

HX-500 Outdoor Industrial Recirculating Chiller

NESLAB Manual P/N U00163
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Installation, Operation, and Maintenance Manual

NESLAB online

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

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HX-500 Recirculating Chiller Installation, Operation, and Maintenance 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.

On units with a remote control box, the box is packed in a separate carton. Be sure to locate this separate carton; do not dispose of it by mistake.

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

The unit has a warranty against defective parts and workmanship for one full year from date of shipment. Refer to the last page of this manual for complete warranty 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 or the information in this manual, 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 refer to the serial number label on the rear of the case top to obtain the following information (see Section II, Description for the serial number label location):

- *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 for assistance (see Preface, After-sale Support).

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.

Do not attempt to defeat any of the interlock switches or safety features built into the unit.

Observe all warning labels.

Never remove warning label.

Never operate damaged or leaking equipment.

Never operate the unit without cooling fluid in the fluid reservoir.

Make sure the unit is off before connecting or disconnecting the power cord or other cables.

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

Always empty the fluid reservoir before moving the unit.

Never operate equipment with damaged power cords.

Refer service and repairs to a qualified NESLAB technician.

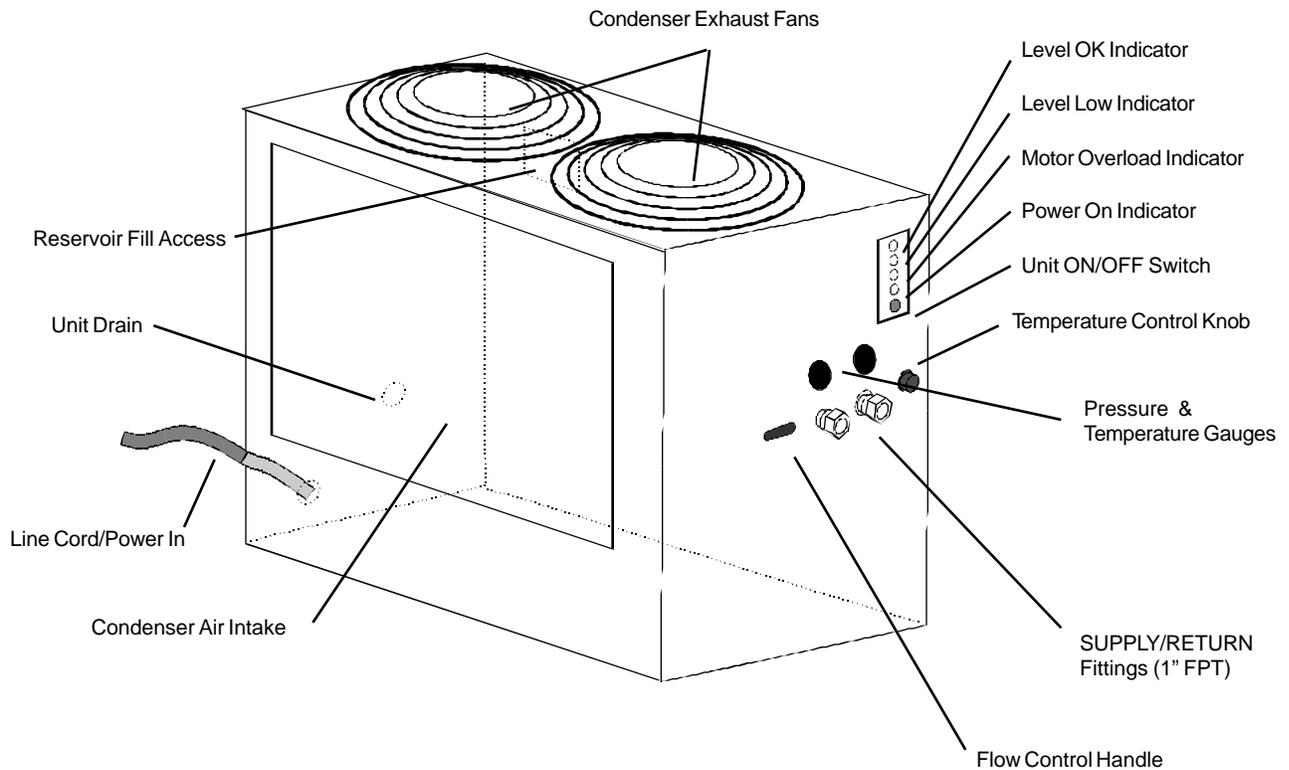
In addition to the safety warnings listed above, warnings are posted throughout the manual. These warnings are designated by an exclamation mark inside an equilateral triangle with text highlighted in bold. Read and follow these important instructions. Failure to observe these instructions can result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

Section II General Information

Description

The HX-500 Recirculating Chiller is designed to provide a continuous flow of cooling fluid at a constant temperature and volume. The unit consists of an air-cooled refrigeration system, a stainless steel fluid reservoir, a fluid recirculation pump, and a thermostatic temperature controller.

