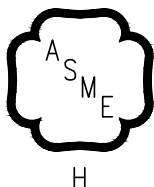


# Electric Hot Water Boiler

## Installation, Operating and Service Instructions

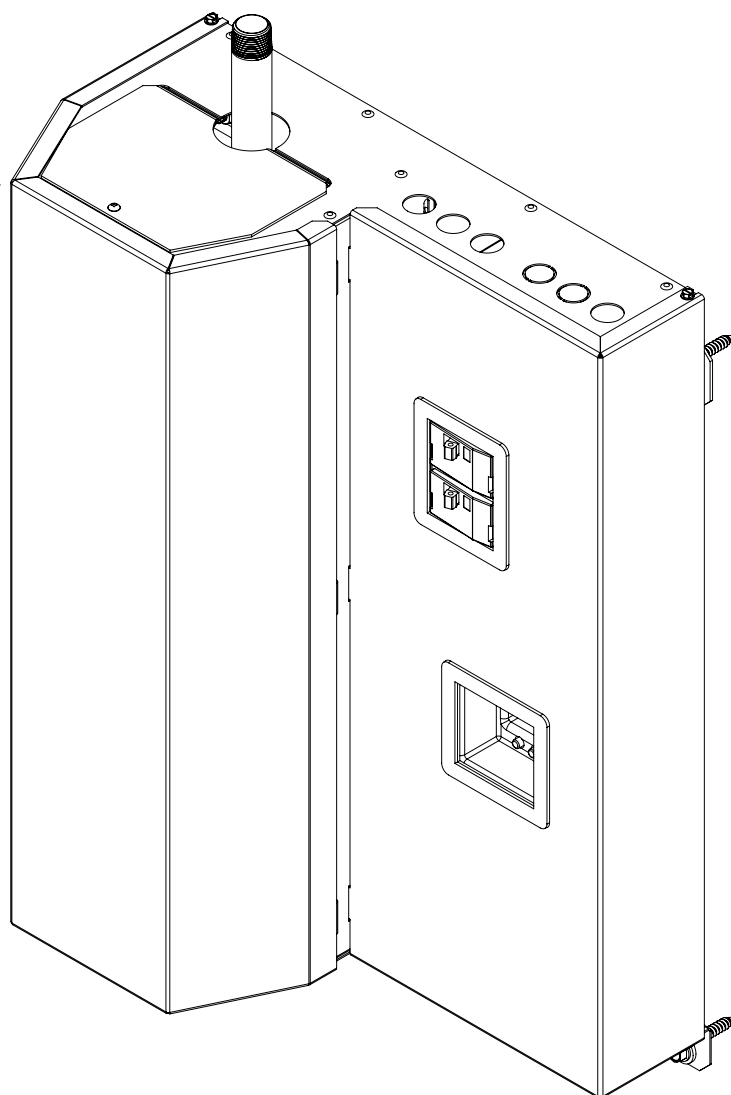


### Models:

- SWA16
- SWA20
- SWA24

### Manual Contents

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### TO THE INSTALLER:

Affix these instructions adjacent to boiler.  
Provide model number and serial number when seeking information and support.

### TO THE CONSUMER:

Retain these instructions for future reference.  
Contact heating installer or technician for all issues and support.

# 1 Read Before Proceeding

Read and understand this document before proceeding with installation or maintenance.

Boiler is listed with Massachusetts Board of Plumbers and Gas Fitters. See Massachusetts Boards of Plumbers and Gas Fitters website for the latest Approval Code ([https://licensing.reg.state.ma.us/pubLic/pl\\_products/pb\\_pre\\_form.asp](https://licensing.reg.state.ma.us/pubLic/pl_products/pb_pre_form.asp)). Commonwealth of Massachusetts requires this product to be installed by a licensed Plumber or Gas Fitter.

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

## DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

## CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

## WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

**NOTICE:** Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

## DANGER

**Explosion Hazard.** DO NOT store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.

- If you smell gas, DO NOT try to operate any appliance - DO NOT touch any electrical switch or use any phone in the building. Immediately, call the gas supplier from a remotely located phone.

## WARNING

**This boiler must only be serviced and repaired by qualified installer, service agency, gas supplier, or electrician.**

- Replace controls with manufacturer-suggested replacements.
- Read, understand and follow all instructions and warnings in this manual's sections.
- If any electrical wires are disconnected during service, clearly label wires, and assure wires are correctly connected.
- Never jump out or bypass any safety or operating control or component.
- Assure all safety and operating controls are working correctly before placing boiler back in service.
- Annually inspect boiler.

**NOTICE:** Keep these instructions near boiler for future reference.

# 1 Read Before Proceeding *(continued)*

## Installer or Qualified Service Agency Read Before Proceeding

### WARNING

#### **Burn and Electrical Shock Hazard.**

1. Carefully read all instructions in literature packet and labels posted on boiler before attempting installation, startup, or service of this boiler. Perform steps in order given. Failure to follow all instructions in proper order could result in severe personal injury, death or substantial property damage.
2. Use proper personal protective equipment when installing, servicing, or working near this boiler. Materials of construction contain heavy metals and/or other toxic or harmful substances that can be hazardous to health and life and that are known to the State of California to cause cancer, birth defects, and other reproductive harm.
3. Do not disconnect pipe fittings on boiler or in heating system without first verifying system is cool and free of pressure and that your clothing will protect you from a release of hot water or steam. Do not rely solely on boiler temperature and pressure gauge when making this judgement.
  - Disconnect electrical supply before installing or performing maintenance.
  - Install all guards, cover plates, and enclosures before leaving boiler in operation.

**NOTICE:** Size boiler properly relative to design heat load or, if using DHW priority, the peak hot water load, whichever is larger. A grossly oversized boiler will cycle excessively leading to premature failure of boiler and its components. Warranty does not cover damage from excessive cycling.
4. For heating system employing convection radiation (baseboard or radiators), use an industry accepted sizing method such as the I=B=R Guide RHH published by the Air Conditioning, Heating and Refrigeration Institute (AHRI).
5. For new radiant heating systems, refer to radiant tubing manufacturer's boiler size guidelines.
6. For system including indirect water heater, ensure boiler has output called for per indirect water heater manufacturer's instructions.
7. A hot boiler installed above radiation level or as required by the authority having jurisdiction must be provided with a low water cutoff (LWCO) device. A UL353 listed flow switch is provided with this boiler.

8. Inspect shipment carefully for signs of damage. Any claim for damage for shortage in shipment must be filed immediately against carrier by consignee. No claims for variances or shortages will be allowed by boiler manufacturer, unless presented within 60 days.

## User/Homeowner Read Before Proceeding

### WARNING

#### **Burn and Electrical Shock Hazard.**

1. A skilled and experienced service technician should annually inspect boiler and replace any component exhibiting damage or deterioration.

### CAUTION

#### **Burn and Electrical Shock Hazard.**

Keep children and pets away from hot surfaces of the boiler including boiler piping, vent piping, and vent terminal.

**NOTICE:** Boiler may leak water at the end of its useful life. Be sure to protect walls, carpets, and valuables from water that could leak from boiler. Protect your home in freezing weather. Do not leave heating system unattended during cold weather unless alarms or other safeguards are in place to prevent such property damage.

## 2 Introduction

### Introduction

- Size boiler based on total heat load of the building.
- Calculate maximum hourly heat loss for each heated space following procedures described in The Hydronic Institute Manual H-22 (Heat Loss Calculation Guide) or a method suitable for local conditions.
- Do not oversize the boiler—correct boiler sizing is critical for in-floor radiant heating applications.

### Unpacking

- Remove packing and inspect unit for damage or missing parts.
- Check packing list and verify all shipped loose items are received.
- Report any concealed damage or claims to carrier immediately.

### Control Standard Features

- Three-character LED display
- Three button User Interface
- Error code display
- Element Staging and Element Start Rotation
- Dual set points for space heating and domestic hot water
- Setting for Fahrenheit or Centigrade temperature scales
- Water temperature heating range 90°-180°F (32°-82°C)
- Dry fire protection
- Connections for provided flow switch
- Low water cutoff connections
- Load management control connection with auxiliary heat source connection
- Freeze protection
- Circulator pump terminals
- 40VA transformer
- Three-wire thermostat connection
- Audible alarm
- Pump exercising
- Relay contact monitoring
- Non-Volatile memory

### Product Description

Electric Boiler is a heating device that converts electrical energy to hot water.

*Kilowatts of Electricity Used per Hour x 3412 = British Thermal Units (BTUH) Available Per Hour for Heating.*

- Follow information in Table 3-1.
- Electric Boiler is constructed to conform to American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel Code, Section IV.
- Maximum Allowable Working Pressure Water (MAWP) 30 PSI.
- Construction conforms to Canadian Standards Association (CSA) Standards Electric Boilers, C22.2.
- Important product information on boiler:
  - Model number
  - Manufacturer's serial number
  - BTU rating
  - Heating element ratings
  - Water pressure & temperature limits
  - CSA listing
  - ASME stamp
  - Total Amps
  - Clearances
- Boiler is operated by control board maintaining water temperature. Control cycles heating elements based on heating demand and preset boiler outlet water temperature.
- Control also operates 120 VAC circulator pump rating up to 5A. When thermostat calls for heat, control will operate boiler to regulate water temperature at pre-established set point. System pump is on whenever thermostat calls for heat.

### 3 Specifications

**Table 3-1: Electrical Specifications, 4 Element Boiler Operating at 240 VAC**

| Model Number | Boiler Size (kW) | Voltage (AC) | Output Power (Watts) | Output Power BTU/hr. | Amps  | Element Size (Watts) | Total Amps | MCA   | MOP | *Recommended Copper Wire |                  | *Recommended Aluminum Wire |                  |
|--------------|------------------|--------------|----------------------|----------------------|-------|----------------------|------------|-------|-----|--------------------------|------------------|----------------------------|------------------|
|              |                  |              |                      |                      |       |                      |            |       |     | 140°F (60°C) AWG         | 167°F (75°C) AWG | 140°F (60°C) AWG           | 167°F (75°C) AWG |
| SWA16        | 16               | 240          | 16,000               | 54,600               | 66.7  | 4,000                | 72.7       | 90.8  | 100 | 2                        | 3                | 1/0                        | 1                |
| SWA20        | 20               | 240          | 20,000               | 68,200               | 83.3  | 5,000                | 89.3       | 111.7 | 125 | 1/0                      | 2                | 2/01                       | 2/0              |
| SWA24        | 24               | 240          | 24,000               | 82,000               | 100.0 | 6,000                | 106.0      | 132.5 | 150 | 2/0                      | 1/0              | 4/0                        | 3/0              |

#### WARNING

\* Minimum Recommended Field Wire Size per National Electric Code (NEC). Check with latest version of NEC and local codes.

\*\*Recommended aluminum wire (not for use in Canada). It is recommended to apply antioxidant paste for aluminum conductors. Aluminum is more malleable than copper—avoid cuts or nick during termination.

Based on ambient temperature of 86°F (30°C). Other ambient temperature see NEC or CEC for correction factors. UL-834, Section 14.2. No more than three (3) current-carrying conductors in raceway.

**Table 3-2: Dimensions and Connections**

| Model Number | Height (in.) | Width (in.) | Depth (in.) | Water Inlet (in.) | Water Outlet (in.) | Water Volume (gal.) | Approx. Shipping Weight (lb.) | Ship Loose Items      |                |                    |                         |
|--------------|--------------|-------------|-------------|-------------------|--------------------|---------------------|-------------------------------|-----------------------|----------------|--------------------|-------------------------|
|              |              |             |             |                   |                    |                     |                               | Flow Switch Tee (NPT) | Air Vent (in.) | Relief Valve (in.) | Temp./Pres. Gauge (in.) |
| SWA16        | 24           | 19          | 10          | 3/4               | 3/4                | 2.20                | 54                            | 3/4                   | 3/4            | 3/4                | 1/4                     |
| SWA20        | 24           | 19          | 10          | 3/4               | 3/4                | 2.20                | 54                            | 3/4                   | 3/4            | 3/4                | 1/4                     |
| SWA24        | 24           | 19          | 10          | 3/4               | 3/4                | 2.20                | 54                            | 3/4                   | 3/4            | 3/4                | 1/4                     |

All dimensions are approximate. Manufacturer reserves the right to change dimensions and/or specifications without notice.

#### WARNING

Follow NEC and local building code when selecting wires and insulation.

