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**CHEMYX**

## **OPERATING MANUAL**

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C-Series Standard Heating Circulators

R-Series Standard Refrigerated & Heating Circulators

I-Series Standard Immersion Circulators

**Intellectual Property**

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**Thank you for choosing Chemyx Industries Temperature Control Instruments!**

This manual covers basic operational usage of our circulators. For optimal utilization of all functions, we recommend that you thoroughly study this manual prior to beginning operation. Chemyx does not directly support OEM systems or system branded for other companies. OEM systems may contain different specifications and features that are not covered in this manual. This manual also does not include usage instructions for OEM / custom designed systems or custom software designed by other companies.

**Unpack the circulator and accessories and inspect them for possible transport damage.**

Immediately report damage to Chemyx and the responsible carrier.

Failure to report transport damage will not allow us to support your claim for insurance.

# TABLE OF CONTENTS

Introduction	4
Safety	5
Application safety	6
Installation	6
Safe Bath fluids	6
Bath fluids	7
Filling procedures	7
Disposal	8
Technical specifications	9
Operating controls and functional elements	10-13
Computer Control (RS232 Operation)	14-15
Maintenance	16
Warranty	17

# INTRODUCTION

Chemyx circulators control the temperature of fluids in a bath tank. The system features a pump connection for temperature control of external systems in a closed loop circuit.

Chemyx circulators are not for direct temperature control. Direct temperature control means direct contact of the object with the bath fluid. This includes food, tobacco, pharmaceutical and other consumed organic products.

Do not use Chemyx circulators to directly cook food for human consumption – at no time should food products come in contact with bath fluid. Food must be vacuum-sealed before use with circulator.

Do not use Chemyx circulators to directly circulate food products like juices.

# SAFETY

**Chemyx products ensure safe operation when installed, operated, and maintained according to safety recommendations in this manual. This section explains the potential dangers that may arise when operating Chemyx circulator and notes many important safety precautions.**

## **FIRE HAZARD**

- Be careful when filling the bath with flammable fluids
- Observe fluid flash points and adjust safety dial
- Observe all warnings for bath fluids and the respective safety datasheets
- Only use the system in well-ventilated areas when using flammable fluids
- Insufficient ventilation may result in the formation of explosive mixtures

## **DO NOT OPERATE WITH SUSPECTED FAILURES**

- Do not run circulation fluids above their boiling point
- Do not use crimped circulation lines long term – some polymers are brittle and to tear.
- Do not circulate cold fluid into hot glassware
- Do not set safety temperature limiter above fluid flash points.
- Chemyx is not responsible for any damage that might result from examples similar to above

## **BURN HAZARD**

- Do not touch connectors and bath cover or fluids when bath is under high temperature

## **OBSERVE ALL WARNING LABELS ON PRODUCT**

- Read all labels on product to ensure proper usage.

## **GROUND PRODUCT**

- Proper grounding is required.

## **Operational Safety**

Follow the safety instructions to avoid personal injury and property damage.

Fluids Safety:

- Set the temperature safety dial to at least 25 °C below the flash point of the bath fluid.
- Never operate the system without bath fluid in the bath.
- Do not introduce water into hot oil.
- Pay attention to the thermal expansion of bath oil during heating to avoid overflows.
- Do not drain the bath fluid while it is hot!

Circulation Safety:

- Note the temperature range of plastic bath tanks and tubing – they melt!!!
- Avoid bent and crimped tubing in the tubing, and maintain a sufficient distance from surrounding walls.
- Regularly check the tubing for material defects (e.g., for cracks and leaks).

Installation and transport safety

- Place the system on an even surface to prevent spills and tip over.
- Do not operate damaged or leaking units.
- Disconnect power before cleaning the unit.
- Sudden jolts or drops may cause damage in the interior of the unit.
- Do not remove warning labels.

## Application Safety:

Temperature controlling the contents of a reactor constitutes normal circulator practice.

