

RTE-200 & RTE-300 Refrigerated Baths/Circulators

NESLAB Manual P/N U00094

Rev. 03/05/97

Instruction and Operation Manual

NESLAB online

Product Service Information, Electronic Catalog,
Applications Notes, MSDS Forms, e-mail.

(603)427-2490

Set modem to 8-N-1 protocol, 1200 - 14400 baud

Voice Info: (800) 4-NESLAB

Comments on this manual can be sent to:

NESLAB@lifesciences.com

or visit our Web page at:

<http://www.neslabinc.com>



RTE-200 & RTE-300 Refrigerated Circulator Instruction and Operation Manual

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Preface

Compliance

Products tested and found to be in compliance with the requirements defined in the EMC standards defined by 89/336/EEC as well as Low Voltage Directive (LVD) 73/23/EEC can be identified by the CE label on the rear of the unit. The testing has demonstrated compliance with the following directives:

LVD, 73/23/EEC	Complies with UL 3101-1:93
EMC, 89/336/EEC	EN 55011, Class A Verification EN 50082-1:1992 IEC 1000-4-2:1995 IEC 1000-4-3:1994 IEC 1000-4-4:1995

For any additional information refer to the Letter of Compliance that shipped with the unit (Declaration of Conformity).

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 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. If your unit fails to operate properly, or if you have questions concerning spare parts or Service Contracts, contact our Service

Department. Before calling, please obtain the following information from the unit's serial number label:

- *BOM number* _____

- *Serial number* _____

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.

Transport the unit with care. Sudden jolts or drops can damage the refrigeration lines.

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

Never operate the unit without fluid in the circulator.

Use tap water unless operating above 80°C. Above 80°C use Dow 200 silicon oil.

For 220-240 volt units supplied without a line cord, use a harmonized (HAR) grounded 3-conductor cord, type H05VV-F. A suitable cord end is needed for connecting to the equipment (see unit socket) and must terminate with an IEC approved plug for proper power supply connection.

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 circulator before moving the unit.

Never operate equipment with damaged line cords.

Refer service and repairs to a qualified technician.

In addition to the safety 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, personal injury or death.

General Information

Description

The RTE Refrigerated Circulators are designed to provide temperature control for applications requiring a fluid work area or pumping to an external system.

The units consist of a circulation pump, stainless steel reservoir, a work area cover, and a temperature controller.

Specifications

Temperature Range °C¹

*Digital
Programmable*

Temperature Stability²

Pumping Capacity

Cooling Capacity¹

*@ +20°C
@ 0°C
@ -10°C
@ -20°C*

Heater Watts

Circulator Work Area

*(L x W x D)
Inches
Centimeters*

Reservoir Volume

*Gallons
Liters*

Case Dimensions

*(L x W x D)
Inches
Centimeters*

Unit Weight

*Pounds
Kilograms*

	RTE-200	RTE-300
	-20 to +200 -20 to +200	-30 to +200 -30 to +200
	±0.01	
	12 lpm at 0' (0 M) 0 lpm at 7' (2 M)	
	175 watts 100 watts 75 watts N/A	545 watts ⁴ 400 watts N/A 165 watts
	1000 @ 230V	
	5¼ x 8 x 5½ 13.3 x 20.3 x 14.0	5¼ x 9 x 8 13.3 x 22.9 x 20.3
	1½ 6	3 ⁷ / ₁₆ 13
	15¾ x 9¼ x 21¼ 40.0 x 23.3 x 54	17 ⁵ / ₈ x 15 x 26 44.8 x 38.1 x 66.0
	73 33	120 54

1. Low-end temperatures and cooling capacities achieved using a fluid with a specific gravity of 0.5.
2. Stability is measured at fluid temperature of 20°C, ambient of 20°C, with tap water as the fluid and not in maximum cooling mode.
3. Pumping capacity for units operating at fluid temperature of 20°C, ambient of 21°C, with tap water as the fluid.
4. 20°C heat load data taken in maximum cooling mode.

Installation

Site



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

Locate the unit on a sturdy table or bench top. Ambient temperatures should be inside the range of +50°F to +89.6°F (+10°C to +32°C).

The unit has an air-cooled refrigeration system. Air is drawn through the front panel and discharged through the rear panel. The unit must be positioned so the air intake and discharge are not impeded. A minimum clearance of 12 inches (30 centimeters) at the front and rear of the unit is necessary for adequate ventilation. Inadequate ventilation will reduce cooling capacity and, in extreme cases, can cause compressor failure.

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

Electrical Requirements



Line voltage may be easily accessible inside the pump/control box. Always unplug the unit prior to removing the pump/control box cover.



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 the user's responsibility to assure a proper ground connection is provided.



For 220 - 240 volt units supplied without a line cord, use a harmonized (HAR) grounded 3-conductor cord, type H 0 5 V V - F . A suitable cord end is required for connecting to the equipment (see unit socket) and must terminate with an IEC approved plug for proper connection to power supply.

