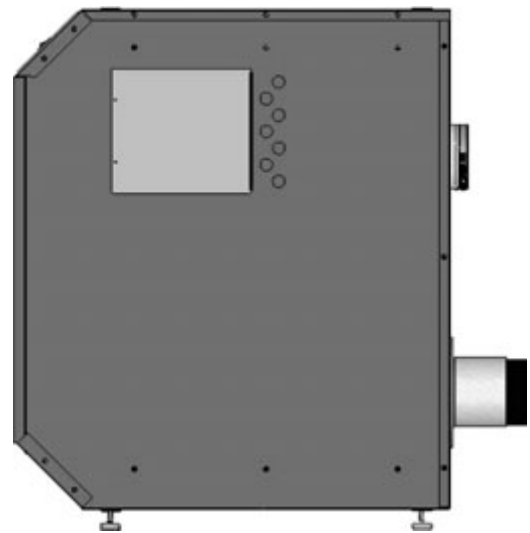
time and money. Piping, Venting, Condensation Removal are just a few issues that need to be addressed prior to the installation of the boiler.

**⚠ CAUTION**

When preparing the boiler location, make sure the area where you are placing the boiler is level. In order for the condensate properly to flow out of the collection system, the boiler must be level to assure proper flow direction. The Mod Con Boiler comes equipped with leveling feet. Should you find the floor beneath the boiler is uneven, with a wrench, adjust the leveling feet.



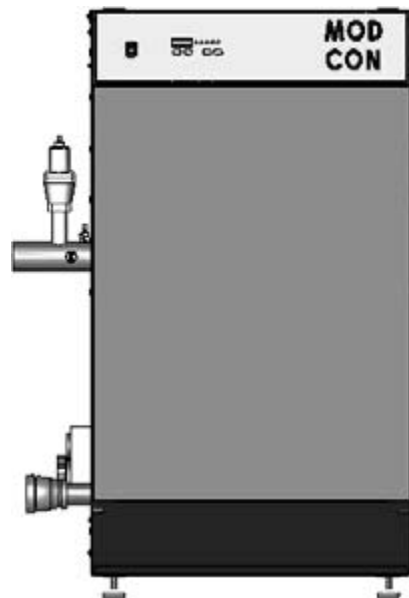
**INCORRECT**



**CORRECT**

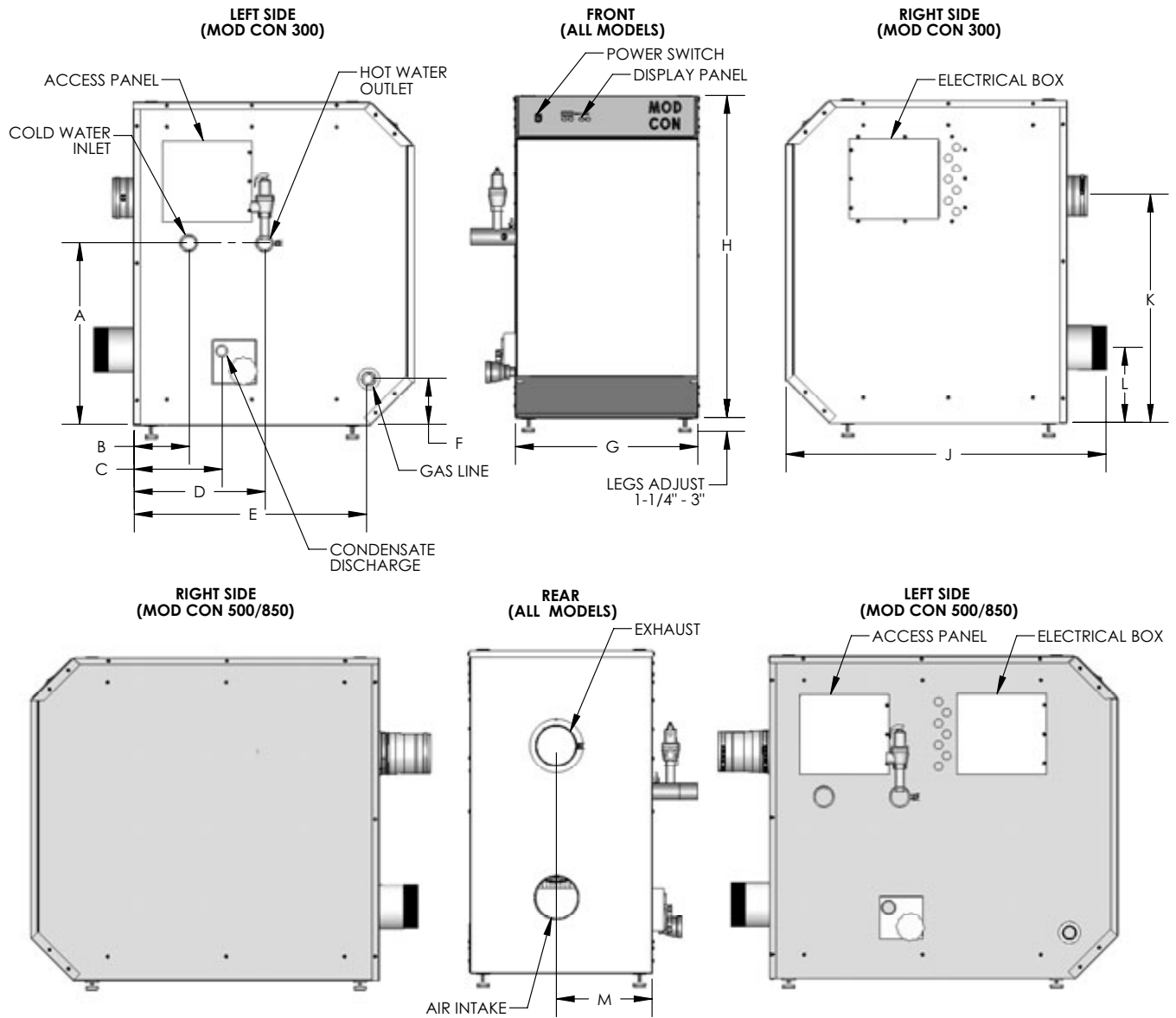


**INCORRECT**



**CORRECT**

## DIMENSIONS



MODEL	A	B	C	D	E	F	G	H	J	K	L	M
MOD CON 300	20.00"	6.25"	10.25"	14.50"	26.00"	5.15"	20.50"	36.00"	35.75"	25.50"	8.25"	10.50"
MOD CON 500	20.00"	6.25"	13.25"	14.50"	26.00"	5.15"	20.50"	36.00"	41.75"	25.50"	8.25"	10.50"
MOD CON 850	20.00"	6.75"	16.25"	18.75"	43.50"	20.00"	20.50"	36.00"	66.75"	25.50"	8.25"	10.50"

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

MODEL	BTU/HR INPUT LOW FIRE	BTU/HR INPUT HIGH FIRE	DOE HEATING CAPACITY	SUPPLY/RETURN CONNECTION	GAS CONNECTION	VENT DIAMETER	FAN SPEEDS		
							HIGH	LOW	IGNITION
MOD CON 300	60,000	300,000	282,000	1-1/2"	1-1/4"	4"	5400	1500	3000
MOD CON 500	100,000	500,000	470,000	2"	1-1/2"	4"	6930	1250	3000
MOD CON 850	170,000	850,000	799,000	2"	2"	6"	5500	1250	3000

**Figure 2-1**

**PART 3: PREPARE BOILER LOCATION (CONTINUED)**

**B. INSTALLATIONS MUST COMPLY WITH:**

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1 – latest edition.
- Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, when required.
- National Electrical Code.
- For Canada only: B149.1 or B149.2 Installation Code, CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

**NOTICE**

The Mod Con Boiler gas manifold and controls met safe lighting and other performance criteria when the boiler underwent tests specified in ANSI Z21.13 — latest edition.

**C. BEFORE LOCATING THE BOILER**

1. Check for nearby connections to:
  - System water piping
  - Venting connections
  - Gas supply piping
  - Electrical power
  - Condensate drain
2. Check area around boiler. Remove any combustible materials, gasoline and other flammable liquids.

**WARNING**

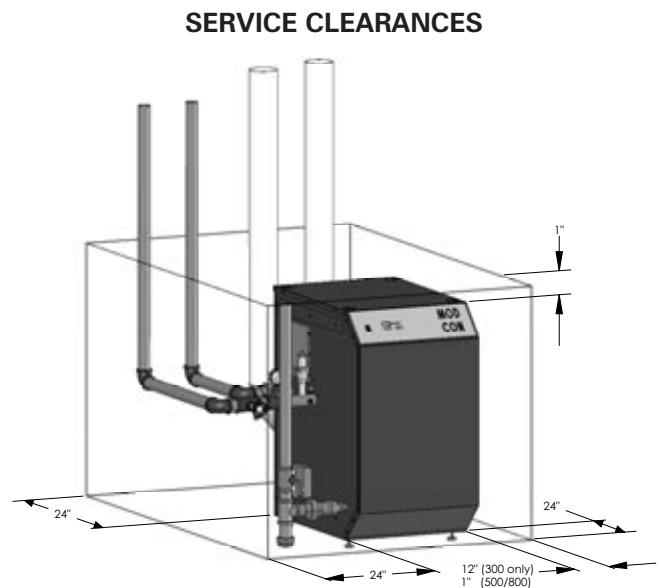
Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death or substantial property damage.

3. The Mod Con Gas Control System components must be protected from dripping water during operation or service.
4. If the Mod Con Boiler is to replace an existing boiler, check for and correct any *existing* system problems such as:
  - System leaks.

- Incorrectly-sized expansion tank.
- Lack of freeze protection in boiler water causing system and boiler to freeze and leak.
- Excessive glycol which will affect the boiler system operation.
- Clean and flush system when re-installing a boiler.

**D. CLEARANCES FOR SERVICE ACCESS**

1. See Figure 3-1 for recommended service clearances. If you do not provide minimum clearances shown, it might not be possible to service the boiler without removing it from the space.



**Figure 3-1**

LP-205-M Rev. 5/27/08

**WARNING**

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

**PART 3: PREPARE BOILER LOCATION (CONTINUED)**

**E. RESIDENTIAL GARAGE INSTALLATION**

**Precautions**

Take the following special precautions when installing the boiler in a residential garage. If the boiler is located in a residential garage, per ANSI Z223.1, paragraph 5.1.9:

- Mount the boiler with a minimum of 18 inches above the floor of the garage to the bottom of the boiler to ensure the burner and ignition devices will be no less than 18 inches above the floor.
- Locate or protect the boiler so it cannot be damaged by a moving vehicle.

**F. EXHAUST VENT AND INTAKE AIR VENT**

**⚠ WARNING**

**Vents must be properly supported. The Mod Con's Intake and Exhaust Connections are not designed to carry heavy weight. Vent support brackets must be within 1 foot of the boiler and the balance at 4 foot intervals. The Mod Con venting must be readily accessible for visual inspection for the first three feet from the boiler.**

The Mod Con Boiler requires a special vent system, designed for pressurized venting. Mod Con Boilers are rated ANSI Z21.13 Category IV (pressurized vent, likely to form condensate in the vent).

You must also install air intake piping from outdoors to the boiler flue adaptor. The resultant installation is categorized as direct vent (sealed combustion). **Note: To prevent combustion air contamination see Table 3-2 in this section when considering exhaust vent and intake air vent termination.**

Intake and exhaust must terminate near each other and may be vented vertically through the roof or out a side wall. The intake and exhaust venting methods are detailed in the Venting Section. Do not attempt to install the Mod Con Boiler using any other means. Be sure to locate the boiler such that the air 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 the methods and limits given in the venting section.

**G. PREVENT COMBUSTION AIR CONTAMINATION**

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

Table 3-2: Corrosive contaminants and sources

<b>Products to avoid</b>
Spray cans containing fluorocarbons
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint or varnish removers
Hydrochloric acid/muriatic acid
Cements and glues
Antistatic fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
Adhesives used to fasten building products and other similar products
<b>Areas likely to have contaminants</b>
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages and workshops

**PART 3: PREPARE BOILER LOCATION (CONTINUED)**

**H. WHEN REMOVING A BOILER FROM AN EXISTING COMMON VENT SYSTEM**

**⚠ DANGER**

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

**⚠ WARNING**

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

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

- a. Seal any unused openings in the common venting system.
- b. Visually inspect the venting system for proper size and horizontal pitch and determine that there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.
- c. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining

connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

- d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
- e. Test for spillage at draft hood opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
- f. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined herein, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.
- g. Any improper operation of common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 — latest edition. Correct by resizing to approach the minimum size as determined using the appropriate tables in Table 13 of NFPA54 ANSI Z223.1 2006 of that code. Canadian installations must comply with B149.1 or B149.2 Installation Code.

**PART 4: PREPARE BOILER**

**⚠ WARNING**

**Uncrating Boiler – Any Claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.**

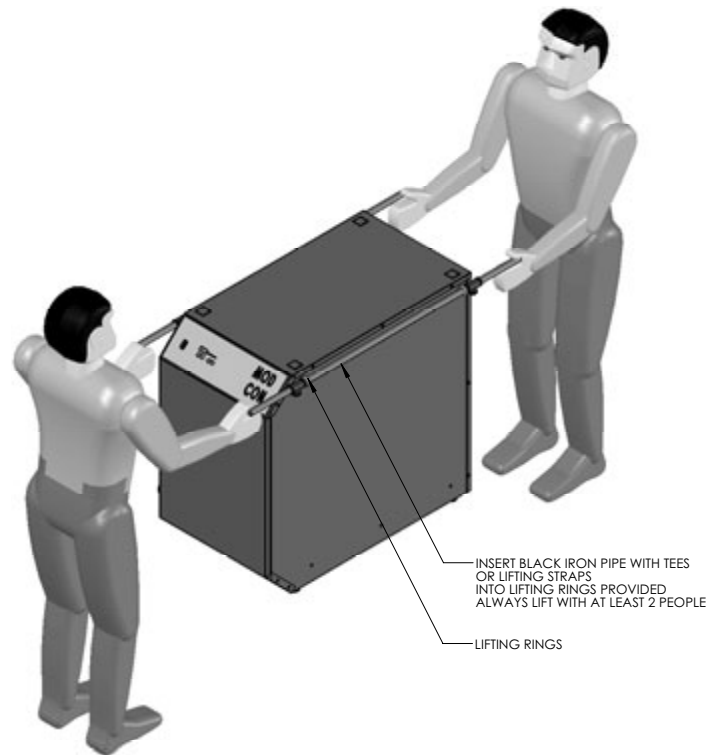
**CAUTION**

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

Remove all sides of the Mod Con shipping crate in order to allow the boiler to be lifted into its installation location. You must pick the boiler up by the lift rings to avoid damage to the boiler

## PART 4: PREPARE BOILER (CONTINUED)

enclosure. You can use either a solid  $\frac{3}{4}$ " in diameter black iron pipe or lifting straps to lift the boiler off of its shipping crate. You must have at least two individuals to handle the boiler properly to avoid damage as care should be taken as the Mod Con is very heavy. The Mod Con is also equipped with leveling feet that can be used to level the boiler properly if the surface location is not level. If surface flooring is rough, care should be taken when sliding boiler into position, you could catch the leveling feet and damage the boiler if it is slid to its location.



## PART 5: BOILER PIPING

### A. RELIEF VALVE

Connect discharge piping to a safe disposal location, follow the guidelines in the WARNING below.

### **⚠ WARNING**

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

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the valve discharge.
- Discharge line must be as short as possible and be 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 where any discharge will be clearly visible.
- The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375 °F or greater.
- Do not pipe the discharge to any place where freezing could occur.
- No shutoff valve shall 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 valve after filling and pressurizing 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.
- Failure to comply with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.

**PART 5: BOILER PIPING (CONTINUED)**

**B. GENERAL PIPING INFORMATION**

**NOTICE**

The Mod Con Boiler 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.

**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)

**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 Heat Transfer Products representative or refer to separate Mod Con Boiler piping details in this manual (Part 5).

**D. SYSTEM WATER PIPING METHODS**

**Expansion tank and make-up water**

1. Ensure that the expansion tank size will handle boiler and system water volume and temperature. Allow for boiler and its piping:

Mod Con 300	2.9 Gallons
Mod Con 500	4.2 Gallons
Mod Con 850	5.8 Gallons

**CAUTION**

Undersized expansion tanks cause system water to be lost from relief valve and makeup water to be added through a fill valve. Eventual boiler failure can result due to excessive make-up water addition. This type of failure is **NOT** covered by warranty.

2. The expansion tank must be located as shown in Boiler Piping Part 5 or following

recognized design methods. See tank manufacturer's instructions for details.

3. Connect the expansion tank to the air separator only if the separator is on the suction side of the circulator. Always install the system fill connection at the same point as the expansion tank connection to the system.
4. Most chilled water systems are piped using a closed type expansion tank.

**Diaphragm (or bladder) expansion tank**

1. 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 its air cushion. An automatic air vent would cause air to leave system, resulting in water-logging the expansion tank.

**CAUTION**

**DO NOT** use the boiler circulator in any location other than the ones shown in this manual. The boiler circulator is selected to ensure adequate flow through the Mod Con Boiler. Failure to comply could result in unreliable performance and nuisance shut downs from insufficient flow.

**Sizing space heat system piping**

1. See Piping Details in this manual Part 5. 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 Mod Con Boiler is designed to function in a closed loop Hydronic System. We have also included a Temperature and Pressure gauge that al-

**PART 5: BOILER PIPING (CONTINUED)**

allows the user to monitor the system pressure and outlet temperature from the Mod Con Boiler. It is important to note that the Mod Con Boiler has a minimal amount of pressure drop and must be calculated when sizing the circulators. Each Mod Con Boiler installation must have an Air Elimination device that will remove air from the system. Install the Mod Con Boiler so the gas ignition system components are protected from water (dripping, spraying, etc.) allowing clearance for basic service of boiler circulator, valves and other components. Observe minimum 1" clearance around all un-insulated hot water pipes when openings around pipes are not protected by non-combustible materials. On a Mod Con Boiler installed above radiation level, some states and local codes require a low water cut off device which is standard on the Mod Con boiler. Check with local codes for additional requirements. If the Mod Con Boiler supplies

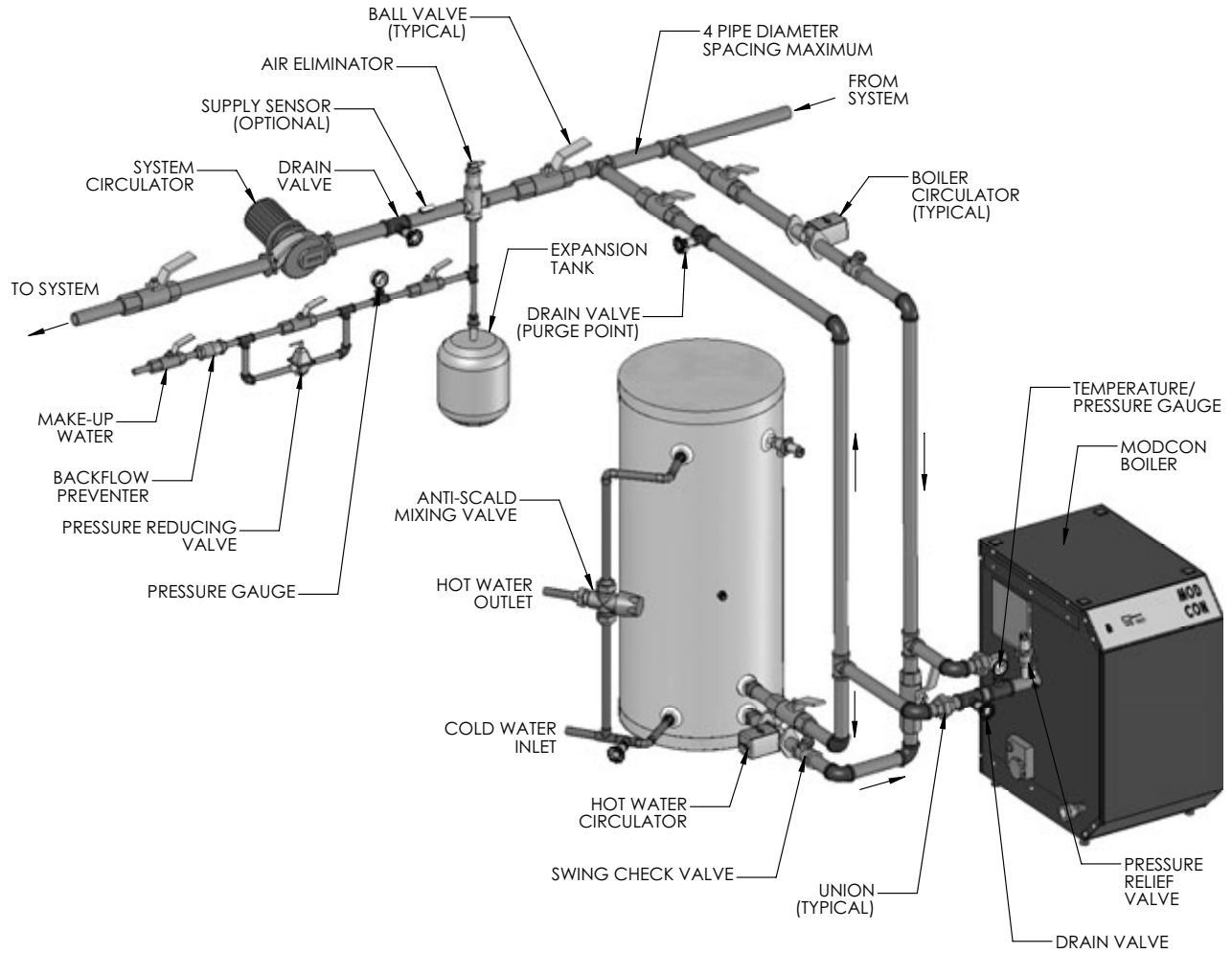
hot water to heating coils in air handler units, flow control valves or other devices must be installed to prevent gravity circulation of boiler water in the coils during the cooling cycle. Chilled Water Medium must be piped in parallel with the boiler. Freeze Protection for new or existing systems must use glycol that is specifically formulated for this purpose. It will include inhibitors that will prevent the glycol from attacking the 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 recommend 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 F to 180 F, while water expands 3% with the same temperature rise.



