polystat®

Cole-Parmer®

Immersion Circulators

Manual P/N U01081 Rev. 01/28/11

CE

Installation
Operation

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Preface

Compliance

NOTE Third party compliance is pending. ▲

Warranty

The Cole-Parmer immersion circulators distributed by Cole-Parmer, Cole-Parmer warrants to the direct purchaser that the product will be free from defects in material or workmanship for a period of two years from the date of delivery.

Cole-Parmer will repair or replace the product or provide credit, as its sole option, upon prompt notification and compliance with its instructions.

The Distributor warrants to Customer that upon prompt notification and compliance with Distributor's instructions, that the Distributor will repair or replace, at Distributor's sole option, any Product which is defective in material or workmanship.

Distributor expressly disclaims all other warranties, whether expressed, implied or statutory, including the warranties of merchantability, and fitness for a particular purpose. Distributor's sole responsibility and the Customer's exclusive remedy for any claim arising out of the purchase of any Product is repair or replacement, as described above. In no event shall Distributor's liability exceed the purchase price pain therefor; nor shall Distributor be liable for any claims, losses or damage of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages, howsoever arising, even if Distributor has been advised of the possibility of such damages.

Unpacking

Retain all cartons and packing material until the unit is operated and found to be in good condition. If the unit shows external or internal damage contact the transportation company and file a damage claim. Under ICC regulations, this is your responsibility.

Refrigerated units should be left in an upright position at room temperature for 24 hours before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

Section 1 Safety

Safety Warnings

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, please contact us. See inside cover for contact information.

DANGER indicates an imminently hazardous situation which, if not avoided, *will* result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, *could* result in death or serious injury.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is also be used to alert against unsafe practices.

The lightning flash with arrow symbol, within an equilateral triangle, is intended to alert the user to the presence of non-insulated "dangerous voltage" within the unit's enclosure. The voltage magnitude is significant enough to constitute a risk of electrical shock.

This label indicates the presence of hot surfaces.

This label indicates read the manual.

Observe all warning labels. ▲

Never remove warning labels. ▲

Refrigerated units should be left in an upright position for 24 hours before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

The unit construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided. ▲

The circuit protector located on the rear of the unit is not intended to act as a disconnecting means. ▲

Never operate the unit with the immersion circulator removed from the bath. ▲

Do not mount the immersion circulator backwards on the bath; the line cord could contact the reservoir fluid. Ensure the electrical cords do not come in contact with any of the plumbing connections or tubing. ▲

Operate the unit using only the supplied line cord. If the unit's power cord is used as the disconnecting device, it must be easily accessible at all times. ▲

Never place the unit in a location or atmosphere where excessive heat, moisture, or corrosive materials are present. ▲

Ensure the tubing you select will meet your maximum temperature and pressure requirements. ▲

Ensure all communication and electrical connections are made prior to starting the unit. ▲

Many refrigerants which may be undetectable by human senses are heavier than air and will replace the oxygen in an enclosed area causing loss of consciousness. Refer to the unit's nameplate and the manufacturer's most current MSDS for additional information. ▲

Never operate the unit without fluid in the reservoir. ▲

Other than water, before using any fluid, or when performing maintenance where contact with the fluid is likely, refer to the manufacturer's MSDS and EC Safety Data sheet for handling precautions. ▲

Ensure, that no toxic gases can be generated by the fluid. Flammable gases can build up over the fluid during usage. ▲

Never use corrosive or flammable fluids with this unit. Use of these fluids will void the manufacturer's warranty. ▲

When using ethylene glycol and water, check the fluid concentration and pH on a regular basis. Changes in concentration and pH can impact system performance. ▲

Ensure the fluid is at a safe temperature (20°C to 55°C) before handling or draining. ▲

Never operate damaged or leaking equipment, or with any damaged cords. ▲

Never operate the unit or add fluid to the reservoir with panels removed. ▲

Do not clean the unit with solvents, only use a soft cloth and water. ▲

Drain the unit before it is transported and/or stored in, near or below freezing temperatures.

Always turn the unit off and disconnect the supply voltage from its power source before moving the unit or before performing any service or maintenance procedures. ▲

Transport the unit with care. Sudden jolts or drops can damage the unit's components. ▲

Refer service and repairs to a qualified technician. ▲

Section 2 General Information

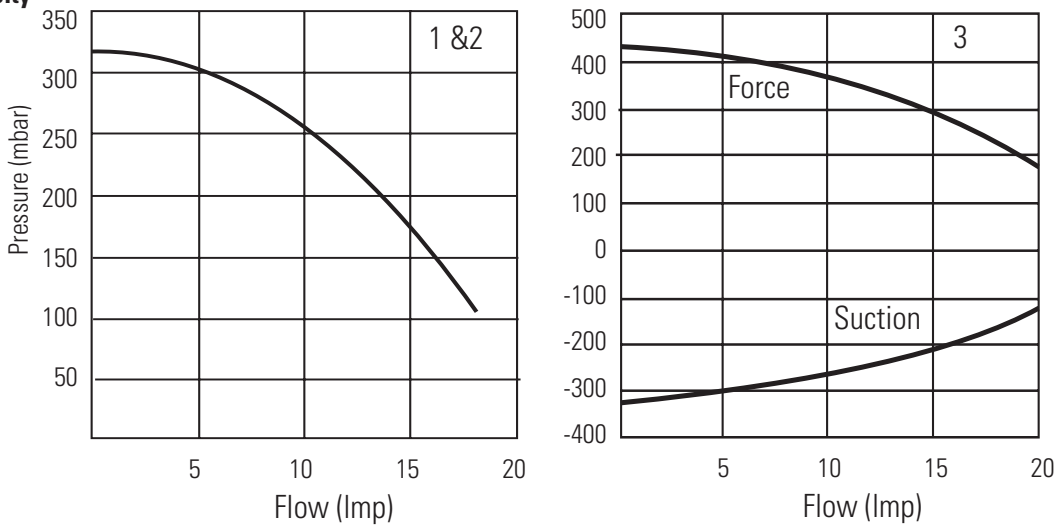
Description

The Cole Palmer Polystat® Immersion Circulators are used with refrigerated and heated baths. All circulators can pump to an external system. All have a digital display and easy-to-use touch pad, five programmable setpoint temperatures, acoustic and optical alarms, and offer adjustable high temperature protection.

Specifications

	1	2	3
Process Fluid Temperature and Setpoint Range	Ambient to 100°C Ambient to 212°F	Ambient to 150°C Ambient to 302°F	Ambient to 200°C Ambient to 392°F
Temperature Stability	±0.1°C	±0.1°C	±0.05°C
Heater Capacity KWatts 230V 115V	1.2 1.0	1.2 1.0	2.0 1.2
Footprint or Dimensions (H x W x D) mm Inches	 176.9 x 112.5 x 189.6 7.0 x 4.4 x 7.5	 176.9 x 112.5 x 189.6 6.9 x 4.4 x 7.5	 194.4 x 144.3 x 189.6 7.7 x 5.7 x 7.5
Net Weight kg lb	3.9 7.4	3.9 7.4	4.7 10.1
Electrical Requirements (Voltage ±10%)	230V/50 Hz or 115V/60 Hz	230V/50Hz or 115V/60Hz	230V/50Hz or 115V/60Hz
Pump Type	Force	Force	Force/Suction

Pumping Capacity



- Lower process fluid temperature ranges available with supplemental cooling.
- Pumping curves obtained using water at ambient temperature, nominal voltage operating in high speed mode. Other conditions will affect performance.
- Cole Palmer reserves the right to change specifications without notice.

Refrigerated Bath/Circulator Specifications

Stainless Steel Refrigerated Baths/Circulators with Controller 1				
	C6	**C6F**	**C15**	**C15++**
Temperature Range	-20 to 100°C -4 to 212°F	-20 to 100°C -4 to 212°F	-28 to 100°C -18 to 212°F	-35 to 100°C -31 to 212°F
Bath Volume liters gallons	3 - 6 0.8 - 1.6	3 - 6 0.8 - 1.6	8 - 15 2.1 - 4.0	8 - 15 2.1 - 4.0
Cooling Capacity watts @20°C	250	250	500	800
Refrigerant	R134a	R134a	R134a	R404a
Dimensions (H x W x D)* mm inches	617.2 x 205 x 414 24.3 x 8.1 x 16.3	425.5 x 467.4 x 416.6 16.8 x 18.4 x 16.4	647.9 x 258 x 483 25.5 x 10.2 x 19.0	686.9 x 370 x 520.7 27.0 x 14.6 x 20.5
Net Weight kg lb	23.9 52.7	26.7 58.9	33.3 73.4	52.6 115.9
Electrical Requirements (Voltage ±10%)	115 V/60 Hz or 230 V/50 Hz			

Stainless Steel Refrigerated Baths/Circulators with Controller 2		
	C15	**C15++**
Temperature Range	-28 to 150°C -18 to 302°F	-35 to 150°C -31 to 302°F
Bath Volume liters gallons	8 - 15 2.1 - 4.0	8 - 15 2.1 - 4.0
Cooling Capacity watts @20°C	500	800
Refrigerant	R134a	R404a
Dimensions (H x W x D)* mm inches	647.9 x 258 x 483 25.5 x 10.2 x 19.0	686.9 x 370 x 519 27.0 x 14.6 x 20.4
Net Weight kg lb	33.3 73.4	52.6 115.9
Electrical Requirements (Voltage ±10%)	115 V/60 Hz or 230 V/50 Hz	

Stainless Steel Refrigerated Baths/Circulators with Controller 3				
	C6	**C6F**	**C15**	**C15++**
Temperature Range	-20 to 100°C -4 to 212°F	-20 to 100°C -4 to 212°F	-28 to 200°C -18 to 392°F	-35 to 200°C -31 to 392°F
Bath Volume liters gallons	3 - 6 0.8 - 1.6	3 - 6 0.8 - 1.6	8 - 15 2.1 - 4.0	8 - 15 2.1 - 4.0
Cooling Capacity watts @20°C	250	250	500	800
Refrigerant	R134a	R134a	R134a	R404a
Dimensions (H x W x D)* mm inches	635.0 x 205 x 414 25.0 x 8.1 x 16.3	443.0 x 467.4 x 416.6 17.4 x 18.4 x 16.4	665.4 x 258 x 483 26.2 x 10.2 x 19.0	706.1 x 370 x 520.7 27.8 x 14.6 x 20.5
Net Weight kg lb	24.7 53.5	27.1 59.7	33.7 74.2	52.9 116.7
Electrical Requirements (Voltage ±10%)	115 V/60 Hz or 230 V/50 Hz			

*Add ~15 mm to D for drain fitting

Heated Bath/Circulator Specifications

Stainless Steel Baths/Circulators with Controller 1			
	W7	**W11**	**W24**
Temperature Range*	Ambient +10 to 100°C Ambient +50 to 212°F	Ambient +10 to 100°C Ambient +50 to 212°F	Ambient +10 to 100°C Ambient +50 to 212°F
Bath Volume liters gallons	4 - 7 1.1 - 1.8	7 - 11 1.8 - 2.9	14 - 24 3.7 - 6.3
Dimensions** (H x W x D) mm inches	393.7 x 214 x 361 15.5 x 8.4 x 14.2	393.7 x 300 x 361 15.5 x 11.8 x 14.2	393.7 x 367 x 561 15.5 x 14.1 x 22.1
Net Weight kg lb	10.6 23.4	12.3 27.0	16.5 36.2