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, $\pm 10\%$.

Plumbing Requirements



Ensure the unit is off before connecting tubing to the unit.

Hose Connections

The pump connections are located at the rear of the pump box and are labelled INLET and OUTLET. The connections are capped with stainless steel serrated plugs.

The pump lines have ¼ inch male pipe threads for mating with standard plumbing fittings. For your convenience two stainless steel adapters, ¼ inch female pipe thread to ⅜ inch O.D. serrated fitting, are provided. (To assure proper fit, they should be installed using Teflon® tape around the threads.)

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 to prevent loss of cooling capacity.

It is important to keep the distance between the unit and the external system as short as possible, and to use the largest diameter tubing practical. Tubing should be straight and without bends. If diameter reductions must be made, make them at the inlet and outlet of the external system, not at the unit.

If substantial lengths of cooling lines are required, they should be pre-filled with bath fluid before connecting them to the unit. This will ensure that a adequate amount of fluid will be in the circulator once it is in operation.

Pumping

The pump is designed to deliver a flow of 12 liters/minute at 0 feet head. To prevent external circulation, the INLET and OUTLET lines are capped. The caps must be removed when external circulation is required.

To properly secure the external hose connections to the unit, wrap Teflon® tape around the pipe line threads before installation. Once the hose connections are made, the pump must be properly plumbed to an external system. *It is important the circulator is not in operation until all plumbing is complete.*

If the circulator is not used for external circulation, make sure the stainless steel caps are in place prior to operating the circulator.

Fluids



Never use flammable or corrosive fluids with this unit.

Tap water is the recommended fluid for operation from 7°C to +80°C.

Above +80°C, Dow 200® silicon oil is recommended.

For operation below 7°C, a 50/50 mixture, by volume, of tap water and laboratory grade ethylene glycol is suggested.



Never use pure ethylene glycol as a fluid. A minimum 80/20 mixture of Ethylene Glycol and tap water is allowed.

Filling Requirements

The circulator work area has a high and low level marker to guide filling. The markers are 1 inch horizontal slits located in the center of the stainless steel baffle separating the work area and the pump assembly. The correct fluid level falls between these two markers. The heating and cooling coils will be exposed and may become damaged if the correct fluid level is not provided.

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



Never run the unit when the work area is empty.

Controllers

Controllers

Two temperature controllers are available with the unit: Digital and Microprocessor. This section explains the installation and operation of each.

Start Up

Before starting the unit, check all electrical and plumbing connections and make sure the work area has been properly filled with fluid.

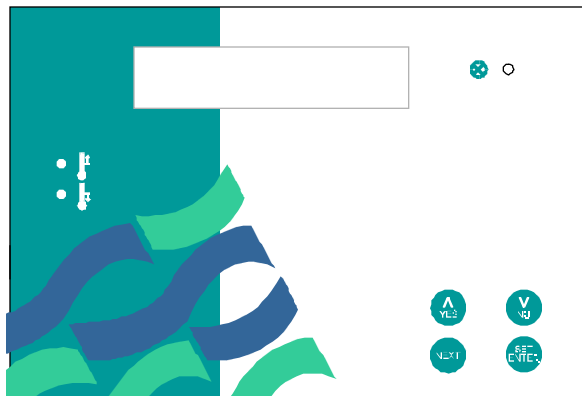
To start any unit place the I/O switch on the side of the controller to the I (power on) position. The pump will start and the controller display will light.

NOTE: When the unit is shut off, wait approximately five 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.

Digital Controller

The digital controller consists of a seven-segment LCD Main Display with contrast control, heating/cooling status indicators, a four-button keypad and user adjustable 0.1° or 0.01° display resolution. It also features on/off refrigeration control, automatic min/max refrigeration control, audio/visual alarm messages, user selected high/low temperature limits and a user-adjustable Proportional, Integral and Derivative (PID) control.

NOTE: The refrigeration turns off when operating above 35°C.



Main Display

The LCD Main Display normally indicates the fluid temperature as well as the current setpoint temperature.

Key Button Definition

SET is used to change the current value or status of a function within the software.

ENTER is used to "accept" the new value or function.

YES is used to confirm a question asked within the software.

NO is used to reject or change a function within the software.

NEXT is used as a means to quickly scroll through the software loops and settings.

The up and down arrow keys are used to change a numeric value.

Changing Setpoint

To change the setpoint, press **SET**. The current setpoint will flash. Use the keys to change the setpoint. Scrolling includes three speed acceleration. Press **ENTER** to accept the new setpoint. **NOTE:** If you do not press **ENTER**, a time out will occur 30 seconds after the last key is pressed and the old setpoint will be used.

Setup Loop

The setup loop is used to enable cooling, change the display resolution, change the temperature scale, change temperature limits and adjust the PID control.