**PART 5: BOILER PIPING (CONTINUED)**

**G. BOILER PIPING DETAILS**

**Single Mod Con Boiler Space Heating with Indirect Priority**

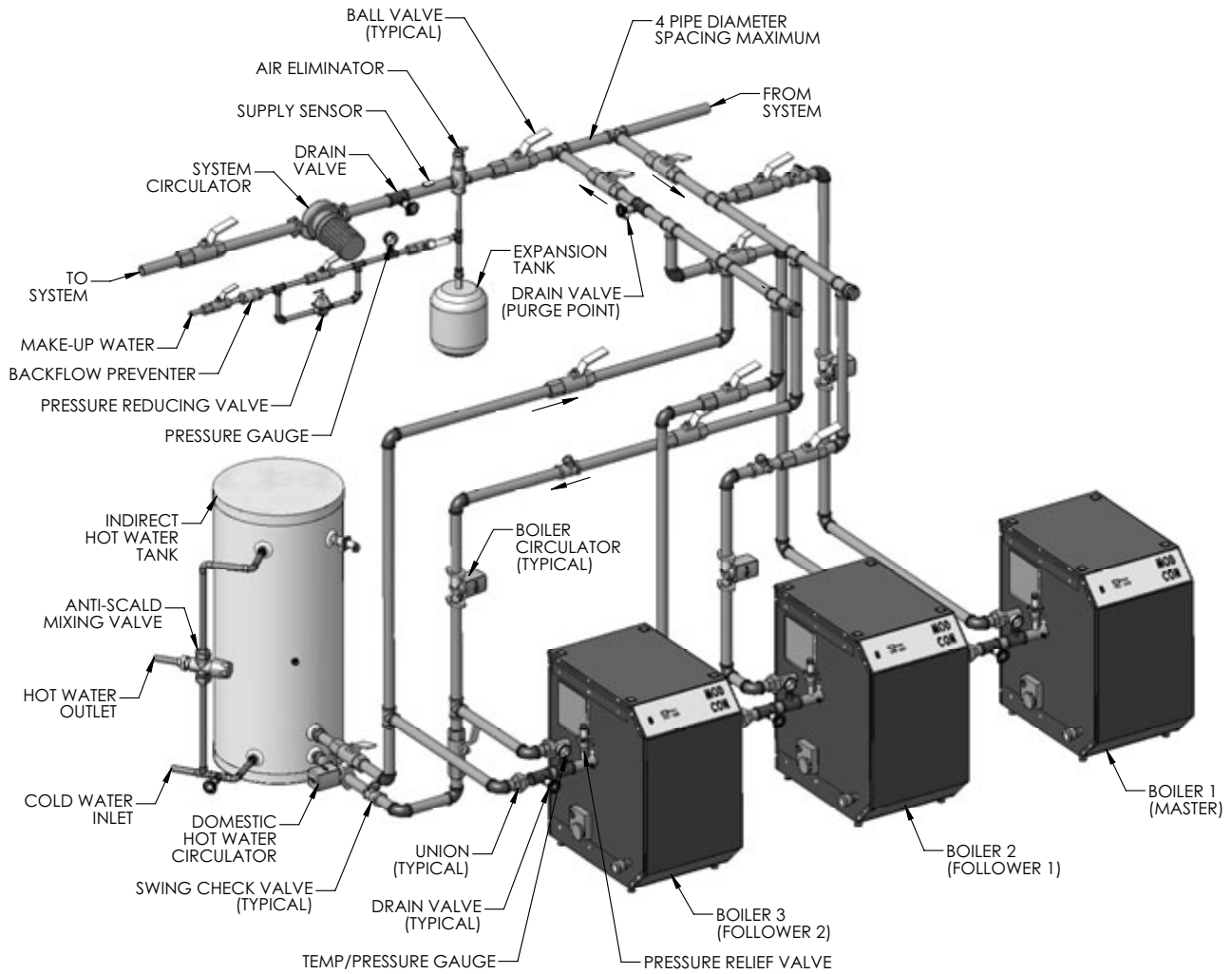


**NOTES:**

1. This drawing is meant to show system piping concept only.
2. An Anti-Scald 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.

**PART 5: BOILER PIPING (CONTINUED)**

**Cascade Multiple Mod Con Boilers with Indirect Priority on One Boiler**

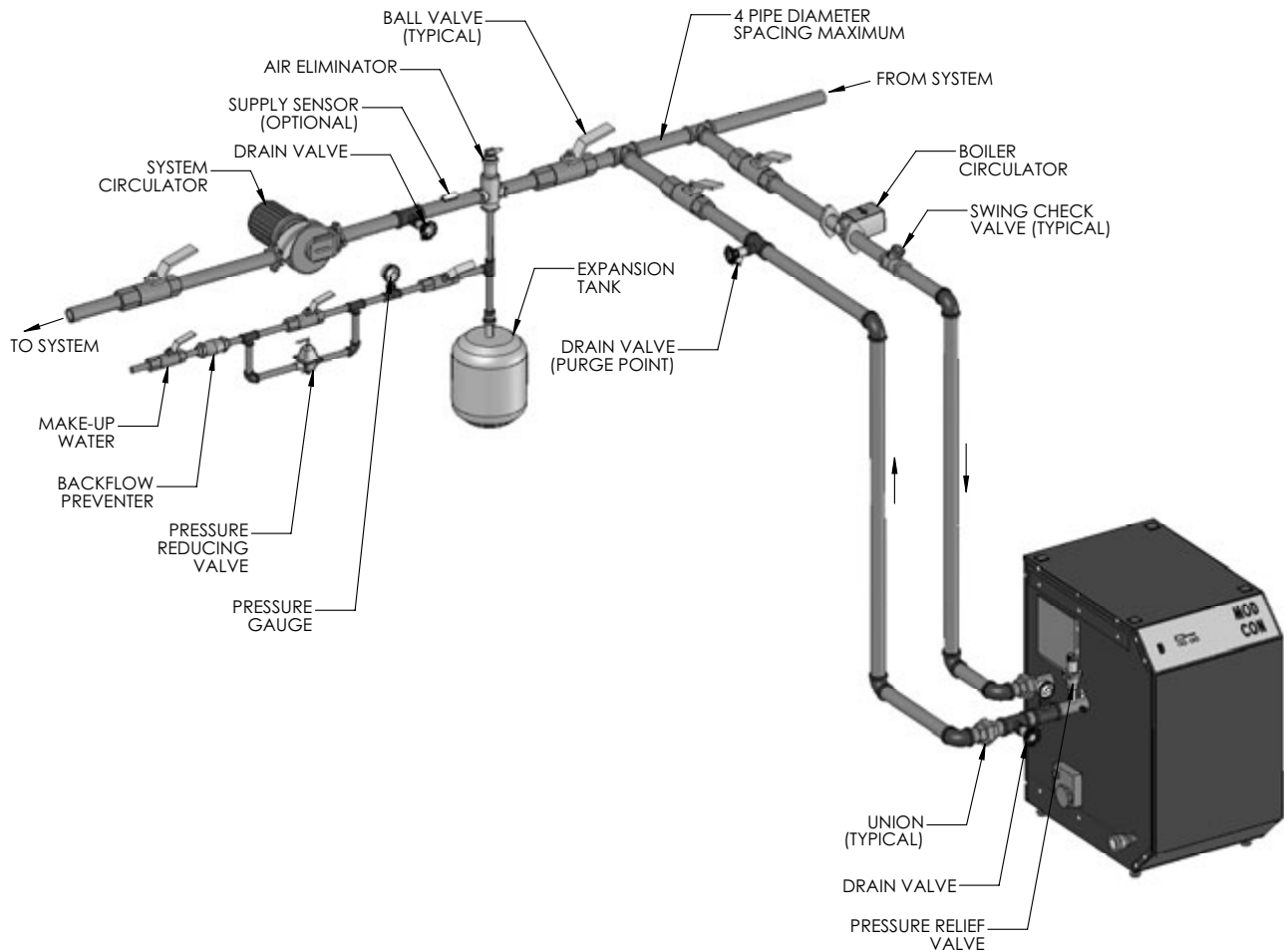


**NOTES:**

1. This drawing is meant to show system piping concept only.
2. An Anti-Scald 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. Reference Figure 5-2 to determine manifold pipe sizing.
6. System Flow (Secondary Loop) must be greater than the boiler's primary loop flow.

**PART 5: BOILER PIPING (CONTINUED)**

**Single Mod Con Boiler  
Space Heating**

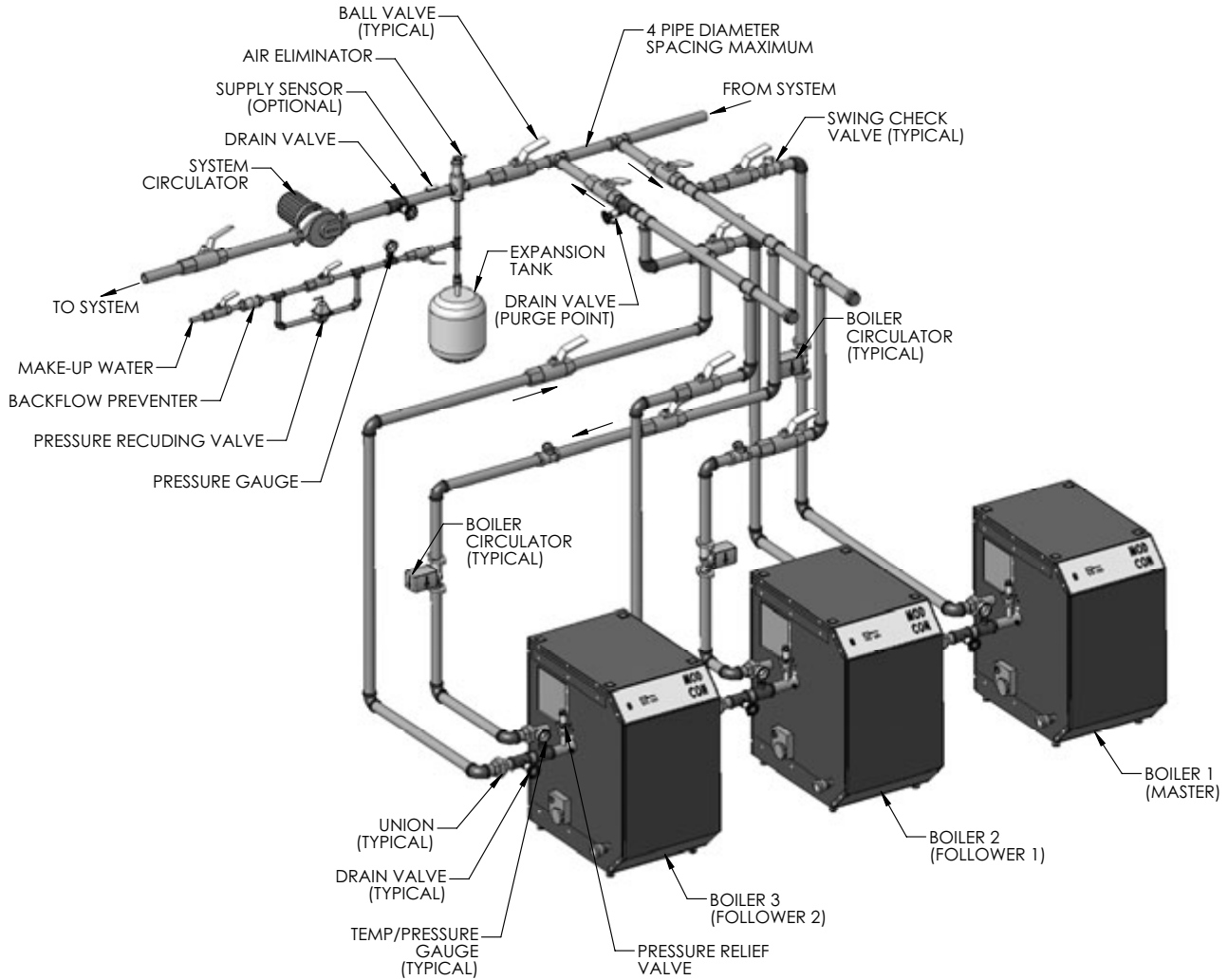


**NOTES:**

1. This drawing is meant to show system piping concept only.
2. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
3. Piping shown is Primary/Secondary
6. System Flow (Secondary Loop) must be greater than the boiler's primary loop flow.

**PART 5: BOILER PIPING (CONTINUED)**

**Cascade Mod Con Boilers  
Space Heating Only**



**NOTES:**

1. This drawing is meant to show system piping concept only.
2. An Anti-Scald 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.
6. System Flow (Secondary Loop) must be greater than the boiler's primary loop flow.

**PART 5: BOILER PIPING (CONTINUED)**

**⚠ CAUTION**

**The Mod Con Boiler should not be operated as a potable Hot Water Heater. It should not be used as a direct Hot Water Heating Device.**

Basic steps are listed below, with Illustration, that will guide you through the installation of the Mod Con.

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 preventor 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 minimum pressure of 12 PSI.
6. Install a circulator as shown in piping details (this section). Make sure the circulator is

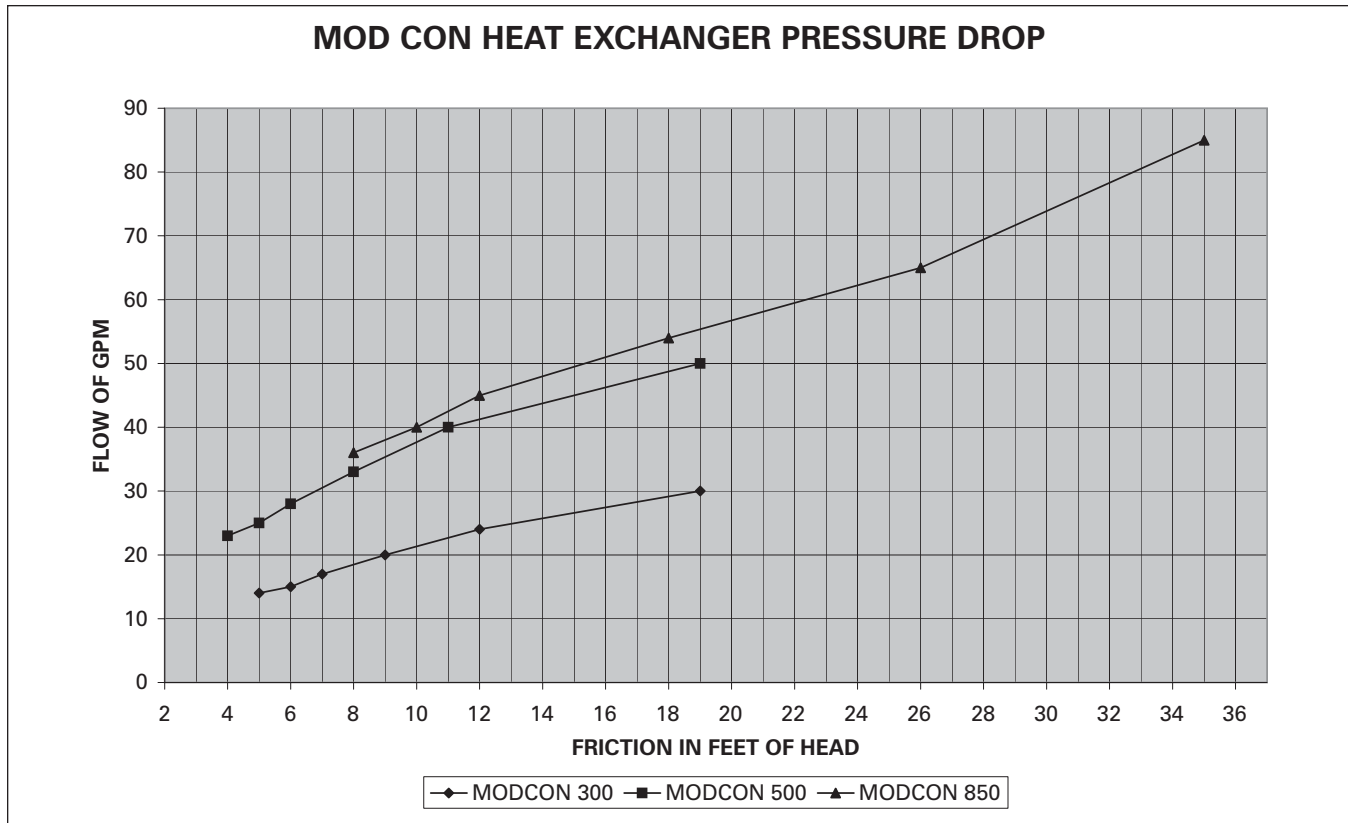
properly sized for the system and friction loss.

7. Install an Expansion Tank on the system supply. Consult the tank manufacturer's instruction 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 Mod Con Boiler can not be drained completely of water without purging the unit with an air pressure 15 PSI.
10. The relief valve is installed at the factory. A pipe discharge line should be installed 6" above the drain in the event of a pressure relief. The pipe size must be the same size as the relief valve outlet. **NEVER BLOCK THE OUTLET OF THE SAFETY RELIEF VALVE.**

**H. CIRCULATOR SIZING**

The Mod Con Boiler Heat Exchanger does have pressure drop which must be considered in your system design. Refer to the graph in Fig. 5-1 for pressure drop through the Mod Con Boiler Heat Exchanger.

**PART 5: BOILER PIPING (CONTINUED)**



**Figure 5-1**

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

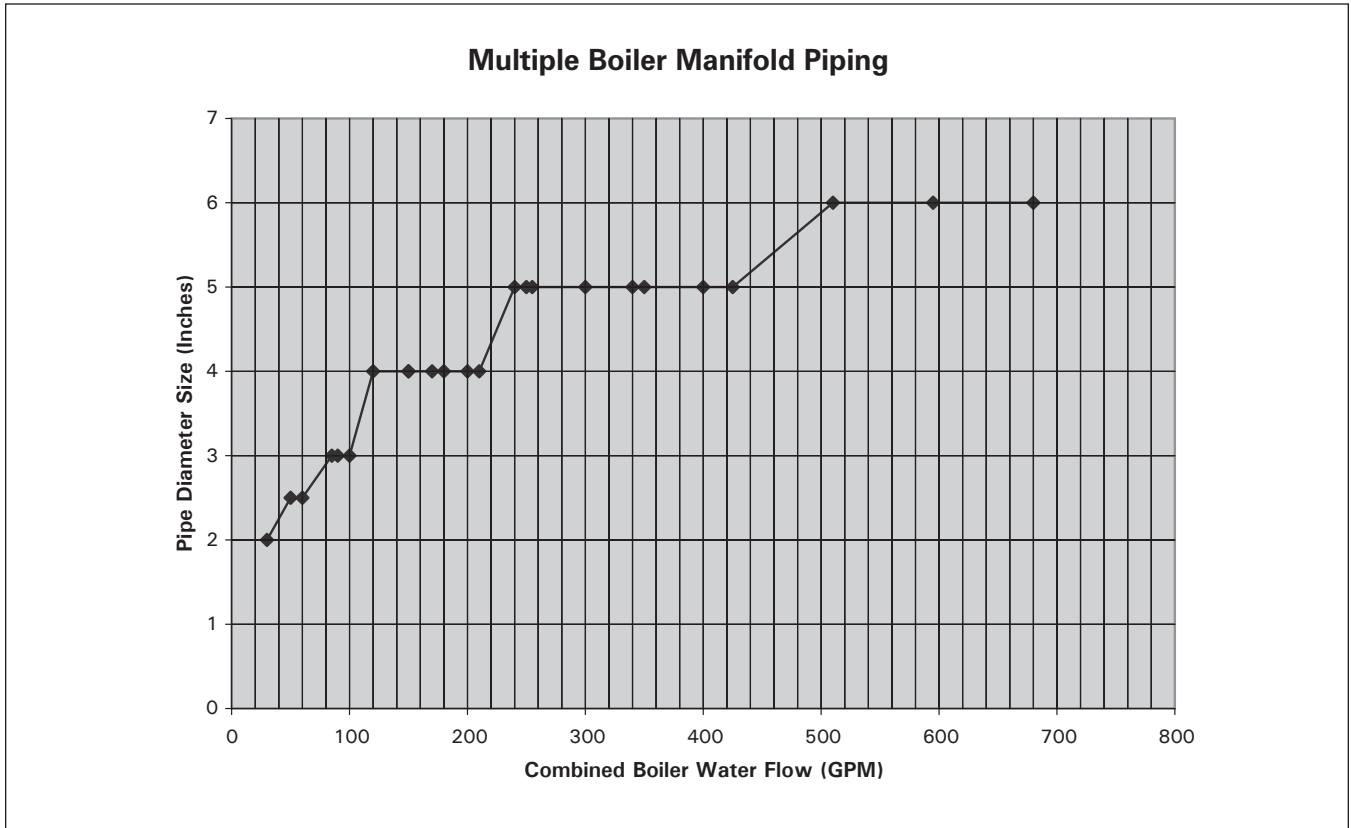
SYSTEM TEMPERATURE RISE CHART												
Model	20°Δt		25°Δt		30°Δt		35°Δt		40°Δt		45°Δt	
	Friction Feet	Flow G P M	Friction Feet	Flow G P M	Friction Feet	Flow G P M	Friction Feet	Flow G P M	Friction Feet	Flow G P M	Friction Feet	Flow G P M
Mod Con 300	19'	30	12'	24	9'	20	7'	17	6'	15	5'	14
Mod Con 500	19'	50	11'	40	8'	33	6'	28	5'	25	4'	23
Mod Con 850	35'	85	26'	65	18'	54	12'	45	10'	40	8'	36

LP-205-E Rev. 12/5/07

**PART 5: BOILER PIPING (CONTINUED)**

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 degree temperature rise with each boiler having an individual flow rate of 20 GPM. To correctly size the manifold feeding these (5) Mod Con 300 Boilers you would need a pipe size of 3".



**Figure 5-2**

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

**I. 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 valve manufacturer’s instruction prior to opening valves manually, so as not to damage the valve.)
- Manually operate fill valve regulator. When water runs out of the hose, while it’s connected to the balance and purge valve or drain 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).

**PART 5: BOILER PIPING (CONTINUED)**

**⚠ 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 vent until water flows out, then close vent. Repeat procedure, working your way toward 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.

**⚠ WARNING**

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

1. Glycol in hydronic applications which is specially formulated for this purpose 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° F to 180° F, while water expands 3% with 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.). You must carefully figure the additional friction loss in the system as well as the reduction in heat transfer co-efficients.