Throughout the manual, you will be asked to consult the unit's serial number label, or the pump identification label, or both, for specific information. Both labels are located on the unit's right side.

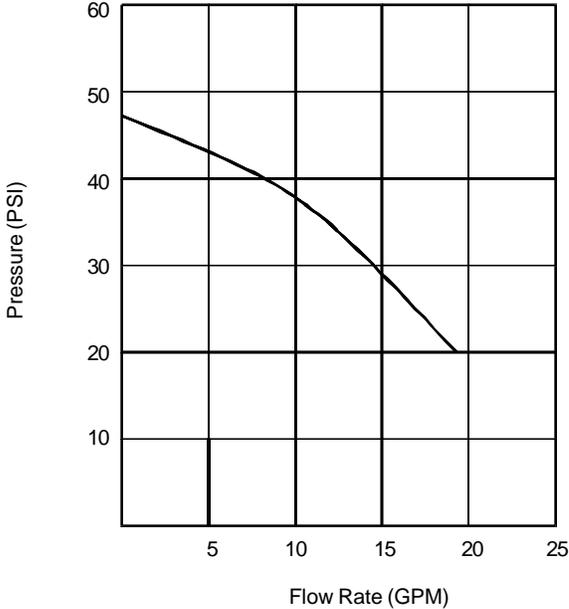


Specifications

Temperature Range

Cooling Capacity (60Hz)
Watts
BTU/Hr

CP-55 Pumping Capacity

	+10°C to +30°C
	15700 @ 20°C 53500 @ 20°C
	
Unit Dimensions² (H x W x D) <i>Inches</i> <i>Centimeters</i>	59½ x 46½ x 29½ 151.1 x 118.1 x 75.0
Reservoir Volume <i>Gallons</i> <i>Liters</i>	8 30
Shipping Weight <i>Pounds</i> <i>Kilograms</i>	900 408

Section III Installation

Site

The unit should be located on a well constructed level surface in a clean environment where ambient temperatures are inside the range of -20°F to +110°F (-29°C to +43°C).

The unit will retain its full rated capacity in ambient temperatures to 110°F.



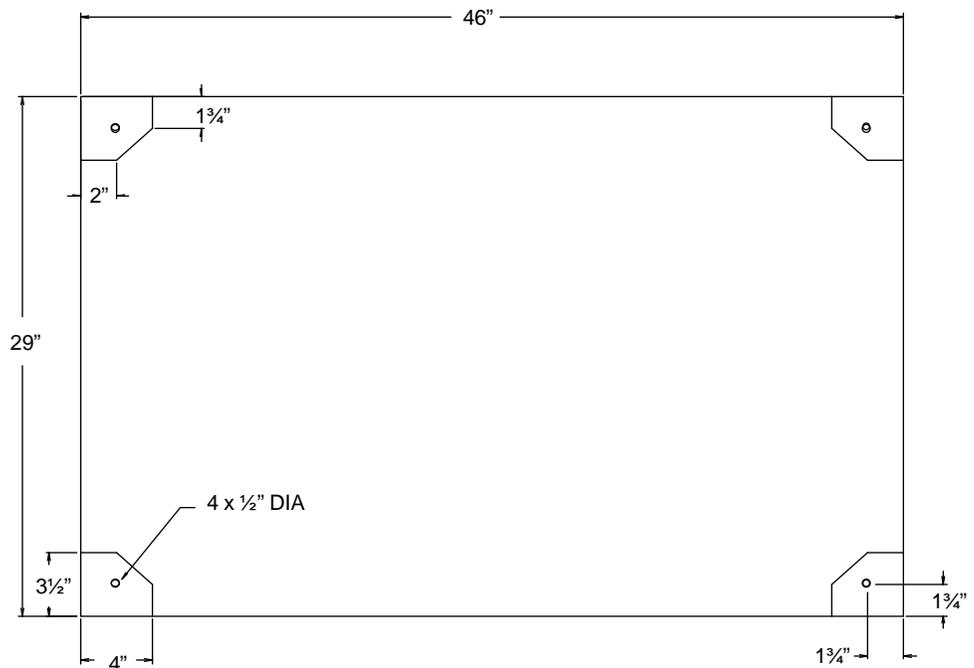
Never place the unit in a location where excessive heat or corrosive materials are present.