To enter the setup loop, press and hold **NEXT** for three seconds. The display will indicate SETUP LOOP? **NOTE:** Pressing **NO** will display the software version number and then return to the Main Display. A time out will occur 60 seconds after the last key is pressed and the display will revert to the Main Display.

Press **NEXT** or **YES** to display COOLING ENABLED PRESS NO TO CHANGE. Press **NO** to toggle between cooling enable and disable.

Press **NEXT** to display RESOLUTION = 0.01 PRESS NO TO CHANGE. Press **NO** to toggle the resolution between 0.1° and 0.01° resolution.

Press **NEXT** to display UNITS ARE C PRESS NO TO CHANGE. Press **NO** to toggle the scale between Fahrenheit (F), Celsius (C) or a user (U) scale.

NOTE: The following is displayed only if a user (U) scale was selected. Press **NEXT** to display $U = K1(C + K2) + K3$ Kn=xxx.x. Press **SET** and then use the arrow keys to change the K values.

Press **NEXT** to display HIGH T LIMIT xxx.xx°C LOW T LIMIT xxx.xx°C. Press **SET** to be able to use the arrow keys to change the high temperature limit. Press **ENTER** to accept the new value. Press **SET** again to be able to change the low temperature limit. Press **ENTER** to accept the new value.

NOTE: To bypass changing the high temperature value press **SET SET** when HIGH T LIMIT xxx.xx°C LOW T LIMIT xxx.xx°C is initially display.

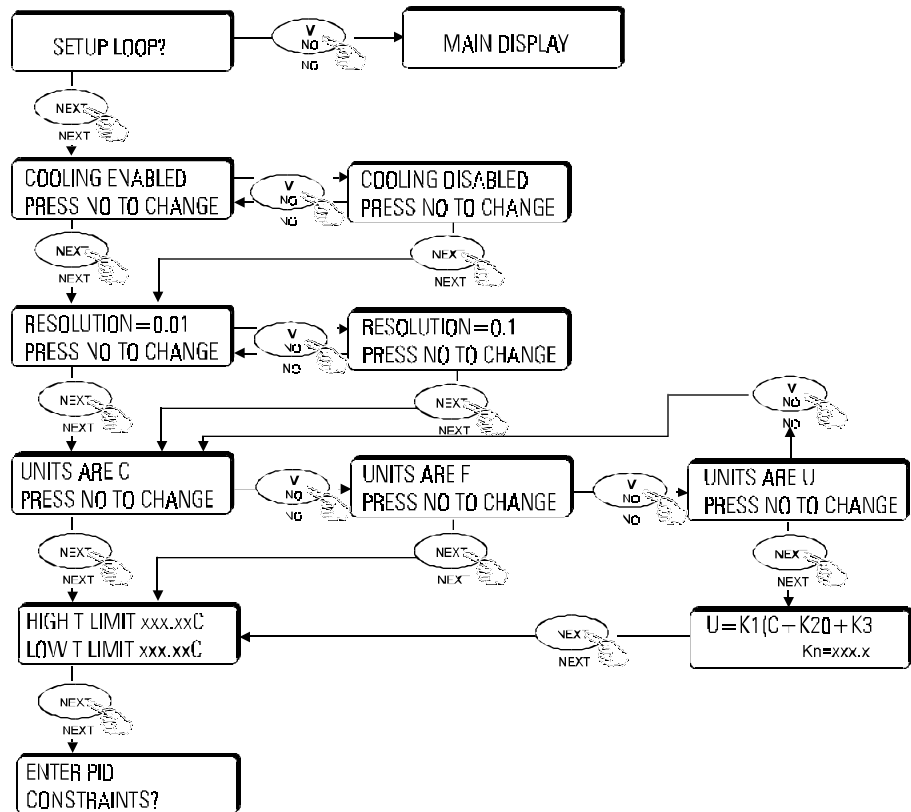
NEXT to display ENTER PID CONSTANTS? Press **NO** to bypass changing the constants and display **SAVE SETUP?** Press **YES** or **NEXT** to display **PROPORTIONAL TERM P = xx.x% OF SPAN**. Press **SET** and then use the arrow keys to change the value.

Press **NEXT** to display INTEGRAL TERM I = x.xx REPEATS/MIN. Press **SET** and then use the arrow keys to change the value.

Press **NEXT** to display DERIVATIVE TERM D = x.xx MINUTES. Press **SET** and then use the arrow keys to change the value.

Press **NEXT** to display MAX COOLING DISABLED PRESS NO TO CHANGE. **NOTE:** Applicable to RTE-300 only. RTE-300s are equipped with a min/max cooling solenoid. With large heat loads it may be necessary to enable max cooling. Press **NO** to toggle between modes.

Press **NEXT** to display SAVE SETUP? PRESS YES OR NO. Press **YES** to accept the changes. Press **NO** to ignore them. With either choice the unit will return to the main display.



