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# Operator's Manual

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## Heated Recirculator

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## Introduction

Thank you for choosing this Heated Recirculator. Designed to provide low-cost pumping and heating for closed-loop applications, it connects directly to your own tank or system and provides accurate control within a frequently used temperature range. This Recirculator is ideal for applications such as thawing plasma, tempering photographic solutions, or circulating to an external device.





### General Safety Information

When installed, operated, and maintained according to the directions in this manual and common safety procedures, the Heated Recirculator should provide safe and reliable temperature control. Please ensure that all individuals involved in the installation, operation, or maintenance of this Recirculator read this manual thoroughly prior to working with the unit.

	This symbol marks chapters and sections of this instruction manual that are particularly relevant to safety. When attached to the unit, this symbol draws attention to the relevant section of the instruction manual.
	This symbol indicates that hazardous voltages may be present.
	This symbol indicates that a hot surface may be present.
	This symbol marks information that is particularly important.
	This symbol indicates alternating current.
	This symbol on the Power Switch indicates that it places the unit into a fully powered state.
	This symbol on the Power Switch indicates that it disconnects power to the unit.
	This symbol indicates a protective conductor terminal.
<b>Read all instructions pertaining to safety, set-up, and operation. Proper operation is the user's responsibility.</b>	

## Safety Recommendations

To prevent injury to personnel and/or damage to property, always follow your workplace's safety procedures when operating this equipment. You should also comply with the following safety recommendations:

	<p><b>WARNING:</b></p> <ul style="list-style-type: none"><li>• Always connect the power cord on the Recirculator to a grounded (3-prong) power outlet. Make certain that the outlet is the same voltage and frequency as your unit.</li><li>• Never operate the Recirculator with a damaged power cord.</li><li>• Always turn the Recirculator OFF and disconnect mains power before performing any maintenance or service.</li></ul>
	<p><b>WARNING:</b></p> <ul style="list-style-type: none"><li>• Never operate the Recirculator without bath fluid in the reservoir. Periodically check the reservoir to ensure that the liquid depth is within acceptable levels. Always refill the reservoir using the same bath fluid type that is already in the reservoir. Bath oil must not contain any water contaminants and should be preheated to the actual bath temperature before adding as there is an explosion hazard at high temperatures.</li><li>• Use compatible bath fluids only.</li><li>• Always drain all fluid from the reservoir before moving your Recirculator.</li></ul>
	<p><b>WARNING:</b> Always allow the reservoir fluid to cool to ambient temperature before draining.</p>
	<p><b>WARNING:</b> It is the user's responsibility to properly decontaminate the unit in the event hazardous materials are spilled on exterior or interior surfaces. Consult manufacturer if there is any doubt regarding the compatibility of decontamination or cleaning agents.</p>

