



## OPERATING AND MAINTENANCE MANUAL

# Hubbell Synergy Hydro BWXP

10/18/23



**-IMPORTANT-**

Always reference the full model number and serial number when calling the factory.

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## **WARNING / CAUTION**

1. **FLUIDS UNDER PRESSURE MAY CAUSE INJURY WHEN RELEASED.** Always shut off all incoming and outgoing valves and carefully decrease all trapped pressures to zero before opening any covers, piping, or gauge connections, etc.
2. **HOT WATER OR HOT SURFACES CAN CAUSE SEVERE BURNS.** Wear safety goggles and protective gloves when carrying out maintenance procedures involving the heater and/or when removing accessories from the heater. Shield your eyes and body to protect from spray when opening a relief valve.
3. Due to the rigors of transportation, all connections should be checked for tightness before heater is placed in operation.
4. Safety relief valve must be installed in tapping provided.
5. **KEEP AWAY FROM LIVE ELECTRICAL CIRCUITS.**  
Do not perform any maintenance, make any adjustments, or replace any components inside the control panel with the high voltage power supply turned on. Under certain circumstances, dangerous potentials may exist even when the power supply is off. To avoid casualties, always turn the power supply safety switch off, turn the charge or ground the circuit before performing any maintenance or adjustment procedure.
6. Generalized instructions and procedures cannot anticipate all situations. For this reason, only qualified installers should perform the installations. A qualified installer is a person who has licensed training and a working knowledge of the applicable codes, regulations, tools, equipment, and methods necessary for safe installation of a steam fired water heater. If questions regarding installation arise, check with your local plumbing and electrical inspectors for proper procedures and codes.

## SECTION I - GENERAL DESCRIPTION AND CONSTRUCTION

### **GENERAL DESCRIPTION**

This manual provides a complete description, as well as installation, operation, troubleshooting, maintenance, and servicing procedures for a fully packaged indirect fired water heater. This heater provides potable hot water for various functions. It is a permanently installed, stationary, self-contained unit with automatic operating controls.

### **GENERAL OPERATION**

The BWXP model operates using boiler water as its power source for heating potable hot water. Boiler water and potable water enter the plate heat exchanger, in a counter flow pattern, where heat transfer takes place from the boiler water to the potable water. The heated potable water exits the heat exchanger and passes through a series of safety and control components prior to exiting the heater through the hot water outlet. A skid mounted control panel provides a central location for electrical power and remote display connections. A microprocessor-based temperature controller is mounted in the panel and monitors the potable water outlet temperature via a thermocouple mounted within the outlet piping, regulating the boiler water flow to the heat exchanger to produce the desired potable water outlet temperature.

### **CONSTRUCTION**

The water heater components and operating controls are factory selected, sized, piped, and tested to ensure reliable operation. See applicable drawing supplied with water heater for specific details.

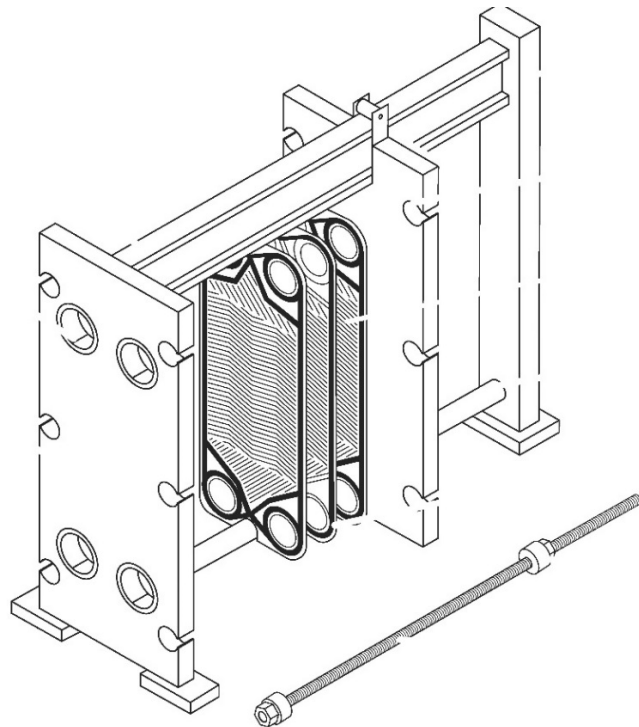
### **PLATE AND FRAME HEAT EXCHANGER**

Model: BWXP-\*\*\*\*-PF\* only

The water heater is supplied with a high-quality Plate and Frame Heat Exchanger certified to ASME Section VIII Division 1 standards.

The heat exchanger consists of individual embossed plates with associated plate gaskets, contained between bolted end plates and supports. The serially arranged plates form a pack of flow gaps inside the heat exchanger. The boiler water and potable water flow through every other flow gap in opposite directions for efficient heat transfer. The number and arrangement of the heat exchanger plates depends on the specific requirements of each water heater application.

