



Installation, Operation and Maintenance Manual

RQ Series

Mold Temperature Control Units
0.75 to 7.5 hp and 0 to 24 kW

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Foreward

The intent of this manual is to serve as a guide for placing your mold temperature control unit in service and operating and maintaining it properly. Improper installation can lead to poor equipment performance or severe equipment damage. Failure to follow the installation instructions may result in damage not covered by your warranty. Please supply these instructions to your installer. This manual is for our standard product line with supplements as required to accommodate any special items provided for a specific application. The written information contained in this manual, as well as various drawings, are intended to be general in nature. The drawings included in this manual are typical only and may not represent the actual unit purchased. Actual drawings are included with the equipment for troubleshooting and servicing of the unit. Additional copies of drawings are available upon request. We strive to maintain an accurate record of all equipment during the course of its useful life. Every effort is made to standardize the design features of these units, the various options may make it necessary to rearrange some of the components; therefore, some of the general drawings in this manual may differ from your specific unit.

Due to the ever-changing nature of applicable codes, ordinances, and other local laws pertaining to the use and operation of this equipment we do not reference them in this manual. There is no substitute for common sense and good operating practices when placing any mechanical equipment into operation. We encourage all personnel to familiarize themselves with this manual's contents. Failure to do so may unnecessarily prolong equipment down time.

We trust your equipment will have a long and useful life. If you should have any questions, please contact our Customer Service Department specifying the serial number and model number of the unit as indicated on the nameplate.

Safety Guidelines

Observe all safety precautions during installation, startup, and service of this equipment due to the presence of high voltage and refrigerant charge. Only qualified personnel should install, startup, and service this equipment.

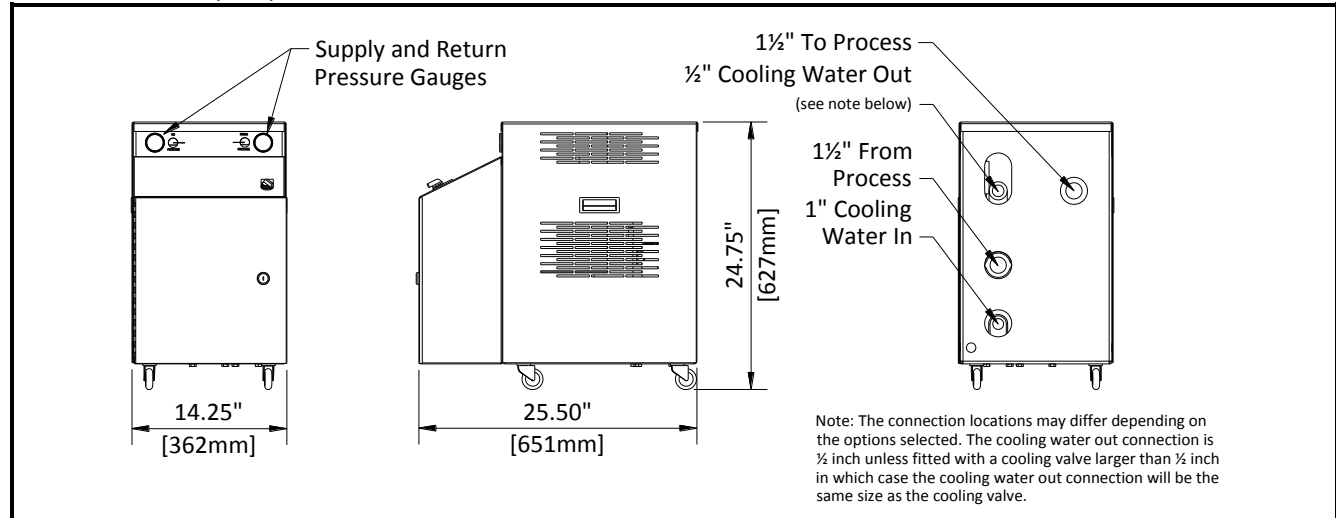
When working on this equipment, observe precautions in literature, and on tags, stickers, and labels located on the equipment. Wear work gloves and safety glasses.



WARNING: This equipment contains hazardous voltages that can cause severe injury or death. Disconnect and lock out incoming power before installing or servicing the equipment.

General Information

Table 1 – General Data (60 Hz)



Model	Heater kW	Pump Performance			Unit FLA 460/3/60	Shipping Weight (lbs)
		hp	gpm	psi		
RQ0008	0	3/4	30	19	3	230
RQ0010	0	1	35	25	3	230
RQ0020	0	2	50	30	4	235
RQ003A	0	3	70	30	6	240
RQ003B	0	3	85	35	6	240
RQ0050	0	5	95	50	9	260
RQ0075	0	7 1/2	110	55	12	265
RQ0908	9	3/4	30	19	13	230
RQ0910	9	1	35	25	13	230
RQ0920	9	2	50	30	14	235
RQ093A	9	3	70	30	15	240
RQ093B	9	3	85	35	15	240
RQ0950	9	5	95	50	17	260
RQ0975	9	7 1/2	110	55	20	265
RQ1208	12	3/4	30	19	17	230
RQ1210	12	1	35	25	17	230
RQ1220	12	2	50	30	18	235
RQ123A	12	3	70	30	19	240
RQ123B	12	3	85	35	19	240
RQ1250	12	5	95	50	21	260
RQ1275	12	7 1/2	110	55	24	265
RQ1808	18	3/4	30	19	24	230
RQ1810	18	1	35	25	24	230
RQ1820	18	2	50	30	25	235
RQ183A	18	3	70	30	26	240
RQ183B	18	3	85	35	26	240
RQ1850	18	5	95	50	28	260
RQ1875	18	7 1/2	110	55	31	265
RQ2408	24	3/4	30	19	32	230
RQ2410	24	1	35	25	32	230
RQ2420	24	2	50	30	33	235
RQ243A	24	3	70	30	34	240
RQ243B	24	3	85	35	34	240
RQ2450	24	5	95	50	36	260
RQ2475	24	7 1/2	110	55	39	265

Installation

Receiving Inspection

Each unit is skid mounted and boxed prior to shipment. Lag bolts secure the unit to the skid for shipping and require removal. Before accepting delivery, check the overall condition of the box or crate for visible damage and document any evidence of damage on the delivery receipt. Shipping damage is the responsibility of the carrier. In order to expedite payment for damages, it is important to follow proper procedures and record keeping. Photographs of damaged equipment are excellent documentation for your records.

Our Customer Service Department will provide assistance with the preparation and filing of your claims, including arranging for an estimate and quotation on repairs; however, filling the claim is the responsibility of the receiving party.

Rigging, Handling, and Locating Equipment

The units have a steel base platform and casters for easy positioning. Use proper rigging methods to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the unit. Use pads on any abrasive surface contact areas.

Standard units are for indoor use and should not be installed or even stored in an outdoor location; however, some custom units may be design for outdoor installations. The unit can be stored in environments between -22°F (-30°C) and 122°F (50°C) and is designed for operation in environments between 30°F (-1°C) and 110°F (43°C).



CAUTION: To prevent damage to the equipment caused by freezing, do not store or operate the unit in an ambient which may cause freezing without adequate freeze protection

If it is necessary to store the unit in an unheated area when not in use, drain all water out of the unit or ensure the unit is full of a proper glycol solution to prevent freeze-up of the unit. A primary concern when designing your unit was serviceability, therefore, we recommend the unit is located in an accessible area.

Electrical Power

All wiring must comply with local codes and the National Electric Code. Minimum Circuit Ampacities (MCA) and other unit electrical data are on the unit nameplate and are in the Electrical Specification section at the back of this manual. A specific electrical schematic ships with the unit. Measure each leg of the main power supply voltage at the main power source. Voltage must be within the voltage utilization range given in Table 2 - Voltage Utilization Range.

Table 2 - Voltage Utilization Range

Rated Voltage	Utilization Range
230	208 to 254
460	414 to 506
575	516 to 633

If the measured voltage on any leg is not within the specified range, notify the supplier and correct before operating the unit. Voltage imbalance must not exceed two percent. Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. Voltage imbalance is determined using the following calculations:

$$\% \text{ Imbalance} = (V_{\text{avg}} - V_x) \times 100 / V_{\text{avg}}$$

$$V_{\text{avg}} = (V_1 + V_2 + V_3) / 3$$

$$V_x = \text{phase with greatest difference from } V_{\text{avg}}$$

For example, if the three measured voltages were 442, 460, and 454 volts, the average would be:

$$(442 + 460 + 454) / 3 = 452$$

The percentage of imbalance is then:

$$(452 - 442) \times 100 / 452 = 2.2 \%$$

This exceeds the maximum allowable of 2%.

