

# MOLD TEMPERATURE CONTROLLERS

## Model RQE

# INSTRUCTION MANUAL



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## Foreword

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The temperature control unit typically consists of a fluid pump, electric immersion heater, and temperature control valve in a compact packaged cabinet for easy location in industrial applications where fluid temperature control is required.

This manual is to serve as a guide for installing, operating, and maintaining the equipment. Improper installation can lead to poor performance and/or equipment damage. We recommend the use of qualified installers and service technicians for all installation and maintenance of this equipment.

This manual is for our standard product. The information in this manual is general in nature. Unit-specific drawings and supplemental documents are included with the equipment as needed. Additional copies of documents are available upon request. We strive to maintain an accurate record of all equipment during the course of its useful life.

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.

Follow good piping practices and the information in this manual to ensure successful installation and operation of this equipment.

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

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Observe all safety precautions during installation, start-up, and service of this equipment. The following is a list of symbols used in this manual and their meaning.



**General Warning**



**Electricity Warning**



**Sharp Element Warning**



**Hot Surface Warning**



**Explosive Material Warning**



**General Mandatory Action**



**Wear Eye Protection**



**Wear Protective Gloves**



**Disconnect Before Carrying Out Maintenance or Repair**



**Connect an Earth Terminal to Ground**

Only qualified personnel should install, start-up, and service this equipment. When working on this equipment, observe precautions in literature, and on tags, stickers, and labels located on the equipment.



**WARNING: Any use or misused of this equipment outside of the design intent may cause injury or harm.**



**WARNING: This equipment contains hazardous voltages that can cause severe injury or death.**



**WARNING:** This equipment contains hot water or coolant under pressure. Accidental release of this hot fluid may result in steam formation and can cause personal injury and or property damage.



**WARNING:** This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.



**WARNING:** The exposed surfaces of motors, heater tubes, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.



**CAUTION:** Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. A power supply provides 24 VDC control power. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.



**CAUTION:** Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



**CAUTION:** Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

## Pre-Installation

### Receiving Inspection

When the unit arrives, verify the information on the unit nameplate agrees with the order acknowledgement and shipping papers. Inspect the equipment for any visible damage and verify all items shown on the bill of lading are present. If damage is evident, document it on the delivery receipt by clearly marking any item with damage as "unit damage" and notify the carrier. In addition, notify our Customer Service Department and they will provide assistance with preparing and filing freight damage claims, including arranging for an estimate on repair costs; however, filing the shipping damage claim is the responsibility of the receiving party. Do not install damaged equipment without getting the equipment repaired.

Shipping damage is the responsibility of the carrier. To protect against possible loss due to damage incurred during shipping and to expedite payment for damages, it is important to follow proper procedures and keep records. Photographs of

damaged equipment are excellent documentation for your records.

Start unpacking the unit, inspect for concealed damage, and take photos of any damage found. Once received, equipment owners have the responsibility to provide reasonable evidence that the damage did not occur after delivery. Photos of the equipment damage while the equipment is still partially packed will help in this regard. Check for broken lines, damaged controls, or any other major component torn loose from its mounting point.

Record any signs of concealed damage and file a shipping damage claim immediately with the shipping company. Most carriers require concealed damages be reported within 15 days of receipt of the equipment. In addition, notify our Customer Service Department and they will provide assistance with preparing and filing freight damage claims, including arranging for an estimate on repair costs; however, filing the shipping damage claim is the responsibility of the receiving party.

### Unit Storage

If the temperature control unit is stored prior to installation, it is important to protect it from damage. Blow out any water from the unit to protect it from damage from freezing. Cover the equipment to keep dirt and debris from accumulating on it. Units should not be stored in areas warmer than 145°F.

## Installation - Mechanical

### Foundation

The unit is for installation on a concrete foundation or level floor suitable to support the full operating weight of the equipment. When installed the equipment must be level within ¼ inch over its length and width.

### Unit Location

The unit is available in many different configurations for various environments. Refer to the proposal and order acknowledgement document for the equipment to verify the specific design conditions in which it can operate.

When locating the unit it is important to consider accessibility to the components to allow for proper maintenance and servicing of the unit. In general, allow a minimum of 36 inches of clearance around and above the unit. Avoid locating piping or conduit over the unit to ensure easy access with an overhead crane or lift to lift out heavier components during replacement or service.

Proper ventilation is another important consideration when locating the unit. Locate the unit in an area that will not rise above 120°F. To allow for proper ventilation and heat dissipation allow a minimum of 12 inches clearance on both sides of the unit. Failure to do so may lead to overheating of the motor windings and other components that can cause premature component failure. In addition, ensure the pressure relief valve can vent in accordance with all local and national codes.

## Rigging

The unit has a structural steel base with casters to facilitate easy movement and positioning. Follow proper rigging methods to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the unit. Use pads where abrasive surface contact may occur. Use the frame supporting the unit for positioning it with a crane or a forklift.

