

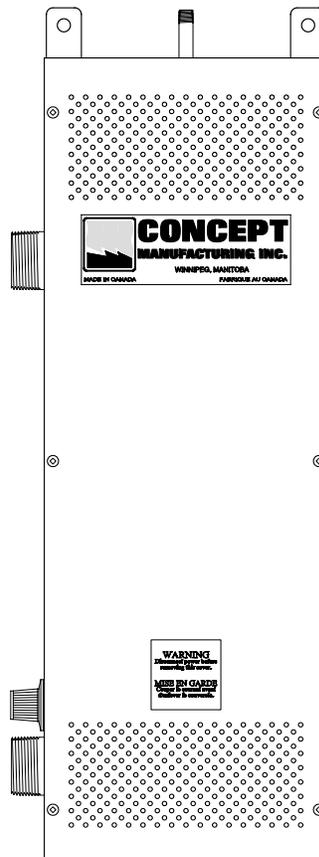


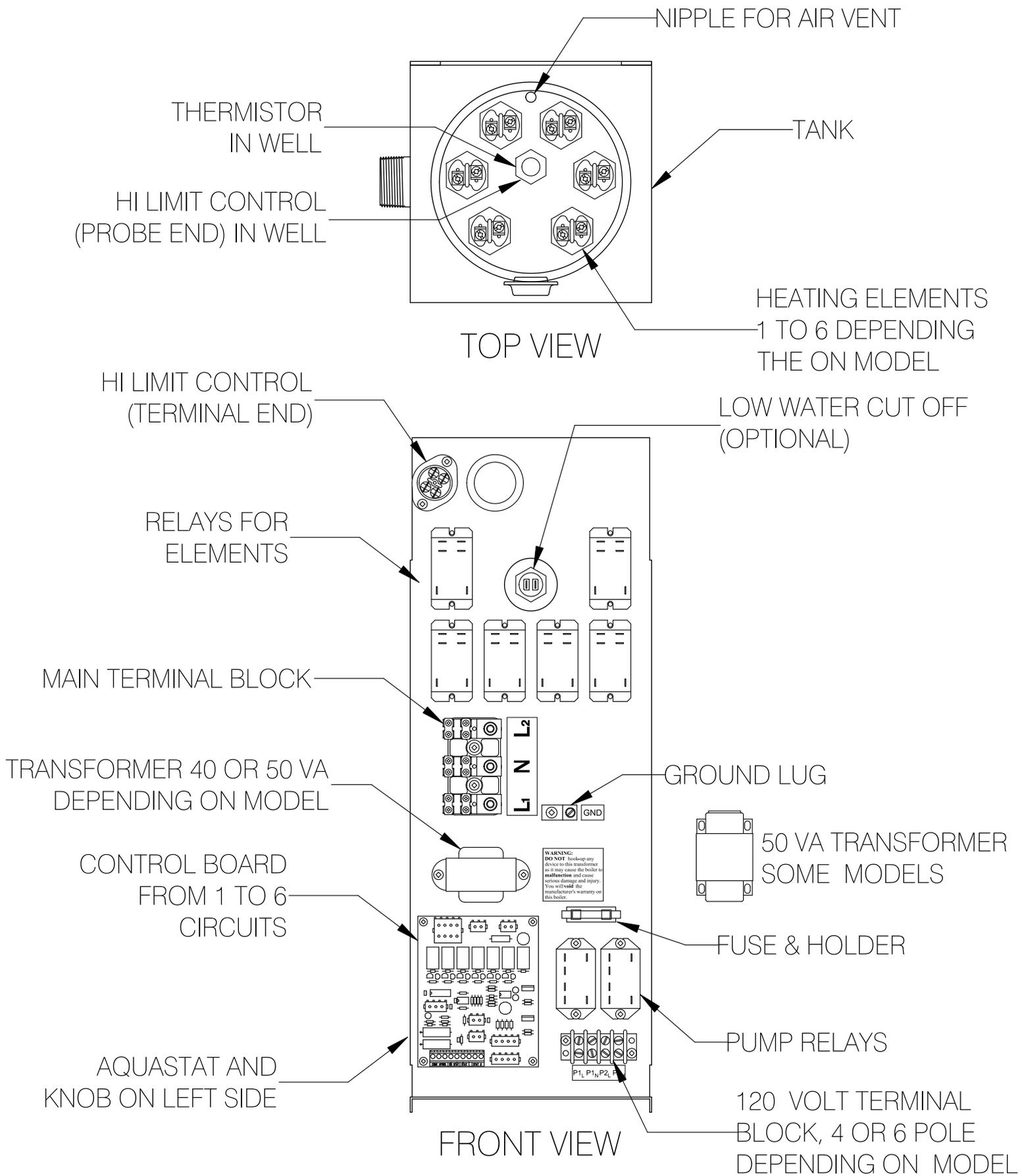
Warning: Use only water or an appropriate antifreeze. Do not use any other liquids especially methanol, automotive antifreeze or any kind of oil. Do not exceed 50% antifreeze.

LION

BOILERS™

CEBR2 Series Boiler Installation Manual





PARTS LAYOUT

Before You Begin

Please read this manual thoroughly before you begin. If you encounter problems please see the troubleshooting section near the end of this manual. This boiler should only be installed and tested by qualified personnel with experience in hydronic heating systems, and electrical installations. This boiler should not be modified or altered in any manner. Any modification or alteration may cause the boiler to malfunction and cause serious damage and injury, and will void the manufacturers warranty.

The installation of this boiler must comply with all local regulations and codes. Verify the “Name Plate” rating to properly size conductors, and overcurrent protection.

- (1) Before installation, ensure that the local electrical inspection authority will accept connection of this boiler to the existing panel.
- (2) This boiler may only be installed and tested by qualified personnel.
- (3) The electrical power supply should be checked for adequacy for the additional load of the boiler. 240 volt models require connection of 240 volt single phase power to terminals L1 and L2, and connection of a neutral conductor to the N terminal (see Fig. 4). Three phase models require connection of three phase power of the correct voltage to the L1, L2, and L3 terminals, and a 120 volt 15 amp supply to the terminals SL and SN (see Fig. 5).

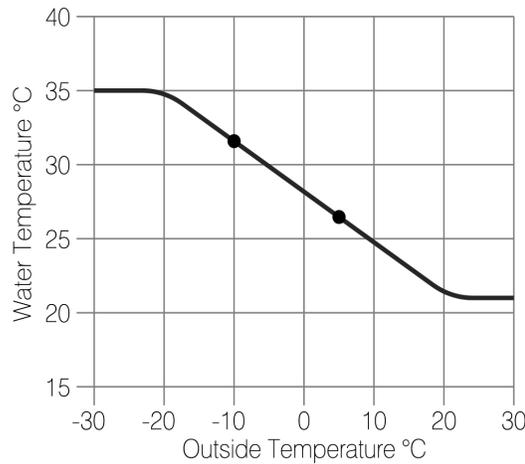
Introduction

Your Electric Boiler has been designed to exacting specifications to provide controlled efficient heating and maximum service life. The boiler is controlled internally by an electronic control board. The boiler is energized when one of the external thermostat wired to the control board calls for heat. The circulation pump is started first to provide flow through the heating system, then the heating elements are staged on as required. A temperature sensor mounted in the tank monitors the water temperature, and the internal control board maintains the temperature of the water exiting the boiler by staging the elements on or off as required. This is know as modulating. The temperature is set by the aquastat control on the side of the boiler. The modulating control strategy built into the control board uses only the minimum number of elements necessary to maintain the desired temperature, resulting in maximum comfort.