Refer to the separate component O&M manual for a complete functional description as well as detailed information on the construction and maintenance of the plate and frame heat exchanger.

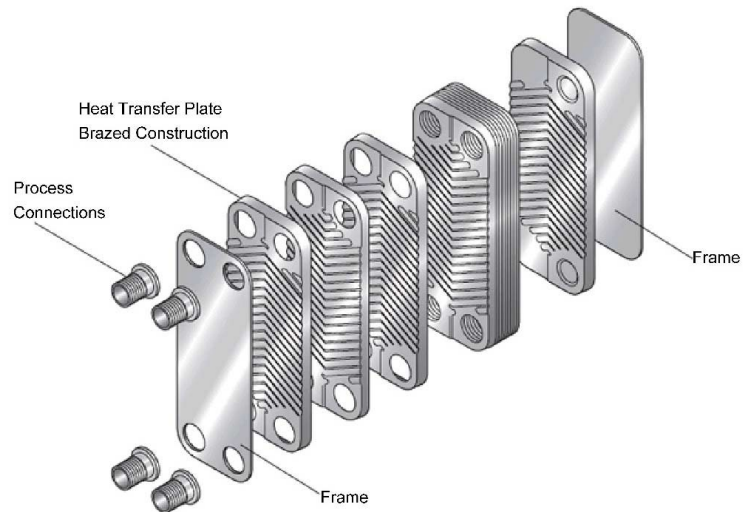


## **BRAZED PLATE HEAT EXCHANGER**

Model: BWXP-\*\*\*\*-BP\* only

The water heater is supplied with an efficient high quality Brazed Plate Heat Exchanger.

The heat exchanger consists of individual embossed plates contained between end plates. The serially arranged plates are brazed together forming a sealed pack with flow gaps between each plate. The boiler water and potable water flow through every other flow gap in opposite directions for efficient heat transfer. The number and arrangement of the heat exchanger plates depends on the specific requirements of each water heater application.



Refer to the separate component O&M manual for a complete functional description as well as detailed information on the construction and maintenance of the brazed plate heat exchanger.

## **BOILER WATER COMPONENTS**

### **Boiler Water Control Valve**

There are two types of boiler water control valves utilized in the BWXP Water Heater. The following describes the design and functional differences of these two optional methods of construction. Refer to the technical drawings provided with the heater to determine which valve type is utilized.

#### **Control Valve, 3-Way**

The control valve is a motorized 3-way characterized control valve that regulates the flow of boiler water to the heat exchanger, providing the precise amount of boiler water to produce the desired potable water output temperature. This valve receives an electrical position signal from the panel mounted temperature controller, directing excess boiler water flow around the heat exchanger and directly to the boiler water outlet piping. The control valve is spring loaded and is installed in such a way that in the event of reaching the potable water high limit temperature, power is removed from the valve and the spring action directs the full flow of boiler water to bypass the heat exchanger preventing an excessive over-temperature of the potable water.



Refer to the separate component O&M manual for a complete functional description as well as detailed information.

### **Control Valve, 2-Way**

A high quality electrically operated control valve is installed in the boiler water line upstream of the heat exchanger. This sophisticated electronic device proportionally controls the flow of boiler water to the heat exchanger providing the precise amount of boiler water to produce the desired potable water output temperature. This valve receives an electrical position signal from the panel mounted temperature controller to maintain the pre-set water temperature. The control valve is installed in such a way that in the event of reaching the potable water high limit temperature, power is removed from the control valve allowing it to automatically close. The closed valve blocks the flow of boiler water to the heat exchanger thereby preventing an excessive over-temperature of the potable water. Refer to the separate component O&M manual for a complete functional description as well as detailed information of the 2-way valve.

### **Strainers**

A cast iron 'Y' strainer with 20 mesh screen protects the boiler water controls and the passages within the plate heat exchanger from dirt and debris in the boiler water supply.

## **POTABLE WATER COMPONENTS**

### **Thermocouple**

A dual element thermocouple is mounted in the potable water outlet piping. One element is wired to the panel mounted temperature controller for monitoring and control of the desired water temperature. The second element is wired to the panel mounted High Limit Controller. See Control Panel components for additional detail.

### **Temperature and Pressure Safety Relief Valve**

A temperature and pressure Safety Relief valve is provided for installation in the potable water line downstream of the heat exchanger but prior to the control instrumentation.



### **Circulator**

A skid mounted recirculation loop is used to maintain a continuous flow of potable hot water through the heat exchanger. This loop continuously recirculates the potable water via a small circulator installed between the heat exchanger inlet and outlet connections. The circulator runs any time the control panel on/off switch is in the "on" position and the power available light is lit.