## Fluid Distribution Piping

Proper insulation of any cooling fluid system where the supply cooling fluid temperature is below the dew point is crucial to prevent condensation. In most cases this will apply to systems where the supply temperature is 55°F or colder. The formation of condensation on water piping caused by the state change of the water from gas to liquid adds a substantial heat load and becomes an additional burden for the cooling system.

The importance of properly sized piping between the cooling system and the temperature control unit and between the temperature control unit and the process cannot be overemphasized. See the ASHRAE Handbook or other suitable design guide for proper pipe sizing. 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 unsatisfactory unit

performance is poor piping system design. Avoid long lengths of hoses, quick disconnect fittings, and manifolds wherever possible as they offer high resistance to water flow. When manifolds are required, install them as close to the use point as possible. Provide flow-balancing valves at each machine to assure adequate water distribution in the entire system. We recommend shut-off valves at each machine to allow for isolation of the unit.

## Installation - Electrical

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All wiring must comply with local codes and the National Electric Code (NEC). Minimum Circuit Amps (MCA) and other unit electrical data are on the unit nameplate. A unit 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 on the drawings included with the unit. 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%. There is 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. There is a separate lug in the main control panel for grounding the unit. Check the electrical phase sequence at installation

and prior to start-up. Operation of the unit with incorrect electrical phase sequencing will result in improper pump performance. 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). Do not interchange any load leads that are from the unit contactors or the motor terminals.



**WARNING:** This equipment contains hazardous voltages that can cause severe injury or death.



**WARNING:** This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.



**WARNING:** The exposed surfaces of motors and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.



**CAUTION:** To prevent improper pump performance due to reverse rotation, connect L1-L2-L3 in the A-B-C phase sequence.



**CAUTION:** Ground the unit properly in compliance with local and national codes.



**CAUTION:** Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. A power supply provides 24 VDC control power. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.



**CAUTION:** Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



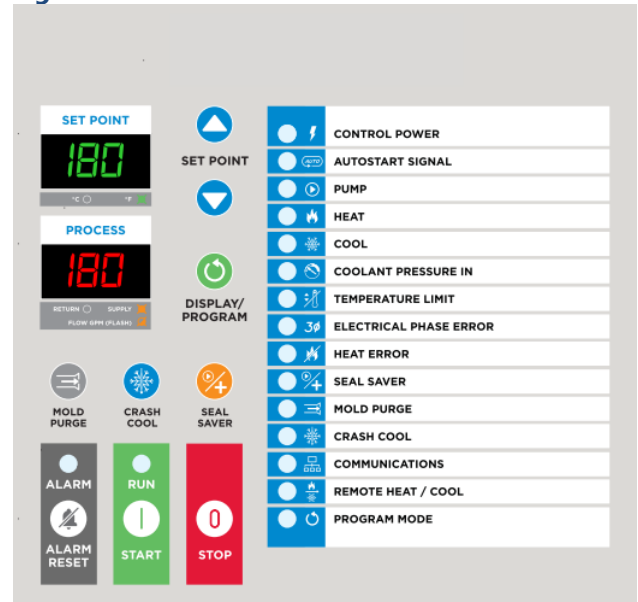
**CAUTION:** Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

## Controller Operation

Figure 1 – Standard Controller User Interface



Figure 2 – Premium Controller User Interface



The temperature control unit includes a 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 is shown in the temperature display for a moment. After the initial diagnostic sequence is completed, the controller is ready for operation.