Outdoor Reset Control

This model also has Outdoor Reset control. An outdoor temperature sensor is used to monitor the outside temperature. The electronic controls then regulate the water temperature based on both the aquastat setting and the outside temperature to fine tune the boilers heat output. As the temperature outside increases, the boiler control will decrease the target water temperature set on the aquastat. By modulating the boilers heat output based on both the indoor and outdoor temperature, your CEBR2 model provides you with the ultimate in indoor comfort.

The graph below is an example with the aquastat set to 35° C. During colder weather, below -20° C, the boiler will maintain the heat output at the aquastat setting, but as the temperature increases outdoors, the heat output of the boiler will be decreased. For example when it is -10° C outside the water temperature will be 32° C, and when it is 5° C outside the water temperature will be 27° C.



Target Water Temperature Example (Temperature in degrees C)

Dual Thermostat Inputs, two Operating Modes

Dual thermostat inputs allow for two boiler operating modes. These two operating modes are “normal” and “priority”. The two thermostat inputs allow for one normally operating thermostat input for “normal” space heating demands, and a second “priority” thermostat input operating at a higher temperature, for temporary demand in a zone requiring a higher temperature. Thermostat 1, is for normal space heating, the water temperature is controlled by the boiler to the setting of the aquastat. Thermostat 2, the priority thermostat puts the boiler in it's high temperature mode, the water temperature is controlled by the boiler to a setting of 180°F.

Specifications

Model	kW	Volts	Phase	Amps	Minimum Breaker Size	Wire Size (Amps)
CEBR2-3	3	240	1	12.5	20	16
CEBR2-5	5	240	1	20.8	30	24
CEBR2-6	6	240	1	25.0	40	32
CEBR2-8	8	240	1	33.3	50	40
CEBR2-9	9	240	1	37.5	50	40
CEBR2-10	10	240	1	41.7	60	48
CEBR2-12	12	240	1	50.0	70	56
CEBR2-15	15	240	1	62.5	100	80
CEBR2-18	18	240	1	75.0	100	80
CEBR2-19	19	240	1	79.2	100	80
CEBR2-20	20	240	1	83.3	125	100
CEBR2-23	23	240	1	95.8	125	100
CEBR2-24	24	240	1	100.0	125	100
CEBR2-25	25	240	1	104.2	150	120
CEBR2-28	28	240	1	116.7	150	120
CEBR2-208-9	9	208	3	25.0	40	32
CEBR2-208-11	11.25	208	3	31.2	40	32
CEBR2-208-15	14.7	208	3	40.8	60	48
CEBR2-208-22	22.5	208	3	62.5	100	80
CEBR2-208-30	29.4	208	3	81.6	125	100
CEBR2-600-9	9	600	3	8.7	15	12
CEBR2-600-15	14.7	600	3	14.1	20	16
CEBR2-600-18	18	600	3	17.3	30	24
CEBR2-600-24	23.7	600	3	22.8	30	24
CEBR2-600-30	29.4	600	3	28.3	40	32

Control Voltage 24 Volts AC

Tank Capacity – Approx. 2 Gallons

Shipping Weight – about 85 pounds

Inlet and Outlet pipe size 1 1/4” NPT

Pump Switch Rating, 120 Volt, 1 HP

Maximum Recommended Operating Temperature 180° F

In Floor heating temperatures are generally 90° F to 110° F

Baseboard and Radiator temperatures are generally 160° F to 180° F

Recommended Operating Pressure 12 PSI

Warning: The control transformer is sized to power only the internal controls. External devices must be powered from a separate power source.

New Boiler Inspection

All Boilers are inspected and tested at the factory prior to shipment. On receipt of your new boiler, be sure to check for any damage that may have occurred during shipping. Any such damage should be reported to the carrier immediately.

Never install a damaged boiler.

Unpacking

The Boiler is shipped to you in one carton, which contains the boiler, a pressure & temperature gauge, pressure relief valve, air vent, outdoor temperature sensor, and fittings.

System Design

For proper operation of the heating system; the boiler, the radiation system, and maximum heat loss of the building must be considered. The boiler selected should provide between 110% and 130% of the maximum design heat loss of the building. The radiation system should be designed to properly dissipate the heating capacity of the boiler at the radiation system design temperature.

The recommended cold fill pressure of the system is 12 psi; this pressure should leave at least 4 psi at the highest point in the heating system. Pressure will decrease at a rate of 0.433 psi per foot above the fill point. An expansion tank must be included to allow for approximately 4% expansion of the water in the entire heating system. As the water in the system is heated the pressure will increase, but a properly sized expansion tank will prevent the pressure from exceeding the recommended operating pressure.

The radiators or floor system should be designed with parallel loops. If too many radiators or floor loops are connected in series, the accumulated heat loss may cause uneven heating. The minimum recommended flow rate must be used, but higher flow rates may give more even heating. If a number of parallel heating circuits are used, valves are usually required to balance the flow in each circuit to provide uniform heating.

A zoned heating system is also possible with separate heating zones and individual thermostats in each zone. Individual thermostats in each zone can control a zone valve, or a circulation pump providing flow to that zone. End switches on the zone valves can be wired in parallel to the thermostat connection of the boiler.

The entire heating system must comply with all local codes or regulations.

Installation

Location

- (1) The site selected for installation of your boiler should leave at least 24" of clear space in front of the unit. The sides require only enough room for plumbing and electrical connections (see Fig. 2). The rear of the unit is considered as a "Zero Clearance" face (see Fig. 2). If wall mounting is chosen ensure that the wall can withstand the weight of the unit including water (approximately 115 lbs.). Two brackets are provided on top and are drilled for 3/8" bolts or screws, these are for wall mounting. Optional "Mounting Feet" are available for floor mounting. Holes are also provided in these feet for floor mounting.
- (1) To install the optional feet, the two outside #10 screws at the bottom on each side are removed. Each of the feet are then lined up with the holes, then the screws are tightened back in place holding the feet in place.
- (2) The space selected should be well ventilated and kept normally below 77° F or 25° C. It must be clean, and dry. The boiler must not be subjected to water leakage, drips, splashes, or spray. Flammable materials must not be used or stored anywhere near the boiler.
- (3) Though the unit is suitable for floor or wall mount, only faces indicated as "Zero Clearance" may be mounted against combustible surfaces.
- (4) Units must be mounted straight as shown in Fig. 2 with the outlet at the top, and the inlet on the bottom. See "Up Arrow" on label on side of boiler.
- (5) The circulation pumps should be connected to the outlet side of the boiler (see Fig. 3).

