

Quartz H₂O T SHOT™

Quartz Inline Water Heater



**PROCESS
TECHNOLOGY**

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INTRODUCTION:

The Quartz H₂OT SHOT™ inline quartz water heater is a uniquely designed, compact, self-contained unit that heats ultrapure water on demand. The Quartz H₂OT SHOT is specifically designed to minimize holdup volume and provide a clean flow path for high purity processes. With an all-quartz heating element construction, ultrapure deionized water receives no ionic contamination. There are no metallic wetted surfaces. The cleanliness of these units have been confirmed by independent third party testing.

The Quartz H₂OT SHOT is easy to install, operate and requires only limited maintenance. All programming and calibration is performed at the factory. The only requirements for startup are plumbing and a power supply. Upon startup, the unit will supply heated water when flow is provided. When the flow rate falls below a preset minimum value, the Quartz H₂OT SHOT disables the heating elements and standby mode is initiated. During standby mode, a small amount of fluid is allowed to flow through the unit, cooling the heating assembly. This unit will remain in standby mode until water flow is re-established.

The Quartz H₂OT SHOT inline water heaters are available in wattages from 24kW to 72kW. These units consist of one or more heating modules combined with a control system and all necessary power distribution circuitry in a freestanding enclosure. The photo on the cover shows a typical unit with two heating modules, with the maintenance access panels removed.

These units are CE, ETL and Semi S2/S3 compliant. They also conform to UL499 standards.

INTRODUCTION (Continued):

This system features the patented DAC™ control system operating from a PLC with a touch-screen operator interface. The DAC control system provides superior temperature control and faster response to changes in conditions versus a typical PID temperature control system. The figure below illustrates the improved performance of the DAC control system over a PID temperature control system on the same inline heater under the same operating conditions.

While the DAC control system is capable of providing an outlet temperature within 0.3°C of the desired PROCESS SETPOINT, the maximum possible temperature rise through the heater is dependant upon the wattage of the unit and the water flow rate through the unit. The following table illustrates the maximum temperature rise of various models based upon the water flow rate through the unit.

Heater Power (Kilowatts)			
Flow Rate	24	48	72
L/min	Maximum Theoretical Temperature Rise (°C)		
5	68.6	-	-
10	34.3	68.6	-
15	22.9	45.7	68.6
20	17.1	34.3	51.4
25	13.7	27.4	41.1
30	11.4	22.9	34.3
35	9.8	19.6	29.4
40	8.6	17.1	14.3
45	7.6	15.2	22.9
50	6.9	13.7	20.6
55	6.2	12.5	18.7
60	5.7	11.4	17.1





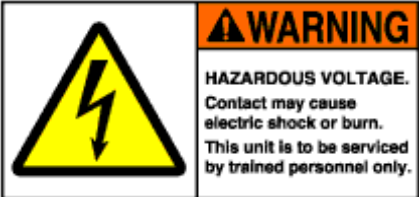


Figure 1: Maximum Temperature Rise Table

The Quartz H₂O T SHOT inline water heaters include a comprehensive system of safety controls and devices to insure safe and long-lasting operation. The list of safety devices includes but is not limited to the following:

- EMO pushbutton
- Circuit breaker
- Ground fault protection
- Leak detector
- Low flow rate heater cutoff
- High process temperature sensors
- High element temperature sensors
- Automatic cycle cool-down
- Sensor failure (open sensor) detection

INTRODUCTION (Continued):

The following symbols and warning labels appear on the unit and in the instruction manual. The table below provides an explanation of each one.

DESCRIPTION	PICTORIAL DESCRIPTION
<p>DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.</p>	
<p>WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.</p>	
<p>CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.</p>	
<p>DANGER: HAZARDOUS VOLTAGE ENCLOSED Voltage or current hazard sufficient to cause shock, burn or death. Disconnect and lock out power before servicing.</p>	
<p>WARNING: HAZARDOUS VOLTAGE Contact may cause electric shock or burn. This unit to be serviced by trained personnel only.</p>	
<p>CAUTION: HOT SURFACE. DO NOT TOUCH Heater column may be hot. Allow unit to cool before servicing.</p>	
<p>PROTECTIVE EARTH (GROUND)</p>	

INTRODUCTION (Continued):

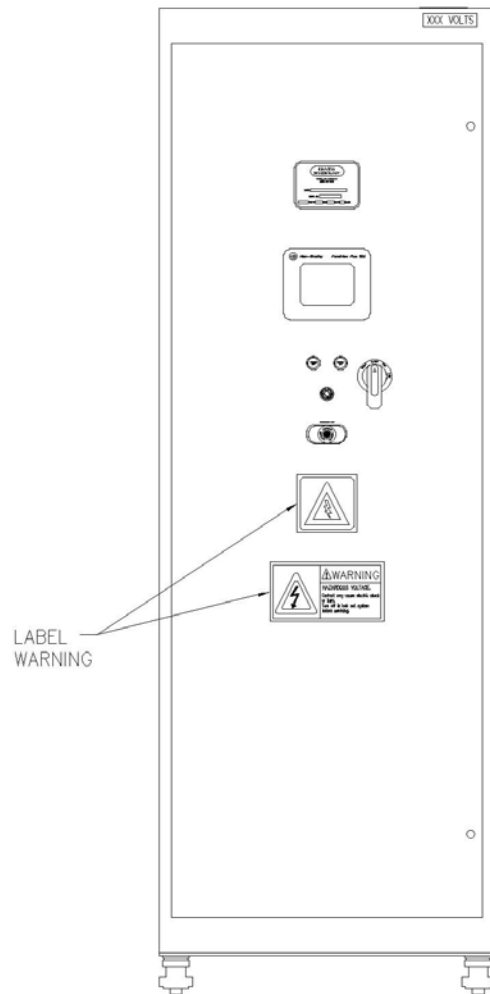


Figure 2: Warning Label Locations

SYSTEM SPECIFICATIONS:

Product	Quartz H ₂ O _T SHOT inline water heater			
Standards	CE, ETL, Semi S2/S3, UL 499			
Available Wattage Range	24kW – 72kW Refer to model number label for the wattage of any specific unit			
Available Voltages	208V – 600V, 50/60Hz, 3 phase only			
Cabinet dimensions and unit weight:	Width	Depth	Height	Weight
24kW – 72kW	711 mm (28-in)	820 mm (32.3-in)	2187 mm (86.1-in)	227 kg (500 lbs)
Wetted surfaces:				
Heating elements	Quartz, type 214			
Internal plumbing	PFA			
o-rings	none			
Operating temperatures:				
Process inlet	30°C maximum			
Process outlet	Up to 95°C, depending upon operating conditions			
Temperature accuracy	+/- 0.3°C, depending upon operating conditions			
Ambient air temperature	30°C maximum			
Water flow rate range	2 l/min (0.5 gpm) to 60 l/min (15.8 gpm)			
Water pressure rating	690 kPa (6.9 bar, 100 psi) at 24°C, 310 kPa (3.1 bar, 45 psi) at 90°C (Limited by the rating of the internal PFA fittings)			

MODEL NUMBER:

Process Technology model numbers are designed to offer some description of the heater construction, including wattage and rated voltage. The model number can be found on the model/serial number label located on the rear of the unit, above the communications interface connectors.

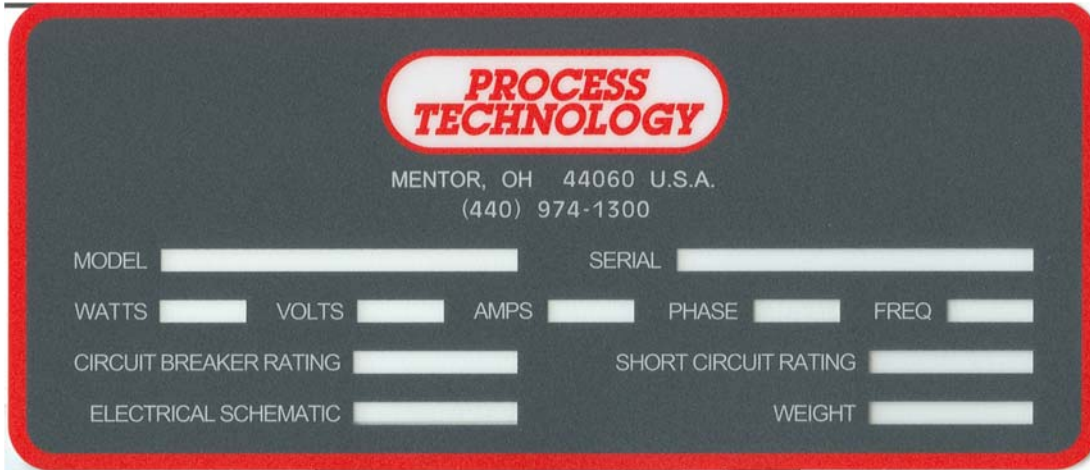


Figure 3: Model/Serial Number Label

MODEL NUMBER (Continued):

Model Number Explanation:

Provided below is an example of a typical model number along with an explanation of each part. This key will help you understand your model number.

Model number example:

HCQ024-1AAA5-C5-R12

① ② ③ ④ ⑤ ⑥

- ① **Heater Series.** The beginning of each model number will designate the product line. In this case, the Quartz H₂ot Shot inline water heater.
- ② **Heater Wattage.** The numerical portion of the model number will always begin with the wattage of your heater. This product is available in 24kW, 48kW or 72kW models.
- ③ **Heater Voltage.** The first character following the heater Wattage will describe the rated Voltage of the heater.

Heater Model Number	Rated Voltage (V)	Heater Model Number	Rated Voltage (V)
1	208	6	480
2	240	7	440
3	380	8	575
4	400	9	220
5	415	10	200

Model Number Explanation (continued):

- ④ **Plumbing Connections.** The heater inlet, outlet and return plumbing connections are usually the same. However, it is possible to have different plumbing connections for the inlet and outlet. The characters to describe the plumbing connections have the same designation for both the inlet and outlet connections. Please refer to the table below to see the specific plumbing connections provided with the heater:

Heater Model Number	Plumbing Connection Type	Plumbing Connection Size: mm (in)
A	Flared Tube Fitting	13mm (1/2-inch)
B	Flared Tube Fitting	19mm (3/4-inch)
P	Pillar Tube Fitting	13mm (1/2-inch)
Q	Pillar Tube Fitting	19mm (3/4-inch)

- ⑤ **Flow Meter Device.** The flow meter device is part of the DAC temperature control system. The flow meter is selected based upon total wattage of the heater and operating flow rate range. This device does not require routine maintenance or re-calibration.

Heater Model Number	Flow Monitor Device	Device Brand	Connection Size	Process Technology Part Number
0-4	Not Used			
5	Ultrasonic	Thornton	13mm (1/2-inch)	8136
6	Ultrasonic	Thornton	19mm (3/4-inch)	8137
7	Ultrasonic	Honda	13mm (1/2-inch)	9238
8	Ultrasonic	Honda	19mm (3/4-inch)	09-6820

- ⑥ **Options.**

Heater Model Number	Description
C1	Ethernet communications
C2	Device net communications
C3	RS232 communications
C4	RS485 communications
C5	Modbus communications
C#	Additional communications option. Contact the Process Technology technical service department for assistance.
CS	Color touch-screen interface
RI	Expanded remote interface
ROI	Remote touch-screen interface.
R#	Additional remote interface option. Contact the Process Technology technical service department for assistance.
##	Customer specific design/construction (Which may or may not include some of the above options)

FACILITY REQUIREMENTS:

Before installing the Quartz H₂OT SHOT inline water heater confirm the facility requirements listed below.