## Controller Operating Buttons

Button	Description of Operation
<b>Start</b>	Pressing the Start button initiates a vent sequence. The vent sequence removes air that may have separated out from the water to prevent improper operation and premature heater failure. When initiated, the vent sequence opens the cooling valve for 30 seconds to allow air to escape then runs the pump for 30 seconds while the cooling valve is open to remove any remaining air from the system. Once the vent sequence is complete, the cooling valve closes, the pump remains running, and normal operation begins. When the unit is running the Run indicating light is on and green. If the auto start 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 auto start feature. The vent sequence cancel prevents the vent sequence from occurring when the unit has been operating and the fluid temperature is 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.
<b>Stop</b>	Pressing the Stop button clears all faults and stops the pump. With the auto start function enabled and an auto start signal is present, pressing the stop button will not stop the unit. The Stop button also performs a cancel function while in the programming menu.
<b>Alarm Reset</b>	When an alarm condition is present, the alarm light is on and red. The first Alarm Reset button press will silence the alarm horn (optional), open the remote alarm contact (optional), and the alarm light changes from red to yellow. The alarm horn (optional) and/or remote alarm contact (optional) remain disabled until a subsequent alarm occurs. A second press of the Alarm Reset button resets the state from Alarm to Normal Operation.
<b>Up</b>	The Up button raises the set point temperature. Pressing the Up button and releasing it increases the set point temperature by one degree. Pressing the Up 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 button adjusts various alarms and set point values when the unit in the programming mode.
<b>Down</b>	The Down button decreases the set point temperature. Pressing the Down button and releasing it decreases the set point temperature by one degree. Pressing the Down 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 button adjusts various alarms and set point values when the unit is in the programming mode.
<b>Display/Program</b>	Pressing the Display/Program button changes the temperature displayed in the Process screen from supply to return. When the display is set to supply temperature, an orange indicating light is on in the lower right corner of the Process temperature display. When the display is set to return temperature, there is 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 initiates and navigates through the program menu. See the Program Menu section for more detail.
<b>Mold Purge (Optional)<sup>1</sup></b>	The Mold Purge button initiates a mold water purge if this option is present and enabled. 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 stop the unit then press and release the mold purge button. During a mold purge, the cooling water out valve opens, the mold purge compressed air solenoid valve opens, and the cooling water inlet 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. See the Program Menu section for instructions on how to enable or disable this feature.
<b>Crash Cool (Optional)<sup>1</sup></b>	The Crash Cool button opens the crash cool solenoid valve if this option is present and enabled. Pressing the Crash Cool button initiates a crash cool sequence. The crash cool sequence opens the crash cool 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. See the Program Menu section for instructions on how to enable or disable this feature.
<b>Seal Saver (Optional)<sup>2</sup></b>	The Seal Saver button initiates a cool-down sequence if the process supply water is above 90°F. The seal saver cool-down sequence reduces the water temperature before the unit shuts off to extend the life of the pump seal. To initiate a Seal Saver cool-down sequence, press and release the Seal Saver button. During this sequence, the cooling valve opens and the pump runs for 120 seconds or until the temperature of the water reaches 90°F, whichever occurs first. During the Seal Saver cool-down sequence the Set Point display temporarily toggles between the target value 90°F and current set point and the Pump, Cool, and Seal Saver lights flash green. After the Seal Saver cool-down sequence is complete, the unit stops, the set point temperature displays in the Set Point display, and the Seal Saver light remains solid green to indicate the completion of the sequence. Pressing the Start and/or Stop buttons during a Seal Saver cool-down sequence stops the sequence. See the Program Menu section for instructions on how to enable or disable this feature.

<sup>1</sup>Requires the Premium Controller option as well as the individual option for this function.

<sup>2</sup>Requires the Premium Controller option to have a dedicated easy-access control button. To initiate a Seal Save cool-down sequence on a unit with the standard controller press and hold down the Start button, then press the Stop button and then release both buttons.

## Temperature Displays

Display	Description of Operation
<b>Set Point</b>	The Set Point display normally shows the set point temperature. A decimal point in the lower right corner of this display indicates the temperature unit of measure is set to °F, no decimal point indicates the temperature unit of measure is set to °C. See the Program Menu section to change the temperature scale units of measure. This display also shows alarm codes and programming information.
<b>Process</b>	The Process Temperature display normally shows supply temperature. A decimal point in the lower right corner of the display indicates the temperature displayed is the supply temperature, no decimal point indicates the temperature displayed is the return temperature. To change the 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. This display also shows alarm codes and programming information.