The unit includes a terminal block for main power connection to the main power source. The main power source should be connected to the terminal block through an appropriate disconnect switch. A separate terminal for grounding the unit is in the main control panel. Check the electrical phase sequence at installation and prior to Startup. Operation of the unit with incorrect electrical phase sequencing can result in mechanical damage. Check the phasing with a phase sequence meter prior to applying power. The proper sequence should read ABC on the meter. If the meter reads CBA, open the main power disconnect and switch two line leads on the line power terminal blocks (or the unit mounted disconnect). All components are wired and phased correctly at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals.



WARNING: It is imperative to connect L1-L2-L3 in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.



WARNING: The control panel and safeties are such that connecting the appropriate power source to the main terminal block energizes the entire electric circuitry of the unit. A power supply has been factory wired to step down the incoming power to the 24VDC control power. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance. Ground the unit in compliance with local and national codes.

Table 3 – Unit Electrical Specifications (60 Hz)

Model	Heater(s)						Pump						Unit MCA ²			
	Qty	KW	FLA Each (3-phase, 60 Hz)				Qty	HP	FLA Each (3-phase, 60 Hz)				Amps (3-phase, 60 Hz)			
			208V	230V	460V	575V			208V	230V	460V	575V	208V	230V	460V	575V
RQ0008	0	0	0.0	0.0	0.0	0.0	1	0.75	3.7	3.4	1.7	1.4	4.2	3.9	2.2	1.9
RQ0010	0	0	0.0	0.0	0.0	0.0	1	1	3.7	3.4	1.7	1.4	4.2	3.9	2.2	1.9
RQ0020	0	0	0.0	0.0	0.0	0.0	1	2	6.6	6.0	3.0	2.4	7.1	6.5	3.5	2.9
RQ003A	0	0	0.0	0.0	0.0	0.0	1	3	9.9	9.0	4.5	3.6	10.4	9.5	5.0	4.1
RQ003B	0	0	0.0	0.0	0.0	0.0	1	3	9.9	9.0	4.5	3.6	10.4	9.5	5.0	4.1
RQ0050	0	0	0.0	0.0	0.0	0.0	1	5	16.5	15.0	7.5	6.0	17.0	15.5	8.0	6.5
RQ0075	0	0	0.0	0.0	0.0	0.0	1	7.5	24.2	22.0	11.0	8.8	24.7	22.5	11.5	9.3
RQ0908	1	9	24.9	22.6	11.3	9.0	1	0.75	3.7	3.4	1.7	1.4	35.3	32.2	16.3	13.2
RQ0910	1	9	24.9	22.6	11.3	9.0	1	1	3.7	3.4	1.7	1.4	35.3	32.2	16.3	13.2
RQ0920	1	9	24.9	22.6	11.3	9.0	1	2	6.6	6.0	3.0	2.4	38.2	34.8	17.6	14.2
RQ093A	1	9	24.9	22.6	11.3	9.0	1	3	9.9	9.0	4.5	3.6	41.5	37.8	19.1	15.4
RQ093B	1	9	24.9	22.6	11.3	9.0	1	3	9.9	9.0	4.5	3.6	41.5	37.8	19.1	15.4
RQ0950	1	9	24.9	22.6	11.3	9.0	1	5	16.5	15.0	7.5	6.0	48.1	43.8	22.1	17.8
RQ0975	1	9	24.9	22.6	11.3	9.0	1	7.5	24.2	22.0	11.0	8.8	55.8	50.8	25.6	20.6
RQ1208	1	12	33.0	30.0	15.0	12.0	1	0.75	3.7	3.4	1.7	1.4	45.5	41.4	21.0	16.9
RQ1210	1	12	33.0	30.0	15.0	12.0	1	1	3.7	3.4	1.7	1.4	45.5	41.4	21.0	16.9
RQ1220	1	12	33.0	30.0	15.0	12.0	1	2	6.6	6.0	3.0	2.4	48.4	44.0	22.3	17.9
RQ123A	1	12	33.0	30.0	15.0	12.0	1	3	9.9	9.0	4.5	3.6	51.7	47.0	23.8	19.1
RQ123B	1	12	33.0	30.0	15.0	12.0	1	3	9.9	9.0	4.5	3.6	51.7	47.0	23.8	19.1
RQ1250	1	12	33.0	30.0	15.0	12.0	1	5	16.5	15.0	7.5	6.0	58.3	53.0	26.8	21.5
RQ1275	1	12	33.0	30.0	15.0	12.0	1	7.5	24.2	22.0	11.0	8.8	66.0	60.0	30.3	24.3

Table 3 – Unit Electrical Specifications (60 Hz) - Continued

Model	Heater(s)		FLA Each (3-phase, 60 Hz)				Qty	HP	Pump				Unit MCA ²			
	Qty	KW	FLA Each (3-phase, 60 Hz)						FLA Each (3-phase, 60 Hz)				Amps (3-phase, 60 Hz)			
			208V	230V	460V	575V			208V	230V	460V	575V	208V	230V	460V	575V
RQ1808	2	9	24.9	22.6	11.3	9.0	1	0.75	3.7	3.4	1.7	1.4	66.5	60.4	30.5	24.4
RQ1810	2	9	24.9	22.6	11.3	9.0	1	1	3.7	3.4	1.7	1.4	66.5	60.4	30.5	24.4
RQ1820	2	9	24.9	22.6	11.3	9.0	1	2	6.6	6.0	3.0	2.4	69.4	63.0	31.8	25.4
RQ183A	2	9	24.9	22.6	11.3	9.0	1	3	9.9	9.0	4.5	3.6	72.7	66.0	33.3	26.6
RQ183B	2	9	24.9	22.6	11.3	9.0	1	3	9.9	9.0	4.5	3.6	72.7	66.0	33.3	26.6
RQ1850	2	9	24.9	22.6	11.3	9.0	1	5	16.5	15.0	7.5	6.0	79.3	72.0	36.3	29.0
RQ1875	2	9	24.9	22.6	11.3	9.0	1	7.5	24.2	22.0	11.0	8.8	87.0	79.0	39.8	31.8
RQ2408	2	12	33.0	30.0	15.0	12.0	1	0.75	3.7	3.4	1.7	1.4	86.7	78.9	39.7	31.9
RQ2410	2	12	33.0	30.0	15.0	12.0	1	1	3.7	3.4	1.7	1.4	86.7	78.9	39.7	31.9
RQ2420	2	12	33.0	30.0	15.0	12.0	1	2	6.6	6.0	3.0	2.4	89.6	81.5	41.0	32.9
RQ243A	2	12	33.0	30.0	15.0	12.0	1	3	9.9	9.0	4.5	3.6	92.9	84.5	42.5	34.1
RQ243B	2	12	33.0	30.0	15.0	12.0	1	3	9.9	9.0	4.5	3.6	92.9	84.5	42.5	34.1
RQ2450	2	12	33.0	30.0	15.0	12.0	1	5	16.5	15.0	7.5	6.0	99.5	90.5	45.5	36.5
RQ2475	2	12	33.0	30.0	15.0	12.0	1	7.5	24.2	22.0	11.0	8.8	107.2	97.5	49.0	39.3

Notes:

1. Voltage utilization range is: 208 (187 to 254), 230 (187 to 254), 460 (414 to 508), and 575 (518 to 635).
2. Unit MCA (Minimum Circuit Ampacity) is based upon 125% of the largest FLA plus 100% of remaining components FLA.

Process Connections

The importance of properly sized piping or hose between the temperature control unit and the process equipment cannot be overemphasized. In general, run full size piping out to the process and then reduce the pipe size to match the connections on the process equipment. One of the most common causes of poor unit performance is improper piping. Avoid unnecessarily long lengths of hoses and piping as well as quick -disconnect fittings that offer high resistance to water flow. When manifolds are required for water distribution, install them close to the point of use as possible.

The return line should be the same size as the supply line. In addition to the process water connections, the unit requires a cooling water supply and return connection. We recommend shut-off valves at each machine to allow for isolation of the unit.

Start-up

Every unit is factory set to deliver water in accordance with the standard operating specifications for that particular unit. Due to variables involved with different applications and different installations, minor adjustments may be required during the initial start-up to ensure proper operation. Follow the start-up procedure in sequence. Trouble during start-up is usually due to one of the control or safety devices. Use this checklist for the initial start-up and for subsequent start-ups if the unit is out of service for a prolonged period.