Mechanical Installation

- (1) Refer to Fig. 3 for a typical system before installation.
- (2) Packed with your boiler are the following.
 - a) Temperature & Pressure Gauge
 - b) Pressure Relief Valve
 - c) Air Vent
 - d) Outdoor Temperature Sensor
 - e) Necessary fittings.
- (3) Mount unit as per instructions under "Location"
- (4) Install Pressure Relief Valve and Pressure & Temperature Gauge. These must be connected directly to the boiler as shown in Fig. 1
- (5) A discharge line must be attached to the outlet of the pressure relief valve. The discharge line will direct water or steam from the pressure relief valve should it open. The discharge line must be as short as possible, not have any valves or restrictions, not be smaller than the outlet of the pressure relief valve, slope downwards, and the end must be open to the atmosphere. The discharge line should terminate at a drain 6 inches above the floor level.
- (6) Install inlet and outlet piping.

- (7) An expansion tank must be installed (see Fig. 3) to allow for water expansion as the system is heated.

Dissimilar Metals

Do not connect dissimilar metals on the inlet and outlet nipples. Dielectric Unions should be used. Another solution is to use brass or cast iron fittings between the boiler and any copper fittings that you may be using. Failure to do so will result in galvanic corrosion and cause the inlet and/or outlet nipples to fail over time.

This is not covered under the warranty.

Pump Installation

The circulation pumps should be positioned as close to the boiler as possible, with the delivery arranged to pump out of the tank outlet on the upper left side of the boiler (see Fig. 3).

The pumps are powered by the boiler through the terminals P1L P1N and P2L P2N located on the 120 volt terminal block (lower right terminal block see Fig. 4 and Fig. 5). The pumps start when the corresponding thermostat terminals on the control board are closed, and stop when these terminals are opened. Thermostat 1 terminals “STAT 1” controls pump 1, and thermostat 2 terminals “STAT 2” control pump 2 (the priority terminals).

Thermostat Connections

The thermostat connections are 24 volt AC. **Only connect the thermostats after all other work is complete, and the entire heating system is thoroughly purged of air.** The thermostats are connected to the terminals “STAT 1” and “STAT 2” on the control circuit board (see Fig. 4 and Fig. 5). **STAT 1 is for normal space heating. STAT 2 is the priority high temperature thermostat. As STAT 2 is the priority thermostat, it will override STAT 1. When in the priority high temperature mode, Pump 1 will be switched off even if thermostat 1 is calling for heat.** This prevents the higher temperature water from being circulated through the normal lower temperature heating zone.

In zoned systems, the end switches of all the zone valves may be connected in parallel and hooked up to the “STAT 1” connection on the control board. For a typical system (see Fig. 6).

Thermostats described as “Power Stealing” or as “Parasitic Thermostats” must not be used.

Thermostat Anticipators

The thermostat anticipator setting recommended is 0.2 amps. Failure to correctly adjust this setting may result in unsatisfactory comfort conditions, and could result in damage to the thermostat.

This setting may have to be adjusted slightly to ideally match the boiler control system to the thermostat, as well as overcome the normal inertia of the radiation system. A setting to low will be characterized by a short cycle, which does not allow the room temperature to be satisfied before the boiler shuts down. A setting too high will be characterized by a long cycle, which allows the room temperature to rise too high before the boiler shuts down. Adjustments should be made to the setting, if required, but should not exceed 0.1 amps per adjustment.

Newer electronic thermostats typically have provisions for the cycle length, and type of heating system. The instructions for the thermostat should be followed.

In zoned systems where the thermostat is controlling a zone valve, or circulation pump and not the boiler, the anticipator should be set to match the current draw of the zone valve being used.

Temperature Control Setting (Aquastat)

The boiler has a temperature control knob known as an aquastat on the left hand side. This sets the maximum temperature that the boiler will operate at while in the normal mode. The internal control system monitors the water temperature in the tank and modulates the heating elements to maintain the desired water temperature. Note that the setting on the knob only sets the maximum temperature, it is normal for the boiler to operate at lower temperatures than this setting at times, this is especially true in the spring and fall when it is not so cold outside. The actual temperature setting will be determined by the type of heating system the boiler is installed in. While in priority mode the aquastat setting is overridden as the boiler goes to it's high temperature operation, the water temperature is controlled to 180°F .

Outdoor Temperature Sensor Connection

The outdoor temperature sensor should be mounted in a suitable location outside the building where it will be exposed to the outside air. Mount the sensor high enough so it will not be covered by snow or ice, and in a location where it will not be exposed to direct sunlight.

The outdoor temperature sensor is connected to the terminals "OD STAT" on the control circuit board (see Fig. 4 and Fig. 5).

Start Up

A new system must be thoroughly cleaned, flushed and drained, then refilled with clean water. Foreign material circulating through the system could be detrimental to the pump and to the heat transfer efficiency of the system and may lead to future problems. **The system must be thoroughly purged of air before it is energized for the first time. Elements will burn out if the boiler is not full of water when the boiler is turned on. Do not connect the thermostat wires until the entire system is full of water, and thoroughly purged of air.**

The automatic air vent is to assist in removing air from the top of the tank to prevent elements from burning out. It alone is not sufficient in removing air from the entire heating system. **Additional air vents must be installed throughout the system to eliminate any air that may enter the system.**

Check List

- (1) Plumbing complete.
- (2) System flushed.
- (3) System free of air (purged).
- (4) Pumps rotates freely.
- (5) Thermostats connected.
- (6) Thermostat anticipators set.
- (7) Outdoor Sensor connected.
- (8) Electrical supply connections complete.

Maintenance

At the start of each heating season it is advisable to have a qualified technician check and inspect the boiler and the heating system for proper operation.

Troubleshooting Guide

Problem	Correction
Boiler not heating, water cool.	Check power supply, fuses or breakers. Check thermostat setting. Check temperature control on side of boiler.
Boiler heating pipes cool.	Check for air in system. Check pump circulation. Check all valves. Check for flow stoppage, or air locks.
Boiler rapid cycles.	Check anticipator setting. Check pump circulation.
Boiler operates continuously.	Check anticipator setting.
Boiler noisy.	Oversized pump. Flow rate too high. Flow rate too low. Pump location incorrect.
Boiler not heating enough	Insufficient capacity. Burnt Elements. Flow rate too low.
Pressure too high.	Defective expansion tank. Defective automatic fill valve. Expansion tank too small.
Safety relief valve dripping.	Check expansion tank. Flush relief valve.

See the troubleshooting step by step procedure at the end of this manual for additional information.