## Operating Lights

Light	Description of Operation
<b>Control Power</b>	The Control Power light is on and green when 24VDC control voltage is present.
<b>Autostart Signal</b>	The Autostart Signal light is green when closed (run), yellow when open (stop), and unlit if this feature is disabled. This feature allows starting and stopping of the unit by a remote contact closure. From the factory, the Autostart feature is disabled. See the Program Menu section for instructions on how to enable or disable the Autostart feature. <b>Do not introduce any external voltage to the Autostart contacts; this will result in damage to the controller.</b>
<b>Pump</b>	The Pump light is solid green when the pump is running and flashes red if the pump motor overload trips.
<b>Heat</b>	The Heat light is on and green when the heating is required.
<b>Cool</b>	The Cool light is on and green while in normal running operation when the cooling valve is open. The light flashes green during an Autovent sequence or Seal Saver cool-down sequence.
<b>Coolant Pressure In</b>	The Coolant Pressure In light 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 is above the cut-in set point of the pressure switch. The light is solid green if the Coolant Inlet Pressure is satisfactory. It will flash green while in the Purge mode.
<b>Temperature Limit</b>	The Temperature Limit light flashes yellow if a high or low temperature limit warning occurs and flashes red if a high or low temperature limit safety occurs. A temperature limit safety stops the unit. Pushing the Alarm Reset button will reset this alarm.
<b>Electrical Phase Error (Optional)<sup>1</sup></b>	The Electrical Phase Error light flashes red when a line voltage problem exists. This error indicates a loss of phase, phase reversal, or phase imbalance.
<b>Heat Error (Optional)<sup>1</sup></b>	The Heat Error light is solid red when the controller calls for heat and heating does not occur. The Heat Error light flashes red when the controller does not call for heat but heating occurs. Both conditions cause the unit to stop.
<b>Seal Saver (Optional)<sup>1</sup></b>	The Seal Saver light flashes green when the unit is executing a Seal Saver sequence. The Cool and Pump lights will also flash green during a seal saver sequence. After the Seal Saver sequence is complete, the unit stops and the Seal Saver light remains green to indicate the completion of the sequence. See the Seal Saver Button section for a description of the Seal Saver function and operation.
<b>Mold Purge (Optional)<sup>2</sup></b>	The Mold Purge light flashes green when the unit is executing a purge sequence. The Cool light will also flash green during a mold purge sequence. After the Mold Purge sequence is complete, the unit stops and the Mold Purge light remains green to indicate the completion of the sequence. See the Mold Purge Button section for a description of the Mold Purge function and operation. See the Program Menu section for instructions on how to enable or disable this feature.
<b>Crash Cool (Optional)<sup>2</sup></b>	The Crash Cool light flashes green when the unit is executing a Crash Cool sequence. The Cool light will also flash green during a crash cool sequence. After the Crash Cool sequence is complete, the unit stops and the Crash Cool light remains green to indicate the completion of the sequence. See the Crash Cool Button section for a description of the Crash Cool function and operation. See the Program Menu section for instructions on how to enable or disable this feature.
<b>Communications (Optional)<sup>2</sup></b>	The Communications light flashes green when the unit is properly transmitting and receiving a communication signal. See the Program Menu section for instructions on how to enable or disable this feature.
<b>Remote Heat/Cool (Optional)<sup>2</sup></b>	The Remote Heat/Cool light is on and yellow when this option is enabled. 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 this feature. <b>Do not introduce any external voltage to the Remote Heat/Cool contacts; this will result in damage to the controller.</b>
<b>Program Mode</b>	The Program Mode light flashes yellow when the control system is in the programming menu.

<sup>1</sup>Requires the Premium Controller option.

<sup>2</sup>Requires the Premium Controller option as well as the individual option for this function.

## Controller Control Fault Logic

Fault	Alarm Indication	Pump Shut Off	Heater Shut Off	Unit Shut Off	Alarm Reset Required <sup>1</sup>	Manual Reset Required <sup>2</sup>	Remote Alarm Activated <sup>3</sup>
<b>Low Coolant Inlet Pressure</b>	The Coolant Pressure In Light flashes red	Yes	Yes	Yes	No	No	Yes
<b>Temperature Limit Safety</b>	The Set Point and Process Temperatures Flash and the Temperature Limit Light flashes red	Yes	Yes	Yes	Yes	No	Yes
<b>Temperature Limit Warning</b>	The Temperature Limit Light flashes yellow	No	No	No	Yes	No	Yes
<b>Pump Motor Overload</b>	The Pump Light flashes red	Yes	Yes	Yes	Yes	Yes	Yes
<b>Supply Probe Fault Hi</b>	The Set Point Temperature Display shows <b>PPS</b> and the Process Temperature Display shows <b>Eh I</b>	Yes	Yes	Yes	Yes	No	Yes
<b>Supply Probe Fault Lo</b>	The Set Point Temperature Display shows <b>PPS</b> and the Process Temperature Display shows <b>ELD</b>	Yes	Yes	Yes	Yes	No	Yes
<b>Return Probe Fault Hi</b>	The Set Point Temperature Display shows <b>PPP</b> and the Process Temperature Display shows <b>Eh I</b>	Yes	Yes	Yes	Yes	No	Yes
<b>Return Probe Fault Lo</b>	The Set Point Temperature Display shows <b>PPP</b> and the Process Temperature Display shows <b>ELD</b>	Yes	Yes	Yes	Yes	No	Yes
<b>Brownout</b>	The Set Point Temperature Display shows <b>bPP</b> and the Process Temperature Display shows <b>OUT</b>	Yes	Yes	Yes	Yes	No	Yes
<b>3-Phase Power Error (Optional)<sup>4</sup></b>	The Electrical Phase Error light flashes red	Yes	Yes	Yes	Yes	No	Yes
<b>Heater Contactor Error (Optional)<sup>4</sup></b>	The Heat Error light flashes red	Yes	Yes	Yes	Yes	No	Yes

<sup>1</sup>Pressing the Alarm Silence/Reset resets alarm.

<sup>2</sup>A manual reset of the pump motor thermal overload is required to reset this alarm.

<sup>3</sup>Activates the alarm horn and closes the alarm contact (optional).

<sup>4</sup>Requires the Premium Controller option.