**However, we do not know what substances are contained within reactor vessels and cannot help with determining the safety of your applications and reactions.**

Many chemicals are:

- **Flammable or explosive**
- **Hazardous to health**
- **Environmentally unsafe**

**Many materials and processes are unstable at room temperature.**

The user alone is responsible for the handling of these substances and determining the safety of his or her individual applications.

## Installation

- The installation location should be large enough and provide sufficient air ventilation.
- Keep at least 1 feet of open space on the front and rear vents.
- Do not set up the unit in the immediate vicinity of heat sources
- Do not install in outdoors and do not expose to sun light
- Make sure that the power supply has low impedance.
- Ambient temperature range: 40 °C, min. 5 °C.
- Relative humidity: 50% (40 °C).

## Safe Bath Fluids

Ethylene Glycol (temperature less than 80C)

Water – It is best to use distilled/decalcified water and not deionized water.

Mineral Oil

Silicone Oil

Dow SYLTHERM®

Ethanol/Isopropyl Alcohol – temps less than 10C due to flash point of fluids

If user chooses to use non-approved fluids make sure they are non corroding.

If using hazardous materials or materials that could become hazardous, the operator must affix safety labels to the front of the unit so they are highly visible:

# BATH FLUIDS

Carefully read the safety data sheet of the bath fluid, pay attention to the fluid flash point!  
Use only non-acidic and non-corrosive bath fluids.

## Water:

Try using only soft decalcified water. Tap water quality is highly variable based on local conditions – if possible use store bought distilled water or lab distilled water.

- Hard water leads to calcification in the bath – You can use hard water if you do not mind calcification of the bath or switching out the bath fluid from time to time. Calcium deposits promote microbial growth and allow locations for microbes to “anchor”
- Ferrous water can cause corrosion.
- Chloric water can cause pitting corrosion.
- Deionized water will cause corrosion if used long term. DI water tends to pull ions from metals into solution over time, even stainless steel.

## **Fluid recommendations for cold temps:**

Temperature ranges 1°C -10°C: Ethanol or water/glycol mixture 1:1

## **Fluid recommendations for hot temps:**

Temperature ranges 1°C to 80°C: Soft/decalcified water or distilled water only. Tap water quality is highly variable based on local conditions.

Temperature ranges 80 °C to 100 °C: Mineral/silicone oils

Please contact Chemyx before using other than recommended bath fluids. Chemyx assumes no liability for damage caused by the selection of an unsuitable bath liquid.

Unsuitable bath fluids are fluids which:

- are highly viscous
- have creep characteristics
- have corrosive characteristics
- shear thickening

## **Filling**

- Take care that no liquid enters the interior of the circulator's head.
- Recommended maximum filling level of 1.5 Inches below the rim.
- Pay attention to overflow of liquid – when the bath circulates the max fluid level can fluctuate due to objects in the bath.

## **Disposal**

This product uses bath fluids that might partially consist of mineral oil or synthetic oil. For disposal, observe the instructions in the safety data sheets. Some systems contains common refrigerants found in household products please contact your local waste management company to determine disposal requirements.

# TECHNICAL SPECIFICATIONS

<b>System</b>	<b>C6</b>
<b>Temperature Min</b> °C	ambient +10°C
<b>Temperature Max</b> °C	100 °C
<b>Stability</b>	± .01°C
<b>Heater Power</b>	1.1kW variable
<b>Circulation Pump (adj.)</b>	20 LPM
<b>Pressure (ethanol)</b>	5.2 PSI
<b>Input power</b>	120V

<b>System</b>	<b>R-10</b>
<b>Temperature Min</b> °C	-10 °C
<b>Temperature Max</b> °C	100 °C
<b>Stability</b>	± .01°C
<b>Heater Power</b>	1.1kW variable
<b>Circulation Pump (adj.)</b>	22 LPM
<b>Pressure (ethanol)</b>	5.2 PSI
<b>Input power</b>	120V