1. Connect the main power source properly, make sure it matches the voltage shown on the nameplate of the unit, and that it is within the voltage utilization range given in Table 2 - Voltage Utilization Range. Check the phasing with a phase sequence meter prior to applying power. The proper sequence should read “ABC” on the meter. If the meter reads “CBA”, open the main power disconnect and switch two line leads on the line power terminal blocks (or the unit mounted disconnect). All components requiring electric power are in-phase at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals. After confirming proper power connection and grounding exist, turn the main power on.



WARNING: It is imperative to connect L1-L2-L3 in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.

2. Check all water line connections to ensure they are the proper size. All water lines and connectors should be rated for a minimum of 250°F (121°C) and 150 PSI (10.5 Bar). We recommend the cooling water supply and return lines are of metal composition (black steel, galvanized or copper).

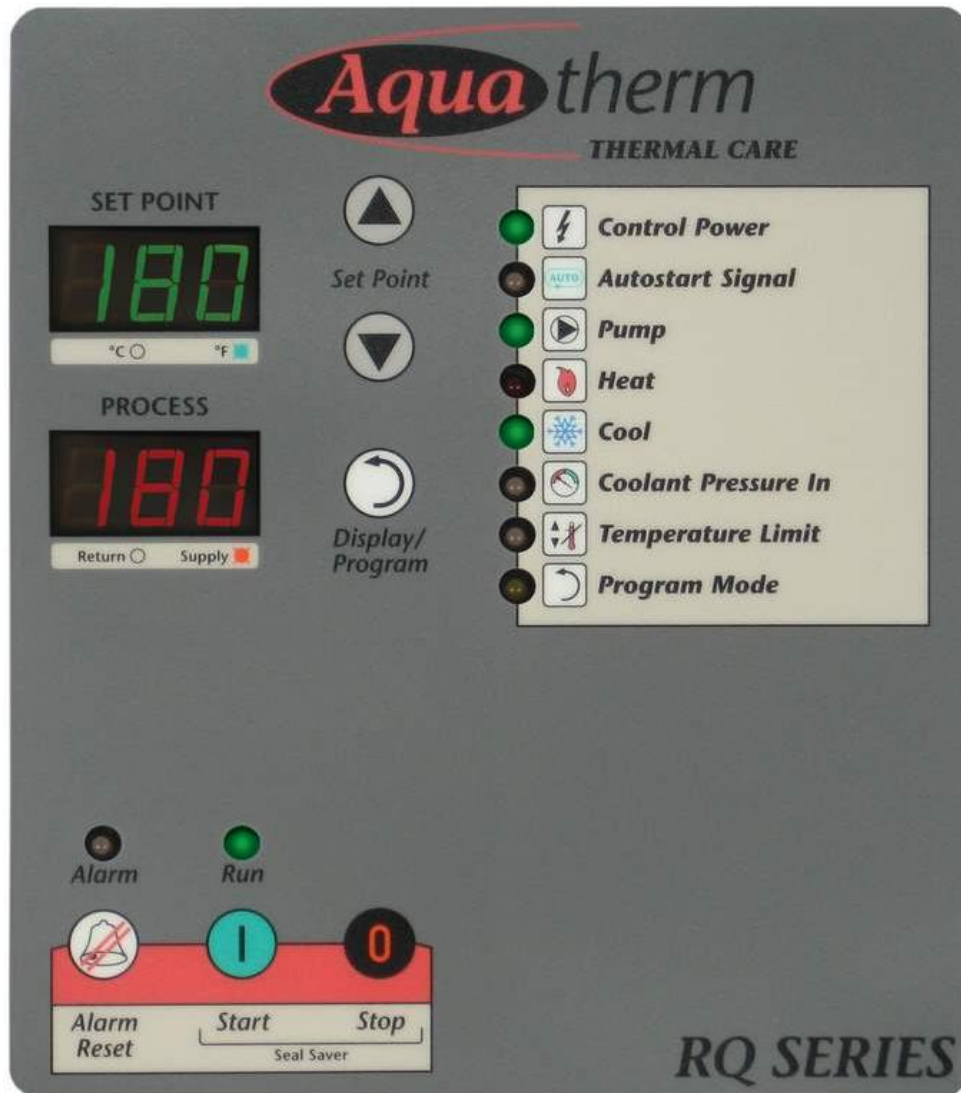
3. Check the pressure switch to ensure it is properly set for the intended operating temperature. The pressure switch is factory set for 15 PSI (1.05 Bar) and the unit will not start unless the cooling water pressure is 15 PSI (1.05 Bar) or greater. For set point temperatures above 200°F (93°C) the pressure switch should be set for a minimum of 25 PSI (1.75 Bar).
4. Make sure that the supply chilled water source is the appropriate temperature and pressure for your application. In most cases, the cooling water temperature is between 40°F (4.4°C) and 85°F (29.4°C). The cooling water source pressure must be above the set point of the pressure switch in order for the unit to start. For most applications the design cooling water pressure is between 25 PSI (1.75 Bar) and 50 PSI (3.5 Bar). If the supply cooling water pressure is higher than 50 PSI (3.5 Bar), a pressure-regulating valve should be installed on the supply line to the temperature control unit. For assistance in installing a pressure-regulating valve, please contact our Customer Service Department.
5. Enter the set point temperature. Refer to the Control Panel Operation section for further information.
6. Turn the Control Power Switch to the ON position and Start the unit by pressing the Start button on the control panel. Pressing the Start button enables the microprocessor control functions, initiates an Auto-vent sequence, and turns on the Run indicating light which is green when on.

The Auto Vent sequence removes air that may have separated out from the water or been entrapped in the water circuit for some reason. Air in the system can lead to improper operation and premature heater failure. When initiated, the Auto Vent sequence opens the cooling valve for 30 seconds to allow air to escape. This allows the majority of the air to escape from the system. For further air purging, the Auto Vent sequence energizes the pump for 30 seconds while the cooling valve is open to remove any remaining air from the system. While in the vent sequence, the PUMP and COOL LED's will flash. Once the Auto Vent sequence is complete, the cooling valve is closed, the pump remains energized, and normal operation initiates.

7. Check the rotation of the pump by visually confirming the motor shaft rotation matches the directional arrow sticker on the motor case. If the pump is running backwards, switch two of the main power leads, after shutting off the disconnect switch.

The unit is now ready for service.

Standard Controller Operation



The temperature control unit includes a microprocessor controller to perform all control functions directly from the front panel. When Control Power is applied, the controller initiates a diagnostic test of each indicating light and display segment which momentarily lights them sequentially. As part of this initial diagnostic test, the program revision level display in the temperature display for a moment. After the initial diagnostic sequence is completed, the controller is ready for operation.

Table 4 – Standard Controller Control Fault Logic

Fault	Alarm Indication	Pump Shut Off	Heater Shut Off	Unit Shut Off	Alarm Reset Required ¹	Manual Reset Required ²	Remote Alarm Activated ³
Low Coolant Inlet Pressure	The Coolant Pressure In Light Flashes Red	Yes	Yes	Yes	No	No	Yes
Temperature Limit Safety	The Set Point and Process Temperatures Flash and the Temperature Limit Light Flashes Red	Yes	Yes	Yes	Yes	No	Yes
Temperature Limit Warning	The Temperature Limit Light Flashes Yellow	No	No	No	Yes	No	Yes
Pump Motor Overload	The Pump Light Flashes Red	Yes	Yes	Yes	Yes	Yes	Yes
Supply Probe Fault Hi	The Set Point Temperature Display shows “PRS” and the Process Temperature Display shows “EHj”	Yes	Yes	Yes	Yes	No	Yes
Supply Probe Fault Lo	The Set Point Temperature Display shows “PRS” and the Process Temperature Display shows “ELO”	Yes	Yes	Yes	Yes	No	Yes
Return Probe Fault Hi	The Set Point Temperature Display shows “PRR” and the Process Temperature Display shows “EHj”	Yes	Yes	Yes	Yes	No	Yes
Return Probe Fault Lo	The Set Point Temperature Display shows “PRR” and the Process Temperature Display shows “ELO”	Yes	Yes	Yes	Yes	No	Yes
Brownout	The Set Point Temperature Display shows “Brn” and the Process Temperature Display shows “Out”	Yes	Yes	Yes	Yes	No	Yes

¹ Alarm Silence/Reset button on control panel must be pressed.

² Safety control device must be manually reset before the controller can be reset.

³ Activates the alarm horn and closes the alarm contact if the remote alarm contact option has been purchased.



Start Button

Pressing the Start button enables the microprocessor control functions, initiates an Auto-vent sequence, and turns on the Run indicating light which is green when on. If the Autostart feature is enabled it will have precedence over the Start Button. See the Program Menu section for instructions on how to enable or disable the Autostart feature.