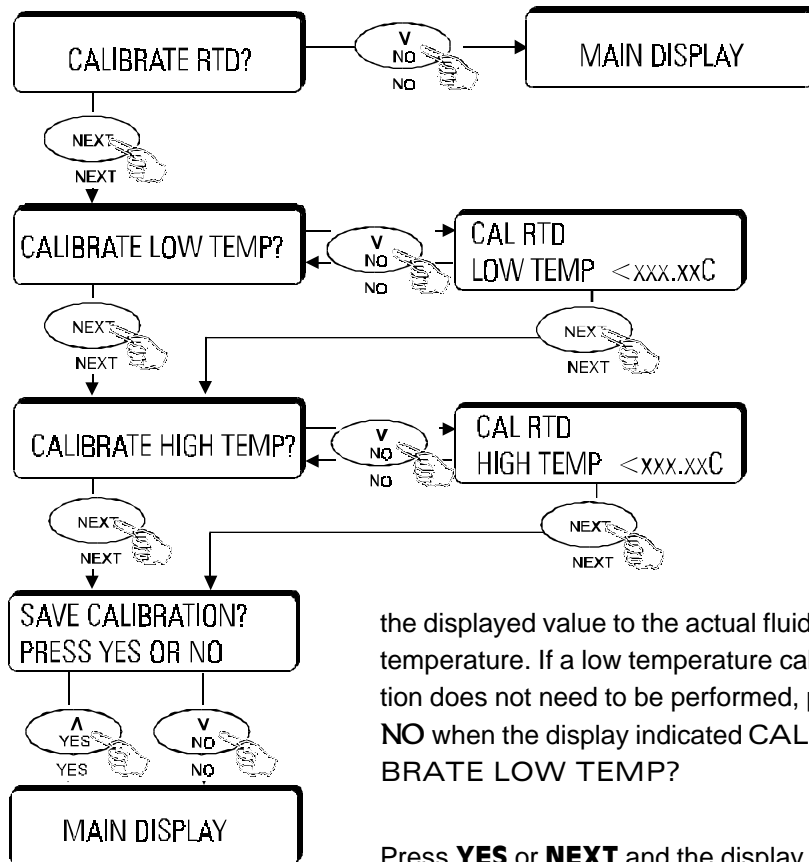
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Calibration Loop

Use the calibration loop to calibrate the RTD temperature probe. The wider the temperature spread used, the more accurate the calibration. **NOTE:** Changing the factory set calibration will affect the accuracy of the controller. A time out is not used in this loop.

To enter the calibration loop, from the main display press and hold **NEXT** while pressing, within three seconds, **ENTER - NO - ENTER**. The display will indicate CALIBRATE RTD?

Press **NO** to return to the main display or press **NEXT** and the display indicates CALIBRATE LOW TEMP?. To perform a low temperature calibration press **YES** or **NEXT** and the display will indicate CAL RTD LOW TEMP xxx.xx°C. Press **SET** and then use the arrow keys to change



the displayed value to the actual fluid temperature. If a low temperature calibration does not need to be performed, press **NO** when the display indicated CALIBRATE LOW TEMP?

Press **YES** or **NEXT** and the display indicates CALIBRATE HIGH TEMP?

To perform a high temperature calibration press **NEXT** and the display will indicate CAL RTD HIGH TEMP xxx.xx°C. Press **SET** and then use the arrow keys to change the displayed value to the actual fluid temperature. If a high temperature calibration does not need to be performed, press **NO** when the display indicated CALIBRATE HIGH TEMP?

Press **NEXT** and the display will indicate SAVE CALIBRATION PRESS YES OR NO. Press **YES** to save the changes, press **NO** to ignore them. With either choice the unit will return to the main display.

Microprocessor Controller

The microprocessor controller consists of a seven-segment LCD with contrast control, heating/cooling status indicators, a 12-button keypad and user adjustable 0.1° or 0.01° temperature display resolution, external sensor input with automatic switching in the event of external sensor failure. It also features automatic on/off refrigeration control, automatic min/max refrigeration control, audio/visual alarm messages, automatic fixed temperature limit, user selected high/low temperature limits, programmable temperature profile, RS-232 communication and a user-adjustable Proportional, Integral and Derivative (PID) control.

Main Display

The LCD normally indicates the fluid temperature as well as the current setpoint temperature, or the external temperature and setpoint.



Key Button Definition

SET is used to change the current value or status of a function within the software.

ENTER is used to "accept" the new value or function.

YES is used to confirm a question asked within the software.

NO is used to reject or change a function within the software.

NEXT is used as a means to quickly scroll through the software loops and settings.

± is used to change the current numeric value from positive to negative, or negative to positive.

SETUP is used to enter the controller's setup loop.

PROG is used to enter the controller's program loop.

ESC is used to backtrack to the previous screen within a software loop.

The up and down arrow keys are used to change a numeric value.

1 - 9 keys are used to enter a number.

