CUSP

SYSTEM I
w/ PD-2

SYSTEM I OPERATION AND

INSTRUCTION MANUAL

PD2

PURCHASED BY CHEM DEPT
68- 405471
11/30/89 $2595

SN 90AmL17910-9

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

Model # 32200304010O

SYSTEM I LIQUID TO LIQUID HEAT EXCHANGER

INSTRUCTION AND OPERATION MANUAL

SECTION I GENERAL INFORMATION

1.1 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.

1.2 WARRANTY

All NESLAB units are shipped with a warranty card. The top portion should remain with the unit. The bottom section must be filled out and returned to NESLAB. NESLAB units are warranteed against defective parts and workmanship for one full year from date of shipment.

1.3 DESCRIPTION

The NESLAB System I Liquid/Liquid Heat Exchanger is designed to remove heat loads up to 12 KW from a variety of water cooled instrumentation. The System I utilizes building recirculating water or tap water as the secondary cooling medium to remove heat from the primary fluid in the closed recirculation loop of the System I.

The System I includes a recirculation pump, panel mounted temperature and pressure gauges and high temperature safety cutout. The desired recirculating temperature is set with the calibrated control dial located on the front panel.

The temperature control system of the System I will actuate a solenoid valve on the secondary (tap) water line allowing only the amount of cooling water required by the heat load to pass through the System I. A Low Level Safety in the reservoir will provide protection for both the circulation pump and the instrumentaion being cooled.

1.4 SPECIFICATIONS

COOLING CAPACITY *:	12 KW MAX SEE ATTACHED CHART	
TEMPERATURE RANGE:	+5°C to +35°C	
TEMPERATURE STABILITY:	±1.0°C	
PUMPING CAPACITY:	PD-2	4.0 gpm @ 55 psi, 80 psi, max.
SECONDARY COOLING WATER:	SEE ATTACHED SHEET REQUIREMENTS	
RESERVOIR VOLUME:	1.5 GALLONS	
DIMENSIONS (HXWXD):	22" x 14" x 17½"	
POWER REQUIREMENTS:	115 volt	208/230 volt
	6 amps	3 amps
	50/60 Hz	50/60 Hz

*Cooling capacity is a function of the temperature difference between secondary cooling water supply and the desired output of the System I.

SECTION II INSTALLATION

2.1 SITE

Because the System I is a water to water heat exchanger it should be placed in a location with easy access to a secondary cooling water source and a drain.

IMPORTANT

The pressure required to push the secondary cooling water through the System I increases as the required flow increases. If the System I is used with a building water supply the drain back pressure must be lower than the building water supply pressure. For example if the supply pressure id 48 psi, the drain back pressure must be 36 psi or less for 8 gpm, 41 psi or less for 6 gpm, etc. (See graph).
In an effort to minimize thermal losses the System I should also be positioned to keep the recirculating lines as short as possible. Avoid running lines near radiators, hot water pipes, etc. If substancial lengths of transmission tubing are necessary, thermal insulation may be required to prevent serious loss of cooling ability.

2.2 ELECTRICAL REQUIREMENTS

115 volt	60/50 Hz	6 Amps
208/230 volt	60/50 Hz	3 Amps

2.3 RECIRCULATING SYSTEM

2.3.1 Building chilled water or tap water should be connected to the 3/4" FPT fittings labeled "Cooling Water Inlet" and "Cooling Water Outlet". Be sure that cooling water supply is connected

to the inlet to insure proper heat transfer. Hose connections should be securely clamped and rated to withstand the maximum pressure of the cooling water supply, as the inlet line will be subjected to the maximum pressure when the temperature controlling solenoid valve closes. The lines to the instrument being cooled should be connected to the 1/2" MPT fittings marked "Recirculating Water Inlet" and "Recirculating Water Outlet". Recirculating Water Outlet goes to the inlet of the instrument being cooled (see attached plumbing diagram for details). Hose connections should be securely clamped and rated to withstand the maximum pressure of the circulating pump in the System I (60-80 psi). If substancial lengths of cooling lines are required they should be prefilled before connecting to the System I. Flexible hose, if used, should be of heavy wall or reinforced construction.