The Auto Vent sequence removes air that may have separated out from the water or been entrapped in the water circuit for some reason. Air in the system can lead to improper operation and premature heater failure. When initiated, the Auto Vent sequence opens the cooling valve for 30 seconds to allow air to escape. This allows the majority of the air to escape from the system. For further air purging, the Auto Vent sequence energizes the pump for 30 seconds while the cooling valve is open to remove any remaining air from the system. Once the Auto Vent sequence is complete, the cooling valve is closed, the pump remains energized, and normal operation initiates.

It may not be desirable to vent the unit, which results in cooling water intake and temperature reduction. There is a vent sequence cancel feature built into the controls that prevents the vent sequence from occurring in cases where the unit has been in proper operation and the fluid temperature is already elevated. The factory default value for the vent sequence cancel is 120°F. See the Program Menu section for instructions on how to change the vent sequence cancel temperature.

The Start button also performs an “Enter” function while in the programming menu.



Stop Button

Pressing the Stop button de-energizes the pump, clears all faults, and disables the microprocessor control program. A local Stop button press will override the Autostart signal and stop the unit.

This button also performs a “Cancel” function while in the programming menu.



Alarm Silence/Reset Button

When an alarm condition is present, the alarm LED above the Alarm Silence/Reset button will be on and red. The first Alarm Silence/Reset button press will silence the alarm horn, open the remote alarm contact (optional), and turn the LED from red to yellow. The alarm horn and/or remote alarm contact remain disabled until a subsequent alarm occurs. A second press of

the Alarm Silence/Reset button resets the state from Alarm to Normal Operation. If the fault is still present the unit will immediately go into a new alarm state.



Up Arrow Button

The Up Arrow button raises the set point temperature. Pressing the Up Arrow and releasing it increases the set point temperature by one degree. Pressing the Up Arrow button and holding it increases the set point temperature until reaching the maximum allowable set point temperature. In addition to adjusting the set point temperature, the Up Arrow button adjusts various alarms and set point values when the unit is in the programming mode.



Down Arrow Button

The Down Arrow button decreases the set point temperature. Pressing the Down Arrow and releasing it decreases the set point temperature by one degree. Pressing the Down Arrow button and holding it decreases the set point temperature until reaching the minimum allowable set point temperature. In addition to adjusting the set point temperature, the Down Arrow button adjusts various alarms and set point values when the unit is in the programming mode.



Display/Program Button

The Display/Program button will change the temperature displayed in the Process screen from Supply to Return. When the display is set to supply temperature, there will be an orange indicating light in the lower right corner of the Process temperature display. When the display is set to return temperature, there will be no orange indicating light in the lower right corner of the Process temperature display. To toggle the process temperature display from supply to return temperature, press and release the Display/Program button. The display will return to the default Supply temperature automatically after 5 seconds without a button press.

In addition to switching between the supply and return process temperature displays, the Display/Program button will initiate and navigate through the program menu. See the Program Menu section for more detail.



Control Power LED

The Control Power light is on and green when the Control Power Switch is in the ON position and 24VDC control voltage is present.



Autostart Signal LED

The Autostart Signal light is on and yellow when the Autostart function is enabled and no Autostart signal is present. It is on and green when the Autostart function is enabled and the signal is present. This feature allows the unit to be turned on and off by a remote contact closure. Switching the contacts from open to close simulates pressing the Start button on the control panel. Switching the contacts from closed to open simulates pressing the Stop button. From the factory, the Autostart feature is disabled. See the Program Menu section for instructions on how to enable or disable the Autostart feature.



Warning: Do not introduce any external voltage to these contacts, as this will result in damage to the microprocessor.



Pump LED

The Pump LED is green flashing while in Vent or Seal Saver modes. It is solid green while in normal running operation. It will flash red if the overload safety trips.



Heat LED

The Heat LED is on and green when the microprocessor determines that heating is required.



Cool LED

The Cool LED is green flashing while in Vent and Seal Saver modes. It is solid green while in normal running operation when the controller determines that cooling is required.



Coolant Pressure In LED

The Coolant Pressure In LED will flash red if the inlet cooling water pressure drops below the set point of the low-pressure safety switch. If a low-pressure condition occurs, the unit will automatically stop and remain de-energized until the cooling water pressure rises back above the cut-in set point of the pressure switch. The LED will be solid green if the Coolant Inlet Pressure is satisfactory. It will flash green while in the Purge mode.



Temperature Limit LED

The Temperature Limit LED will flash yellow if a deviation warning exists. It will flash red if a high or low critical temperature safety alarm condition exists.



Program Mode LED

The Program Mode LED will flash yellow while in the programming menu.

Set Point Temperature Display

The Set Point Temperature Display normally displays the set point temperature. An indicator light in the lower right corner of this display area shows the temperature unit of measure that has been set in the programming menu. When the display is set to °F there will be a green indication light, when the display is set to °C there will be no green indicating light. See the Program Menu section to change the temperature scale units of measure.

In addition to displaying the set point temperature, the Set Point temperature display shows other alarm and programming information.

Process Temperature Display

The Process Temperature Display displays the selected supply or return temperature. An indicator light in the lower right corner of the display area show the temperature displayed. When the display is set to supply temperature there will be an orange indicating light, when the display is displaying return temperature there will be no orange indicating light. To toggle the Process temperature display from supply to return temperature, press and release the Display/Program button. The display will return to the default Supply temperature automatically after 5 seconds without a button press. The display will return to the default Supply Temperature automatically after 5 seconds. In addition to displaying the selected temperature, the display shows other alarm and programming information.

Seal Saver

The Seal Saver cool-down sequence reduces the water temperature before the unit shuts off to extend the life of the pump seal. From the factory, the Seal Saver feature is enabled. See the Program Menu section for instructions on how to enable or disable the Seal Saver feature.

To initiate a Seal Save cool-down sequence, press and hold the Start button while simultaneously pressing the Stop button. Release both buttons and the Seal Saver cool-down sequence begins if the process supply water temperature is above 90°F (32°C). During this sequence, the cooling valve opens to cool the water down. The pump remains running while the unit is cooling down. The cooling valve remains open for 120 seconds or until the temperature of the water reaches 90°F (32°C),

whichever occurs first. During the Seal Saver cool-down sequence, the Set Point display temporarily toggles between the target value 90°F (32°C) and current set point, and the Pump and Cool LED's will blink green. After the Seal Saver cool-down sequence is complete, the unit will stop and return to the normal display of set point temperature. Pressing the Start and/or Stop buttons during a Seal Saver cool-down sequence will stop the sequence and execute the function of the Start or Stop button pressed.

Pump Run Hours

The total accumulated pump running hours are stored for maintenance purposes. See the Program Menu section to display the pump running hours. The display of running hours is in units of hundreds so a display value of 10 would mean 1,000 hours. To reset the accumulate pump running hours, simultaneously press the Start and Alarm Silence/Reset buttons for 3 continuous seconds.

Program Menu

The program menu provides access to a number of control user-adjustable parameters and feature enable/disable control. Access the program menu is password protected to prevent unintended alteration to the program settings and parameters.

To access the programming menu the unit must be in a stopped state. Once the unit is stopped, press and hold the Display/Program button for 10 continuous seconds puts the controller in program mode. The Program Mode LED will flash yellow and the display will show "PAS" on the Process display and "000" on the Set Point display. The unit is now ready to have the password entered. From the factory, the password is set to "000". Use the Up or Down arrow buttons to increase the numeric value on the Set Point display until the correct password value is shown. To enter the password, press and release the Start button.

If the password is entered incorrectly, there will be a "no" on the Set Point display and "PAS" on the Process display. After 5 seconds, the unit will go back to the password entry mode and display "PAS" on the Process display and "blanks" on the Set Point display. If no activity occurs for another 5 seconds, the controller exits the programming mode and returns to the Stopped state.

Once in the program menu, use the Display/Program button to scroll through the different adjustable parameter as shown in Table 5 – Standard Controller Program Menu. To change an item, press the Display/Program button until the item code displays in the Process display. Pressing the Alarm Reset button and Display/Program button at the same time will reverse the direction the Display/Program button indexes through the menu items. Once the desired menu item code displays in the Process display, use the Up and Down arrow buttons to adjust the value shown in the Set Point display until the desired value is shown. Press the Start button to enter the display value. Press the Stop button to cancel and revert to the previously value.