Press **YES** or **NEXT** to display the temperature, step number and time duration. Steps start at 0. Press **SET ENTER** and using the keypad enter the setpoint temperature. Press **SET ENTER**. Press **SET ENTER** and enter the number of hours. Press **SET ENTER**. Press **SET ENTER** and enter the number of minutes. Press **SET ENTER**.

NOTE: Step time starts when the fluid temperature gets within 0.5°C of the current setpoint.

The display will increment to step 1. Repeat the procedure for the total number of desired steps. To skip a number press **SET ENTER** twice. To end a program with fewer than ten steps, enter 0 hours and 0 minutes.

Press **NEXT** to display the number of program repetitions. Press **SET ENTER** and enter the number of reps. Press **SET ENTER**. Press **SET ENTER** and enter the final setpoint for the program. Press **SET ENTER**.

Press **NEXT** to display EDIT PROGRAM B? Use the same procedures.

Press **NEXT** to display SAVE PROGRAMS? Press **YES** to save or **NO** to ignore. The unit returns to the main display.

With program(s) saved, when the display reads RUN PROGRAM pressing **YES** will start the program, pressing **NO** will stop it. With either choice the unit returns to the main display.

Setup Loop

NOTE: The setup loop is not accessible if a program is running. If RS-232 communications is enabled, only the RS-232 portion of the setup loop is active.

The setup loop is used to enable refrigeration, change the display resolution, change the temperature scale, change temperature limits, adjust the PID control, select internal or external probe, enter the maximum internal and external temperature difference and enable RS-232 communications.

To enter the setup loop from the main display, press and hold **SETUP** for three seconds. The display will indicate **SETUP LOOP?** **NOTE:** A time out will occur 60 seconds after the last key is pressed and the display will revert to the fluid temperature.

Press **YES** or **NEXT** to display **REFRIGERATION OFF WHEN SETPOINT > xxC**. Use the keypad to display the desired temperature.



The refrigeration system is not designed to operate above 35°C.

Press **NEXT** to display **RESOLUTION = 0.01 PRESS NO TO CHANGE**. Press **NO** to toggle between 0.1°C and 0.01°C display resolution, press **YES** or **NEXT** to maintain the displayed resolution.

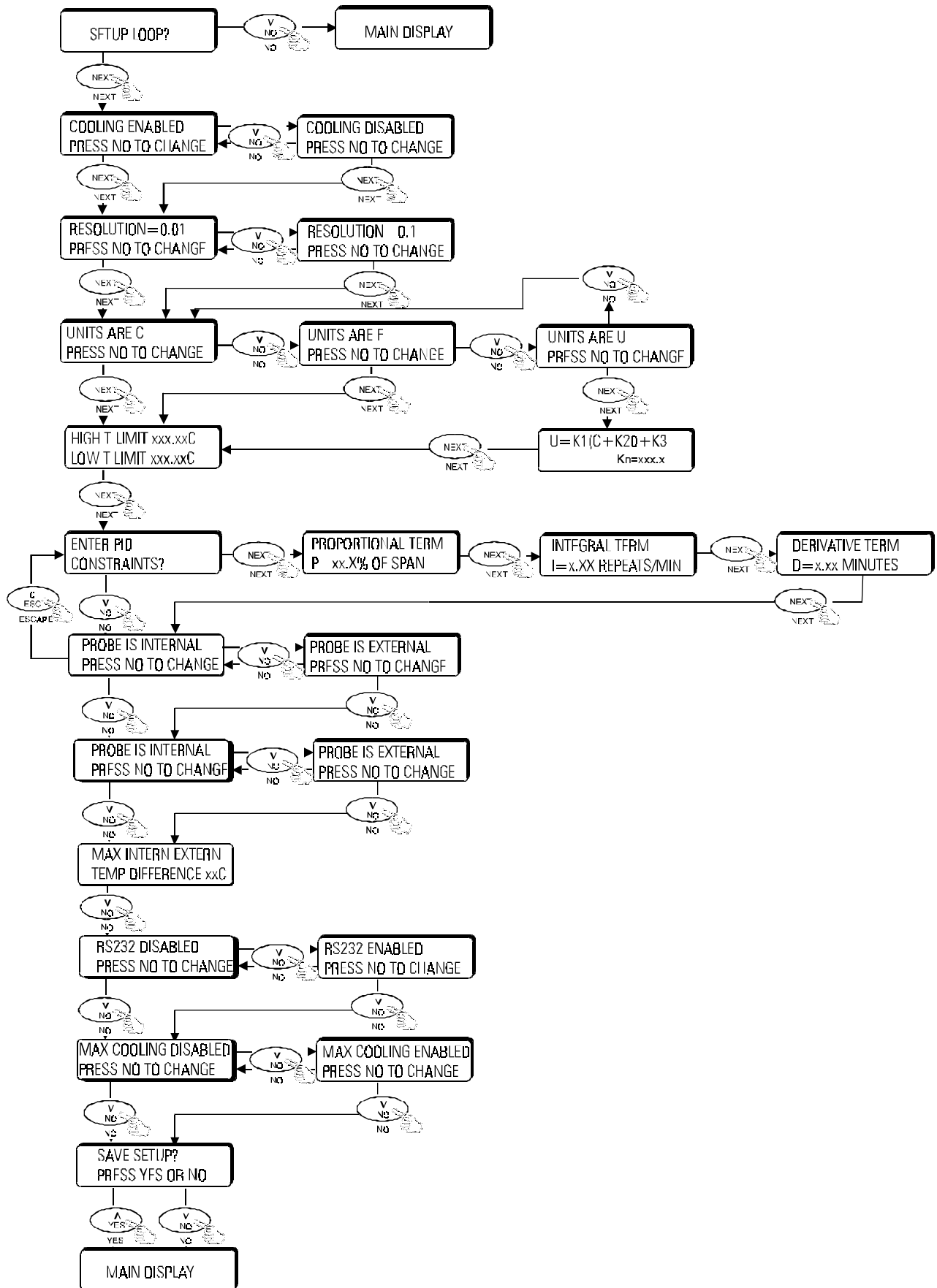
Press **NEXT** to display **UNITS ARE C PRESS NO TO CHANGE**. Press **NO** to toggle between temperature scales Celsius (C), Fahrenheit (F) and a user defined (U) scale. Press **YES** or **NEXT** to maintain the displayed scale.