<b>System</b>	<b>I-100</b>
<b>Temperature Min</b> °C	ambient+10°C
<b>Temperature Max</b> °C	100 °C
<b>Stability</b>	± .01°C
<b>Heater Power</b>	1.1kWvariable
<b>Circulation Pump (adj.)</b>	20 LPM
<b>Pressure (ethanol)</b>	5.2 PSI
<b>Input power</b>	120V

## **Wetted materials in the Circulator:**

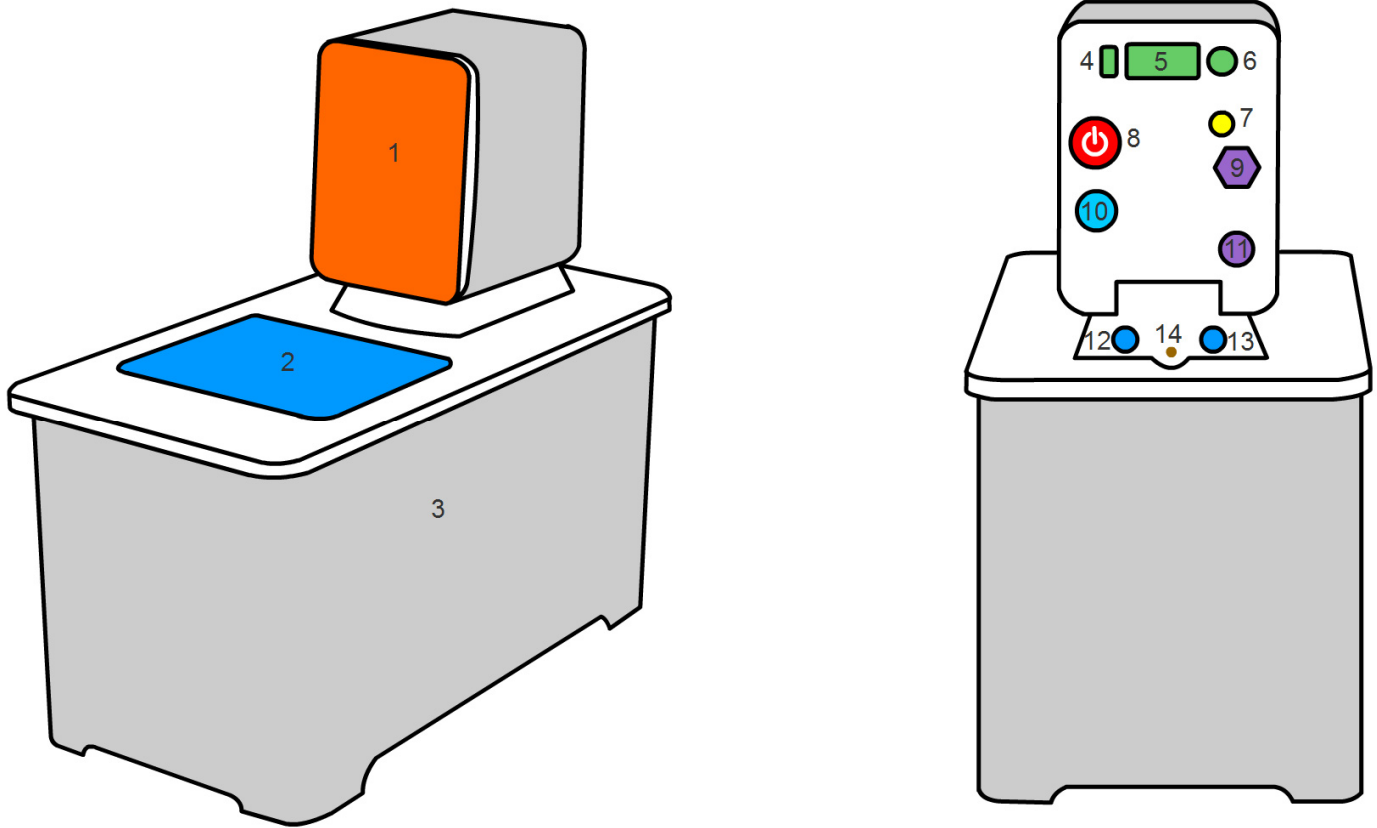
- 1) ABS plastic (acrylonitrile butadiene styrene) - top cover and internal circulator pump housing
- 2) Stainless steel – tank, various circulator parts and casing
- 3) Viton® (DuPont fluoropolymer elastomer) – internal pump connector tube