**J. ZONING WITH ZONE VALVES**

1. Connect the boiler to the system as shown in 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 as shown.

**K. ZONING WITH CIRCULATORS**

1. Connect the boiler to the system when using circulator zoning as shown in Piping Details when zoning with circulators. NOTE: The boiler circulator cannot be used for a zone. It must supply only the boiler loop.
2. Install a separate circulator for each zone.
3. Connect DHW (domestic hot water) piping to indirect storage water heater as shown in Piping Details.

**L. MULTIPLE BOILERS**

1. Connect multiple boilers as shown in 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 as shown in Piping Details.
5. The system flow (secondary loop) must be greater than the boiler's primary loop flow.



## PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL

### A. INSTALLING EXHAUST VENT AND INTAKE AIR VENT

#### **DANGER**

The Mod Con Boiler must be vented as detailed in this section. Ensure the exhaust and intake piping comply with these instructions regarding the venting system.

Inspect finished combustion air intake and exhaust piping thoroughly to ensure all joints are secure and airtight and comply with all applicable code requirements, as well as with the instructions provided in this manual.

Failure to provide a properly installed vent system will cause severe personal injury or death.

#### **WARNING**

This vent system will operate with a positive pressure in the pipe. Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure. Follow these venting instructions carefully. Failure to do so may result in severe personal injury, death, or substantial property damage.

### B. GENERAL

1. Install the boiler 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.
2. This boiler is a direct vent appliance and is listed as a Category IV appliance with Underwriters Laboratories, Inc.

### C. APPROVED MATERIALS FOR EXHAUST VENT AND INTAKE AIR VENT

1. Use only Non Foam Core venting material or AL294C. The following materials are approved for use as vent pipe for this boiler. See Table 6-1 for all approved venting.

#### **WARNING**

Use only the materials listed in table 6-1 for the venting systems. Failure to do so could result in severe personal injury, death or substantial property damage.

### 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 AL244C stainless steel venting to comply with Canadian requirements.
2. The first three (3) feet of vent pipe from the appliance 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.

#### **WARNING**

Do not use Cellular Foam Core Pipe in any portion of the exhaust piping from this boiler. Use of Foam Core Pipe may result in severe personal injury, death, or substantial property damage.

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

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

**Table 6-1**

APPROVED PLASTIC EXHAUST VENTING MATERIAL		
MATERIAL	STANDARDS FOR INSTALLATION IN:	
	UNITED STATES	CANADA
PVC SCHEDULE 40	ANSI /ASTM D1785	ULC S636**
PVC -DWV	ANSI /ASTM D2665	ULC-S636**
CPVC SCHEDULE 40	ANSI /ASTM F441	ULC- S636**
*Note: Cellular Foam Core Pipe must only be used on INTAKE piping.		**Note: IPEX is an approved Manufacturer in Canada supplying vent material listed to ULC-S636

**Table 6-2**

APPROVED PLASTIC INTAKE VENTING MATERIAL		
MATERIAL	STANDARDS FOR INSTALLATION IN:	
	UNITED STATES	CANADA
PVC SCHEDULE 40	ANSI /ASTM D1785	ULC S636**
CPVC SCHEDULE 40	ANSI /ASTM F441	ULC- S636**
PVC DWV	ANSI /ASTM D2665	N/A
PVC-CELLULAR FOAM CORE*	U.L. LISTED	N/A
*Note: Cellular Foam Core Pipe must only be used on INTAKE piping.		**Note: IPEX is an approved Manufacturer in Canada supplying vent material listed to ULC-S636

**Table 6-3**

APPROVED PLASTIC CONDENSATE PIPING MATERIAL		
MATERIAL	STANDARDS FOR INSTALLATION IN:	
	UNITED STATES	CANADA
PVC SCHEDULE 40	ANSI /ASTM D1785	ULC S636**
		**Note: IPEX is an approved Manufacturer in Canada supplying vent material listed to ULC-S636

**Table 6-4**

APPROVED PIPE CEMENT AND PRIMER FOR PLASTIC PIPE		
MATERIAL	STANDARDS FOR INSTALLATION IN:	
	UNITED STATES	CANADA
CEMENT AND PRIMER		
CPVC	ANSI/ASTM F493	IPEX System 636
PVC	ANSI/ASTM D2564	Cements and Primers

**Table 6-5**

APPROVED METALLIC EXHAUST VENTING MATERIAL		
MATERIAL	STANDARDS FOR INSTALLATION IN:	
	UNITED STATES	CANADA
AL294C	U.L.LISTED	U.L.LISTED

**Table 6-6**

APPROVED METALLIC INTAKE VENTING MATERIAL		
MATERIAL	STANDARDS FOR INSTALLATION IN:	
	UNITED STATES	CANADA
"B" GAS VENT	U.L. LISTED	U.L. LISTED
GALVANIZED	U.L. LISTED	U.L. LISTED

**Table 6-7**

APPROVED STAINLESS STEEL VENT ADAPTERS AND TERMINATIONS		
Mod Con 300 & 500	HTP PART NUMBER	Z-FLEX PART NUMBER
Boiler Adapter 4"	7250P-732	2SVSMK04
Horizontal Vent Terminal 4"	7350P-607	2SVSRTF04
Rain Cap 4"	7350P-609	2SVSRCF04
Mod Con 850	HTP PART NUMBER	Z-FLEX PART NUMBER
Boiler Adapter 6"	7350P-114	2SVEP06.5
Horizontal Vent Terminal 4"	7350P-608	2SVSRTX06
Rain Cap 6"	7350P-610	2SVSRCF06

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

**⚠ WARNING**

You must not use "B" Vent in an exhaust application. 'B' vent is for intake applications only. Failure to do so will result in serious injury or death.

**⚠ WARNING**

Both exhaust and intake air vents must exit from the same side of the building to assure correct appliance operation.

**D. EXHAUST VENT AND INTAKE AIR VENT PIPE LOCATION**

Please refer to chart below for U.L.-approved stainless steel adapters and terminations.

1. Determine exhaust vent location:

- Total length of vent may not exceed the limits specified in the venting Sizing Section.
- The vent piping for this boiler is approved for zero clearance to combustible construction.
- See illustration within this section of clearances for location of exit terminals of direct-vent venting systems.
- Avoid terminating exhaust vent 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 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 terminal at least 7 feet above grade.
- Do not locate the exhaust directly under roof overhangs to prevent icicles from forming.
- Provide 6 feet clearance from the inside corner of vertical walls, chimneys, etc., as well as horizontal corners created by roof overhangs.

2. Determine air intake vent location.

- Provide 1 foot clearance from the bottom of the intake air vent and the level of maximum snow accumulation. Snow removal may be necessary to maintain clearances.
- Do not locate intake air vent in a parking area where machinery may damage the pipe.
- Follow required minimum clearances located in Fig. 6-3, 6-4, 6-5.

3. Determine location of Condensate Piping

This boiler is a high efficiency appliance, therefore the boiler produces condensate. Condensate is a by-product of the boiler 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 3/4" sweat connection provided to connect the outlet of the collection system to a drain or condensate pump. (See table 6-1 for approved condensate piping material)

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)****CAUTION**

It is very important that the condensate piping be no smaller than  $\frac{3}{4}$ " and you must use a tee at the condensate connection with the branch vertically up and open to the atmosphere so it will not cause a vacuum that could obstruct the flow of condensate from the boiler. The condensate piping should also be properly supported with pipe supports to prevent sagging and to maintain the pitch of the piping.

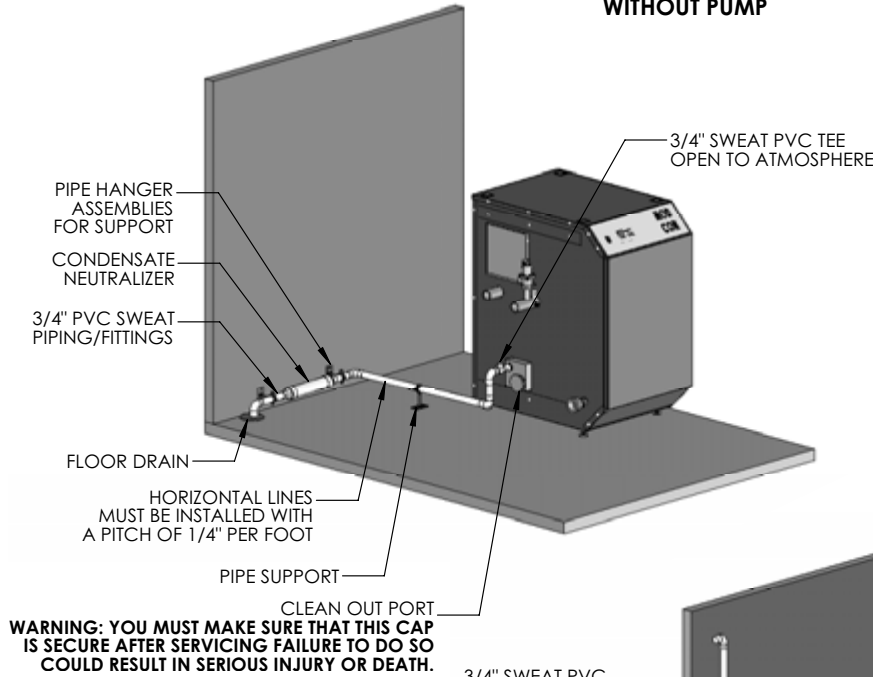
**4. Condensate Neutralization**

The condensate from the boiler is slightly acidic with a ph of 3.2 - 4.5 Heat Transfer

Products recommends neutralizing the condensate with a Condensate Neutralizer Kit (p/n 7350P-611) that can be added to your system to avoid long term damage to the drainage system and to meet local code requirements. The neutralizer kit is connected to the drain system and contains marble chips that will neutralize the ph level of the water vapor. The neutralizer should be checked at least once a year and the marble chips should be replenished if necessary. When replacing the marble chips, they should no smaller than  $\frac{3}{4}$ " to avoid blockage in condensate piping. (Refer to fig 6-1 and 6-2 for piping of the Condensate neutralizer.)

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

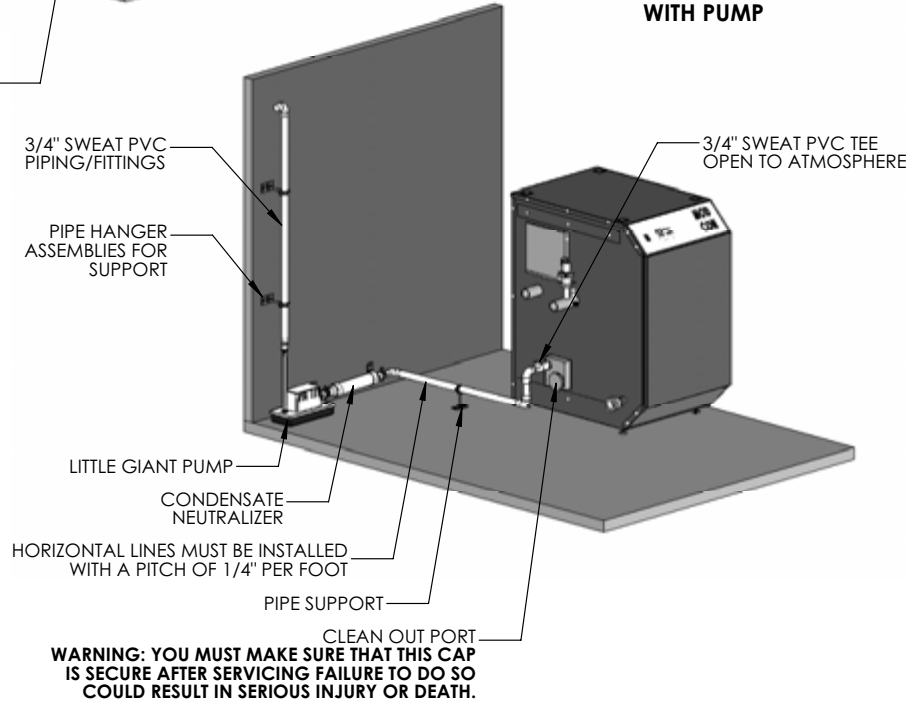
**CONDENSATE NEUTRALIZER WITHOUT PUMP**



**WARNING: YOU MUST MAKE SURE THAT THIS CAP IS SECURE AFTER SERVICING FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.**

**Fig. 6-1**

**CONDENSATE NEUTRALIZER WITH PUMP**



**WARNING: YOU MUST MAKE SURE THAT THIS CAP IS SECURE AFTER SERVICING FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.**

**Fig. 6-2**

LP-205-W Rev. 5/7/08

**CAUTION**

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

**NOTICE**

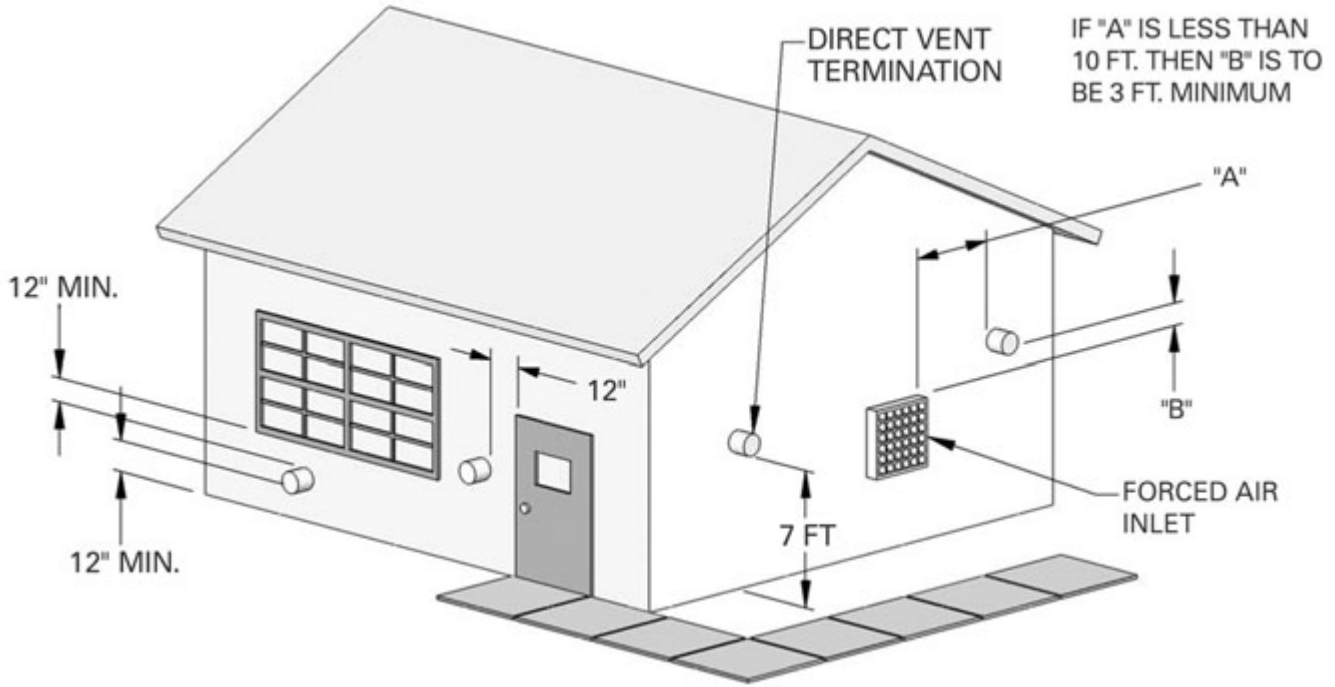
When installing a condensate pump, select one approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage.

Condensate from the Mod Con Boiler will be slightly acidic (typically with a pH from 3.2 to 4.5). Install a neutralizing filter if required by local codes.

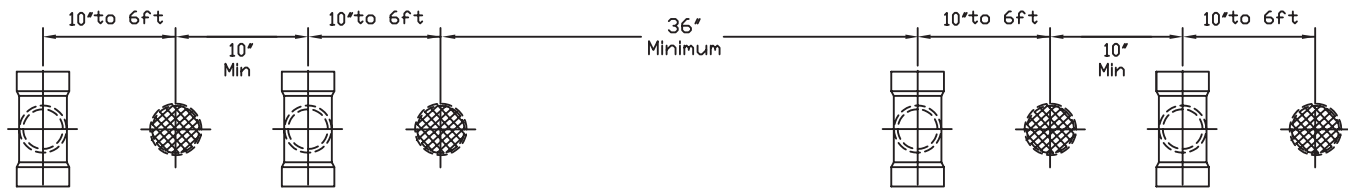
**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

**Location of exit terminals of mechanical draft and direct-vent venting systems.**

(Reference: National Fuel Gas Code ANSI Z223.1/NFPA 54 2002).



**Fig. 6-3 Multiple Vents**

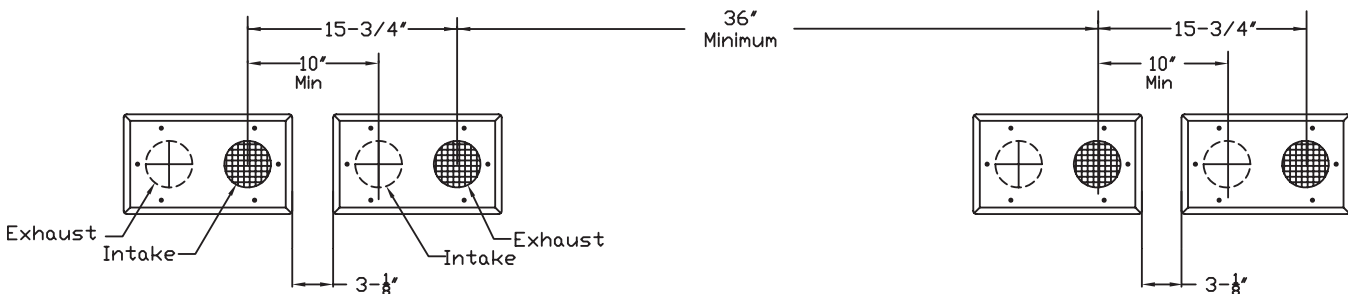


**Fig. 6-4 Multiple Vent Spacing\***

\*Note: Exhaust must extend out 1 foot. There should be no more than 2 vents and 2 intakes then a space of 36" to the next set of vents.

\*Note: There must be a minimum of 36" spacing between every 2 kit grouping.

**Multiple "V" Series Vents**



**Fig. 6-5 Multiple Stainless Steel Horizontal Vent Kit Installation – Front View**

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

**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 elbows, tees, and other fittings are listed in the Friction Loss Table 6-8.

**Table 6-8**

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'
AL29 4C Vent Terminal	1'	1'	1'
Pipe (All materials)	1'	1'	1'

\*Friction loss for long radius elbow is 1 foot 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 =  $(2 \times 3) + 10 = 16$  feet

Further, if the intake air vent pipe has two 90° elbows, one 45° elbow and 10 feet of PVC pipe, the following calculation applies:

Intake Air Vent Pipe Equivalent Length =  $(2 \times 3) + 1 + 10 = 17$  feet

- c. The intake air vent pipe and the exhaust vent are intended to penetrate the same wall or roof of the building.
  - d. Effort should be made to keep a minimum difference in equivalent length between the intake air vent pipe and the exhaust vent.
3. The minimum combined equivalent length is 15 equivalent feet.

**F. LONGER VENT RUNS**

1. The maximum combined equivalent length can be extended by increasing the diameter of both exhaust vent and intake air vent pipe equally. However, the transitions should begin a minimum of 15 equivalent feet from the boiler on both the intake and exhaust equally.
  - a. The maximum equivalent length for the increased diameter vent pipes is 275 feet, which includes the combined 30 feet from the boiler, 15 ft. (inlet) + 15 ft. (exhaust) = 30 ft. combined with transition total of 245 ft. upsize piping for longer vent runs.

**Table 6-9**

Vent Transition Fitting		
Size	Reducing Coupling	Final Vent Size
4" venting	6" x 4"	6"
6" venting	8" x 6"	8"

- b. Transitions must always be made in vertical sections of pipe to prevent the condensate from pooling in the vent pipe.
- c. If the transition occurs at a distance greater than 15 equivalent feet from the boiler, the maximum equivalent length will be reduced.

**G. EXHAUST VENT AND INTAKE AIR PIPE INSTALLATION**

1. Use only solid PVC, or CPVC schedule 40 or 80 pipe and AL294C Stainless Steel. **FOAM CORE PIPING IS ONLY ALLOWED FOR INTAKE PIPING.**
2. Remove all burrs and debris from joints and fittings.
3. All joints must be properly cleaned, primed, and cemented. Use only cement and primer approved for use with the pipe material. Refer to the Venting Table 6-4.

**⚠ WARNING**

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

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

4. Horizontal lengths of exhaust vent must slope back towards the boiler not less than ¼" per foot to allow condensate to drain from the vent pipe. If the exhaust pipe must be piped around an obstacle that results in the creation of a low point, condensate will collect in this low point and form a blockage. This condensate must be drained away using a field-installed condensate drain assembly. 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. The condensate drain piping should be a minimum of ¾" PVC Rigid Piping, pitched at a minimum of ¼" per foot away from the boiler. (See Fig. 6-1, 6-2)
5. 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. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet of the boiler.
6. Do not use the boiler to support any piping.
7. A screened straight coupling is provided with the boiler for use as an outside exhaust termination.
8. A screened inlet air tee is provided with the boiler to be used as an outside intake termination.
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 space in which the appliance remains connected to the common venting system located 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 with the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z 223.1

**H. HEATER REMOVAL FROM A COMMON VENT SYSTEM**

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

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

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.

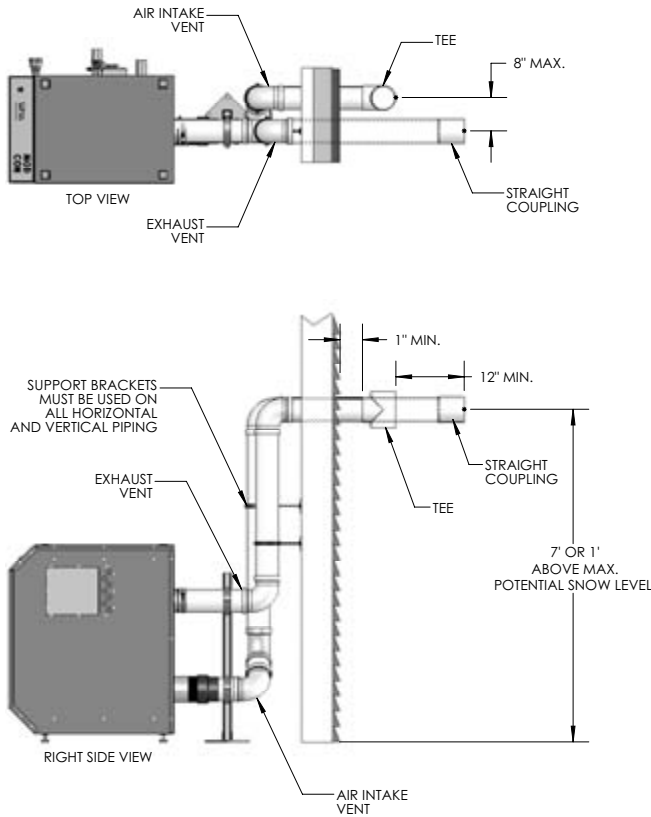
Please refer to 6-7 below for U.L. Approved Stainless Steel Vent Adapters.