Stainless Steel Baths/Circulators with Controller 2			
	W7	**W11**	**W24**
Temperature Range*	Ambient +10 to 150°C Ambient +50 to 302°F	Ambient +10 to 150°C Ambient +50 to 302°F	Ambient +10 to 150°C Ambient +50 to 302°F
Bath Volume liters gallons	4 - 7 1.1 - 1.8	7 - 11 1.8 - 2.9	14 - 24 3.7 - 6.3
Dimensions** (H x W x D) mm inches	393.72 x 214 x 361 15.5 x 8.4 x 14.2	393.7 x 300 x 361 15.5 x 11.8 x 14.2	393.7 x 358.1 x 561 15.5 x 14.1 x 22.1
Net Weight kg lb	10.6 23.4	12.3 27.0	16.5 36.2

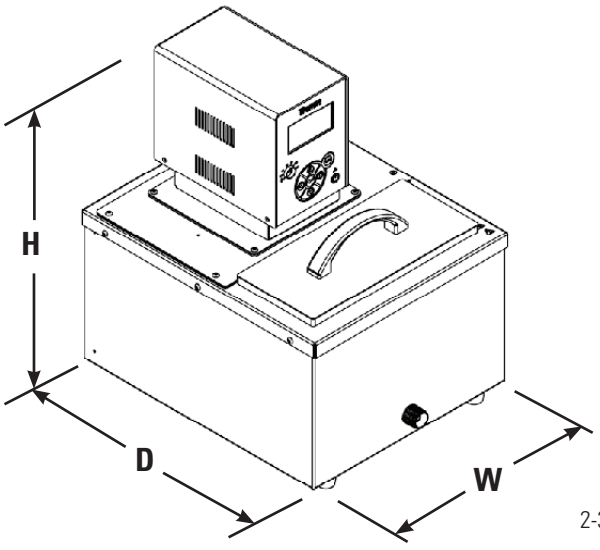
Stainless Steel Baths/Circulators with Controller 3			
	W7	**W11**	**W24**
Temperature Range* (Low pump speed)	Ambient +10 to 200°C Ambient +50 to 392°F	Ambient +10 to 200°C Ambient +50 to 392°F	Ambient +10 to 200°C Ambient +50 to 392°F
Temperature Range* (High pump speed)	Ambient +25 to 200°C Ambient +77 to 392°F	Ambient +20 to 200°C Ambient +68 to 392°F	Ambient +10 to 200°C Ambient +50 to 392°F
Bath Volume liters gallons	4 - 7 1.1 - 1.8	7 - 11 1.8 - 2.9	14 - 24 3.7 - 6.3
Dimensions** (H x W x D) mm inches	414 x 214 x 361 16.3 x 8.4 x 14.2	414 x 300 x 361 16.3 x 11.8 x 14.2	412.7 x 358.1 x 561 16.3 x 14.1 x 22.1
Net Weight kg lb	11.9 26.1	13.5 29.7	17.7 39.0

*Lower temperature ranges available with supplemental cooling.

**Add ~15 mm to D for drain fitting.

***See Section 3 for additional information.

- Cole Palmer reserves the right to change specifications without notice.



Polyphenylene oxide (PPO) Baths/Circulators with Controller 1			
	W5P	**W14P**	**W21P**
Temperature Range*	Ambient +10 to 100°C Ambient +50 to 212°F	Ambient +10 to 100°C Ambient +50 to 212°F	Ambient +10 to 100°C Ambient +50 to 212°F
Bath Volume liters gallons	3 - 5 0.8 - 1.3	8 - 14 2.1 - 3.7	13 - 21 3.4 - 5.5
Dimensions (H x W x D) mm inches	346.9 x 190.5 x 452.0 13.7 x 7.5 x 1.8	347.9 x 358.1 x 452.0 13.7 x 14.1 x 17.8	347.9 x 358.1 x 642.6 13.7 x 14.1 x 25.3
Net Weight kg lb	4.6 10.1	6.3 13.8	7.1 15.6

Transparent Acrylic Baths/Circulators with Controller 1			
	W6A	**W12A**	**W19A**
Temperature Range*	Ambient +10 to 80°C Ambient +50 to 176°F	Ambient +10 to 80°C Ambient +50 to 176°F	Ambient +10 to 80°C Ambient +50 to 176°F
Bath Volume liters gallons	4 - 6 1.1 - 1.6	8 - 12 2.1 - 3.2	12 - 19 3.2- 5.0
Dimensions (H x W x D) mm inches	336.9 x 188.8 x 407 13.3 x 7.4 x 16	338.9 x 352.8 x 348** 13.3 x 13.9 x 13.7	338.9 x 352.8 x 526** 13.3 x 13.9x 20.7
Net Weight kg lb	5.2 11.4	7.1 15.6	8.2 18.1

*Lower temperature ranges available with supplemental cooling.

**Add ~2.4 mm to D for drain

- Cole Palmer reserves the right to change specifications without notice.

Wetted Materials

Immersion Circulators

Viton

EPDM

Ryton

Ultem

Vectra

Stainless Steel

Stainless Steel Baths/Circulators

Stainless Steel 316

Stainless Steel 304

EPDM (drain fitting)

Ryton

Zotek-N (cover seal)

Transparent Acrylic Baths/Circulators

Poly-acryl

Polyphenylene oxide (PPO) Baths/ Circulators

Polyphenylenoxid

Section 3 Installation

Ambient Conditions

Ambient Temperature Range	10°C to 40°C (50°F to 104°F)
Maximum Relative Humidity	80% at 31°C (88°F)
Operating Altitude	Sea Level to 2000 meters (6560 feet)
Overvoltage Category	II
Pollution Degree	2
Degree of Protection	IP 20

The unit is designed for continuous operation and for indoor use.

⚠ CAUTION

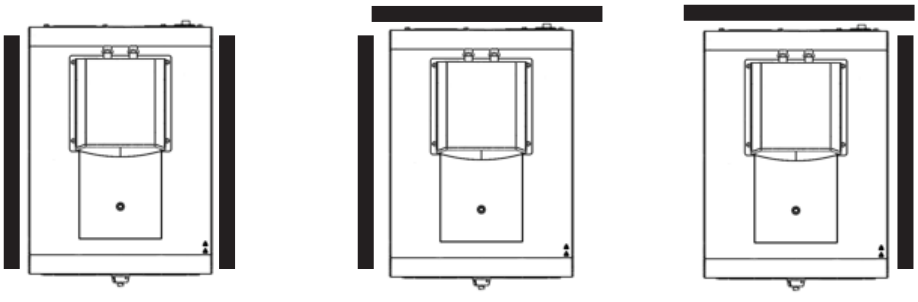
Never place the unit in a location where excessive heat, moisture, inadequate ventilation, or corrosive materials are present. ▲

⚠ CAUTION

Refrigerated units should be left in an upright position for 24 hours at room temperature before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

Ventilation

The unit can operate with 0 clearance on two exhaust sides as long as the third exhaust side has unrestricted air flow. Blocked ventilation will increase the unit's temperature, reduce its cooling capacity and, on refrigerated units, eventually lead to premature compressor failure.



Ventilation Options

Electrical Requirements

DANGER

The unit construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided. ▲

The unit is intended for use on a dedicated outlet.

NOTE If the circuit protector activates allow the unit to cool before resetting. Restart the unit. Contact us if it activates again. ▲

The circuit protection is designed to protect the controller, and is not intended as a substitute for branch circuit protection. Position the unit so it is not difficult to operate the disconnecting device.

CAUTION

If the unit's power cord is used as the disconnecting device, it must be easily accessible at all times. ▲

Refer to the unit nameplate on the rear, upper-left-hand corner of the unit for specific electrical requirements. Voltage deviations of ± 10% are permissible. The outlet must be rated as suitable for the total power consumption of the unit, see below.

The following power options are available:

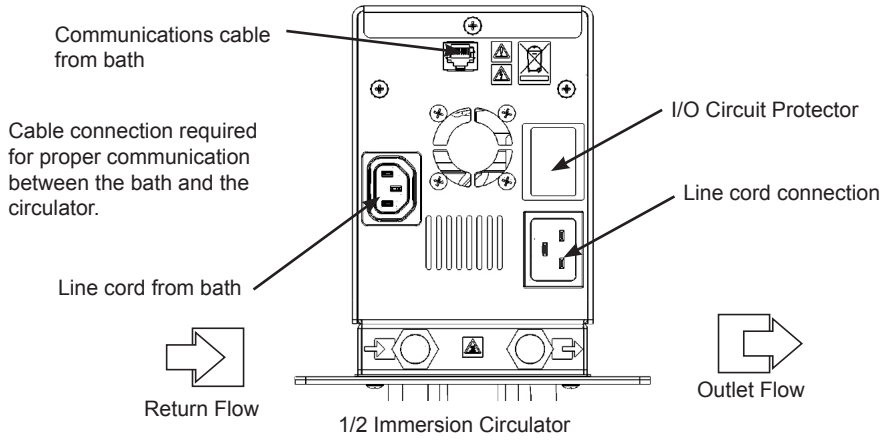
Unit	Volts[1]/Hertz/Phase	Amps[2]	Total Wattage	Plug Type
C6/C6F	115/60/1	12	1328	N5-15
1	230/50/1	12	1573	Country Specific
C6/C6F	115/60/1	12	1328	N5-15
3	230/50/1	12	2373	Country Specific
C15	115/60/1	12	1345	N5-15
1/2	230/50/1	12	1596	Country Specific
C15	115/60/1	12	1345	N5-15
3	230/50/1	12	2396	Country Specific
C15++	115/60/1	16	1662	N5-20
1/2	230/50/1	12	1798	Country Specific
C15++	115/60/1	16	1662	N5-20
3	230/50/1	12	2598	Country Specific
All Heated Units	115/60/1	12	1104	N5-15
1/2	230/50/1	12	1338	Country Specific
All Heated Units	115/60/1	12	1304	N5-150
3	230/50/1	12	2138	Country Specific

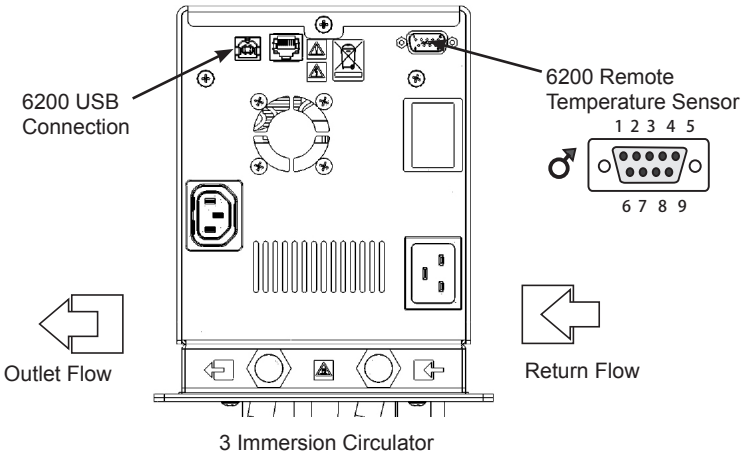
1. Volts ± 10%
2. Maximum amp draw

CAUTION

Ensure all communication and electrical connections are made prior to starting the unit. ▲

- Ensure the line cord from the bath is securely connected to the rear of the controller.
- Ensure the communications cable from the bath is connected to the RJ45 connectors (similar to Ethernet) on the rear of the controller.
- Connect the supplied line cord to the controller and to a properly grounded outlet.





Remote Temperature Sensor (3 Only)

WARNING

Never apply line voltage to the connection. ▲

The optional remote temperature sensor is enabled using the controller, see Section 4.