Concept Manufacturing Inc. Limited Warranty

Concept Manufacturing Inc. (the "Manufacturer") warrants its Hydronic Boiler (the "Boiler") to be free from defects in material and workmanship under normal use and maintenance for a period of two (2) years from the date of original installation. The Manufacturer further warrants the tank to be free from defects in material and workmanship under normal use and maintenance for an additional eight (8) years for a total of ten (10) years from the date of original installation.

If any part of the Boiler is found by the Manufacturer, as sole judge, to be defective in material or workmanship, the Manufacturer, at its sole discretion, agrees to:

- (i) Repair any defect;
- (ii) replace any defective Boiler; or
- (iii) refund the original purchase price of the Boiler.

The Manufacturer, at its sole discretion, reserves the right, at any time during the warranty period, to refund the original purchase price to the current owner of the Boiler regardless of any prior attempt by the Manufacturer to repair or replace that Boiler.

The obligation of the Manufacturer to repair, replace or refund the purchase price exists provided the defective part or complete unit is returned to the Manufacturer. ANY AND ALL TRANSPORTATION COSTS WILL BE BORNE BY THE PURCHASER.

Repair, replacement or refund of any defective part or unit shall be considered as complete fulfillment of this warranty.

THIS WARRANTY DOES NOT APPLY TO:

1. Labor or other costs incurred for diagnosing, repairing, removing, installing, reinstalling, shipping, servicing or handling of any defective part or complete unit;
2. Costs incurred for normal maintenance;
3. The workmanship of any installer of the Boiler. In addition, this warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation;
4. Damage or repair as a consequence of storage and handling, improper or careless installation, improper maintenance, or misuse or neglect as determined by the Manufacturer as sole judge;
5. Damage as a consequence of misapplication, abuse, improper servicing, unauthorized alteration, improper operation or usage contrary to the Manufacturer's direction, design or specifications, as to any and all of which the Manufacturer shall be the sole judge;

6. Damage as a consequence of electrical surges, inadequacy or interruption of electrical services or corrosion, whether caused by chemicals or the environment;
7. Damages as a consequence of floods, winds, fires, lightning, freezing conditions or other conditions beyond the control of the Manufacturer.

LIMITATION OF WARRANTY

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED, AND ALL SUCH OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS LIMITED WARRANTY.

THE MANUFACTURER'S LIABILITY ON ANY CLAIM OF ANY KIND, INCLUDING NEGLIGENCE, WITH RESPECT TO THE GOODS OR SERVICES COVERED HEREUNDER, SHALL IN NO WAY EXCEED THE PURCHASE PRICE OF THE BOILER, OR PART THEREOF, WHICH GIVES RISE TO THE CLAIM. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, OR ANY DAMAGES IN THE NATURE OF PENALTIES. ALL WORK UNDER THE TERMS OF THIS WARRANTY SHALL BE PERFORMED DURING NORMAL WORKING HOURS.

ALL REPLACEMENT PARTS OR UNITS, WHETHER NEW OR REMANUFACTURED, ASSUME AS THEIR WARRANTY PERIOD ONLY THE REMAINING TIME PERIOD OF THIS WARRANTY.

