

**RTE-5/5B & RTE-9/9B
Refrigerated
Bath Circulators**

NESLAB Manual P/N 013529

Installation, Operation and Service Manual

RTE-5 & RTE-9 Bath and Circulator

Instruction and Operation Manual

Table of Contents

PREFACE	Unpacking 2
	Warranty 2
	After-sale Support 2
SECTION I Safety	Warnings 3
SECTION II General Information	Description 4
	Specifications 4
SECTION III Installation & Operation	Site 5
	Electrical Requirements 5
	Plumbing Requirements 5
	Fluids 6
	Filling Requirements 7
	Temperature Adjustment 7
	High Temperature Safety 8
	PST Preset Temperature Option 8
SECTION IV Maintenance/ Troubleshooting	Cleaning 9
	Algae 9
	Checklist 9
	Service Assistance 10
SECTION VI Warranty	Warranty 11

Preface

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, or does not operate properly, contact the transportation company and file a damage claim. Under ICC regulations, this is your responsibility.

Warranty

Units have a warranty against defective parts and workmanship for one full year from date of shipment. See back page for more details.

After-sale Support

NESLAB is committed to customer service both during and after the sale. If you have questions concerning the operation of your unit contact our Sales Department, see back cover. If your unit fails to operate properly, or if you have questions concerning spare parts or Service Contracts, contact our Customer Service Department. Before calling, please obtain the following information from the unit's serial number label:

- *BOM number* _____

- *Serial number* _____

Section I 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, contact our Sales Department.

Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty.

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

Never operate the unit without bath fluid in the bath.

Always turn off the unit and disconnect the line cord from the power source before performing any service or maintenance procedures, or before moving the unit.

Always empty the bath before moving the unit.

Never operate equipment with damaged line cords.

Refer service and repairs to a qualified technician.

In addition to the warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle with text highlighted in bold print. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, or personal injury, or death.

Section II General Information

Description

The RTE Constant Temperature Baths are designed to provide temperature control for applications requiring a fluid work area or pumping to an external system. The units are capable of closed loop circulation.

The units consist of an air-cooled refrigeration system, heater, circulation pump, stainless steel bath, and a temperature controller. The RTE-5 and RTE-9 have increased temperature stability and uniformity, and can interface with the ETP Temperature Programmer and DCR-1 Digital Control Readout.

Specifications	RTE-5	RTE-5B	RTE-9	RTE-9B
Temperature Range	-20°C to +100°C			
Temperature Stability	±0.01°C	±0.1°C	±0.01°C	±0.1°C
Temperature Uniformity	±0.02°C	±0.1°C	±0.02°C	±0.1°C
Cooling Capacity¹	400 Watts at 20°C Bath Temp 200 Watts at 0° Bath Temp 100 Watts at -20°C Bath Temp			
Cooling Rate (+20°C to -20°C)	40 Minutes		60 Minutes	
Pump Capacity^{1,2}	"F" Pump - 13 liters per minute @ 0' Head, 10' Max "Z" Pump - 13 liters per minute @ 0' Head, 17' Max			
Bath Work Area	8 3/8" x 2" x 5 3/8" Deep		8 3/8" x 5 1/2" x 5 3/8" Deep	
Bath Volume	4.2 Liters		6.4 Liters	
Unit Dimensions	11" x 13" x 20"D			

Specifications subject to change.

1. Reduce 17% for 50Hz operation.
2. The "F" pump is designed for close loop circulation only. The "Z" pump is designed for close loop and open circulation.

Section III Installation & Operation

Site

The unit should be located on a sturdy table or bench top. The units will retain their full rated capacity at air intake temperatures up to approximately 80°F (27°C). Higher temperatures will reduce the load handling capability.



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

A minimum clearance of 30 centimeters (12 inches) between the rear of the unit and the nearest wall is required for adequate ventilation through the pump box. This space will also accommodate the pump connections.

Excessively dusty areas should be avoided and a periodic cleaning schedule should be instituted (see Section VI, Cleaning).