**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

**I. DIAGRAMS FOR SIDEWALL VENTING**

**SIDEWALL VENTING W/TEE (INTAKE) AND COUPLING (EXHAUST)**

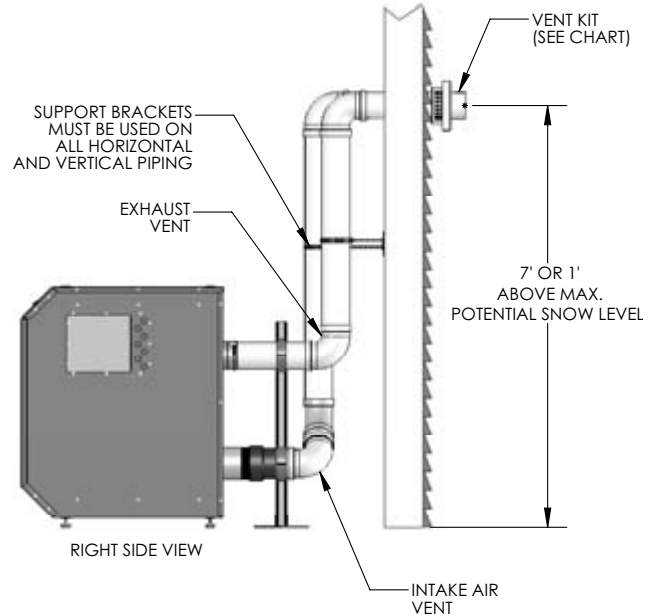


NOTE: VENT MUST BE AT LEAST 12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER - CHECK WITH LOCAL CODE REQUIREMENTS

**Figure 6-9**

LP-205-E Rev. 5/15/08

**SIDEWALL VENTING WITH KIT**



NOTE: VENT MUST BE AT LEAST 12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER - CHECK WITH LOCAL CODE REQUIREMENTS

**Figure 6-10**

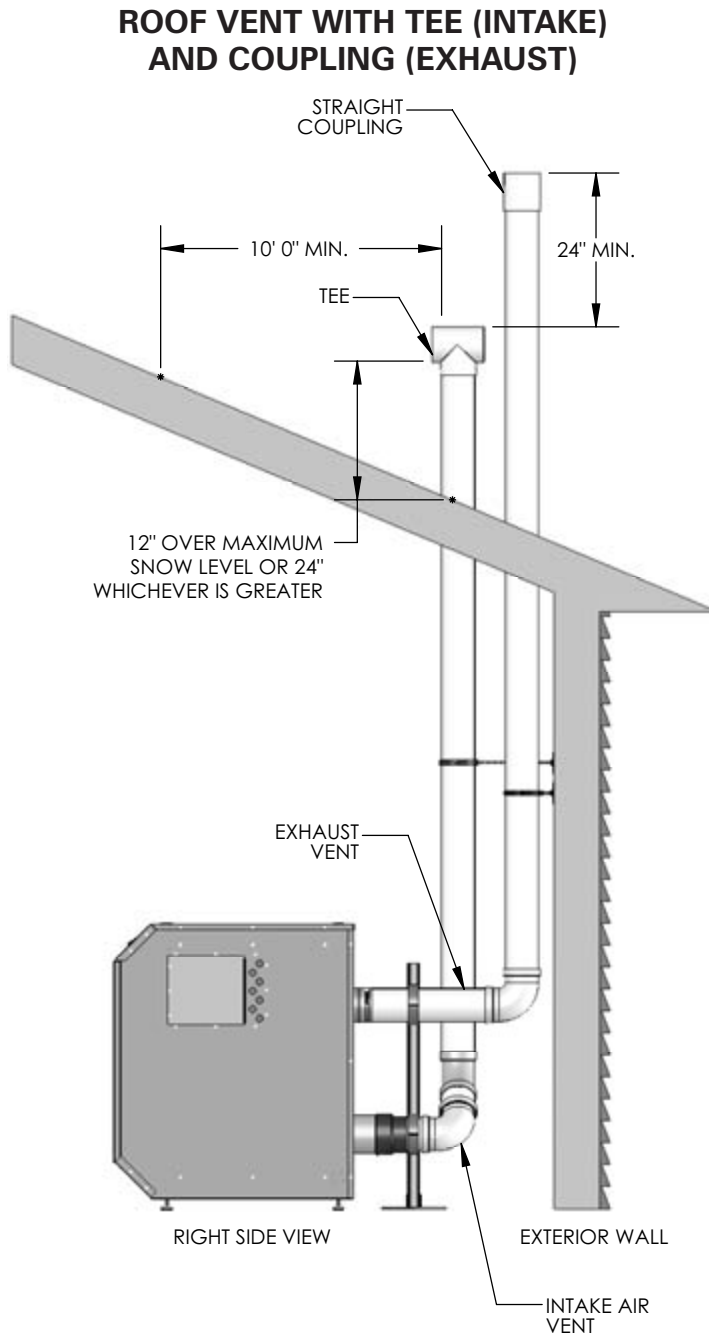
LP-205-F Rev. 5/15/08

**GENERAL NOTE:** All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a 1/4" per foot back to the heater (to allow drainage of condensate).

**NOTE:** When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**

**J. DIAGRAM FOR VERTICAL VENTING**



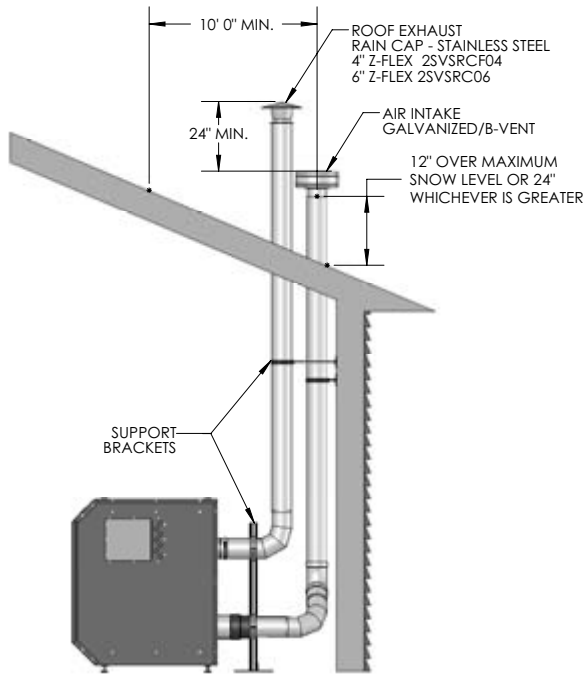
**Figure 6-11**

LP-205-G Rev. 5/6/08

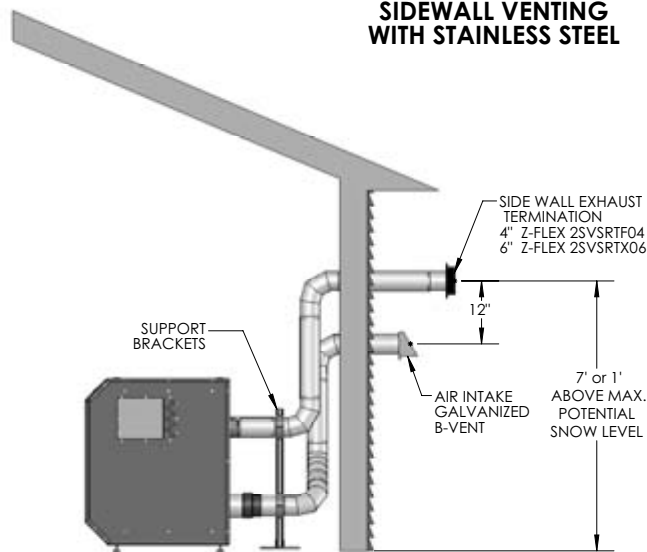
**NOTE:** When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

**GENERAL NOTE:** All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a 1/4" per foot back to the heater (to allow drainage of condensate).

**PART 6: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)**



**ROOF VENTING WITH STAINLESS STEEL (AL294C)**



**SIDEWALL VENTING WITH STAINLESS STEEL**

NOTE: VENT MUST BE AT LEAST 12" OVER MAXIMUM SNOW LEVEL OR 24" WHICHEVER IS GREATER - CHECK WITH LOCAL CODE REQUIREMENTS

**Figure 6-12**

LP-205-Y Rev. 5/28/08

**NOTE: When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance at 4 foot intervals on the vent pipe. The boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.**

**GENERAL NOTE: All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a 1/4" per foot back to the heater (to allow drainage of condensate).**

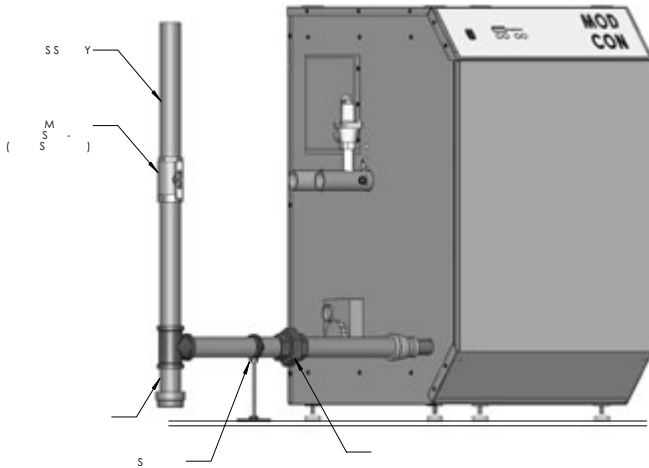
## PART 7: GAS PIPING

### **⚠ WARNING**

**Failure to follow all precautions in this section could result in fire, explosion or death!**

#### A. GAS CONNECTION

The gas supply shall have a maximum inlet pressure of less than 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.



### **⚠ WARNING**

**It is very important that you are connected to the type of gas as noted on the rating plate. "LP" for liquefied petroleum, propane gas or, "Nat" natural or city gas. You must not do a gas conversion on this boiler. All gas connections must be approved by the local gas supplier, or utility in addition to the governing authority, prior to turning the gas supply on.**

The gas connection on the Mod Con 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 Mod Con is no smaller than the unit supplied connection. Once all the inspections have been performed, the piping must be leak tested.

If the leak test requirement is a higher test pressure than the maximum inlet pressure, you must isolate the Mod Con from the gas line. In order to do this, you must shut the gas off using factory and field-installed gas cocks. This will prevent high pressure. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than 1/2 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 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 connection. Care must be taken when applying compound to prevent blockage or obstruction of gas flow which may effect the operation of the unit.

### **⚠ WARNING**

**Never use an open flame (Match or Lighter) to check for Gas leaks. Use A soapy solution to test gas connection for leaks. Failure to use soapy solution test or check gas connection for leaks can cause substantial property damage, severe personal injury or death .**

### **NOTICE**

**CSA or UL listed Flexible gas connections can be used when installing The Mod Con 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 adequately sized for the job. Follow local codes for proper installation and service requirements.**

**PART 7: GAS PIPING (CONTINUED)**

**C. GAS TABLE**

Refer to Table 7-1 to size the supply piping to minimize pressure drop between meter or regulator and unit.

Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 w.c. or Less and a Pressure Drop of 0.3 Inch w.c.

Table 7-1

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								
<b>Boiler Model</b>	<b>1 Boiler</b>	<b>2 Boilers</b>	<b>3 Boilers</b>	<b>4 Boilers</b>	<b>5 Boilers</b>	<b>6 Boilers</b>	<b>7 Boilers</b>	<b>8 Boilers</b>
<b>Cubic Ft. Hr.</b>	300	600	900	1200	1500	1800	2100	2400
<b>ModCon 300 @ 100' of pipe</b>	1 1/4"	1 1/2"	2"	2 1/2"	2 1/2"	2 1/2"	3"	3"
<b>ModCon 300 @ 250' of pipe</b>	1 1/2"	2"	2 1/2"	3"	3"	3"	4"	4"
<b>Boiler Model</b>	<b>1 Boiler</b>	<b>2 Boilers</b>	<b>3 Boilers</b>	<b>4 Boilers</b>	<b>5 Boilers</b>	<b>6 Boilers</b>	<b>7 Boilers</b>	<b>8 Boilers</b>
<b>Cubic Ft. Hr.</b>	500	1000	1500	2000	2500	3000	3500	4000
<b>ModCon 500 @ 100' of pipe</b>	1 1/2"	2"	2 1/2"	3"	3"	3"	4"	4"
<b>ModCon 500 @ 250' of pipe</b>	2"	2 1/2"	3"	3"	4"	4"	4"	4"
<b>Boiler Model</b>	<b>1 Boiler</b>	<b>2 Boilers</b>	<b>3 Boilers</b>	<b>4 Boilers</b>	<b>5 Boilers</b>	<b>6 Boilers</b>	<b>7 Boilers</b>	<b>8 Boilers</b>
<b>Cubic Ft. Hr.</b>	850	1700	2550	3400	4250	5100	5950	6800
<b>ModCon 850 @ 100' of pipe</b>	2"	2 1/2"	3"	4"	4"	4"	4"	5"
<b>ModCon 850 @ 250' of pipe</b>	2 1/2"	3"	4"	4"	5"	5"	5"	5"

**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. Before you connect to the inlet pressure you must shut off the gas and electrical power to unit.
2. Loosen the pressure tap with a small screwdriver. Refer to Figures 7-2 and 7-3 for location.
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 in 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 correct action that is needed to provide proper gas pressure to the unit. If Gas Pressure is within normal range proceed to next step.

6. Exit Service mode, then turn power off and shut off gas supply at the manual gas valve before disconnecting the hose from the gas monitoring device. Tighten the screw on the pressure tap tightly and turn gas on and checks for leaks with soapy solution.

It is recommended that a soapy solution be used to detect leaks. Bubbles will appear on the pipe to indicate a leak is present. The gas piping must be sized for the proper flow and length of pipe, to avoid pressure drop. Both the gas meter and the gas 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 is undersized or in need of service. You can attach a manometer to the incoming gas drip leg, by removing the cap and installing the manometer. 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 regula-**

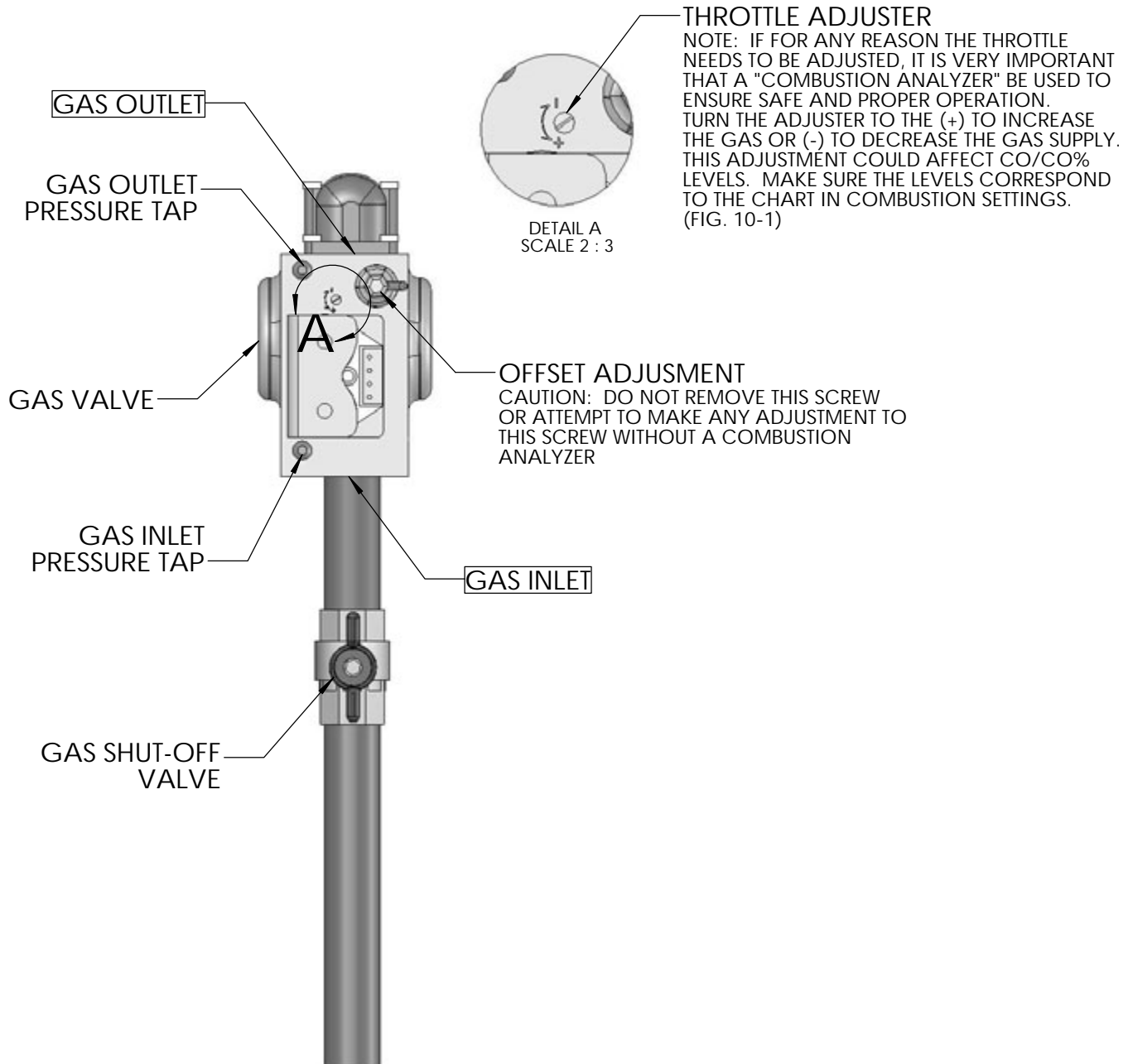
**PART 7: GAS PIPING (CONTINUED)**

tor is used, it must be a minimum of 10 feet from the Mod Con. 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 also in empty tank situations. This 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.