The unit has an air-cooled refrigeration system. It must be positioned so the air intake and discharge are not impeded. Air is drawn through the front of the unit and discharged through the top. A minimum of 5 feet (1.5 meters) on the front of the unit is necessary for ventilation.

In some applications where space is at a premium, the minimum ventilation clearance can be compromised. However, consult our Sales Department before positioning the unit in a location with less minimum clearance than listed above. Inadequate ventilation will cause a reduction in cooling capacity and, in extreme cases, compressor failure.

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

The illustration below shows the bolt pattern for the unit's base.



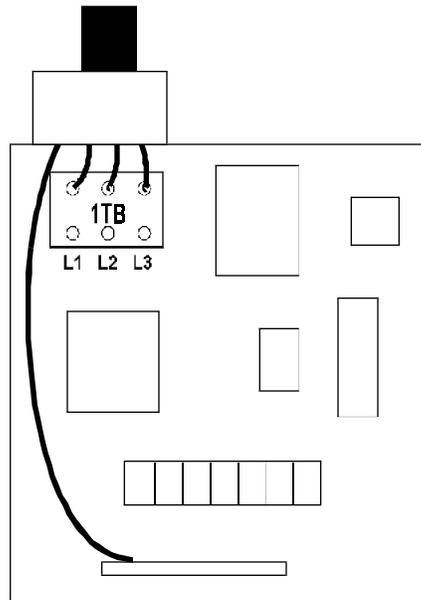
Electrical Requirements



The unit construction provides extra protection against the risk of electric shock by grounding appropriate metal parts. It is the user's responsibility to assure a proper ground connection is provided.

Verify electrical requirements by reviewing the ratings listed on the nameplate on the unit's right side. Ensure the voltage of the power source agrees with the unit's voltage and frequency rating. The unit is designed to tolerate deviations of $\pm 10\%$ from the rated line voltage.

A line cord must be installed on the unit. Remove the unit's left side panel and bring the line cord through the strain relief located on the unit's base. Remove the electrical enclosure cover. Pass the line cord through the second strain relief located on the top of the electrical enclosure. A large terminal strip, labelled 1TB, is used to make the proper connections. Connect L1, L2 and L3 to the corresponding labelled connections on the terminal strip. The ground connection is located at the base of the enclosure.



Install the unit in conformance with National Electric Code, UL, and all other local, state and federal electrical codes. Check all wiring to ensure it is both properly connected and protected from the elements.

Units are equipped with a compressor crankcase heater. The crankcase heater warms the oil in the compressor and prevents refrigerant from mixing with the oil. Before start up, the unit must be connected to its power source for at least 12 hours. This allows time for the oil to be heated and separate from the refrigerant. The unit is equipped with a receiver heater which warms the refrigerant for cold-ambient starting.

NOTE: Whenever power is applied, the unit's POWER ON indicator will be illuminated.

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. Consult the manufacturer of the instrument for a cleaning fluid recommendation.

The plumbing fittings used to connect the HX to the instrument being cooled are located on the right side of the unit (labelled SUPPLY and RETURN). These connections are 1 inch FPT.

Remove the protective plugs from the SUPPLY and RETURN connections. Connect the SUPPLY fitting to the inlet of the instrument being cooled. Connect the RETURN fitting to the outlet of the instrument being cooled.

The RESERVOIR DRAIN connection, located on the bottom left of the unit, is a ½ inch FPT fitting connected internally to the unit's fluid reservoir. This fitting is for draining the reservoir. The unit is shipped with a ½ inch MPT plug installed in this fitting. Remove the plug to drain the reservoir.

If the unit is "hard plumbed" to the instrument being cooled or to the cooling water supply, damage can occur if the unit is bumped or jolted from its site. Provisions should be made to prevent the unit from being moved after installation. Once the unit is plumbed, the unit may be attached to the floor using lag bolts. There are ½" holes provided on the unit's feet.