Electrical Requirements



The unit construction provides extra protection against the risk of electric shock by grounding appropriate metal parts. The extra protection may not function unless the power cord is connected to a properly grounded outlet. It is your responsibility to assure that a proper ground connection is provided.

Refer to the serial number label on the rear of the unit to identify the specific electrical requirements of your unit.

Ensure the voltage of the power source meets the specified voltage, $\pm 10\%$.

The units are equipped with heater fuses located in the rear of the unit. 115 Volt units require a 10 Amp fuse, 230 Volt units require a 5 Amp fuse.

Plumbing Requirements

Hose Connections

The pump connections are located at the rear of the pump box. These connections are 3/8" O.D. stainless steel serrated pipes which accept 3/8" I.D. or 5/16" I.D. tubing.

NOTE: If the bath is not used for external circulation, plug the RTE inlet line to prevent aeration and lowering the unit's cooling capacity.

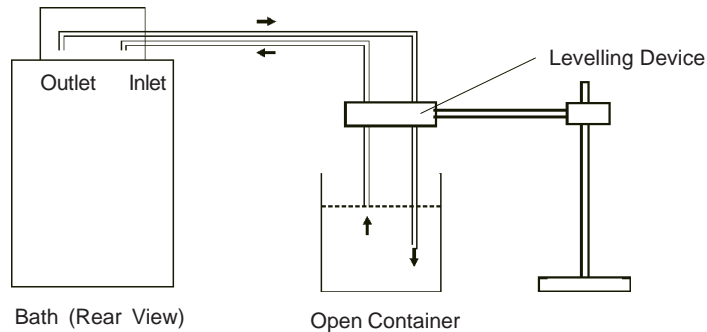
Flexible tubing, if used, should be of heavy wall or reinforced construction. Make sure all tubing connections are securely clamped. Avoid running tubing near radiators, hot water pipes, etc. If substantial lengths of tubing are necessary, insulation may be required for improved temperature control.

It is important to keep the distance between the unit and your application as short as possible and to use the largest diameter tubing practical. Tubing should be straight and without bends. If diameter reductions are required, they should be made at your application, not at the unit. **NOTE:** Use of smaller diameter tubing will reduce the flow specifications.

Flow Control

The flow adjustment knob is located directly in front of the control panel and is clearly labeled. To start flow turn the knob counterclockwise. **NOTE:** Do not over tighten the knob in either the open or closed position.

Circulating to an open container



A stainless steel leveling device is available to aid circulation to an open vessel. Contact our Sales Department for more information (see Preface).

Support the leveling device over the open container with a ringstand. Stagger the tubes in the leveling device so one tube is submerged in the vessel fluid, and the other tube is level with the fluid surface. Connect the deeper tube to the pump outlet and the shorter tube to the pump inlet.

Adjust the flow rate. When properly adjusted, the pump inlet will draw an occasional air bubble to prevent overflow, and the pump outlet will force fluid through the submerged tube to prevent aeration of the vessel.

To avoid siphoning the bath work area when the unit is shut off, lift the leveling device out of the vessel and above the level of the unit.

Fluids



Never use flammable or corrosive fluids with this unit.

The selected fluid must have a viscosity of 50 centistokes or less at the lowest operating temperature. Filtered tap water is the recommended fluid for operation from +7°C to +80°C.

Below +7°C, a 50/50 mixture, by volume, of filtered tap water and laboratory grade ethylene glycol is suggested.

Above +80°C, the user is responsible for fluids used.

Filling Requirements

Fill the reservoir to within 3/4" of the top plate to insure contact of all refrigerant coils with the bath fluid. Do not allow the bath fluid level to fall below 2 1/2" of the top. Heater burn out and aeration of bath fluid will occur if bath fluid level is too low.



If the correct fluid level is not maintained, the heater will be exposed and may become damaged.

NOTE: When pumping to an external system be sure to have additional bath fluid on hand to compensate for the loss in volume to the system. Also, when the RTE is used to maintain temperatures below 8°C, a non-freezing fluid should be used.



Never run the unit when the work area is empty. Avoid overfilling. Overfilling the bath may damage the insulation, and affects stability as well as low-end performance.