2.3.2 FLUIDS

Single distilled water is recommended as the recirculating fluid above +10°C (50°F). A mixture of distilled water and laboratory grade ethylene glycol is recommended when cooling below +10°C is desired. A mixture of 40% glycol to 60% water by volume is normally sufficient.

2.3.3 FILLING

Remove the top access panel and locate the reservoir plug (square nut). Remove plug and fill reservoir with clean cooling fluid. See specification chart for reservoir volume. Fill to the bottom of the fill hole flange. Since tank capacity is small compared to the volume of many systems to be cooled, have extra cooling fluid available to keep the system topped off when external circulation is started. When installing System I on a system that previously used tap water, flush the system several times to remove any rust or particles that have built up. Flushing will also pre-fill the circuit.

2.3.4 PUMPS

The following pumps are available for the System I units.

PD-2 Positive Displacement = 4 gpm (15.2 1/min) @ 50-80 psi.

TU-1 Turbine Pump = 3.5 gpm (13.2 1/min) @ 40 psi, 1 gpm @ 60 psi.

The PD-2 pump is the standard pump in the System I. It has a factory installed bypass which is set for 60 psi and should not be altered. Flow rate for the PD pump will not change appreciably unless the pressure drop exceeds the setting on the pressure bypass.

The TU-1 pump is a turbine pump which is available as an option in the System I. The TU-1 is equipped with a pressure bypass factory set at 60 psi. See the attached flow chart for the TU-1 recirculating pump.

NOTE: Pump bypass setting establishes a maximum limit only and does not determine the actual operating pressure. Actual system operating pressure can be read from the front panel pressure meter.

2.3.5 PUMP PRIMING

System I units equipped with the PD-2 do not require priming. System I units equipped with the TU-1 pump may require priming. To prime the pump proceed as follows:

1. Fill the reservoir with the desired coolant.
2. Place a container under the hose connector marked "Recirculating Water Outlet" and loosen the connection so the outlet line is completely unrestricted. After a few moments water should begin to flow from the outlet. If water does not begin to flow of its own accord, attach a short piece of tubing to the outlet hose connection and apply

suction to start flow. The pump is now primed. Replace and retighten the outlet connection. The unit is now ready for operation.

2.4 START-UP

Once the System I has been filled and the proper plumbing and electrical connections have been made the power toggle switch on the front panel should be placed in the "ON" position. Adjust the High Temperature Safety to the maximum setting (screw driver adjustment located on the rear panel of the unit). Depress the "Push to Start" button and hold for several seconds. At this point the System I will start and circulation will begin.
If the unit does not continue to run when the start button is released be sure the reservoir is topped off with recirculating fluid. The low liquid level safety built into the reservoir will prevent the unit from operating when the reservoir level is low. Once the System I continues to recirculate through the external instrumentation, top off the reservoir and replace the plastic reservoir plug. This plug should be hand tightened only, as excess pressure could cause damage to the plastic reservoir.

2.5 TEMPERATURE ADJUSTMENT

The desired recirculation temperature is set using the calibrated dial on the front panel of the System I. The temperature gauge on the front panel will inducate the actual temperature of the recirculating fluid in the reservoir. The controller of the System I will open and close a solenoid valve on the inlet line of the secondary cooling water circuit to maintain the desired output temperature in the primary recirculating water. When using tap water as a secondary cooling water source a very slight bucking may occur as the solenoid valve opens and closes. The amount of bucking is dependant

on the pressure differential between the secondary cooling water inlet and cooling water drain. By lowering the pressure of the secondary water supply to a 12 psi differential the amount of bucking can be reduced. This bucking does not cause any vibration in the recirculating water and is not harmful to the System I.

The lowest recirculating temperature attainable with the System I is a function of the secondary cooling water temperature and the heat load of the instrument being cooled. In turn the maximum cooling capacity of the System I is a function of the T between the secondary cooling water inlet and desired primary outlet temperature of the System I and the cooling water flow rate.