Optional: Polycarbonate – open transparent tank material

Wetted materials were carefully chosen for both temperature and chemical resistance. There however are a number of materials that are incompatible with one or more of these materials and can damage the circulator.

# OPERATING CONTROLS & FUNCTIONAL ELEMENTS

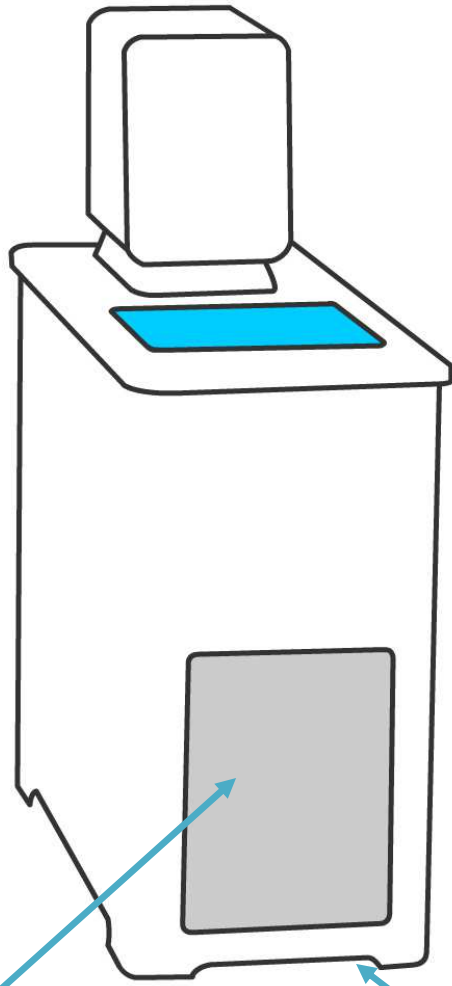
## C-6 & R10 operational elements



- 1) Interface – use to control & display
- 2) Bath Opening – use to fill fluids & operate as a small circulation water bath
- 3) Bath Case
- 4) USB A Port – the USB port is a Serial COM port emulator
- 5) D9 RS232 Serial Port
- 6) External Probe Input Port
- 7) Safety Overtemp Dial – set to limit max temperature
- 8) Power Switch
- 9) Power Connector
- 10) Cooling Control Outlet(R-10 cooling units only)
- 11) Fuse
- 12) Pump Outlet – The system is a push only pump
- 13) Pump Inlet
- 14) Thermostat Attachment Screw – unscrew if you want remove the header