## Unpacking Your Recirculator

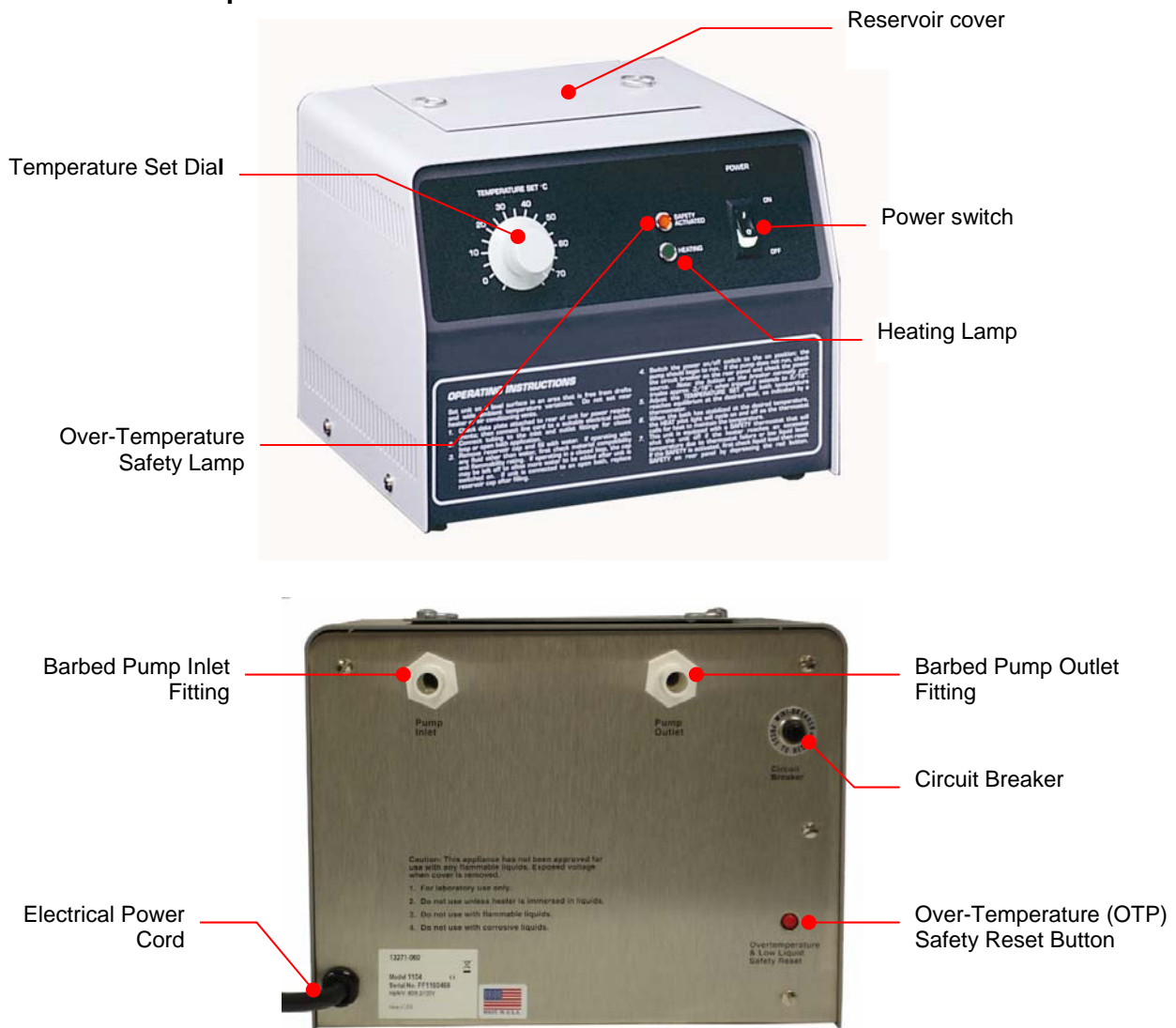
Your Heated Recirculator is shipped in a special carton. Retain the carton and all packing materials until the unit is completely assembled and working properly. Set up and run the unit immediately to confirm proper operation. Beyond one week, your unit may be warranty repaired, but not replaced. If the unit is damaged or does not operate properly, contact the transportation company, file a damage claim, then contact the company where your unit was purchased.

## Contents

The items included with your Recirculator are:

- Heated Recirculator
- Tubing and Clamps
- Operator's Manual

## Controls and Components



## Installation and Startup


Your Heated Recirculator is designed to be simple to setup and install. The only tools required are a flat-blade screwdriver and a container for adding water or another suitable fluid to the bath reservoir.

### General Site Requirements

Locate your Recirculator on a level surface in an area that is free from drafts and wide ambient temperature variations, such as near heater or air conditioning vents. Do not place it where there are corrosive fumes, excessive moisture, or in excessively dusty areas. It must be placed a minimum of 4 inches (10.2 cm) away from walls or vertical surfaces so that air flow is not restricted.


Avoid voltage drops by using properly grounded power outlets wired with 14 gauge or larger diameter wire and, if possible, be close to the power distribution panel. The use of extension cords is not recommended; this will reduce the potential for problems caused by low line voltage.


### Fluid Connections

	<p><b>WARNING:</b></p> <ul style="list-style-type: none"><li>• Always use tubing and fittings that are compatible with the bath fluid and temperature range being used.</li><li>• Secure all tubing to inlet and outlet fittings using hose clamps of the appropriate size. Do not operate unit without hose clamps.</li></ul>
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The Recirculator's inlet and outlet connections are 0.5 inch barbed polypropylene fittings for use with 0.5 inch ID tubing. The Recirculator's inlet should be connected to the outlet of the external tank or device; the outlet should be connected to the inlet of the external tank or device. Secure tubing using the appropriate size hose clamps.