2.6 INTERLOCK SYSTEM

The System I is equipped with an HTS High Temperature Cutout switch and a LLS Low Liquid Level switch as standard features.

2.6.1 ADJUSTMENTS OF HIGH TEMPERATURE SAFETY CUTOUT

a. Allow the System I to stabilize at the desired recirculation temperature.

b. Adjust the calibrated dial on the rear of the System I approximately 10°C higher than the recirculating temperature. If the recirculating temperature exceeds the limit set on the high temperature safety cutout the System I will shut off. A red indicator light will glow and the external contacts will open (See 2.6.3).

2.6.2 LOW LIQUID LEVEL SAFETY

The System I has a Low Liquid Level Safety built into the reservoir of the unit. This float switch will open if the reservoir level drops thereby shutting off the System I and opening the external contacts.

2.6.3 EXTERNAL CONTACTS

As a means to provide further protection, an external contact receptacle is included on all System I units. This receptacle is used as a continuity

switch only. It is not a source of external power. The receptacle and contacts are rated for 15 amps maximum. The receptacle can be wired to customer supplied relays to provide a variety of safety functions. Should any of the interlock parameters be exceeded the System I will shut off and the continuity of the external receptacle will be interrupted. These contacts are always open when the System I is off.

SECTION III MAINTENANCE

3.1 STRAINER

Located on the PD-2 and TU-1 pump suction line (from System I reservoir) is a wire mesh screen (under hex nut). If debris is inadvertantly drawn into the system the strainer will prevent the material from being sucked into the pump and damaging the vanes. The strainer screen may be removed for cleaning by unscrewing the cap.

Strainer cleaning is recommended if unusual grinding or squealing noise is made by the pump. Shut down the System I unit and clean the strainer before restarting.

3.2 ALGAE

To restrict the growth of algae in the reservoir it is recommended that the 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, an algicide called Chloramin-T is available from EM Sciences, 480 Democrat Road, Gibbstown, N.J. 08027. Used at a rate of 0.2 - 0.3 grams/liter (1 gram/gallon) this algicide is compatible with all units.

SECTION IV TROUBLE SHOOTING CHECKLIST

4.1 Unit will not run, "ON/OFF" switch is "ON" HTS/LLS light is not illuminated.

a. Check power supply to unit.

4.2 Unit runs when "Start" button is pressed but stops when released.

a. Check for proper reservoir level, Low Level Safety will prevent the System I's start relay from latching.

b. Check for correct HTD setting (must be higher than front panel thermometer reading).

c. Allow a few more seconds before releasing "Start" button.

4.3 Unit continues to run for a short period and then stops, Red light is "ON".

a. Check reservoir level, if low check total system for leaks.

b. Check thermometer reading. If same or higher than the HTS setting, check temperature dial setting. "Cooling Water" light must be on to maintain desired temperature lower than HTS setting.

c. Check secondary water circuit for proper flow verses heat load (see graph).