## Operating controls and functional elements (cont.)

### R-10 system specific operational elements

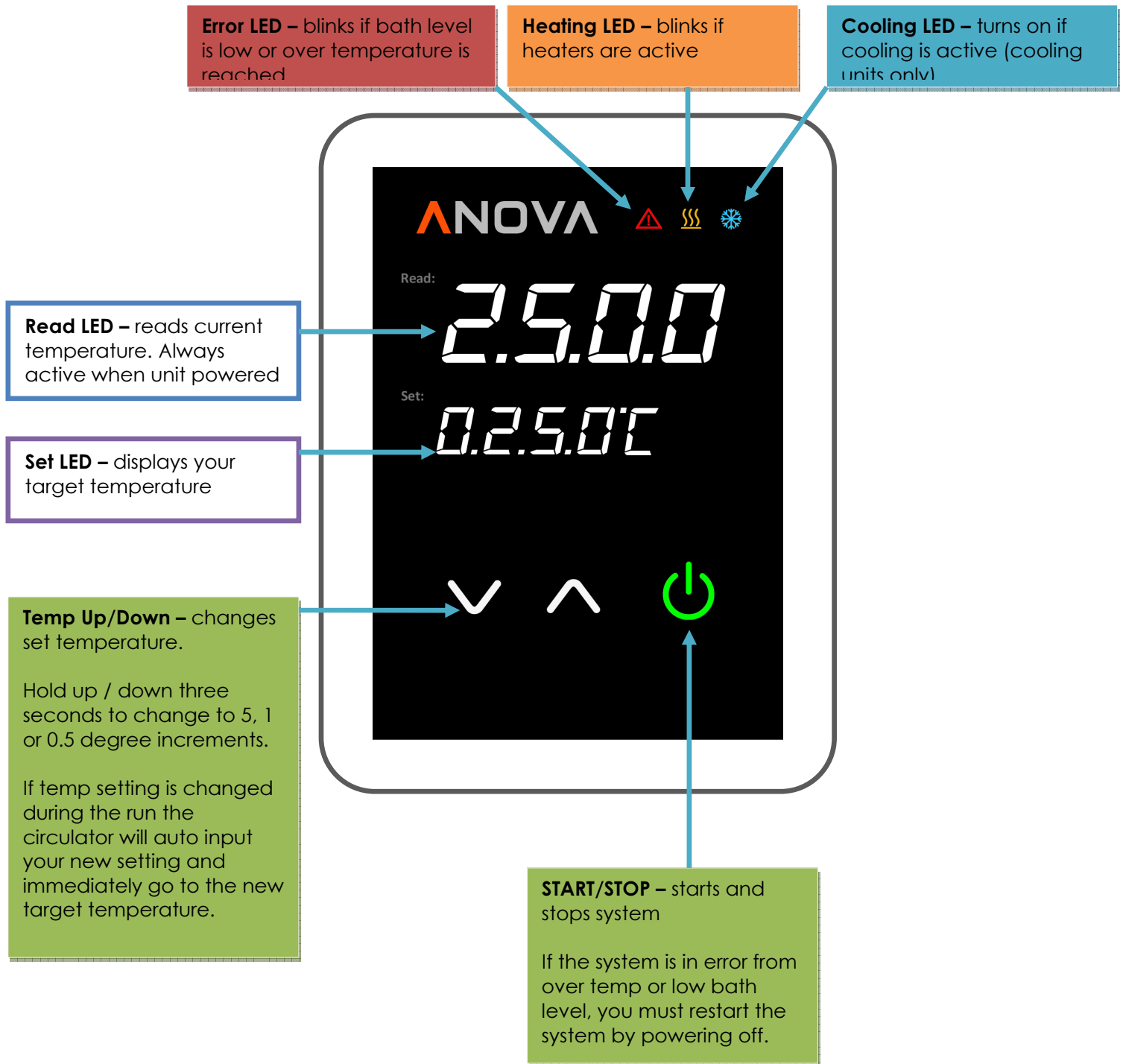


15) Cooling Inlet grate – do not block

16) Polyethylene filter (remove from underneath the grate)

## Operating controls and functional elements (cont.)

### Interface elements



## Operating controls and functional elements (cont.)

**Error Codes:** If fault is detected you will see one of the error codes below. You must cycle power after a fault.

“LL9” – Low water level error. To correct this fault add in more fluid into the bath. Please note sometimes you have to add more bath fluid to handle jacketed reactors or long circulation lines.

“SFt” – Over temperature alarm has been triggered. You can adjust the over temperature dial on the back of the system to reset the alarm.