Table 5 – Standard Controller Program Menu

Item Name	Item Code	Default Value	Range
User Password	UPA	000	0 to 999
Display Units	Unt	F	F or C
Deviation alarm - over set point	Hld	10	5 to 100
User high safety limit alarm	HSU	260	Between factory low and high limits
Deviation alarm - under set point	Lod	10	5 to 100
User low safety limit alarm	LSU	22	Between factory low and high limits
Brownout monitor	brn	EnA	Disabled (DIS) or Enabled (EnA)
Proportional band	bnd	10	1 to 300
Proportional band ratio	Pbr	5	1 to 10
Derivative time	dEr	5	0 to 200
Integral time	Int	25	1 to 800
Alarm delay for low deviation alarm	AdL	30	10 to 60
Alarm delay for high deviation alarm	AdH	30	10 to 60
Autostart Enable	ASE	DIS	Disabled (DIS) or Enabled (EnA)
Vent Sequence Cancel Temperature	SCT	120	Between factory low and high limits
Pump Run Hours	PrH	0	0 to 999 (x100)
Seal Saver Enabled	SSE	EnA	Disabled (DIS) or Enabled (EnA)

There is a Master Reset function to restore all User menu parameters to their factory default values. To initiate a Master Reset the unit must be in a stopped state. Once the unit is stopped, press and hold the Alarm Silence/Reset button and Stop button simultaneously for 10 consecutive seconds until "PRG" is displayed on the Set Point display and "RSt" is displayed on the Process display. To confirm a Master Reset is desired, press and release the Start button and the system will perform a

Master Reset and reboot. The Master Reset is aborted after the “PRG” is displayed on the Set Point display and “RSt” is displayed on the Process display by turn the control power off or taking no action for 10 consecutive seconds.

Remote Alarm Contact (Optional)

This option includes a set of dry (no voltage induced by the unit) normally open contacts that will close when there is an alarm condition. Refer to Table 4 – Standard Controller Control Fault Logic to determine which faults will trigger the Remote Alarm contacts. The contacts will return to open by pressing the Alarm Silence/Reset button. Certain alarms require a second press to reset the control after correcting the fault.

Premium Controller Operation



The temperature control unit includes a microprocessor controller to perform all control functions directly from the front panel. When Control Power is applied, the controller initiates a diagnostic test of each indicating light and display segment which momentarily lights them sequentially. As part of this initial diagnostic test, the program revision level display in the temperature display for a moment. After the initial diagnostic sequence is completed, the controller is ready for operation.

Table 6 – Premium Controller Control Fault Logic

Fault	Alarm Indication	Pump Shut Off	Heater Shut Off	Unit Shut Off	Alarm Reset Required ¹	Manual Reset Required ²	Remote Alarm Activated ³
Low Coolant Inlet Pressure	The Coolant Pressure In Light flashes red	Yes	Yes	Yes	No	No	Yes
Temperature Limit Safety	The Set Point and Process Temperatures Flash and the Temperature Limit Light flashes red	Yes	Yes	Yes	Yes	No	Yes
Temperature Limit Warning	The Temperature Limit Light flashes yellow	No	No	No	Yes	No	Yes
Pump Motor Overload	The Pump Light flashes red	Yes	Yes	Yes	Yes	Yes	Yes
Supply Probe Fault Hi	The Set Point Temperature Display shows “PRS” and the Process Temperature Display shows “EHj”	Yes	Yes	Yes	Yes	No	Yes
Supply Probe Fault Lo	The Set Point Temperature Display shows “PRS” and the Process Temperature Display shows “ELO”	Yes	Yes	Yes	Yes	No	Yes
Return Probe Fault Hi	The Set Point Temperature Display shows “PRR” and the Process Temperature Display shows “EHj”	Yes	Yes	Yes	Yes	No	Yes
Return Probe Fault Lo	The Set Point Temperature Display shows “PRR” and the Process Temperature Display shows “ELO”	Yes	Yes	Yes	Yes	No	Yes
Brownout	The Set Point Temperature Display shows “Brn” and the Process Temperature Display shows “Out”	Yes	Yes	Yes	Yes	No	Yes
3-Phase Power Error	The Electrical Phase Error list flashes red	Yes	Yes	Yes	Yes	No	Yes
Heater Contactor Error	The Heat Error light flashes red	Yes	Yes	Yes	Yes	No	Yes

¹ Alarm Silence/Reset button on control panel must be pressed.

² Safety control device must be manually reset before the controller can be reset.

³ Activates the alarm horn and closes the alarm contact if the remote alarm contact option has been purchased.



Start Button

Pressing the Start button enables the microprocessor control functions, initiates an Auto-vent sequence, and turns on the Run indicating light which is green when on. If the Autostart feature is enabled it will have precedence over the Start Button. See the Program Menu section for instructions on how to enable or disable the Autostart feature.

The Auto Vent sequence removes air that may have separated out from the water or been entrapped in the water circuit for some reason. Air in the system can lead to improper operation and premature heater failure. When initiated, the Auto Vent sequence opens the cooling valve for 30 seconds to allow air to escape. This allows the majority of the air to escape from the system. For further air purging, the Auto Vent sequence energizes the pump for 30 seconds while the cooling valve is open to remove any remaining air from the system. Once the Auto Vent sequence is complete, the cooling valve is closed, the pump remains energized, and normal operation initiates.

It may not be desirable to vent the unit, which results in cooling water intake and temperature reduction. There is a vent sequence cancel feature built into the controls that prevents the vent sequence from occurring in cases where the unit has been in proper operation and the fluid temperature is already elevated. The factory default value for the vent sequence cancel is 120°F. See the Program Menu section for instructions on how to change the vent sequence cancel temperature.

The Start button also performs an “Enter” function while in the programming menu.



Stop Button

Pressing the Stop button de-energizes the pump, clears all faults, and disables the microprocessor control program. A local Stop button press will override the Autostart signal and stop the unit.

This button also performs a “Cancel” function while in the programming menu.



Alarm Silence/Reset Button

When an alarm condition is present, the alarm LED above the Alarm Silence/Reset button will be on and red. The first Alarm Silence/Reset button press will silence the alarm horn, open the remote alarm contact (optional), and turns the Alarm LED from red to yellow. The alarm horn and/or remote alarm contact remain disabled until a subsequent alarm occurs. A second press of the Alarm Silence/Reset button resets the state from Alarm to Normal Operation. If the fault is still present the unit will immediately go into a new alarm state.



Up Arrow Button

The Up Arrow button raises the set point temperature. Pressing the Up Arrow and releasing it increases the set point temperature by one degree. Pressing the Up Arrow button and holding it increases the set point temperature until reaching the maximum allowable set point temperature. In addition to adjusting the set point temperature, the Up Arrow button adjusts various alarms and set point values when the unit is in the programming mode.



Down Arrow Button

The Down Arrow button decreases the set point temperature. Pressing the Down Arrow and releasing it decreases the set point temperature by one degree. Pressing the Down Arrow button and holding it decreases the set point temperature until reaching the minimum allowable set point temperature. In addition to adjusting the set point temperature, the Down Arrow button adjusts various alarms and set point values when the unit is in the programming mode.



Display/Program Button

The Display/Program button will change the temperature displayed in the Process screen from Supply to Return. When the display is set to supply temperature, there will be an orange indicating light in the lower right corner of the Process temperature display. When the display is set to return temperature, there will be no orange indicating light in the lower right corner of the Process temperature display. To toggle the process temperature display from supply to return temperature, press and release the Display/Program button. The display will return to the default Supply temperature automatically after 5 seconds without a button press.

In addition to switching between the supply and return process temperature displays, the Display/Program button will initiate and navigate through the program menu. See the Program Menu section for more detail.



Mold Purge Button

The Mold Purge button initiates a mold water purge if this option is present and enabled in the Program Menu. The mold purge option allows compressed air to purge the circuit of water by forcing it out through the cooling valve. To initiate a mold purge sequence the unit must be in a stopped state. Once the unit is stopped, press and release the mold purge button. During a mold purge, the cooling water out valve opens, the mold purge compressed air solenoid valves open, and the cooling water inlet solenoid valve closes. The mold purge sequence is 1 minute long. To stop the mold purge sequence before it is completed, press the Mold Purge button again or press the Stop button.



Crash Cool Button

The Crash Cool button opens the crash cool solenoid valve if this option is present and enabled in the Program Menu. Pressing the Crash Cool button initiates a crash cool sequence. The crash cool sequence opens the crash cool solenoid valve, opens the vent/cooling valve, and disables the heater. The Crash Cool sequence is 1 minute long. To stop the crash cool sequence before it is completed, press the Crash Cool button again, or press the Stop button.



Seal Saver Button

The Seal Saver button initiates a cool-down sequence if the process supply water temperature is above 90°F (32°C). The seal saver cool-down sequence reduces the water temperature before the unit shuts off to extend the life of the pump seal. From the factory, the Seal Saver feature is enabled. See the Program Menu section for instructions on how to enable or disable the Seal Saver feature.