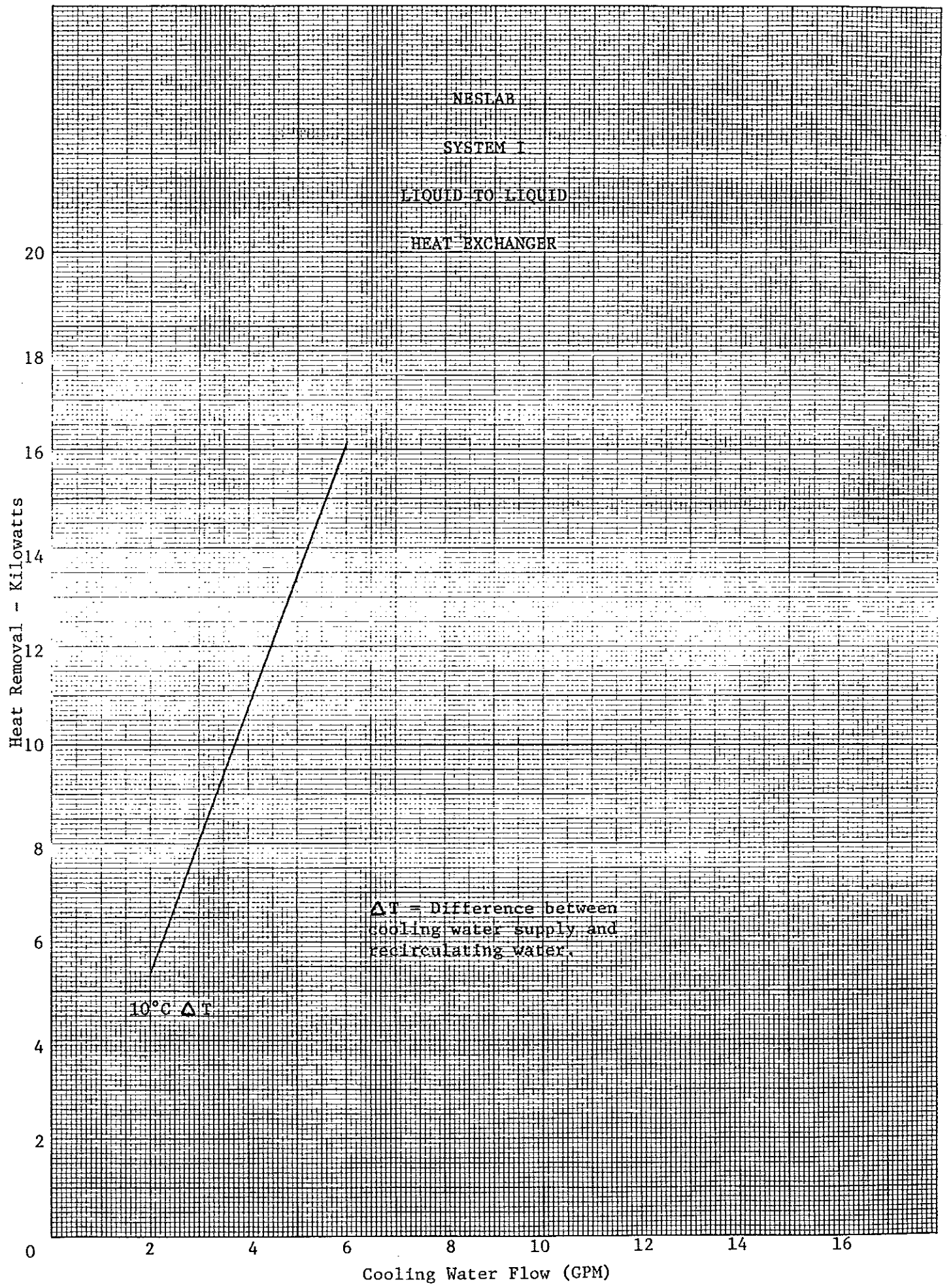
d. Check secondary water circuit for proper differential between supply and desired circulation temperature.

e. Check secondary cooling water circuit for proper pressure differential between supply and drain. If proper differential is not maintained flow through heat exchanger will not occur.