#### What is MCA?

Minimum Circuit Ampacity (MCA) is a calculated value that specifies the minimum primary power wire size to determine the minimum wire size required for a field wired product. The specification is necessary to guarantee the wire will not overheat under expected operating conditions. The wire size takes into account the normal current draw, aging of components and anticipated faults. When operating correctly, the MCA is the highest steady-state electrical current the unit should see.

#### What is MOP?

Maximum Over-Current Protection (MOP) is a calculated value that determines the maximum size of the over-current protection device (fuse or beaker). Depending on your application, there are different MOP equations, to determine maximum breaker size required to adequately protect equipment under anticipated fault conditions. In addition, the MOP takes into account the startup surges and components.

Supply wiring must be rated to carry the amps shown as MCA. By comparison, the over-current protection (a breaker or fuse) must be sized to prevent the unit from drawing more current than the MOP.

## 4 Locating Boiler

### WARNING

#### Electrical Shock Hazard.

Do not install boiler underneath a water source. Failure to do so could result in severe personal injury and death.

1. Boiler is intended for indoor installation only and should not be subject to water spray or leakage.
2. Boiler is intended to be wall mounted and is provided with mounting brackets. Use lag screws or anchor bolts through holes provided or on 3/4 in. plywood panel.
3. Boiler must be installed with heat exchanger vertical.
4. On uneven walls, suggest mounting surface be provided such as two 2 x 4's.
5. Mount boiler no closer than 12 inches to wall surface on left and 12 inches to wall surface on right or more, depending on plumbing.
6. Maintain 19 inches top clearance for element removal and 15 inches bottom clearance for drain connections.
7. Allow sufficient room from front of unit to door or wall to remove cover - at least 12 inches.

### WARNING

Failure to provide minimum clearance between boiler and combustible material may result in fire.

8. When installed in utility room, door should be wide enough to allow largest boiler part to enter or to permit replacement of another appliance such as water heater.
9. Boiler room should be vented to maintain an operating temperature between 45-80°F (7-27°C).

#### 10. Minimum clearances to combustible surfaces:

|                 |        |
|-----------------|--------|
| TOP.....        | 9 in.  |
| FRONT.....      | 2 in.  |
| LEFT SIDE.....  | 12 in. |
| RIGHT SIDE..... | 12 in. |
| REAR.....       | 0 in.  |
| BOTTOM.....     | 10 in. |

#### 11. Minimum service clearance:

|                 |        |
|-----------------|--------|
| TOP.....        | 19 in. |
| FRONT.....      | 12 in. |
| LEFT SIDE.....  | 18 in. |
| RIGHT SIDE..... | 18 in. |
| REAR.....       | 0 in.  |
| BOTTOM.....     | 15 in. |

## 5 Hydronic Piping

### Circulating System

1. Size circulator(s) based on total hydronic system pressure drop and designed flow rate.
2. To prevent rapid cycling on the high limit, adequate flow is required.
3. Maintain 15-25 PSI system pressure.
4. These water trim components are shipped loose with each boiler:
  - Water flow switch
  - Pressure relief valve (30 PSIG)
  - Air vent
  - Temperature/pressure gauge
  - Pipe nipples
5. Provided flow switch opens at approximately 3.0 GPM. Flow switch is intended for "No Flow" situations.
6. Install flow switch vertically in horizontal pipe with at least five straight pipe diameters on either side. See Figure 5-1.
7. Low water cut-off device may be required to satisfy additional local and national code requirements.

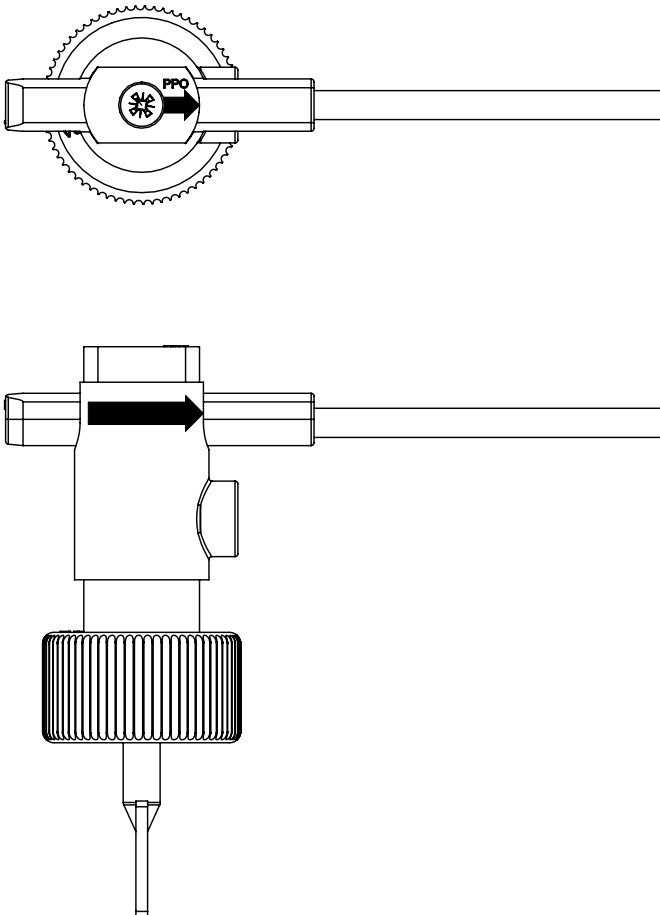


Figure 5-1: Flow Switch Direction

Table 5-2: Maximum Temperature Rise °F

| Boiler Model | @ 3.0 GPM |
|--------------|-----------|
| SWA16        | 37        |
| SWA20        | 45        |
| SWA24        | 55        |

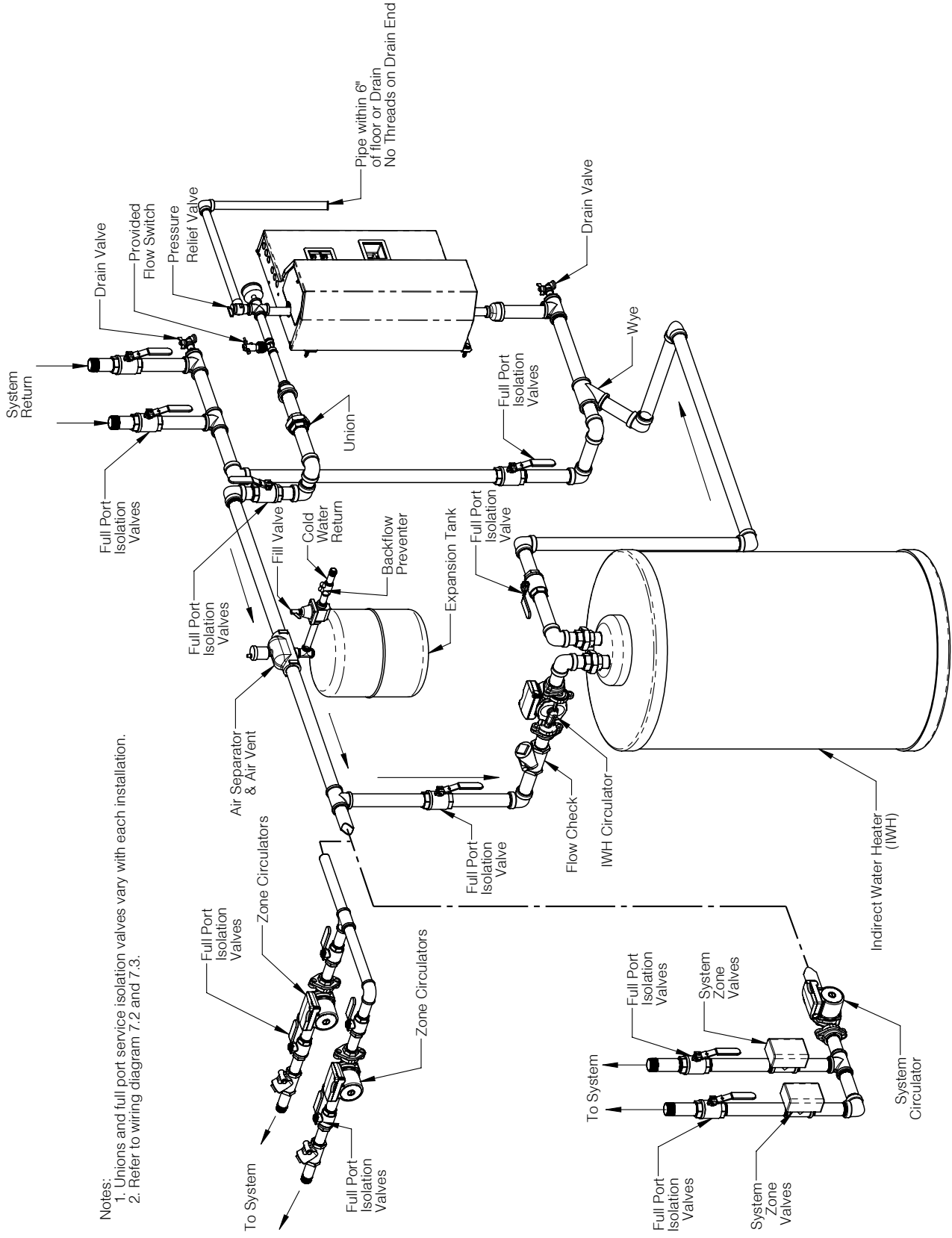
Table 5-3: Flow Rate to Achieve 20°F

| Boiler Model | GPM |
|--------------|-----|
| SWA16        | 5.5 |
| SWA20        | 6.8 |
| SWA24        | 8.3 |

### Connecting Supply and Return Piping

8. When boiler is connected to heating system utilizing multiple zone circulator, each circulator must be supplied with a flow control valve to prevent gravity circulation.
9. Reduce pressure back flow preventer must be present under provisions required by Environmental Protection Agency (EPA).
10. A pressure relief valve is supplied with each boiler and must be installed vertically. Install at location and discharge direction shown using pipe nipple and elbow supplied. See Figure 5-1. Add piping so any water discharge will not damage boiler or other system components.
11. Install gate valves at locations in Figures 5-1 and Table 5-2, so any boiler servicing requiring removal of water can be done quickly and easily. Not illustrated but recommended is installation of air vents at high points of hydronic system to reduce initial startup time and help avoid element burnout during entire life of heating system.
12. Follow piping arrangement as illustrated in Figure 5-1 and Table 5-2. Inlet or return pipe is located at bottom of unit. Reverse flow will cause noisy operation and cause very early element failure. Drain cock is to be located at the lowest point of piping.
13. Pipe discharge outlet of pressure relief valve within 6 in. of the floor or drain. No threads should be present on discharge pipe end.
14. Outlet or supply pipe line to radiation is located at top of unit. A combination temperature/pressure gauge is provided and should be installed close to boiler outlet.
15. For further piping information, refer to an industry accepted sizing method such as the I=B=R Guide RHH published by the Air Conditioning, Heating and Refrigeration Institute (AHRI).