To initiate a Seal Saver cool-down sequence, press and release the Seal Saver button. During this sequence, the cooling valve opens to cool the water down. The pump remains running while the unit is cooling down. The cooling valve remains open for 120 seconds or until the temperature of the water reaches 90°F (32°C), whichever occurs first. During Seal Saver, the Set Point display temporarily toggles between the target value 90°F (32°C), and current set point. During the Seal Saver cool-down sequence the Set Point display temporarily toggles between the target value 90°F (32°C) and current set point and the Pump, Cool, and Seal Saver LED's will flash green. After the Seal Saver cool-down sequence is complete, the unit will stop and return to the normal display of set point. The Seal Saver LED will remain steady green to indicate the completion of the sequence. Pressing the Start and/or Stop buttons during a Seal Saver cool-down sequence will stop the sequence and execute the function of the Start or Stop button pressed.



Control Power LED

The Control Power LED is on and green when the Control Power Switch is in the ON position and 24VDC control voltage is present.



Auto Signal LED

The Autostart Signal light is on and yellow when the Autostart function is enabled and no Autostart signal is present. It is on and green when the Autostart function is enabled and the signal is present. This feature allows the unit to be turned on and off by a remote contact closure. Switching the contacts from open to close simulates pressing the Start button on the control panel. Switching the contacts from closed to open simulates pressing the Stop button. From the factory, the Autostart feature is disabled. See the Program Menu section for instructions on how to enable or disable the Autostart feature.



Warning: Do not introduce any external voltage to these contacts, as this will result in damage to the microprocessor.



Pump LED

The Pump LED is green flashing while in Vent or Seal Saver modes. It is solid green while in normal running operation. It will flash red if the overload safety trips.



Heat LED

The Heat LED is on and green when the microprocessor determines that heating is required.



Cool LED

The Cool LED is green flashing while in Vent, Seal Saver, Purge, or Crash Cool modes. It is solid green while in normal running operation when the controller determines that cooling is required.



Coolant Pressure In LED

The Coolant Pressure In LED will flash red if the inlet cooling water pressure drops below the set point of the low-pressure safety switch. If a low-pressure condition occurs, the unit will automatically stop and remain de-energized until the cooling water pressure rises back above the cut-in set point of the pressure switch. The LED will be solid green if the Coolant Inlet Pressure is satisfactory. It will flash green while in the Purge mode.



Temperature Limit LED

The Temperature Limit LED will flash yellow if a deviation warning exists. It will flash red if a high or low critical temperature safety alarm condition exists.



Electrical Phase Error LED

The Electrical Phase Error LED flashes red when a line voltage problem exists. This optional feature requires the installation of a phase monitor in the control circuit. This error indicates a loss of phase, phase reversal, or phase imbalance.



Heat Error LED

The Heat Error LED is solid red when the microprocessor calls for heater and heating does not occur. The Heat Error light is flashing red when the microprocessor does not call for heater but heating does occur and cooling is forced. Both conditions will cause the unit to stop.



Seal Saver LED

The Seal Saver LED will flash green whenever the unit is executing a Seal Saver sequence. The Cool and Pump LED's will also flash green. After the Seal Saver sequence is complete, the unit will stop and return to the normal display of set point. The Seal Saver LED will remain steady green to indicate the completion of the sequence. See the Seal Saver Button section for a description of the Seal Saver function and operation.



Mold Purge LED

The Mold Purge LED will flash green whenever the unit is executing a purge sequence. The Cool LED will also flash green. After the Mold Purge sequence is complete, the unit will stop and the Mold Purge LED will remain steady green to indicate the completion of the sequence. See the Mold Purge Button section for a description of the Mold Purge function and operation.



Crash Cool LED

The Crash Cool LED will flash green whenever the unit is executing a Crash Cool sequence. The Cool LED will also flash green. After the Crash Cool sequence is complete, the unit will stop and the Crash Cool LED will remain steady green to indicate the completion of the sequence. See the Crash Cool Button section for a description of the Crash Cool function and operation.



Communications LED

The Communications LED will flash green whenever the unit is properly transmitting and receiving a communication signal.



Remote Heat/Cool LED

The Remote Heat/Cool LED is illuminated steady yellow when this option is enabled. Steady yellow presents a warning to the user that external systems are in control of the temperature functions of the unit. This feature allows the heating and cooling to be turned on and off by remote contact closures. Switching a contact from open to close activates the heat or cool function assigned to the contact. Switching the contact from closed to open deactivates the individual heat or cool function assigned to the contact. When enabled the controller does not perform any heat or cool functions and relies exclusively on the external contact closures for these functions; however, the unit maintains all warnings and safety functions. From the factory, the Remote Heat/Cool feature is disabled. See the Program Menu section for instructions on how to enable or disable the Remote Heat/Cool feature.



Warning: Do not introduce any external voltage to these contacts, as this will result in damage to the microprocessor.



Program Mode LED

The Program Mode LED will flash yellow while in the programming menu.

Set Point Temperature Display

The Set Point Temperature Display normally displays the set point temperature. An indicator light in the lower right corner of this display area shows the temperature unit of measure that has been set in the programming menu. When the display is set to °F there will be a green indication light, when the display is set to °C there will be no green indicating light. See the Program Menu section to change the temperature scale units of measure.

In addition to displaying the set point temperature, the Set Point temperature display shows other alarm and programming information.

Process Temperature Display

The Process Temperature Display displays the selected supply or return temperature. An indicator light in the lower right corner of the display area show the temperature displayed. When the display is set to supply temperature there will be an orange indicating light, when the display is displaying return temperature there will be no orange indicating light. To toggle the Process temperature display from supply to return temperature, press and release the Display/Program button. The display will return to the default Supply temperature automatically after 5 seconds without a button press. The display will return to the default Supply Temperature automatically after 5 seconds. In addition to displaying the selected temperature, the display shows other alarm and programming information.

Pump Run Hours

The total accumulated pump running hours are stored for maintenance purposes. See the Program Menu section to display the pump running hours. The display of running hours is in units of hundreds so a display value of 10 would mean 1,000 hours. To reset the accumulate pump running hours, simultaneously press the Start and Alarm Silence/Reset buttons for 3 continuous seconds.

Program Menu

The program menu provides access to a number of control user-adjustable parameters and feature enable/disable control. Access the program menu is password protected to prevent unintended alteration to the program settings and parameters.

To access the programming menu the unit must be in a stopped state. Once the unit is stopped, press and holding the Display/Program button for 10 continuous seconds. The Program Mode LED will flash yellow and the display will read "PAS" on the Process display and "000" on the Set Point display. The unit is now ready to have the password entered. From the factory, the password is set to "000". Use the Up or Down arrow buttons to increase the numeric value on the Set Point display until the correct password value is shown. To enter the password, press and release the Start button.

If the password is entered incorrectly, there will be a "no" on the Set Point display and "PAS" on the Process display. After 5 seconds, the unit will go back to the password entry mode and display "PAS" on the Process display and "blanks" on the Set

Point display. If no activity occurs for another 5 seconds, the controller exits the programming mode and returns to the Stopped state.

Once in the program menu, use the Display/Program button to scroll through the different adjustable parameter as shown in Table 7 – Premium Controller Program Menu. To change an item, press the Display/Program button until the item code displays in the Process display. Pressing the Alarm Reset button and Display/Program button at the same time will reverse the direction the Display/Program button indexes through the menu items. Once the desired menu item code displays in the Process display, use the Up and Down arrow buttons to adjust the valve shown in the Set Point display until the desired valve is shown. Press the Start button to enter the display valve. Press the Stop button to cancel and revert to the previously valve.

There is a Master Reset function to restore all User menu parameters to their factory default values. To initiate a Master Reset the unit must be in a stopped state. Once the unit is stopped, press and hold the Alarm Reset button and Stop button simultaneously for 10 consecutive seconds until “PRG” is displayed on the Set Point display and “RSt” is displayed on the Process display. To confirm a Master Reset is desired, press and release the Start button and the system will perform a Master Reset and reboot. The Master Reset is aborted after the “PRG” is displayed on the Set Point display and “RSt” is displayed on the Process display by turn the control power off or taking no action for 10 consecutive seconds.