Pin		Pin	
1	White	7	Red
2, 3	NA	8	NA
4	White	9	Red (4th wire not connected to the control board)
5, 6	NA		

External Circulation

The plumbing connections for external circulation are located on the rear of the thermostat.  is the return flow from the external application.  is the outlet flow to the external application (supply side). The connections are 16 mm O.D. Remove the union nuts and plates to install the 8 mm or 12 mm hose barbs and clamps supplied with the unit.

Ensure the electrical cords do not come in contact with any of the plumbing connections or tubing. ▲

Fluids

The user is always responsible for the fluid used. Never use corrosive fluids with this unit. ▲

Never use 100% glycol. ▲

Handling and disposal of liquids other than water should be done in accordance with the fluid manufacturers specification and/or the MSDS for the fluid used. ▲

Always adjust the unit's software to the fluid used, see Section 4. ▲

When using water above 80°C closely monitor the fluid level, frequent top-offs will be required. It will also create steam. ▲

Water/glycol mixtures require top-offs with pure water, otherwise the percentage of glycol will increase resulting in high viscosity and poor performance. ▲

The fluid information is only a guide since specifications may change.

Cole Palmer takes no responsibility for damages caused by the selection of an unsuitable bath fluid.

Unsuitable bath fluids are fluids which:

- are very highly viscous (much higher than 30 mPas at the respective working temperature)
- have corrosive characteristics or
- tend to break down at high temperatures

For fluid selection consider application requirements, operating temperature range, material compatibility, safety concerns, and environmental issues.

5°C to 95°C — Distilled Water or Deionized Water (up to 3 MΩ-cm)
Normal tap water leads to calcareous deposits necessitating frequent unit decalcification, see table on next page.

Calcium tends to deposit itself on the heating element. The heating capacity is reduced and service life shortened.

-30°C to 80°C — Water with Glycol
Below 5°C water has to be mixed with a glycol. The amount of glycol added should cover a temperature range 5°C lower than the operating temperature of the particular application. This will prevent the water/glycol from gelling (freezing) near the evaporating coil.

Excess glycol deteriorates the temperature accuracy due to its high viscosity.

-40°C to 200°C — SIL180:
SIL180 is suitable for covering nearly the entire range with just one liquid, especially when used with the cooling units. See next page for additional information. Unfortunately SIL180 has a wetting tendency necessitating the occasional cleaning of the bath cover.

other temperatures:
Cole Palmer offers a range of heat transfer fluids for these temperature control applications.

SYNTH 60, SYNTH 200, SYNTH 260:
Synthetic thermal liquid with a medium life span (several months) and little smell annoyance. See next page for additional information.

SIL 100, SIL 180, SIL 200, SIL 300:
Silicone oil with a very long life span (over 1 year) and negligible smell. See next page for additional information.

Heat transfer fluids are supplied with an EC Safety Data Sheet.

Ensure, when selecting the heat transfer fluid, that no toxic gases can be generated. Flammable gases can build up over the fluid during usage. ▲

Ensure the over temperature cut-off point is set lower than the fire point for the heat transfer fluid selected. ▲

The highest working temperature as defined by the EN 61010 (IEC 1010) must be limited to 25°C below the fire point of the bath fluid. ▲

Water Quality and Standards

Process Fluid	Permissible (PPM)	Desirable (PPM)
Microbiologicals		
(algae, bacteria, fungi)	0	0
Inorganic Chemicals		
Calcium	<25	<0.6
Chloride	<25	<10
Copper	<1.3	<1.0
0.020 ppm if fluid in contact with aluminum		
Iron	<0.3	<0.1
Lead	<0.015	0
Magnesium	<12	<0.1
Manganese	<0.05	<0.03
Nitrates\Nitrites	<10 as N	0
Potassium	<20	<0.3
Silicate	<25	<1.0
Sodium	<20	<0.3
Sulfate	<25	<1
Hardness	<17	<0.05
Total Dissolved Solids	<50	<10
Other Parameters		
pH	6.5-8.5	7-8
Resistivity	0.01*	0.05-0.1*

* MΩ-cm (compensated to 25°C)

Unfavorably high total ionized solids (TIS) can accelerate the rate of galvanic corrosion. These contaminants can function as electrolytes which increase the potential for galvanic cell corrosion and lead to localized corrosion such as pitting. Eventually, the pitting will become so extensive that refrigerant will leak into the water reservoir.

As an example, raw water in the United States averages 171 ppm (of NaCl). The recommended level for use in a water system is between 0.5 to 5.0 ppm (of NaCl).

Recommendation: Initially fill the tank with distilled or deionized water. Do not use untreated tap water as the total ionized solids level may be too high. This will reduce the electrolytic potential of the water and prevent or reduce the galvanic corrosion observed.

Additional Fluid Precautions

When working with fluids other than water:

- Do not use any fluid until you have read and understood the label and the Material Safety Data Sheet (MSDS).
- Do not blend any fluids.
- Ensure any fluid residue or any other material is thoroughly removed before filling the unit with a different fluid.
- Always wear protective clothing, especially a face shield and gloves.
- Avoid spattering on any of the unit's components, always *slowly* add fluid. When adding, point the opening of a container away from yourself.
- Use fume hoods.
- Do not allow any ignition sources in the vicinity.

Filling Requirements

Ensure the reservoir drain port on the front of the unit is *closed* and that all plumbing connections are secure. Also ensure any residue is thoroughly removed before filling the unit.

Before using any fluid refer to the manufacturer's MSDS and EC safety data sheets for handling precautions. ▲

To avoid spilling, place your containers into the bath before filling.

With a low level WARNING the unit continues to run, with a FAULT the unit will shut the refrigeration, pump and heater will shut down, see Section 7. The low level warning is at approximately 4 cm (1 5/8") below the top, the low level fault is at approximately 5.5 cm (2 1/8").

Avoid overfilling, oil-based fluids expand when heated. ▲

When pumping to an external system, keep extra fluid on hand to maintain the proper level in the circulating lines and the external system.

NOTE Monitor the fluid level whenever heating the fluid. ▲

Draining

Before draining any fluid refer to the manufacturer's MSDS and EC safety data sheets for handling precautions. ▲

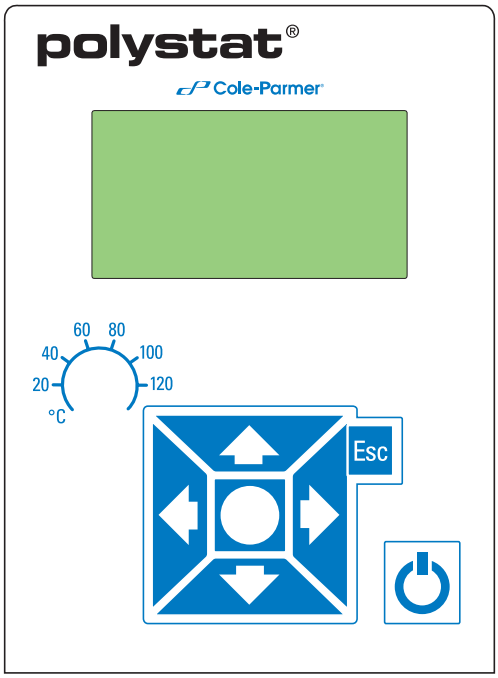
Ensure the fluid is at a safe handling temperature, ~55°C. Wear protective clothing and gloves. ▲

- place a suitable vessel underneath the drain. If desired, attach an 8 mm id tube on the drain.
- *slowly* turn the drain plug until flow is observed.

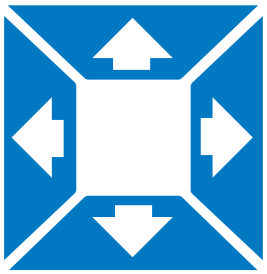
Section 4 Operation

Controller

The Cole Palmer Immersion Circulators have a digital display and easy-to-use touch pad, five programmable setpoint temperatures, acoustic and optical alarms and adjustable high temperature protection.



Use this button to place the unit in and out of standby.



Use these navigation arrows to move through the controller displays and to adjust values.

Use this button to start/stop the unit. This button is also used to make and save changes on the controller's display screen.

Use this button to cancel any changes and to return the controller to its previous display. Canceling a change can only be made before the change is saved. In some cases, it is also used to save changes.

NOTE Holding this button for five seconds resets the display contrast to the default level and also brings up the language menu to change, if needed, the displayed language. See **Settings - Display Options** in this Section. ▲

°C

Use the adjacent dial for adjusting the High Temperature Cutout. Details are explained in Section 6.

Setup

CAUTION

Refrigerated units should be left in an upright position at room temperature (~25°C) for 24 hours before starting. This will ensure the lubrication oil has drained back into the compressor. ▲

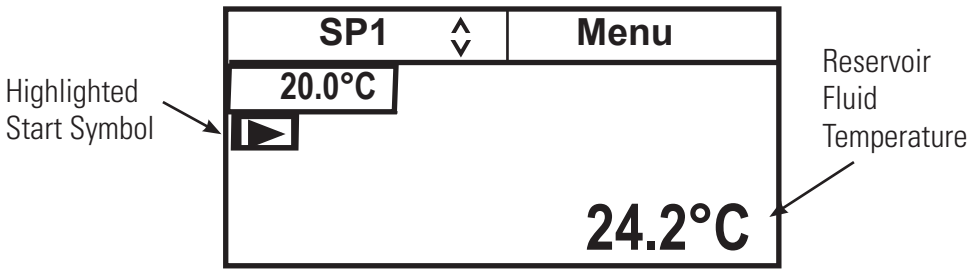
CAUTION

Before starting the unit, double check all USB (optional), electrical and plumbing connections. ▲

Start Up

Do not run the unit until fluid is added to the unit. Have extra fluid on hand. If the unit will not start refer to Section 5 Troubleshooting.

- Place the circuit protector located on the front of the unit to the **I** position.
- Press  , the Start Display will appear.
- Ensure the start symbol has a highlight box around it, if not use the arrow keys to navigate to the symbol.



Start Display

- Press  . The unit will start and the start symbol will turn into a stop symbol (■).

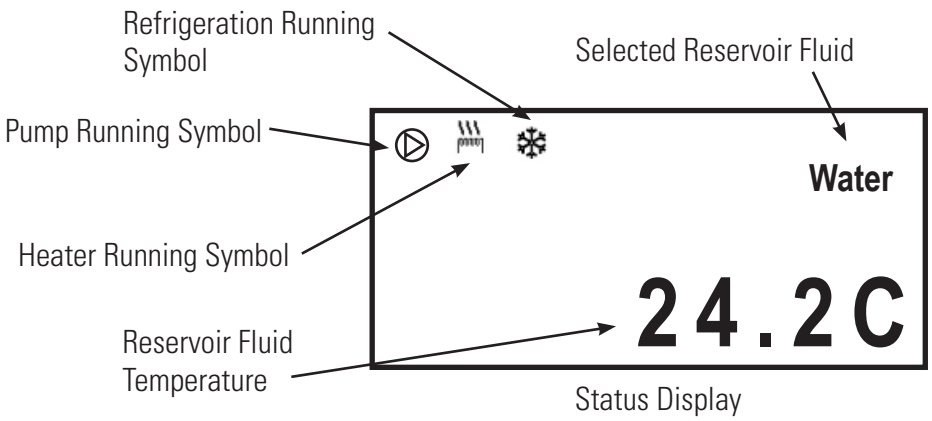
NOTE It will take 30 seconds for the compressor to start. ▲

NOTE After start, check external plumbing connections for leaks. ▲

The **SP1** and **Menu** portions on the top of the display are used to view and/or change the controller's settings. They are explained in detail later in this Section.

Status Display

If desired, press Esc to toggle between the Start/Status Displays.



Stand By Mode

Press  , the display will go blank and the unit will be in the stand by mode.