Temperature Adjustment

The units are designed from a functional/use standpoint. A single three-position toggle switch located toward the bottom of the control box controls power to the bath. When operating in the range of -20°C to +35°C lift up on the toggle switch. The two indicator lights near the switch will illuminate, indicating that both the temperature control system/circulator and refrigeration system are on.

When operating above +35°C push down on the toggle switch. Only the temperature control system/circulator will operate, the refrigeration compressor will remain off.



Never operate the compressor when the bath temperature is above 45°C.

To set the bath operating temperature rotate the large coarse temperature setting dial to the desired control temperature. The temperature reference setting is the white line located at the nine o'clock position.

As the bath approaches the setpoint temperature, the heat indicator light will cycle. Within a few minutes the bath temperature will stabilize. On the RTE-5 and RTE-9 the fine control adjustment is now used for precise temperature setting. Fine temperature setting should be made with the aid of an external thermometer.

NOTE: The RTE-5 and RTE-9 are capable of accepting the temperature programmers, there is a toggle switch located on the rear of the control box. When the bath is used without the temperature programmer the switch must be placed in the OFF position.

High Temperature/Low Liquid Level Safety

All bath models are equipped with a High Temperature/Low Liquid Level Safety Cut out. A single temperature sensing probe is used to control both functions. By attaching the sensing probe to the heater, low liquid level will be detected when the exposed surface of the heater becomes hot and shuts off the bath.

To set the High Temperature/Low Liquid Level Safety, locate the adjustment dial on the rear of the control box. Turn the dial fully clockwise and depress the reset button, start the bath and allow it to stabilize at the desired operating temperature. Turn the dial in a counterclockwise direction until the bath stops. Note the position of the dial where the reset button disengages and bath stops. Turn the dial clockwise past the point where the bath stopped and depress the button. (If the refrigeration was on wait approximately three minutes before depressing the reset button.) Turn the dial counterclockwise to a point just above that where the bath originally stopped (approximately 3/5 of one whole division).

With the temperature safety set in this position the entire bath will be shut down on excess bath temperature or low liquid level. Correct the problem and depress the reset button to start the bath.

PST Pre-Set Temperature Option

The factory installed PST Pre-Set Temperature Option is available on the RTE-5 and RTE-9. A three position selector knob located on the control box allows you to preset *two* most frequently used temperatures in addition to having full use of the calibrated control knob.

Set the selector knob to the position marked dial. The main control knob can now be used to set the bath temperature. Turn knob to the position marked "T1". Using a jewelers screwdriver, turn the small set screw to dial in the desired operation temperature. Turning the set screw in a clockwise direction will increase the bath temperature. An external thermometer should be used to make accurate settings.

Repeat this procedure with selector knob in the "T2" position to dial in the second frequently used temperature. Once the temperatures are set, switching the dial to position T1 or T2 will automatically bring the bath to the preset temperatures.

Section IV Maintenance & Troubleshooting

Cleaning

Periodically clean the case and stainless steel bath using a mild soapy solution. **Do not use steel wool; it is too abrasive and will lead to rusting.** Dry the bath using a soft cloth.

For proper operation, the unit needs to pull substantial amounts of air through the condenser. A build up of dust or debris on the fins of the condenser will lead to a loss of cooling capacity. Periodic cleaning of the condenser is necessary.

The frequency of the cleaning depends on the operating environment. After initial installation, we recommend a monthly visual inspection. After several months, the frequency of cleaning will be established.

Algae

To restrict the growth of algae in the bath, it is recommended that the bath cover be kept in place and that all circulation lines be opaque. This will minimize the entrance of light required for the growth of most common algae.

NESLAB recommends the use of Chloramine-T, 1 gram per 3.5 liters.

Checklist

Unit will not start

Make sure the voltage of the power source meets the specified voltage, $\pm 10\%$. Refer to the serial number label on the rear of the unit to identify the specific electrical requirements of your unit.

Check the high temp safety. Ensure the correct fluid level in the bath is between baffle marks and the high temp setting is greater than the bath temperature. Reset the safety and attempt to restart.

No external circulation

Check for obstructions, kinks, or leaks in the circulation tubing.