**E. DUNGS GAS VALVE**

**MOD CON 300 GAS VALVE**

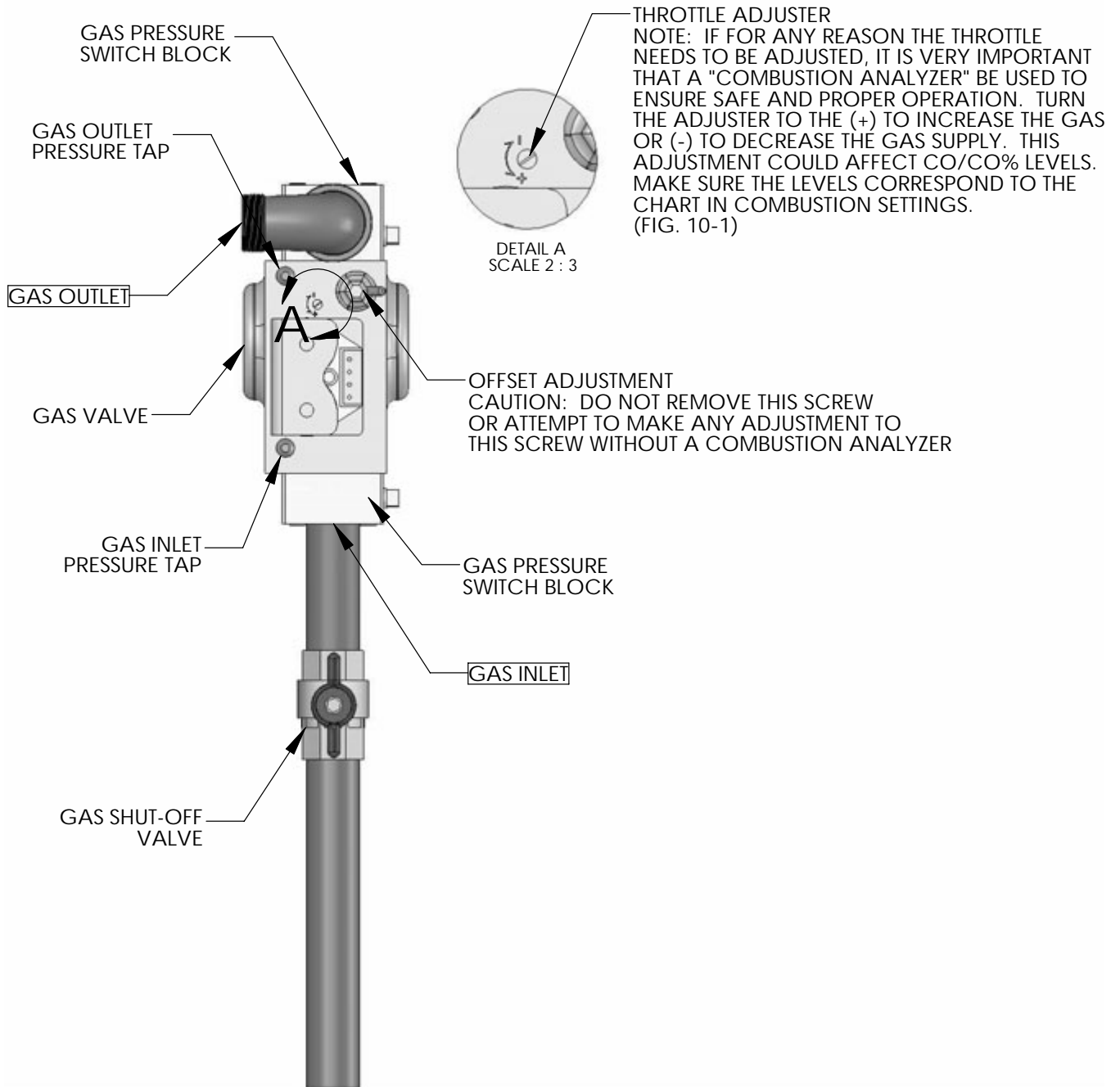


**Fig. 7-2**

LP-205-AA Rev. 6/3/08

**PART 7: GAS PIPING (CONTINUED)**

**MOD CON 500 GAS VALVE**

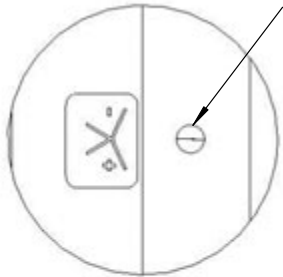


**Fig. 7-3**

LP-205-BB Rev. 6/3/08

**PART 7: GAS PIPING (CONTINUED)**

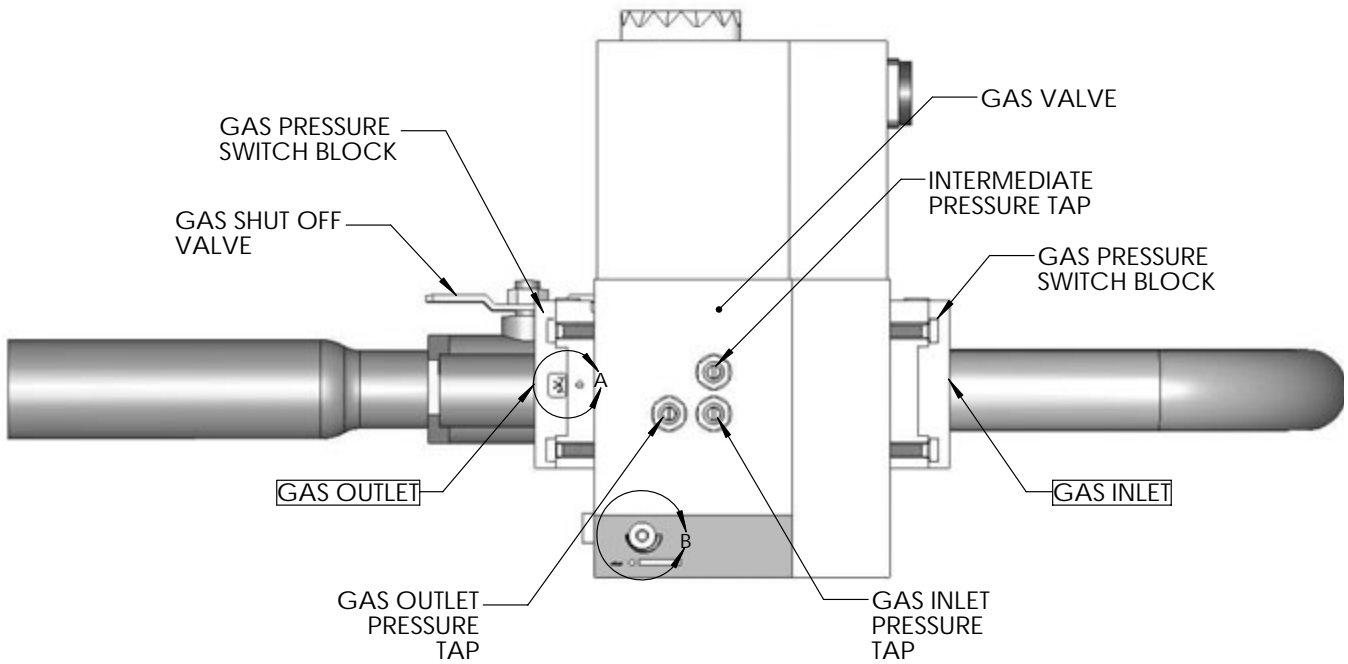
**MOD CON 850 GAS VALVE**



DETAIL A  
SCALE 2:1.5

**THROTTLE ADJUSTER**

NOTE: IF FOR ANY REASON THE THROTTLE NEEDS TO BE ADJUSTED, IT IS VERY IMPORTANT THAT A COMBUSTION ANALYZER BE USED TO ENSURE SAFE AND PROPER OPERATION. TURN THE ADJUSTER TO THE (+) TO INCREASE GAS SUPPLY OR TO THE (-) TO DECREASE GAS SUPPLY. THIS ADJUSTMENT COULD AFFECT CO/CO% LEVELS. MAKE SURE THE LEVELS CORRESPOND TO THE CHART IN THE COMBUSTION SETTINGS SECTION (FIG. 10-1)



DETAIL B  
SCALE 2:1.5

**OFFSET ADJUSTMENT**

CAUTION: DO NOT REMOVE THIS SCREW OR ATTEMPT TO MAKE ANY ADJUSTMENT TO THIS SCREW WITHOUT USING A COMBUSTION ANALYZER.

**Fig. 7-3**



## PART 8: FIELD WIRING

### **WARNING**

**ELECTRICAL SHOCK HAZARD** — For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

### **NOTICE**

**Wiring must be N.E.C. Class 1.**  
**If original wiring as supplied with boiler must be replaced, use only TEW 105 °C wire or equivalent.**  
**Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 — latest edition.**

#### **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 MOD CON 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 left side of MOD CON 500 and MOD CON 850 units and on the right side of MOD CON 300 units. 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.

#### **C. LINE VOLTAGE WIRING FOR STANDARD BOILER**

1. Connect the incoming power wiring to the line voltage terminal strip in the electrical junction box at terminals 120V, Neutral, Ground (shown in figure 8-1.)
2. A line voltage fused disconnect switch may be required to be externally mounted and connected according to local codes that may apply.
3. Connect the central heating pump as shown in Figure 8-1 to the terminals marked BOILER HOT, BOILER NEUT, BOILER GND. The connections shown are suitable for a maximum continuous pump draw of 3 amps at 120 volts. If a 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 as shown in Figure 8-1 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 that requires more current or voltage other than 120 volts supplied, an external motor starter or contactor will be required.

#### **D. ALARM CONNECTIONS**

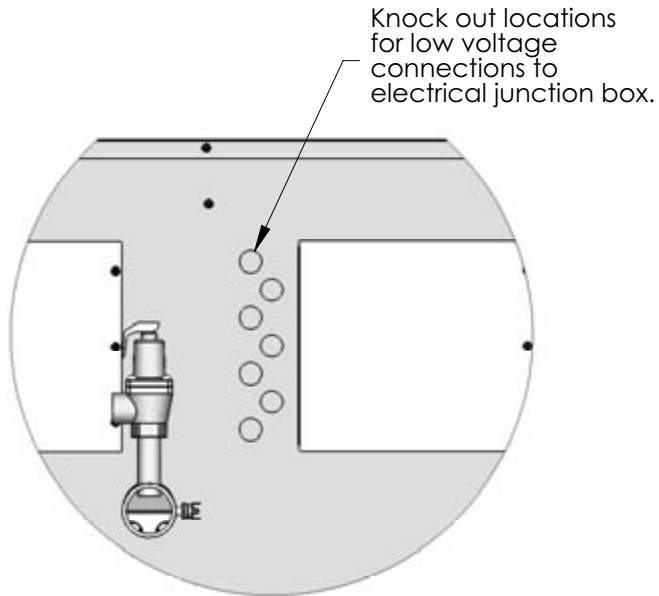
1. The MOD CON control includes a dry contact alarm output. This is an SPDT circuit, rated at 5 amps at 120 volts. This contact can be used to activate an alarm light or bell or notify a building management system if the boiler goes into a lockout condition. The circuit between the ALARM COM and NC terminals is closed during normal operation and the circuit between ALARM COM and NO is open during normal operation. The connections depicted in figure 8-1 shows two 120 volt lights connected to the alarm terminals. One light will be on when the boiler is in normal

**PART 8: FIELD WIRING (CONTINUED)**

mode and the other light will be on when the boiler is in lockout mode.

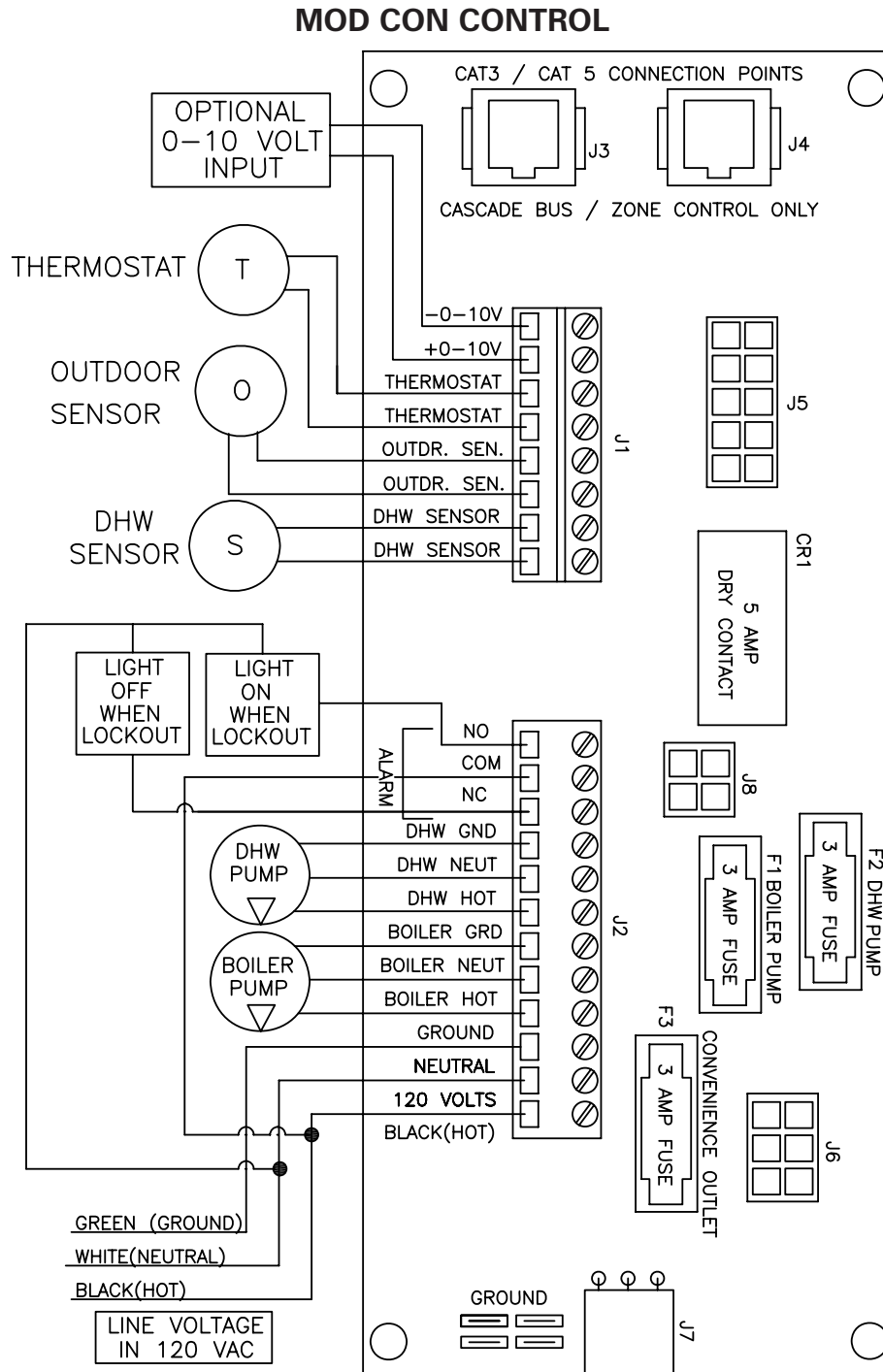
**E. LOW VOLTAGE CONNECTIONS FOR STANDARD BOILER**

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



2. Connect all low voltage field devices to the low voltage terminal strip located in the electrical junction box (shown in Figure 8-1).

**PART 8: FIELD WIRING (CONTINUED)**



**Fig. 8-1**

LP-205-JJ Rev. 5/12/08

**F. THERMOSTAT**

1. Connect the room thermostat to the terminals marked THERMOSTAT in the electrical junction box (shown in figure 8-1) Alternately, any dry contact closure across these terminals will cause the MOD CON unit

to run. Caution should be used to ensure neither of the terminals become connected to ground.

2. Mount the thermostat on an inside wall as central as possible to the area being heated, but away from drafts or heat producing

## PART 8: FIELD WIRING (CONTINUED)

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

1. There is no connection required if an outdoor sensor is not used in this installation.
2. If using an Outdoor Sensor, Connect wires for sensor to the terminals marked OUTDOOR SEN (shown in Figure 8-1) in the electrical junction box. Caution should be used to ensure neither of these terminals become connected to ground.
3. 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.
4. Mount the outdoor sensor on an exterior surface of the building, preferably on the north side in an area that will not be affected by direct sunlight and will be exposed to varying weather conditions.

### H. INDIRECT SENSOR

1. There is no indirect sensor connection required if an indirect water heater is not used in the installation.
2. The MOD CON 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 MOD CON 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 settable set point by more than the user selectable offset. The demand will continue until the sensor measures that the indirect water heater temperature is above the set point.
3. Connect the indirect tank sensor (7250P-325)

to the terminals marked DHW SENSOR (shown in figure 8-1) in the electrical junction box. Caution should be used to ensure neither of these terminals become connected to ground.

### I. OPTIONAL 0-10 VOLT BUILDING CONTROL SIGNAL

1. A signal from a building management system may be connected to the MOD CON 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 MOD CON Boiler. The control interprets the 0-10 volt signal as follows. When the signal is between 0 and 1 volt, the MOD CON Boiler will be in stand by mode, not firing. When the signal rises above 1 volt, the MOD CON Boiler will ignite. As the signal continues to rise towards its maximum of 10 volts, the MOD CON boiler will increase either in set point temperature or firing rate depending on the setting of parameter 17 in the installer menu. See Part 11 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 8-1) 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" 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.

**PART 8: FIELD WIRING (CONTINUED)****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 above 1½" w.c.
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 UL353 LOW WATER CUTOFF SWITCH**

1. If an optional UL353 low water cutoff (LWCO) switch is used, the control box of the LWCO should be mounted to the left side of the boiler cabinet near the low water cutoff probe, which is located on the outlet nipple of the boiler.
2. Remove the wire connected to the low water cutoff 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 cutoff probe on the boiler.
4. Route the rest of the wires through the provided hole 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.

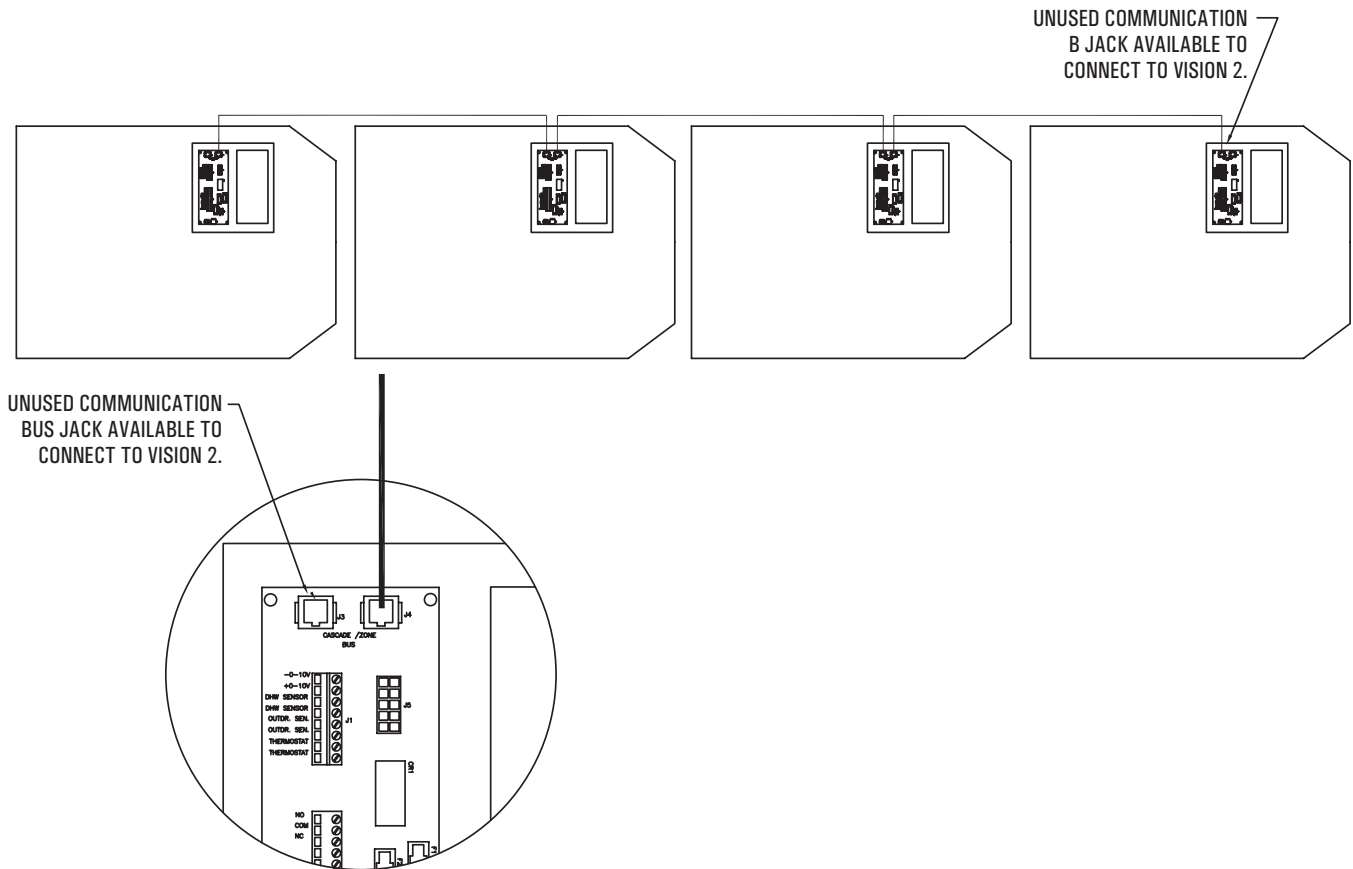
**M. WIRING OF CASCADE SYSTEM COMMUNICATION BUS**

1. 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.
2. It is recommended to use the shortest length cable that will reach between the boilers and create a neat installation. Do not run unprotected cables across the floor or where they will 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.
3. Route the communication cables through one of the knockouts in the cabinet.

**PART 8: FIELD WIRING (CONTINUED)**

4. Connect the boilers in a daisy chain configuration as shown below. It is best to wire the boilers using the shortest wire runs rather than trying to wire them in the order 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 to. If you have connected the boilers to each other properly, two of the boilers will have one open connection port on them.

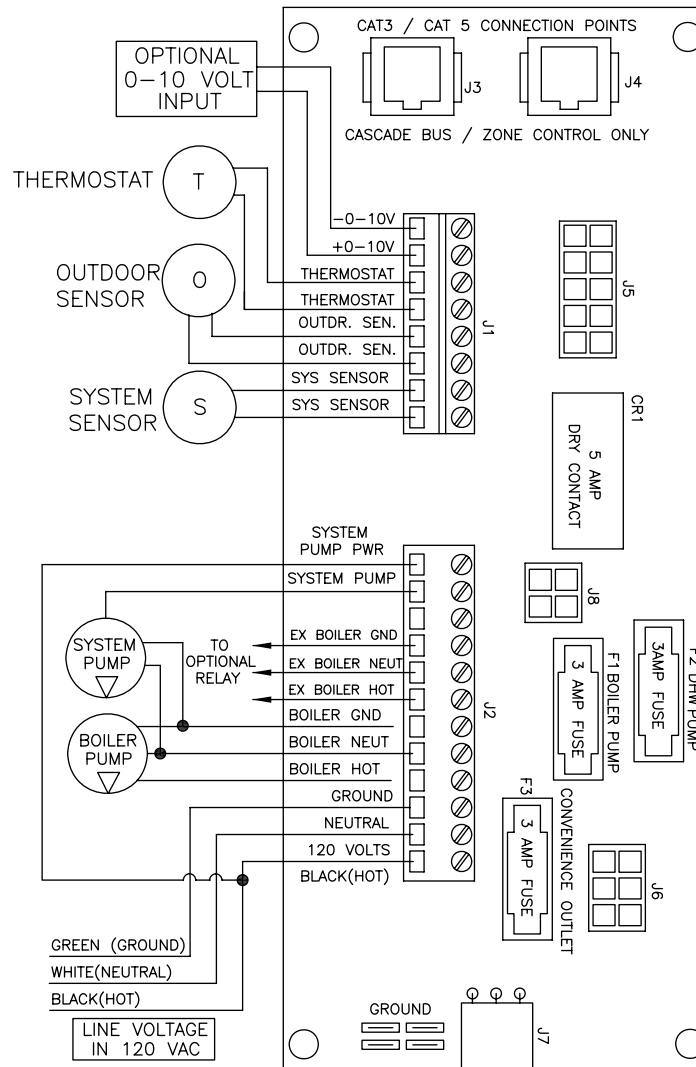


**Fig. 8-2**

LP-205-JJ

**PART 8: FIELD WIRING (CONTINUED)**

**MOD CON Cascade Master**



**NOTE:**  
You must place the Cascade Master label (included in shipping envelope) on top of the Standard Mod Con Control

**Fig. 8-3**

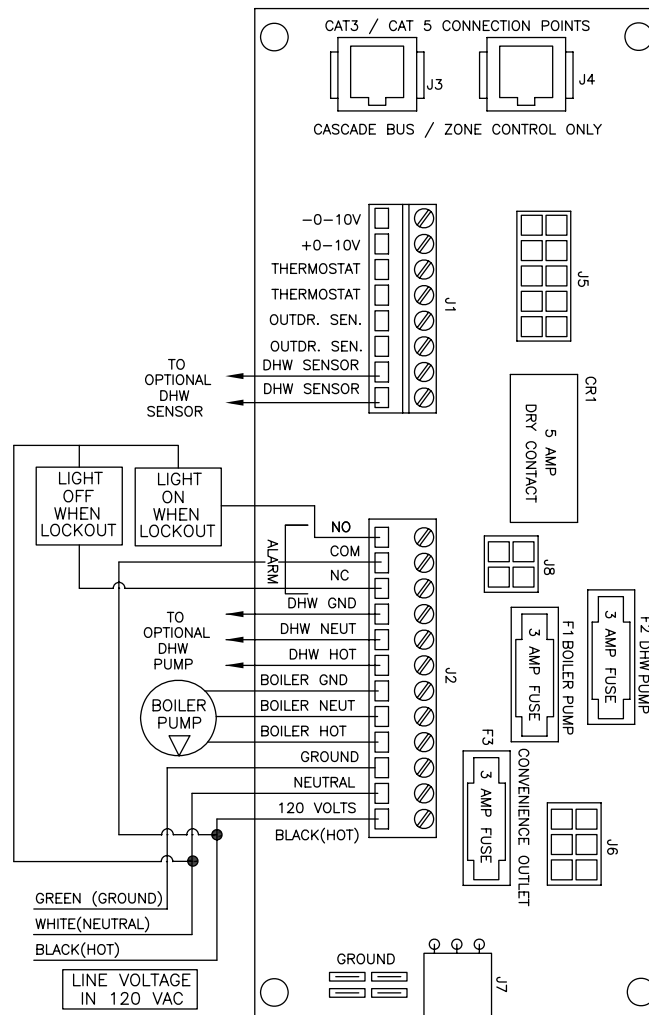
LP-205-JJ1 Rev. 5/12/08

**MOD CON CASCADE MASTER PUMP AND SENSOR WIRING**

1. Place the Cascade Master Overlay Sticker (included) onto the field connection board on the boiler designated as the Cascade Master Only.
  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 OUTDR. 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.