Space Requirements:

The Quartz H₂OT SHOT inline water heater is constructed in a freestanding enclosure. This cabinet includes the common framework for the heating module(s) as well as the electrical components. No additional support is required.

The cabinet assembly requires ventilation. Locate equipment so that the louvers on the sides are not obstructed. Be sure to provide adequate clearance for normal operation and maintenance of this heater.

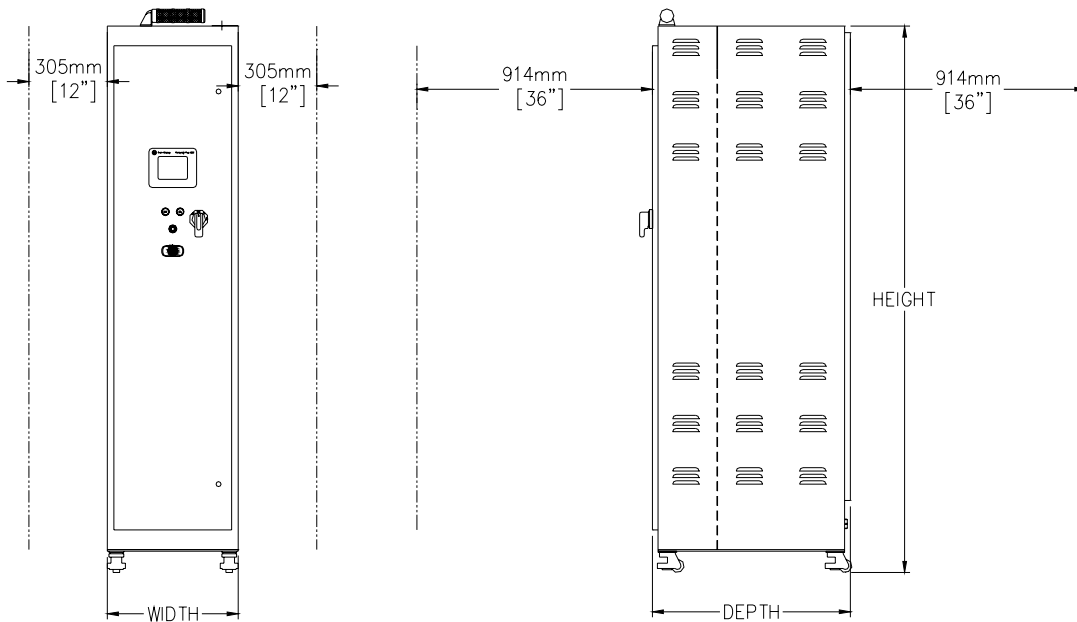


Figure 4: Clearance Dimensions

FACILITY REQUIREMENTS (Continued):

Water Plumbing Requirements:

This unit is typically supplied with a single inlet and outlet water connection as well as a single return connection located on the lower portion of the rear of the cabinet.

The Inlet plumbing should include a means of shutting off the water supply in the case of an internal leak detection alarm. An inlet shutoff valve is available from the factory and can be built into the unit for an additional cost.

The inlet or outlet plumbing should also include a means to drain the unit for service. There are also connections for the discharge/bypass valve and the leak pan drain.

Electrical Requirements:

Reference the unit's model number and model number key or the Electrical Specifications Table inside the front door to identify the electrical power requirements of this unit. In addition, the model number tag on the front of the unit includes the unit's Wattage, Voltage, Amperage draw and Phase. Verify that the incoming electrical service is rated and fused for the required amperage draw.




Do not exceed the rated voltage. Irreparable damage to the heating column or control circuitry may result.

NOTE: Ensure electrical power fusing and disconnects meet local jurisdictional requirements. Fuse ratings noted in this document are for reference only. Ensure external electrical components comply with local requirements before operating this unit.

INSTALLATION:

Note: Before installation, carefully read this entire section. The installation of this unit must be performed by qualified technicians.

	<p>Due to the weight of the unit, DO NOT ATTEMPT to move or lift the unit without the appropriate material handling equipment.</p>
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Inspection and Uncrating:


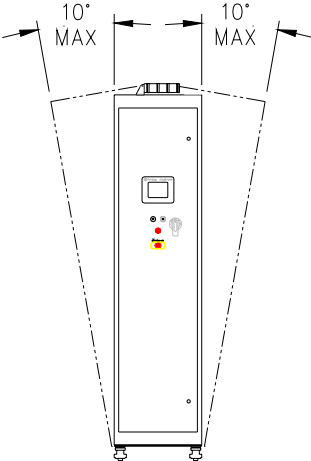
- 1) Inspect the shipping crate for evidence of damage. If any damage is detected, contact the carrier immediately.
- 2) Inspect the shock sensors located on the outside of the crate. (There is a sensor located inside the crate as well). The shock sensors will indicate if the unit experienced rough handling. If the sensors indicate that the unit has experienced rough handling, contact the carrier immediately.



Figure 5: Shockwatch Sensor

Inspection and Uncrating (Continued):


- 3) Remove one side of the crate.
- 4) Remove any protective packaging material and any other materials that may have been packed in the crate with the enclosure.
- 5) Remove any braces used to hold the unit in place during shipping.
- 6) Using a fork truck or other suitable lifting device, lift the unit from underneath and remove from the crate.

	
	<p>Do not tip the unit beyond 10° from vertical. Serious personal injury or equipment damage may result.</p>

- 7) Visually inspect the unit itself for damage. If there is evidence of damage, notify Process Technology and the freight carrier immediately.

Positioning the Unit:

- 1) Once the Quartz H₂O T SHOT inline water heater has been removed from the crate and the unit passes the damage inspection, it can be moved to the service location. Move the unit by lifting the unit from underneath using a fork truck or other suitable handling equipment.


	<p>The castors should not be used to move the unit over long distances or on uneven surfaces. They are intended to facilitate small adjustments to the position of the unit at its place of operation. Move the unit slowly, as there is no means of slowing or stopping the unit. Ensure that there are sufficient personnel to move the unit safely. Failure to follow these instructions can result in serious personal injury and/or damage to the unit.</p>
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- 2) The unit was shipped with the leveling feet extended. To utilize the castors the leveling feet must be retracted.



Figure 6: Leveling Foot Located on Castor

- 3) Place the unit on a hard, level surface.
- 4) Ensure the unit is secured so as not to roll as the casters are extended.
- 5) Leveling is accomplished by adjusting the stem and foot that is concentric with the caster spindle.

	<p>Ensure the unit is on a smooth, level surface and there are sufficient personnel to hold the unit in place. As the leveling feet are retracted and the unit rests on the castors unexpected movement may result. Failure to properly secure the unit may result in serious personal injury and/or damage to equipment.</p>
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Installing Seismic Brackets (optional):

This unit includes four seismic brackets in the event such brackets are a requirement for the installation of this unit. The top-half of these brackets have already been installed on the unit.

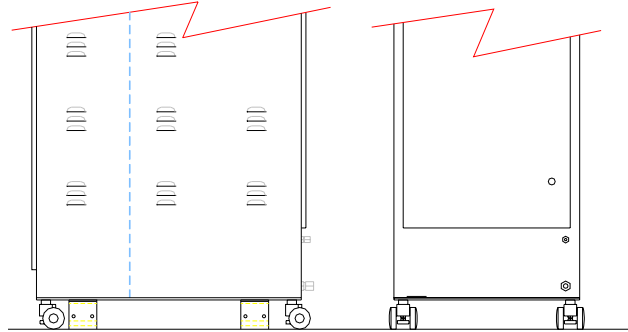
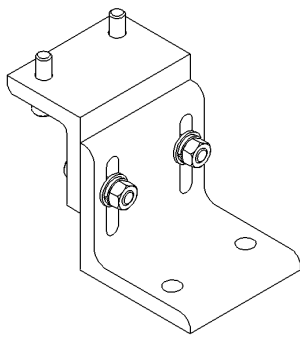
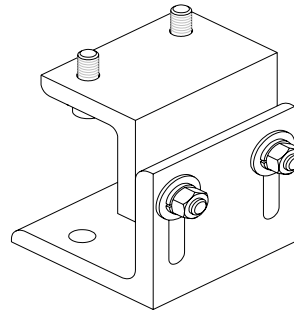


Figure 8: Seismic Brackets (top-half) Attached to Cabinet

If the heater installation requires that the seismic brackets be used, the bottom-half of these seismic brackets may be secured to the floor and then fastened to the bracket halves on the cabinet. The customer can decide whether to install the bottom half of the brackets to face inward or outward, as shown below.



Bottom facing outward



Bottom facing inward

Figure 9: Seismic Bracket Assembled, two possible orientations

Plumbing:

The plumbing installation of this unit should only be performed by qualified technicians.



Verify that the water supply is shut off, and any necessary lockout/tagout devices are properly installed.

The various plumbing connections are located as follows:

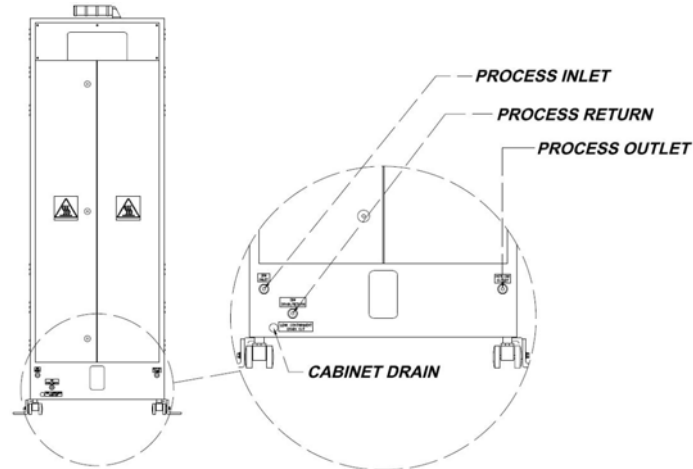


Figure 7: Plumbing connections

The customer must supply an emergency inlet water shutoff valve for the heater. The customer must also supply the means to drain the heater, which will be necessary in the case of replacing a heating coil or some other items. The following describes a recommended means of draining the unit:

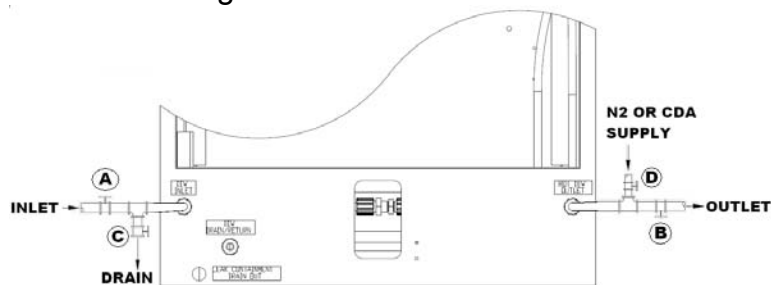


Figure 8: Suggested Plumbing Layout for Draining the HCQ Heater


- 1) Install a service shutoff valve (A, B) before the inlet and after the outlet of the heater.
- 2) After the inlet service shutoff valve, install a 3-way valve (C) on the inlet side of the heater. This valve should be plumbed to direct water flow from the water supply to the heater, and then from the heater to a non-pressurized drain.
- 3) Before the outlet service shutoff valve, install a tee fitting (D) to the outlet side of the heater. The tee portion of the fitting should be closed.

