System II Liquid to Liquid Heat Exchanger

Pump Motors for affinity:
Marthon carbonator:
5KH32FN5598X (original affinity)
5KH33GNA444X (in NesLabs)
5KH32GNB811X (cheap version)
GE 3K987 or 5U256 or 5U257 or 5U255
1725

Instruction and Operation Manual

NESLAB Instruments, Inc.
25 Nimble Hill Road
Newington, New Hampshire 03801

NESLAB P/N 013565
Rev. 01/31/91

System II Liquid to Liquid Heat Exchanger Instruction and Operation Manual

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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

All NESLAB units are shipped with a warranty card. The top portion of the card remains with the unit. The bottom portion must be filled out and returned to NESLAB.

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

North American and European NESLAB Sales and Service Centers are open 8:00 am to 5:00 pm (in their respective time zones), Monday through Friday.

Thermo-electron

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NESLAB Instruments, Inc.
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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 (see After-sale Support).

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

Never operate the unit without cooling fluid in the reservoir.

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

Always empty the reservoir before moving the unit.

Always turn off the unit and disconnect the line cord from the power source before moving the unit.

Never operate equipment with damaged line cords.

Section II General Information

Description

The System II Liquid to Liquid Heat Exchanger uses building recirculating or tap water as the secondary cooling medium to remove heat from the cooling fluid in the closed circulation loop.

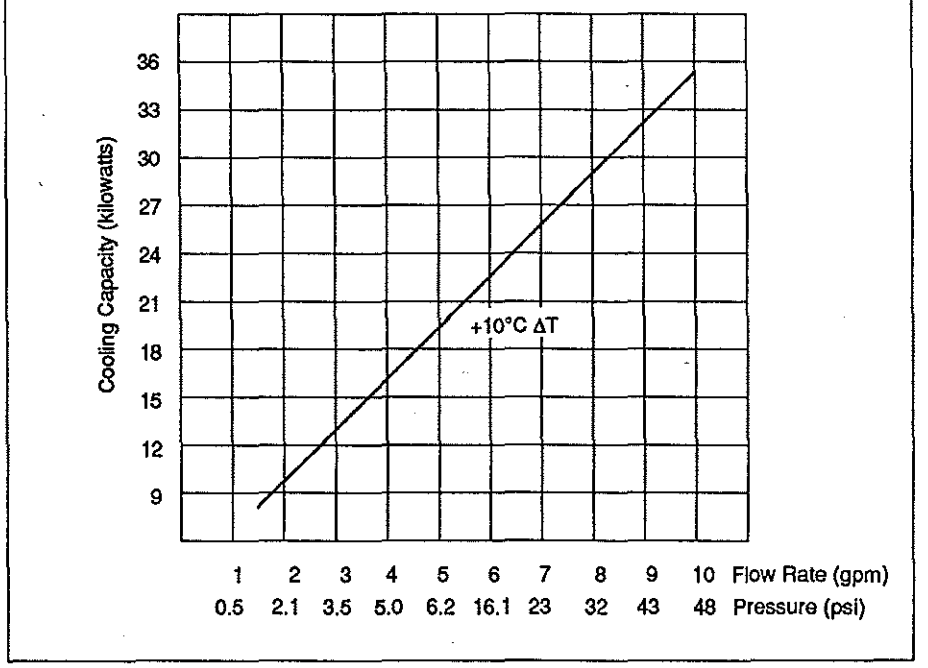
The unit consists of a heat exchanger, recirculation pump, stainless steel reservoir, and an analog temperature controller.

The System II is available with two different plumbing configurations: single circulation loop, and dual circulation loop.

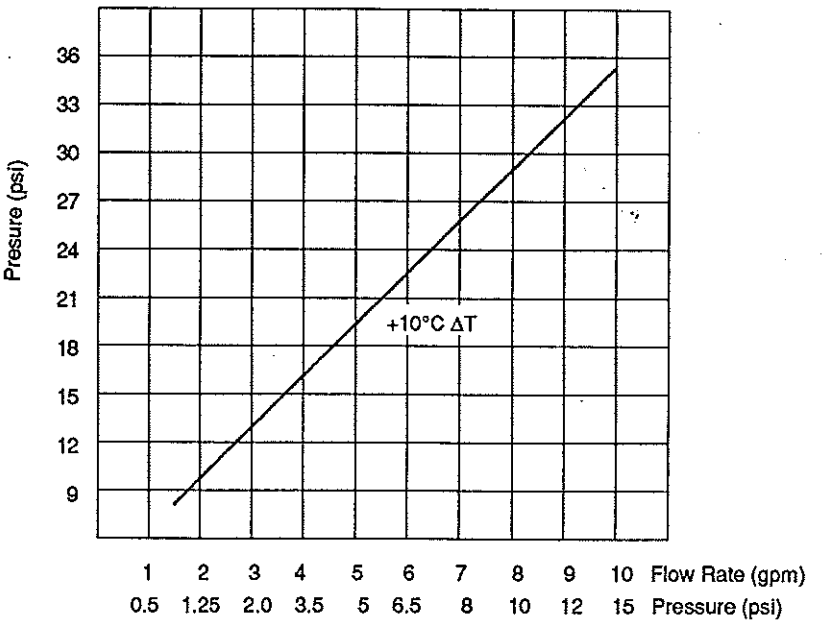
The single circulation loop unit has two positive displacement pumps, plumbed to a single inlet and outlet. The front panel switches and gauges correspond to this loop.