### **Strainers**

A cast bronze 'Y' strainer with 20 mesh stainless steel screen protects the potable water controls and the passages within the plate heat exchanger from dirt and debris in the water supply.

## **CONTROL PANEL**

### **Control Panel Enclosure**

A painted steel NEMA 1 enclosure, housing the main electrical control elements is mounted to integral skid supports and pre-wired to all skid mounted electrical components.

### On/Off Switch

A lighted toggle switch is mounted through the enclosure door and is utilized to turn on power to the panel, control elements and skid mounted components.

### Temperature Controller

A Chromalox 6040 temperature and process controller, configured to control the boiler water control valve with input from a temperature element mounted in the potable water outlet piping. The controller is mounted through the enclosure door to allow full access to the user interface. Refer to the separate component O&M manual for a complete functional description as well as detailed information.



### High Limit Controller

A Chromalox 6050 limit controller configured to remove power to the boiler water control valve, upon reaching a pre-set high limit of the potable water outlet temperature, with input from a temperature element mounted in the potable water outlet piping. The controller is mounted through the enclosure door to allow full access to the user interface. This controller must be reset locally after the process has returned to acceptable operating parameters. Refer to the separate component O&M manual for a complete functional description as well as detailed information.



### Fused Low Voltage Transformer

A fused low voltage transformer is supplied prewired within the control panel. This is used to step down higher voltages to 24-volts for the control circuit.



## MISCELLANEOUS COMPONENTS

### Dial Temperature and Pressure Gauge

A combination temperature (70° - 250° F) and pressure (0 – 200 psi) gauge with 2½-inch dial may be installed within the potable and boiler water inlet and outlet piping for local indication.



### Shut Off Valves

Ball valves are installed at the inlet and outlet connections of both the boiler and potable water connections.

### Drain Valves

A system drain valve with a GHT threaded connection is installed in a low point of both the boiler and potable water piping.

### SUPPORT STAND

The unit is mounted on a heavy-duty integrally welded painted steel skid, with sturdy supports, for floor mounting.

## **OPTIONS**

The following optional features may be included in your water heater. Reference included drawing specific to your heater for further details.

### **High Limit Thermostat**

The water heater may be supplied with an immersion thermostatic switch that is installed and wired at the factory. The immersion thermostat can be adjusted through a range of 100° - 190° F and is typically set 10° F above the panel mounted high limit set point. The thermostat is adjustable with a flat tip screwdriver. The high limit thermostat is wired in series with the solenoid dump valve mounted in the potable water outlet piping, downstream of the thermostat. This is a redundant circuit that is utilized to “dump” overheated potable hot water to drain in the event that the potable outlet water temperature continues to rise to the thermostat set point after actuation of the high limit controller.



### **Solenoid Dump Valve**

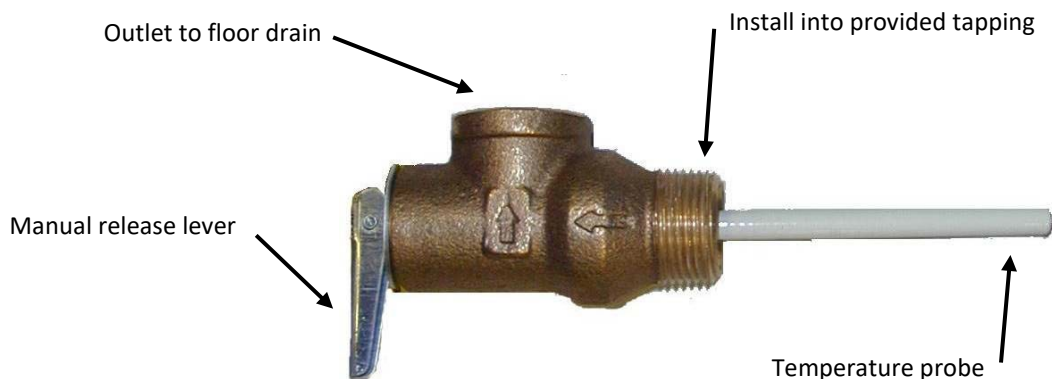
The solenoid dump valve, in conjunction with the high limit thermostat, is utilized as a double safety on the potable water outlet. It is a normally closed 2-way internally piloted solenoid valve of brass and stainless-steel construction.





## SECTION II – INSTALLATION

1. The water heater is floor mounted. It is important that the unit is level and on a solid foundation. Ensure there is adequate room around the unit for servicing.
2. Provide clear access to the heat exchanger to allow for heat exchanger service and removal.  
**NOTE:** All integral components have been properly sized to meet design conditions. Piping to the unit should be sized to meet the design conditions, as dictated by good engineering practices and be in accordance with applicable plumbing codes.
3. Connect the boiler and potable water inlet and outlet to the appropriate connections. Refer to the appropriate Hubbell drawing for size and location of piping connections.  
**NOTE:** The most effective means for preventing deterioration from accelerated corrosion due to galvanic and stray current is the installation of dielectric fittings/unions. The installation of these fittings is the responsibility of the installation contractor.
4. The combination temperature and pressure safety relief valve may have been shipped loose. If so, install the combination temperature and pressure safety relief valve in the tapping provided. Note that this is required by law for safety considerations.