## Program Menu

Access to 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. To enter the program menu stop the unit then press and hold the Display/Program button for 10 continuous seconds to put the controller in program mode. The Program Mode light flashes yellow and the display will show **PPS** 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 an incorrect password is entered the Set Point display shows **no** and the Process display shows **PPS**. After 5 seconds, the unit will go back to the password entry mode and display **PPS** 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 parameters (see Program Menu Items table). 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.

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 **PPG** is displayed on the Set Point display and **PS 1** 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 **PPG** is displayed on the Set Point display and **PS 1** is displayed on the Process display by turning the control power off or taking no action for 10 consecutive seconds.

## Program Menu Items

Item Name	Item Code	Default Value	Range
User password	UPA	000	0 to 999
Display units	UN1	F	F or C
Deviation alarm - over set point	H Id	10	5 to 100
User high safety limit alarm	HSU	260	Between factory low and high limits
Deviation alarm - under set point	L Od	10	5 to 100
User low safety limit alarm	LSU	22	Between factory low and high limits
Brownout monitor	BNM	ENA	Disabled (d IS) or Enabled (ENA)
Proportional band	bPd	10	1 to 300
Proportional band ratio	PbP	5	1 to 10
Derivative time	dEP	5	0 to 200
Integral time	IN1	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	AStE	d IS	Disabled (d IS) or Enabled (ENA)
Vent sequence cancel temperature	SC 1	120	Between factory low and high limits
Pump run hours	PRh	0	0 to 999 (x100)
Seal-Saver enabled	SSE	ENA	Disabled (d IS) or Enabled (ENA)
Purge enabled (optional) <sup>1</sup>	PUE	d IS	Disabled (d IS) or Enabled (ENA)
Crash Cool enabled (optional) <sup>1</sup>	CCE	d IS	Disabled (d IS) or Enabled (ENA)
Remote Setpoint enabled (optional) <sup>1</sup>	RSSE	d IS	Disabled (d IS) or Enabled (ENA)
Remote Setpoint high limit (optional) <sup>1</sup>	RSH	260	rSL to 999
Remote Setpoint low limit (optional) <sup>1</sup>	RSL	10	-99 to rSH
Communications type (optional) <sup>1</sup>	CO1	OFF	OFF, Retransmit (RE 1), SPI (SP 1), ModBus (BUS), Handheld Remote (HAN)
Retransmit high limit (optional) <sup>1</sup>	REh	260	rEL to 999
Retransmit low limit (optional) <sup>1</sup>	REL	10	-99 to rEH
Communications Baud rate (optional) <sup>1</sup>	BAU	12	12 to 96
SPI address (optional) <sup>1</sup>	SPA	32	32 to 63
Modbus ID (optional) <sup>1</sup>	b Id	1	1 to 247
Remote heat/cool enabled (optional) <sup>1</sup>	PHC	d IS	Disabled (d IS) or Enabled (ENA)

<sup>1</sup>Requires the Premium Controller option as well as the individual option for this function.

## Seal Saver Sequence Initiation

The Seal Saver cool-down sequence reduces the water temperature before the unit shuts off to extend the life of the pump seal. See the Program Menu section for instructions on how to enable or disable this feature. During this sequence, the cooling valve opens and the pump runs for 120 seconds or until the temperature reaches 90°F, whichever occurs first. During the Seal Saver cool-down sequence the Set Point display temporarily toggles between the target value 90°F and current set point and the Pump, Cool, and Seal Saver lights flash green. After the Seal Saver cool-down sequence is complete, the unit stops, the set point

temperature displays in the Set Point display, and the Seal Saver light remains solid green to indicate the completion of the sequence. Pressing the Start and/or Stop buttons during a Seal Saver cool-down sequence stops the sequence.

To initiate a Seal Saver cool-down sequence on units with the Premium Controller simply press and release the Seal Saver button. To initiate a sequence on units with the standard controller, press and hold the Start button, then press the Stop button and release both buttons. The Seal Saver cool-down sequence begins if the process supply temperature is above 90°F.

## Pump Running Hour Display

The total accumulated pump running hours are stored for maintenance purposes. See the Program Menu section to display the pump running hours. Running hours are in units of hundreds so a display value of 10 means 1,000 hours. To reset the pump running hours, press the Start and Alarm Reset buttons at the same time and hold for 3 seconds.

## SPI Communications (Optional)

Several members of SPI : The Plastics Industry Trade Association developed a communications standard for plastic processing equipment to communicate using the Serial Peripheral Interface bus (SPI bus), which coincidentally has the same abbreviation as the

trade association. This option includes an expansion module and a RS-485 communication port on the unit. The communication hardware firmware is SPI 3.01 standard compliant.

To activate or deactivate this feature use the program menu Communication Type function. In addition to activating the communication type, a baud rate and SPI address must be set using the Communication Baud Rate and SPI Address function. If multiple pieces of equipment are on the same network, the base address of each machine has to be unique.