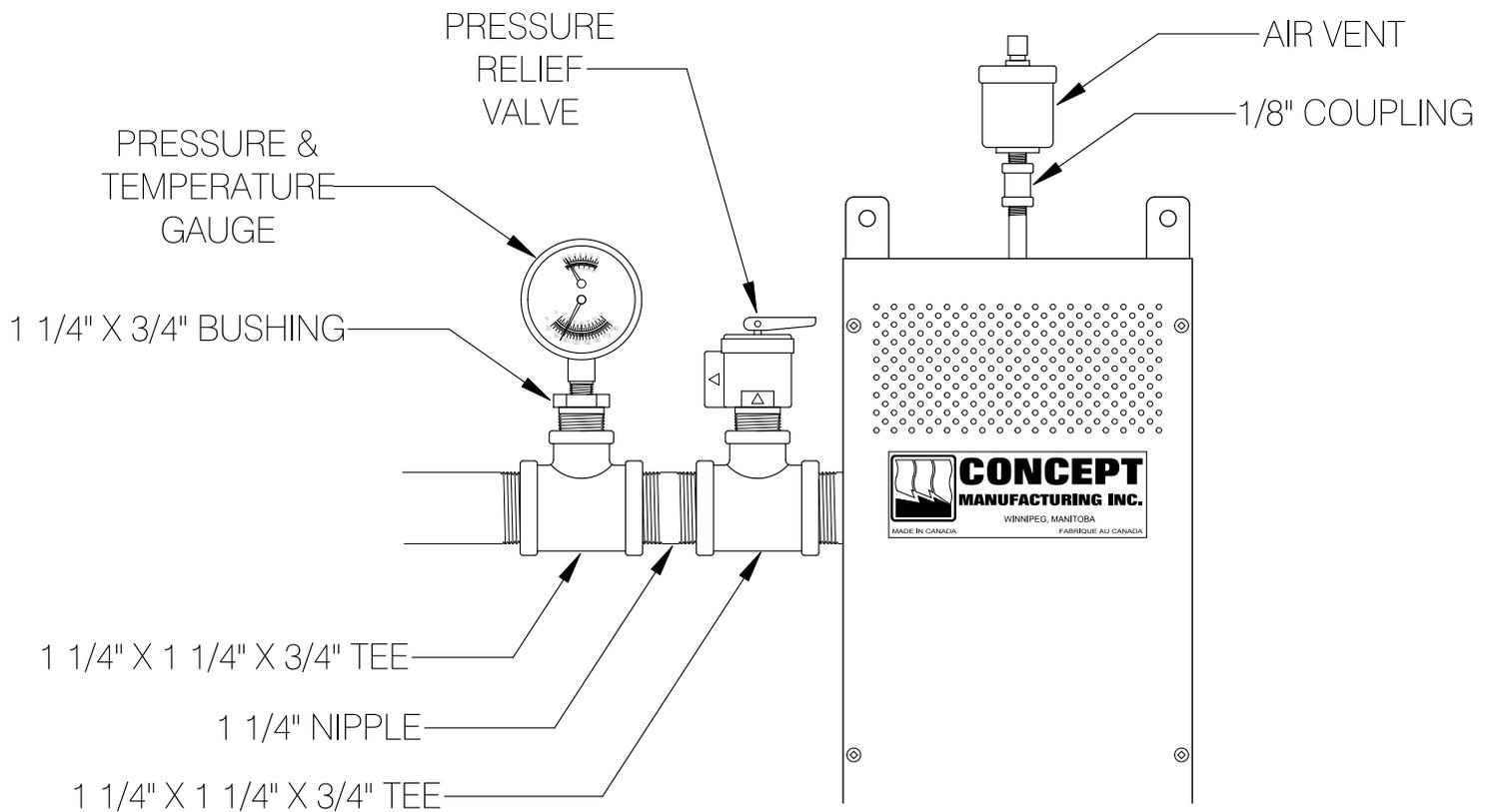


FIG. 1 BOILER COMPONENTS

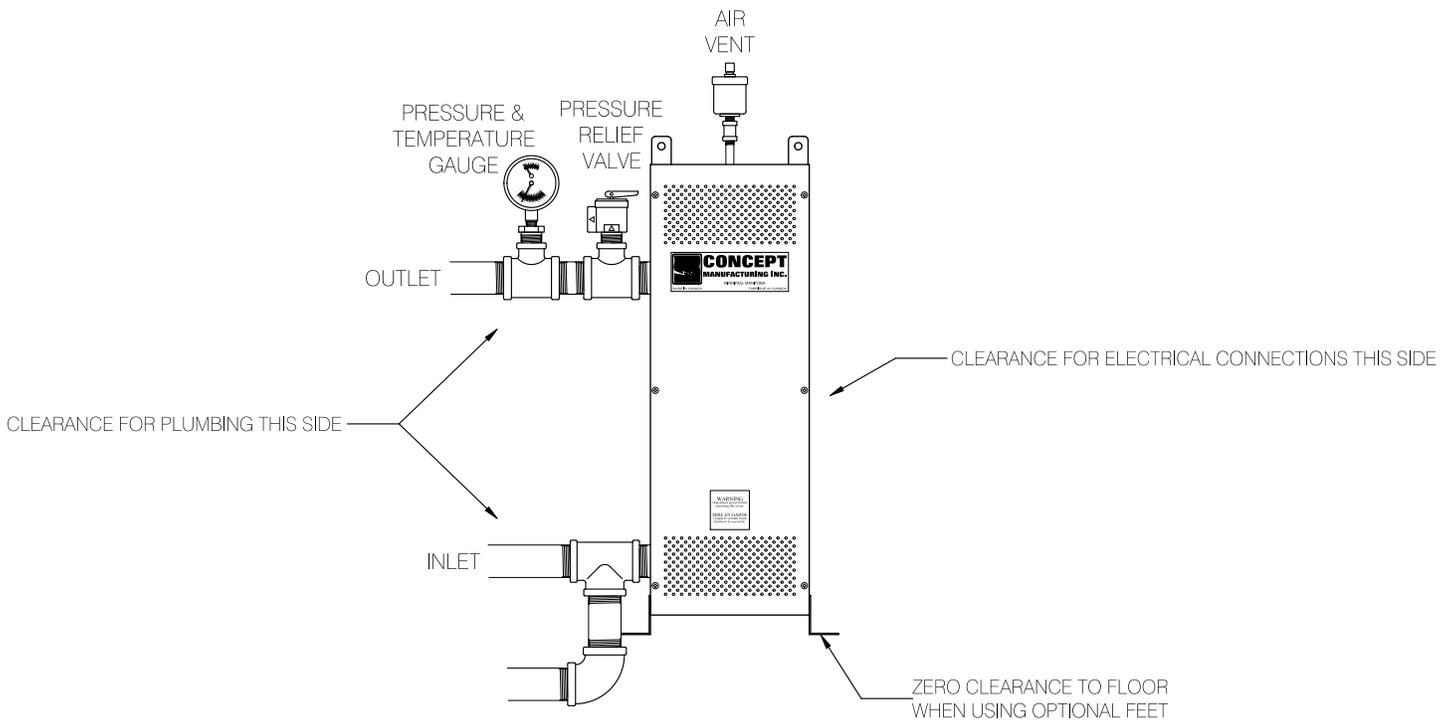
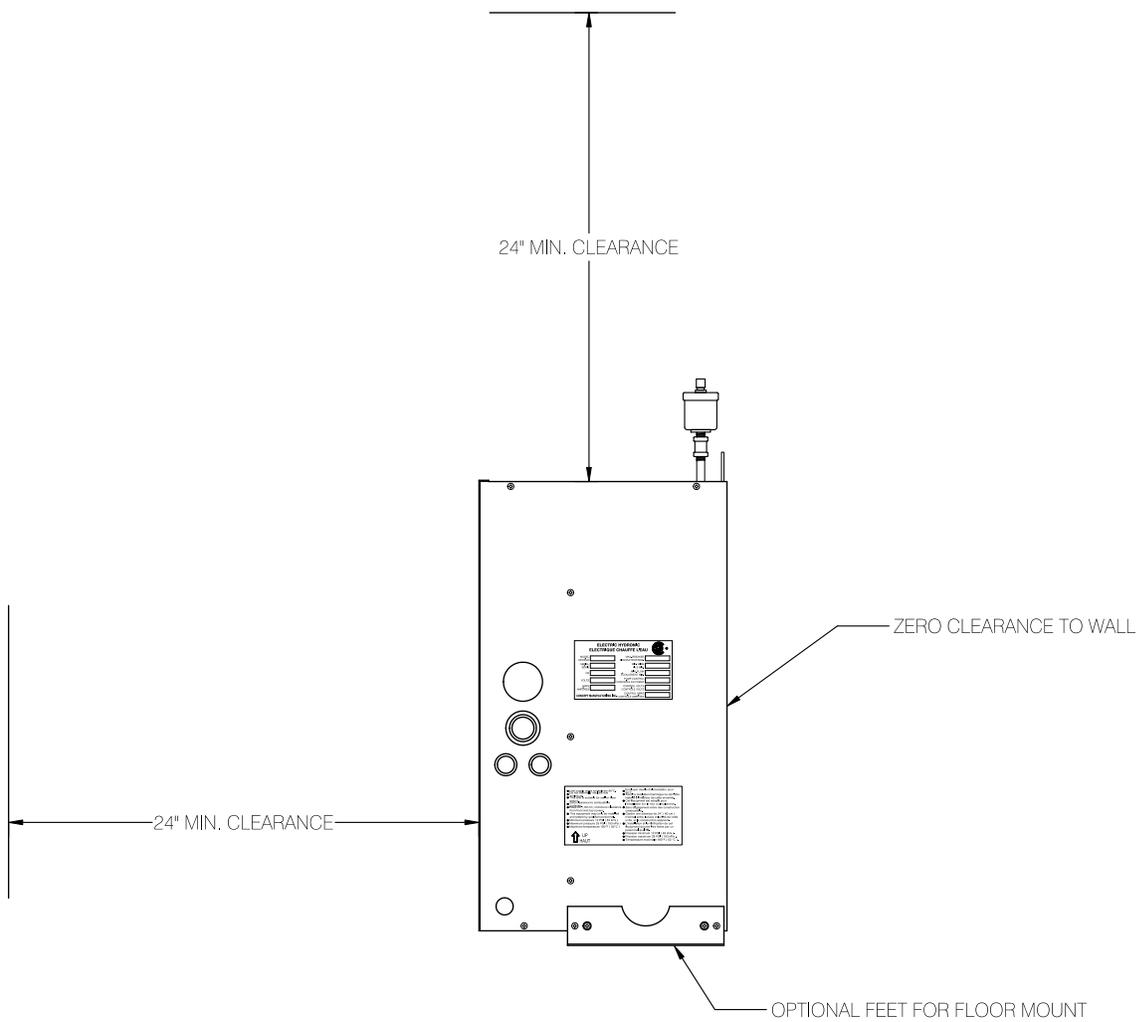