# 5 Hydronic Piping (continued)

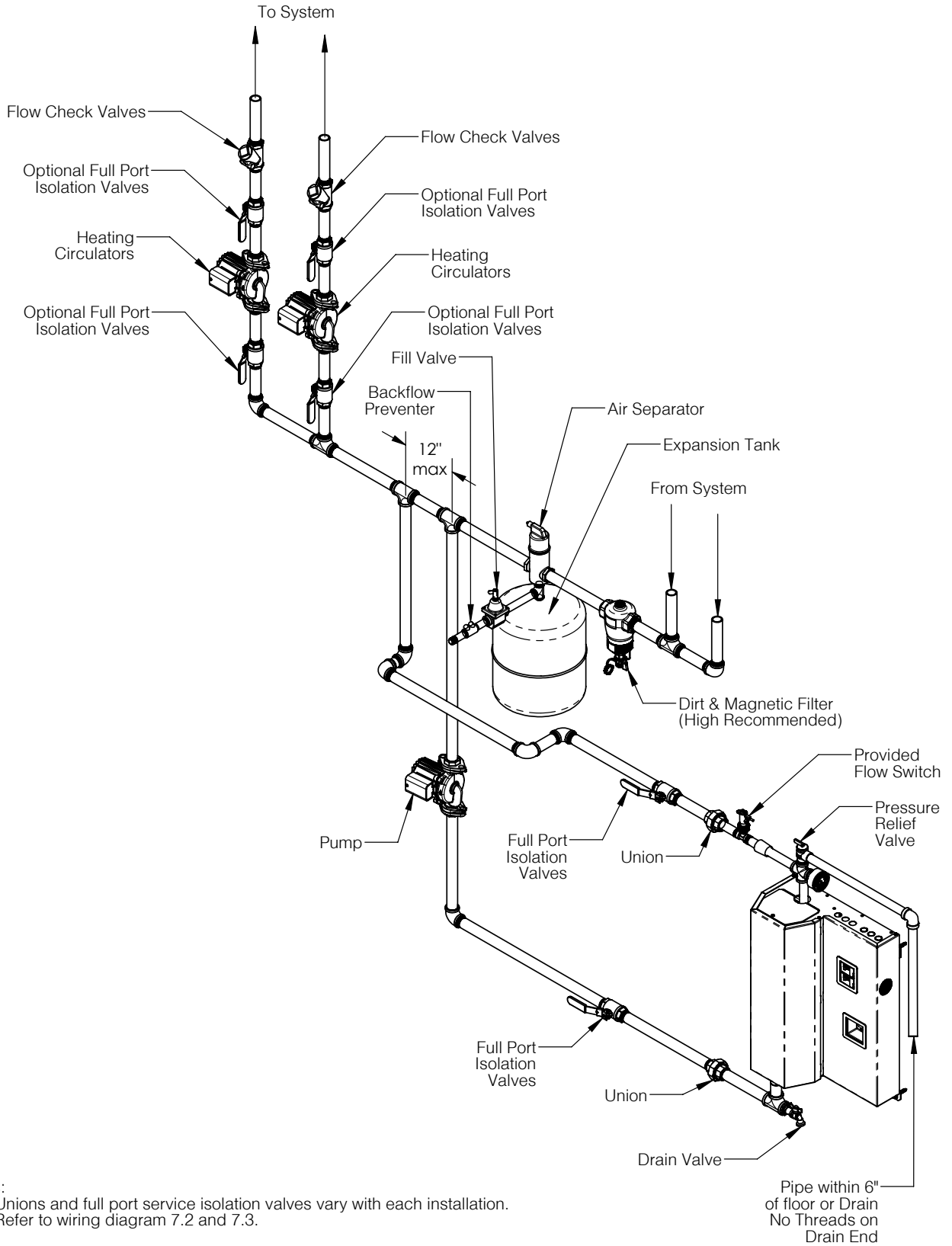


Notes:  
 1. Unions and full port service isolation valves vary with each installation.  
 2. Refer to wiring diagram 7.2 and 7.3.

Figure 5-4: Typical Water Piping



# 5 Hydronic Piping *(continued)*



- Notes:
1. Unions and full port service isolation valves vary with each installation.
  2. Refer to wiring diagram 7.2 and 7.3.

**Figure 5-5: Primary/Secondary Piping with Zone Pumps**

## 6 Water Quality

1. Poor water quality causes oxidation, scaling, corrosion, and fouling, which can severely damage the heating element and pressure vessel.  
**NOTICE:** Warranty does not cover component failure caused by scale build-up or poor water conditions.
2. Since water quality varies by location, the installer should consult a qualified water treatment expert about developing a water treatment plan.
3. A proper water treatment plan and regular boiler maintenance extend the boiler's working life. Refer to Table 6-1 for water quality requirements.

**Table 6-1: Water Quality**

|                      |                   |
|----------------------|-------------------|
| Oxygen               | Less than 250 ppb |
| pH                   | 8.0-10.5          |
| Chlorides            | Less than 250 ppm |
| Total Water Hardness | Less than 150 ppm |

Note: Softened water is not recommended.

4. Adhere to the following installation recommendations to prevent excess dissolved gas and minerals from entering the heating loop.
5. Adhere to the following installation recommendations to prevent excess dissolved gases and minerals from entering the heating loop.
  - Install system makeup water valve with backflow preventer.
  - Install air-vent provided with this unit at highest point on near boiler piping.
  - Install an expansion tank designed for system total water volume.
  - Makeup water should be added at the boiler outlet and not fed directly to the boiler.
  - Keep makeup water at a minimum to prevent scale build-up.
  - Immediately repair leaks and maintain 14-25 psi system pressure.

## 7 Electrical Connections/Wiring

### Boiler Wiring

#### ⚠ WARNING

DO NOT alter any internal wiring or bypass any built-in safety limit controls. Doing so will result in unsafe operation.

1. This boiler uses 240-volt, 3 wire, single-phase, 50/60-hertz power.
2. Electrical wiring should be in accordance with requirements of authority having jurisdiction. Refer to:
  - Canada-Canadian Electrical Code, CSA C22.1 Part 1, Safety Standards for Electrical Installations.
  - USA-National Electrical Code, ANSI/NFPA 70.
3. Verify nameplate rating and related codes to properly size conductors, switches, and over current protection.

#### ⚠ WARNING

All circuit breakers or disconnects ahead of boiler must be OFF. Turn integral boiler breakers off at the same time as well.

4. Remove boiler front cover by removing 4 screws from top and bottom.
5. For boilers used in multiple zone system, zone valves must be powered from an independent source and have electrically isolated end switches or isolating relays wired in parallel to boiler thermostat terminals.

#### ⚠ CAUTION

- Do not power zone valves from transformer in boiler control.
- Control does not support secondary pump. See Figure 7-4.

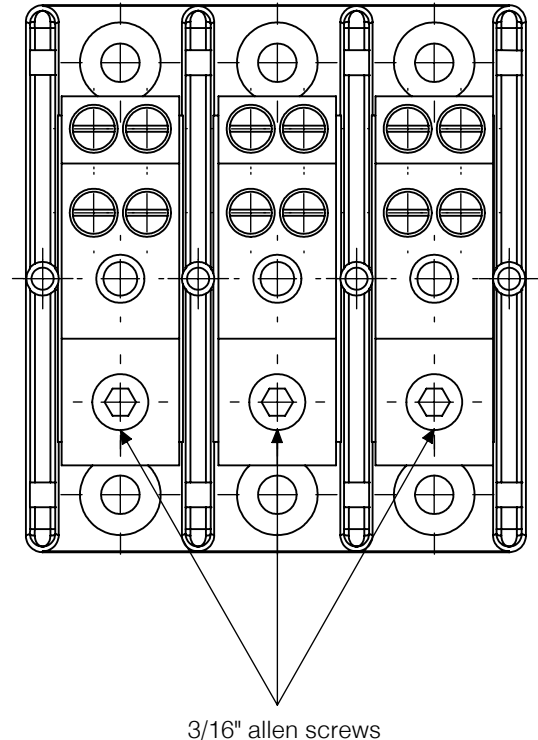
### Field Wiring

1. All field wiring should be in accordance with NEC or CEC standards.
2. Minimum Circuit Ampacity (MCA) and recommended Maximum Over-current Protection (MOP) are listed on nameplate of unit. See Table 3-1.

| Line Connections | lb.-in. | Conductor          |
|------------------|---------|--------------------|
| AWG 8            | 40      | Copper or Aluminum |
| AWG 6 to 2/0     | 120     | Copper or Aluminum |

#### ⚠ CAUTION

Use torque device to properly tighten line to prevent overheating.



**Figure 7-1: Power Distribution Block**

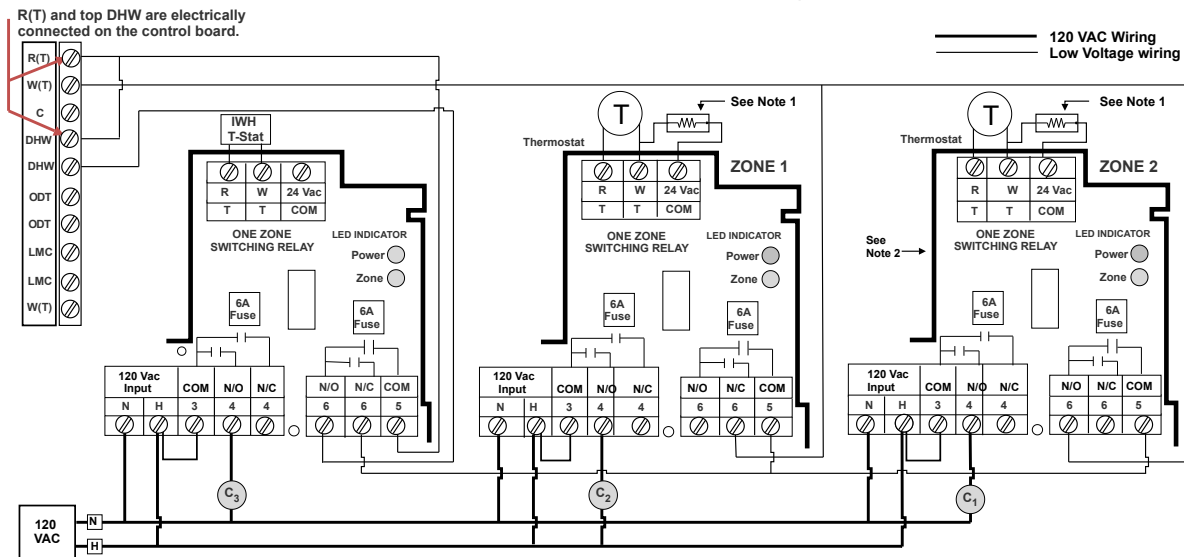
## 7 Electrical Connections/Wiring (continued)

### System Wiring

#### CAUTION

Follow directions and wiring diagrams from accessory relay panel manufacturers. Do not use the 24 VAC transformer to power zone valves or other accessories.

### Multizone Wiring



Control has two TT inputs for two temperature operations:

1. R&W typically for central heat
2. DHW for a second operating temperature

Example, 100°F set point for radiant floor and 180°F set point for a fan coil or indirect water heater.

The pump electrical output, limited to 120 VAC at 5 amps, turns on when either TT makes a call for heat. It is possible to set the control for domestic priority.

It is important to configure wiring with accessory zone controls to address pump or zone valve operation as well as domestic water or other system temperature priorities.

#### NOTE 1:

Domestic Hot Water Priority

When IWH calls for heat it disconnects one control from making a call for heat at a different temperature and preventing zone pumps from running.

#### NOTE 2:

Taco Zone Valve control panel or similar products.