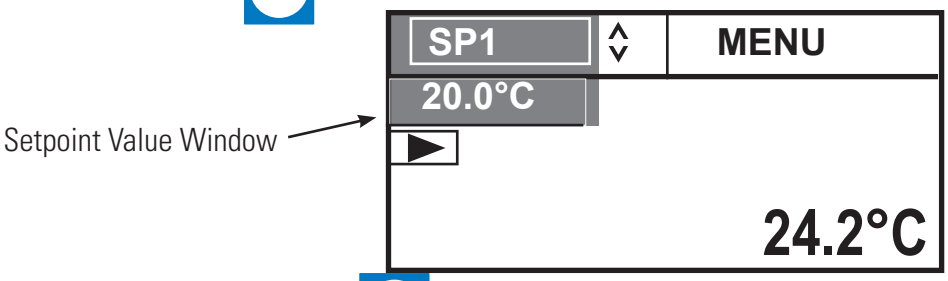
Changing the Setpoint

NOTE You cannot adjust the setpoint closer than 0.1°C to either of the fluid's system limits, see Fluids Type in this Section, or beyond the unit's temperature range. ▲

NOTE The setpoint can be changed with the unit running or not. ▲

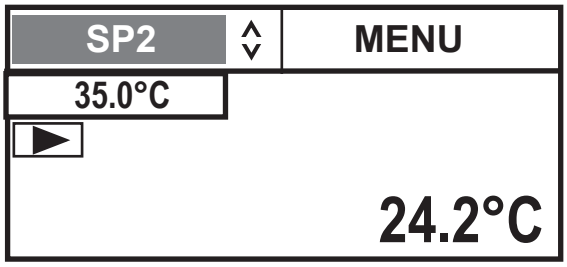
The Setpoint is the desired fluid temperature. The controller can store up to five setpoints, **SP1** through **SP5**. The procedure for changing the stored setpoint values is discussed later in this Section.

Use the navigation arrows and move to the **SP1** window and then press to highlight it as shown below.



Use the up and navigation arrows to bring up the desired setpoint and then press .

The display on the Setpoint Value Window will now indicate the corresponding setpoint's stored value.



If desired, you can change the displayed setpoint value by using the navigation arrows to highlight the Setpoint Value Window and then pressing . The right-most digit will have a cursor beneath it.

Use the left and right arrows to move the cursor to the desired digit and then use the up and down arrows to change the value. Once all the desired changes are made, press to save the change.

NOTE Using this procedure also changes the setpoint's stored value. ▲

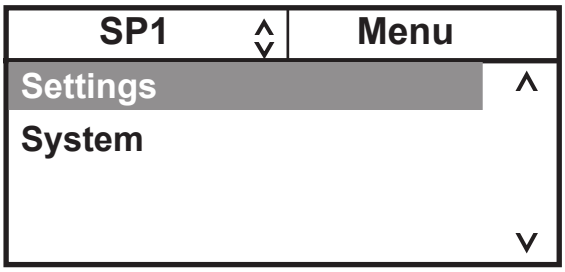
Menu Displays

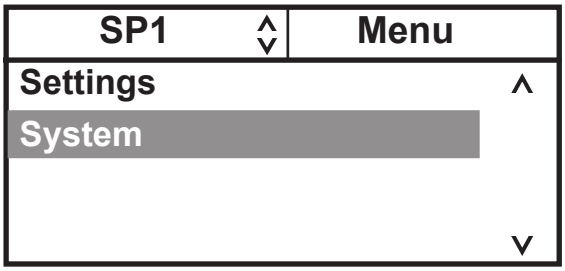
The controller uses menus to view/change the unit's settings.

NOTE The unit does not need to be running to view/change these settings. ▲

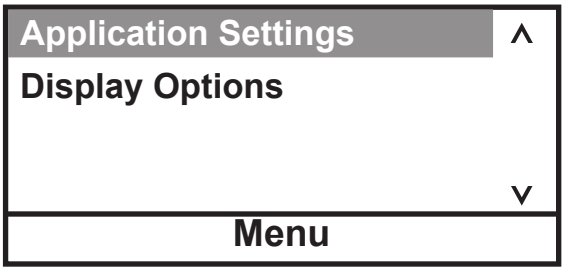
For all Menu displays, once ◯ is pressed to change a display, you can press Esc to return to the previous screen.

1. Use the right arrow button to highlight **Menu** and the controller brings up the Main Menu Display.

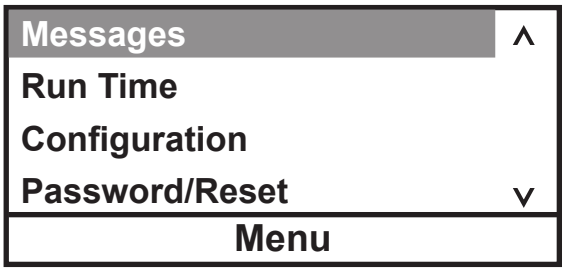




2. Use the up and down arrow to highlight the desired setting and then press ◯ to bring up additional submenus.



See page 4-7.



See page 4-12.

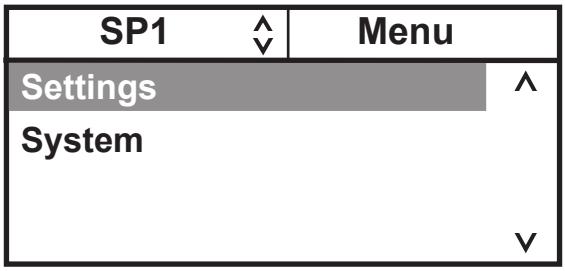
Menu

The **Menu** line, at the bottom of all the submenu displays, is another way to return the controller back to the Main Menu Display.

1. From any submenu display, use the down arrow button to highlight **Menu**.

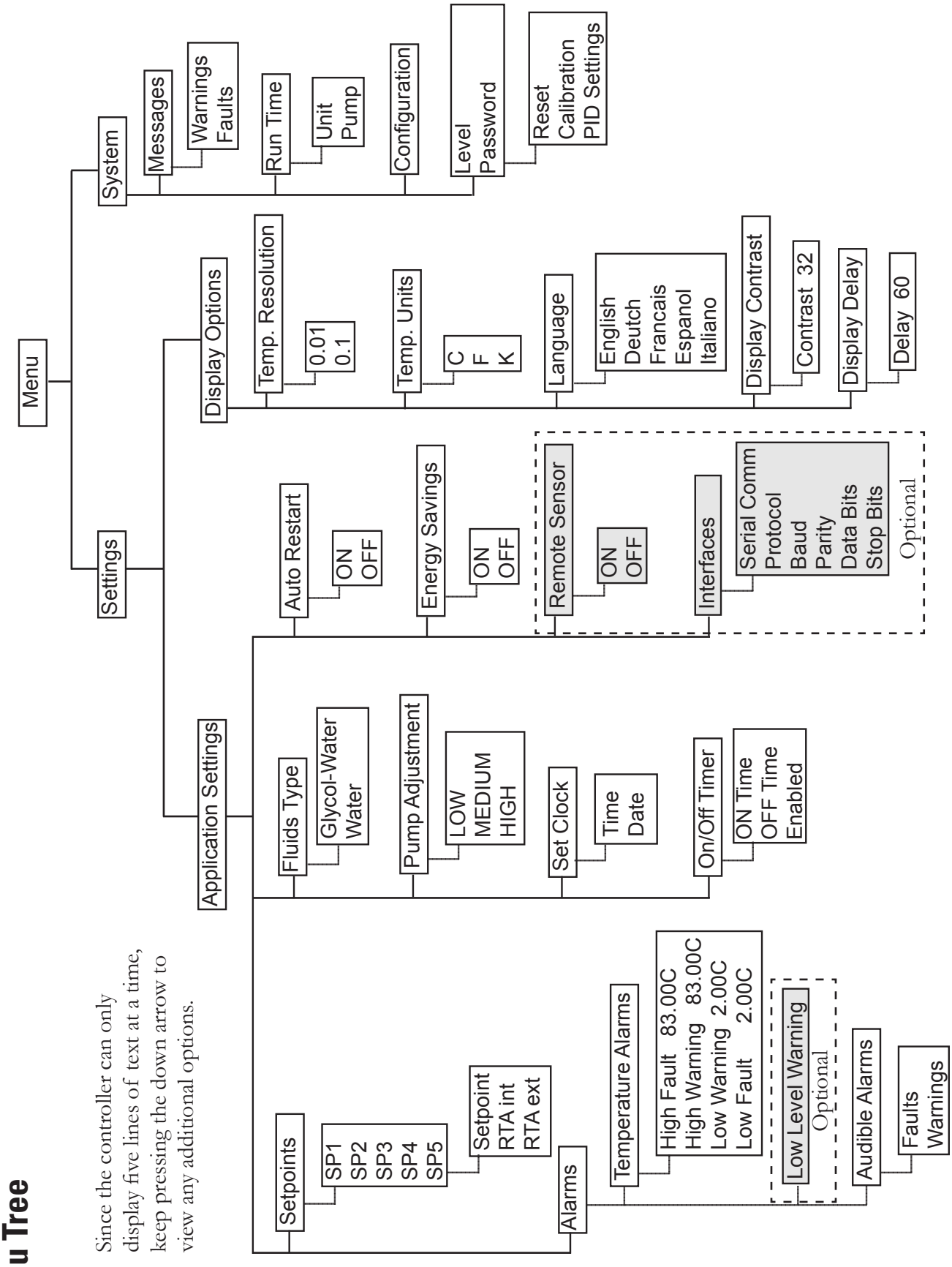
Pressing Esc from the Menu line returns you tho the previous screen. ▲

2. Press ◯ to return to the Main Menu Display.



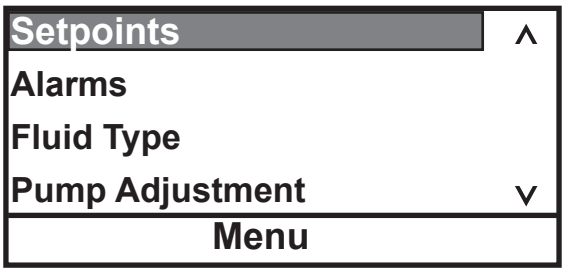
Menu Tree

Since the controller can only display five lines of text at a time, keep pressing the down arrow to view any additional options.



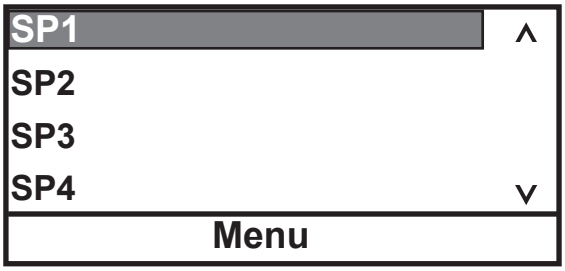
Settings - Application Settings is used to view/adjust the controller's five Setpoints and Real Temperature Adjustments (RTA) enable/disable the alarms, change the fluid type, set the pump speed, configure the interfaces (optional), set the clock, turn the timer on or off, and turn auto restart and energy savings on or off.

1. With **Application Settings** highlighted press ◯ to view:

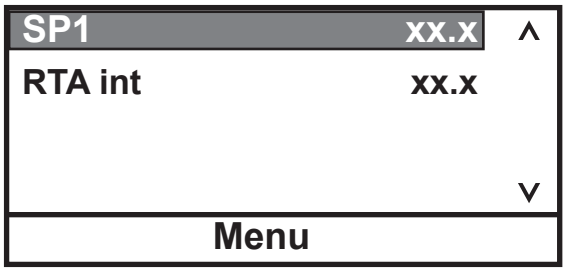


Scroll down for additional options:

2. With **Setpoints** highlighted, press ◯ to display the list. Use the up/down arrows to highlight the desired **SP**. **NOTE** Use the down arrow to display **SP5**. ▲



3. Press ◯.



If this temperature on the Start/Status Displaysdoes not accurately reflect the actual temperature in the reservoir, an RTA can be applied. The RTA can be set ±10°C (±18°F).