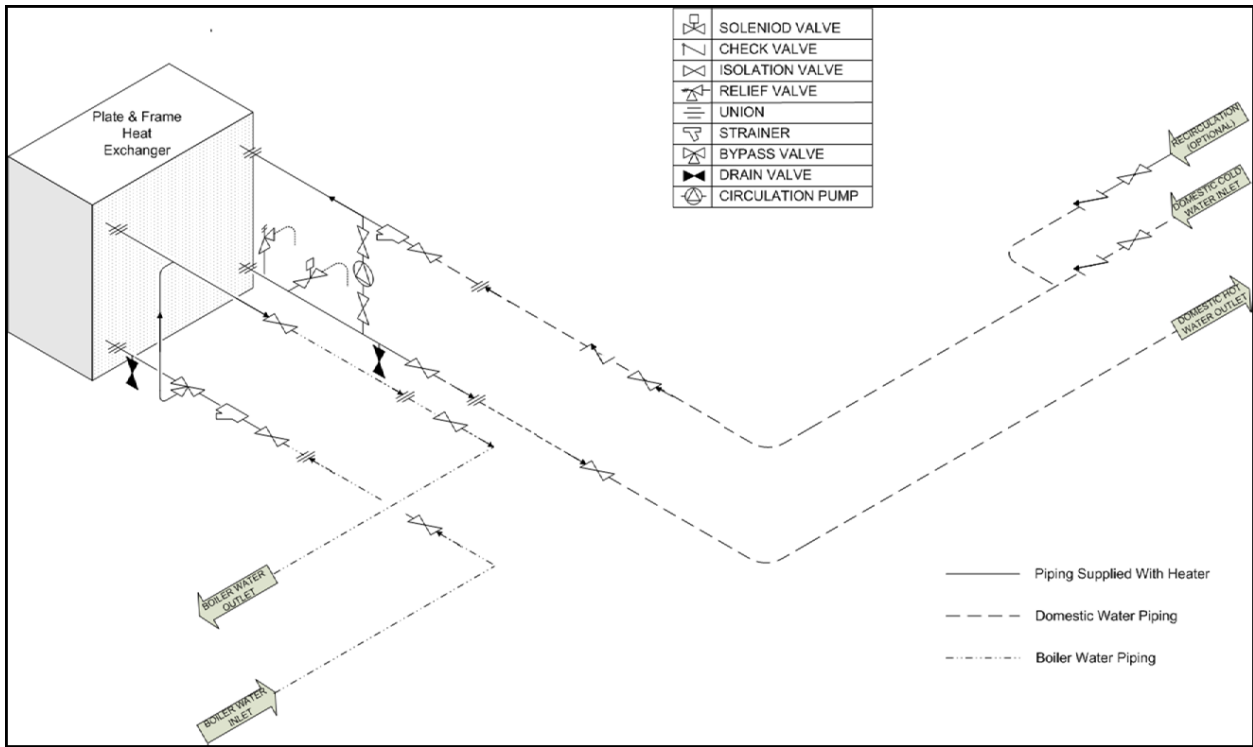


**Temperature and Pressure Relief Valve**

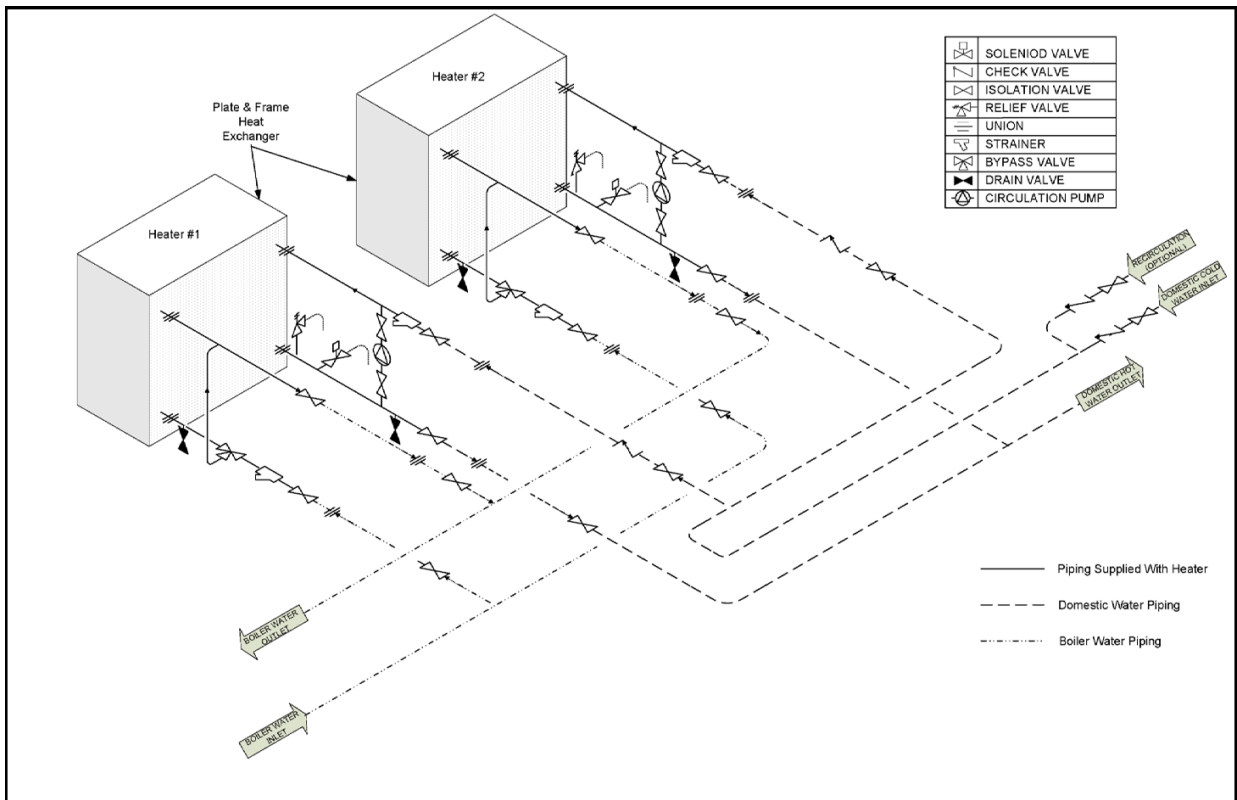
5. Install a relief valve overflow pipe to a nearby floor drain.  
**CAUTION:** No reduction in pipe size, no valves or restrictions of any type should be installed between the relief valve and process line or in the drain line.
6. Install a line from the dump valve, if so equipped, to a nearby floor drain.  
**CAUTION:** No reduction in pipe size, no valves or restrictions of any type should be installed between the dump valve and the drain line.
7. Make any desired connections necessary for drain lines.
8. Check the tightness of all factory plumbing connections. Tightening may be required due to the rigors of transportation.
9. The water heater and all piping should be protected from freezing and waterlines insulated to reduce energy and water waste. If the unit is painted or insulated on the job site, care should be taken not to paint or insulate over the nameplate or other component markings.
10. Refer to the appropriate Hubbell drawing for electrical requirements. Enter control panel enclosure with properly sized feeder leads. Be sure to properly ground the water heater. Connect the appropriate power supply lines to proper terminals within the control panel. Connect any remote display or remote indication connections, if so equipped, to the proper terminals within the control panel.

**NOTE:** All electrical wiring to unit must be in accordance with the latest edition of the N.E.C. and comply with all local code requirements.

## Single Unit Piping Schematic



## Multiple Unit Piping Schematic



## SECTION III – START-UP AND OPERATION

### START UP & OPERATION

1. Check all joints for tightness.
2. Close the four potable and boiler water inlet/outlet ball valves. Open the isolation valves on the integral circulator line.