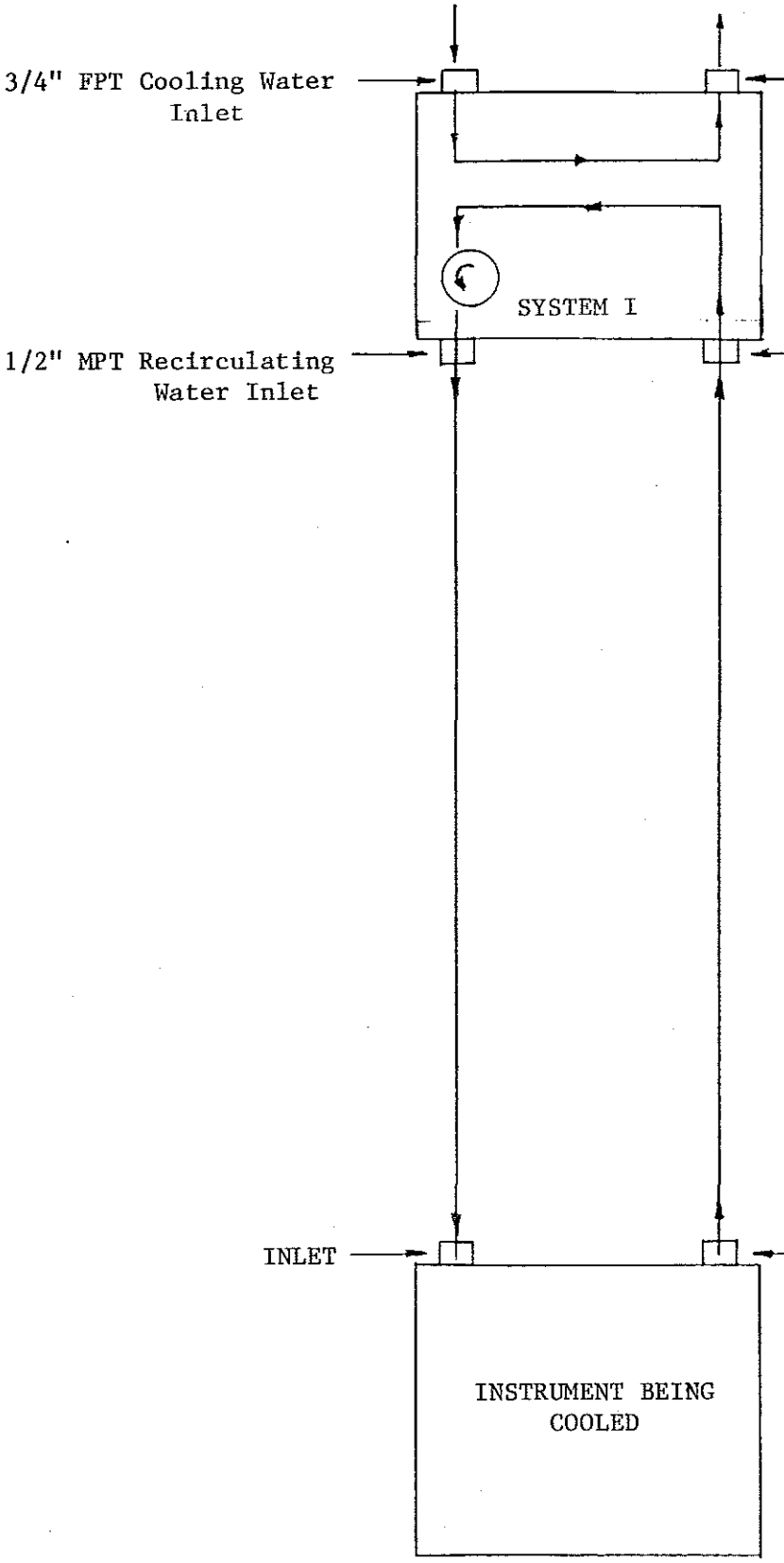
f. Possible power interruption has occured causing "Latch" relay to unlatch, shutting unit down. Attempt to restart.

NOTE: If after following these trouble shooting steps, your unit fails to operate, contact our Instrument Service Dept. Before calling, please have the following information ready.

a. Type of fluid used
b. Application
c. Units and accessories being used
d. Temperature at which problem occurs
e. Serial number)s) of unit(s)