As an example, if the unit's temperature is stabilized and displaying 20°C but a calibrated reference thermometer reads 20.5°C, the RTA should be set to -0.5°C. After you enter a RTA value allow unit to stabilize before verifying the temperature in the bath. **NOTE** If display accuracy is required, we recommend repeating this procedure at various setpoint temperatures and on a regular basis. ▲

NOTE You cannot adjust the setpoint closer than 0.1°C to either of the fluid's system limits, see Fluids Type in this Section. ▲

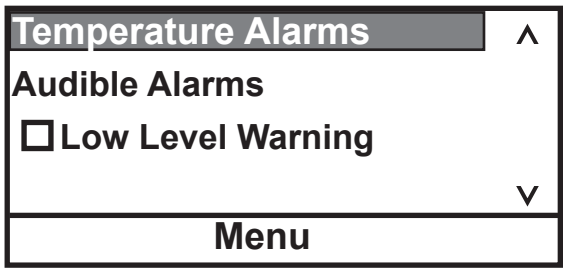
4. With the desired line highlighted press ◯.

The right-most digit will have a cursor beneath it. Use the left and right arrows to move the cursor to the desired digit and then use the up and down arrows to change the value. Once all the desired changes are made, press ◯ to save the change. or Esc to cancel it.

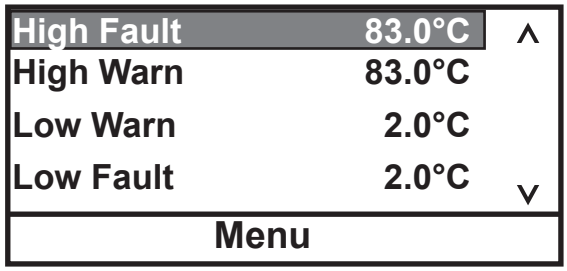
35.0°C

Alarms is used to view/adjust the high and low temperature alarm limits, to enable/disable the audible alarms and to configure the optional low level warning reaction.

1. With **Alarms** highlighted, press ◯ to display:



2. With **Temperature Alarms** highlighted, press ◯ to display:



3. Highlight the desired limit and press ◯. Follow the same procedure used to change a setpoint.

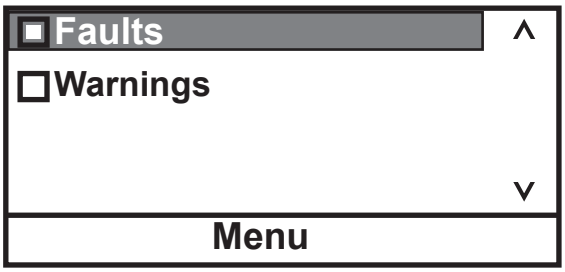
If the Fault temperature is exceeded the unit will shut down and, if enabled, the audible alarm will sound. If the Warn temperature is exceeded the unit will continue to run and, if enabled, the audible alarm will sound. In both cases a message will be displayed.

High Fault cannot be set below **High Warn**.
High Warn cannot be set below **Low Warn**.
Low Fault cannot be set above **High Warn**.

Press Esc, or use the **Menu** window, to save and return to the previous display.

1. With **Audible Alarms** highlighted, press ◯ to display the alarms.

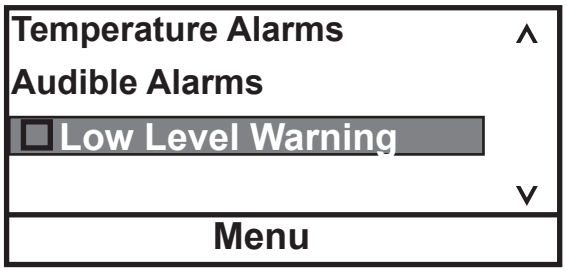
Highlight the desired alarm and press ◯ to toggle between enable and disable mode.



If **Faults** is enabled the alarm will sound when a fault occurs. If **Warnings** is enabled the alarm will sound when a warning occurs.

Press Esc, or use the **Menu** window, to save and return to the previous display.

1. With **Low Level** highlighted, press ◯ to toggle the low level warning alarm on/off:

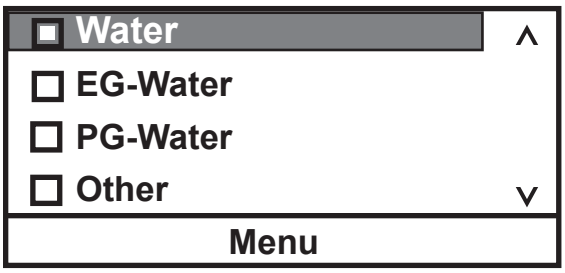


Press Esc, or use the **Menu** window, to save and return to the previous display.

Fluids Type is used to identify the type of fluid used. The controller uses the fluid type to automatically set certain operating parameters.

1. With **Fluid Type** highlighted, press ○ to display the list of acceptable fluids.

Highlight the desired fluid and press ○ to select it.

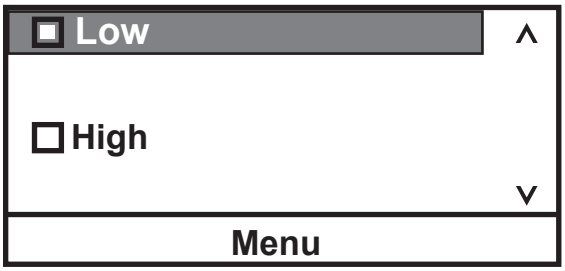


2. With the desired fluid selected press Esc, or use the **Menu** window, to save and return to the previous display.

Pump Adjustment is used to review/set the desired pump speed.

1. With **Pump Adjustment** highlighted, press ○ to display the speeds.

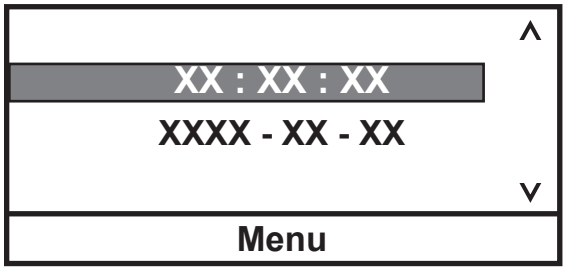
Highlight the desired speed and press ○ to select it.



Fluid system limits	High °C	Low °C
All units:		
Water	+98	+2
EG-Water	+103	-33
PG-Water	+103	-33
Controller 1 units:		
Other	+103	-33
Controller 2 units:		
Other	+103	-33
SIL 100	+75	-30
SIL 180	+150	-30
SIL 300	+150	+80
SYNTH 60	+45	-30
SYNTH 200	+150	+30
SYNTH 260	+150	+45
Controller 3 units:		
Other	+200	-90
SIL 100	+75	-75
SIL 180	+200	-40
SIL 300	+200	+80
SYNTH 60	+45	-50
SYNTH 200	+200	+30
SYNTH 260	+200	+45

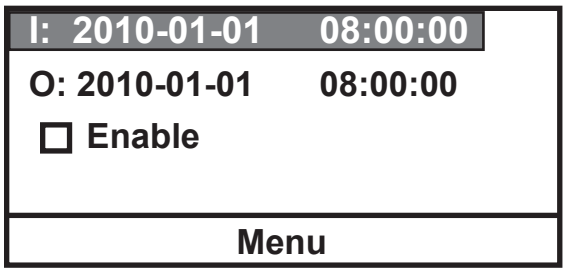
NOTE The range is also limited by the bath temperature range, see Section 2. ▲

Set Clock is used to set the controller's time (hr : min : sec) and date (year - month - day).



On/Off Timer is used to enable and set the controller's timer.

1. With **On/Off Timer** highlighted, press to display the on (**I**) and off (**O**) time as well as the enable box.



After setting the on and off times select **Enable** to activate the timer.

Auto Restart is used to enable the auto restart feature. When enabled, the unit will automatically restart after a power failure or power interruption condition.

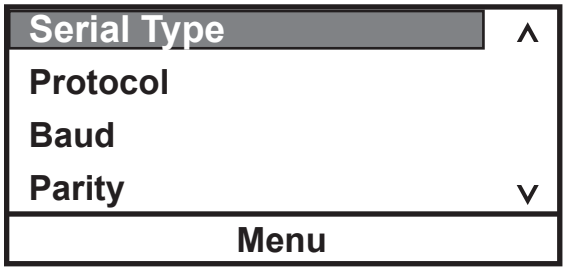
1. With **Auto Restart** highlighted, press to toggle between enable and disable.

Energy Saving is used to enable the energy savings mode. The Energy Saving mode is primarily designed for applications running under a stable load. Enabling the mode saves energy by reducing the unit's heater power and cooling requirements. This can result in substantial energy savings over the life of the unit. The default setting is **ON**.

1. With **Energy Saving** highlighted, press to toggle between enable and disable.

Interfaces is used to enable/configure the optional serial communications feature.

1. With **Interfaces** highlighted, press to display the list of parameters.
Highlight the desired parameter and press to view the available options.



Available options:

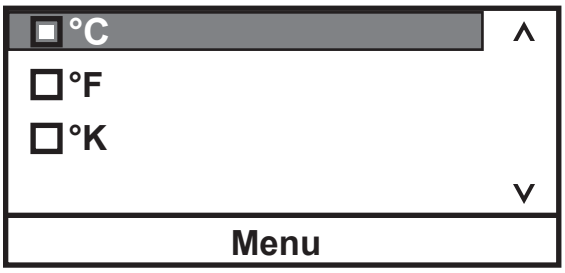
Serial Type	USB, Off
Protocol	Standard, NC
Baud	19200, 9600, 4800, 2400, 1200, 600, 300
Parity	None, Odd, Even
Data Bits	8, 7
Stop Bits	1, 2

See the Appendix for additional information.

Settings - Display Options is used to view/adjust the controller's Temperature Units, the Temperature Resolution, the displayed Language, and the Display Contrast and Display Delay.

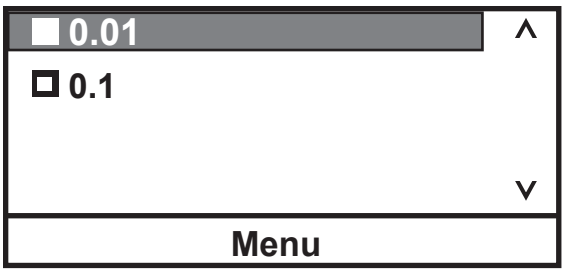
1. With **Temp. Unit** highlighted press . Use the up/down arrows to highlight the desired temperature scale.

Press .



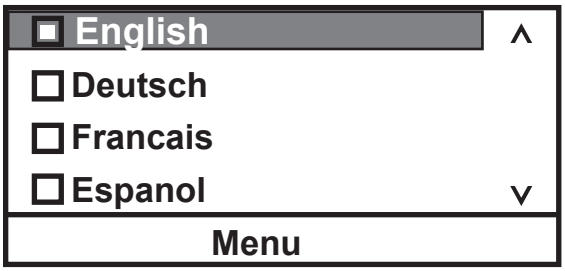
2. With **Temp. Resolution** highlighted press .

Use the up/down arrows to highlight the desired resolution. Press .