### Reservoir Fluids


	<p><b>WARNING:</b> Read the safety data sheet for the bath fluid being used carefully before filling reservoir.</p> <p><b>WARNING:</b> See <i>Technical Information</i> in the rear of this manual for a list of compatible liquids.</p> <p><b>CAUTION:</b> If the proper fluid level is not maintained, the unit could possibly be damaged.</p>
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	<p><b>WARNING:</b> Do not use a flammable liquid as a fire hazard may result.</p>
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Distilled water is preferred for temperatures from 10° to 90°C (50° to 194°F) and a mixture of laboratory grade ethylene glycol and distilled water for temperatures from -25° to 100°C (-13° and 212°F).

A variety of fluids can be used with the Heated Recirculator depending on the application. The fluid must be compatible with all wetted components (stainless steel, PVC, polypropylene, brass, and nylon). The fluid must also be able to produce the temperature range desired.

For good temperature stability, the viscosity should be 50 centistokes or less at the lowest operating temperature to allow good fluid circulation and to minimize heating from the pump.

	<p><b>WARNING:</b> Always drain all fluid from the reservoir before moving the Recirculator.</p>
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	<p><b>WARNING:</b> To avoid the potential for burns, allow the Recirculator to cool completely before cleaning or performing any maintenance.</p>
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## Electrical Power



**WARNING:** The Recirculator's power cord must be connected to a properly grounded electrical receptacle. Make certain that this electrical outlet is the same voltage and frequency as your unit. The correct voltage and frequency for your Circulator are indicated on the identification label on the back of the Recirculator.



**CAUTION:** The use of an extension cord is not recommended. If one is necessary, it must be properly grounded and capable of handling the total wattage of the unit. The extension cord must not cause more than a 10% drop in voltage to the unit.

Plug the Recirculator's power cord into a properly wired and grounded electrical outlet.

Check that the Circuit Breaker on the rear of the unit is in the ON position. It should be protruding about 3/16" / 4.8 mm. If it is protruding more (about 5/16" / 7.9 mm), it is OFF or tripped; press to reset.

## Startup



**WARNING:** Exposed voltage when cover removed.

1. Remove the unit's top cover to access the reservoir cap.
2. Remove the filler cap from the reservoir and, using a funnel, add fluid until it is approximately 1 inch / 2.54 cm below the top of the fill tube. Once the reservoir is full, remove the funnel but do not replace the cap at this time.
3. Place the Power Switch on the front panel in the ON position. The pump will turn on and fluid will begin circulating through the system.
4. With the pump running, the reservoir's fluid level will drop as the tubing and connected device fill with fluid. Slowly add fluid to the reservoir until the liquid level remains stable.
5. Check all connections for leaks. If leaks are found, do not continue to operate the Recirculator until all connections are secure.
6. Adjust the Temperature Set Dial to the desired temperature and monitor the temperature of the connected device using a thermometer or other temperature sensor. Adjust the Temperature Set Dial as needed to stabilize the connected device at the intended temperature.

## Normal Operation


### Turning Your Recirculator ON


Place the Power Switch on the front panel in the ON position. If the actual bath temperature is lower than the set point temperature, the Heating Lamp will light. When the unit has stabilized at the desired temperature, the Heating Lamp will cycle on and off as the internal thermostat calls for heat to maintain the temperature.

### Adjusting the Set Point Temperature

Rotate the Temperature Set Dial until the indicator is at the desired set point temperature. Use an external thermometer to read the actual bath temperature; adjust the Temperature Set Dial as needed until the bath temperature stabilizes at the desired operating temperature.

## Routine Maintenance & Troubleshooting

	<b>WARNING:</b> Hazardous voltages may be present. Disconnect power before performing maintenance.
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	<b>WARNING:</b> To avoid the potential for burns, allow the Recirculator to cool completely before cleaning or performing any maintenance.
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### Cleaning

Use only mild soap and water when cleaning. Do not use steel wool as damage to the unit may result. Non-steel scouring pads are acceptable.