Table 7 – Premium Controller Program Menu

Item Name	Item Code	Default Valve	Range
User Password	UPA	000	0 to 999
Display Units	Unt	F	F or C
Deviation alarm - over setpoint	HId	10	5 to 100
User high safety limit alarm	HSU	260	Between factory low and high limits
Deviation alarm - under setpoint	Lod	10	5 to 100
User low safety limit alarm	LSU	22	Between factory low and high limits
Brownout monitor	brn	EnA	Disabled (DIS) or Enabled (EnA)
Proportional band	bnd	10	1 to 300
Proportional band ratio	Pbr	5	1 to 10
Derivative time	dEr	5	0 to 200
Integral time	Int	25	1 to 800
Alarm delay for low deviation alarm	AdL	30	10 to 60
Alarm delay for high deviation alarm	AdH	30	10 to 60
Autostart Enable	ASE	DIS	Disabled (DIS) or Enabled (EnA)
Vent Sequence Cancel Temperature	SCt	120	Between factory low and high limits
Temp Cntl Pump Run Hours	PrH	0	0 to 999 (x100)
Seal Saver Enabled	SSE	EnA	Disabled (DIS) or Enabled (EnA)
Purge Enabled	PuE	DIS	Disabled (DIS) or Enabled (EnA)
Crash Cool Enabled	CCE	DIS	Disabled (DIS) or Enabled (EnA)
Remote Setpoint Enabled	rSE	DIS	Disabled (DIS) or Enabled (EnA)
Remote Setpoint Hi Limit	rSH	260	rSL to 999
Remote Setpoint Low Limit	rSL	10	-99 to rSH
Communications Type	COt	OFF	OFF, Retransmit (rEt), SPI (SPi), ModBus (bUS), or Handheld Remote (Han)
Retransmit High Limit	rEH	260	rEL to 999
Retransmit Low Limit	rEL	10	-99 to rEH
Communications Baud Rate	bAU	12	12 to 96
SPI Address	SPA	32	32 to 63
Modbus ID	bId	1	1 to 247
Remote Heat/Cool Enabled	rHC	DIS	Disabled (DIS) or Enabled (EnA)

Remote Alarm Contact (Optional)

This option includes a set of dry (no voltage induced by the unit) normally open contacts that will close when there is an alarm condition. Refer to Table 6 – Premium Controller Control Fault Logic to determine which faults will trigger the Remote Alarm contacts. The contacts will return to open by pressing the Alarm Silence/Reset button. Certain alarms require a second press to reset the control after correcting the fault.

Remote Control Panel (Optional)

This option removes the display and control buttons from the unit and places them in a small hand-held NEMA-1 enclosure. Included with this option is a 50 Ft (15 M) cable to connect the controller and the unit. All control functions are available to the operator at the location of the remote panel and no control functions are available at the location of the unit.

SPI Communications (Optional)

This option provides an RS-485 communication port on the unit. The serial communications will be multi-drop, half-duplex, SPI 3.01 compatible and will allow the unit to communicate with another piece of equipment that also has SPI protocol capabilities.

The controller supports the following SPI commands: Process Temperature Set Point, High Temperature Deviation, Low Temperature Deviation, Process Status, and To Process Temperature. The controller also supports the following optional SPI commands, Status Machine 1, Status Machine 2, Mode Machine, and From Process Temperature. The controller accepts inputs and delivers outputs according to SPI protocol. There must also be a computer or another piece of equipment that is equipped with the SPI protocol in order for the communications from the unit to be of use. The programming of this computer and/or other equipment is not the responsibility of Thermal Care.

Note: The manufacturer is not responsible for SPI protocol programming beyond what is included in the microprocessor controller.

If multiple pieces of equipment are going to be on the same communications network, the base addresses of each machine will have to be unique. The communication baud rate may also need to be adjusted. Refer to the Program Menu section of this manual for instructions on how to access and adjust the controller's parameters. The base address is parameter "SPA" and the communication baud rate is "bAU."

Modbus RTU (Optional)

The Modbus RTU option will be available with later releases of the product.

Operation

The temperature control unit cycles a heater and cooling valve to maintain precise temperature control of the supply water temperature. Your unit may differ somewhat depending upon the various options purchased; however, the overall function of the unit is fundamental to all our temperature control units.

The pump continuously moves the system fluid from process to the temperature controller. The flow rate is high to ensure turbulent flow and efficient heat transfer. The unit includes both a Supply and Return water RTD temperature sensor. The microprocessor controls to the value of the supply water temperature. If this water temperature is below the user-adjustable set point, the microprocessor energizes the heater. Conversely, the microprocessor opens the cooling valve whenever the water temperature is above set point. Opening the cooling valve allows some of the warm water from the process water circuit to exit through the cooling water out line. At the same time, cool water enters the process circuit from the cooling water in line. The replacement of warm water with cool water provides the cooling that is required, and this methodology is "Direct Injection."

A fixed bypass line protects the pump from a 'dead-head' condition and ensures flow through the pump to keep the pump seal lubricated.

A pressure switch monitors the inlet cooling water pressure to ensure it is sufficient to allow the unit to operate without the possibility of steam flashing. A pressure relief valve will vent the process loop if the operating pressure becomes too high.



WARNING: Do not plug the opening in the pressure relief valve under any circumstances, as this is safety device that must not be defeated.

A small pump seal flush line continuously flushes the pump seal of dirt and debris and vents the seal cavity of entrained air.

Construction

Pump Assembly

The centrifugal close-coupled pump features a specially designed cast volute to eliminate fittings and provide easy connection to the heater(s) and/or mixing tubes. The pump volute is cast iron. The ¾ through 3A pumps have stainless steel impellers and shafts and use a silicon-carbide mechanical pump seal. The 3B through 7½ HP pumps have iron impellers with a bronze wear ring in the pump volute and carbon steel shafts with a bronze sleeve covering. All pumps include a pump seal flush line.

Heater and Mixing Tube

Depending on the options and heater kW capacity of the unit, there will be either two heater tubes or a heater tube and a mixing tube. Both the heater and mixing tubes match up to the pump volute casting. The tubes are cast iron and connect with the pump volute with two flange seals. Units with 0 kW through 12 kW heating capacity will include a larger heater tube and a smaller mixing tube. Units with heating capacities of 18 kW or 24 kW will have two larger heater tubes and no mixing tube. Special requirements may have different patterns.

Heater

The heaters are vertical flange mounted with Incoloy heater element sheathing. All units will use 9 kW or 12 kW heater elements. The heaters energize whenever the microprocessor determines that heating is required. Some units are designed to provide cooling only and do not include a heater.

Cooling Solenoid or Modulating Valve

The cooling solenoid or modulating valve meters the cooling water required for proper cooling. The valve allows warm water to leave the process loop while letting cooling water to enter the loop. In addition, this valve vents the process circuit during Autovent and/or Mold Purge sequences.

Pressure Switch

All units are equipped with a pressure switch to ensure that the unit will not start until the inlet cooling water pressure exceeds the pressure switch setting. This safety protects the heater and pump seal from potential damage caused by lack of water as well as ensuring that the system pressure is above the vapor pressure of the water to prevent the water from flashing to steam.



WARNING: If the Set Point temperature is 200°F (93°C) or higher, the pressure switch should be set for a minimum of 25 PSI (1.75 Bar).

The pressure switch is located on the back of the electrical panel, in the pump/heater section of the unit. The pressure switch is adjustable by using the screws located on top of the pressure switch. When looking at the front of the pressure switch, the left-hand screw adjusts the differential and the right-hand screw adjusts the set point. The differential is factory set for 10 PSI (.7 Bar) and should not need to be changed. The set point is adjustable by turning the right-hand screw until the set point indicator points to the desired pressure.

Pressure Relief Valve

The pressure relief valve is a safety device designed to vent the system if the operating pressure exceeds 150 PSI (10.5 Bar). The pressure relief valve is located on the pump discharge side of the system. The pressure in the process loop is the sum of the cooling water supply pressure and the pressure added by the temperature controller pump. It is possible that a high pressure cooling water source and/or a low flow application will cause periodic pressure relief valve venting during normal operation. If you are experiencing this, please contact our Customer Service Department for assistance and have the serial number and model number of the unit as shown on the nameplate located on the back of the unit.

Preventative Maintenance

Once the unit is in service, we suggest following the maintenance procedures as closely as possible. The importance of a properly established preventive maintenance program cannot be overemphasized. Taking the time to follow these simple procedures will result in substantially reduced downtime, reduced repair costs, and an extended useful lifetime for the unit. The following is a list of suggested periodic maintenance.

Once a Week

1. Check to make sure that the To Process temperature is reasonably close to the Set Point temperature. If the temperature stays more than 2°F (2°C) away from the set point, there may be a problem with the unit. If this is the case, refer to the Troubleshooting section of this manual or contact our Customer Service Department.
2. Check the pump discharge pressure. Investigate further if the pressure starts to stray away from the normal operating pressure.
3. Check the pump for leaks in the seal area. Replace pump seal if necessary.