## SPI Option Parameters

Command	Poll	Select	Description
Echo	20 20	20 21	Controller integrity command used to accept and retain data and provide it in response to a poll inquiry in an open 4-byte ASCII format with ASCII units.
Version	20 22		Controller version command used to provide a version number following format: AABB, where AA=SPI assigned version level, BB=vendor assigned version level in an open 4-byte ASCII format with ASCII units.
Set Point Process Temperature	20 30	20 31	Target supply coolant temperature leaving the unit in a numeric format in °F.
Alarm, High Temperature Deviation	20 32	20 33	Value in conjunction with the process set point that determines the high alarm temperature in a numeric format in °F must always be positive.
Alarm, Low Temperature Deviation	20 34	20 35	Value in conjunction with the process set point that determines the low alarm temperature in a numeric format in °F must always be positive.
Status, Process	20 40		Process status in a 16-bit format as follows: 0=controlling 1=an alarm is present 2=an alarm affecting the process has occurred (high or low temperature deviation) 3=an alarm affecting the machine has occurred (probe fault or pump fault) 4=the controller has exceeded its over set point deviation 5=the controller has exceeded its below set point deviation.
Status, Machine 1	20 42		Machine status in a 16-bit format as follows: 0=controlling 1=an alarm is present 2=an alarm affecting the process has occurred (high or low temperature deviation) 3=an alarm affecting the machine operation has occurred (probe fault or pump fault) 4=the controller has exceeded its over set point deviation 5=the controller has exceeded its below set point deviation.
Status, Machine 2	20 44		Machine status in a 16-bit format as follows: 0=controlling 1=an alarm is present 2=an alarm affecting the process has occurred (high or low temperature deviation) 3=a sensor error has been detected 4=an alarm affecting the machine operation has occurred.
Mode, Machine	20 48	20 40	Machine mode in two 8-bit bytes. When polling 20 48 bit 0 indicated the machine is off. 20 40 bit 0 commands the unit to be turned on or off (on when high or off when low). 20 40 bit 1 is used to recognized the alarm condition.
Temperature, To Process (Supply)	20 70		Returns the process supply temperature in a numeric format in °F.
Temperature, To Process (Return)	20 72		Returns the process return temperature in a numeric format in °F.

## Modbus RTU (Optional)

The Modbus RTU option provides a RS-485 communications port for Modbus RTU communications. Note the ModBus Parity = None, Stop Bits = 1, and default Baud Rate = 9,600.

### ModBus Option Parameters

Register	Description	Read/Write	Format	Notes
4002	Machine State	R	Integer	0=Off, 1=Stop, 2=Run, 3=Run Fault 2, 4=Run Fault 3, 5=Fault 1, 6=Factory Menu, 7=User Menu, 8=Get User Password, 9=Master Reset
4007	Derivative	R/W	Integer	
4008	Integral	R/W	Integer	
4009	Heat Cycle Rate	R		
4010	Cool Cycle Rate	R		
4011	Low Alarm Delay	R	Integer	
4012	High Alarm Delay	R	Integer	
4013	Temperature Display Units	R	Integer	0 = °F, 1 = °C
4015	Brownout Enabled	R	Integer	0 = Disabled, 1 = Enabled
4017	Seal Saver Enabled	R		0 = Disabled, 1 = Enabled
4018	Remote Heat Cool Enabled	R		0 = Disabled, 1 = Enabled
4019	Mold Purge Enabled	R		0 = Disabled, 1 = Enabled
4020	Crash Cool Enabled	R		0 = Disabled, 1 = Enabled
4024	Remote Setpoint Enabled	R	Integer	0 = Disabled, 1 = Enabled
4025	Autostart Enabled	R	Integer	0 = Disabled, 1 = Enabled
4027	Communication BAUD Rate	R/W	Integer	0 = 1200, 1 = 2400, 2 = 4800, 3 = 9600
4028	MODBUS Identification	R/W	Integer	
4030	SPI Communications Address	R/W	Integer	
4038	PID OUT	R		-100 to 100 PID algorithm output
4039	MODBUS Command	R/W	Integer	0 = Do Nothing, 1 = Start, 2 = Stop
8002	Supply Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8004	Return Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8010	Low Temperature Deviation (°C)	R/W	Floating Point	
8012	High Temperature Deviation (°C)	R/W	Floating Point	
8014	Low Setpoint Limit Temperature (°C)	R	Floating Point	
8016	High Setpoint Limit Temperature (°C)	R	Floating Point	
8018	Supply Temperature Retransmit Range Low (°C)	R	Floating Point	
8020	Supply Temperature Retransmit Range High (°C)	R	Floating Point	
8022	Low Temperature Safety – User Set (°C)	R/W	Floating Point	
8024	High Temperature Safety – User Set (°C)	R/W	Floating Point	
8026	Proportional Band (°C)	R/W	Floating Point	
8002	Supply Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8004	Return Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8010	Low Temperature Deviation (°C)	R/W	Floating Point	
8012	High Temperature Deviation (°C)	R/W	Floating Point	
8014	Low Setpoint Limit Temperature (°C)	R	Floating Point	
8016	High Setpoint Limit Temperature (°C)	R	Floating Point	
8018	Supply Temperature Retransmit Range Low (°C)	R	Floating Point	
8020	Supply Temperature Retransmit Range High (°C)	R	Floating Point	
8022	Low Temperature Safety – User Set (°C)	R/W	Floating Point	
8024	High Temperature Safety – User Set (°C)	R/W	Floating Point	
8026	Proportional Band (°C)	R/W	Floating Point	
8052	Pump Running Hours	R	Floating Point	
8054	Setpoint Temperature (°C)	R/W	Floating Point	
8056	Low Temperature Safety – Factory Set (°C)	R	Floating Point	
8058	High Temperature Safety – Factory Set (°C)	R	Floating Point	
8070	Supply Temperature Input Offset	R	Floating Point	
8072	Return Temperature Input Offset	R	Floating Point	
8074	Remote Setpoint Temperature Input Offset	R	Floating Point	
8080	Remote Setpoint Limit Temperature (°C)	R	Floating Point	
8082	Remote Setpoint High Temperature Limit (°C)	R	Floating Point	