SYSTEM I PLUMBING DIAGRAM



SECONDARY COOLANT CIRCUIT

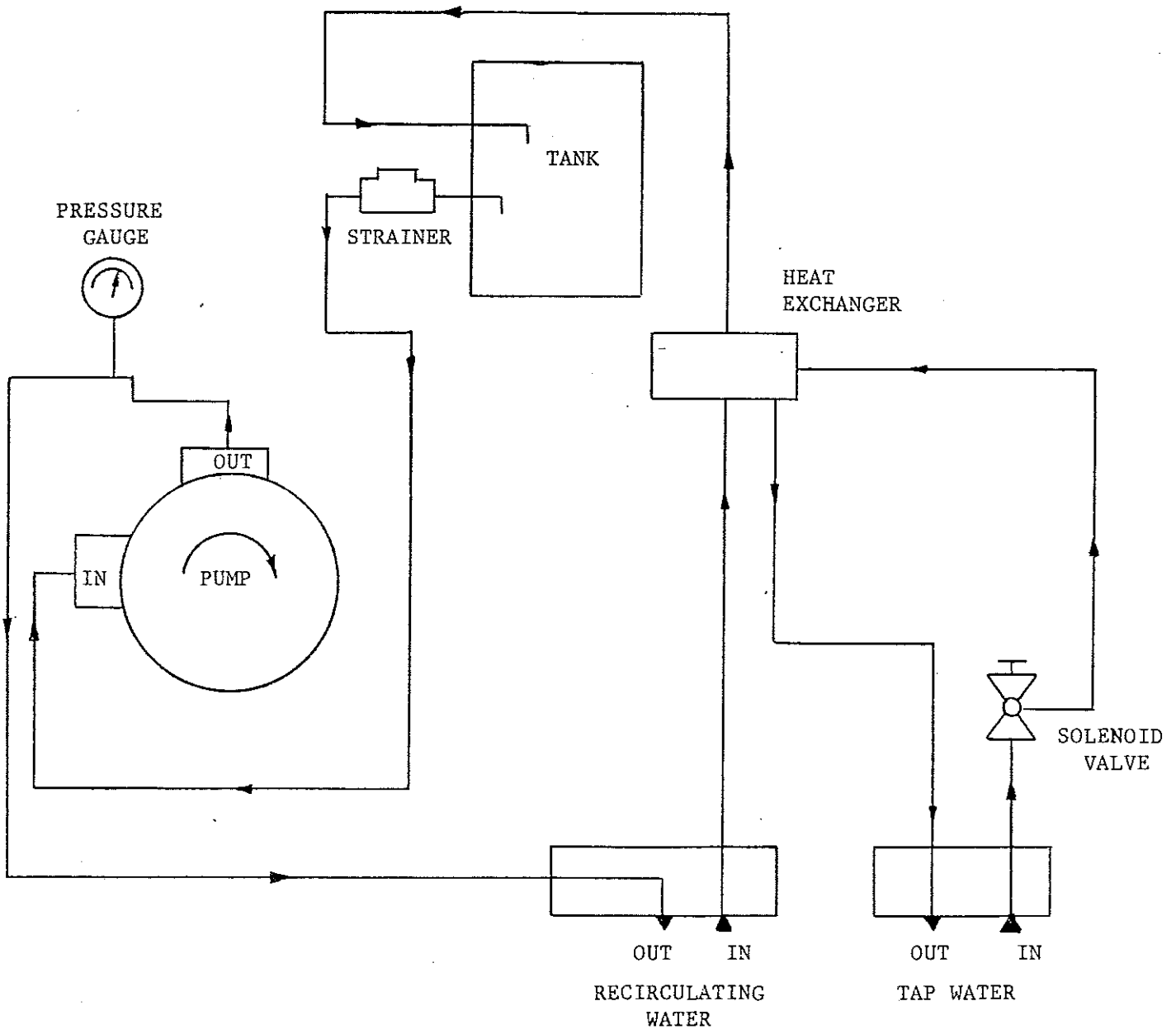
Building or Tap water supply
Hose lines should be 3/4" I.D. Tubing

PRIMARY COOLANT CIRCUIT

Hose lines should be a minimum of 1/2" I.D. and should be as short as possible. If reducer fittings must be used, they should be made at the INLET/OUTLET of the instrument being cooled.