3. Open the potable water inlet valve, fill unit with cold water. Lift lever on relief valve to relieve trapped air. Release relief valve lever when all traces of air have been vented from the unit. Leave cold-water valve open.
4. Turn the water heater power switch to the “on” position.
5. Confirm the circulator is operating. Circulator operates any time the power switch is in the “on” position.  
**CAUTION:** Do not operate the pump without the unit being filled with water and isolation valves being opened, as damage to the pump could result.
6. Confirm temperature controller and high limit controller are set to specified temperatures. Confirm actuation of temperature control valve.
7. “Crack” open the potable water outlet valve allowing a minimal water flow through the heat exchanger.  
**CAUTION:** Due to thermal expansion, during initial heating, the pressure may increase and cause water to flow from the relief valves. This is normal and will subside when pressure is released downstream. **To avoid this, personnel should closely monitor the pressure during initial startup and relieve the water pressure from a fixture as necessary.**
8. Gradually open boiler water inlet and outlet valves to allow heating medium to enter the heat exchanger. (Boiler water lines should be vented to eliminate trapped air.) Monitor the potable water outlet temperature until the desired temperature is reached. If the temperature control shuts off before the desired temperature is reached, or if over-shoot occurs, adjustment of the panel mounted temperature controller will be required. (Refer to enclosed O&M manuals for your specific unit)
9. After the desired temperature has been reached, open the valve on the hot water outlet and the building recirculation line.
10. Tightening of some gasketed and threaded joints (if used) may be required after the unit has been heated.
11. Observe operation of unit for 30-40 minutes after initial startup.