The dual circulation loop unit has two positive displacement pumps, each plumbed to a separate inlet and outlet (A and B). The front panel switches and gauges labelled A, correspond with loop A. Front panel switches and gauges labelled B, correspond with loop B.

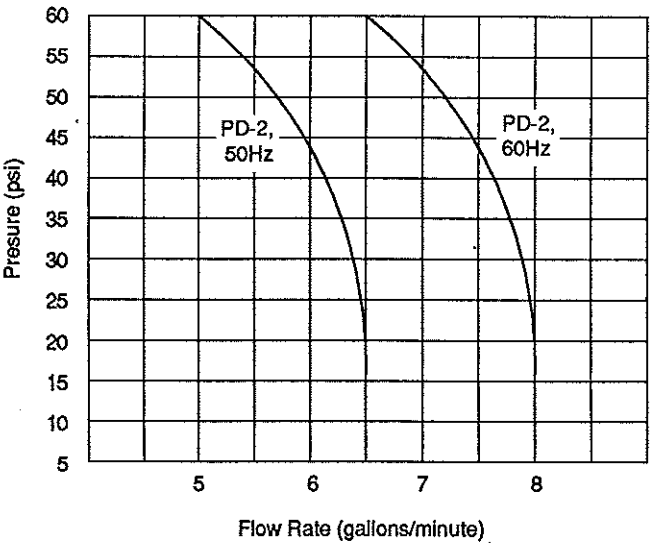
Specifications

Temperature Range	+10°C to +30°C
Temperature Stability[1]	±1.0°C
Cooling Capacity[1,2,3]	

Cooling Capacity[1,2,4]



Pump Capacity[1]



Reservoir Volume	
Gallons	1.75
Liters	6.6
Unit Dimensions	
(H x W x D)	
Inches	29.5 x 16.0 x 18.0
Centimeters	74.9 x 40.6 x 45.7

1. Specifications listed are for a standard unit, +20°C fluid temperature, with tap water as the cooling fluid.
2. Cooling capacity is based on a 10°C difference between the temperature of the cooling water supply and the cooling fluid returning from the instrument being cooled (see Section III, Facility Water Requirements).
3. Units with a single circulation loop.
4. Units with a dual circulation loop.

Section III Installation

Site

The unit should be placed in a location with easy access to a cooling water source and a drain. Never place the unit in a location where excessive heat, moisture, or corrosive materials are present.

Facility Water Requirements

A control valve, located in the COOLING WATER INLET line, regulates the flow rate of the cooling water supply as it enters the unit. The valve regulates the flow rate based on the heat load. Flow through the unit is discontinued when the unit is shut off.

Refer to the Cooling Capacity chart in Section II, Specifications. The flow rate of the cooling water supply must meet or exceed these requirements for the unit to operate at its full rated capacity. If the cooling water does not meet these standards, the cooling capacity will derate. The chart is based on a 10°C difference between the temperature of the cooling water supply and the cooling fluid returning from the instrument being cooled.

As the heat load increases, the required flow rate of the cooling water supply increases. For example, if the heat load is 12 kilowatts, only 2.75 gallons per minute is required to remove the heat. However, if the heat load is 30 kilowatts, about 8.5 gallons per minute is required.

Electrical Requirements

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

Make sure the voltage of the power source meets the specified voltage, ±10%.

Plumbing Requirements

Before installing the unit to an instrument that previously used tap water as a cooling fluid, flush the instrument several times to remove any rust or scale that has built up. The manufacturer of the instrument should be able to recommend a cleaning fluid for their equipment.