# COMPUTER CONTROL

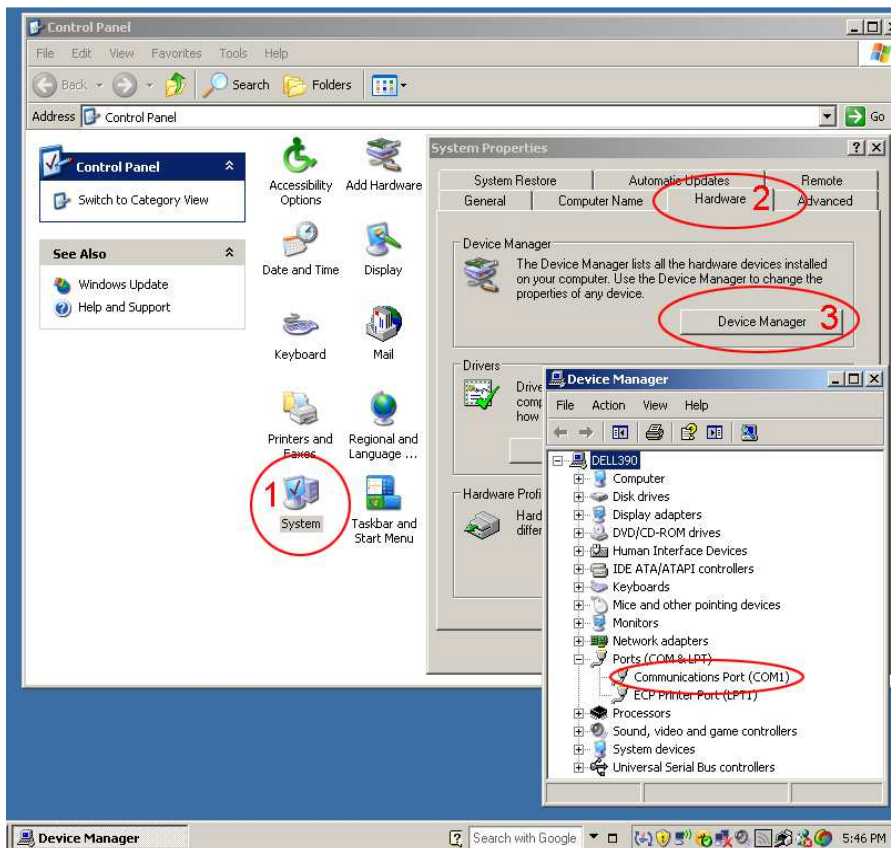
## Cable Requirements

In order to interface to a PC you need the following hardware cable pictured below:

DB9 Serial Cable Male to Female – Strait though configuration. Do not purchase a “Null Modem,” “crossover,” or “crossed over” cables.



## RS232 Port Settings



Before interfacing with a PC, make sure a RS232 port exists on your PC. RS232 ports will be in parentheses and named “COM1-100” like the one above named COM1

## RS232 Port Settings

**Baud Rate - 9600, Data Bits - 8, Parity - none, Stop bits - 1, Flow control – none.**

Most programming packages like LabView, LabWindows and Visual Studio will allow you to program comport settings dynamically in program.

## RS232 Commands

Note: All Rs232 commands are **not case sensitive**.  
Do not include **quotation marks** when entering in commands.  
Commands are "initiated" by a **carriage return**.

### Status commands

"help" – returns list of end user commands  
"version" – returns software version information  
"status" – returns status of system  
"temp" – returns bath temperature

### Control commands

"start" – starts system  
"stop" – stops system  
"clear" – clears stops from errors

### Setting commands

"set temp xxx.xx" - sets temperature max 5 significant digits  
"get temp setting" – returns temperature settings

# SYSTEM MAINTENANCE

## BEFORE BEGINNING SERVICE

- Always **turn off** the unit.
- Electrical connections and any other work must be performed by Chemyx certified personnel only
- Make sure bath is at room temperature

Disconnect water bath from power source. Check for signs of damage including pulled cord or physical damage to enclosure. Check for puncture to bath tank or front interface membrane. If any signs of physical damage are found send back for factory service and replacement parts.