NOTE: The following is displayed only if a user (U) scale was selected. Press **NEXT** to display **U = K1(C + K2) + K3 Kn=xxx.x**. Press **SET ENTER** and use the keypad to change the values.

Press **NEXT** to display **HIGH T LIMIT xxx.xxC LOW T LIMIT xxx.xxC**. Press **SET ENTER** and enter the high temperature limit. Press **SET ENTER** to accept the new value. Press **SET ENTER** again to be able to change the low temperature limit. Press **SET ENTER** to accept the new value. **NOTE:** To bypass changing the high temperature value press **SET ENTER** twice when **HIGH T LIMIT xxx.xxC LOW T LIMIT xxx.xxC** is initially display.

Press **NEXT** to display **ENTER PID CONSTANTS?** Press **NO** to bypass changing the constants and display **PROBE IS INTERNAL PRESS NO TO CHANGE** or press **NEXT** to display **PROPORTIONAL TERM P = xx.x% OF SPAN**. Press **SET ENTER** and use the keypad to enter the desired value.

Press **NEXT** to display **INTEGRAL TERM I = x.xx REPEATS/MIN**. Press **SET ENTER** and use the keypad to enter the desired value.



Press **NEXT** to display DERIVATIVE TERM D = x.xx MINUTES.
Press **SET ENTER** and use the keypad to enter the desired value.

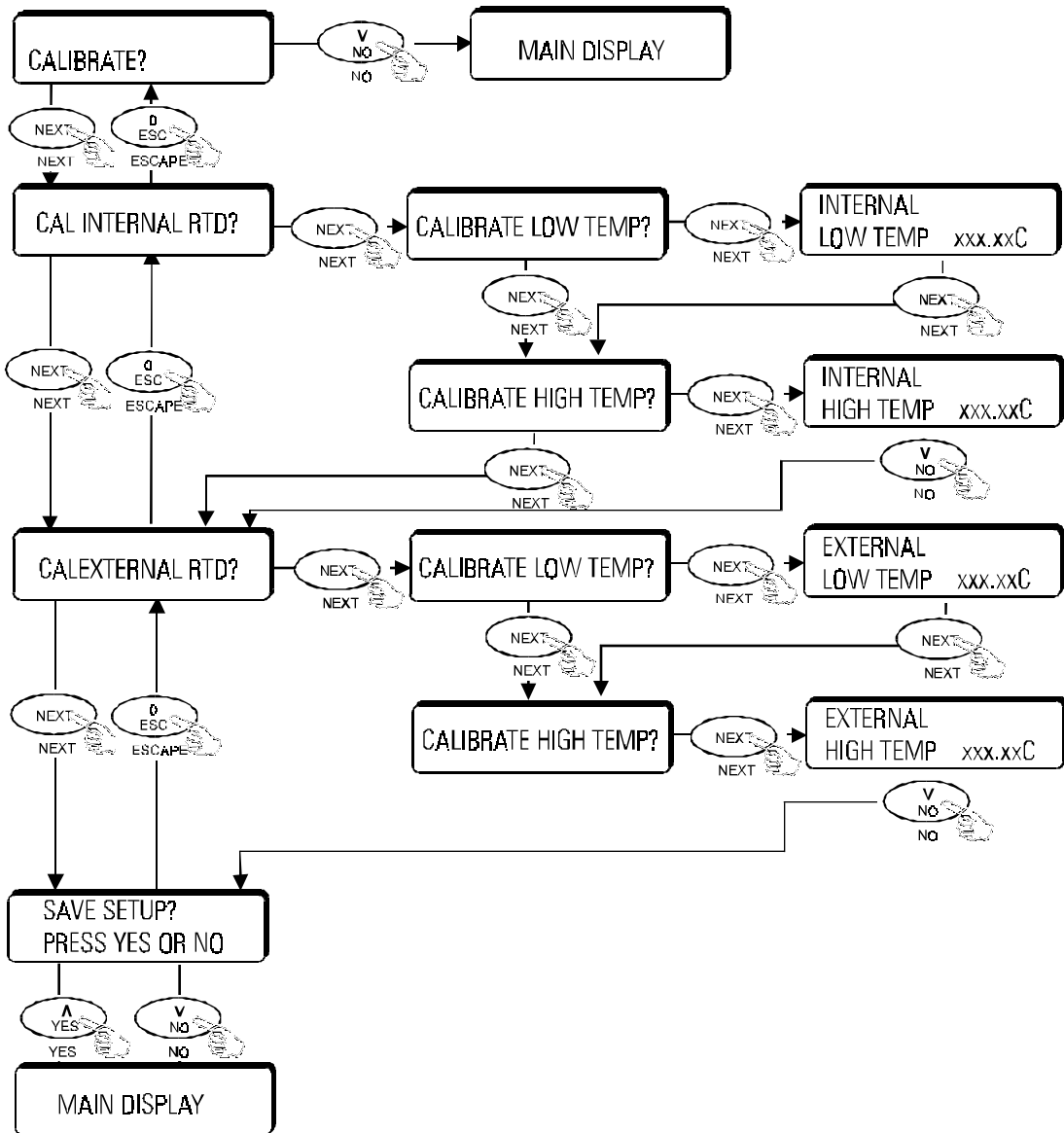
Press **NEXT** to display **PROBE IS INTERNAL PRESS NO TO CHANGE**.
Press **NO** to toggle between internal or external probe or press **YES** or
SET ENTER to use the displayed probe.