Be careful to prevent cleaning liquids from entering the inside of the Recirculator.

### Pump Motor

The bearings are permanently lubricated and should not require lubrication.

### Safety Thermostat (OTP)

The Recirculator is equipped with an Over-Temperature Protection (OTP) Safety Thermostat that disconnects electrical power from the heater and pump if the liquid level in the reservoir drops too low or the fluid reaches an excessive temperature due to thermostatic failure. Should this occur, the Over-Temperature Safety Lamp on the front panel lights to indicate that the OTP has been activated. The OTP Reset Button on the rear of the unit will also trip.

If activated, check and correct the fluid level, wait ten minutes and then press the OTP Reset Button.



## Troubleshooting Chart

Problem	Cause	Corrective Action
No power to unit	Electrical power disconnected Circuit Breaker tripped Power Switch in OFF position	Check that power cord is plugged into an operating electrical outlet of the correct voltage and frequency. Reset Circuit Breaker. Place Power Switch in ON position.
No pumping	No electrical power to unit Fluid level too low Blockage in circulating system	Check electrical power (see <i>No power to unit</i> above). Check fluid level and correct as required. Check lines for blockage and correct as required.
No heating	No electrical power to unit No or insufficient circulation Set point temperature too low Over Temperature Safety activated Liquid level too low	Check electrical power (see <i>No power to unit</i> above). Check for proper circulation (see <i>No pumping</i> above). Check set point temperature; increase as required. Check if Over Temperature Safety Lamp is lit; reset as required. Check liquid level and correct as required.
Insufficient heating	No or insufficient pumping Improper line voltage Recent change in set point or cooling load Excessive cooling load	Check for proper circulation (see <i>No pumping</i> above). Check that line voltage meets specifications. Allow sufficient time for temperature to stabilize when changes in cooling load or set point are made. Check and correct as required.
Over Temperature Safety Lamp lit	Liquid level too low Thermostat failure	Check liquid level and correct as required; reset OTP. Consult supplier.

## Technical Information

### Performance Specifications

Working Temperature: Ambient to 70°C / Ambient to 158°F)

Temperature Stability: ±0.2°C / ±0.4°F

Heater: 750 watt

Pump: Single-speed Centrifugal

Maximum Pressure: 2.0 psi / 0.13 bar


Maximum Flow Rate: 3.0 gpm / 11.4 lpm

Electrical Requirements: 120V, 60Hz, 6.6A  
240V, 50Hz, 3.3A


#### Environmental Conditions

Indoor use only  
Maximum Altitude: 2000 meter  
Operating Ambient: 5° to 35°C (41° to 95°F)  
Relative Humidity: 80%, non-condensing  
Installation Category: II  
Pollution Degree: 2

## Reservoir Fluids

	<b>WARNING:</b> Do not operate unit with any potentially flammable materials, as a fire hazard may result.
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Fluid Description	Specific Heat			Normal Temperature Range	Extreme Temperature Range
	@ Fluid Temperature	BTU/lb°F	KJ/Kg°C		
Distilled water	50°C	1.00	4.18	10° to 90°C	2° to 100°C
Ethylene glycol (50/50 mix with distilled H <sub>2</sub> O)	-20°C	0.78	3.26	-25° to 100°C	-30° to 115°C
Ethylene glycol (30/70 mix with distilled H <sub>2</sub> O)	0°C	0.89	3.72	0° to 95°C	-15° to 107°C
Propylene glycol (50/50 mix with distilled H <sub>2</sub> O)	-10°C	0.83	3.47	-20° to 100°C	-30° to 115°C
Propylene glycol (30/70 mix with distilled H <sub>2</sub> O)	5°C	0.92	3.85	5° to 90°C	-10° to 107°C