Plumbing (Continued):

Process Fluid Line Connections:


When tightening all connections on this unit, be sure to support the internal plastic piping as close as possible to the plumbing connections, to prevent excessive torque or strain from being applied to the internal plumbing of the unit.

The various flared tube fittings provided on this unit do not require very much force to properly seal. Once the plumbing connections have been made, test the connections for possible leaks and repair any leaks as needed.

	Failure to properly secure the plastic piping when tightening the plumbing connections may result in internal damage to the plumbing of this unit. Such damage is not covered under our product warranty.
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The Process Fluid Line connections consist of Inlet, Outlet Ports with two (2) 13mm (1/2-inch) flared tube fittings, plus a return line with a 13mm (1/2-inch) flared tube fitting. The return line will hold the water discharged during the cool-down cycle, as well as any trickle flow that will flow through the heater during non-cycle times.

- 1) Remove the protective plastic caps from the flared fittings on the process inlet, outlet and return piping of the heater assembly.
- 2) Connect properly flared 13mm (1/2-inch) tubing to the Inlet, Outlet and Return connections.
- 3) Tighten the fitting nuts until “hand tight”, then torque fitting nut to a minimum of 1.24 Newton-meter (11 in/lbs).

	Ensure Process Fluid Line connections are at 30°C or below before tightening of the fittings. Tightening the fitting at higher temperatures WILL result in damage to the flared tubing, and damage to the seal.
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Plumbing (Continued):


Cabinet Drain (1/2-inch FNPT (13mm) threaded connection)

The cabinet drain must be plumbed to a non-pressurized drain. This connection must always be open. Do not install a shutoff valve into this line. Under normal conditions there will never be any water in this drain line. However, in the case of an internal leak or broken quartz tube, this drain will allow the water to flow into a drain rather than overflow the cabinet and spill onto the floor.

- 1) Remove and discard the pipe plug.
- 2) Test fit the pipe or tubing to ensure proper length. The tubing must be plumbed to a non-pressurized drain.
- 3) Cover the male pipe threads with PTFE tape or some other approved pipe thread sealant.
- 4) Engage threads into drain connection. Tighten the threaded connection securely.

Wiring:

The wiring of this unit should only be performed by qualified technicians.

	Verify that the electrical supply is shut off, and any necessary lockout/tagout devices are properly installed.
---	--

Before the wiring is connected to this unit, verify that the electrical supply is shut off. Apply any electric lockout/tagout devices as required by factory guidelines.

Incoming power should be routed through the top of the unit. A 9mm (3/8-inch) pilot hole is provided to assist in locating the proper location for the incoming power supply conduit. The power wires and ground wire must be connected to the main circuit breaker and ground lug, per the electrical prints that are provided with the unit.

In addition to providing incoming power, all high-voltage wiring connections must be inspected for connections that may have loosened during shipment. Refer to the TORQUE SPECIFICATIONS LABEL for the proper settings for the various high voltage connections in this unit. The TORQUE SPECIFICATIONS LABEL is located on the inside of the electrical access door.

OPERATION:

The Quartz H2OT SHOT fluoropolymer inline water heater can be operated from the front of the unit, remotely through the interface cable provided with the unit, or through an optional remote operator interface panel (ROI). This section deals with controlling the heater locally from the front of the unit. For an explanation of controlling the unit remotely refer to the REMOTE INTERFACE (RI) or (ROI) section of this manual.

Front Panel Layout:

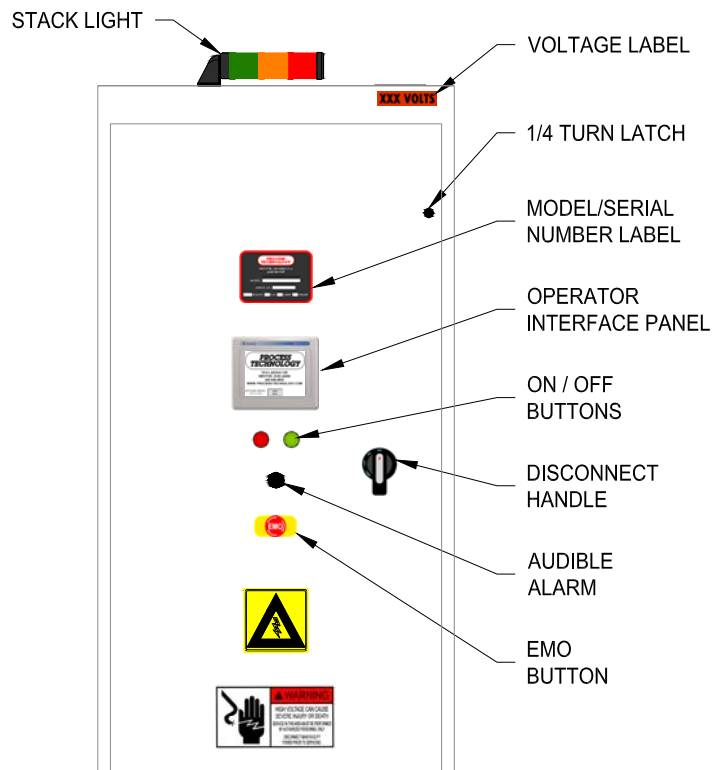


Figure 8: Front Panel Layout

Stack Light:

The status lights on the top of the unit indicates the operating status of the unit.



Figure 9: Status Lights

Color	Description
RED	Indicates an alarm condition exists with the system and operation halted. Correct the alarm condition and press the FAULT RESET button to resume operation.
AMBER	Indicates that the system is in a standby mode, or is operating with a warning condition. A message will appear on the information panel notifying the user of the warning condition as it occurs.
GREEN	Indicates the system is operating with all conditions in a normal operating state.

Operator Interface Buttons:

There are two push buttons are located on the front panel of the unit.

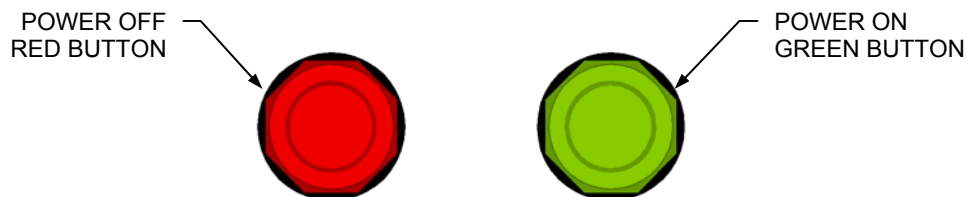


Figure 10: Operator Interface Buttons

Power On Button: When depressed, this button enables the main power contactor and readies the system for operation. It illuminates to indicate the system is in an operational mode.

Power Off Button: When depressed this button disables heater operation by disengaging the main power safety contactor. It illuminates to indicate the main power is off.

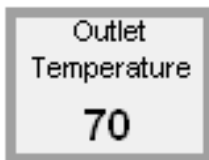
Operator Interface Touchscreen/Display:

The operator interface panel is an intelligent flat panel display. It is designed to interchange and display graphical data from a PLC by merely viewing or touching the screen. To ensure the effectiveness of the panel, it is important to take the following precautions:

- Do not press sharp objects against the screen.
- Do not strike the panel with hard objects.
- Do not press the screen with excessive force.

Indicators:

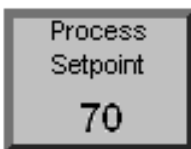
The different screens and menus available in the PLC touch screen interface have different types of push buttons and display fields. The following are examples of these different items.



The simple rectangular fields with the light borders are information fields only.



The oval fields with the dark borders are function buttons. The specific function is indicated in the center of the button.



The rectangular fields with the dark borders are also function buttons. These buttons require that numeric values be entered to change these settings.

When you press these buttons, a keypad will appear to allow you to change the value of the specific setting. After you key-in a new value, you must press the ENTER (↵) key in order to complete the change.

If you fail to press the ENTER key, or if the control system is locked, you will not be able to make changes to these settings.



The rectangular fields with dark borders that are located in the navigation area (at the bottom of the screen) are used to navigate between different screens and menus.

Operator Interface Touchscreen/Display (Continued):

Typical Touch Screen Display: General information

All of the touch screen displays have a similar format, as illustrated below. Navigating from screen to screen will change the information in the center of the screen, but the information at the top, right side and bottom of the screen will usually remain unchanged.

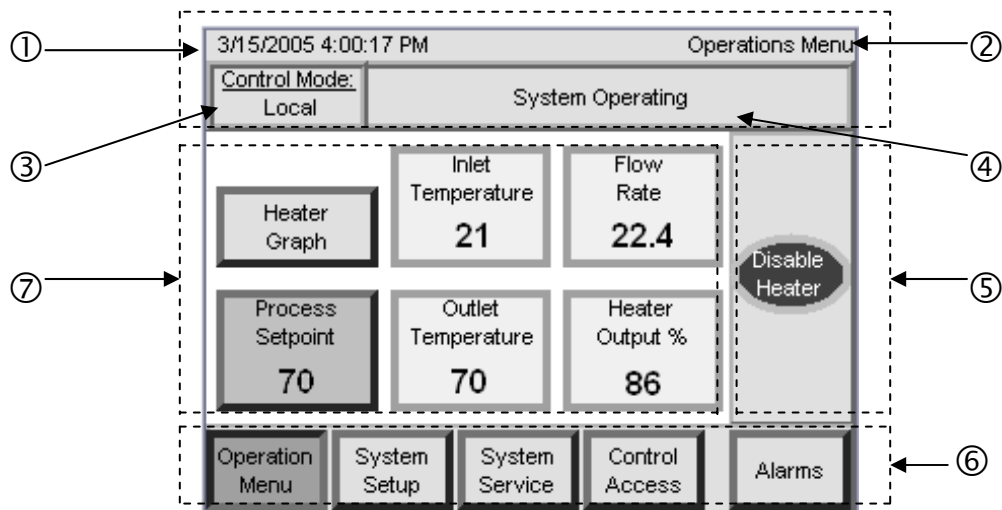


Figure 11: Typical Touch Screen Display

Explanation of Display Features:

①-④ **Title Panel.** This top section of the display provides general information about the unit and the display.

① **Time, Date.** This is factory set prior to shipment. However, if the customer wants to change the date or time (to match their local time zone), the run-time file application would first need to be shut down in order to change the time and date in the operating system menu of the panel display itself.

The run-time application can be terminated in the SYSTEM SERVICE menu by selecting the SHUTDOWN APPLICATION pushbutton.

② **Menu Name.** The name of the current menu is always provided at the very top of the display.