The plumbing connections are located on the rear of the unit and are labelled COOLING WATER and PROCESS WATER. The COOLING WATER connections are 3/4 inch FPT. The PROCESS WATER connections are 1/2 inch MPT.

Connect the COOLING WATER connections to the cooling water supply.

Connect the PROCESS WATER connections to the instrument being cooled.

Flexible tubing, if used, should be of heavy wall or reinforced construction. All tubing should be rate to withstand 80 psi at +35°C. 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.

Tubing and insulation are available from NESLAB. Contact our Sales Department for more information (see Preface, After-sale Support).

It is important to keep the distance between the unit and the instrument being cooled 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, they should be made at the inlet and outlet of the instrument being cooled, not at the unit.

If substantial lengths of cooling lines are required, they should be pre-filled with cooling fluid before connecting them to the unit.

Fluids

Tap water is the recommended fluid for operation above 8°C.

Below +8°C, a non-freezing solution is required. A 50/50 mixture of laboratory grade ethylene glycol and water is suggested.

Do not use automobile anti-freeze. Commercial anti-freeze contains silicates that can damage the pump seals. Use of automobile anti-freeze will void the manufacturer's warranty.

Never use flammable or corrosive fluids with this unit.

Filling Requirements

The reservoir access cover is located on top of the unit. Fill the reservoir to within 1 inch of the top. Keep extra cooling fluid on hand until the entire system (the System II, the instrument being cooled and the tubing that connects them) is filled.

Section IV Operation

Start Up

Before starting the unit, double check all electrical and plumbing connections and make sure the circulating system has been properly filled with cooling fluid.

To start the unit, place the momentary OFF/ON/START switch in the START position. The recirculation pump will start and the POWER ON lamp will light.

If the unit does not continue to run when the OFF/ON/START switch is released, check the fluid level in the reservoir. The float switch in the reservoir prevents the unit from operating if the fluid level in the reservoir is below the operating level. If the fluid level is low, "top off" the reservoir and restart the unit.

Temperature Adjustment

The temperature of the cooling fluid is adjusted by turning the recessed valve screw located on top of the unit. Adjust the screw by inserting a screwdriver through the hole in the top. Turn the screw counter-clockwise to increase the temperature of the cooling fluid, clockwise to decrease the temperature.

The TEMPERATURE gauge on the front of the unit indicates the temperature of the fluid in the reservoir.

When selecting an operating temperature, remember that the lowest achievable temperature is a function of the available flow rate, the temperature of the cooling water supply, the heat load and the cooling fluid.

Section V Special Features

Low Fluid Level Monitor

The low fluid level monitor is connected to a float switch in the reservoir. A low fluid level fault occurs when the cooling fluid in the reservoir drops below the operating level.

In the event of a low fluid level fault, the unit will shut down, and the INTERLOCK contacts will open. For proper operation, the cause of the fault must be identified and corrected before the unit can be restarted, the fluid level must be restarted.

High Temperature Monitor

The high temperature monitor (HTC) is connected to a sensor that monitors the cooling fluid temperature as it exits the heat exchanger. The monitor protects the system from exposure to excessively hot cooling fluid. A temperature fault occurs when the cooling fluid temperature exceeds the set temperature limit.

In the event of a high temperature fault, the unit will shut down, and the INTERLOCK contacts will open. The cause of the fault must be identified and corrected before the unit can be restarted.

The monitor is not pre-set and must be adjusted during initial installation. The monitor is located on the rear of the unit.

A slotted adjustment screw is located in the center of the monitor. A temperature range scale surrounds the adjustment screw. The temperature scale is in °F.

To adjust the monitor, turn the adjustment screw until the pointer on the temperature scale corresponds to the desired temperature limit. A temperature limit ~50°F higher than the operating temperature is recommended.

INTERLOCK Contacts

A set of relay contacts is connected to a receptacle on the front panel. The contacts are rated 15A, 250V. This is not a power inlet or outlet. The receptacle is isolated from the circuitry. Its ground pin is connected to the chassis. The contacts are normally open: they are closed during normal operation and open when the unit is turned off or when a fault occurs.

Pressure Relief Valve

The pressure relief valve establishes the maximum operating pressure of the unit. If the pressure of the fluid leaving the pump exceeds the valve setting, the relief valve will bypass the fluid within the unit to relieve the pressure. The relief valve does not determine the actual operating pressure; the operating pressure of the system is determined by the back pressure of the connected equipment and the setting of the flow control.

If adjustment is necessary, contact our Service Department.