	<p><b>WARNING: DO NOT USE THE FOLLOWING LIQUIDS</b></p> <ul style="list-style-type: none"> <li>• Automotive antifreeze with additives**</li> <li>• Hard tap water**</li> <li>• Deionized water with a specific resistance &gt; 1 meg ohm</li> <li>• Any flammable fluids</li> <li>• Concentrations of acids or bases</li> <li>• Solutions with halides: chlorides, fluorides, bromides, iodides or sulfur</li> <li>• Bleach (Sodium Hypochlorite)</li> <li>• Solutions with chromates or chromium salts</li> <li>• Glycerine</li> <li>• Syltherm fluids</li> </ul> <p>** At temperatures above 40°C, additives or mineral deposits may develop. If deposits are allowed to build up, the unit may overheat and fail. Higher temperatures and higher concentrations of additives will hasten deposit build up.</p>
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## Equipment Disposal (WEEE Directive)



or



This equipment is marked with the crossed out wheeled bin symbol to indicate it is covered by the Waste Electrical and Electronic Equipment (WEEE) Directive and is not to be disposed of as unsorted municipal waste. **Any products marked with this symbol must be collected separately, according to the regulatory guidelines in your area.**

It is your responsibility to correctly dispose of this equipment at lifecycle-end by handing it over to an authorized facility for separate collection and recycling. It is also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect the persons involved in the disposal and recycling of the equipment from health hazards. By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Requirements for waste collection, reuse, recycling, and recovery programs vary by regulatory authority at your location. Contact your local responsible body (e.g., your laboratory manager) or authorized representative for information regarding applicable disposal regulations.

## Replacement Parts

Description	Part Number
Power switch	235-022
Integrated circuit UAA1016B	200-061
Circuit breaker	215-086
Heater indicator lamp (green), 120V	215-145
Heater indicator lamp (green), 240V	215-146
OTP indicator lamp (orange), 120V	215-147
OTP indicator lamp (orange), 240V	215-148
Triac tab mount heat sink	200-058
Temperature sensing probe	200-098
Printed circuit board, 120V	500-094
Printed circuit board, 240V	500-095
Pump, 120V	215-143
Pump, 240V	215-144
Reservoir assembly (without sensing probe), 120V	590-054
Reservoir assembly (without sensing probe), 240V	590-055
Reservoir cap	300-106
Inlet / outlet fittings	330-041

## Service and Technical Support

If you have followed the troubleshooting steps outlined previously and your Recirculator Bath still fails to operate properly, contact the supplier from whom the unit was purchased. Have the following information available for the customer service person:

- Model, Serial Number, and Voltage (from back panel label)
- Date of purchase and purchase order number
- Supplier's order number or invoice number
- A summary of the problem

## Warranty

The manufacturer agrees to correct for the original user of the product, either by repair (using new or refurbished parts), or at the manufacturer's election, by replacement (with a new or refurbished product), any defects in material or workmanship which develop during the warranty period. The standard warranty is twenty-four (24) months after delivery of the product. In the event of replacement, the replacement unit will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer. For purposes of this limited warranty, "refurbished" means a product or part that has been returned to its original specifications. In the event of a defect, these are your exclusive remedies.

If the product should require service, contact the manufacturer's/supplier's office for instructions. When return of the product is necessary, a return authorization number is assigned and the product should be shipped, transportation charges pre-paid, in either its original packaging or packaging affording an equal degree of protection to the indicated service center. To insure prompt handling, the return authorization number must be placed on the outside of the package. A detailed explanation of the defect should be enclosed with the item.

The warranty shall not apply if the defect or malfunction was caused by accident, neglect, unreasonable use, improper service, acts of God, modification by any party other than the manufacturer, or other causes not arising out of defects in material or workmanship.

**EXCLUSION OF IMPLIED WARRANTIES.** THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHICH EXTEND BEYOND THE DESCRIPTION AND PERIOD AS STATED IN THE OPERATOR'S MANUAL INCLUDED WITH EACH PRODUCT.

**LIMITATION ON DAMAGES.** THE MANUFACTURER'S SOLE OBLIGATION UNDER THE WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT AND THE MANUFACTURER SHALL NOT, IN ANY EVENT, BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND RESULTING FROM USE OR POSSESSION OF THIS PRODUCT.

Some states do not allow: (A) limitations on how long an implied warranty lasts; or (B) the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may have other rights that vary from state to state.