### SHUT DOWN

1. Close boiler water inlet valve and outlet valve.  
**CAUTION:** Failure to close the boiler water valves and isolate the water heater from the heat source prior to closing the potable water inlet and outlet valves may cause the potable water pressure and/or temperature to increase and cause water to flow from the relief valves and/or dump valve.
2. If so equipped, shut down the building circulation pump and close the building recirculation inlet valve.
3. Close hot water outlet valve.
4. Close the potable water inlet valve.
5. Turn the control panel mounted power switch off.
6. Disconnect all electrical power to the water heater.
7. Drain both the boiler water and potable water sides of the water heater. (Lift lever on relief valve to vent heater on the potable water line, then slowly open drain valve.)

## SECTION IV - MAINTENANCE

### WARNING / CAUTION

Before performing any maintenance procedure, make certain power supply is **OFF** and cannot accidentally be turned on.

#### HEAT EXCHANGER

**CAUTION:** The following is only to be performed after the unit has been shut down per shut down procedures located in Section III, Start Up and Operation.

1. Plate & Frame Heat Exchanger (Model: BWXP-\*\*\*\*-PF)

The Plate & Frame Heat Exchanger should be maintained per the separate component O & M Manual. The heat exchanger can be accessed by removing the sheet metal insulation cover. The top cover and three sides can be fully removed from the skid. The fourth side is designed to be slid back onto the piping, providing full access to the heat exchanger and associated hardware without breaking the main piping lines.

2. Brazed Plate Heat Exchanger (Model: BWXP-\*\*\*\*-BP)

The Brazed Plate Heat Exchanger should be maintained per the separate component O & M Manual. The heat exchanger is typically supplied without insulation allowing for easy access. If insulation has been installed in the field, it will first have to be removed to gain access to the heat exchanger.

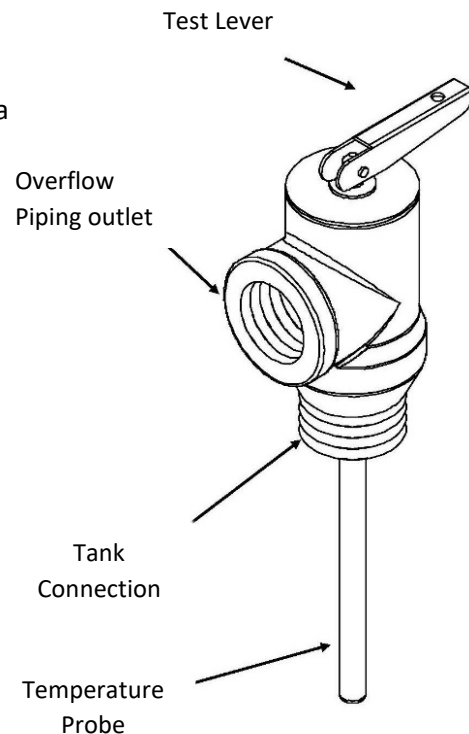
#### T & P RELIEF VALVE

##### Perform Quarterly

Lift test lever on relief valve and let water run through valve for a period of approximately 10 seconds. This will help flush away any sediment that might build up in water passageways.

##### Replacement

- a. Shut off power to unit.
- b. Shut off inlet and outlet water connections.
- c. Lift test lever on relief valve to relieve pressure in piping and heat exchanger.
- d. Disconnect overflow piping.
- e. Unscrew relief valve, remove assembly, and replace with new one.
- f. Connect overflow piping.
- g. Turn on water lines and check for leaks. Test Lever.
- h. Turn the power on to the unit.



#### CIRCULATOR

This circulator should be serviced per the enclosed pump O&M manual. The majority of service and repair can be performed with the circulator in line. The following steps should be utilized if the circulator must be removed from the water heater:

- a. Turn the power switch to OFF position and disconnect power to the unit.
- b. Close inlet and outlet valves to circulator.
- c. Disconnect wiring at the circulator enclosure.
- d. Disconnect conduit from circulator enclosure.