For applications requiring maximum pressure less than 55 psi, a retrofittable External Pressure Reducer (EPR) is available. An EPR allows an operating pressure of 10 to 50 psi. Contact our Sales Department for more information (see Preface, After-sale Support). Before calling please obtain the following information:

Part number

Serial number

Section VI Maintenance

Service Contracts

NESLAB offers on-site Service Contracts that are designed to provide extended life and minimal down-time for your unit. For more information, contact our Service Department (see Preface, After-sale Support).

Cleaning

Periodically inspect the reservoir. If cleaning is necessary, flush the reservoir with a cleaning fluid compatible with the circulating system and the cooling fluid.

Algae

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

If algae becomes a problem, contact our Service Department for a recommendation (see Preface, After-sale Support).

Section VII Service

For personal safety and equipment reliability, the following procedure should only be performed by a competent technician. Contact our Service Department for assistance (see Preface, After-sale Support).

Pump Strainer

A wire mesh screen (under hex nut) is located in each pump suction line.

If debris is drawn into the system, the strainers will prevent the material from being sucked into the pump and damaging the pump vanes.

After initial installation, the strainers may become clogged with debris and scale. Therefore, the strainers must be cleaned after the first week of installation. After this first cleaning, a monthly visual inspection is recommended. After several months, the frequency of cleaning will be established.

Before cleaning the strainers, disconnect the line cord from the power source and drain the reservoir.

Remove the unit's wrapper. The strainers are located on the right side of the unit's base, next to the pump. Unscrew the hex nut on the strainers and remove the screens. Clean the screens by rinsing it with water.

When the screens are clean, replace it in the strainer, tighten the hex nut and replace the panel. Refer to Section III, Filling Requirements for instructions on replacing the cooling fluid.

Pump Lubrication

The pump motors requires pump lubrication. These motors use sleeve type bearings with large oil reservoirs. Oiling instructions are generally posted on each motor. In the absence of legible lubrication instructions, add approximately 30 to 35 drops of SAE 20 non-detergent oil to each bearing on the following schedule (SAE 20 = 142 CS viscosity):

Duty Cycle	Oiling Frequency
Continuous	Each year
Intermittent	Each 2 years
Occasional	Each 5 years

Section VIII Troubleshooting

Checklist

Unit will not run
Make sure the voltage of the power source meets the specified voltage, ±10%. Refer to the serial number on the rear of the unit for the specific electrical requirements of your unit.

Unit runs when OFF/ON/START button is in START position, but stops when button is released.

Hold switch in START position for longer period of time.

Check for proper reservoir level. The float switch in the reservoir prevents the unit from operating if the fluid level in the reservoir is below the operating level. If the fluid level is low, "top off" the reservoir and restart the unit.

Make sure the high temperature monitor is set higher than the temperature of the cooling fluid.

Unit runs for a short period, then stops.
Check the fluid level in the reservoir. If it is low, check the system for leaks.

Make sure the heat load is not greater than the cooling capacity of the unit (see Section II, Cooling Capacity).

Make sure the cooling water supply meets the requirements outlined in Section III, Facility Water Requirements.

A possible power interruption has occurred, causing the "latch" relay to unlatch. Attempt to restart.

Service Assistance

If, after following these troubleshooting steps, your unit fails to operate properly, contact our Service Department for assistance (see Preface, After-sale Support). Before calling please obtain the following information:

Part number

Serial number

Voltage of unit

Voltage of power source

Temperature at which the problem occurs

Temperature, pressure, and flow rate of cooling water supply

Technical Support

Our Service Department can provide you with a wiring diagram and a complete list of spare parts for your unit (see Preface, After-sale Support). Before calling, please obtain the following information:

Part number

Serial number

Section X Warranty

NESLAB Instruments, Inc. warrants for one (1) year 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 judgement of NESLAB to be defective in material or workmanship will be repaired by an authorized NESLAB Service Center without charge for parts or labor. The unit including any defective part must be returned to an authorized NESLAB Service Center within the warranty period. The expense of returning the unit to the authorized NESLAB Service Center for warranty service will be paid for by the buyer. NESLAB's responsibility in respect to warranty claims is limited to making the required repairs or replacements, and no claim of breach of warranty shall be cause for cancellation or rescission of the contract of sale of any unit.

This warranty does not cover any unit that has been subject to misuse, neglect, or accident. The 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 as 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, the warranty does not extend to repairs made by the use of parts, accessories, or fluids which are either incompatible with the unit or adversely effect 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 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 parts, and NESLAB does not assume or authorize anyone to assume for them 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 revenue, loss of use of the unit, loss of time, or convenience.

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 of it shall be governed by law of the State of New Hampshire, United States.