FIG. 2 BOILER INSTALLATION

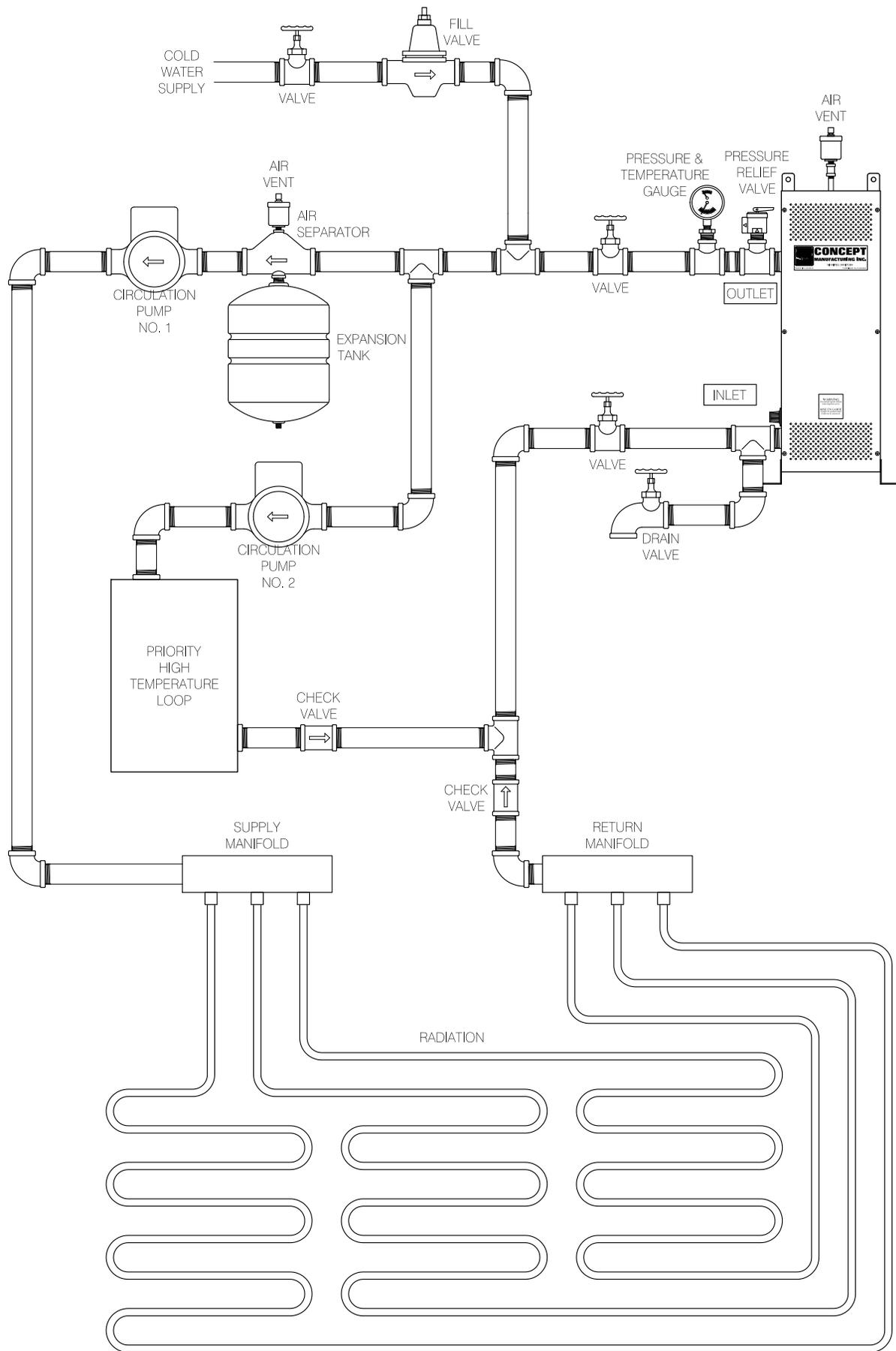


FIG. 3 TYPICAL HEATING SYSTEM

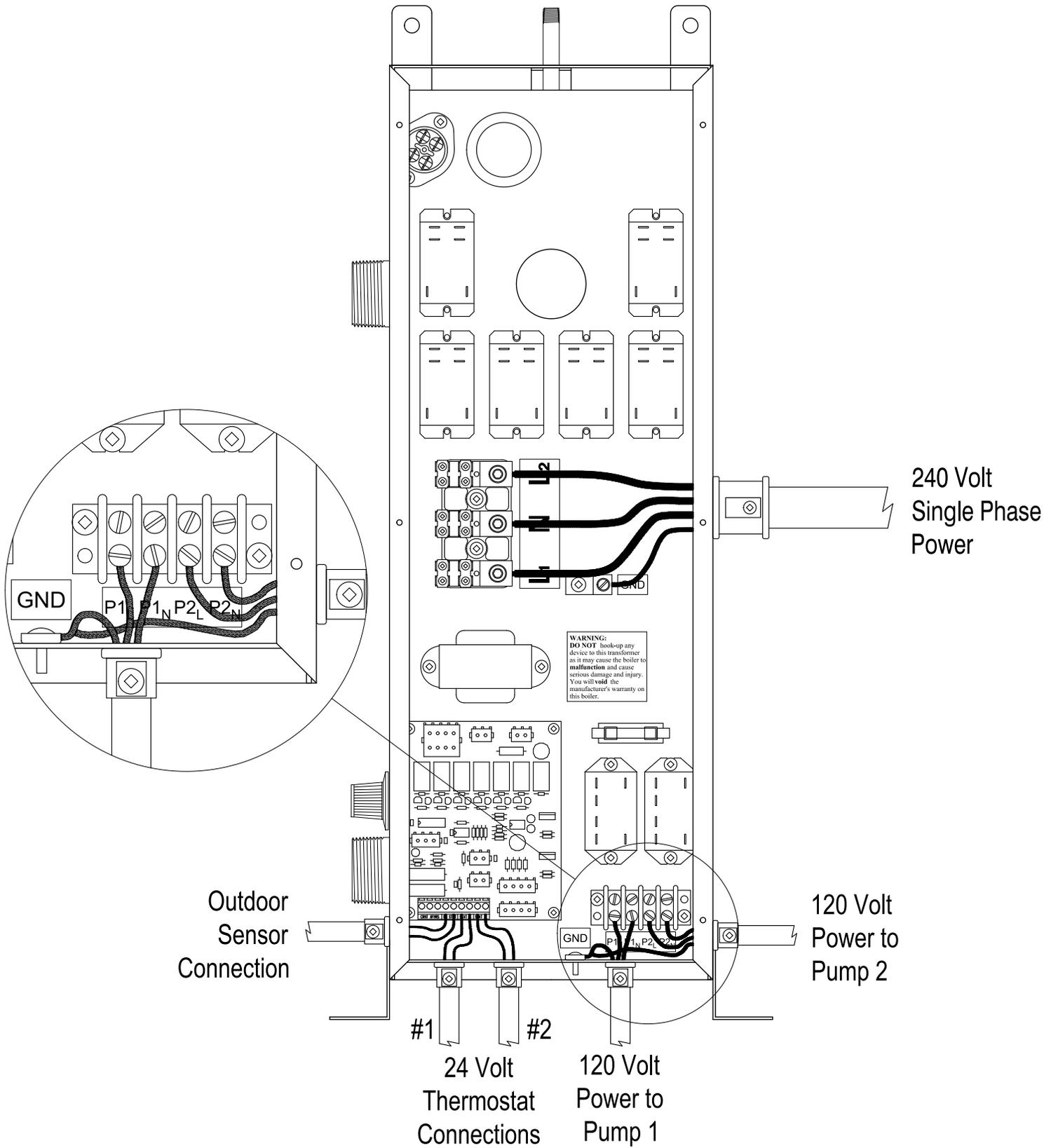


FIG. 4 CEBR2 ELECTRICAL WIRING, SINGLE PHASE

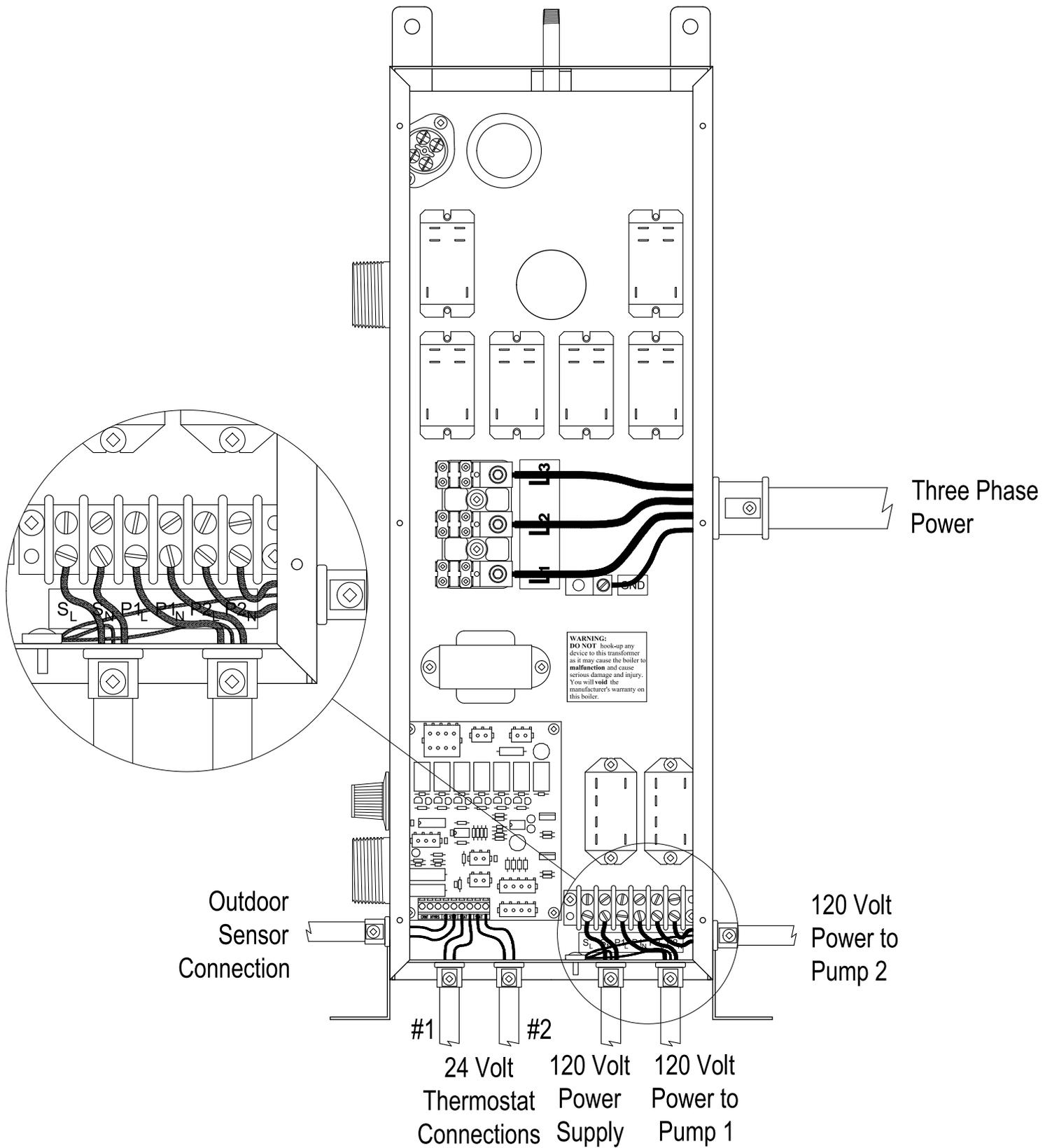


FIG. 5 CEBR2 ELECTRICAL WIRING, THREE PHASE

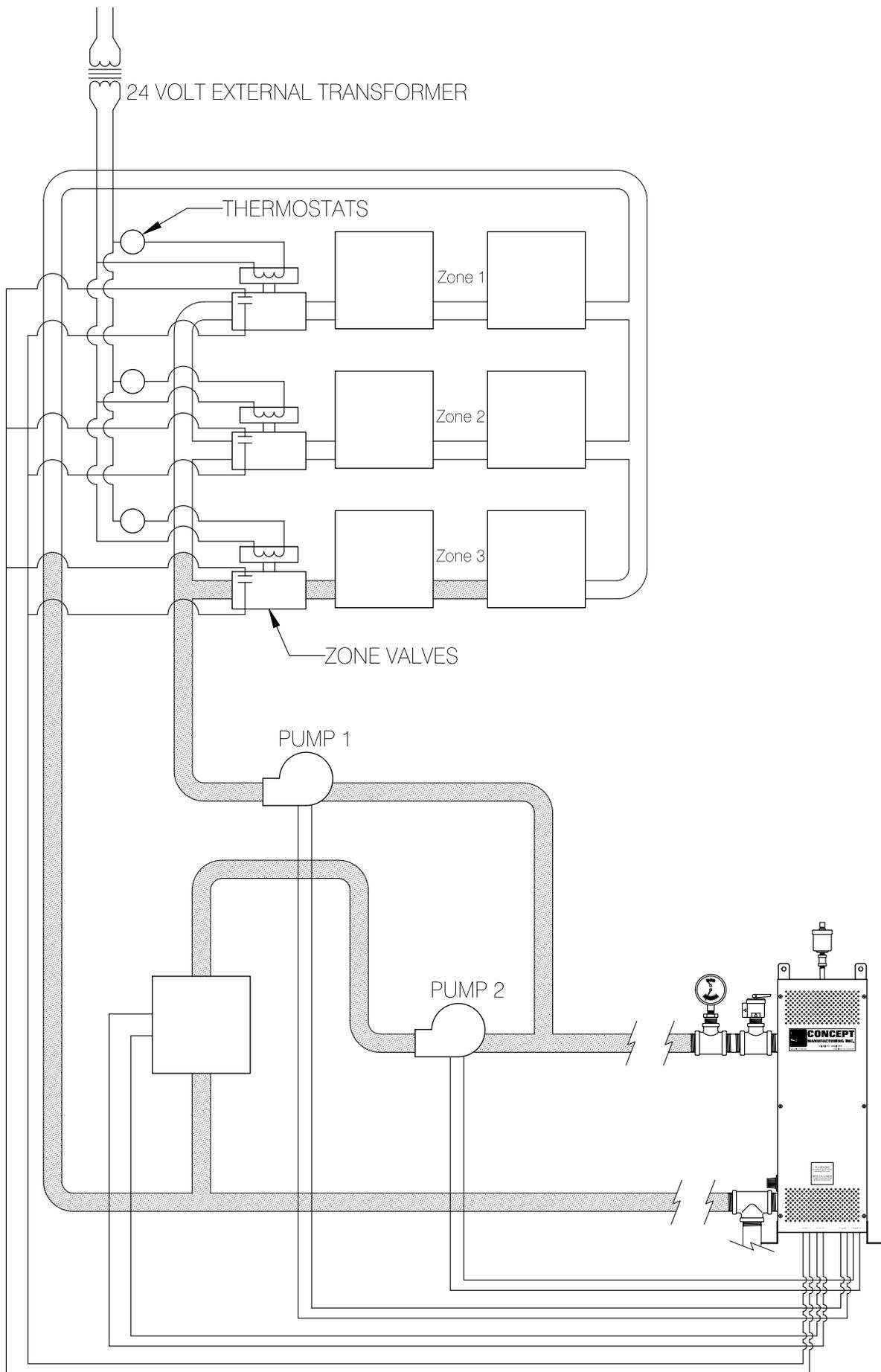


FIG. 6 MULTI ZONE INSTALLATION

Troubleshooting Step By Step Procedure

The following is a step by step procedure to help in troubleshooting any problems with this boiler. These steps should be performed only by qualified personnel with experience in hydronic heating systems, and electrical heating equipment. You are working with high voltages and should be extremely careful.

Before energizing boiler, ensure system is full of water.

- (1) Make sure that there is power to the boiler. There must be power to the boiler to complete these troubleshooting steps.
 - a) On 240 volt single phase models there should be power at the main terminal block. You should read 120 volts between L1 and N, 120 volts between L2 and N, and 240 volts between L1 and L2.
 - b) On three phase models there should be power at the main terminal block. You should take three readings on the main terminal block, you should read the appropriate voltage for your model between L1 and L2, between L2 and L3, and between L1 and L3. You should also read 120 volts on the terminal block on the lower right side on the terminals labeled S_L and S_N .
 - c) Disconnect the thermostat wires from the terminals "STAT 1" AND "STAT 2". Measure the voltage at the top of the boiler at each heating element. If you measure voltage at any of the elements, then the element relay for that element is stuck on and needs to be replaced.
- (2) Check the fuse on models equipped with a fuse.
 - a) Remove the fuse located inside the boiler. Check it for continuity. Replace with a new fuse of the correct type if necessary.
 - b) Otherwise replace the existing fuse.
- (3) Check that there is 24 volt AC power on the secondary side of the transformer. These are the two wires running from the transformer to the control board. There must be 24 volt AC power on the secondary side of the transformer for the boiler to operate. If there is no power the transformer needs to be replaced.