Circulation will cease when the pump head pressure has been exceeded.

Check the high temp safety. Ensure the correct fluid level in the bath is between baffle marks and the high temp setting is greater than the bath temperature. Reset the safety and attempt to restart.

Loss of Cooling Capacity

Be sure the refrigeration is on and the temperature set to the desired value.



Never operate the compressor when the bath temperature is above 45°C.

Check the position of the temperature programmer toggle switch.

Be sure the cooling capacity of the unit has not been exceeded if circulating to an external system.

When the unit is shut off, wait approximately ten minutes before restarting. This allows time for the refrigeration pressures to equalize. If the pressures are not allowed to equalize, the compressor will short-cycle (clicking sound) and no cooling will occur.

Proper ventilation is required for heat removal. Make sure ventilation through the unit is not impeded and free of dust and debris.

Ice build up on the cooling coil can act as insulation and lower the cooling capacity. Raise the temperature of the bath to deice the cooling coil and increase the concentration of non-freezing fluid.

Loss of Heating Capacity

Be sure the refrigeration is off and the temperature set to the desired value.

Check the position of the temperature programmer toggle switch.

Check the fuses on the rear of the unit.

Service Assistance

If, after following these troubleshooting steps, your unit fails to operate properly, contact our Service Department for assistance. Our Service Department can also provide you with list of spare parts for your unit (see Preface, After-sale Support). Before calling, *please* obtain the following information:

BOM number

Serial Number

Voltage of power source

WARRANTY

NESLAB Instruments, Inc. warrants for 12 months from date of shipment any NESLAB unit according to the following terms.

Any part of the unit manufactured or supplied by NESLAB and found in the reasonable judgment of NESLAB to be defective in material or workmanship will be repaired at an authorized NESLAB Repair Depot without charge for parts or labor. The unit, including any defective part must be returned to an authorized NESLAB Repair Depot within the warranty period. The expense of returning the unit to the authorized NESLAB Repair Depot for warranty service will be paid for by the buyer. NESLAB's responsibility in respect to warranty claims is limited to performing the required repairs or replacements, and no claim of breach of warranty shall be cause for cancellation or rescission of the contract of sales of any unit.

With respect to units that qualify for field service repairs, NESLAB's responsibility is limited to the component parts necessary for the repair and the labor that is required on site to perform the repair. Any travel labor or mileage charges are the financial responsibility of the buyer.

The buyer shall be responsible for any evaluation or warranty service call (including labor charges) if no defects are found with the NESLAB product.

This warranty does not cover any unit that has been subject to misuse, neglect, or accident. This warranty does not apply to any damage to the unit that is the result of improper installation or maintenance, or to any unit that has been operated or maintained in any way contrary to the operating or maintenance instructions specified in NESLAB's Instruction and Operation Manual. This warranty does not cover any unit that has been altered or modified so as to change its intended use.

In addition, this warranty does not extend to repairs made by the use of parts, accessories, or fluids which are either incompatible with the unit or adversely affect its operation, performance, or durability.

NESLAB reserves the right to change or improve the design of any unit without assuming any obligation to modify any unit previously manufactured.

THE FOREGOING EXPRESS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

NESLAB'S OBLIGATION UNDER THIS WARRANTY IS STRICTLY AND EXCLUSIVELY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE COMPONENT PARTS AND NESLAB DOES NOT ASSUME OR AUTHORIZE ANYONE TO ASSUME FOR IT ANY OTHER OBLIGATION.

NESLAB ASSUMES NO RESPONSIBILITY FOR INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO LOSS OR DAMAGE TO PROPERTY, LOSS OF PROFITS OR REVENUE, LOSS OF THE UNIT, LOSS OF TIME, OR INCONVENIENCE.

This warranty applies to units sold in the United States. Any units sold elsewhere are warranted by the affiliated marketing company of NESLAB Instruments, Inc. This warranty and all matters arising pursuant to it shall be governed by the law of the State of New Hampshire, United States. All legal actions brought in relation hereto shall be filed in the appropriate state or federal courts in New Hampshire, unless waived by NESLAB.