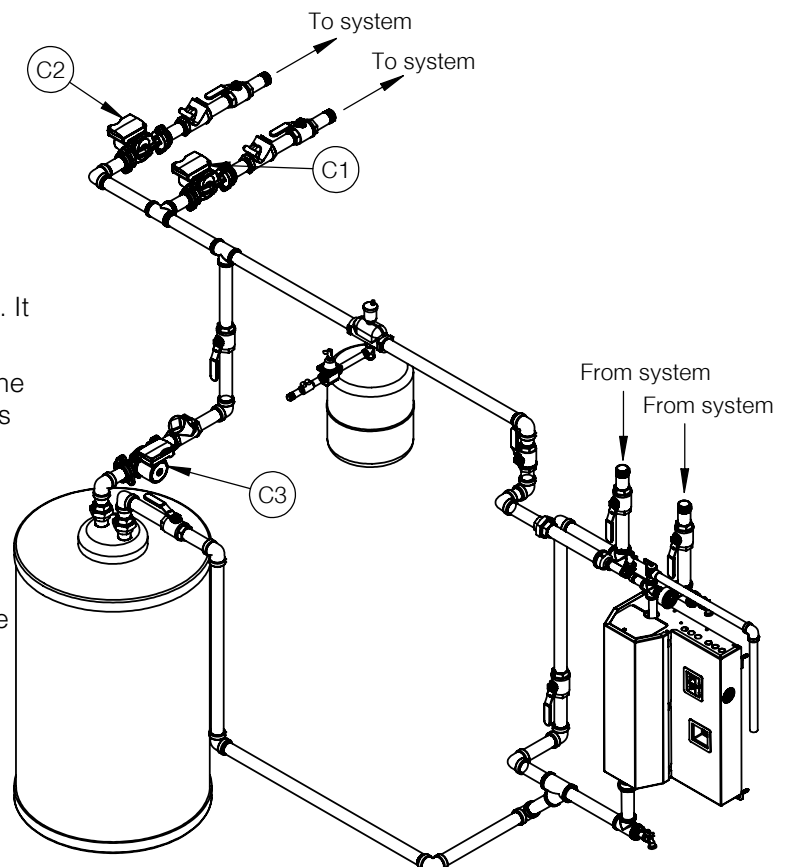


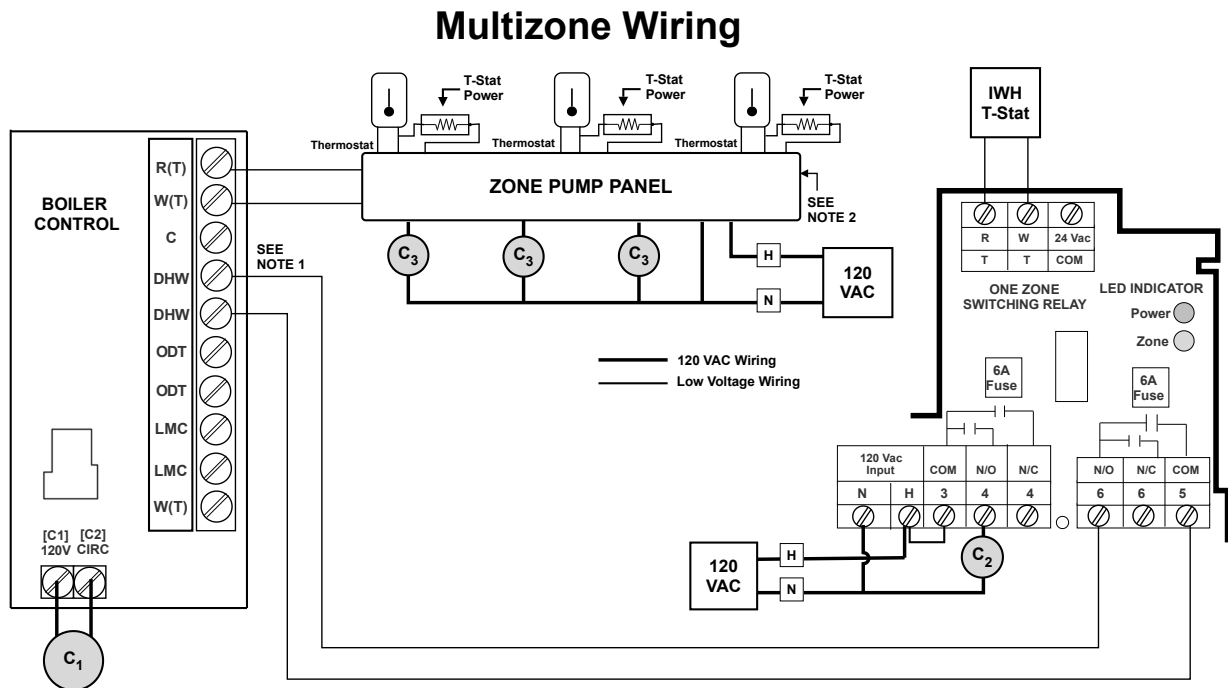
Figure 7-2: Wiring Diagram for Direct Connection Piping with Zone Pumps and Indirect Water Heater

## 7 Electrical Connections/Wiring *(continued)*

### System Wiring

#### ⚠ CAUTION

Follow directions and wiring diagrams from accessory relay panel manufacturers. Do not use the 24 VAC transformer to power zone valves or other accessories.



**Figure 7-3: Wiring Diagram Primary Secondary Piping with Zone Pumps and Indirect Water**

Control has two TT inputs for two temperature operations:

3. R&W typically for central heat
4. DHW for a second operating temperature

Example, 100°F set point for radiant floor and 180°F set point for a fan coil or indirect water heater.

The pump electrical output, limited to 120 VAC at 5 amps, turns on when either TT makes a call for heat. It is possible to set the control for domestic priority.

It is important to configure wiring with accessory zone controls to address pump or zone valve operation as well as domestic water or other system temperature priorities.

#### **NOTE 1:**

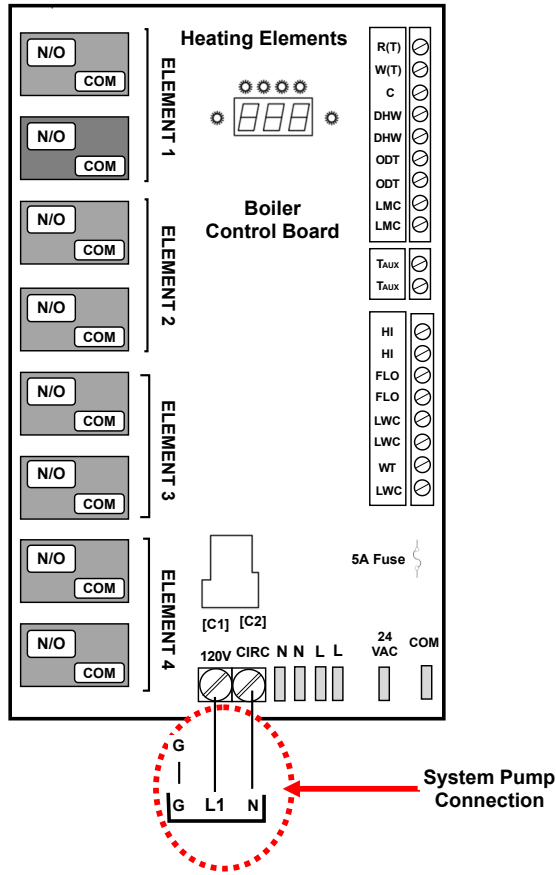
Domestic Hot Water Priority

When IWH calls for heat it disconnects one control from making a call for heat at a different temperature and preventing zone pumps from running.

#### **NOTE 2:**

Taco Zone Valve control panel or similar products.

# 7 Electrical Connections/Wiring *(continued)*



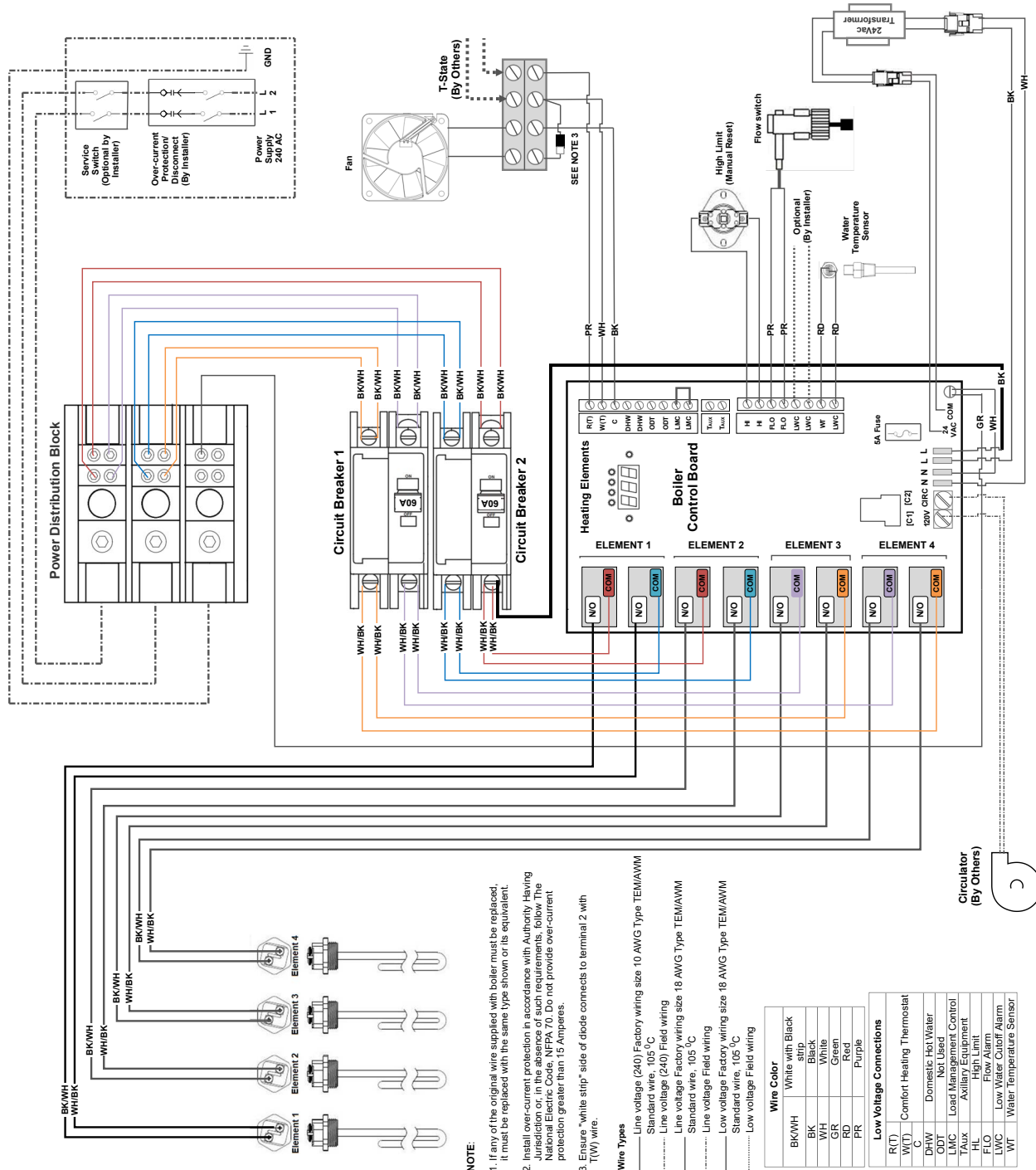
**Figure 7-4: Wiring Control Board**

| Control Inputs (NEC Class - 2 Low Voltage) |  |
|--|--|
| R(T)                                       | Thermostat Input (R W C) or zone valve end switch (R W), Dry Contract Close R-W Activation, 24 VAC R-C |
| W(T)                                       |  |
| C  |  |
| DHW  | Domestic Hot Water - Thermostat Input. Dry Contact Close Activation DHW - DHW                          |
| ODT  | Not used   |
| *LMC                                       | Load Management Control Input. Dry Contact Normally Close LMC - LMC                                    |
| HL   | High Limit Input (factory installed)   |
| *FLO                                       | Flow Switch Input (provided with boiler)   |
| *LWC                                       | Low Water Cutoff Input - Installer supplied. Dry Contract Normally Closed LWC - LWC                    |
| WT   | Water Temperature Sensor Input (Factory Installed)   |

| Control Output (NEC Class-2 Low Voltage) |   |
|--|---|
| T Aux                                    | Auxiliary Heating Appliance Thermostat Connection |
| *Factory Jumper Installed                |   |

| System Pump Connection (120 VAC 60Hz, 1ph, 5A) |                  |
|--|------------------|
| C1   | Pump Hot (L1)    |
| C2   | Pump Neutral (N) |
| G  | Pump Ground (G)  |

# 8 Wiring Diagram



- NOTE:**
1. If any of the original wire supplied with boiler must be replaced, it must be replaced with the same type shown or its equivalent.
  2. Install over-current protection in accordance with Authority Having Jurisdiction or, in the absence of such requirements, follow The National Electrical Code (NEC) requirements. Do not provide over-current protection greater than 15 Amperes.
  3. Ensure "white strip" side of diode connects to terminal 2, with (T/W) wire.