Operator Interface Touchscreen/Display (Continued):

Explanation of Display Features:

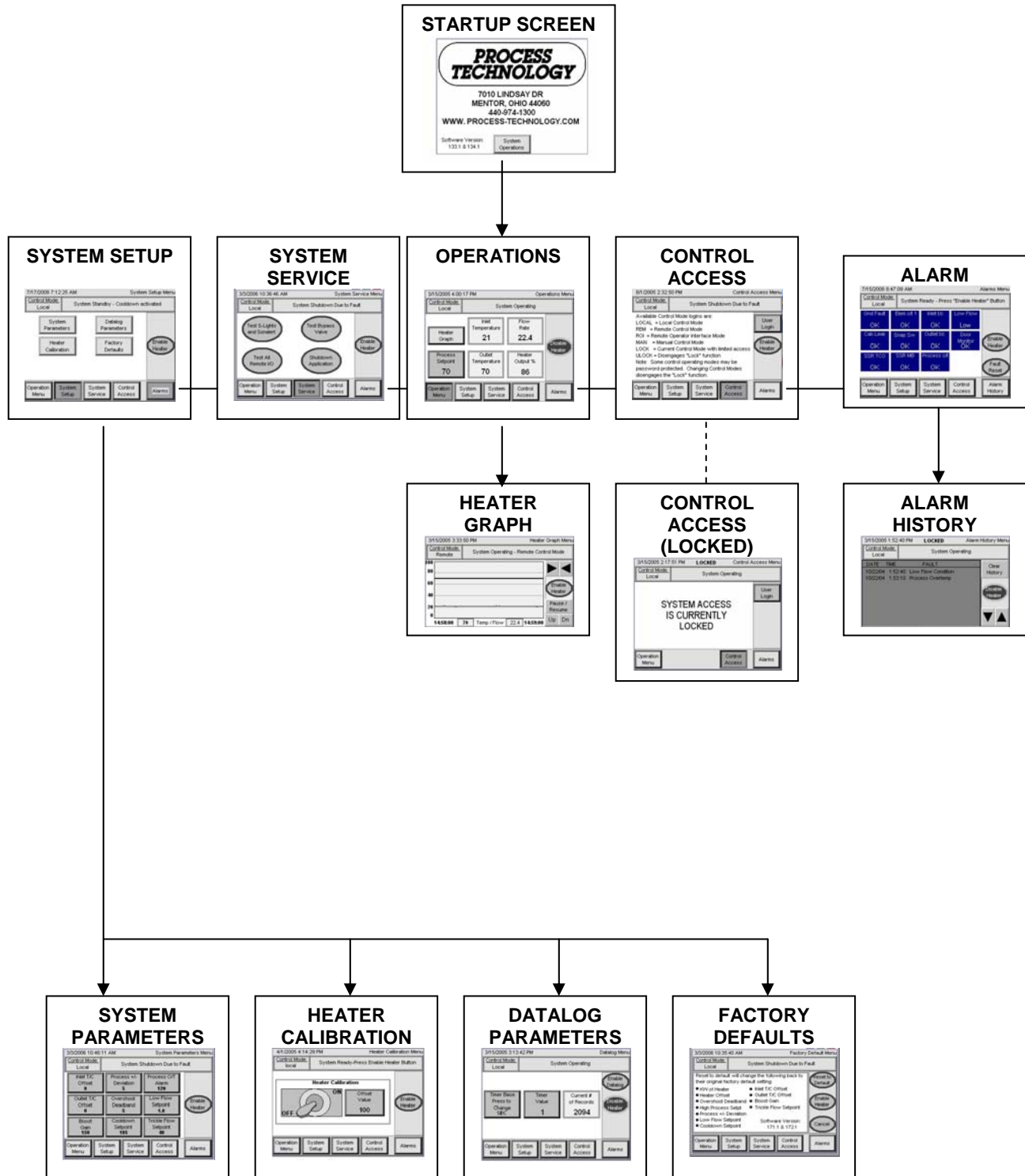
- ③ **Control Mode.** This box indicates whether the unit is in LOCAL, MANUAL or REMOTE control mode.

When in LOCAL mode the heater control settings may be adjusted from the touch screen interface only.

When in REMOTE mode the heater control settings may be adjusted through the interface cable connection only.

When in ROI mode (**optional**) the ENABLE HEATER and PROCESS SETPOINT heater control settings may be adjusted through the remote touch-screen interface only.
- ④ **Message Box.** This box indicates the status of the water heater. It will detail current system messages such as heater operation or any potential alarms.
- ⑤ **Command Panel.** In most menus the command panel will provide the function buttons to start and stop the operation of the heater. On one menu screen the command panel will also have the function buttons needed to enable or disable the datalog function of the controller.
- ⑥ **Navigation Panel.** These buttons will allow the user access to other available system menus. The current menu will be highlighted.
- ⑦ **Information Panel.** This area of the screen will feature different information fields and function buttons for the different menu screens. This section of the display is explained for each of the menu screens in the following pages of this section.

Touchscreen Menu Overview:



Operations Menu:

The operations menu provides current performance statistics of the Quartz H₂O_T SHOT inline water heater. It is the default menu that appears following the startup screen. The navigation keys at the bottom of the screen provide access to the other menus available.

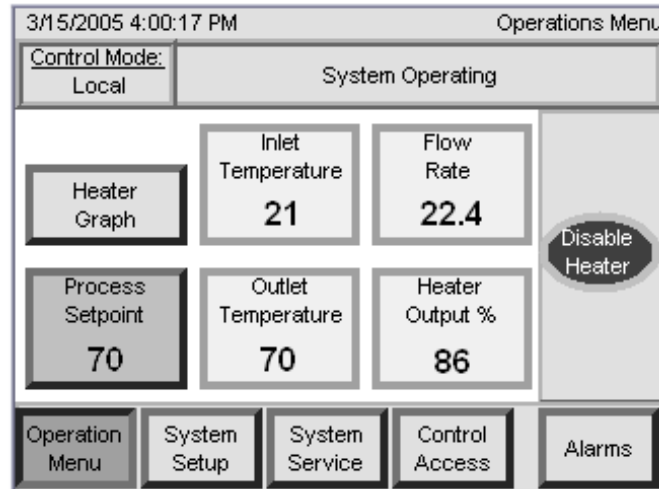


Figure 12: Operations Menu

Operations Menu Information Panel	Description
HEATER GRAPH	This button will go directly to a display that charts the current temperature performance of the heater.
INLET TEMPERATURE	This value is the temperature measured from the process sensor located at the inlet of the heater.
FLOW RATE	This value is the water flow rate measurement taken from the internal flow meter.
PROCESS SETPOINT	This button will display the current temperature outlet setting. The operator can change this value by pressing the button. A numeric keypad will appear to allow the operator to enter a new setpoint value. The operator must press ENTER (↵) on the keypad in order to save the new value.
OUTLET TEMPERATURE	This value is the temperature measured from the process sensor located at the outlet of the heater.
HEATER OUTPUT %	This value shows the output load of the heating elements needed at that specific time in order to provide the desired outlet temperature.

System Setup Menu:

This menu will provide navigation to five different setup menus. The information in these various menus are factory set during performance testing and should only be modified if necessary. The different setup menus are described in more detail in the following pages.

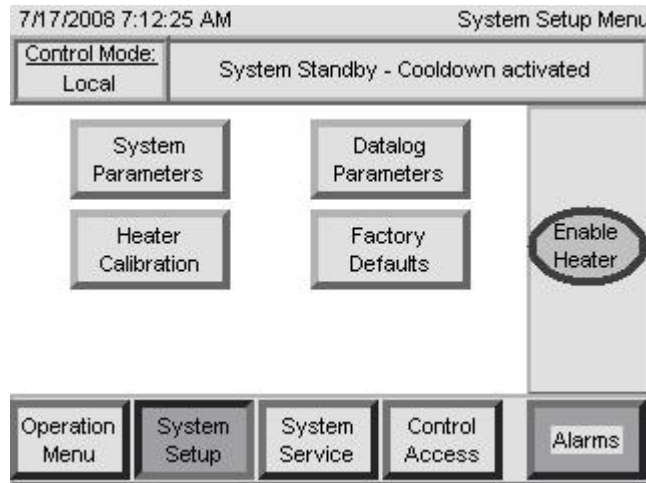


Figure 13: System Setup Menu Screen

System Setup Menu Information Panel	Description
SYSTEM PARAMETERS	This button will forward the operator to the SYSTEM PARAMETERS menu.
DATALOG PARAMETERS	This button will forward the operator to the DATALOG PARAMETERS menu.
HEATER CALIBRATION	This button will forward the operator to the HEATER CALIBRATION PARAMETERS menu.
FACTORY DEFAULTS	This button will forward the operator to the FACTORY DEFAULTS menu. This is also where the operator will find the software version number, including the revision code.

System Parameters Menu:

This menu will provide information pertaining to the different offset values entered for the temperature sensors as well as some adjustable control parameters. When one of these buttons is selected, a keypad will appear to allow the operator to change the value. The operator must press enter after making a change in order to save the new value.

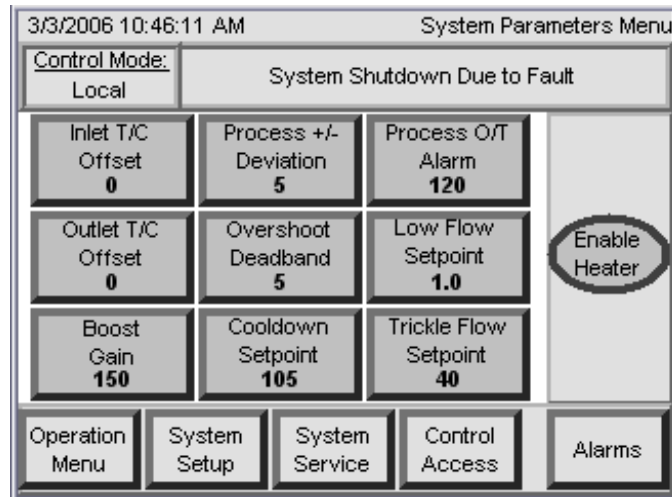


Figure 14: System Parameters Menu

System Parameters Menu Information Panel	Description
INLET T/C OFFSET	This button allows adjustment of the offset value for the inlet water thermocouple sensor. The adjustment range is -10°C to +10°C.
PROCESS +/- DEVIATION	This button allows adjustment of the process deviation value. The maximum value for this setting is 20°C. The process deviation provides indication to the operator whenever the heater outlet water temperature is above or below the process setpoint by a value greater than the value of this setting. This setting does not trigger an alarm and will not shut down the heater.
PROCESS O/T ALARM	This button allows adjustment of the PROCESS O/T ALARM. This is a high-temperature alarm setting, which will shut down the heater, sound the audible alarm and will require a manual reset. This is factory set at 120°C. The maximum value for this setting is 120°C.
OUTLET T/C OFFSET	This button allows adjustment of the offset value for the outlet water thermocouple sensor. The adjustment range is -10°C to +10°C.
OVERSHOOT DEADBAND	This button allows adjustment of the outlet temperature OVERSHOOT DEADBAND. When the heater outlet temperature rises above the process setpoint by this value (°C), the heater power output will be reduced to 0%. This will not trip an alarm. The DAC control system will detect the peak of the temperature overshoot and re-establish power to the heater once the peak has occurred in order to provide a more gradual and precise return to the process setpoint.