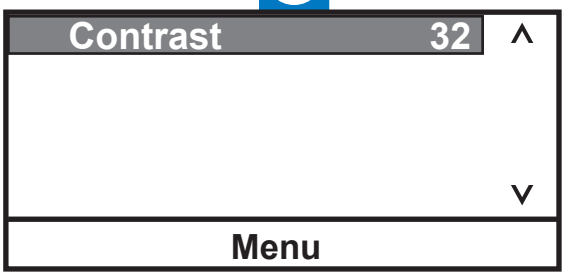
3. With **Language** highlighted press . Use the up/down arrows to highlight the desired language. (Scroll down for additional languages.)

Press .



4. With **Display Contrast** highlighted press .

Press again and use the up/down arrows keys to change the contrast. With the desired contrast showing, press again.

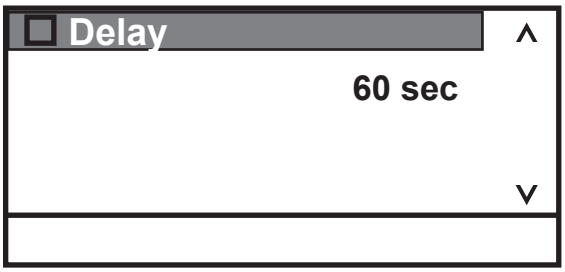


NOTE Holding Esc for five seconds resets the display contrast to the default level and also brings up the language menu to change, if needed, the displayed language. ▲

5. With **Display Delay** highlighted press to enable/disable it.

Use the up/down arrows to highlight the time and press again.

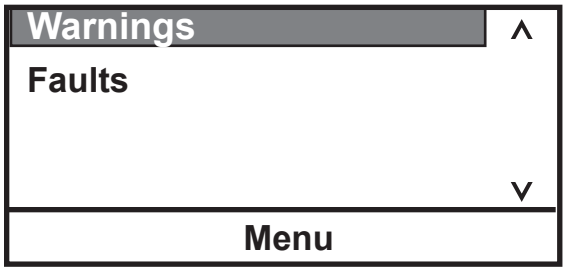
Use the up/down arrows to change the value. Once the desired delay is displayed press .



With **Display Delay** enabled and the Start Display showing, if no arrows are pressed the Start Display will change to the Status Display after the delay expires.

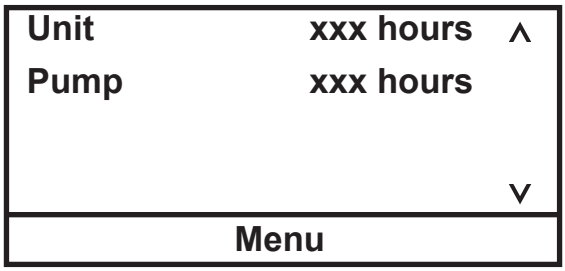
System Messages is used to view any Warning or Fault messages.

1. With **Messages** highlighted, press ○ to display the options.



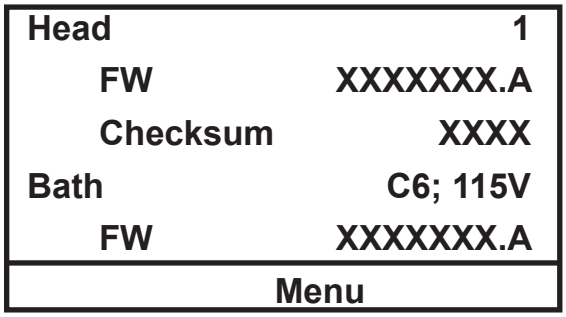
System Run Time is used to view the unit and pump operating hours.

1. With **Run Time** highlighted, press ○ to display the times.



System Configuration is used to view the unit's configuration.

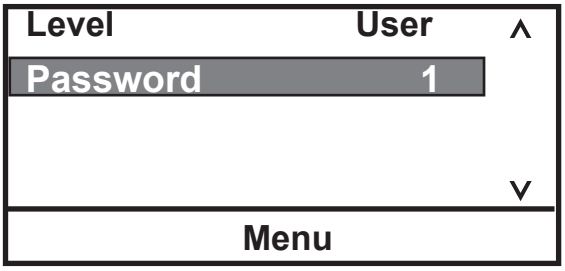
1. With **Configuration** highlighted, press ○ to display the settings.



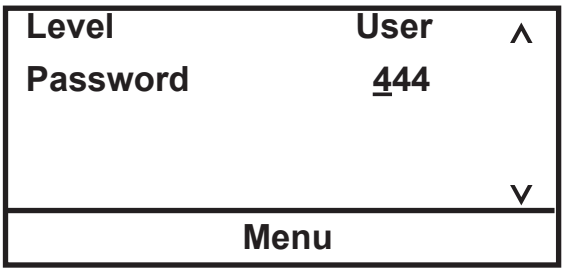
NOTE Non refrigerated units display **Bath Unknown**. ▲

System - Password/Reset is used only by a qualified technician. Changing the password enables controller reset options, the temperature sensor calibration procedure and displays PID values.

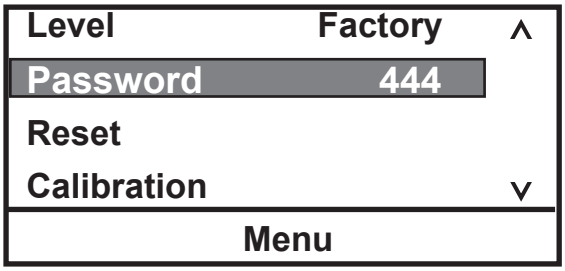
1. With **Password/Reset** highlighted, press to display:



2. Press and change the number to **444**.



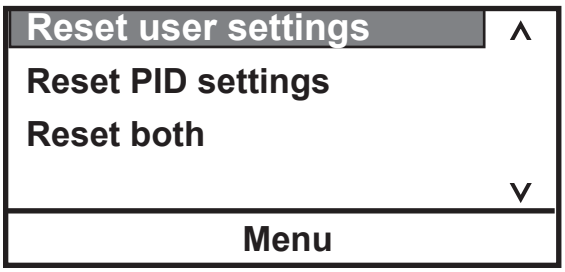
3. Press to display:



NOTE The controller resets to the **User** mode whenever the unit is turned off. The controller also resets to the **User** mode whenever the Start/Status Display is displayed continuously for 10 minutes. ▲

Scroll down to display **PID Tuning**.

1. If desired, highlight **Reset** and press to display:

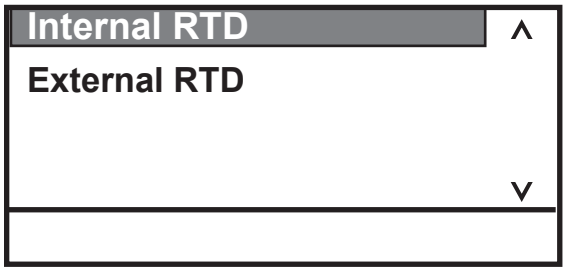


Highlight the desired reset option and press .

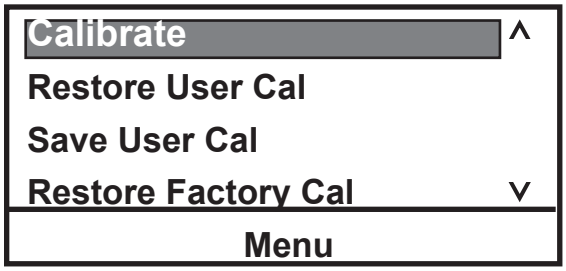
A confirmation message will appear, press again.

1. To calibrate the temperature sensor highlight **Calibration** and press ◯ to display:

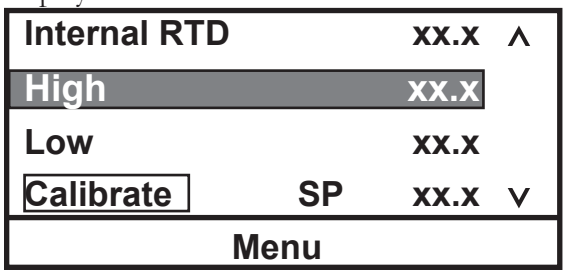
NOTE Ensure the RTA is set to 0 before doing a calibration. ▲



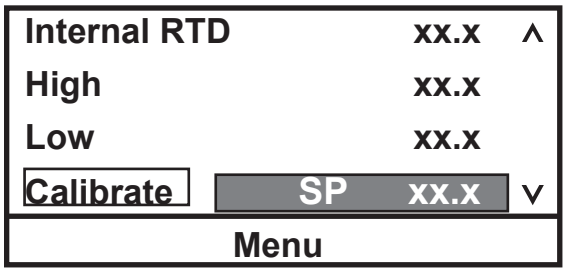
2. With the desired sensor highlighted, press ◯ to display:



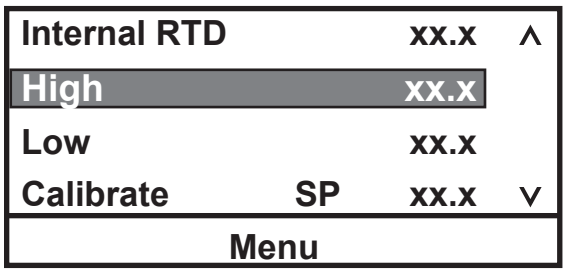
3. With **Calibrate** highlighted, press ◯ to display:



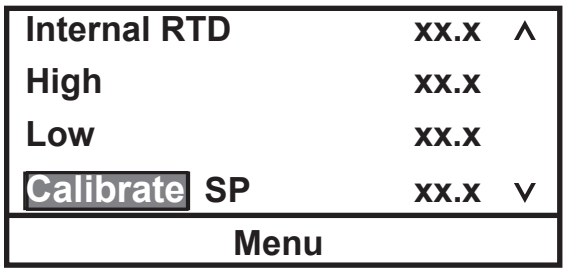
4. Highlight the **SP** temperature box and enter either the desired high or low setpoint value.



5. Press ◯ and enter the desired calibration temperature .



6. Highlight **Calibrate** and the press ◯ to complete the procedure.



7. Repeat for the other calibration point.

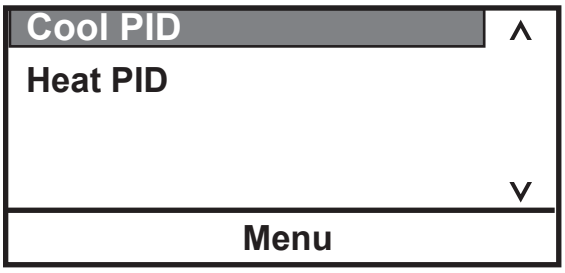
Once the calibration is complete you can store it into the controller's memory by selecting **Save User Cal** and pressing ◯.

You can later restore the same calibration by highlighting **Restore User Cal** and pressing ◯.

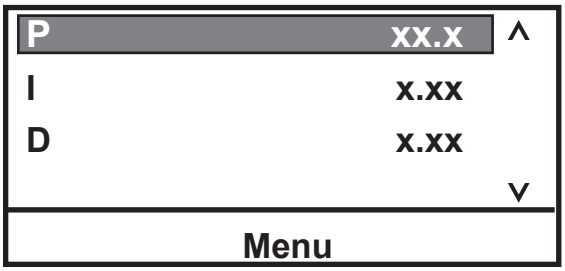
Another option is to restore the factory calibration values by highlighting **Restore Factory Cal** and pressing ◯.

The **Save Factory Cal** option is designed to be used only by a qualified technician.