- Wire Types**
- Line voltage (240) Factory wiring size 10 AWG Type TEMAWMM
  - Standard wire, 105 °C
  - Line voltage (240) Field wiring
  - Line voltage Factory wiring size 18 AWG Type TEMAWMM
  - Standard wire, 105 °C
  - Line voltage Field wiring
  - Low voltage Factory wiring size 18 AWG Type TEMAWMM
  - Standard wire, 105 °C
  - Low voltage Field wiring

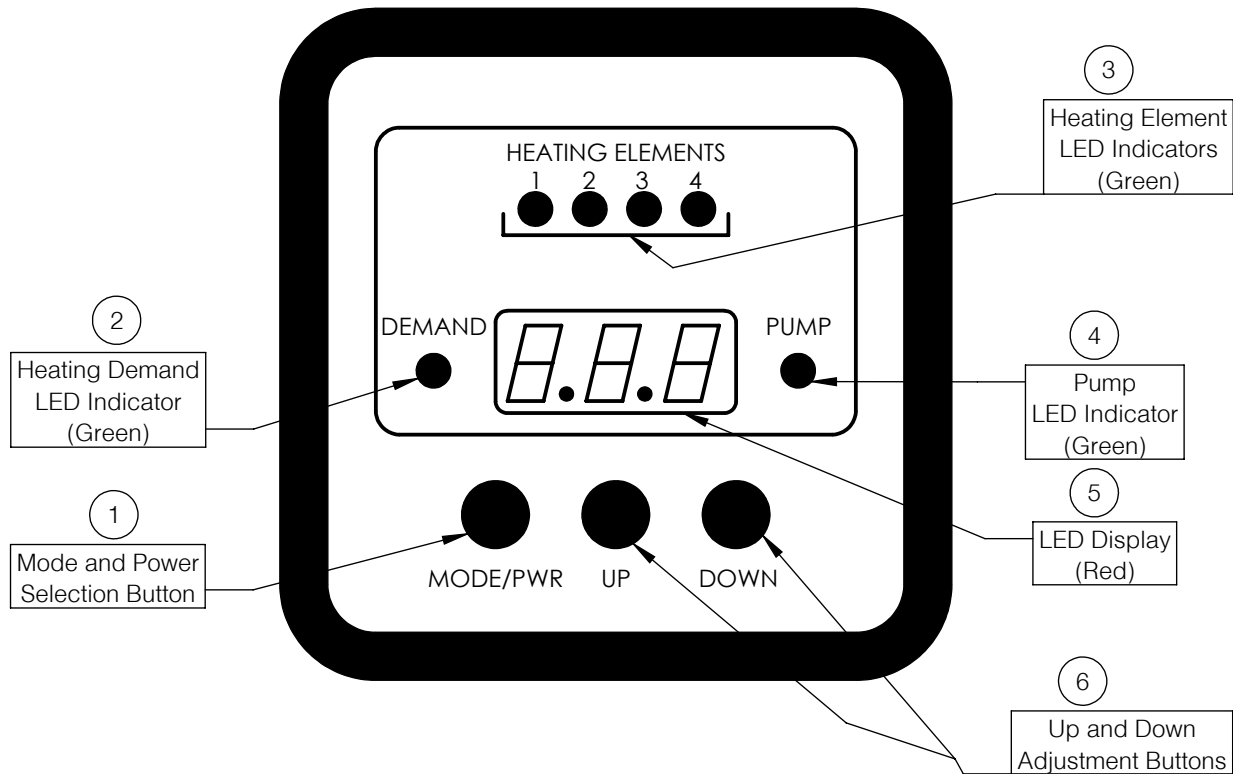
| Wire Color |                         |
|------------|-------------------------|
| BK/WH      | White with Black stripe |
| BK         | Black                   |
| WH         | White                   |
| GR         | Green                   |
| RD         | Red                     |
| PR         | Purple                  |

| Low Voltage Connections |                            |
|-------------------------|----------------------------|
| R(T)                    | Comfort Heating Thermostat |
| WT                      | Water Temperature Sensor   |
| C                       | Domestic Hot Water         |
| DHW                     | Not Used                   |
| ODT                     | Load Management Control    |
| LMC                     | Auxiliary Equipment        |
| TAUX                    | High Limit                 |
| HL                      | High Limit                 |
| LWC                     | Low Water Cutoff Alarm     |
| WT                      | Water Temperature Sensor   |

Figure 8-1: Wiring Diagram

## 8 Sequence of Operation



**Figure 8-2: Boiler Controller**

|   |   |
|---|---|
| 1 | Mode and Power Selection Button - Turns boiler on and off, selects mode and configuration settings                                      |
| 2 | Heating Demand LED Indicator - Energized with call for space heating or domestic hot water  |
| 3 | Heating Element LED Indicator - Energized with corresponding heating element  |
| 4 | Pump LED Indicator - Energized with boiler pump relay   |
| 5 | LED Display - Indicates water temperature, set point, mode, and error codes   |
| 6 | Up and Down Adjustment Buttons - Used to select temperature set point for space heating, domestic hot water, and configuration settings |

### Boiler Display Codes

| Display | Description                | Range                             | Note  |
|---------|----------------------------|-----------------------------------|---|
| ON      | Boiler in On mode          |                                   |   |
| OFF     | Boiler in Off mode         |                                   |   |
| CHS     | Space Heating Setting      | 90-180°F (32-82°C)                | Control prevents setting from being higher than Domestic Hot Water Setting  |
| dHS     | Domestic Hot Water Setting | 90-180°F (32-82°C)                | Control prevents setting from being lower than Domestic Hot Water Setting   |
| dFS     | Differential Setting       | 4-20°F (2-11°C)                   | Applies to CHS and dHS  |
| dEg     | Degrees Temperature scale  | F or C                            |   |
| Stg     | Heating Element Stages     | 4                                 |   |
| dFt     | Dry Fire Test              |                                   | Displayed when power initially applied                                      |
| LdC     | Load Management            | Displayed when LMC terminals open | De-activates heating elements. Diverts TT to TTAux for secondary appliance. |
| F       | Degrees Fahrenheit         |                                   |   |
| C       | Degrees Centigrade         |                                   |   |



## 9 Control Operation

### Initial Start Up

- When electrical power is applied control displays firmware revision code. It will then revert to mode it was in prior to power loss (factory setting in OFF mode).
- Pressing MODE/PWR button for 2 seconds, unit will enter ON mode. Pressing MODE/PWR button again for 2 seconds will return unit to OFF mode.
- Once in ON mode control automatically begins a DRY Fire Test (DFt is set to Y in the configuration) where pump is energized and first element is pulsed (see Dry Fire Test Mode).
- Dry Fire Test is only initiated after power loss. To by-pass Dry Fire Test Mode and enter heating mode, press up ▲ and down ▼ arrow buttons for 2 seconds.

### Two Temperature Operation

- Boiler is designed to control two loads with independent temperature control such as a comfort heating zone (CHS) and indirect domestic hot water tank (DHS).

### Setting Water Temperature

- To set boiler water temperature, place boiler in ON mode and then select temperature setting mode by pressing MODE/PWR button. Use up ▲ or down ▼ arrow buttons to set temperatures for heating "CHS", domestic hot water setting "dhs" and differential setting "dFS".

**NOTICE:** Setting for CHS cannot exceed setting for DHW. Setting for DHW cannot be set below setting for CHS.

### Heating Operation Sequence

- To begin heating sequence control board must be "On" for boiler operation. All safety inputs must be closed (HL, LWC, FLO) as well as Load Management Control (LMC) terminals. Set point temperature for either CHS or dHS above current water temperature.
- To start boiler heating sequence thermostat or pump end switch will close connection between terminals [heat - R & W (T & T)] or [Domestic hot water - DHW\_T & T] on control.
- Pump relay energizes for 30 seconds prior to electric elements while a check of safety circuit and water temperature is conducted. (Note: Flow and LWCO circuits check is conducted after pump starts, since water flow and water level are dependent of pump being energized).
- If heating load is satisfied by residual boiler heat during 30 second pre-purge period elements will not energize. Heating element(s) will begin to energize after 30 second pre-purge is complete.

- LED's for heating elements, pump status and heat call will illuminate as each is energized. If safety circuit is open, elements will not energize and error code is displayed.
- During heating operation, safety circuit is monitored. If no faults exist, first element will energize, and rate of water temperature rise is calculated.
- Control will energize elements in sequence based on temperature rise of water and target time of 5 minutes to reach set point. Minimum on and off times apply to each element.
- When water temperature approaches set point, temperature heating elements will de-energize to prevent water temperature from exceeding set point temperature. When water temperature reaches set point, all remaining heating elements will de-energize.
- Control will cycle elements on and off to maintain set point temperature. At start of each heating cycle, lead element to energize will rotate to allow for even duty cycle time for all elements.
- Pump will remain energized while there is call for heat (TT or DHW-TT closed). When call for heat is satisfied, unit enters post purge period. Pump will remain energized for 3 minutes, starting at a point in which last element de-energized.
- Differential set point setting is used to determine point at which heating elements are energized or de-energized. Increasing differential setting will de-energize heating elements sooner and reduce potential for temperature overshoot. A larger differential will also reduce cycles per hour of the boiler.
- Decreasing differential set point setting will keep heating elements on longer and allows for tighter set point control increasing potential for temperature overshoot. A small differential also increases boiler cycles per hour.
- Starting point for differential setting is 10°F (5.5°C). Depending on application, boiler size, number of heating zones and whether or not there is domestic hot water application, differential setting can be adjusted to accommodate installation.

### Dry Fire Test

- Dry Fire Test detects presence or lack of water in the boiler and prevents elements from energizing if dry condition exists.
- Dry Fire Test Mode is initiated following power outage and **can take from 5 to 10 minutes to complete.**

## 9 Control Operation *(continued)*

- Boiler must be ON and configuration setting for dFt must be set to Y. During Dry Fire Test pump is energized and first heating element is pulsed while temperature sensor is monitored to determine if water is present in the boiler. If failure occurs, "DIFF" is displayed and a retry occurs.
- After three consecutive failures, an audible alarm will sound and pump will stop. Power must be removed and dry condition corrected to clear the fault code.
- Once initiated, Dry Fire Test can be canceled by pressing ▲ up or ▼ down arrow buttons simultaneously for 2 seconds.

**NOTICE:** This bypass feature is intended for installer and should only be used when dry condition does not exist.

- Dry Fire Test is selectable in configuration mode and can be set to Y or N. To prevent Dry Fire testing from automatically occurring, change setting for dFt to N in configuration mode. Do not change setting unless special circumstances exist with application where conducting of Dry Fire Test does not accurately detect presence of water in the boiler.

### **Load Management Control (LMC)**

- Load Management (LMC) feature can deactivate boiler and temporarily place it in standby mode. Some utility companies use this feature during peak demand periods to load trim utility's power grid.
- Control is equipped with an auxiliary set of contacts (T Aux) which can be used to connect a secondary heating appliance. While the load management terminals (LMC) are open, heating elements are prevented from energizing, and "LdC" is displayed. The call for heat on TT or DHW terminals is then diverted to the T Aux terminals to energize a secondary heating appliance.
- When LMC is open and TT or DHW\_TT is closed, the pump shall remain off except for post-purge mode.
- LMC terminals on boiler are intended to be connected to low voltage, normally closed dry contacts of the utility LMC unit. **Do not connect power to LMC terminal.**
- To connect utility LMC system, first remove jumper from LMC terminals on boiler control, then connect LMC unit to terminals.

### **Flow Switch Input (FLO) (provided with boiler)**

- Control is equipped with a set of contacts (FLO) which are used to connect provided water flow switch. While the flow switch terminals (FLO)

are open, heating elements are prevented from energizing and "FLO" is displayed. Sensor input is only active while control is attempting to energize heating element(s). Flow switch input IS NOT active during pre-and post-purge modes.

- Boiler FLO terminals are intended to be connected to low voltage, normally closed dry contacts of water flow switch.

### **Low Water Cutoff**

- Low Water Cutoff Sensor feature can be used to connect an installer provided low water cutoff to de-activate boiler if water is not present at the sensor (abnormal condition).
- Control is equipped with an auxiliary set of contacts (LCO) which can be used to connect a low water cutoff sensor. While low water cutoff terminals (LCO) are open, heating elements are prevented from energizing and "LCO" is displayed.
- The sensor input is only active while the control attempts to energize heating element(s). The low water cutoff sensor input IS NOT active during the pre-and post-purge modes. LOC terminals on boiler are intended to be connected to low voltage, normally closed dry contacts of the water flow switch.
- To connect a low water cutoff sensor, first remove factory installed jumper from the LCO terminals. Then connect alarm output, dry contact, and normally closed low water cutoff sensor terminals to LCO terminals.
- Low Water Cutoff alarm will only be monitored during the heating cycle while elements are energized. An open Low Water Cutoff has no effect while heating elements are off. If Low Water Cutoff opens while elements are energized or attempting to be energized, control switch off all elements and enter 60 seconds purge mode. The audible alarms sound and "LCO" is displayed for minimum of 30 seconds and until the error clears or demand for heat ceases. The pump will remain on for minimum of 30 seconds after fault clears.

### **Anti-Short Cycle Timer, Heating Call Satisfied**

- After completion of a space heating or domestic hot water cycle, heating elements will remain off for a minimum of 3 minutes. ASCT time begins when the last heating element de-energizes. Pump will be allowed to run during the ASCT period.

## 9 Control Operation *(continued)*

### **Anti-Short Cycle Timer, Water Temperature Satisfied**

- While a heating call exists (TT or DHW-TT closed) and an element cycles off to maintain set point temperature, it will not re-energize for 90 seconds.

### **Pump Exercising**

- After 24 hours of pump inactivity, the pump will turn on for 60 seconds. Boiler must be in ON mode for pump exercising to occur.

### **Non-Volatile Memory**

- If power is lost, after it is restored, unit will return to mode it was in before power loss. In addition, all user settings will be retained and restored.

### **Boiler Fault Codes**

#### ***Freeze Protection***

- If water temperature falls below 45°F (7°C), the control will automatically initiate a heat call sequence RW (TT) until water temperature reaches 5°F (13°C). Boiler must be in ON mode for freeze protection to occur.