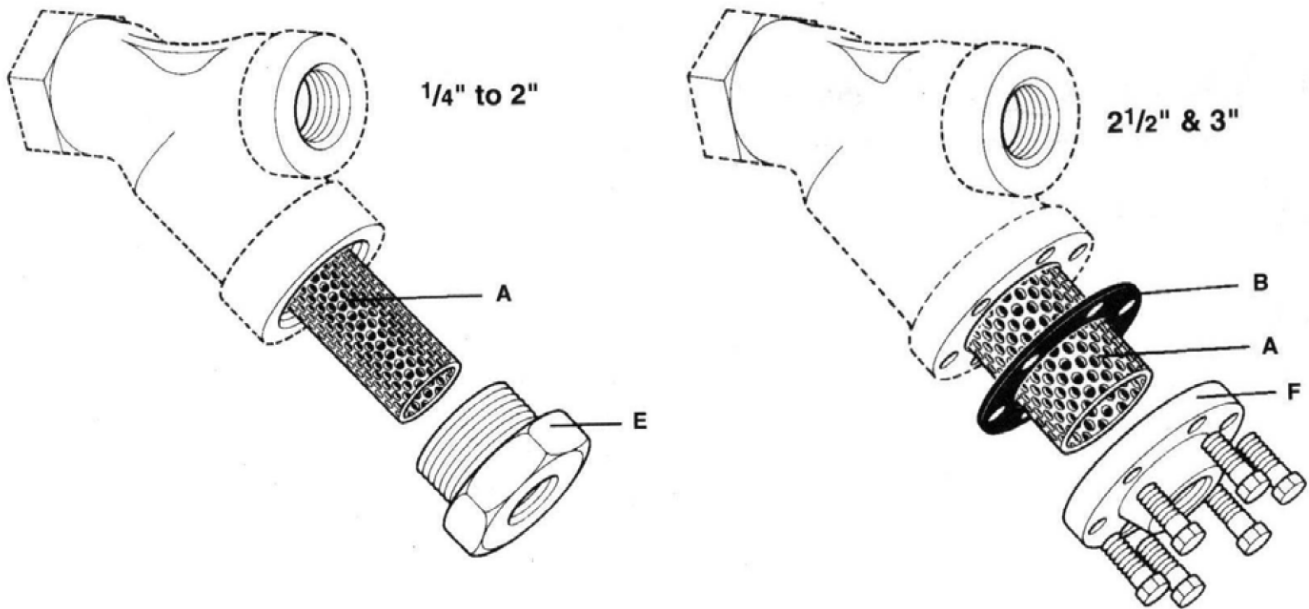
- e. Disconnect flanges at inlet and outlet of circulator and remove circulator.
- f. Install a new pump using reverse procedures.

**STRAINER FILTER**

Clean strainer filter. Perform annually or more often, if required.

**CAUTION:** The following is only to be performed after the unit has been shut down per shut down procedures located in Section III, Start Up and Operation.

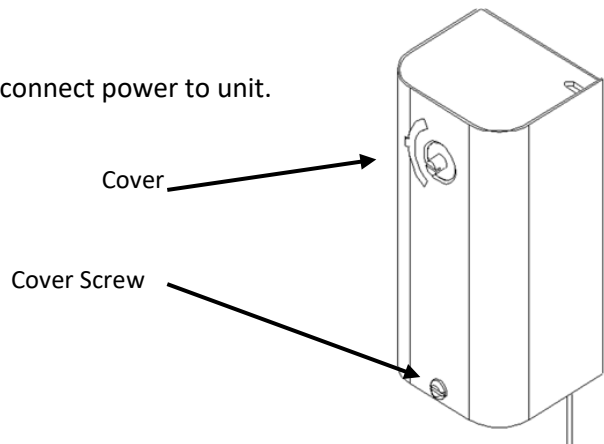
- a. Remove blow off bushing (E) or cap (F), as required.
- b. Remove gasket (B), if required.
- c. Remove, clean, and re-install screen (A).
- d. Replace gasket (B).
- e. Re-install blow off bushing (E) or cap (F), as required.



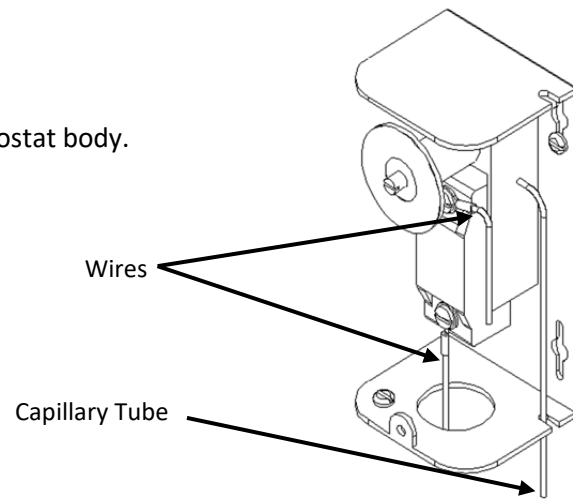
**Packing on valves and regulators should be checked for leaks and repaired or replaced as necessary.** Check for loose electrical connections, tighten as necessary. Check piping connections for leaks, tighten as necessary.