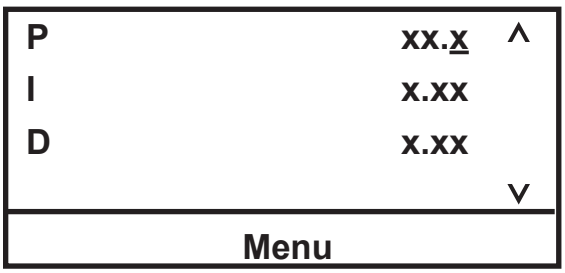
1. With **PID Tuning** highlighted, press  to display:



2. Highlight the desired PID and press  to display:



3 . If required, press  to change the value.

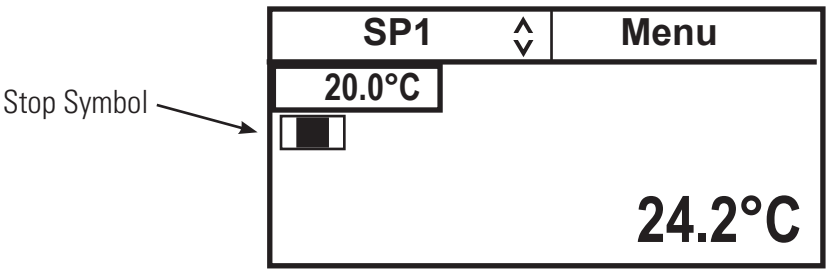


Factory values are:
P = 05.0
I = 0.10
D = 0.00

Stopping the Unit

Ensure the stop symbol is highlighted, if not use the arrow keys to navigate to the symbol.

Press  . The unit will stop and the stop symbol will turn into a start symbol (▶).



Power Down

Press  . The controller's screen will go blank .

Shut Down

Place the circuit protector on the front of the unit to the **O** position.

⚠ CAUTION

Using any other means to shut the unit down can reduce the life of the compressor. ▲

⚠ CAUTION

Always turn the unit off and disconnect it from its supply voltage before moving the unit. ▲

⚠ CAUTION

The circuit protector located on the front of the unit is not intended to act as a disconnecting means. ▲

Restarting

NOTE When quickly restarting, the compressor may take up to 10 minutes before it starts to operate. ▲

Section 5 Preventive Maintenance

Disconnect the power cord prior to performing any maintenance. ▲

⚠ CAUTION

Handle the unit with care. Sudden jolts or drops can damage the unit's components. ▲

Cleaning

After time, the unit's stainless steel surfaces may show spots and become tarnished. Normal stainless steel cleaners can be used.

Clean the bath vessel and built-in components at least every time the bath liquid is changed. Use water and a soft cloth.

⚠ CAUTION

Do not use scouring powder. ▲

The inside of the bath must be kept clean in order to ensure a long service life. Substances containing acidic or alkaline substances and metal shavings should be removed quickly as they could harm the surfaces causing corrosion. If corrosion (e.g., small rust marks) should occur in spite of this, cleaning with stainless steel caustic agents has proved to be suitable. These substances should be applied according to the manufacturer's recommendations.

⚠ CAUTION

For cleaning the baths do not use any substances which contain solvents. ▲

Condenser Fins

In order to maintain the cooling capacity of the unit, clean the fins two to four times per year, depending on the operating environment.

Switch off the unit and unplug the power cord.

Clean the fins with compressed air.

For extreme soiling a qualified technician will need to remove the cooling compressor casing.

Testing the Safety Features

The safety features for high temperature protection and low liquid level protection must be checked at regular intervals. The frequency depends on the unit's designated application and the heat transfer fluid used.

High temperature protection
Set a cut-off temperature that is lower than the desired setpoint temperature.

Switch on the circulator and ensure the unit shuts down at the set cut-off temperature.

If the unit does not shut down have the unit checked by a qualified technician.

Acrylic unit's maximum high temperature setting should be limited to the temperature indicated on the label on the front of the bath, 80°C. ▲

Low liquid level protection
With the unit on, slowly drain the bath fluid (use a drainage tap if necessary) and ensure the unit shuts down.

If not, have the unit checked by qualified a technician.

Section 6 Troubleshooting

Error Displays

Error messages are cleared by pressing the enter key. Once the cause of the error message is identified and corrected, to restart the unit press the enter key again. If the message does not clear contact us.

FAULT:
HTC
HIGH TEMP. CUTOUT-
PRESS ENTER

Error Message (Typical)

Fault Displays

The heating element, pump and, if applicable, refrigeration shut down with a fault. A fault also sounds the alarm, if enabled.

Message	Action
High Fixed Temp.	• unit's nonadjustable high temperature protection limit exceeded • check fluid selection • check environmental conditions
High Temperature	• adjustable high temperature protection limit exceeded • check limit setting • check fluid selection • ensure unit has adequate ventilation
High Temperature Refrigeration	• check voltage supply • the refrigeration may need servicing
HPC High Press. Cutout	• check for obstructions to air flow • the refrigeration may need servicing
HTC High Temp. Cutout	• high temperature protection limit exceeded • check limit setting • allow unit to cool down
LLC Low Level Cutout	• reservoir fluid level too low for safe operation • check fluid level • check for leaks
Low Fixed Temp.	• unit's nonadjustable low temperature protection limit exceeded • check fluid selection

Low Temperature	• adjustable high temperature protection limit exceeded • check limit setting • check fluid selection
Motor Fault	• it can take over 10 minutes for the motor temperature to get low enough before the unit can be restarted
MOL Motor Overload	• allow unit to cool down
Open RTD1 Internal	• open internal temperature sensor
Open RTD2 External	• open external temperature sensor
Shorted RTD1 Internal	• shorted internal temperature sensor
Shorted RTD2 External	• shorted external temperature sensor

Warning Displays

The unit will continue to run with a warning. A warning also sounds the alarm, if enabled.

Bad Calibration	• redo calibration
High Temperature	• adjustable high temperature protection limit exceeded • check limit setting • check fluid selection
High Temperature	• adjustable high temperature protection limit exceeded • check limit setting • check fluid selection
Low Level	• reservoir fluid level too low for safe operation • check fluid level
Low Temperature	• adjustable low temperature protection limit exceeded • check limit setting • check fluid selection

Checklist

Unit will not start

Check the controller for error codes, see Error Codes in this section.

Ensure the circuit protector is in the on (I) position.

Make sure supply voltage is connected and matches the unit's nameplate rating ±10%

No display on controller

Recycle the circuit protector on the rear of the controller.

Unit will not circulate process fluid

Check the reservoir level. Fill, if necessary.

Check the application for restrictions in the cooling lines.

The pump motor overloaded. The pump's internal overtemperature overcurrent device will shut off the pump causing the flow to stop. This can be caused by low fluid, debris in system, operating unit in a high ambient temperature condition or excessively confined space. Allow time for the motor to cool down.

Make sure supply voltage matches the unit's nameplate rating ±10%.

Inadequate temperature control

Verify the setpoint.

Make sure the condenser is free of dust and debris.

Check the fluid concentration.

Ensure unit installation complies with the site requirements in Section 3.

Make sure supply voltage matches unit nameplate rating ±10%.

If the temperature continues to rise, make sure your application's heat load does not exceed the rated specifications.

Check for high thermal gradients (e.g., the application load is being turned on and off or rapidly changing).

Unit shuts down

Ensure  button wasn't accidently pressed.

Ensure the circuit protector is in the on (I) position.

Check the controller for error codes.

Make sure supply voltage is connected and matches the unit's nameplate rating ±10%.

Restart the unit.

USB Driver Not Recognized

If your operating system does not automatically recognize the optional driver log on to:

http://www.ftdichip.com/FTDrivers.htm

for instructions.

Appendix NC Serial Communications Protocol

NOTE This appendix assumes you have a basic understanding of communications protocols. ▲

All data is sent and received in binary form, do not use ASCII. In the following pages the binary data is represented in hexadecimal (hex) format.

The NC Serial Communications Protocol is based on a master-slave model. The master is a host computer, while the slave is the chiller's controller. Only the master can initiate a communications transaction (half-duplex). The slave ends the transaction by responding to the master's query. The protocol uses an RS-232/RS-485 serial interface with the default parameters: 9600 baud, 8 data bits, 1 stop bit, no parity and no RS-232 handshaking. RS-485 offers a a slave address selection from 1 to 100, default parameter: 1.

The unit can be controlled through your computer's serial port by using the unit's standard 9-pin connection.

All commands must be entered in the exact format shown in the tables on the following pages. The tables show all commands available, their format and responses. Controller responses are either the requested data or an error message. The controller response *must* be received before the host sends the next command.

The host sends a command embedded in a single communications packet, then waits for the controller's response. If the command is not understood or the checksums do not agree, the controller responds with an error command. Otherwise, the controller responds with the requested data. If the controller fails to respond within 1 second, the host should resend the command.

NOTE All byte values are shown in hex, hex represents the binary values that must be sent to the chiller. **Do not use ASCII.** ▲

The framing of the communications packet in both directions is:

	Checksum region						
Lead char CA or CC	**Addr-MSB 0**	**Addr-LSB 1**	**Command**	**n d-bytes**	**d-byte 1**	**...**	**d-byte n**	**Checksum**

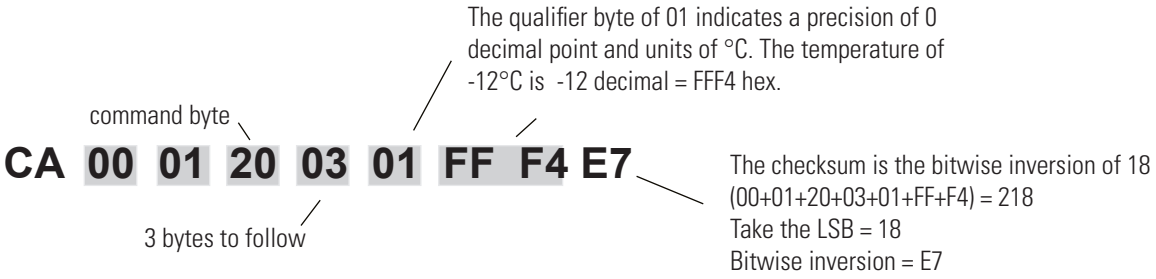
Lead char	0xCA (RS-232) 0xCC (RS-485)
	Device address is 1 (RS-232)
Addr-msb	Most significant byte of device address (RS-232: 0).
Addr-lsb	Least significant byte of device address is 1 (RS-232).
Command	Command byte (see Table 1).
n d-bytes	Number of data bytes to follow (00 to 03 hex).
d-byte 1	1st data byte (the qualifier byte is considered a data byte).
...	...
d-byte n	nth data byte.
Checksum	Bitwise inversion of the 1 byte sum of bytes beginning with the most significant address byte and ending with the byte preceding the checksum. (To perform a bitwise inversion, "exclusive OR" the one byte sum with FF hex.)

The master requests information by sending one of the Read Functions as shown in Table 1. Since no data is sent to the chiller during a read request, the master uses 00 for the number of data bytes following the command byte.

The chiller will respond to a Read Function by echoing the lead character, address, and command byte, followed by the requested data and checksum. When the chiller sends data, a qualifier byte is sent first, followed by a two byte signed integer (16 bit, MSB sent first). The qualifier byte indicates the precision and units of measure for the requested data as detailed in Table 2.