Press **NEXT** to display MAX INTERN EXTERN TEMP DIFFERENCE
xxC. This is the maximum temperature difference between the internal and
external probes. Use this to prevent the unit from running out of control in the
event the external probe is accidentally removed from the fluid. Press **SET
ENTER** and use the keypad to enter the desired value.

Press **NEXT** to display RS232 IS DISABLED PRESS NO TO
CHANGE. Press **NO** to toggle between disabled and enabled or press **YES**
or **SET ENTER** to use the displayed mode.

Press **NEXT** to display MAX COOLING DISABLED PRESS NO TO
CHANGE. **NOTE:** Applicable to RTE-300s only. RTE-300s are equipped
with a min/max cooling solenoid. With large heat loads it may be necessary to
enable max cooling. Press **NO** to toggle between disabled and enabled or
press **YES** or **SET ENTER** to use the displayed mode.

Press **NEXT** to display SAVE SETUP? PRESS YES OR NO. Press
YES to accept the changes. Press **NO** to ignore them. The unit will return to
the main display.



Calibration Loop

NOTE: The calibration loop is not accessible if a program is running or if RS-232 communications is enabled.

Use the calibration loop to calibrate the internal and external RTD temperatures. **NOTE:** Changing the factory set calibration will affect the accuracy of the controller. A time out is not used in this loop.

To enter the calibration loop, from the main display press and hold **NEXT** while pressing **ESC - ENTER - ESC**. The display will indicate CALIBRATE?

Press **NO** to return to the main display. Press **YES** or **NEXT** and the display indicates CALIBRATE INTERNAL RTD? Press **YES** or **NEXT** and the display indicates CALIBRATE LOW TEMP? Press **NEXT** and the display indicates INTERNAL LOW TEMP xxx.xx°C. To perform a low tem-

perature calibration press **SET** and use the keypad to change the value. If the values did not need to be changed, press **NO** when the display indicated CALIBRATE LOW TEMP?

Press **NEXT** and the display indicates CALIBRATE HIGH TEMP? Press **NEXT** and the display indicates INTERNAL HIGH TEMP xxx.xx°C. To perform a high temperature calibration press **SET** and use the keypad to change the value. If the values did not need to be changed, press **NO** when the display indicated CALIBRATE HIGH TEMP?

Press **NEXT** and the display indicates CALIBRATE EXTERNAL RTD? Press **NEXT** and the display indicates CALIBRATE LOW TEMP? Press **NEXT** and the display indicates EXTERNAL LOW TEMP xxx.xx°C. To perform a low temperature calibration press **SET** and use the keypad to change the value. If the values did not need to be changed, press **NO** when the display indicated CALIBRATE LOW TEMP?

Press **NEXT** and the display indicates CALIBRATE HIGH TEMP? Press **NEXT** and the display indicates EXTERNAL HIGH TEMP xxx.xx°C. To perform a high temperature calibration press **SET** and use the keypad to change the value. If the values did not need to be changed, press **NO** when the display indicated CALIBRATE HIGH TEMP?