Repeat items 1 through 3 listed above and continue with the following.

Once a Month

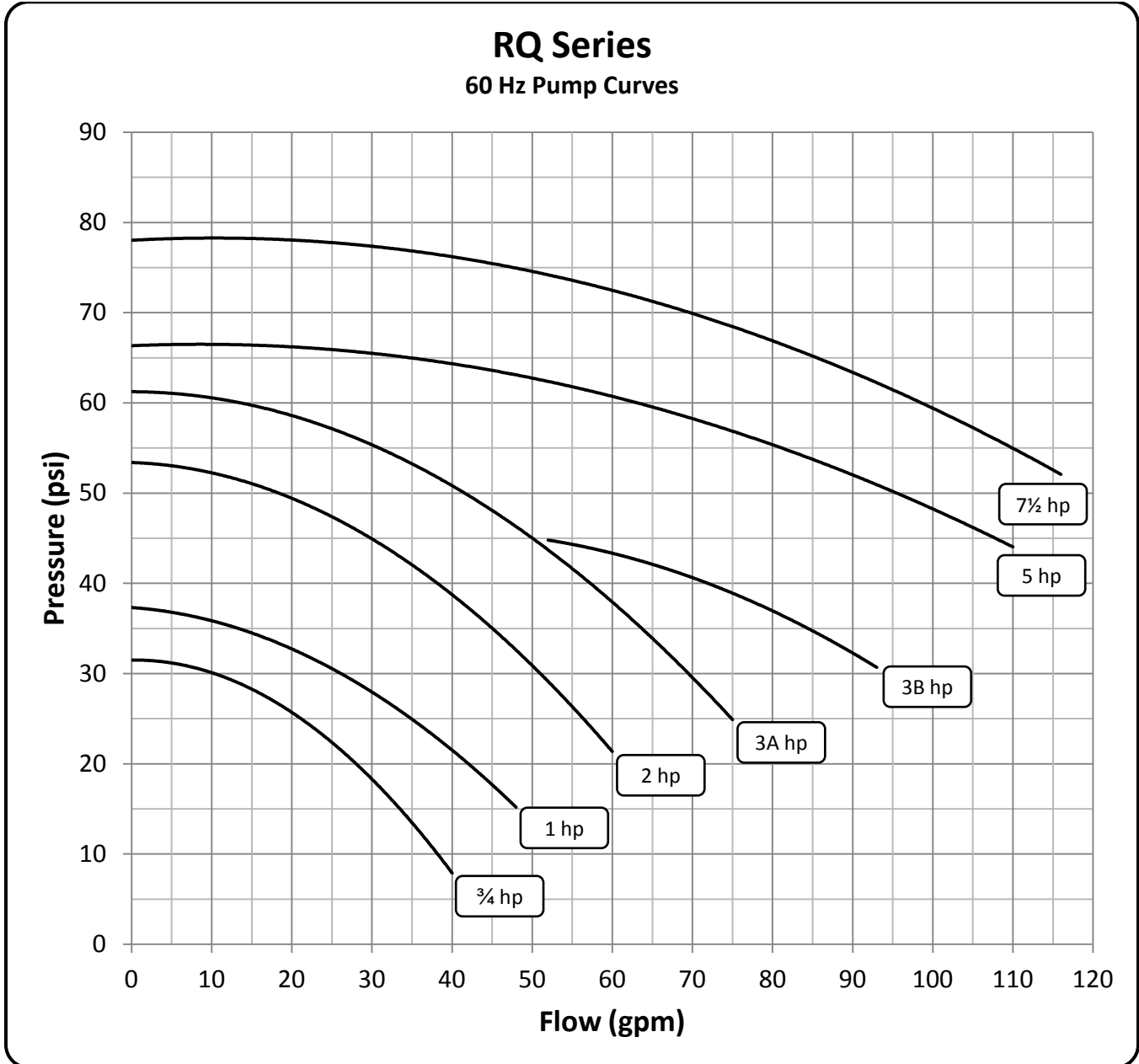
4. With the main power shut off, check the condition of electrical connections at all contactors, starters, and controls. Check for loose or frayed wires.
5. Check the incoming voltage to make sure it is within 10% of the design voltage for the temperature control unit.
6. Check the amp draws to each leg of the pump motor and heater to confirm that they are drawing the proper current.

Troubleshooting

Problem	Possible Cause	Remedy
Alternating overheating and overcooling or rapid cycling from heat to cool	Poor water flow	Check connectors and increase size if necessary. If there are a large number of hoses and/or they are long, try to short hose runs and use as large of a hose as possible to minimize water-circuit pressure drop. If quick disconnects with check valves are used, remove the check valves to reduce pressure drop through water circuit.
	Poor connection or failure of RTD	Check connection, replace if necessary
	Failure of the microprocessor	Replace controller
Unable to heat properly	Cooling valve is stuck in the open position	Flush out the cooling valve by adjusting the Set Point up and down several times to open and close the cooling valve. If this does not work, stop the unit and turn off the electric power and water and take the valve apart for cleaning or replacement
	Leaking connection and/or the manual pressure relief valve is in an open condition	Check for leaks and replace any faulty valves
	Immersion heater is inoperative	Have a qualified electrician check to see if the heater and/or heater contactor are functioning correctly and replace any defective components.
	Microprocessor controller failure	Replace controller
	Failure of RTD	Replace RTD
Unable to cool properly	Cooling water supply is not sufficient	Check to make sure the cooling water supply is of sufficient temperature, volume and pressure for the unit.
	Drain (cooling water return line) is not sufficient	Check the drain (cooling water return line) to ensure there is no restriction preventing water flow to the drain (cooling water return line).
	Cooling valve is inoperative	Check the drain (cooling water return line) and see if you can feel or hear a change in the flow as the cooling valve open and closes. If you cannot hear or feel the flow it is likely the valve has failed. Replace valve if necessary.
	Plugged heat exchanger (only on models with heat exchanger option)	Clean or replace heat exchanger
	High backpressure in the cooling water system	Reduce backpressure.
Heater failure	Unit not filled with water	Fill unit with water
	Faulty heater	Replace heater
	Plugged heater tube / flow restriction	Clear obstruction

Charts & Pump Curves

Figure 1 – RQ Series Pump Curves



Drawings

We have prepared a custom set of drawings for your unit and placed them inside the control panel prior to shipment. Please refer to these drawings when troubleshooting, servicing, and installing the unit. If you cannot find these drawings or wish to have additional copies, please contact our Customer Service Department and reference the serial number of your unit.

Warranty

Temperature Control Units (RQ Series)

Thermal Care warrants its equipment to be free from defects in material and workmanship when used under recommended operating conditions.

Thermal Care's obligation is limited to repair (i.e. rewind a motor) or replacement (not adjustment or maintenance), F.O.B. the factory of any parts supplied by Thermal Care within a period as shown below from the date of shipment to the original purchaser.

Model	Parts	Labor ¹
RQ Series	3 years	3 years
Microprocessor Controller	5 years ²	
Castings (tubes and pump volute)	Lifetime	
Pump seals (standard seal only)		

¹Unit must be returned to Thermal Care freight pre-paid and will be returned to customer freight collect. Repairs done in the field can be submitted for credit if pre-authorized by the Thermal Care Customer Service Department. Credit will be based on rates pre-determined by Thermal Care.

²\$175 lifetime exchange policy at any time as long as the unit is in service.

This warranty does not cover the cost of labor during overtime hours (after normal working hours or during weekends and holidays). Any cost differential for overtime labor will be the responsibility of the customer. Thermal Care is not responsible for any sales, use, excise or other applicable taxes associated with the replacement of parts under this warranty. This warranty will be voided when, in Thermal Care's opinion, the equipment and/or system has been subject to misuse, negligence or operation in excess of recommended limits, including freezing, or has been altered, and/or repaired without express factory authorization. If equipment is installed in hostile environments, unless such conditions were specified at the time of purchase; or the serial number has been removed or defaced, this warranty shall not apply. This warranty is not transferable.

Under no circumstances shall Thermal Care be liable for loss of prospective or speculative profits, or special, indirect, incidental or consequential damages.

All warranty service must be authorized by Thermal Care prior to work being performed and have a Thermal Care purchase order issued. All defective parts become the property of Thermal Care and must be returned as advised by Thermal Care.

Thermal Care neither assumes, nor authorizes any person to assume for it, any liability not expressed in this warranty. There is an implied warranty of merchantability and of fitness for that particular purpose; all other implied warranties, and any liability not based upon contract are hereby disclaimed and excluded by this warranty. This warranty is part of the standard conditions and terms of sale of Thermal Care.



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