System Parameters Menu (Continued):

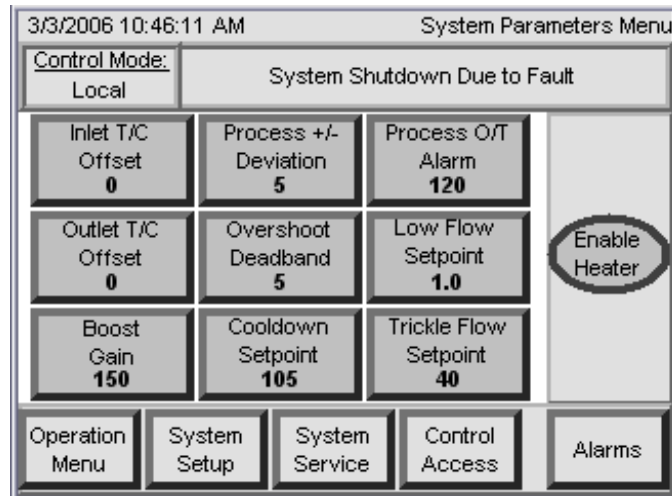


Figure 15: System Parameters Menu

System Parameters Menu Information Panel	Description
LOW FLOW SETPOINT	This button allows adjustment of the LOW FLOW SETPOINT. This setting will set the heater output to 0% when the flow rate through the heater falls below this setting (liters per minute), and if the outlet water temperature is above the TRICKLE-FLOW SETPOINT, the bypass valve will open. The controller will provide a warning message when the flow rate has dropped below this setting, but it will not enter an alarm state. When the flow rate through the heater has risen above the value of this setting heater operation will continue. This setting is preset at the factory at 1 LPM.
BOOST GAIN	This button allows adjustment of the BOOST GAIN. This setting improves heater performance during initial temp rise from a low temperature. This setting has a range of 0-1000 (no units). It is factory set during testing. The factory set value is saved in the FACTORY DEFAULT menu. By increasing the value of this setting (by increments of 1), the heater will increase the rate of temperature rise from a low temperature. Note however that increasing the value of this setting will result in a temperature overshoot as the heater outlet temperature reaches the process setpoint. The default value will provide the quickest rate of temperature rise with no temperature overshoot above the process setpoint.
COOLDOWN SETPOINT	This button allows adjustment of the COOLDOWN SETPOINT. This setting opens the bypass valve and adjusts the heater output to 0% when the outlet temperature exceeds this setting but will not enter an alarm state. When the outlet temperature falls below this setting, the heater will automatically return to normal operation. This setting is preset at the factory at 105°C.
TRICKLE-FLOW SETPOINT	This button allows adjustment of the TRICKLE FLOW SETPOINT. This setting will open the bypass valve when the outlet temperature exceeds this value during a LOW FLOW condition. When the outlet temperature drops below this value or when the heater re-enters normal operating mode, the bypass valve will close.

Heater Calibration Menu:

This menu is used during initial startup only. The value listed in the information panel is used, if needed, to make adjustments to the heater's power output rating. Depending upon operating conditions and the supply voltage these values may help improve the precision of the DAC control system.

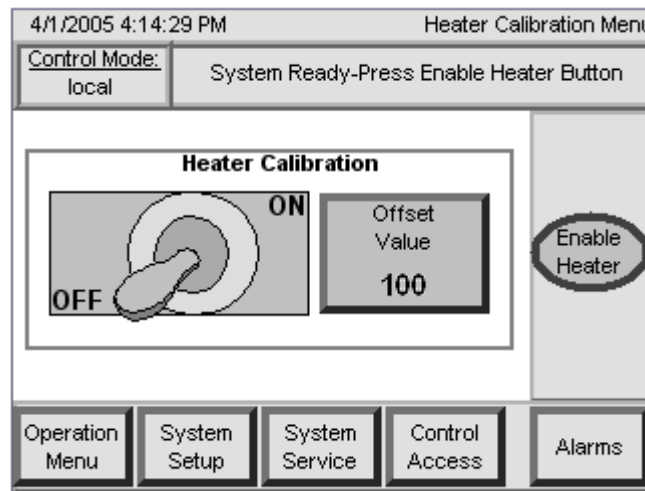


Figure 16: Heater Calibration Menu Screen

Heater Calibration Menu Information Panel	Description
ON / OFF	This animated toggle switch will enable the system calibration mode. In this mode, the error correction is disabled, and the DAC control system will operate as an open loop control. The HEATER CALIBRATION STARTUP PROCEDURE details the proper calibration procedure for this unit. The procedure may be found in the STARTUP section of this manual. This calibration was performed at the factory prior to shipment.
OFFSET VALUE	This button allows adjustment of the heater power output rating. This setting will be adjusted at the factory, so the initial value may not be 100(%). If, during initial startup, the heater is having difficulty in reaching the process setpoint, this value may be adjusted (in 1% increments) up or down in order to improve the precision of the unit.

Datalog Menu:

This menu allows adjustment of the frequency of datalog sampling. The DAC control systems will record the following information:

Flow rate (liters per minute)

Outlet Temperature (°C)

Alarm Events

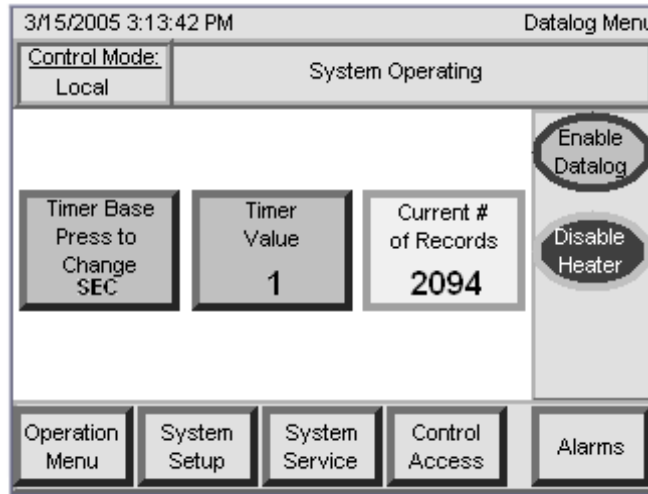


Figure 18: Datalog Menu Screen

Datalog Menu Information Panel	Description
TIMER BASE PRESS TO CHANGE	This button allows adjustment of the time interval for the data sampling. Pressing this button will change the time units from SEC (seconds) to MIN (minutes). Pressing the button again will change the time units from MIN to HR (hours). Pressing the button a third time will change the time units from HR back to SEC.
TIMER VALUE	This button allows adjustment of the time period between datalog events.
CURRENT # OF RECORDS	This display indicates the number of datalog records that have been collected. The controller can collect a maximum of 4096 datalogs. Beyond this, the controller will begin to replace the oldest datalogs with the new datalogs as they are taken.
ENABLE DATALOG	This button in the command panel will enable the datalog feature of the controller. Once enabled, this function button will change to DISABLE DATALOG.

Factory Default Menu:

This menu holds the record of all the factory-set control parameters of the DAC™ control system.

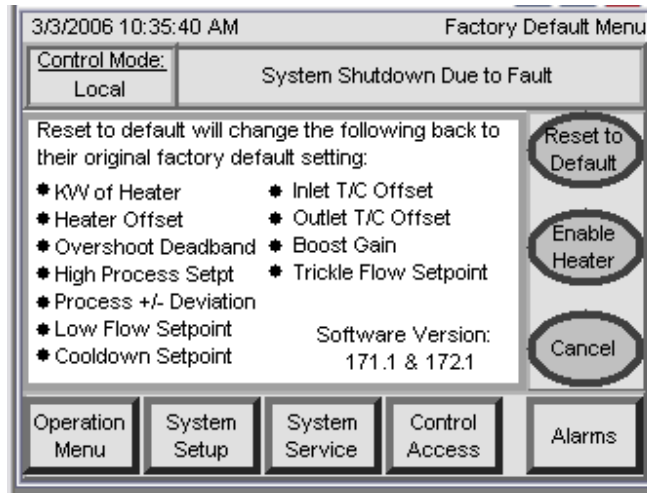


Figure 19: Factory Default Menu Screen

Factory Default Menu Command Panel	Description
RESET TO DEFAULT	This button will reset all controller settings to the factory default settings listed in the information panel.
CANCEL	This button will return the display to the SYSTEM SETUP menu.

System Service Menu:

This menu provides buttons that can test the various output signals and indicator lights on the unit, as well as shut down the OIP application software.

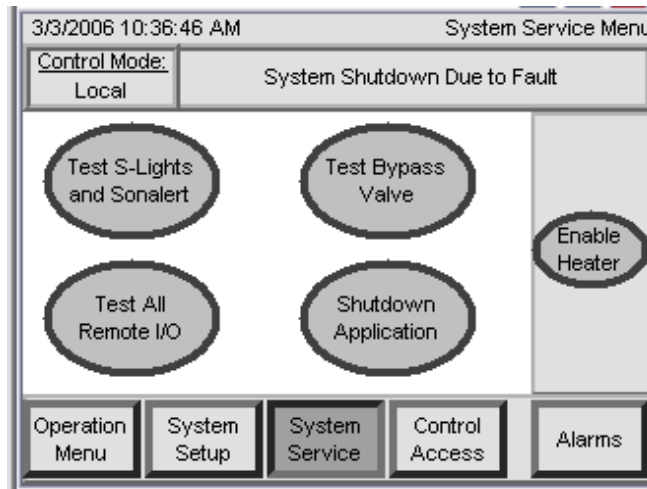


Figure 20: System Service Menu

System Service Menu Information Panel	Description
TEST S-LIGHTS AND SONALERT	Depress this button to energize the stack lights and Sonalert audible alarm. This function will not send the unit into an alarm condition.
TEST BYPASS VALVE	Depress this button to open the bypass valve.
TEST ALL REMOTE I/O	This button allows testing of all output signals through the interface cable. When this button is depressed, all interface outputs toggle from normal operating states.
SHUTDOWN APPLICATION	When the heater is disabled, this button will shut down the OIP application software. The PLC and the touch screen display will remain turned on. When this button is depressed, a verification message and two buttons in the command panel called APPLY and CANCEL will appear.

System Service Menu Command Panel	Description
APPLY	This button will appear if the SHUTDOWN APPLICATION button is depressed. Depress the APPLY button to shut down the DAC™ control system.
CANCEL	This button will appear if the SHUTDOWN APPLICATION button is depressed. Depress the CANCEL button return to the SYSTEM SERVICE menu.

Control Access Menu:

This menu provides access to adjust the DAC control system from LOCAL control mode to remote (REM) control mode or manual (MAN) control mode. This menu also provides the ability to LOCK or UNLOCK the control system. The different login modes are described on the following page.