**PART 8: FIELD WIRING (CONTINUED)**

**MOD CON Cascade Follower**



**Fig. 8-4**

LP-205-JJ1 Rev. 5/12/08

**MOD CON CASCADE FOLLOWER PUMP AND SENSOR WIRING**

1. Connect the boiler pump to the terminals labeled BOILER HOT, BOILER NEUT, BOILER GND.
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 you desire, an alarm bell or light can be connected to the alarm contacts of the follower boiler. Optionally 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.

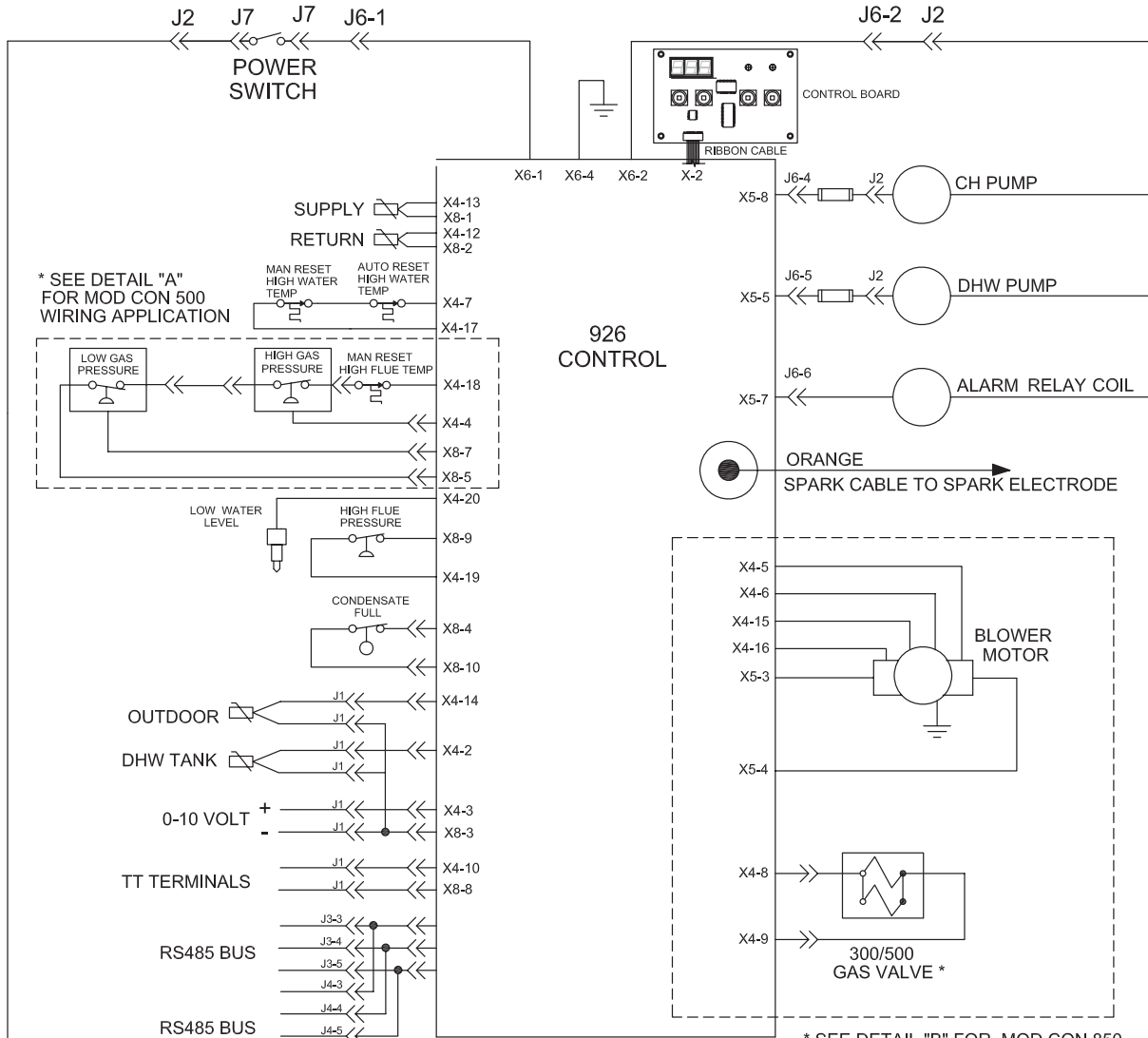
To connect a device that should be powered off during a boiler lockout condition, follow the same instructions as above except use the ALARM NC terminal rather than the ALARM NO terminal.

Note that 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 as 2-7 will only sound if a lockout condition occurs on that specific boiler.



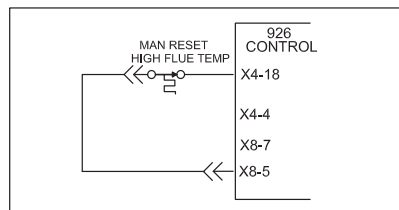
**PART 8: FIELD WIRING (CONTINUED)**

**MOD CON CONNECTION DIAGRAM**

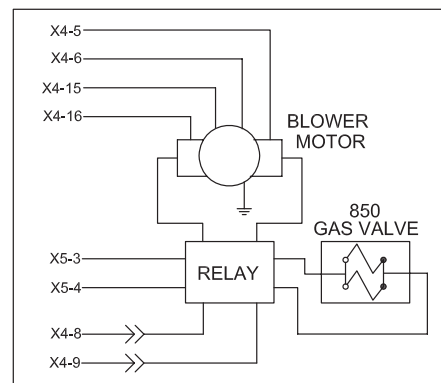


\* SEE DETAIL "A" FOR MOD CON 500 WIRING APPLICATION

\* SEE DETAIL "B" FOR MOD CON 850 GAS VALVE WIRING APPLICATION



DETAIL "A"



DETAIL "B"

**Fig. 8-3**

## PART 9. START-UP PREPARATION

### A. CHECK/CONTROL WATER CHEMISTRY

#### **WARNING**

Do not use petroleum-based cleaning or sealing compounds in boiler system. Damage to elastomer seals and gaskets in 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 chemically analyzed by water treatment company.
2. If pH differs from above, consult local water treatment company for treatment needed.

#### **Hardness less than 7 grains.**

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

#### **Chlorine concentration less than 200 ppm**

1. Using chlorinated fresh water should be acceptable since drinking water chlorine levels are typically less than 5 ppm.
2. Do not connect the boiler to directly heat swimming pool or spa water.
3. Do not fill boiler or operate with water containing chlorine in excess of 200 ppm.

#### **Clean system to remove sediment**

1. You must thoroughly flush the system (without boiler connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment build up.
2. For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system.)
3. Flush system until water runs clean and you are sure piping is free of sediment.

#### **Test/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.

### B. FREEZE PROTECTION (WHEN USED)

#### **WARNING**

**NEVER** use automotive or standard glycol antifreeze, even ethylene glycol made for hydronic systems. Use only freeze-prevention 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 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 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.
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 160 psig.
4. At initial fill and during boiler startup and testing, check system thoroughly for any leaks. Repair all leaks before proceeding further.

**PART 9. START-UP PREPARATION (CONTINUED)**

**⚠ WARNING**

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

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

**⚠ CAUTION**

**It is important that you 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 make-up 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 that 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 tem-

perature 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 the **S2/+** key 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. 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 a while, eliminate any residual air by using the manual air vents located throughout the system.
- j. If purge valves are not installed in system, open manual air vents in system one at a time, beginning with 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 leak at once.**

## PART 9. START-UP PREPARATION (CONTINUED)

### **⚠ WARNING**

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

### 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 thermostat circuits. Close each thermostat, zone valve and relay in the external circuit one at a time and check the voltmeter reading across the incoming wires.
3. There should NEVER be a voltage reading.
4. If a voltage does occur under any condition, check and correct the external wiring. (This is a common problem when using 3-wire zone valves.)
5. Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires to boiler low voltage terminal strip. Allow the boiler to cycle.

### G. CONDENSATE REMOVAL

1. The Mod Con 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 an automobile when it is initially started. The condensation is slightly acidic (typically with pH of 3 to 5) and must be piped with the correct materials. Never pipe the condensate using steel, copper, brass or other materials that will be subject to corrosion. Plastic PVC or CPVC pipe are the only approved materials. A condensate filter, if required by local authorities, can be made up of lime crystals, marble or phosphate chips that will neutralize the condensate. This may be done by the installer or you may purchase a

condensate neutralizer from Heat Transfer Products, Inc. (P/N S7350-025)

2. The Mod Con 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 Mod Con to a suitable inside drain. If the condensate outlet on the Mod Con is lower than the drain, you must use a condensate removal pump, available from Heat Transfer Products (#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 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

1. If the boiler is used in a stand alone configuration, skip this section.
2. Programming The Master Boiler
  1. Make sure there is no demand for heat being supplied to the boiler
  2. Apply power to the boiler

## PART 9. START-UP PREPARATION (CONTINUED)

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 must match the follower boiler set point in order for the system to operate properly.

### 3. Follower Boilers

**NOTE: 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. Example: In a 2 boiler system 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 being supplied to the master boiler
2. Apply power to the follower boiler you are working on
3. Enter the installer Menu following instructions in part 11 of this manual
4. Set parameter 15 to 1 for the first follower, 2 for the second follower, etc. depending on which boiler you are programming.
5. Verify that parameter 23 is set to 0. This makes the boiler be 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 10. START-UP PROCEDURE

**FOR YOUR OWN SAFETY READ BEFORE OPERATING**

1. This appliance 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 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.
  - Turn off gas shutoff valve (located inside 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 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.
  5. The Mod Con Boiler shall be installed so the gas ignition system components are protected from water (dripping, spraying,

**PART 10. START-UP PROCEDURE (CONTINUED)**

rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.)

**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 electric power to appliance.
2. Adjust the temperature setpoint of the Mod Con Boiler if desired. The factory default setting is 180°. If changes are necessary follow "Adjusting The Mod Con Setpoint" in this section.
3. On the initial start-up of this boiler, you will 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 for the Mod Con 500 and on the right for the Mod Con 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 yellow LED has now gone out. Press and hold the **S4** key on the control panel for about 4 seconds to begin normal operation.
4. Set the thermostat to the desired setting.
5. If the appliance fails to start, refer to the Troubleshooting section in the back of this manual.

**B. ADJUSTING THE SETPOINT**

**NOTE: Before you can change the temperature from the factory setting of 180 degrees, you must 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 to the Mod Con Boiler:**

- Press the **S3/Program** Key for 3 seconds until you see a flashing "C" alternating to "180" (this number is the factory set point of 180°)

**To change the temperature set point:**

- Press the **S1/-** to decrease temperature (Boiler temperature can go as low as 50°)

- Press the **S2/+** to increase temperature (Boiler temperature can go as high as 200°)

**To access additional setting options:**

- Press **S3** to scroll through and view the following settings:
  - 1st time** – **C** Boiler Temperature Set Point
  - 2nd time** – **Ch** Boiler Differential Set Point
  - 3rd time** – **D** Indirect Temperature Set Point
  - 4th time** – **DH** Indirect Differential Set Point
  - 5th time** – **f** Temperature measurement in Fahrenheit to Celsius

**To increase or decrease the values, press the **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 Mod/Con Boiler parameters by pressing the **S4/RESET** key for 3 seconds. Once activated, the display will show **d1** alternating value of the actual supply temperature. To change to the next function value, the user can press the **S1/-** (alternating down to previous function value) or press the **S4/RESET** key (alternating up to the next function value). Actual values are displayed for each function. Listed below are the values which can be displayed. These values cannot be changed. To exit menu, simply press **S3/Program** key to resume normal operation.

**Function Value**

- d1 — Actual Temperature from supply sensor
- d2 — Actual Temperature from return sensor
- d3 — Indirect Temperature will be displayed if a Superstor indirect fired water tank and a 7250P-325 sensor is connected. If a mechanical control is used, the display will show a **0** if the control is open and a **1** if it is closed. If an DHW tank is not connected the display will read **0**.
- d4 — **320** Not used
- d5 — Actual Temperature from the outdoor sensor if connected **NC**.

**PART 10. START-UP PROCEDURE (CONTINUED)**

- Function Value**
- 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 bus communication  
**CO** = connected, **NO** = not connected
  - d11 — Central Heating Set Point
  - d12 — Power On Hours in thousands (display will not read until 100 hrs.)  
Example: Display x 1000 = Power on Hours  
12.3 x 1000 = 12300 Hours)
  - d13 — Total Central Heat Hours in Thousands (display will not read until 100 hrs)  
Example: Display x 1000 = Power on Hours  
12.3 x 1000 = 12300 Hours
  - d14 — Total Domestic Hot Water Hours in Thousands (display will not read until 100 hrs)  
Example: Display x 1000 = Power on Hours  
12.3 x 1000 = 12300 Hours
  - d15 — Passed Ignition Attempts in Thousands (display will not read until 100 ignition attempts)  
Example: Display x 1000 = Power on Hours  
12.3 x 1000 = 12300 ignition attempts
  - d16 — This function only becomes active when the 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 percent is displayed. To toggle between values press the **S1/-** to go down and the **S4/RESET** key to go up. The first function you will see is

System Pump - **0** off or **1** on

Master Boiler - **P0** alternating (0-100 Percentage firing rate)

Follower Boiler #1 – **P1** alternating (0-100 Percentage firing rate)

Follower Boiler #2 – **P2** alternating (0-100 Percentage firing rate)

Follower Boiler #3 – **P3** alternating (0-100 Percentage firing rate)

Follower Boiler #4 – **P4** alternating (0-100 Percentage firing rate)

Follower Boiler #5 – **P5** alternating (0-100 Percentage firing rate)

Follower Boiler #6 – **P6** alternating (0-100 Percentage firing rate)

Follower Boiler #7 – **P7** alternating (0-100 Percentage firing rate)

NOTE: If you toggle beyond parameters of connected boilers, the display will go into the next function value.

**D. TEST MODE**

This function is intended to simplify the gas valve adjustment if needed. Listed below are the recommended limits on each Mod Con Boiler and the Combustion Settings. Automatic modulation does not take place when the controller is in Test mode, only temperature limitation based on the Mod Con Boiler Central Heating set point. The user will be allowed to increase or decrease the fan speed by pressing in either the **S1/-** or **S2/+** keys.

To activate the Test mode simply press the **S2/+** and **S3/Program** key 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 speed. After 20 minutes, the Test mode stops automatically. To exit Test Mode press **S1/-** and **S2/+** key together for 1 second.

COMBUSTION SETTINGS ON ALL MODELS				
	Natural Gas		Propane LP	
	low	high	low	high
Carbon Monoxide (CO %)	0–20 ppm	70 ppm–135 ppm	0–20 ppm	80 ppm–150 ppm
Carbon Dioxide (CO <sub>2</sub> %)	8½% – 9½%	8½% – 9½%	9½% – 10½%	9½% – 10½%

**Fig. 10-1**

## PART 11: START-UP PROCEDURES FOR THE INSTALLER

### A. PROGRAMMING FOR THE INSTALLER

This section allows the installer to set system limits and the heat curve for the Mod Con Boiler. These system limits should not be changed by the user. It is important to document your settings within this manual after you program the system parameters so this will be recorded for future reference. Record settings in Fig. 11-3.

### B. PROGRAM ACCESS

To start, press down and hold the **S/3** and **S/4** simultaneously for three seconds. You will notice that the display will change to **000**. Then, with your **S/1-** key on the display press down until you see **925**. This is the pass code. To confirm that the pass code is correct, you will need to press and hold the **S3/Program** for 1 second to confirm. If the pass code is entered incorrectly, the controller program function will be cancelled and the control returns 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 will address the requirements of the Superstor Indirect Fired Water Heater.

### C. PROGRAM NAVIGATION

Next you will have to press the **S/3** key to move through each function. To increase or decrease a value, you will need to press either the **S/1-** key or **S/2+** key 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 **S/4** key is pressed down for 3 seconds then the new values are stored. Listed below are the variety of functions the installer can program into the 926 Control.

### CAUTION

**The Boiler cannot be programmed while there is a call for heat.**

**NOTE:** See Chart 11-1 in Part 11 to set outdoor reset curve.

Function Number	Default Value	Function Description
1	de	Not Applicable
2	149°F	Not Applicable
3	180°	Maximum Domestic water heater delivery temperature allowed in user menu. Installer can set the maximum temperature that
4	36°F	Not Applicable
5	7°F	Allows the installer to change the differential in the Indirect Fired Water Heater (Does not apply if used with a Mechanical Control) Range: 1°F to 18°F
6	0 Min.	Allows the installer to change the Indirect Circulator Post Purge Time once the sensor is satisfied (Note: it is recommend that Circulator Post Purge Time be set no greater than 5 minutes). Range: 0 to 10 minutes
7	68°F	Outdoor temperature that you wish the central heating should be disabled—(warm weather shut-off) Range: 41°F to 122°F
*8	5°F	Allows the installer to change the Minimum Outside Design Temperature. Range: -49°F to 32°F (See Chart 11-1 to set outdoor reset curve)
*9	180°F	Allows the installer to change the Design Supply Water Temperature from the Mod Con based on the Minimum Outside Design Temperature Range: 77°F to 200°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	Allows the installer to change the Design Supply Water Temperature from the Mod Con based on the Maximum Outside Design Temperature. Range: 32°F to 200°F



**PART 11: START-UP PROCEDURES FOR THE INSTALLER (CONTINUED)**

Function Number	Default Value	Function Description	Function Number	Default Value	Function Description
12	68° F	Allows the installer to set the lowest temperature on the Mod Con for Central Heating. Range: 32°F to 200°F	21	0	Allows the installer to set the control to display <b>FOU</b> error. If outdoor sensor is open or shorted <b>FOU</b> error does not prevent boiler from running. 0 = No <b>FOU</b> displayed. 1 = <b>FOU</b> displayed if outdoor sensor shorted or open.
13	0 Min.	Allows the installer to change the Central Heating Circulator Post Purge Time once the thermostat is satisfied. Range 0 to 10 minutes.	22	100%	Maximum boiler output percentage. Default = 100%. This parameter can be adjusted to lower the maximum boiler output if necessary. Example MODCON500 boiler setting at 80% boiler will go to 400000 BTU/hr max rather than 500000 BTU/hr. Range 50–100%
14	30 Min.	Allows the installer to set the Maximum run time for the Indirect Fired Water Heater and the Minimum run time for Central Heating. Range 0 to 60 Minutes	23	0	Cascade configuration default 0. Change this to 1 if the boiler is a cascade master
15	0	Bus Addressing Boilers (Cascade 8 Boiler Max.) Master = Address 0 / Followers = Address 1 thru 7. Note: Never address boiler with number 8 which is not to be used. Range: 0-8	24	24	Power on hours for cascade priority changeover. This parameter is used to set how many power on hours will go by before the priority boiler will be rotated in the cascade system
16	0	Allows the installer to connect up 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 board Range: 0-3	25	0	Not applicable, must be at 0
17	0	Allows the user to control the function of the 0–10 volt input 0 = Boiler Temperature 1 = Boiler Power	26	--	Only used on Master Boiler in a multiple boiler installation to provide system pump activation at a user defined temperature. Adjustment to the default setting can be made by pressing the <b>S/2+</b> key to increase temperature Activation point. Range -40°F to 104°F
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°	Indirect boiler set point (flow) Temperature default = 119° to 180°			
20	3	Low water cut-off. Do not change 0= none 1=water pressure switch 2=flow switch 3=low water cutoff (MODCON default)			

**\* 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 own custom heat curve you will have to set the following parameters. Use graph in Fig. 11-1 and 11-2 to assist you in the design of the curve.

**PART 11: START-UP PROCEDURES FOR THE INSTALLER (CONTINUED)**

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**

**NOTICE**

It is important to note that the user can adjust the heat curve down by adjusting the central heating temperature to a lower setting.