Flexible tubing, if used, should be heavy wall or reinforced construction. All tubing should be rated to withstand 110 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 HX.

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

Fluids

The selected cooling fluid must have a viscosity of 50 centistokes or less at the lowest operating temperature.



Never use flammable or corrosive fluids with this unit. Distilled and deionized water may be aggressive and cause material corrosion. Please contact NESLAB before subjecting this unit to prolonged exposure to distilled or deionized water.

Tap water is the recommended fluid for operation from +8°C to +35°C.

Below +8°C or in an outdoor environment where temperatures may drop below 0°C, a non-freezing solution is required. A 50/50 mixture, by volume, of water and laboratory grade ethylene glycol 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.

Filling Requirements

Before filling, ensure the unit's reservoir drain plug is properly installed.

The reservoir cover is located under the fill access panel located on the rear of the unit. Open the panel, loosen and remove the cover.

Initially fill the reservoir with five gallons of cooling fluid and then turn the unit on. Continue to fill the fluid reservoir with cooling fluid until the green LEVEL OK indicator illuminates.

The fluid capacity of the instrument being cooled and the recirculation lines may be significant. To prevent the lowering of the fluid level in the reservoir below the operating level, have extra cooling fluid on hand to keep the reservoir filled to just below the hand guard.

When the recirculating system is full, replace the reservoir cover and close the access panel.

Perform periodic checks of the fluid level by checking the LEVEL OK indicator.

Section IV Temperature Control

Thermostatic Mixing Valve

The unit uses an adjustable Thermostatic Mixing Valve (TMV) for temperature control. The valve balances the unit's refrigeration capacity against any applied heat load to maintain the desired temperature. As the heat load changes, the shift in balance will cause the temperature to vary and the valve to adjust in response.

For start up we recommend the valve be set to the maximum position (full clockwise). After your application is on adjust the valve to the desired temperature. If your application is momentarily shut off the temperature of the coolant will drop. NOTE: As long as the valve is not readjusted the coolant temperature will return to the desired setting when the application is turned on.

Because refrigerant capacity varies with ambient temperature, adjust the valve for changes in ambient temperatures.

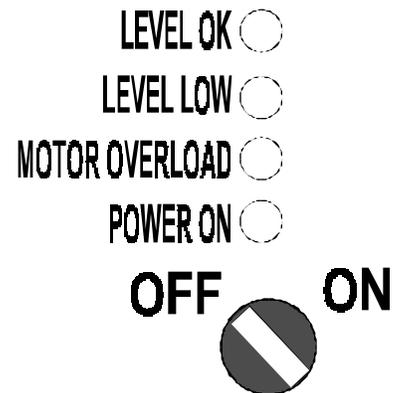
Refrigeration

The refrigeration system is not adjustable. Factory preset mechanical refrigeration valves limit the refrigeration upper and lower limits. These valves should be adjusted only by a qualified NESLAB service technician.

Start Up

Before starting the unit, double check all electrical and plumbing connections and ensure the recirculating system (the HX, your application, and the tubing connecting them) has been properly filled with cooling fluid (see Section V, Flow Control).

The unit's MAIN POWER indicator illuminates to indicate the unit's main power circuit is energized. To start the unit, place the ON/OFF switch to the ON position. The pump and refrigeration will start and the LEVEL and MOTOR OVERLOAD indicators will be operational. Check the pump for proper rotation (see Phase Rotation in Section VI).



Cold-Ambient Start Up

A temperature sensor located in the reservoir keeps the refrigerant compressor off until the reservoir temperature reaches 0°C. Above 0°C the compressor and condenser fans energize. NOTE: The pump motor operates as soon as the ON/OFF switch is placed to the ON position.

Temperature Adjustment

Adjust the temperature by turning the TMV adjustment knob. Turning the knob clockwise increases the unit's cooling capacity. After adjusting the knob wait two to three minutes for the unit to respond. Readjust as necessary to achieve the desired temperature. The temperature gauge next to the knob provides coolant temperature reading.

Fault Response

All the fault indicators are located above the ON/OFF switch. The unit is designed to run under all fault conditions. Two fault conditions are monitored - low reservoir and pump motor overload.

The red LEVEL LOW indicator indicates the reservoir level has dropped below the low level switch. Add fluid to the reservoir.