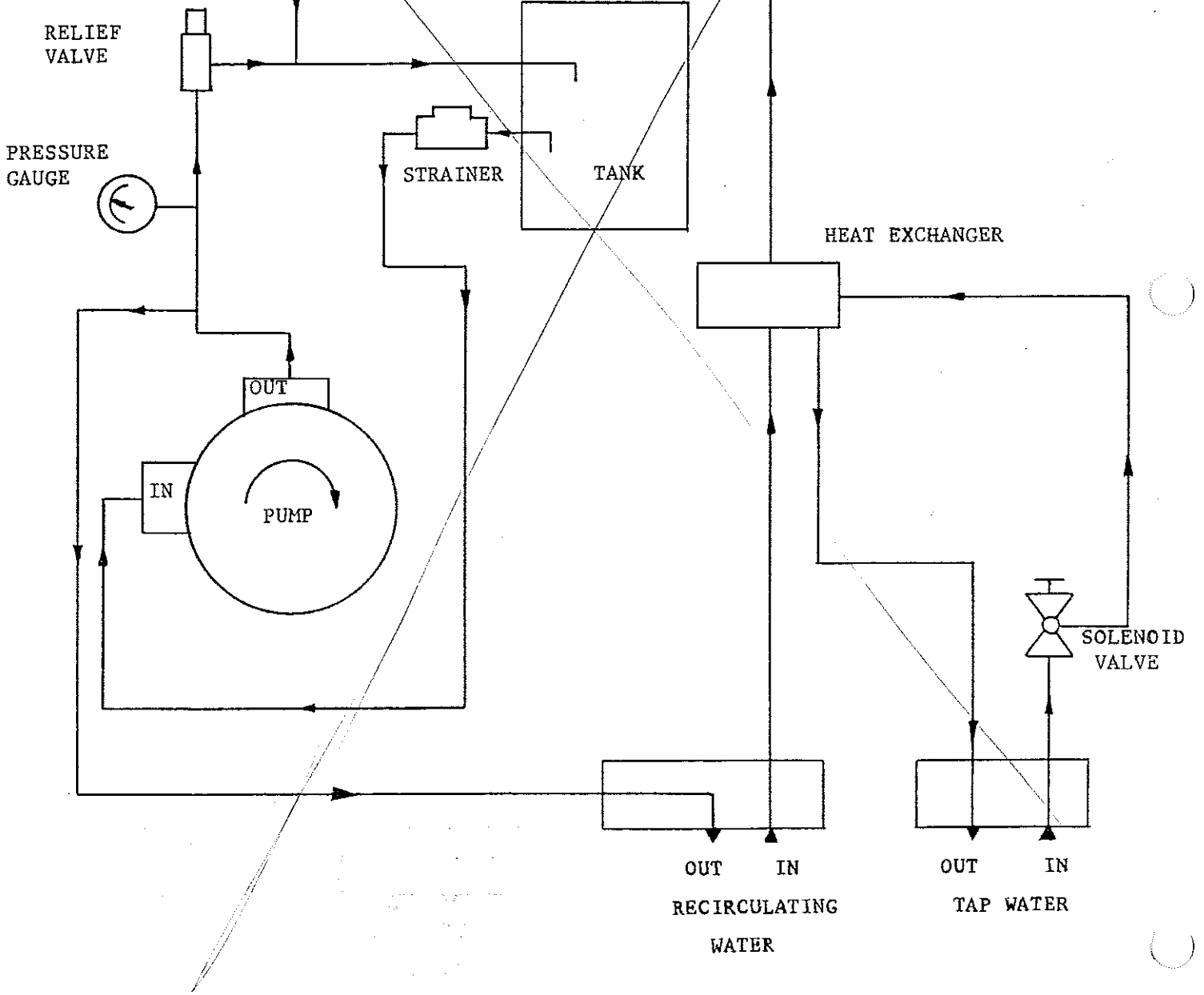
SYSTEM I WITH STANDARD PD PUMP

FLOW DIAGRAM

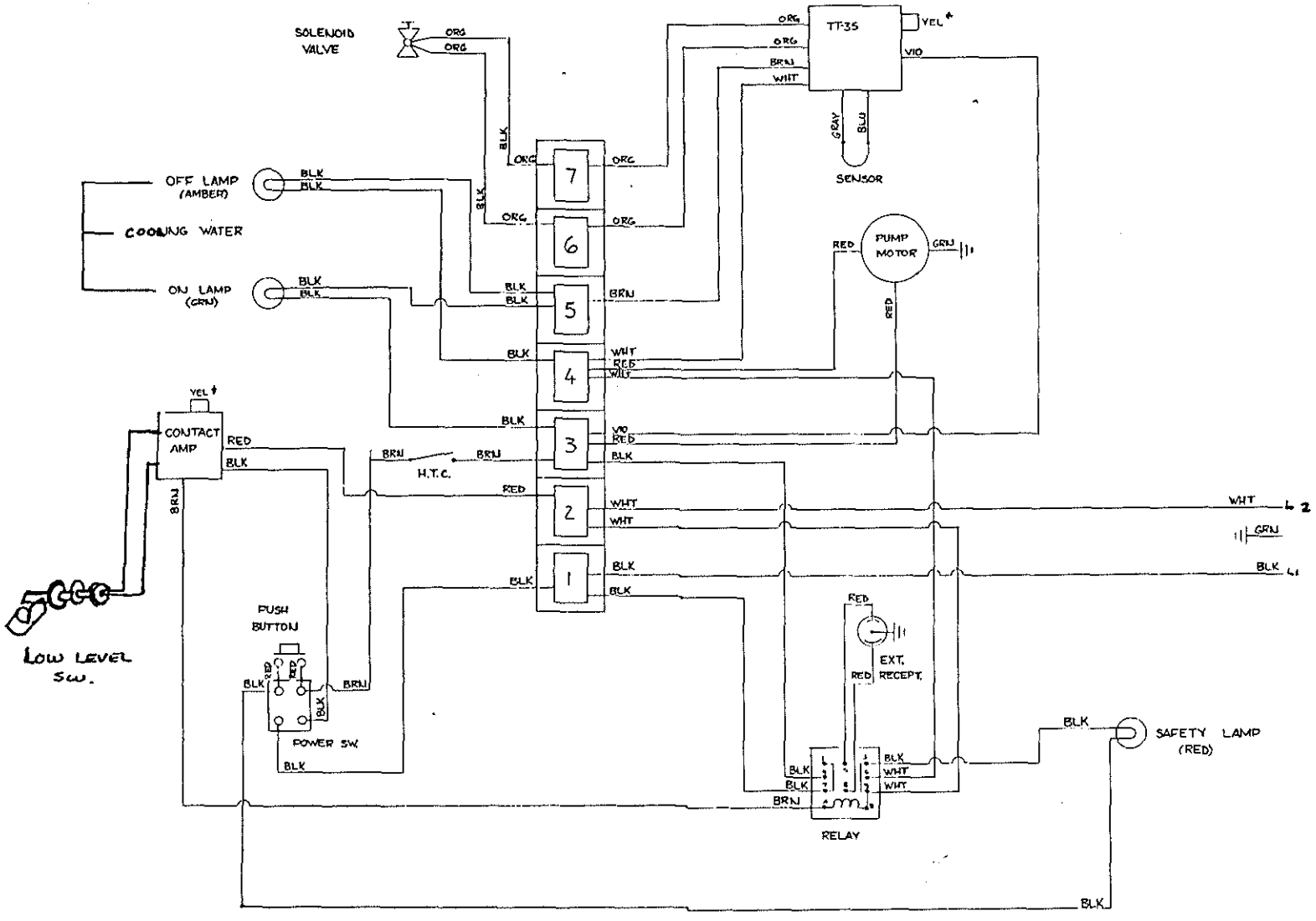


SYSTEM I/TU-1 PUMP

FLOW DIAGRAM



SECTION B



* YEL. JUMPER FOR 115V ONLY. CUT OFF FOR 220V.

WARRANTY

NESLAB Instruments, Inc., warrants for one (1) year from the 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 or replaced by an authorized NESLAB Service Center without charge for parts and 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, negligence, 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 the NESLAB's Instruction and Operations Manual. The 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 necessary 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 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 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 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 of it shall be governed by the law of the State of New Hampshire, United States.