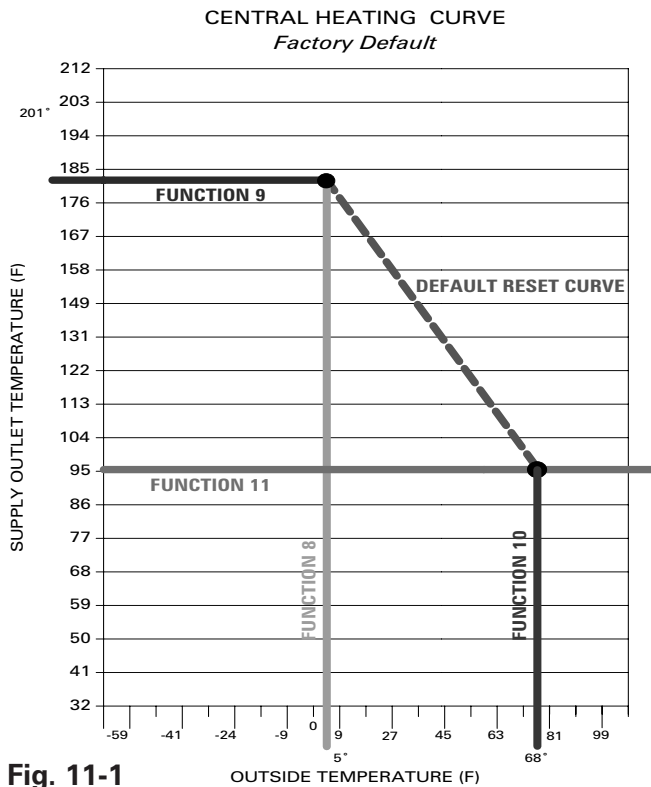


Fig. 11-1

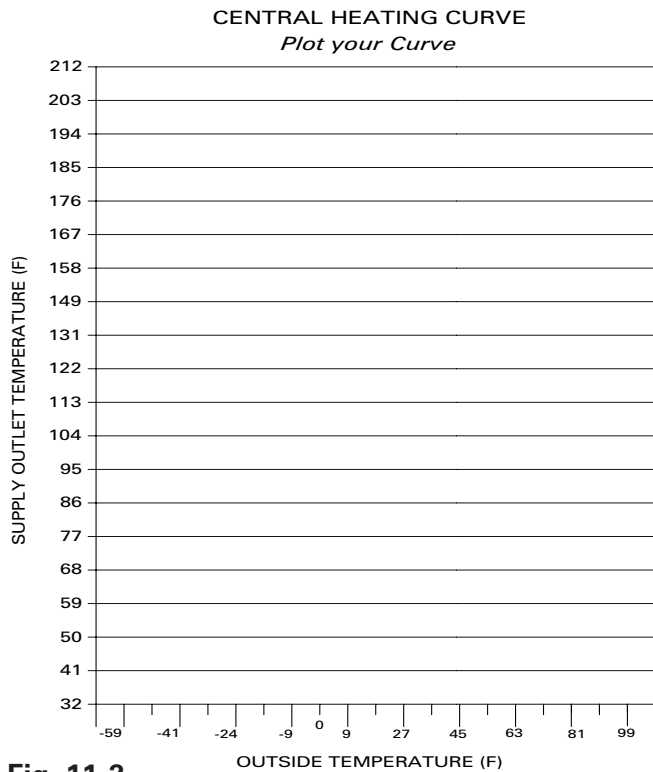


Fig. 11-2

**CONTROL PROGRAM REFERENCE CHART**

Function	Default Setting	Programmed Setting	Function	Default Setting	Programmed Setting
1	de	No change allowed	14	30 minutes	
2	149°F	No change allowed	15	0	
3	180°F		16	0	
4	36°F	No change allowed	17	0	
5	7°F		18	1	
6	0 minutes		19	180°F	
7	68°F		20	3	
8	5°F		21	0	
9	180°F		22	100%	
10	68°F		23	0	
11	95°F		24	24 hrs.	
12	68°F		25	0	No change allowed
13	0 minutes		26	---	

Fig. 11-3

## PART 12: TROUBLESHOOTING

### A. MOD CON ERROR CODE

If any of the sensors detect an abnormal condition or an internal component fails during the operation of the ModCon Boiler, the display may show an error code. This code may either be the result of a temporary condition in which case the display will revert to its normal readout when the condition is corrected or it may be the result of a condition that the controller has evaluated as not safe to restart the 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** button for more than 1 second. Typically, if the display has a code beginning with F followed by 2 numbers the ModCon Boiler is locked out. If the display has a 3 letter code it 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 12-1.

### C. BOILER FAULT

1. When a fault condition occurs the controller will illuminate the red "fault" indication light and display a fault code in the format. 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 12-2 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 re-occurrence 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 depend 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 under water. Improper or dangerous operation may result. Contact a qualified service technician to inspect the boiler and to repair or replace any part of the boiler that has been under water prior to placing the boiler back in operation.

#### **CAUTION**

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 proper operation after servicing.

#### **CAUTION**

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

**PART 12: TROUBLESHOOTING (CONTINUED)**

**Table 12-1 : 926 Control Board ERROR Codes**

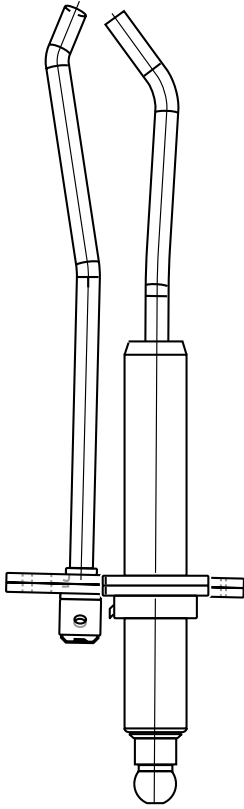
<b>Code</b>	<b>Description</b>	<b>Corrective Action</b>
<b>Fou</b>	Outside sensor shorted or temperature less than -40 Degrees Fahrenheit	Inspect wiring from outside sensor for damage or shorted connections repairing as necessary. Measure resistance of outdoor sensor and compare to resistance chart. If not within range on chart, shorted or open, replace sensor
<b>E19</b>	Line voltage frequency out of range.	Inspect power wiring to boiler and repair as necessary. If connected to line voltage, notify power company. If connected to alternate power source such as generator or inverter make sure line voltage frequency supplied by the device is 60 Hz
<b>HIO</b>	Condensate error.	<ol style="list-style-type: none"> <li>1. Check condensate lines for obstructions</li> <li>2. Check float switch in condensate reservoir.</li> <li>3. Check wiring from condensate reservoir to 926 control and repair as necessary</li> </ol>
<b>Flu</b>	Blocked vent pressure switch	<ol style="list-style-type: none"> <li>1. Assure that the vent is not blocked</li> <li>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 unit WARNING: Do not use jumper to remedy this error. Faulty switch MUST be replaced. Failure to do so could result in serious injury or death.</li> </ol>
<b>LEO</b>	Water level in boiler is low.	<ol style="list-style-type: none"> <li>1. Check boiler feed water system to be sure it is supplying make up water to boiler system.</li> <li>2. Be sure all air is bled from the system.</li> <li>3. Check for leaks in boiler and system piping and repair as necessary.</li> <li>4. Inspect low level switch and wiring for damage and repair as necessary</li> </ol>
<b>LOU</b>	24 volt low	<ol style="list-style-type: none"> <li>1. Check line voltage. Must be between 100-128 volts.</li> <li>2. If available, connect 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.</li> <li>3. Remove 10 pin Molex connector from customer connection board. If LOU code 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 boiler is so equipped, disconnect high gas pressure switch, then low gas pressure switch, then UL 353 low water cut-off in this order one at a time to see if LOU code clears. Replace faulty part. Check low voltage wire harness in boiler for shorts to ground.</li> <li>4. If LOU only occurs when burner tries to light, check gas valve for excessive current draw.</li> <li>5. If LOU is present with the low voltage harness disconnected from the 926 control board, replace the 926 control board.</li> </ol>
<b>EO3</b>	System sensor failure (Cascade Master only)	<ol style="list-style-type: none"> <li>1. Check wiring to system sensor. Repair as necessary</li> <li>2. Check sensor resistance. Compare to the table in Fig. 12-4. Replace if not correct.</li> </ol>
<b>FL</b>	Low water flow	<ol style="list-style-type: none"> <li>1. Check to see if boiler circulator is functioning. Repair as necessary.</li> <li>2. Be sure water is flowing in the system. Check for valves that should be open, plugged filter screens, etc.</li> <li>3. Check flow switch and wiring. Repair as necessary.</li> </ol>

**PART 12: TROUBLESHOOTING (CONTINUED)**

**Table 12-2: 926 Control Board FAULT Codes**

<b>Code</b>	<b>Description</b>	<b>Remedy</b>
<b>F00</b>	High Limit Exceeded.	<ol style="list-style-type: none"> <li>1. Check circulation pump operation</li> <li>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 thermister to the supply thermister.</li> <li>3. Check thermister reading on supply thermister. Replace switch if faulty.</li> <li>4. If this is a new installation, disconnect the two light grey wires from the zone control, and twist the wires together. Depress the S4 reset button. If the fault clears, the problem is outside the boiler</li> <li>5. If this is an existing installation with glycol in it, check the condition of the water pressure switch. It may be necessary to jump out the water pressure switch (temporarily only, as a trouble shooting aid) The 24 VAC signal, may have grounded through the glycol if the water pressure switch is leaking.</li> </ol>
<b>F01</b>	ECO circuit 2 Vent temperature High Gas Pressure (if equipped) Low gas pressure (if equipped) Low Level (if equipped with UL353 LWCO)	<ol style="list-style-type: none"> <li>1. If the boiler is equipped with High and/or Low gas pressure switches, examine the switch(es) to see if the yellow LED is illuminated on the switch. If so, correct the gas supply problem associated with the switch and reset the switch by pressing on the cover of the switch over the red button to reset the switch. Pressing the button requires a firm push. Push the Reset button on the front panel of the boiler to reset the boiler control.</li> <li>2. If the boiler has a UL353 LWCO, check to see if the 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 the LWCO. Press the reset button on the front panel of the boiler to reset the boiler control.</li> <li>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. 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 combustion controls on the boiler. If problem persists, inspect the target wall in the combustion chamber and replace it if cracked or damaged.</li> </ol>
<b>F02</b>	Interrupted or Shorted Supply (Outlet) Thermister.	<ol style="list-style-type: none"> <li>1. Check the electrical connection to the thermister on the outlet manifold. Verify 5 VDC by checking in Molex connector. Verify thermister values by referencing chart in this manual.</li> <li>2. Replace thermister if necessary.</li> </ol>
<b>F03</b>	Interrupted or Shorted Return (Inlet) Thermister.	<ol style="list-style-type: none"> <li>1. Check the electrical connection to the thermister on the inlet manifold. Verify 5 VDC by checking in Molex connector. Verify thermister values by referencing chart in this manual.</li> <li>2. Replace thermister if necessary.</li> </ol>
<b>F05</b>	Supply (Outlet) Temperature exceeds 230°F.	<ol style="list-style-type: none"> <li>1. Check circulation pump operation.</li> <li>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 thermister to the supply thermister.</li> </ol>
<b>F06</b>	Return (Inlet) Temperature Exceeded 230°F.	<ol style="list-style-type: none"> <li>1. Check circulation pump operation.</li> <li>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 thermister to the supply thermister.</li> <li>3. Check direction of flow on boiler circulator. (See Piping Details in this manual.)</li> </ol>
<b>F09</b>	No flame detected – The boiler will make three attempts at ignition before the control goes into this lockout condition.	<ol style="list-style-type: none"> <li>1. Watch the igniter through the observation window provided.</li> <li>2. If there is no spark, check the spark electrode for the proper 1/4" gap. Use 2 quarters together as a gauge to hold ignitor against to check gap distance. (See Fig. 12-3)</li> <li>3. Remove any corrosion from the spark electrode and flame rectifier probe.</li> <li>4. If there is a spark but no flame, check the gas supply to the boiler.</li> <li>5. If there is a flame, check the flame sensor.</li> <li>6. Check any flue blockage or condensate blocks.</li> </ol>
<b>F10</b>	Loss of Flame Signal – The boiler will relight 4 times before the control goes into this lockout condition – Will reset in 1 hour.	<ol style="list-style-type: none"> <li>1. Monitor the gas pressure to the unit while in operation.</li> <li>2. Assure that the flame is stable when lit.</li> <li>3. Check to see if the green light on the display module is out while the boiler is running.</li> <li>4. If the green light doesn't come on or goes off during operation check the flame signal on the status menu.</li> <li>5. If the signal reads less than 1 microampere, clean the flame rectifier probe.</li> <li>6. If the flame rectifier probe continues to read low, replace it.</li> <li>7. Check the stability of the flame rectification signal. If the signal is unstable, you may need to replace the burner gasket.</li> </ol>
<b>F11</b>	False Flame Signal – The boiler will lock out if it senses a flame signal when there should be none present.	<ol style="list-style-type: none"> <li>1. Turn the gas off to the unit at the service valve.</li> <li>2. If the flame signal is still present replace the flame rectification probe.</li> <li>3. If the flame signal is not present after turning off the gas supply, check the gas valve electrical connection.</li> <li>4. Remove the valve and check for obstruction in the valve seat or replace the gas valve.</li> <li>5. Turn the gas on at the service valve after corrective action is taken.</li> <li>6. Check for condensate back up. Condensate back up can damage the refractory wall, and if the wall falls against the rectifier probe, it may conduct the signal to ground, giving a false reading.</li> </ol>
<b>F13</b>	Combustion Fan Speed too low or high – Boiler will lock out if it senses fan speed is less than 70% or greater than 130% of its expected rate for less than 60 seconds.	<ol style="list-style-type: none"> <li>1. Check the combustion air fan wiring. <ol style="list-style-type: none"> <li>1a. Check the 24 VAC signal by measuring from any connected safety to ground. A low voltage situation may cause a "false" error code</li> </ol> </li> <li>2. Replace the combustion air fan.</li> <li>3. Replace the control board.</li> </ol>
<b>F20</b>	Condensate cup is full.	<ol style="list-style-type: none"> <li>1. Check condensate lines for obstructions</li> <li>2. Check float switch in condensate reservoir.</li> <li>3. Check wiring from condensate reservoir to 926 control and repair as necessary</li> </ol>
<b>PP</b>	Parameters Programmed	Press S4 reset for at least 1 second.
<b>F31</b>	Program Parameter Error	Control must be re-programmed. If pgramming does not solve problem, control must be replaced.

**PART 12: TROUBLESHOOTING (CONTINUED)**



**Fig. 12-3**

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

**Fig. 12-4**

System Sensor 7250P-324	
Boiler Sensor (7250P-667)	Indirect 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

**PART 13: MAINTENANCE**

**A. MAINTENANCE PROCEDURES**

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is operating safely and efficiently. The owner should make necessary arrangements with a qualified heating contractor for periodic maintenance of the 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 manual. Failure to do so could result in death or serious injury.

**PART 13: MAINTENANCE (CONTINUED)**

**⚠ 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 (Group1).":

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH website at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining to prevent dust
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

**NIOSH stated First Aid.**

- Eye: Irrigate immediately
- Breathing: Fresh air.

**B. COMBUSTION CHAMBER COIL CLEANING INSTRUCTIONS FOR MOD CON 300/500 ONLY**

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

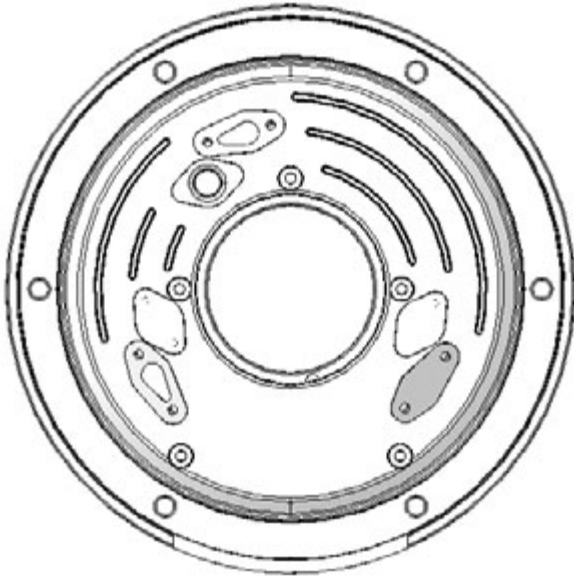
- a nylon, stainless steel or brass brush (not steel)
- "Rydlyme" (recommended for best results) (available on line [www.rydlyme.com](http://www.rydlyme.com)) or "CLR" (available at most hardware stores)
- Gloves, eye protection

1. Shut down the Mod Con 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 Mod Con Boiler side**), so the flow from condensate reservoir can be observed.
  - c. Disconnect electrical connections from the gas valve, spark electrode and flame rectification probe and combustion blower.
  - d. Remove the (4) screws on the aluminum 3/4" NPT connector on the right side of the gas valve.
  - e. Disconnect the wiring connected to the combustion blower motor.
  - f. Remove the (6) 10MM nuts from the burner plate assembly .
  - 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 the recommended product "RYDLYME" or "CLR", spray liberally on the coils, making sure the solution penetrates and funnels down through the condensate system. If the condensate system is blocked, let the chemical penetrate for at least 15 minutes or until it drains.
3. Use the nylon, stainless steel or brass brush (do not use steel) and scrub coils to remove any buildup, then vacuum the debris from the coils. **WARNING:** Follow precautions above
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 clear water runs from the condensate. At this point, the Mod Con should be ready to be re-assembled.
  - a. Inspect gaskets.
  - b. Re-install the burner assembly

**PART 13: MAINTENANCE (CONTINUED)**

- c. Replace and tighten the (6) 10MM nuts to the burner plate using staggered tightening sequence. (See detail)

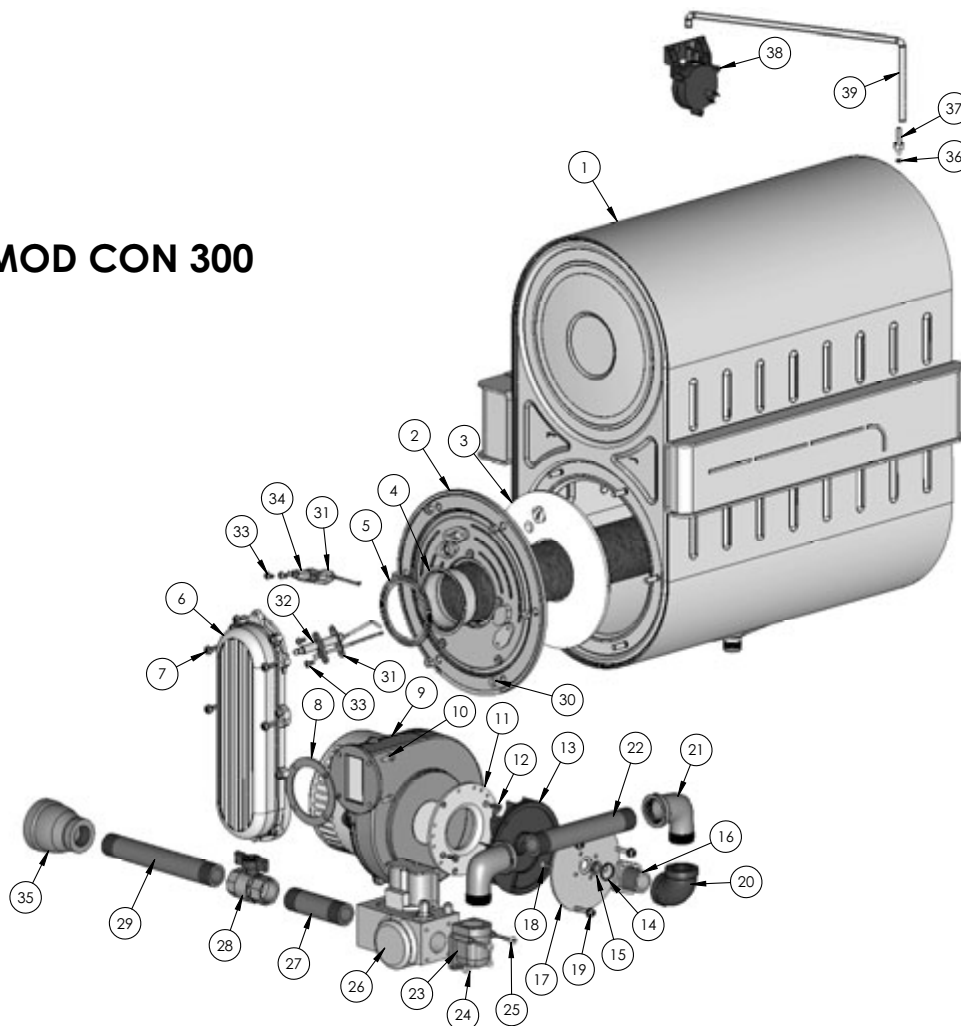


- d. Re-connect all wiring connections
- e. Inspect gas valve to assure O-ring is in place. Replace the (4) screws on the aluminum connector on the gas valve. Turn the gas back on. **(IMPORTANT: CHECK FOR GAS LEAKS)**
- g. Turn the Mod Con Boiler power back on and create a demand on the boiler. When 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.