When the system is UNLOCKED the CONTROL ACCESS MENU will appear as follows:

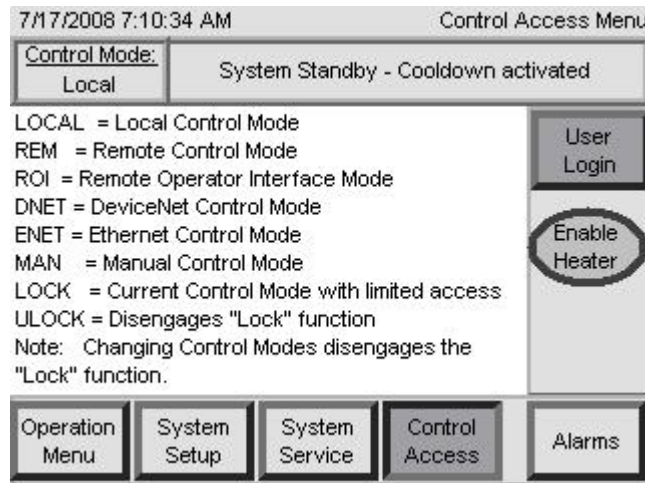


Figure 21: Control Access Menu Screen

Control Access Menu Command Panel	Description
USER LOGIN	This button will bring up the LOGIN display on the information panel. Pressing User (F2) on the LOGIN display will bring up a small keyboard. From the keyboard you can enter one of the available control mode login codes (shown on display, see above figure), to change the control mode. When finished entering the code, press the enter (↵) key to input the change. Press the enter (↵) key on the LOGIN display to enter the login code, which will then change the control mode.
CANCEL	This button will return the display to the CONTROL ACCESS menu.

Control Access Menu (Continued):

When the system is LOCKED the CONTROL ACCESS MENU will appear as follows:

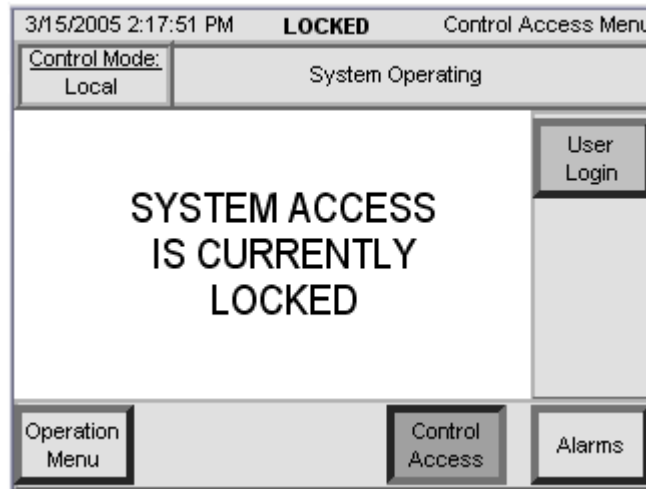



Figure 22: Control Access Menu Screen (locked)

Control Mode Login Code	Description
LOCAL	LOCAL MODE. This control mode allows heater control from the touch screen display of the PLC. All menus and settings can be accessed and changed from the touch screens.
REM	REMOTE MODE. This control mode allows heater control through the interface cable connection only. The customer provided remote control system can access and change settings remotely.
ROI	REMOTE OPERATOR INTERFACE MODE. This selection will only appear if the Quartz H₂OT SHOT heater includes the ROI option. This control mode allows ENABLE HEATER and PROCESS SETPOINT heater control settings to be adjusted through the remote operator interface heater control only. The customer can also access and change all other user settings either locally or remotely.
ENET	ETHERNET MODE. This selection will only appear if the Quartz H₂OT SHOT heater includes the C1 communications option. This control mode allows heater control through the Ethernet cable connection only. The Ethernet network can access and change settings remotely.
DNET	DEVICENET MODE. This selection will only appear if the Quartz H₂OT SHOT heater includes the C2 communications option. This control mode allows heater control through the DeviceNet cable connection only. The DeviceNet network can access and change settings remotely.
MBUS	MODBUS MODE. This selection will only appear if the Quartz H₂OT SHOT heater includes the C5 communications option. This control mode allows heater control through the Modbus cable connection only. The Modbus network can access and change settings remotely.

Control Access Menu (Continued):

Control Mode Login Code	Description
MAN	<p>MANUAL MODE. This control mode allows an operator to control the % output of the heater, regardless of flow rate or desired outlet temperature. When this mode is selected, the HEATER CALIBRATION menu will disappear, and the PROCESS SETPOINT button in the OPERATION MENU will be replaced by MANUAL OUTPUT %.</p>
	<div data-bbox="443 590 764 653" style="border: 1px solid black; padding: 2px; display: inline-block;">  </div> <p>Once in manual control mode the automated control is no longer active and may result in erratic behavior or over-temperature conditions. For this reason, manual control should only be used by qualified personnel as a maintenance tool.</p>
LOCK	<p>This control mode limits operator access to most operator functions. When the control system is LOCKED (see above figure), the SYSTEM SETUP and SYSTEM SERVICE menus will disappear. In addition, the settings in the OPERATION MENU will be locked, so no changes can be made to the system.</p> <p>In order to unlock the control system the operator must access the USER LOGIN function, and enter the login code ULOCK.</p> <p>The system can be locked while in any of the operating modes. Changing control modes will automatically unlock the control system.</p>
ULOCK	<p>This control mode will disable the lock function.</p>

Alarms Menu:

This menu provides a display status of all alarm conditions in the Quartz H₂O T SHOT inline water heater. When one of the alarms trip, the Alarms menu will automatically appear. The alarm setting(s) that has tripped will flash.

Note: To silence the audible alarm during an alarm event, press the POWER OFF button on the front of the unit. When the alarm condition has been cleared, press the POWER ON button before the unit is restarted.

When the alarm condition(s) has been corrected, the alarm setting will continue to flash until the control system has been reset. To reset the safety, press the FAULT RESET button located on the command panel.

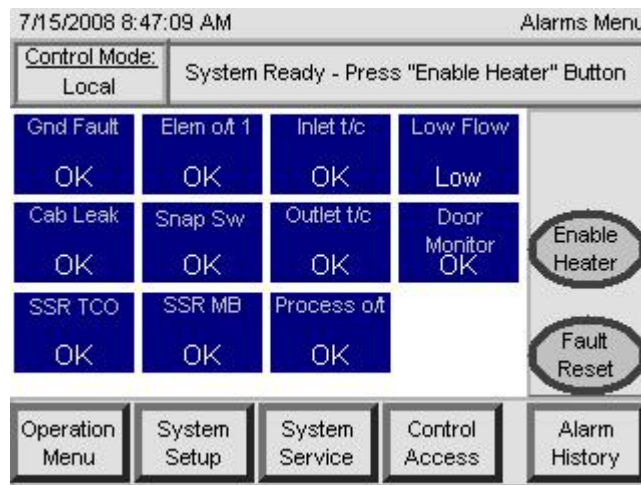


Figure 23: Alarms Menu

Alarm Menu Command Panel	Description
FAULT RESET	This button will reset all of the safety settings. If a particular safety has tripped and the conditions causing the safety trip has not been corrected, then the safety indicator will not reset and will continue to flash.

Alarm Menu Navigation Panel	Description
ALARM HISTORY	This button will forward the operator to the ALARM HISTORY display.

Alarm History Menu:

This display will list the alarm history of the unit. The information panel provides the date and time of the event, as well as the type of fault that occurred.

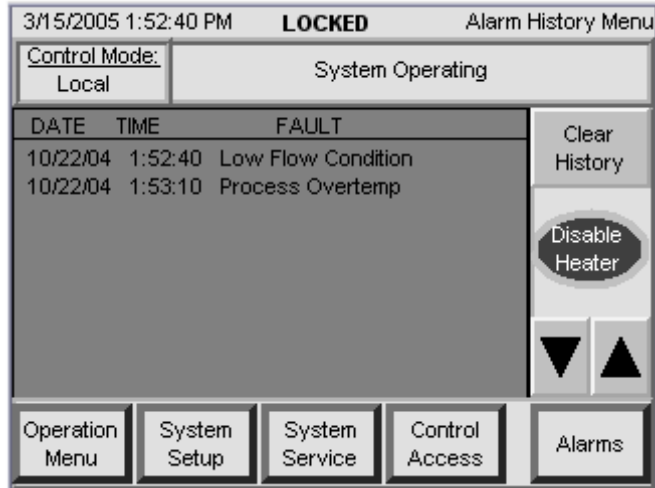


Figure 24: Alarm History Menu Screen

Alarm History Command Menu	Description
CLEAR HISTORY	This button will clear all of the entries in this menu.
▲ ▼	These two buttons will allow the operator to scroll up and down through the alarm history.

Startup Procedure:

- 1) Enable the power at the MAIN SERVICE DISCONNECT.
- 2) Ensure the disconnect handle on the front panel is in the ON Position and that the EMO button on the front panel is not depressed.
- 3) Establish water flow. Allow water to flow for several minutes to ensure all entrapped air has been purged from the heating module(s).
- 4) Press the POWER ON switch on the front panel.
- 5) If all safety components are within allowable ranges, the main load/safety contactor will engage. The YELLOW indicator light will be illuminated.
- 6) Verify that the system parameters are correct.
- 7) Adjust the PROCESS SETPOINT in the OPERATIONS MENU to the desired temperature.
- 8) If the unit is being operated for the first time, complete the HEATER CALIBRATION STARTUP PROCEDURE. This procedure is provided on the following page.

If the unit is not being started for the first time, proceed to step 10.
- 9) Press the ENABLE HEATERS button on the command panel. The unit will now start to heat the water.

Note: Steps 8 and 10 can also be accomplished through the remote control interface or on the ROI. Refer to the REMOTE INTERFACE section of this manual for more information.

Heater Calibration Startup Procedure:

This calibration procedure should be performed the first time the unit is operated. While this unit was tested and calibrated prior to shipment, this procedure will help correct for some offsets caused by variations in nominal supply voltages. While the DAC control system will compensate for these differences, performing this procedure will improve heater response.

This calibration startup procedure will disable the correction routines for the DAC control system and allow the unit to operate with an open loop control. By observing the performance of this unit without any error correction, the operator may adjust the heater to improve heater response. This procedure may not be performed while the unit is in MANUAL or REMOTE control mode.

This procedure must be performed following the STARTUP PROCEDURE provided on the previous page.

- 10) Once the startup procedure is complete, insure that there is an adequate and steady flow of water through the unit. Fluctuations in water flow will affect the results of calibration.
- 11) Access the HEATER CALIBRATION menu on the touch screen interface. Use the buttons on the navigation panel to first access the SYSTEM SETUP menu, and then press the HEATER CALIBRATION button in the information panel to access this display screen.
- 12) Turn the HEATER CALIBRATION setting ON. The image of the toggle switch will change to indicate that the calibration mode has been turned ON.
- 13) Press the ENABLE HEATER button on the command panel of the display.
- 14) Allow enough time for the heater to ramp up to the process setpoint and to stabilize. Depending upon the flow rate and the wattage of the unit, this may take several minutes.

Heater Calibration Startup Procedure (Continued):

15) Compare the outlet temperature of the unit to the process setpoint.

If the outlet temperature is higher than the PROCESS SETPOINT, then decrease the OFFSET VALUE by 1%.

If the outlet temperature is lower than the PROCESS SETPOINT, increase the OFFSET VALUE by 1%.

16) Repeat steps 14-15 until the outlet temperature matches the PROCESS SETPOINT. Once the unit outlet temperature matches the PROCESS SETPOINT the unit is calibrated. Proceed to step 17.

17) Turn the HEATER CALIBRATION setting OFF. The image of the toggle switch will change to indicate the calibration mode has been turned OFF.