- (4) With the thermostat wires still disconnected from step (1)c), disconnect the outdoor sensor as well, then connect a jumper wire from one terminal of STAT 1 to the other terminal of STAT 1.
 - a) This should energize the left hand Pump Relay to the right of the control board, you should hear a click. If not check that there is 24 volt AC power on the two terminals with purple wires going to this relay.
 - b) Remove the jumper wire from the "STAT 1" terminals, and jumper the "STAT 2" terminals. This should energize the right hand Pump Relay. If not check that there is 24 volt AC power on the two terminals with purple wires going to this relay.
 - c) If there is no power at the relay, the control board needs to be replaced.
 - d) If there is power, but one of the relays is not turning on, replace that relay.
- (5) When the relay is energized, it will supply 120 volt power for running the pump, and activate the control board.

- a) There should now be 120 volt AC power to the terminals labeled P2L and P2N, as “STAT 2” has the jumper wire connected.
 - b) If there is no power, replace the relay.
 - c) Reconnect the jumper to the “STAT 1” terminals, there should now be 120 volt AC power to the terminals labeled P1L and P1N, as “STAT 1” has the jumper wire connected.
- (6) With the circuit board now activated, the power relays should turn on one at a time. There is about a one to two minute delay before the first relay turns on, and about the same for each additional relay. If they have not started to come on as yet, temporarily turn up the temperature on the aquastat to the maximum setting, it should be returned to the normal setting when you are finished troubleshooting. The power relays for controlling the elements should now start to turn on. It may take a minute or two for the first relay to turn on, and about the same length of time for each subsequent relay to turn on. As each relay turns on, one indicator light on the control board should come on as well.