#### ***Relay Failure Alarm***

- If a heating element relay fails, control will switch off all heating elements and energize the pump. Audible alarm sound and the relay designator, "r1", "r2", "r3", "r4" will display for a minimum of 30 seconds and until error clears.

#### ***Temperature Sensor Failure***

- Water temperature sensor is always monitored (on and off modes). If sensor is open "tSO" will be displayed. If the sensor is shorted, "tSS" be displayed. In both cases, the control switches off heating elements. Audible alarm sound for a minimum of 30 seconds and until error clears.

#### ***Abnormal Power Alarm***

- Incoming power is always monitored (on and off modes). If power to control falls below 18 VAC, the control switches off.
- Audible alarm will sound for a minimum of 30 seconds until voltage is above 18 VAC.

#### ***Flow Alarm***

- Flow alarm monitored during heating cycle while elements are energized or attempting to be energized. An open flow switch has no effect while heating elements are off. If flow switch opens while elements are energized or attempting to be energized, control will switch off all elements and enter 60 second purge mode. Audible alarm will sound and "FLO" will be displayed for a minimum of 30 seconds and until error clears or demand for heat ceases. Pump will remain on for a minimum of 30 seconds after fault clears.

### ***High Limit Alarm***

- High-limit alarm is always monitored except while LMC terminals are open. If the High Limit switch opens, control will switch off all elements and enter a 60 second purge mode.
- Audible alarm will sound, and "HL" will be displayed for a minimum of 30 seconds and until error clears. Pump will remain on for a minimum of 30 seconds after the fault clears.

### ***Control Hardware Failure***

- Control hardware monitoring system is active while control is on. If control hardware failure is detected, control will switch off boilers. Audible alarm will sound and "CHF" is displayed for a minimum of 30 seconds and until the error clears.

### ***Test Mode***

- Test mode is intended for installer verification of electric boiler control. It is used to reduce time required to conduct comprehensive functional test. Initiation of test mode can be accessed through the user interface and is not intended for unauthorized personnel.
- To enter test mode, unit must be energized and in OFF mode. Press and hold ▲ up arrow button for 4 seconds. Firmware version is displayed for 3 seconds then element configuration ("2" or "4") is displayed. Pressing either up ▲ or down ▼ arrow buttons changes element configuration (2 or 4). Select configuration that coincides with boiler. Press MODE/PWR button, display will illuminate all segments 8.8.8 along with demand LED (TT).
- Pressing MODE/PWR button again, "tSt" is displayed. Check is made of flow switch circuit, low water cutoff sensor circuit, high limit circuit, load management circuit and water temperature sensor. If any circuit is open or temperature sensor is shorted, display will indicate an error code (FLO, LCO, HL, tSO, tSS) and audible alarm will sound.
- Pressing MODE/PWR button again enters element check sequence. Each element heating circuit is checked for power. If element does not have power, error is displayed ("r1", "r2", "r3", "r4") and audible alarm will sound.
- When test is completed "dOn" is displayed. Pressing MODE/PWR button will repeat the test. Pressing ▲ up arrow button exits test mode and returns to OFF mode. Control automatically exits test after 4 minutes. Removing power exits test mode.

# 10 Start-up

## WARNING

Use a qualified service agency for annual inspection of boiler and heating system. Wiring errors can cause improper and dangerous operation.

1. Verify boiler circuit breaker and switch at service entrance and hydronic block circuit breakers within unit are in "Off" position.
2. Label all wires prior to disconnection when servicing controls. Also, verify proper orientation after service. Place Hydronic Block into service.

**NOTICE:** Only propylene glycol can be used in heating system to prevent freezing.

3. Recommendation is maximum 40% or less propylene glycol mixture to ensure proper boiler operation.
4. Fill heating system until pressure is 15-25 PSIG. Check for leaks, repair if necessary, purge all air from system.

## CAUTION

Failure to vent and keep air out of the heating system will result in damage to heating elements. Damage due to element dry fire is not covered by warranty.

1. Turn on circuit breaker at service entrance and/or disconnect switch and all circuit breakers on boiler.
2. Set boiler operating temperature to desired heating water temperature. See Sequence of Operation.
3. Set room thermostat above room temperature. Circulator pump will operate.
4. Check system again for leaks. Allow circulator pump to run until all air has been vented from system. Gurgling or rushing sound indicates presence of air.
5. Do not allow electric elements to fire until all air is purged from system. Reset room thermostat if needed. Re-purge boiler if necessary.

6. Boiler will start to produce heat. Listen for air passing through system as water temperature increases. Water pressure will rise somewhat as temperature increases-this is normal as long as pressure remains less than 25 PSIG. Excessive pressure increase indicates flooded or undersized expansion tank.
7. When thermostat calls for heat, circulator will energize and green pump LED will light. Heating elements are energized with green heating element LEDs. Once boiler water temperature reaches set point temperature, controller will regulate water temperature by staging its elements. Number of element(s) that stays on is based on heating demand and set point of boiler water temperature.
8. After thermostats are satisfied, controller de-energizes element one after another and switches pump off after 3 minutes.

# 11 General Maintenance

Electric Boiler requires periodic maintenance. Annual maintenance allows for trouble-free operation.

## WARNING

**Electrical Shock Hazard.** Turn OFF electrical power supply at main power switch before servicing unit. A qualified service agent should perform service. Failure to do so could result in death or serious injury.

1. Conduct general external examination at beginning of each heating season and mid-heating season to assure good working performance continues. A qualified service technician should examine at least once every year.
2. Do not store anything against boiler or allow dirt or debris to accumulate in area surrounding boiler.
3. Elements will burn out if boiler is not adequately filled with water when electrical power turned on.

**NOTICE:** Do not connect thermostat wire until system has been filled with water.

4. Drain water out of system only when necessary to make repairs or prevent freeze-up during extended cold weather shutdown.
5. Check temperature and pressure gauge frequently. During normal operating conditions, pressure should be stable throughout heating season. If pressure under normal operating conditions consistently rises and falls over a period of time, this can indicate fill valve leak, system, or expansion tank malfunction. Leaks anywhere must be repaired immediately. If leaks or significant pressure fluctuations are observed, call for service immediately.
6. Check field entrance wire connections to unit for any sign of looseness and securely tightened.
7. Check all heating element wiring for signs of dark or damaged connections. Replace if necessary.

## 12 Troubleshooting

This section is to assist service technicians when troubleshooting the electric boiler. Control error codes can help identify cause of problem. If you suspect a wiring fault, check all external wiring and wiring connections following wiring diagram label on the side of the boiler's cover. Additional wiring diagrams are included in this manual.

### **⚠ WARNING**

#### **Electrical Shock Hazard.**

Turn OFF electrical power supply at service panels before making electrical connections. Failure to do so could result in death or serious injury.

#### **Noisy Boiler**

- Check water pressure of boiler. Should be 14-25 PSIG.
- Check for air within system. Install proper air vents and purge unit as necessary.

#### **Heating Element Change**

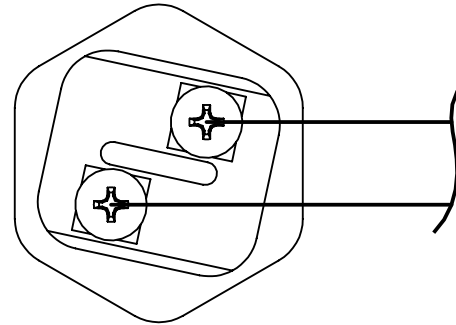
### **⚠ WARNING**

#### **Burn and Electrical Shock Hazard.**

Turn OFF electrical power supply at service panels before making electrical connections. Failure to do so could result in death or serious injury.

Heating element change, use following procedure:

1. Turn off boiler circuit breaker at service entrance and/or disconnect switch.
2. Close valves near inlet and outlet hydronic block.
3. Isolate boiler by closing valves at inlet and outlet piping.
4. Open drain valve and allow water to drain from boiler. This allows for minimum system draining to replace element. Manual operation of relief valve will assist drainage by allowing air to enter.
5. Remove jacket cover. Remove element wires one element at a time.
6. Elements are installed on top of the heat exchanger.



**Figure 12-1: Element Connections**

7. Remove element wires one element at a time. See Figure 12-1.
8. Using Ohm meter to check element resistance.

**Table 12-2: Element Connections**

| Boiler Model | Element (kW) | Resistance Ohms @ Room Temp |
|--------------|--------------|-----------------------------|
| SWA16        | 4            | 14 to 14.5                  |
| SWA20        | 5            | 11 to 12                    |
| SWA24        | 6            | 9 to 10                     |

9. After element has been removed, carefully clean any remaining gasket material from casting surface. Take care not to scratch or score surface.
10. Install new gasket and heating element while assuring element is correctly positioned.

#### **Manual High Limit Sensor**

Follow the steps below to replace or reset high limit sensor.

1. Turn off power before replacing or resetting high limit.
2. Remove front and top jacket panel for better access.
3. Locate high limit sensor installed on top of heat exchanger.
4. To reset high limit, wait until water temperature drops below 200°F, then press reset button.
5. To replace, follow instructions provided with high limit replacement kit.

## 12 Troubleshooting *(continued)*

| Fault   | Possible Cause   | Corrective Action  |
|---|--|--|
| HL - High Limit Trip                              | Is circulator pump functional?   | Check power to pump and replace as necessary.  |
|   | Check temperature rise across boiler.  | Maintain a minimum of 3 GPM. Refer to Table 5-1. Increase flow rate by using larger pump or pipe size. Radiant installation requires maximum 20 °F temperature rise. |
|   | Check for temperature overshoot after completion of heating cycle.   | If greater than 10°F then increase differential setting.   |
|   | Check that HL screw terminals on control board are tight.  |  |
|   | Are high limit switches open while water temperatures less than 200°F (<200°F)                             | Check high limit switches with Ohm meter. Replace high limit(s) open.  |
|   | Is heat load too small?  | Check heat load calculations.  |
| AbP - Abnormal Power Alarm                        | Power too high or too low?   | Check incoming power is between 179 VAC and 240 VAC (197<IP<240 VAC). If power outside range, contact electrician to have power corrected.                           |
|   | Power is OK while unit is off but drops when unit is on.   | Check for adequate wiring and breaker size.  |
| Water Temperature Overshoots Setpoint Temperature | A small overshoot is normal, however if overshoot is greater than 10°F (OS>10°F) then check the following. | Check temperature rise across boiler is less than 20°F. If too high then increase flow rate through boiler, use larger boiler pump if necessary.                     |
|   | Boiler is oversized for heating zone?  | Check heat load calculations.  |
|   | Differential is too low?   | Increase differential temperature setting.   |
| DFF - Dry Fire Alarm                              | Air in boiler?   | Purge boiler until all air is removed.   |
|   |  | Check that adequate air vents are located in critical system high points. Add vents as necessary.  |
| tSO, tSS - Temperature sensor failure.            | Check resistance value of sensor using R/T chart.  | Good - Check for loose WT terminals on control board.  |
|   |  | Bad - Replace sensor.  |
| CHF Control Hardware Failure                      | Check all wiring for damage or loose connections.  | Bad - Tighten any loose terminals. Replace damaged wiring.   |
|   |  | Good - Replace control.  |
| Circuit Breakers Trip                             | Inspect wiring for damage or short circuits.   | Bad - tighten any loose terminals. Replace damaged wiring.   |
|   | Inspect heating elements, check element resistance value is between 9 and 20Ω (Ohms).                      | Bad - replace heating element(s).  |
|   | Is current draw between 12 and 25A (Amps) per element?   | Bad - replace heating element(s).  |
| r1, r2, r3, r4 Relay Failure Codes                | Is heating element wiring loose or damaged. Use clamp meter to check.                                      | Bad - tighten any loose terminals. Replace damaged wiring.   |
|   | Is heat relay stuck closed?  | With power removed check relay contacts with an Ohm meter. Replace control if relay is stuck closed.   |