The HEATER CALIBRATION setting must not be turned on during normal heater operation.

The HEATER CALIBRATION mode will disable the following control performance features:

- Overshoot compensation
- Boost deadband
- Error compensation

Failure to turn the HEATER CALIBRATION setting off will result in poor temperature control and may result in over-temperature conditions.

Shutdown:



The heater must be disabled and allowed to cool before the water flow is turned off. Dangerous temperatures and pressure conditions may result from improper shutdown procedures.

- 1) Press the DISABLE HEATER button on the command panel of the controller. Continue water flow through the heater to allow the heating module(s) to cool down.
- 2) Maintain water flow until the outlet temperature reaches ambient as referenced from the Main screen.
- 3) Press the POWER OFF button located on the front panel of the heater.

Note: Steps 1 and 3 can also be accomplished through the remote control interface or on the ROI. Refer to the REMOTE INTERFACE section of this manual for more information.

- 4) Shut off the water supply to the heater, either at the customer provided emergency shutoff valve or service valve.
- 5) Turn off the disconnect switch to complete the shutdown.

Note: For extended shut down periods, drain the heating columns and dry the columns internally with nitrogen or another inert gas.

Draining the unit:

- 6) Close the customer installed service shutoff valves on the inlet and outlet of the unit. Apply any necessary lockout/tagout device.
- 7) Position the customer supplied 3-way valve on the inlet of the unit to open the heating columns to a non-pressurized drain.
- 8) Open the capped fitting of the customer supplied TEE fitting on the outlet of the unit. Apply pressurized N₂ or CDA gas to drain the heating module(s). Gas pressure must not exceed 1 Bar (14 PSI).
- 9) When the unit is finished draining, shut off the pressurized gas and close the fitting on the TEE fitting.

Alarm Conditions:

The following section describes each of the alarm conditions that may occur on the Quartz H₂O_T SHOT inline water heater.

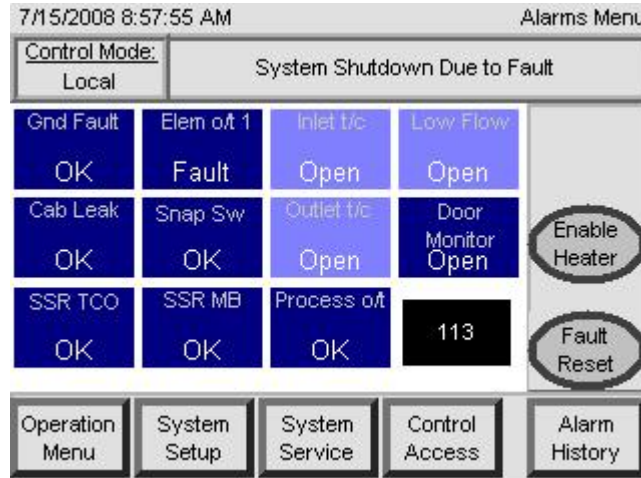


Figure 25: Alarm Menu (PLC Fault shown)

Alarms Menu	Alarm History Menu	Description
Gnd Fault	Ground Fault	A ground fault has occurred somewhere in the unit. This may be caused by a failed component. The cause of the ground fault must be identified and corrected before the heater is reset.
Proc o/t	Process Overtemp	The outlet water temperature has risen above the HIGH PROCESS O/T ALARM value. This setting is located in the SYSTEM PARAMETERS MENU. This may be caused by a sudden and drastic decrease in flow rate or a failed SSR. When the outlet temperature falls below the value of this setting, the unit can be reset.
Cab Leak	Leak Detect	The leak detector has detected liquid accumulation inside the cabinet. This may be caused by a leaking plumbing connection or by a broken quartz tube. Any leaking plumbing fitting should be repaired and the leak pan must be drained before the fault can be reset. A leaking heating heater module must be replaced.
Inlet t/c	Inlet T/C Open	The inlet process temperature sensor has failed (open). The process temperature sensor must be replaced. This may also be caused by a disconnected sensor connection.
Door Monitor	Door Monitor	One or all of the access panels or doors are open. This alarm may be rest once all doors are closed and all access panels are back in place.


Alarm Conditions (Continued):

Alarms Menu	Alarm History Menu	Description
Outlet t/c	Outlet T/C Open	The outlet process temperature sensor has failed (open). The process temperature sensor must be replaced. This may also be caused by a disconnected sensor connection.
Snap SW	Chamber Snap Switch	The over-temperature snap switch has tripped. This switch measures the temperature of the reflective aluminum housing surrounding the heating module, and will open (trip) if it measures a temperature above 185°C. This will trip the alarm circuit and will require a manual reset. When the element temperature falls below this setpoint, the unit can be reset.
Elem O/T 1	Element O/T (slc), HTR 1	The element overtemperature sensor has measured a value above the setpoint of the Safety Limit Controller (slc). This will trip the alarm circuit and will require a manual reset. When the element temperature falls below this setpoint, the unit can be reset.
PLC	PLC Fault	A problem has occurred with the PLC itself, and the system is unable to operate normally. Inspect the PLC unit itself and correct any open or broken connections. Try cycling main power to clear this fault. The PLC Fault alarm will appear as a black field in the lower right corner of the Alarms menu (see figure on previous page). The number shown is an error code for the PLC. If the PLC Fault alarm will not clear, contact PROCESS TECHNOLOGY for assistance.
Low Flow	Low Flow Condition	The flow rate has dropped below the LOW FLOW SETPOINT in the SYSTEM PARAMETERS menu.

Heating Module Replacement:

This procedure should be performed if replacement of the heating subassembly in the Quartz H₂OT SHOT is necessary. The replacement heating assembly is not provided with the unit and must be purchased separately. Contact PROCESS TECHNOLOGY for part numbers and pricing information.

This procedure must be performed by qualified technicians only. Parts of this procedure require two people to complete.

	<p>Always wear clean gloves when handling the quartz tubing in the Quartz H₂OT SHOT unit. Touching the quartz with bare hands will result in devitrification of the quartz tubing and can result in premature element failure.</p>
---	--

- 1) Disconnect all power to the Quartz H₂OT SHOT and verify that power is removed from the unit. Apply any lockout/tagout devices as needed.
- 2) Drain the water from the unit, as described in the SHUTDOWN procedure.
- 3) Open and remove both of the doors on the rear of the cabinet. (Once open, the doors lift off of their hinges.)
- 4) On both sides of the heater, remove the wires from the terminal blocks.

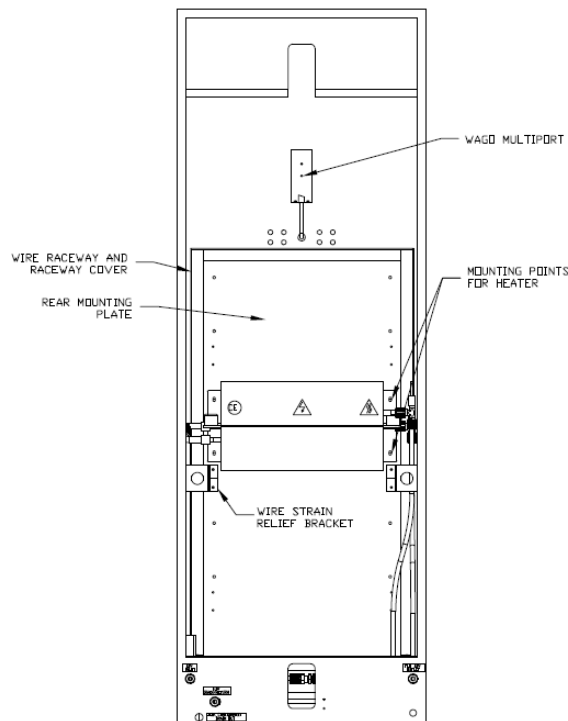


Figure 25: Rear of Cabinet (Doors Removed)

Heating Module Replacement (Continued):

- 5) On both sides of the heater, remove the screws that secure the Wire Strain Relief Brackets. Lay the brackets and wires in the bottom of the cabinet.
- 6) Remove the wire raceway covers on the left and upper wire raceways.

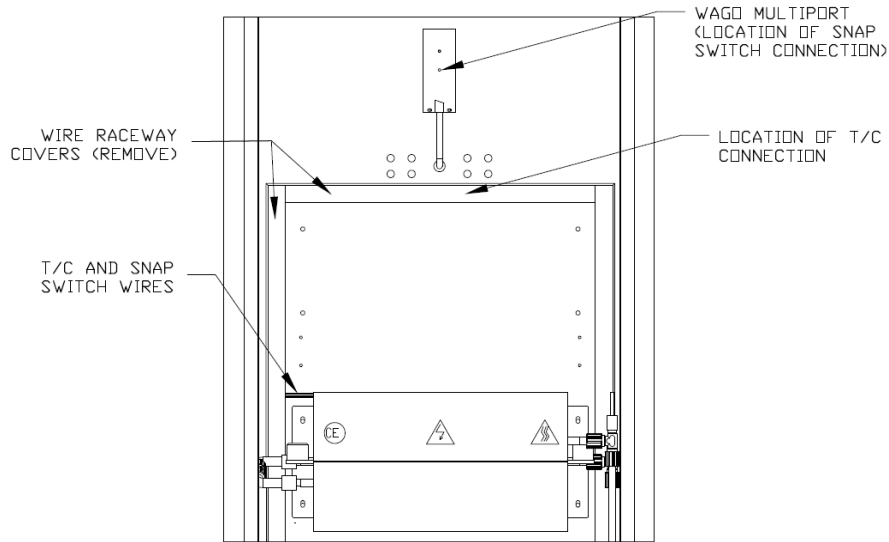


Figure 26: Wire Disconnects

- 7) Two sets of wires extend from the left side of the heater. Trace these wires away from the heater. Disconnect the T/C wire at the Omega T/C Quick Disconnect located in the upper wire raceway. The (2) black wires, which belong to the Heater Overtemperature Snap Switch, are plugged into the Wago Multipoint located above the upper raceway. Disconnect this plug. Free both sets of wires from the raceways and lay them on top of the heater.

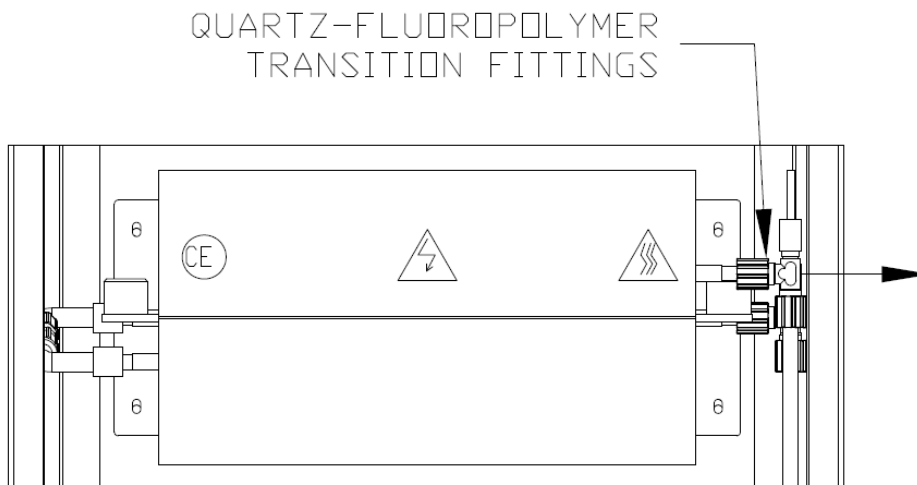


Figure 27: Inlet/Outlet Plumbing Removal

Heating Module Replacement (Continued):

- 8) On the right side of the heater, loosen and remove the compression nuts on the quartz-fluoropolymer transition fittings of the heater assembly. Pull the fluoropolymer tubing assemblies away from the quartz fitting ends.