## 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. We recommend a qualified technician perform the start-up and that they follow the start-up procedure in sequence. The following serves as a checklist for the initial start-up and for subsequent start-ups if the unit is out of service for a prolonged time.



**WARNING:** This equipment contains hazardous voltages that can cause severe injury or death.



**WARNING:** This equipment contains hot water or coolant under pressure. Accidental release of this hot fluid may result in steam formation and can cause personal injury and or property damage.



**WARNING:** This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.



**WARNING:** The exposed surfaces of motors, heater tubes, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.



**CAUTION:** Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. A power supply provides 24 VDC control power. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.



**CAUTION:** Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



**CAUTION:** Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.



**CAUTION:** To prevent improper pump performance due to reverse rotation, connect L1-L2-L3 in the A-B-C phase sequence.



**CAUTION:** Do not shut off To Process, From Process, Cooling Water In, or Cooling Water out valves while this equipment is operating. Equipment failure and/or serious injury could result.



**CAUTION:** Always keep the cover in place while operating this equipment. Internal surfaces may be extremely hot. Only qualified personnel should remove this cover.



**CAUTION:** Ground the unit properly in compliance with local and national codes.

## Step 1 – Connecting Main Power

Connect main power properly ensuring it matches the voltage shown on the nameplate of the unit. Check the electrical phase sequence prior to start-up. The proper sequence is "ABC". If the phasing is incorrect, open the main power disconnect and switch two line leads on the main power terminal blocks (or the unit mounted disconnect). All electrical components 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.

## Step 2 – Fill Coolant Circuit

Check to make sure all piping connections are secure. All fluid lines and connectors should be rated for 150 psi at the maximum operating temperature except for 7½ hp and 10 hp units with the 300°F option that require lines and connectors rated for at least 175 psi. We recommend the cooling source supply and return lines are of metal composition (black steel, galvanized or copper).

Make sure that the cooling source is the appropriate temperature and pressure for your application. In most cases, the cooling source is between 40°F and 85°F. The cooling source fluid pressure must be above the set point of the pressure switch in order for the unit to start. For most applications, the design cooling source supply pressure is between 25 psi and 50 psi. Units with the 300°F operating range option require an inlet cooling source pressure of 75 psi. If the total pressure in the unit (cooling source inlet pressure plus the pump pressure) exceeds 150 psi the pressure relief valve in the unit will open. If this becomes an issue, install a pressure-regulating valve (Part #9616548 available from our Parts

Department) on the supply line to help regulate the pressure to ensure it does not exceed the pressure rating of the pressure relief valve. For further assistance in installing a pressure-regulating valve, please contact our Customer Service Department.

### System Fill Water Chemistry Requirements

The properties of water make it ideal for heat transfer applications. It is safe, non-flammable, non-poisonous, easy to handle, widely available, and inexpensive in most industrialized areas.

When using water as a heat transfer fluid it is important to keep it within certain chemistry limits to avoid unwanted side effects. Water is a “universal solvent” because it can dissolve many solid substances and absorb gases. As a result, water can cause the corrosion of metals used in a cooling system. Often water is in an open system (exposed to air) and when the water evaporates, the dissolved minerals remain in the process fluid. When the concentration exceeds the solubility of some minerals, scale forms. The life giving properties of water can also encourage biological growth that can foul heat transfer surfaces.

To avoid the unwanted side effects associated with water cooling, proper chemical treatment and preventive maintenance is required for continuous plant productivity.