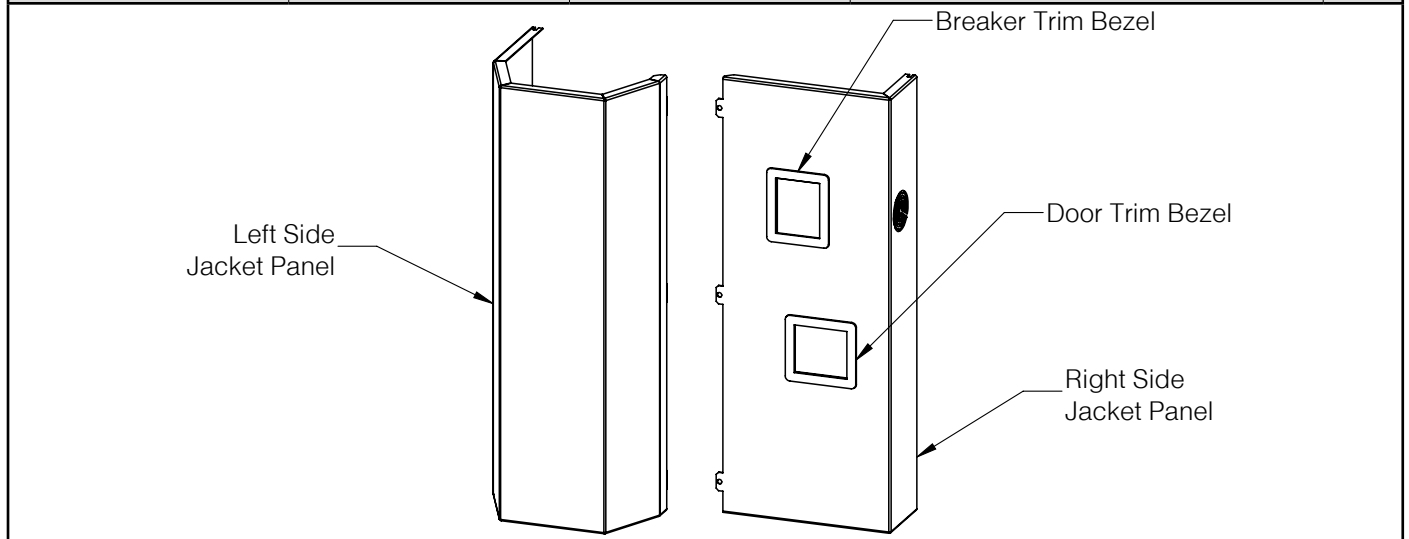
## 12 Troubleshooting *(continued)*

| Fault  | Possible Cause                          | Corrective Action   |
|--|---|---|
| FLO Flow Switch Alarm                                    | Is flow switch installed?               | N - Check control board jumper is in place and secure. Tighten FLO screws if needed.  |
|  |   | Y - System air locked - Purge system and add venting as needed.   |
|  |   | Y - Check that flow switch is functioning properly. Conduct self test on flow switch (consult manufacturer's instructions). Check for proper operation of boiler and system pump. |
| LWC Low Water Cutoff Alarm                               | Is LWCO installed?                      | N - Check control board jumper is in place and secure. Tighten LWC screws if needed.  |
|  |   | Y - System air is locked - Purge system, add venting as needed.   |
|  |   | Y - System low on water. Check water feed to boiler, check for leaks. Repair as needed.   |
|  |   | Y - Check that LWCO is functioning properly. Conduct self test on LWCO switch (consult manufacturer's instructions).  |
| Control Display Dark/ Un-responsive                      | Is electrical power applied to unit?    | Check incoming power is between 197 VAC and 240 VAC ( $197 < IP < 240$ VAC). If power outside range, contact electrician to have power corrected.                                 |
|  | Field service circuit breakers tripped? | Check for loose or damaged wiring. Replace wiring if damaged.   |
|  |   | Check heating element resistance within 9-20 $\Omega$ (Ohms). Replace element if outside range.   |
|  | Is control transformer functioning?     | Check for 24 VAC on R and C terminals of control board. If less than 18 VAC on R & C with primary side between 104 and 130 VAC then replace transformer.                          |
|  |   | With power removed, check control transformer primary and secondary windings for open or short. If windings are open or short, replace transformer.                               |
|  |   | With power removed, check 5A fuse on control board. If bad, replace fuse.   |
|  | Is wiring loose or damaged?             | Inspect all thermostat wiring for damage loose connections or damage. Replace wiring if necessary.  |
| Control functions correctly however does not heat water. | Heating element(s) failed?              | Check heating element resistance within 9-20 $\Omega$ (Ohms). Replace element if outside range.   |
|  | Boiler 60A breaker tripped?             | Check for loose or damaged wiring. Replace wiring if damaged.   |
|  |   | Check heating element resistance within 9-20 $\Omega$ (Ohms). Replace element if outside range.   |
|  |   | Check control board for damaged heat relay(s).  |
|  |   | Check boiler pump is operational. Replace if necessary.   |

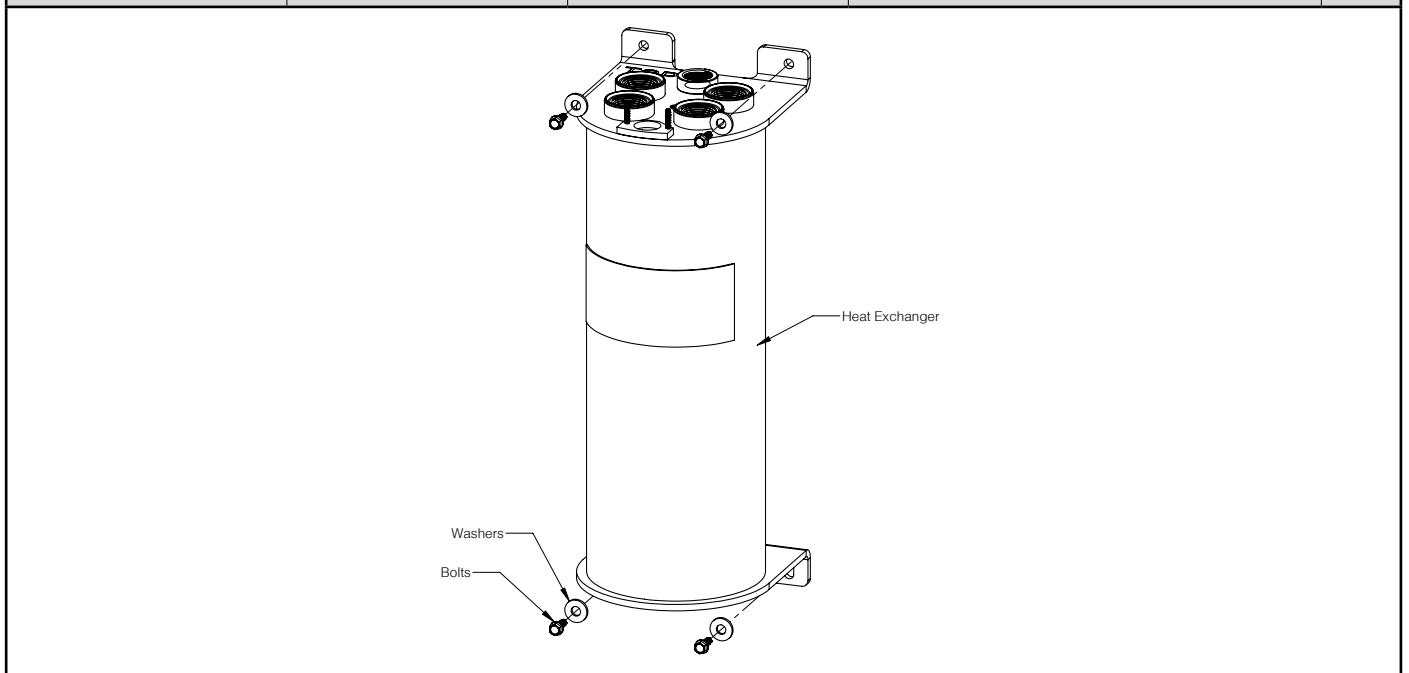


# 13 Service Parts

|                        | Part Number | Boiler Models           | Kit Contents            | Qty |
|------------------------|-------------|-------------------------|-------------------------|-----|
| Jacket Front Cover Kit | 112356-01   | SWA16<br>SWA20<br>SWA24 | Left side jacket panel  | 1   |
|                        |             |                         | Right side jacket panel | 1   |
|                        |             |                         | Boiler logo             | 1   |
|                        |             |                         | Door trim bezel         | 1   |
|                        |             |                         | Breaker trim bezel      | 1   |
|                        |             |                         | Screw                   | 4   |
|                        |             |                         | Instructions            |     |

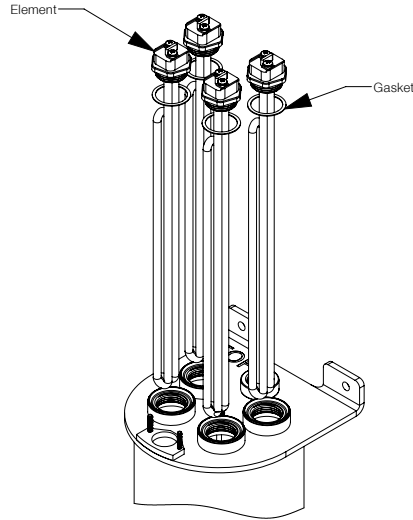


|                | Part Number | Boiler Models           | Kit Contents   | Qty |
|----------------|-------------|-------------------------|----------------|-----|
| Heat Exchanger | 112022-01   | SWA16<br>SWA20<br>SWA24 | Heat exchanger | 1   |
|                |             |                         | Bolts          | 4   |
|                |             |                         | Washers        | 4   |
|                |             |                         | Instructions   |     |

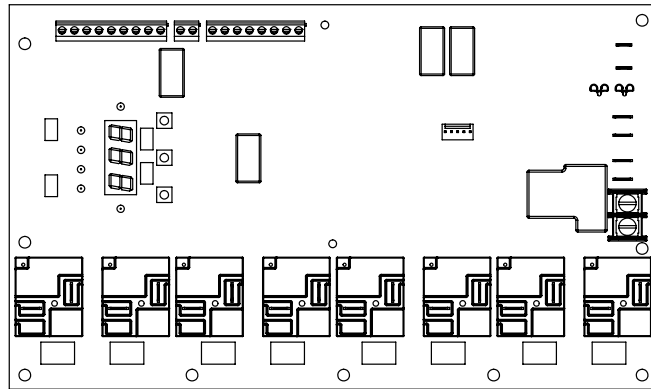


# 13 Service Parts *(continued)*

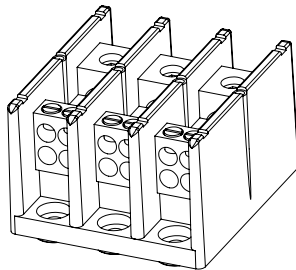
|                 | Part Number | Boiler Models | Kit Contents | Qty |
|-----------------|-------------|---------------|--------------|-----|
| Heating Element | 111999-01   | SWA16         | Element      | 4   |
|                 | 111999-02   | SWA20         | Gasket       | 4   |
|                 | 111999-03   | SWA24         | Instructions |     |



|                | Part Number | Boiler Models           | Kit Contents   | Qty |
|----------------|-------------|-------------------------|----------------|-----|
| Boiler Control | 112003-01   | SWA16<br>SWA20<br>SWA24 | Boiler Control | 1   |
|                |             |                         | Screws         | 8   |
|                |             |                         | Instructions   |     |

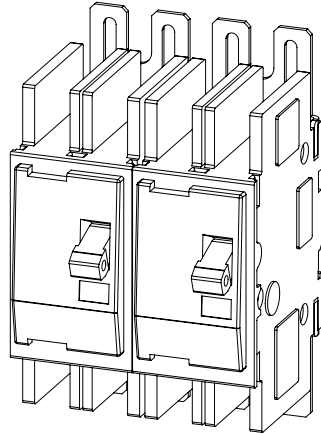


|             | Part Number | Boiler Models           | Kit Contents | Qty |
|-------------|-------------|-------------------------|--------------|-----|
| Power Block | 112021-01   | SWA16<br>SWA20<br>SWA24 | Power Block  | 1   |
|             |             |                         | Screws       | 4   |
|             |             |                         | Instructions |     |