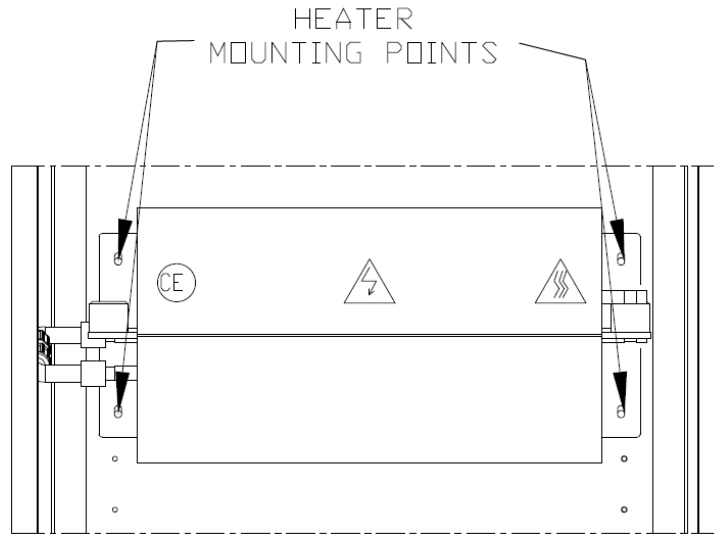


Figure 28: Heater Unit Removal

- 9) While another person holds the heater in place, remove the four bolts that secure the heater to the Rear Mounting Plate. Remove the heater from the cabinet.

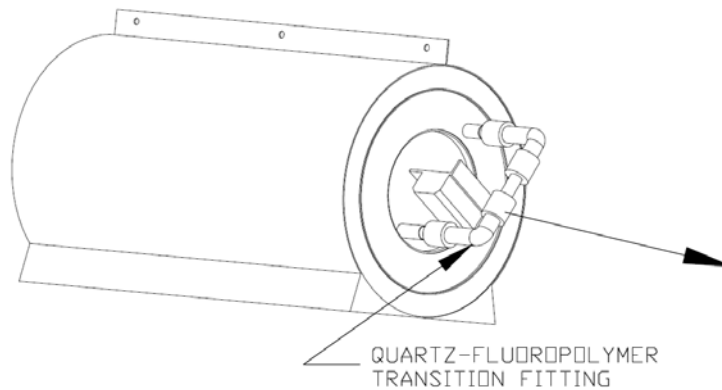


Figure 29: Plumbing Removal

- 10) Remove the remaining plumbing connection from the inner coil and rotate the fluoropolymer plumbing out of the way.

Heating Module Replacement (Continued):



Figure 30: End Clamp (Removed)

11) Remove the end clamps from the heater subassembly retaining rings.

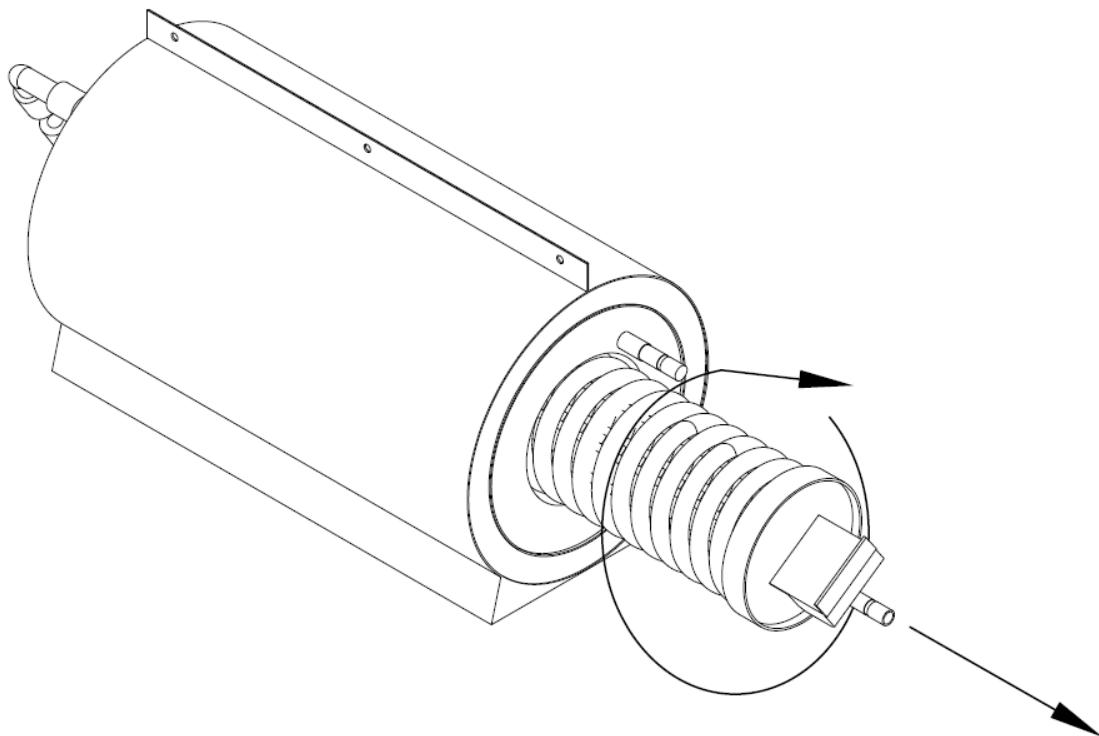


Figure 31: Inner Coil Removal

12) With a gentle, twisting motion, withdraw the heater subassembly from the unit, supporting it as it is removed. Sliding the heater subassembly forward or backward may facilitate this removal.

Heating Module Replacement (Continued):

- 13) Carefully slide the new heater subassembly into the outer coil. Align the new heater subassembly so that the orientation of the quartz tubing matches the existing alignment. Reinstall the end clamps. Carefully reconnect the plumbing connection that was removed in Step 10. Hand tighten the connection until 3 threads are visible on the fitting.
- 14) While another person holds the heater in place, insert and tighten the four bolts and washers that secure the heater to the Rear Mounting Plate.
- 15) Reconnect the T/C and Heater Overtemperature Snap Switch wires. Reinstall the wire raceway covers.
- 16) Reattach the Wire Strain Relief Brackets. Reconnect the wires to the terminal blocks as originally installed matching the numbering of the ceramic terminal blocks to the wires.
- 17) Reinstall the compression nut and ferrule on the quartz tubing and replace the previously removed fluoropolymer plumbing. **Extreme caution must be taken to avoid quartz breakage.** Properly support the quartz while hand tightening the connections until 3 threads are visible on the fitting. Turn on flow to the unit and close the outlet valve. Check for leaks. If leaks exist, gently tighten the connections. Once no leaks exist, return the unit to service.



Extreme caution must be taken to avoid quartz breakage.

CLEANING:

The Quartz H₂O_T SHOT inline water heater was thoroughly cleaned prior to shipment. The inlet/outlet plumbing connections were sealed and the heating columns were charged with nitrogen gas prior to shipment. PROCESS TECHNOLOGY recommends that, at a minimum, the following steps be taken to remove any contamination that may have been added to the system during installation. Additional steps may be required for certain applications. For sanitization procedures, contact your DI Water system supplier for their recommendations. The bypass to the DI recirculation loop should be installed as close as possible to the process tank. Confirm that the bypass plumbing will be able to withstand the maximum temperature and pressure that will be generated by the system.

This procedure should only be performed by qualified technicians.

- 1) Allow DI water to flow through the unit unheated with the maximum possible flow rate for one (1) hour. The effluent should be directed to the drain.
- 2) Turn ON the heater and set the operating temperature at 70°C
- 3) Allow the unit to run at the maximum attainable flow rate for at least three (3) hours at elevated temperature.
- 4) Sanitize the system. Refer to the material compatibility chart to verify that the type-214 quartz tubing will not be damaged by the sanitizing chemicals.
- 5) Proceed with normal operation after sanitizing and rinse procedures are completed.

Notes: The time required for absolute clean up of the system will be dependent on DI Water quality, flow rates, and installation techniques.

System Sanitizing:

Consult your DI Water equipment supplier to determine a method of sanitizing that will be compatible with *all* of the materials used throughout the system.

WARRANTY:

All PROCESS TECHNOLOGY equipment, heaters and controls have been carefully inspected before shipping and are warranted to be free from defects in workmanship and materials for a period of one year from date of purchase on a pro-rated basis. At its option, PROCESS TECHNOLOGY will repair or replace any defects that are exhibited under proper and normal use. PROCESS TECHNOLOGY disclaims any responsibility for misuse, misapplication, negligence or improper installation of equipment, tempering or other operating conditions that are beyond its control (such as excessively high or low purge gas supply pressure). PROCESS TECHNOLOGY makes no warranty or representation regarding the fitness for use or the application of its products by the customer.

All products and components not manufactured by PROCESS TECHNOLOGY will carry the original manufacturer's warranty, copies of which are available upon request. PROCESS TECHNOLOGY makes no warranty or representation, expressed or implied, with respect to the products not manufactured by PROCESS TECHNOLOGY.

Products must be installed and maintained in accordance with PROCESS TECHNOLOGY instructions.

PROCESS TECHNOLOGY is not liable for labor costs incurred in removal, reinstallation, or unauthorized repair of the product or for damage of any type including incidental or consequential damage.

PROCESS TECHNOLOGY neither assumes nor authorizes any representative of PROCESS TECHNOLOGY or any other person to assume for it any other liabilities in connection with the sale of the products. This warranty may not be verbally changed or modified by any representative of PROCESS TECHNOLOGY.

Shipping Damages:

Claims against freight carriers for damage in transit must be filed by the customer at the time of delivery or as soon as possible.

Returns:

No product shall be returned to PROCESS TECHNOLOGY without first obtaining a return material authorization (RMA) number from a PROCESS TECHNOLOGY representative. All returns must be freight prepaid. Freight collect or shipments without authorization will be refused.

Information:

PROCESS TECHNOLOGY will endeavor to furnish such advice as it may be able to supply with reference to the use by buyer of any material purchased, but PROCESS TECHNOLOGY makes no guarantees and assumes no obligation or liability for advice given verbally or in print or the results obtained. Buyer assumes all risk and liability that may result from the use of any material, whether used by itself or in combination with other products. No suggestion for product use shall be construed as a recommendation for its use in infringement on any existing patent.

Conflict Between Documents:

Acceptance of this offer is expressly conditioned upon agreement to all terms and conditions contained herein. In the event of a conflict between the terms and conditions of purchaser's purchase order, and PROCESS TECHNOLOGY's terms and conditions, proposal or offer, the latter shall govern.