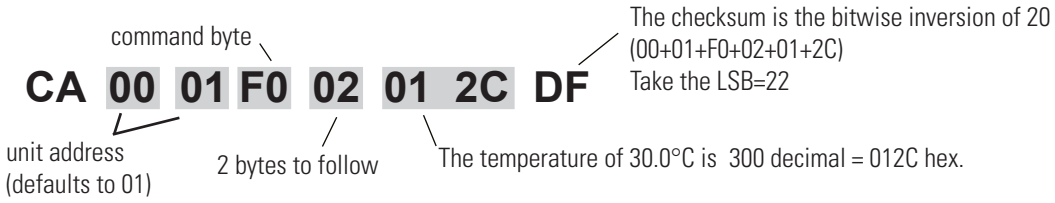
As an RS-232 example, the master requests to read internal temperature unit address 01 by sending:

If the temperature is -12°C, the unit would reply:



The master sets parameters in the chiller by sending one of the Set Functions as shown in Table 1. The master does not send a qualifier byte in the data field. The master should be preprogrammed to send the correct precision and units (it could also read the parameter of interest first to decode the correct precision and units needed).

As an example, if the master wants to set the setpoint to 30°C, it would send :



Unit responds:

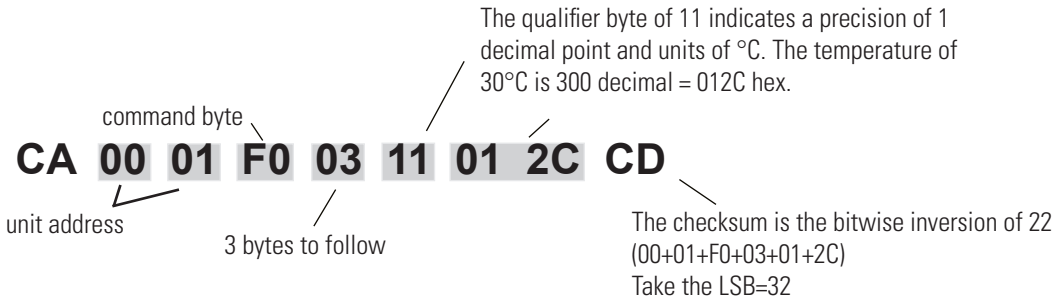


Table 1 Commands (All bytes are in hex)

FUNCTION	MASTER SENDS	UNIT RESPONDS
Read Acknowledge	CA 00 01 **00** 00 FE	CA 00 01 **00** 02(v1)(v2)(cs)
Read Status (see Table 3)	CA 00 01 **09** 00 F5	CA 00 01 **09** 02(d1)(d2)(cs)
Error		CA 00 01 **0F** 02(en)(ed)(cs)
Read Internal Temperature (RTD1)	CA 00 01 **20** 00 DE	CA 00 01 **20** 03(qb)(d1)(d2)(cs)
Read External Temperature(RTD2)	CA 00 01 **21** 00 DD	CA 00 01 **21** 03(qb)(d1)(d2)(cs)
Read Setpoint One	CA 00 01 **70** 00 8E	CA 00 01 **70** 03(qb)(d1)(d2)(cs)
Read Low Temperature Warning	CA 00 01 **40** 00 BE	CA 00 01 **40** 03(qb)(d1)(d2)(cs)
Read Low Temperature Fault	CA 00 01 **41** 00 BE	CA 00 01 **41** 03(qb)(d1)(d2)(cs)
Read High Temperature Warning	CA 00 01 **60** 00 9E	CA 00 01 **60** 03(qb)(d1)(d2)(cs)
Read High Temperature Fault	CA 00 01 **61** 00 BE	CA 00 01 **61** 03(qb)(d1)(d2)(cs)
Read Cool Proportional Band (P)	CA 00 01 **74** 00 8A	CA 00 01 **74** 03(qb)(d1)(d2)(cs)
Read Cool Integral (I)	CA 00 01 **75** 00 89	CA 00 01 **75** 03(qb)(d1)(d2)(cs)
Read Cool Derivative (D)	CA 00 01 **76** 00 88	CA 00 01 **76** 03(qb)(d1)(d2)(cs)
Read Heat Proportional Band (P)	CA 00 01 **71** 00 8D	CA 00 01 **71** 03(qb)(d1)(d2)(cs)
Read Heat Integral (I)	CA 00 01 **72** 00 8C	CA 00 01 **72** 03(qb)(d1)(d2)(cs)
Read Heat Derivative (D)	CA 00 01 **73** 00 8B	CA 00 01 **73** 03(qb)(d1)(d2)(cs)

command bytes shown in **bold**
qb = qualifier byte, see Table 2
d1,d2 = 16 bit signed integer of the value being sent or received
cs = the checksum of the string (see text)

v1, v2 = protocol version
ed Bad command byte gets echoed)
en (error number) 01 = Bad command,
02 = Bad checksum
xx = no valid data, include in checksum

Table 1 Commands (continued) (All bytes are in hex)

FUNCTION	MASTER SENDS	UNIT RESPONDS
Set Setpoint One*	CA 00 01 **F0** 02(d1)(d2)(cs)	CA 00 01 **F0** 03(qb)(d1)(d2)(cs)
Set Low Temp Warning	CA 00 01 **C0** 02(d1)(d2)(cs)	CA 00 01 **C0** 03(qb)(d1)(d2)(cs)
Set Low Temp Fault	CA 00 01 **C1** 02(d1)(d2)(cs)	CA 00 01 **C1** 03(qb)(d1)(d2)(cs)
Set High Temp Warning	CA 00 01 **E0** 02(d1)(d2)(cs)	CA 00 01 **E0** 03(qb)(d1)(d2)(cs)
Set High Temp Fault	CA 00 01 **E1** 02(d1)(d2)(cs)	CA 00 01 **E1** 03(qb)(d1)(d2)(cs)
Set Cool Proportional Band (P = 0.1 - 99.9)	CA 00 01 **F4** 02(d1)(d2)(cs)	CA 00 01 **F4** 03(qb)(d1)(d2)(cs)
Set Cool Integral (I = 0 - 9.99)	CA 00 01 **F5** 02(d1)(d2)(cs)	CA 00 01 **F5** 03(qb)(d1)(d2)(cs)
Set Cool Derivative (D = 0 - 5.0)	CA 00 01 **F6** 02(d1)(d2)(cs)	CA 00 01 **F6** 03(qb)(d1)(d2)(cs)
Set Heat Proportional Band (P = 0.1 - 99.9)	CA 00 01 **F1** 02(d1)(d2)(cs)	CA 00 01 **F1** 03(qb)(d1)(d2)(cs)
Set Heat Integral (I = 0 - 9.99)	CA 00 01 **F2** 02(d1)(d2)(cs)	CA 00 01 **F2** 03(qb)(d1)(d2)(cs)
Set Heat Derivative (D = 0 - 5.0)	CA 00 01 **F3** 02(d1)(d2)(cs)	CA 00 01 **F3** 03(qb)(d1)(d2)(cs)
Set On/Off Array		

The Set On/Off Array command is used to set and/or request unit settings. The master can send the array with a value of 0 (turn off/disable), 1 (turn on/enable), or 2 (do not change). 0 or 1 causes the unit to change the setting, 2 only requests the state of a setting. The slave returns values of 0 (off/disabled) or 1 (on/enabled).

(SW Version 02950.1A-E)	CA 00 01 **81** 01(d1)(cs)	CA 00 01 **81** 01(d1)(cs)
Sample - turn unit on	CA 00 01 **81** 01 01 7B	

* = limited to the range of the chiller
command bytes shown in **bold**
qb = qualifier byte, see Table 2
d1,d2 = 16 bit signed integer of the value being sent or received
cs = the checksum of the string (see text)

**d1 - unit off = 0, on =1
d2 - external sensor disabled = 0, enabled = 1
d3 - fault mode disabled = 0, enabled = 1
d4 - tenths display disabled = 0, enabled = 1
d5 - Alarms on internal = 0, or external sensor = 1, (1 is invalid when d2 = 0, external sensor disabled)

Table 2

QUALIFIER BYTE	
00	0 precision, no units of measure
01	0 precision, °C
10	1 precision, no units of measure
11	1 precision, °C
20	2 precision, no units of measure

Example: The temperature of 45.6°C would be represented by the qualifier 11 hex, followed by the 2 bytes 01 C8 hex (456 decimal).

Table 3 READ STATUS

BIT	d1	d2
b.7	Low Temp Fault	
b.6	High Temp Fault	HTC Fault
b.5	Low Temp Warning	MOL Fault
b.4	High Temp Warning	Pump Speed Fault
b.3	RTD2 Open/Short	High RA Temp
b.2	RDT1 Open/Short	HPC Fault
b.1	Unit Faulted	Low Level Fault/Warning
b.0	Unit Running	High Level Fault/Warning

	Unit of Measure
Index	Unit
0	NONE
1	Temperature in °C
2	Temperature in °F
3	Flow liters per minute
4	Flow in gallons per minute
5	Time in seconds
6	Pressure in PSI
7	Pressure in bars
8	Resistivity in MΩ-cm
9	%
10	Volts
11	Pressure in kPa

DECLARATION OF CONFORMITY

Manufacturer: Cole Parmer

Address: 625 East Bunker Court
Vernon Hills, IL 60061

CE

Year of inception 2011

We declare that the following products conform to the Directives and Standards listed below.

Products: Polystat refrigerated and heated liquid baths, non refrigerated heated liquid baths and immersion liquid circulators.

Refrigerated and non refrigerated heated liquid baths:

Models: C6, C6F, C15 and C15++, W7, W11, W24, W5P, W14P, W21P, W6A, W12A, W19A,. All with control head models 1H, 2H & 3H.

Immersion circulators:

Models: 1BR, 2BR, 3BR, 1CL and 2CL.

All models rated :

1. 115 Volts, 60 Hz or
2. 230 Volts, 50 Hz

Equipment Class:

Measurement, control and laboratory.

Directives and Standards:

2004/108/EC – Electromagnetic Compatibility (EMC Directive):

EN 61326-1: 2006 – Electrical equipment for measurement, control, and laboratory use – EMC Requirements - EMC Class A.

2006/95/EC – Low Voltage Directive (LVD):

EN 61010-1: 2001 – Safety requirements for electrical equipment for measurement, control, and laboratory use – General Requirements.

Manufacturer's Authorized Representative:

Date:

18 January 2011

Mark Sinclair
R & D Manager

RoHS DECLARATION OF CONFORMITY

Manufacturer: Cole Parmer

Address: 625 East Bunker Court
Vernon Hills, IL 60061

Products: Standard Polystat refrigerated and non refrigerated heated liquid baths, models: C6, C6F, C15 and C15++, W7, W11, W24, W5P, W14P, W21P, W6A, W12A, W19A, all with control head models 1H or 2H or 3H.

Polystat immersion circulator models: 1BR, 2BR, 3BR, 1CL and 2CL.

Cole Parmer certifies that the above Polystat models meet the requirements of DIRECTIVE 2002/95/EC, Restriction of Hazardous Substances Directive (RoHS). Cole Parmer certifies that these Polystat models contains less than the following amounts of the six RoHS banned substances with the exemption stated in Note 2 below:

Substance		**Threshold Level**
Lead…	Pb	Less than 0.1% [1 & 2]
Mercury…	Hg	Less than 0.1% [1]
Hexavalent Chromium …	Cr (VI)	Less than 0.1% [1]
Polybrominated Biphenyls …	PBB	Less than 0.1% [1]
Polybrominated Diphenyl Ethers …	PBDE	Less than 0.1% [1]
Cadmium …	Cd	Less than 0.01% [1]

Notes:

1. Tolerated maximum concentration value by weight in homogeneous materials.
2. Exemptions - Lead as an alloying element in steel containing up to 0.35% lead by weight, aluminum containing up to 0.4% lead by weight and as a copper alloy containing up to 4% lead by weight.

Manufacturer's Authorized Representative:

Mark Sinclair
R & D Manager

Date:

18 January 2011