- a) If the element relay indicator lights do not come on, disconnect the temperature sensor by pulling out the connector at the control board (the one with the two gray wires).
 - b) If the indicator lights now come on, after waiting for the one to two minute delay between each element the temperature sensor needs to be replaced. If the indicator lights still do not come on the control board needs to be replaced.
 - c) If the indicator lights come on, but the relays for the elements do not come on then the low water cut off or the high limit control may be preventing them from coming on. This may be due to a faulty component, or may be an actual low water, or high temperature condition.
- (7) If the boiler is equipped with the low water cut off option try the following only when you are sure the boiler and the heating system are completely full of water.
- a) Unplug the low water cut off from the control board. Temporarily (no more than one second) place a jumper wire across the two pins of the low water cut off connector on the control board, the element relays should all immediately turn on.
 - b) If the relays energize, replace the low water cut off, otherwise go on to the next step.
- (8) Temporarily (no more than one second) place a jumper wire across the two terminals on the high limit control.
- a) If the relays energize, replace the high limit control.
- (9) If all the relays energize and there is no heat, then check for power to each of the heating elements.
- a) With all the relays energized, check that there is power to each of the elements with a volt meter. If there is no voltage reading, replace the relay connected to that element.
 - b) If there is power to the elements, but no heat, then with the all the power disconnected to the boiler, check the resistance of each element with an ohm meter to see if is correct. Replace any elements, as necessary. If the element is open circuit and the cause is unknown, it is advisable to also change the relay connected to that element.

If you have gone through the above steps, and the boiler is still not working, please contact us for assistance.

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