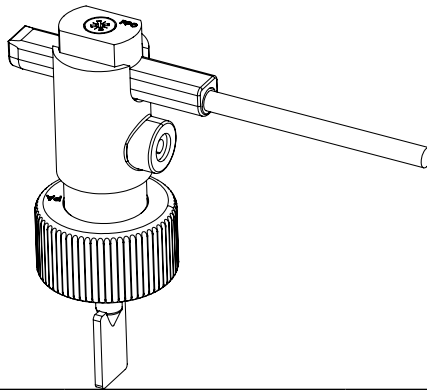


# 13 Service Parts *(continued)*

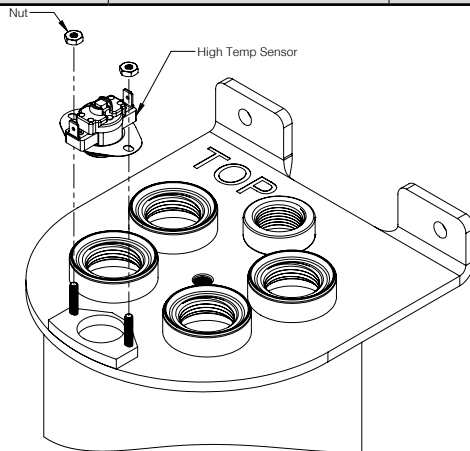
|               | Part Number | Boiler Models           | Kit Contents  | Qty |
|---------------|-------------|-------------------------|---------------|-----|
| Power Breaker | 112002-01   | SWA16<br>SWA20<br>SWA24 | Power Breaker | 1   |
|               |             |                         | Screws        | 4   |
|               |             |                         | Instructions  |     |



|             | Part Number | Boiler Models           | Kit Contents | Qty |
|-------------|-------------|-------------------------|--------------|-----|
| Flow Switch | 112147-01   | SWA16<br>SWA20<br>SWA24 | Flow Switch  | 1   |
|             |             |                         | Instructions |     |

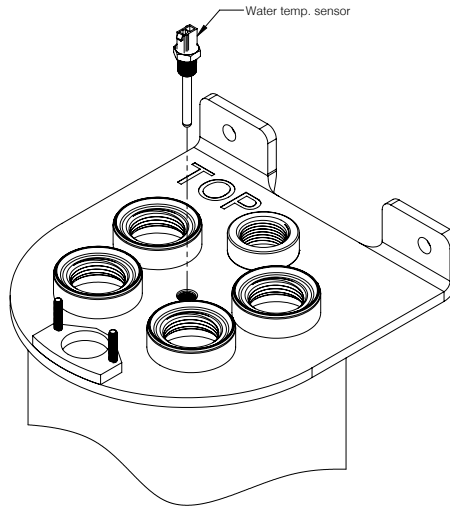


|                         | Part Number | Boiler Models           | Kit Contents       | Qty |
|-------------------------|-------------|-------------------------|--------------------|-----|
| High Temperature Sensor | 112023-01   | SWA16<br>SWA20<br>SWA24 | Temperature Sensor | 1   |
|                         |             |                         | Nuts               | 2   |
|                         |             |                         | Instructions       |     |

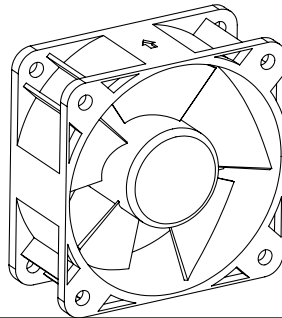


# 13 Service Parts *(continued)*

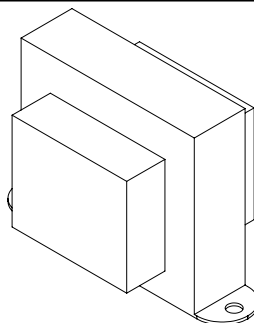
|                          | Part Number | Boiler Models           | Kit Contents       | Qty |
|--------------------------|-------------|-------------------------|--------------------|-----|
| Water Temperature Sensor | 112019-01   | SWA16<br>SWA20<br>SWA24 | Temperature Sensor | 1   |
|                          |             |                         | Instructions       |     |



|             | Part Number | Boiler Models           | Kit Contents | Qty |
|-------------|-------------|-------------------------|--------------|-----|
| Cooling Fan | 112005-01   | SWA16<br>SWA20<br>SWA24 | Fan          | 1   |
|             |             |                         | Screws       | 4   |
|             |             |                         | Locknut      | 4   |
|             |             |                         | Instructions |     |



|             | Part Number | Boiler Models           | Kit Contents | Qty |
|-------------|-------------|-------------------------|--------------|-----|
| Transformer | 112024-01   | SWA16<br>SWA20<br>SWA24 | Transformer  | 1   |
|             |             |                         | Screws       | 2   |
|             |             |                         | Instructions |     |



# 13 Service Parts *(continued)*

|                                    | Part Number | Boiler Models           | Kit Contents | Qty |
|------------------------------------|-------------|-------------------------|--------------|-----|
| Power Block Wire Harness           | 112163-01   | SWA16<br>SWA20<br>SWA24 | Wire Harness | 1   |
|                                    |             |                         | Instructions |     |
|                                    |             |                         |              |     |
|                                    | Part Number | Boiler Models           | Kit Contents | Qty |
| High Voltage Harness Element 1 & 2 | 112164-01   | SWA16<br>SWA20<br>SWA24 | Wire Harness | 1   |
|                                    |             |                         | Instructions |     |
|                                    |             |                         |              |     |
|                                    | Part Number | Boiler Models           | Kit Contents | Qty |
| High Voltage Harness Element 3 & 4 | 112165-01   | SWA16<br>SWA20<br>SWA24 | Wire Harness | 1   |
|                                    |             |                         | Instructions |     |
|                                    |             |                         |              |     |
|                                    | Part Number | Boiler Models           | Kit Contents | Qty |
| Low Voltage Harness                | 112365-01   | SWA16<br>SWA20<br>SWA24 | Wire Harness | 1   |
|                                    |             |                         | Instructions |     |
|                                    |             |                         |              |     |
|                                    | Part Number | Boiler Models           | Kit Contents | Qty |
| Fan Terminal Wire Harness          | 112169-01   | SWA16<br>SWA20<br>SWA24 | Wire Harness | 1   |
|                                    |             |                         | Screws       | 2   |
|                                    |             |                         | Instructions |     |
|                                    |             |                         |              |     |

# Limited Warranty

For SPARQ Electric Boilers

Subject to the terms and conditions set forth below, Velocity Boiler Works (VBW), Philadelphia, PA USA hereby extends the following limited warranties to the original owner of a SPARQ electric boiler or VBW supplied parts and/or accessories for SPARQ electric boilers manufactured and shipped on or after June 1, 2023:

## LIMITED WARRANTY ON BOILERS AND PARTS / ACCESSORIES SUPPLIED BY VELOCITY BOILER WORKS.

VBW warrants to the original owner that its electric boiler and associated parts/accessories comply at the time of manufacture with recognized hydronic industry standards and requirements then in effect and will be free of defects in material and workmanship under normal usage for a period of two years from the date of original installation. If any part of a boiler or any part or accessory provided by VBW is found to be defective in material or workmanship during this two year period, VBW will, at its option, repair or replace the defective part. **NOTE: Repair/replace option does not include labor charges incurred during the repair/replace procedure.**

## HEAT EXCHANGER WARRANTIES

VBW warrants to the original owner that the heat exchanger of its boilers will remain free from defects in material and workmanship under normal usage for twenty years from the date of installation. This warranty applies to the original owner at the original place of installation. If a warranty claim is made during this time, VBW will, at its option, repair or replace the heat exchanger.

**NOTE: Repair/replace option does not include labor charges incurred during the repair/replace procedure.**

NOTE: If the heat exchanger involved is no longer available due to product obsolescence or redesign, the value used to establish the retail price will be the published price as shown in the SPARQ Products Repair Parts Pricing where the heat exchanger last appeared or the current retail price of the then nearest equivalent heat exchanger.

## ADDITIONAL TERMS AND CONDITIONS

1. **Applicability:** The limited warranties set forth above are extended only to the original owner at the original place of installation within the United States and Canada. These warranties are applicable to boilers, parts, or accessories provided by VBW and installed in a single or two-family residential applications with boiler ratings of 299 MBH and lower.
2. **Components Manufactured by Others:** Upon expiration of the one year limited warranty on residential grade boilers, all boiler components manufactured by others but furnished by VBW will be subject only to the manufacturer's warranty, if any.
3. **Proper Installation:** The warranties extended by VBW are conditioned upon the installation of the boiler, parts, and accessories in strict compliance with SPARQ installation instructions. VBW specifically disclaims liability of any kind caused by or relating to improper installation.
4. **Proper Use and Maintenance:** The warranties extended by VBW conditioned upon the use of the boiler, parts, and accessories for its intended purposes and its maintenance accordance with VBW recommendations and hydronics industry standards. For proper installation, use, and maintenance, see all applicable sections of the Installation and Operating, and Service Instructions Manual furnished with the unit.
5. This warranty does not cover the following:
  - a. Expenses for removal or reinstallation. The boiler owner will be responsible for the cost of removing and reinstalling the alleged defective part or its replacement and all labor and material connected therewith, and transportation to and from VBW.
  - b. Components that are part of the heating system but were not furnished by VBW as part of the boiler.
  - c. Improper adjustment, control settings, care or maintenance.
  - d. This warranty cannot be considered as a guarantee of workmanship of an installer connected with the installation of the boiler, or as imposing on VBW's liability of any nature for unsatisfactory performance as a result of faulty workmanship in the installation, which liability is expressly disclaimed.
  - e. Boilers, parts, or accessories installed outside the 48 contiguous United States, the State of Alaska and Canada.

- f. Damage to the boiler and/or property due to installation or operation of the boiler that is not in accordance with the boiler installation and operating instruction manual.
  - g. Any damage or failure of the boiler resulting from hard water or scale buildup in the heat exchanger.
  - h. Any damage caused by additives or contamination that may cause corrosion and/or clogging of the heat exchanger.
  - i. Any damage resulting from air contaminated with particulate including but not limited to sheetrock or plasterboard particles, dirt, and dust particulate.
  - j. Any damage, defects or malfunctions resulting from improper operation, maintenance, misuse, abuse, accident, negligence including but not limited to operation with insufficient water flow, improper water level, improper water chemistry, or damage from freezing.
  - k. Any damage caused by water side clogging due to dirty systems or corrosion products from the system.
    - l. Any damage resulting from natural disaster.
    - m. Damage or malfunction due to the lack of required maintenance outlined in the Installation and Operating Manual furnished with the unit.
6. **Exclusive Remedy:** VBW's obligation for any breach of these warranties is limited to the repair or replacement of its parts in accordance with the terms and conditions of these warranties.
  7. **Limitation of Damages:** Under no circumstances shall VBW be liable for incidental, indirect, special or consequential damages of any kind whatsoever under these warranties, including, but not limited to, injury or damage to persons or property and damages for loss of use, inconvenience or loss of time. VBW liability under these warranties shall under no circumstances exceed the purchase price paid by the owner for the residential grade boiler involved. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
  8. **Limitation of Warranties:** These warranties set forth the entire obligation of VBW with respect to any defect in a boiler, parts, or accessories and VBW shall have no express obligations, responsibilities or liabilities of any kind whatsoever other than those set forth herein. These warranties are given in lieu of all other express warranties.

ALL APPLICABLE IMPLIED WARRANTIES, IF ANY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED IN DURATION TO A PERIOD OF ONE YEAR EXCEPT THAT IMPLIED WARRANTIES, IF ANY, APPLICABLE TO THE HEAT EXCHANGER IN A RESIDENTIAL GRADE BOILER SHALL EXTEND TO THE ORIGINAL OWNER FOR THE TIME SPECIFIED IN THE HEAT EXCHANGER SECTION SHOWN ABOVE AT THE ORIGINAL PLACE OF INSTALLATION. SOME STATES DO NOT ALLOW LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

## PROCEDURE FOR OBTAINING WARRANTY SERVICE

In order to assure prompt warranty service, the owner is requested to register their product online at [www.velocityboilerworks.com](http://www.velocityboilerworks.com) within ten days after the installation of the boiler, although failure to comply with this request will not void the owner's rights under these warranties. Upon discovery of a condition believed to be related to a defect in material or workmanship covered by these warranties, the owner should notify the installer, who will in turn notify the distributor. If this action is not possible or does not produce a prompt response, the owner should write to Velocity Boiler Works, Attn: Customer Service, P.O. Box 14818, Philadelphia, PA 19134, giving full particulars in support of the claim. The owner is required to make available for inspection by VBW or its representative the parts claimed to be defective and, if requested by VBW to ship these parts prepaid to Velocity Boiler Works, 3633 "I" Street, Philadelphia, PA 19134 for inspection or repair. In addition, the owner agrees to make all reasonable efforts to settle any disagreement arising in connection with a claim before resorting to legal remedies in the courts.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.



**SPARQ**  
ELECTRIC BOILER

Velocity Boiler Works  
P.O. Box 14818  
Philadelphia, PA 19134





**Velocity Boiler Works, LLC**

**P.O. Box 14818**

**3633 I Street**

**Philadelphia, PA 19134**

**[www.velocityboilerworks.com](http://www.velocityboilerworks.com)**