## PART 13: MAINTENANCE (CONTINUED)

### MOD CON 300



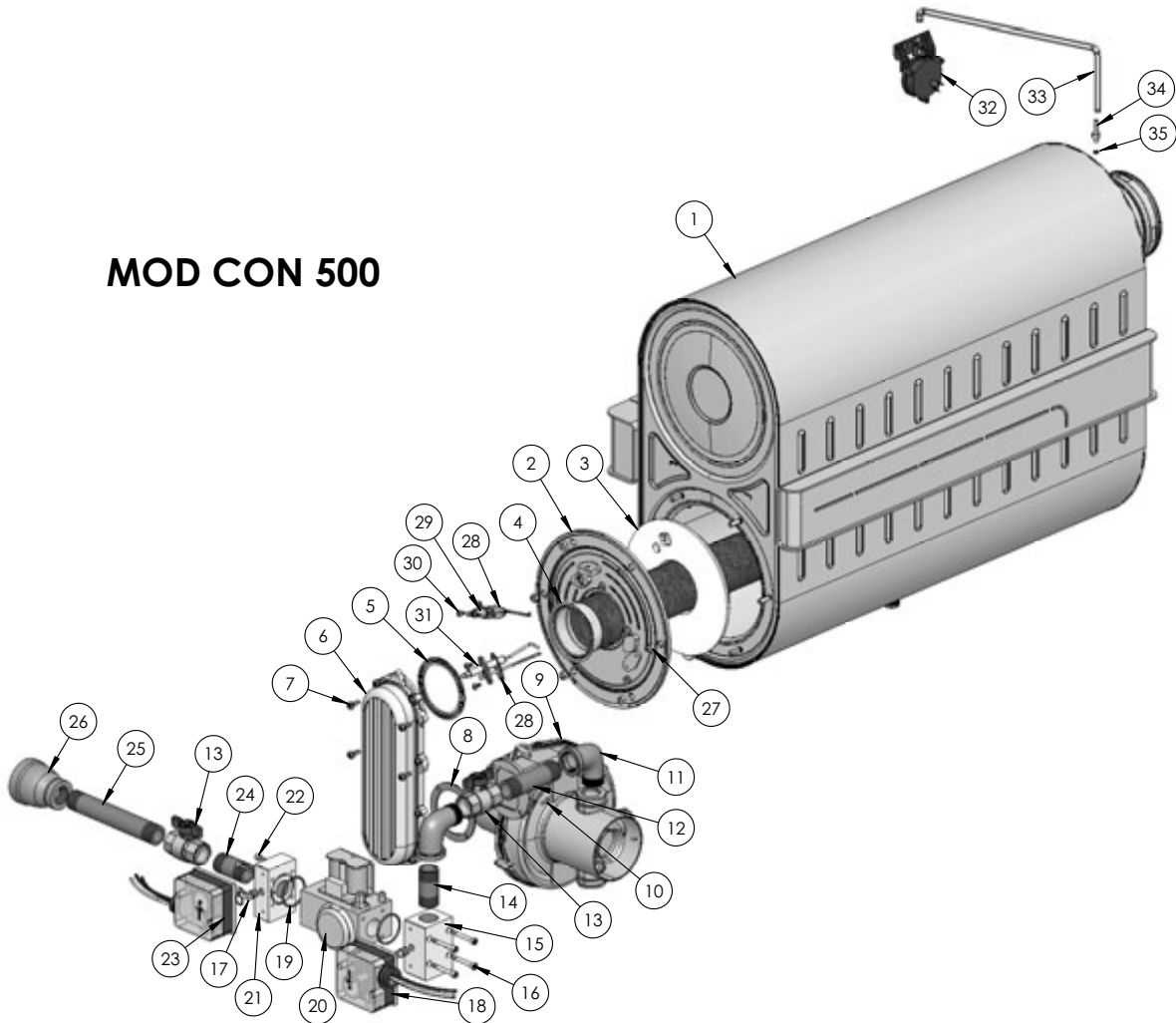
Item No	Replacement Part #	Description
1	7350P-005	300,000 BTU MOD CON MODULE
2	7350P-016	BURNER DOOR
3	7350P-018	BURNER DOOR REFRACTORY
4	7350P-031	BURNER
5	7500P-074	GASKET - BURNER
6	7250P-687	AIR CHANNEL
7	7250P-206	M5 X 14MM TORX SCREWS - AIR CHANNEL
8	7500P-075	GASKET - AIR CHANNEL/BLOWER
9	7250P-727	COMBUSTION BLOWER
10	7350P-119	M5 X 12MM HEX CAP SCREW - BLOWER
11	7250P-711	FAN ADAPTER PLATE
12	7500P-105	M4 X 12MM FLAT HEAD SCREW
13	7250P-712	SWIRL PLATE 16MM
14	7350P-121-3	GAS INJECTOR PLATE O-RING
15	7350P-121-4	GAS INJECTOR
16	7350P-121-1	3/4" NPT ADAPTER
17	7350P-121-1	GAS INJECTOR PLATE
18	7350P-121-5	M4 X 10MM FLAT HEAD SLOTTED SCREW

Item No	Replacement Part #	Description
19	N/A	M4 X 29MM SCREW
20	7350P-083	ELBOW, BLK, 3/4" NPT, SCH40, 90 DEG
21	7350P-084	3/4" X 3/4" NPT STREET ELBOW
22	7350P-118	3/4" NPT X 6" NIPPLE - PHOSPHATE COATED
23	7250P-723	3/4" RIGHT ANGLE CONNECTOR
24	N/A	M5 X 12MM SOCKET HEAD SCREW
25	N/A	M5 X 25MM SOCKET HEAD SCREW
26	7350P-121	GAS VALVE
27	7350P-080	3/4" NPT X 3" NIPPLE - PHOSPHATE COATED
28	7350P-079	3/4" GAS BALL VALVE
29	7350P-074	3/4" NPT X 7" NIPPLE - PHOSPHATE COATED
30	7500P-067	M6 NUT - BURNER DOOR
31	7250P-005	GASKET - PROBE/ELECTRODE
32	7350P-020	SPARK ELECTRODE (w/GASKET)
33	7250P-069	M4 X 8MM S.S. SCREW - PROBE/ELECTRODE
34	7350P-022	FLAME RECTIFICATION PROBE (w/GASKET)
35	7350P-122	3/4" X 1-1/4" NPT REDUCING COUPLING BLK. IRON
36	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING
37	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32
38	7250P-150	BLOCKED VENT PRESSURE SWITCH
39	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12"

Fig. 13-1

**PART 13: MAINTENANCE (CONTINUED)**

**MOD CON 500**



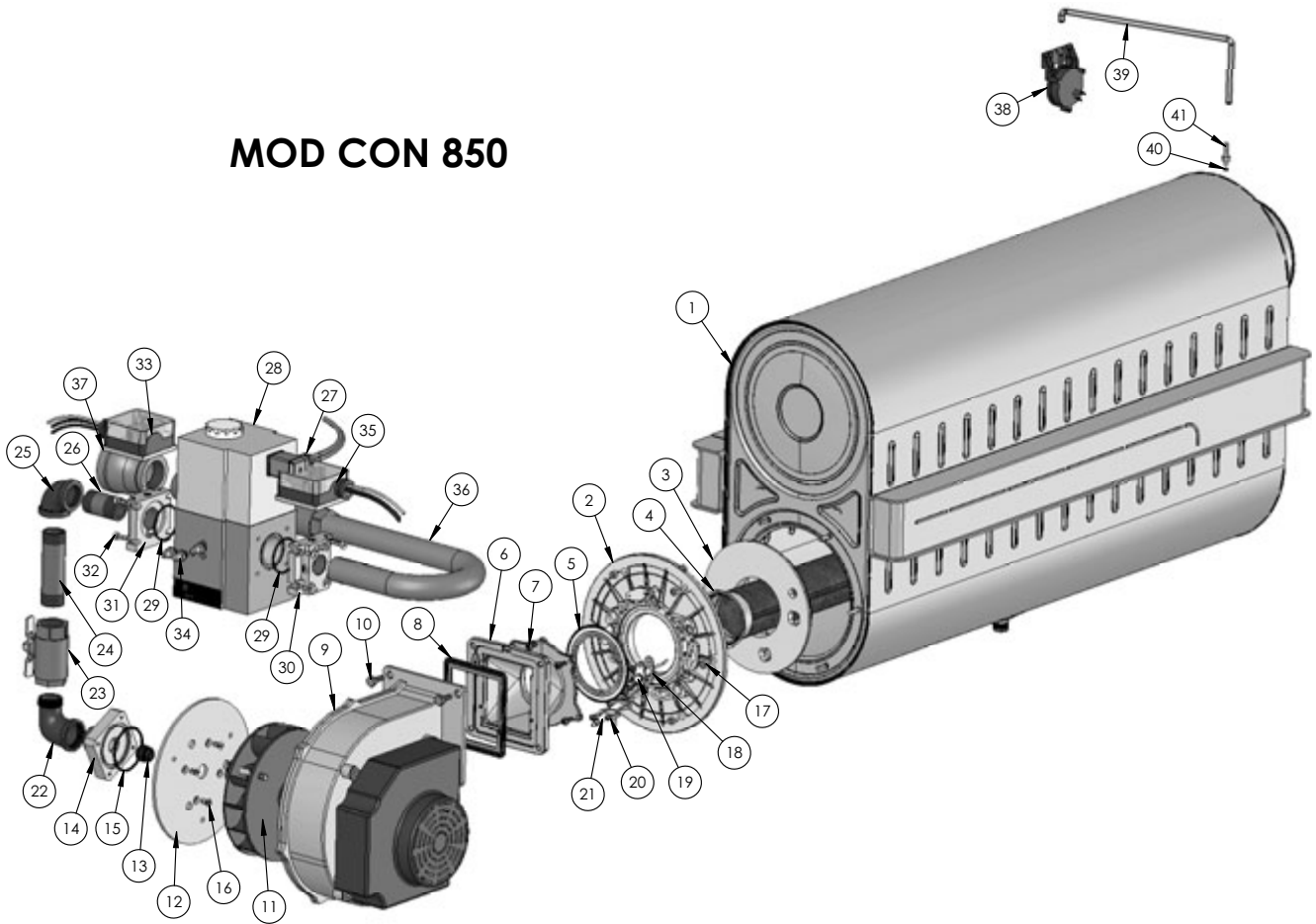
Item No	Replacement Part #	Description
1	7350P-006	500,000 BTU MOD CON MODULE
2	7350P-016	BURNER DOOR
3	7350P-018	BURNER DOOR REFRACTORY
4	7350P-031	BURNER
5	7500P-074	GASKET - BURNER
6	7250P-687	AIR CHANNEL
7	7250P-206	M5 X 14MM TORX SCREWS - AIR CHANNEL
8	7500P-075	GASKET - AIR CHANNEL/BLOWER
9	7350P-032	COMBUSTION BLOWER
10	7250P-478	M5 X 12MM SOCKET CAP SCREW - BLOWER
11	7350P-084	3/4" x 3/4" NPT STREET ELBOW
12	7350P-080	3/4" NPT X 3" NIPPLE - PHOSPHATE COATED
13	7350P-079	3/4" GAS BALL VALVE
14	7350P-102	3/4"NPT x 2" NIPPLE - PHOSPHATE COATED
15	7350P-091	GAS VALVE ADAPTER BLOCK - RIGHT
16	7350P-111	10-32 X 1-1/2" SS SOCKET CAP SCREW - ADAPTER BLOCK RIGHT
17	7350P-078	1/8-27" NPT PLUG - FLANGES
18	7350P-035	HIGH GAS PRESSURE SWITCH (w/O-RING) (OPTIONAL)

Item No	Replacement Part #	Description
19	7350P-077	SILICONE O-RING #127 - ADAPTER BLOCK TO GAS VALVE
20	7350P-033	GAS VALVE (w/O-RINGS)
21	7350P-075	ADAPTER BLOCK - LEFT
22	7250P-061	M5 X 25MM S.S. SOCKET CAP SCREWS - ADAPTER BLOCK LEFT
23	7350P-036	LOW GAS PRESSURE SWITCH (w/O-RING) (OPTIONAL)
24	7350P-102	3/4"NPT x 2" NIPPLE - PHOSPHATE COATED
25	7350P-118	3/4" NPT X 6" NIPPLE - PHOSPHATE COATED
26	7350P-110	3/4" X 1-1/2" NPT REDUCING COUPLING BLK. IRON
27	7500P-067	M6 NUT - BURNER DOOR
28	7250P-005	GASKET - PROBE/ELECTRODE
29	7350P-022	FLAME RECTIFICATION PROBE (w/GASKET)
30	7250P-069	M4 X 8MM S.S. SCREW - PROBE/ELECTRODE
31	7350P-020	SPARK ELECTRODE (w/GASKET)
32	7250P-150	BLOCKED VENT PRESSURE SWITCH
33	7000P-805	PLASTIC TUBING 3/16" ID X 5/16" OD X 12"
34	7250P-154	S.S. BARBED FITTING 1/4 HOSE X 10-32
35	7250P-152	SILICONE O-RING 2-007 - BARBED FITTING

**Fig. 13-2**

**PART 13: MAINTENANCE (CONTINUED)**

**MOD CON 850**



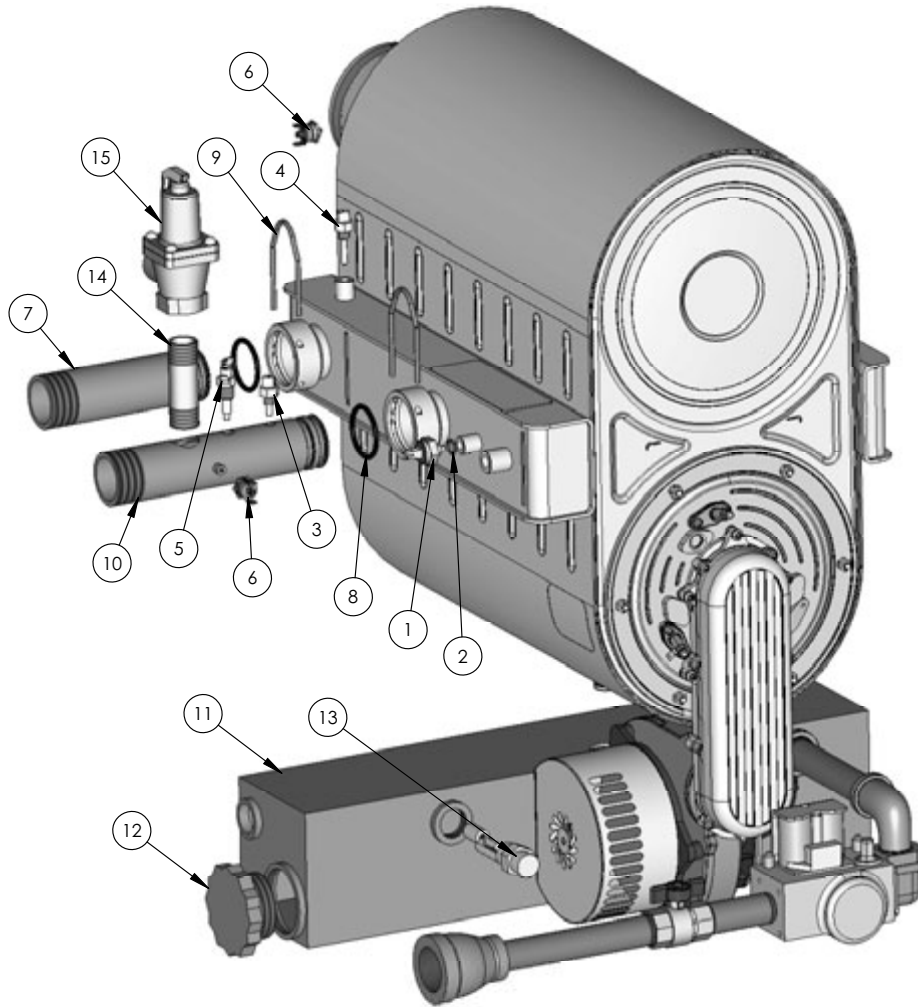
Item No	Replacement Part #	Description
1	7350P-007	850,000 BTU MOD CON MODULE
2	7350P-017	BURNER DOOR
3	7350P-019	BURNER DOOR REFRACTORY
4	7350P-037	BURNER
5	7350P-028	GASKET - BURNER
6	7350P-029	AIR/GAS CHANNEL - CONICAL
7	7350P-030	SCREW - AIR CHANNEL TO BURNER DOOR
8	7350P-064	INTERFACE GASKET - AIR CHANNEL/BLOWER
9	7350P-038	COMBUSTION BLOWER
10	7350P-093	M8 X 20MM HEX HEAD BOLT - BLOWER
11	7350P-034-1	SWIRL PLATE (includes item #12)
12	N/A	MOUNTING PLATE
13	7350P-034-4	12MM GAS INJECTOR
14	7350P-034-2	BLOWER ADAPTER FLANGE (includes items #15 & 16)
15	N/A	O-RING - BLOWER ADAPTER FLANGE
16	N/A	M6 X 25MM FLAT HEAD SCREW - ADAPTER FLANGE
17	7500P-067	M6 NUT - BURNER DOOR
18	7250P-005	GASKET - PROBE/ELECTRODE
19	7350P-023	FLAME RECTIFICATION PROBE (includes item #18)
20	7250P-069	M4 X 8MM S.S. SCREW - PROBE/ELECTRODE

Item No	Replacement Part #	Description
21	7350P-021	SPARK ELECTRODE (includes item #18)
22	7350P-096	1" X 1" STREET ELBOW - SCH. 40
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 2" NIPPLE - PHOSPHATE COATED
27	7350P-034-8	HIRSCHMAN CONNECTOR
28	7350P-034	GAS VALVE (includes items #29 & 31)
29	N/A	O-RING - FLANGE
30	7350P-034-5	1" NPT FLANGE
31	7350P-034-3	MAXIMUM FLOW RESTRICTOR FLANGE
32	N/A	M6 X 25MM SCREWS - FLANGE
33	7350P-035	HIGH GAS PRESSURE SWITCH (w/O-RING) (OPTIONAL)
34	7350P-034-6	AIR ADJUSTMENT PORT
35	7350P-036	LOW GAS PRESSURE 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

**Fig. 13-3**

LP-205-S  
REV. 5/12/08

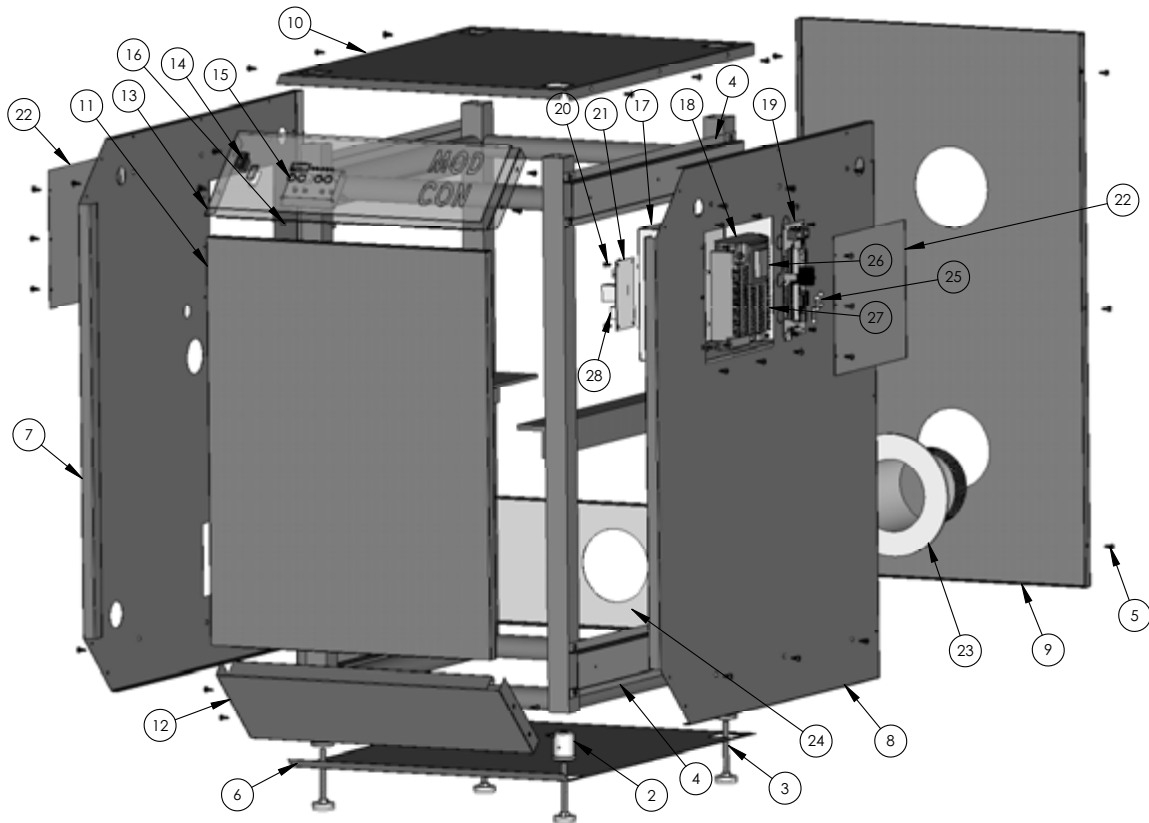
**PART 13: MAINTENANCE (CONTINUED)**



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 - SYSTEM RETURN
5	7350P-089	7350P-089	7350P-089	LOW WATER CUT-OFF PROBE
6	7500P-002	7500P-002	7500P-002	ECO FLUE SENSOR
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	7350P-112	7350P-112	7350P-112	CONDENSATE COLLECTOR
12	7350P-113	7350P-113	7350P-113	2" PVC PLUG
13	7500P-041	7500P-041	7500P-041	CONDENSATE OVERFLOW SWITCH
14	SN1018	SN1018	SN1018	3/4" NPT X 3" NIPPLE - BRASS
15	7350P-065	7350P-065	7350P-065	150# RELIEF VALVE - 3/4" NPT

**Fig. 13-4**

**PART 13: MAINTENANCE (CONTINUED)**



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 FOOT
4	7350P-067	7250P-068	7250P-069	JACKET MOUNTING BRACKET
5	7350P-063	7350P-063	7350P-063	# 10 x 1/2" PH THREAD CUTTING SCREW - JACKET
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	DISPLAY PANEL w/RIBBON CABLE
16	7250P-644	7250P-644	7250P-644	8-32 X 3/8" PAN HD PHILLIPS SCREW - DISPLAY PANEL
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-650	7250P-650	7250P-650	8-32 X 3/8" PAN HEAD SCREW - CONTROL BOARDS
21	N/A	N/A	7250P-580	RELAY BOARD (850 ONLY)
22	7350P-062	7350P-062	7350P-062	ELECTRICAL BOX/ACCESS PANEL COVER
23	7350P-085	7350P-085	7250P-086	GALVANIZED PRESS ON DUCT
24	7350P-103	7350P-103	7350P-104	PRESS ON DUCT SUPPORT
25	7350P-129	7350P-129	7350P-129	FUSE - 3.15 AMPS
26	7350P-025	7350P-026	7350P-043	120V WIRING HARNESS (LOCATION)
27	7350P-024	7350P-044	7350P-045	LOW VOLTAGE WIRING HARNESS (LOCATION)
28	7350P-105	7350P-105	7350P-105	COMBUSTION BLOWER WIRING HARNESS (LOCATION)

**Fig. 13-5**



### BOILER INSPECTION AND MAINTENANCE SCHEDULE

Inspection Activities	Date last completed			
	1st Year	2nd Year	3rd Year	4th Year*
<b>Piping</b>				
Near Heater Piping				
Vent				
Gas				
<b>System</b>				
Visual				
Functional				
Temperatures				
Temperatures				
<b>Electrical</b>				
Connections				
Circuit breakers				
Switch and Plug				
Smoke and CO detector				
<b>Chamber and Burner</b>				
Combustion Chamber				
Combustion Chamber				
Spark Electrode				
Flame Probe				

\* NOTE : CONTINUE MAINTENANCE BEYOND THE 4TH YEAR IS REQUIRED ON A YEARLY BASIS.

### BOILER INSPECTION AND MAINTENANCE SCHEDULE (CONTINUED)

Inspection Activities	Date last completed			
	1st Year	2 Year	3 Year	4 Year*
<b>Condensate</b>				
Condensate Neutralizer				
Condensate System				
<b>Gas</b>				
Pressure				
Pressure Drop				
Check gas pipe for leaks				
<b>Combustion</b>				
Check CO/CO2 Levels				
<b>Safeties</b>				
ECO (Energy Cut Out)				
Thermistors				
<b>Final Inspection</b>				
Check List				
Homeowner				
Tech Sign Off	INIT	INIT	INIT	INIT

\* NOTE : CONTINUE MAINTENANCE BEYOND THE 4TH YEAR IS REQUIRED ON A YEARLY BASIS.



## **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.





© 2008 Heat Transfer Products, Inc.  
[www.HTproducts.com](http://www.HTproducts.com)

**LP-205 REV. 5/16/08**