## Cleaning:

For cleaning the bath tank and the immersed parts of the circulator, use a mild surfactant like dish soap and a soft brush. **Do not use iron wool** or **undiluted bleach** - this will cause corrosion and pitting of the bath.

To clean the filter- pull the filter out from under the circulator and rinse in water. You may need to scrub the filter with detergent to remove grease or organic residue.

## DECONTAMINATION

From time to time algae and other microorganism will grow in the bath if using water. Microorganisms appear as brown or green film or stains on bath tank that usually cover more area on the lower section of bath tank and taper as they reach the water line. Microorganism spread via items placed into the water bath and airborne spores that land and randomly take root.

To decontaminate the system:

- 1) Fill the water bath with water and raise the Temperature to 80°C and hold for one hour. (A lid is required to prevent water from evaporating. If there is no lid available aluminum foil can be used as a cover.) Use a bristled brush to remove dead bacteria; scrub the bath and then discard bath water.
- 2) Killing bacteria spores - heat treatment will kill only active microorganisms. To kill endospores used diluted standard household bleach (with 5% sodium hypochlorite) **diluted 1:10** in water. Clean with paper towel in bath for at least 5 minutes to ensure destruction of spores. Rinse bath out afterwards
- 3) Cleaning the Keypad/Outer enclosure – Use store bought rubbing alcohol to disinfect keypad and outer enclosure.

## System Service

Water bath systems will experience wear and tear over prolonged usage. Factory reconditioning service is recommended every 2 years.

System service includes:

- 1) Inspection of the system + bath tank and enclosure conditions.
- 2) Electrical system inspection.
- 3) Replace electrical parts or recondition bath tank or enclosure if required.
- 4) Factory recalibration (Users may opt out of factory recalibration if they have the systems pre-calibrated)- Users may also elect to have system be calibrated to specific user determined standards - if this is the case please notify the Chemyx service personnel of this request.

If parts need to be replaced, the Service Technician will notify users of costs during the replacement procedure

## Repairs

Please contact an Chemyx for a return authorization number

- During transport the unit has to stand upright. Mark the packing correspondingly.
- When returning a unit, take care of careful and adequate packing.

# WARRANTY PROVISIONS

The following Warranty Provisions shall apply to products sold in North America by Chemyx ("**Seller**") to the entity shown as buyer ("**Buyer**") on Seller's invoice.

1. **Initial Warranty.** Seller warrants to the Buyer that the products manufactured by the Seller are free from defects in material and workmanship for a period not to exceed one (1) year or five thousand (5,000) hours of operation, whichever comes first, from the date the product is shipped by Seller to Buyer (the "**Initial Warranty**").

2. **Exclusions.** The Initial Warranty does not include damage to the product resulting from accident, misuse, improper installation or operation, unauthorized or improper repair, replacement or alteration (including but not limited to repairs, replacements, or alterations made or performed by persons other than Seller's employees or authorized representatives), failure to provide or use of improper maintenance, unreasonable use or abuse of the product, or failure to follow written installation or operating instructions. Buyer must return the product's record of purchase to the Seller or one of Seller's authorized representatives within thirty (30) days of the date the product is shipped by Seller to Buyer in order to make a claim under the Initial Warranty. Notwithstanding anything contained herein to the contrary, all glassware, including but not limited to reference thermometers, are expressly excluded from the Initial Warranty.

3. **Governing Law.** The Warranty Provisions and all questions relating to their validity, interpretation, performance, and enforcement shall be construed in accordance with, and shall be governed by, the substantive laws of the State of Texas.

4. **Shipping.** Buyer will arrange and pay for shipping and handling charges for the unit to be returned to the Seller. Seller will arrange and pay for shipping and handling for the return of the unit to the Buyer.