Press **NEXT** and the display will indicate SAVE CALIBRATION? PRESS YES OR NO. Press **YES** to save the changes, press **NO** to ignore them. The unit will return to the main display.

RS232 Serial Communications Protocol

Baud rate: 9600
Parity: none
Data bits: 8
Stop bits: 1
Flow control: none

Commands (uppercase only):

? help
A1 reports "OK" to indicate that RS232 is enabled
S? report temperature setpoint
Sn change temperature setpoint to n
F? report bath temperature
U? report bath temperature units (C, F or U)
C change temperature units to °C
F change temperature units to °F
U change temperature units to °U (user defined units)
&LH? report high temperature limit
&LL? report low temperature limit
&LHn change high temperature limit to n
&LLn change low temperature limit to n
&P? report temperature resolution (number of decimal places)
&Pn change temperature resolution (1 or 2)
&R? report refrigeration off temperature
&Rn change refrigeration off temperature to n
&X? report controlling temperature probe
&Xn change controlling temperature probe (0/1 = internal/external)
&D? report maximum internal/external differential temperature
&Dn change maximum internal/external differential temperature to n

High Temperature/ Low Liquid Level Safety

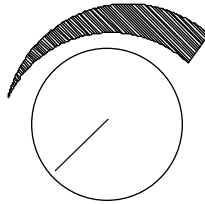
To protect your application, the adjustable High Temperature/Low Liquid Level Safety (HIGH TEMP/LOW LEVEL) ensures the heater will not exceed temperatures which can cause serious damage to your unit. A single temperature sensor, located on the heater coils in the circulator, monitors both conditions. A High Temperature/Low Liquid Level fault occurs when the temperature of the sensor exceeds the set temperature limit.

In the event of a fault, the unit will shut down and a FAULT LED will illuminate. The cause of the fault must be identified and corrected before the unit can be restarted.

To set the safety, locate the HIGH TEMP/LOW LEVEL SAFETY adjustment dial in back of the pump box. Turn the dial fully clockwise and turn the I/O switch on the side of the controller off then back on.

Start the unit. Adjust the setpoint for a few degrees higher than the highest desired fluid temperature and allow the circulator to stabilize at the temperature setpoint. Turn the HIGH TEMP/LOW LEVEL SAFETY dial counterclockwise until you hear a click and the unit shuts down. The red FAULT LED on the temperature controller will light to indicate a fault has occurred.

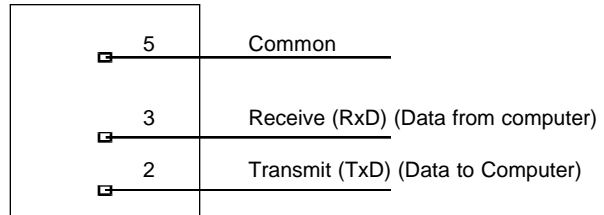
Cool the circulator and then, without moving the adjustment dial, turn the unit off and then back on.



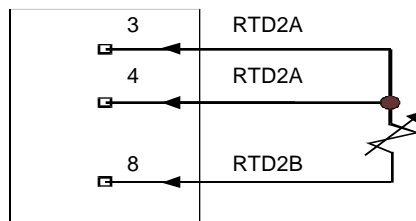
DB9 Connector Pinouts

Programmable units are equipped with DB9 connectors in back of the pump box.

RS232 Connections DB9 Female (J3)



External RTD DB9 Male (P2)



Maintenance & Troubleshooting



To avoid electrical shock, disconnect the mains cord prior to removing any access panels or covers.

Cleaning



Turn the unit off before cleaning.

Routine cleaning can be achieved by simply sponging down the seamless stainless steel tank with a mild soapy solution.



Do not use steel wool; its abrasiveness will lead to rusting.

Dry the circulator using a soft cloth.

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

Periodic vacuuming of the condenser is necessary. The frequency of cleaning depends on the operating environment. After initial installation we recommend the wrapper be removed and a monthly visual inspection of the condenser be made. After several months the frequency of cleaning will be established.

Algae

To restrict the growth of algae in the circulator, we recommend the circulator cover be kept in place and that all circulation lines be opaque. This will eliminate the entrance of light required for the growth of most common algae.

NESLAB recommends the use of Chloramine-T, one gram per gallon.

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 Temperature/Low Liquid Level Safety. If the FAULT light is on, make sure the fluid level in the circulator is between the marks in the baffle and the HIGH TEMP/LOW LEVEL SAFETY setting is greater than the fluid temperature. Turn the unit's I/O switch off then back on to reset the safety.

Loss of cooling capacity

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 five 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 front and rear panels is not impeded and the panels are free of dust and debris.

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

No external circulation

Make sure the stainless steel plugs on the PUMP INLET and PUMP OUTLET have been removed.

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

Circulation will cease when the pump head has been exceeded.

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 OF 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.