**IMMERSION THERMOSTAT**

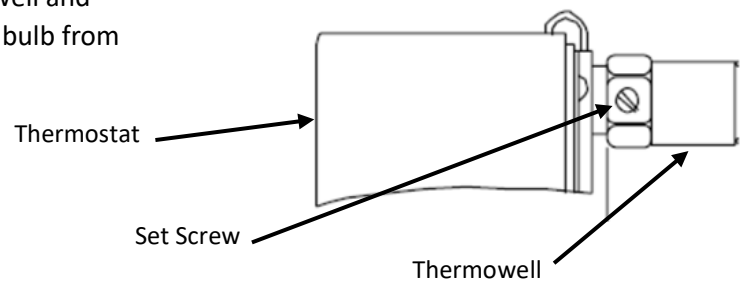
- a. Turn the power switch to OFF position and disconnect power to unit.
- b. Remove cover screw and cover.



- c. Disconnect the two No. 14 wires.
- d. Disconnect the conduit hub from the thermostat body.



- e. Loosen retaining set screw on thermowell and remove thermostat, pulling capillary and bulb from thermowell.



- f. Replace thermostat using reverse procedure.

## SECTION V - TROUBLESHOOTING

(Refer to component O & M Manual for additional detail)

Symptom	Probable Cause	Corrective Action / Remedy
Unit produces only cold water or no water flow at all	Circuit breaker tripped at source.	Reset circuit breaker.
	On/Off switch in 'OFF' position, if installed.	Turn switch to 'ON' position.
	Blown fuse(s) in transformer.	Replace fuse(s).
	High limit switch tripped.	Reset high limit switch.
	Loose wires.	Tighten wires.
	Low or no boiler water.	Refer to "Boiler water flow is reduced or no flow at all".
	Outlet water temperature setting incorrect.	Reset temperature controller to correct temperature.
	Boiler water not to temperature.	Check boiler operation at source.
Reduced or no water flow.	Faulty temperature sensor.	Replace temperature sensor.
	Inlet strainer plugged.	Clean strainer.
	Inlet or outlet valves closed.	Open valves.
Water temperature below settings.	Heat exchanger plugged.	Refer to heat exchanger information in component O & M manual.
	Low or no boiler water.	Refer to "Boiler water flow is reduced or no flow at all".
	Boiler water not to temperature.	Check boiler operation at source.
	Temperature controller is faulty or incorrectly programmed.	Refer to temperature controller information in component O & M manual.
	Faulty Control Valve.	Refer to control valve information in component O & M manual.
	Faulty temperature sensor.	Replace temperature sensor.
	Domestic water flow greater than design limits.	Refer to submittal data and confirm DHW flow rate.
Boiler water flow is reduced or no flow at all.	Boiler water flow less than design limits.	Refer to submittal data and confirm boiler water flow.
	Inlet and/or outlet valves are closed or not fully open.	Open valves.
	Inlet strainer plugged.	Clean strainer.
	Heat exchanger plugged.	Refer to heat exchanger information in component O & M manual.
	Faulty Control Valve.	Refer to control valve information in component O & M manual.
Rise in output temperature above set point.	Outlet water temperature setting incorrect.	Reset.
	Faulty Control Valve.	Refer to control valve information in component O & M manual.
Relief valve discharges continuously	Temperature controller is faulty or incorrectly programmed.	Refer to temperature controller information in component O & M manual.
	Excessive temperature or pressure in system	Temperature and pressure relief valves are made to operate if the water temperature exceeds 210°F or water pressure exceeds the pressure rating of the safety relief valve. If the trouble is excessive temperature, then refer to excessive temperature. If trouble is excessive pressure confirm outlet valve is open.

Dump Valve not functioning properly.	Thermostat set point or malfunction.	Check thermostat adjustment. Replace if necessary.
	Faulty dump valve solenoid coil or valve.	Replace if necessary.
Control panel "Power Available" indicator not lit with switch in "On" position.	Bulb failed	Replace bulb.
	Circuit breaker tripped at source.	Reset circuit breaker.
	Loose wires.	Tighten wires.
Temperature and/or High Limit controllers not on with control panel on and "Power Available" indicator lit.	Blown fuse(s) in transformer	Replace fuse(s).
	Faulty transformer.	Replace transformer.
	Loose wires.	Tighten wires.
	Faulty controller.	Replace controller.



## SECTION VI – METRIC CONVERSIONS

Liters x 0.2641 = Gallons

Gallons x 3.79 = Liters

Gallons x 0.003785 = m<sup>3</sup>

m<sup>3</sup> x 264.2 = Gallons

1°C ΔT = 1.8°F ΔT

°F = (°C x 1.8) + 32

°C = (°F - 32) x 0.556

psi x 0.06896 = Bar

Bar x 14.5 = psi

psi x 6.86 = kPa

kPa x 0.1456 = psi

Lbs x 0.4536 = Kg

Kg x 2.2 = Lbs

ft<sup>2</sup> x 0.0929 = m<sup>2</sup>

m<sup>2</sup> x 10.765 = ft<sup>2</sup>



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