### Unwanted Side Effects of Improper Water Quality

- Corrosion
- Scale
- Fouling
- Biological Contamination

### Cooling Water Chemistry Properties

- Electrical Conductivity
- pH
- Alkalinity
- Total Hardness
- Dissolved gases

The complex nature of water chemistry requires a specialist to evaluate and implement appropriate sensing, measurement and treatment needed for satisfactory performance and life. The recommendations of the specialist may include filtration, monitoring, treatment and control devices. With the ever-changing regulations on water usage

and treatment chemicals, the information is usually up-to-date when a specialist in the industry is involved. The table below shows the list of water characteristics and quality limitations.

### Fill Water Chemistry Requirements

Water Characteristic	Quality Limitation
Alkalinity (HCO <sub>3</sub> <sup>-</sup> ) Aluminum (Al) Ammonium (NH <sub>3</sub> )	70-300 ppm Less than 0.2 ppm Less than 2 ppm
Chlorides (Cl) Electrical Conductivity Free (aggressive) Carbon Dioxide (CO <sub>2</sub> )†	Less than 300 ppm 10-500µS/cm Less than 5 ppm
Free Chlorine(Cl <sub>2</sub> ) HCO <sub>3</sub> <sup>-</sup> /SO <sub>4</sub> <sup>2-</sup> Hydrogen Sulfide (H <sub>2</sub> S)	Less than 1 PPM Greater than 1.0 Less than 0.05 ppm
Iron (Fe) Manganese (Mn) Nitrate (NO <sub>3</sub> )	Less than 0.2 ppm Less than 0.1 ppm Less than 100 ppm
pH Sulfate (SO <sub>4</sub> <sup>2-</sup> ) Total Hardness (dH)k	7.5-9.0 Less than 70 ppm 4.0-8.5

† Dissolved carbon dioxide calculation is from the pH and total alkalinity values shown below or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x 2<sup>[(6.3-pH)/0.3]</sup> where TA = Total Alkalinity, PPM as CaCO<sub>3</sub>



**CAUTION:** When your application requires the use of glycol, use industrial grade glycol specifically designed for heat transfer systems and equipment. **Never use glycol designed for automotive applications.** Automotive glycols typically have additives engineered to benefit the materials and conditions found in an automotive engine; however, these additives can gel and foul heat exchange surfaces and result in loss of performance or even failure of the unit. In addition, these additives can react with the materials of the pump shaft seals resulting in leaks or premature pump failures.



**WARNING:** Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

### Step 3 – Initial Unit Operation

Enter the set point temperature. Refer to the Control Panel Operation section for further information.

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 lights will flash. Once the Auto Vent sequence is complete, the cooling valve is closed, the pump remains energized, and normal operation initiates.

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.

## **Preventive Maintenance**

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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 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.

### **Once a Month**

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

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
<b>Alternating overheating and overcooling or rapid cycling from heat to cool</b>	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 shorten 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
<b>Unable to heat properly</b>	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, shut off the cooling source, 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
<b>Unable to cool properly</b>	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
<b>Heater failure</b>	Unit not filled with water	Fill unit with water
	Faulty heater	Replace heater
	Plugged heater tube / flow restriction	Clear obstruction
<b>Pressure relief valve leaks</b>	The combined pressure of the incoming cooling water pressure and the unit pump pressure exceeds the pressure rating of the pressure relief valve	Install a pressure-reducing valve on the incoming cooling water line. Review the start-up procedure for cooling water pressure requirements at various operating temperatures.
	Pressure relief valve stuck in open position	Replace valve

# Drawings

We have prepared a custom set of drawings for your unit and placed them on top of the unit 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

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A G7ca dUbm warrants its equipment to be free from defects in material and workmanship when used under recommended operating conditions.

A G7ca dUbm'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 A G7ca dUbm within a period as shown below from the date of shipment to the original purchaser.

<b>Model</b>	<b>Parts</b>	<b>Labor<sup>1</sup></b>
RA, RB	2 years	2 years
RQ, RQE	3 years	3 years
Microprocessor Controller	5 years <sup>2</sup>	
Castings (tubes and pump volute)	Lifetime	
Pump seals (standard seal only, 250°F units only)	Lifetime	

<sup>1</sup>Unit must be returned to A G7ca dUbm 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 A G7ca dUbm Customer Service Department. Credit will be based on rates pre-determined by A G7ca dUbm

<sup>2</sup>\$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. A G Cca dUbm 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 A G7ca dUbm'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 A G7ca dUbm be liable for loss of prospective or speculative profits, or special, indirect, incidental or consequential damages.

All warranty service must be authorized by A G7ca dUbm prior to work being performed and have a A G7ca dUbm purchase order issued. All defective parts become the property of A G7ca dUbm and must be returned as advised by A G7ca dUbm

A G7ca dUbm 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 A G7ca dUbm



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