The yellow MOTOR OVERLOAD indicates the pump motor overload relay has tripped. The relay is located in the electrical enclosure, immediately behind where the power cord enters the unit. Open the enclosure and depress the relay reset. **NOTE:** With a MOTOR OVERLOAD fault there is no circulation of coolant to your application (see Pump Motor Overload Protector in Section V).

Section V Operation

Flow Control

The RECIRCULATING FLOW CONTROL handle, located on the right-hand side of your unit, is connected to a valve that controls the flow rate of the cooling fluid to the instrument being cooled.

When the handle is in the “+” position, the valve is open and all possible cooling fluid is supplied to the instrument being cooled. When the handle is in the “-” position, the valve is closed and no cooling fluid is supplied to the instrument being cooled. When the handle is between these two positions, the flow rate of the cooling fluid is between full flow and no flow. Use a flow meter on the SUPPLY line to adjust the desired flow rate.



To prevent “water hammering” always move the flow control handle slowly.

Pressure Gauge

The RECIRCULATING PRESSURE gauge is located near to the flow control handle. The gauge indicates the operating pressure of the system.

Pump Motor Overload Protector

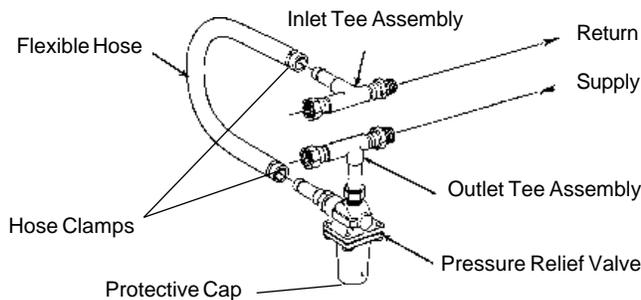
Three phase units with three phase pump motors are equipped with a pump motor overload protector. The overload protector prevents the pump motor from exposure to excessive current. If an overload fault occurs, due, for example, to excessive pressure or flow, or excessive ambient temperature, the overload protector will shut off the pump motor. The unit’s compressor will continue to operate. The fault must be manually reset after the cause is identified and corrected (see Preface, After-sale Support).

The overload relay (with reset switch) is located in the main electrical enclosure. The indicator, located above the ON/OFF switch, illuminates when a fault is detected.

External Pressure Regulator (Optional)

For applications requiring a maximum pressure less than 55 psi, an External Pressure Reducer (EPR) is available. An EPR allows an adjustable operating pressure of 10 to 50 psi. If the pressure of the fluid leaving the unit exceeds the valve setting the relief valve will bypass the fluid back into the unit to relieve the pressure. The pressure of the system is determined by the back pressure of the connected equipment and the flow rate of the recirculating fluid to your application.

Connect the EPR assembly as shown below. Tighten the hose clamps tight enough to prevent leakage. Do not overtighten or the clamps will “bite” into the flexible tubing and can cause excessive wear.



Connect the outlet tee assembly to the inlet of your application. Connect the inlet tee assembly to the outlet of your application.

Adjustment

When adjusting the relief valve some leaking may occur, place a container under the valve during adjustment.

Remove the protective cap and locate a threaded fitting with a slot for a large screwdriver. Hold the threaded fitting in place and loosen the lock nut on the valve body until it is almost flush with the threaded fitting. Unscrew the threaded fitting three to four turns. (If the threaded fitting unscrews completely from the valve housing, screw it back in two to three turns.)

To simulate blockage, close (or pinch off) the hose between the EPR outlet tee assembly and your application. Monitor the operating pressure of the HX unit. Turn the threaded fitting until the desired relief pressure is set (the EPR valve cannot be set lower than the total back pressure of your instrument, or flow will not be received).

Tighten the locknut to secure the position of the threaded fitting. Open the hose between the EPR outlet tee assembly and your application.

Section VI Maintenance & Service

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).



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

Configuration

Service Access Panels

Three service access panels (one on the rear, one on the right side and one on the left) allow easy access to the pump and refrigeration assemblies.



Disconnect the unit from its power source before removing any of the access panels.

Condenser Cleaning

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

The frequency of cleaning depends on the operating environment. It is recommended that a visual inspection of the condenser be made monthly after initial installation. After several months, the frequency of cleaning will be established.



Exercise caution not to damage the condenser fins or coil. Condenser fin or coil damage can result in a loss of performance and, in extreme cases, refrigeration system failure.

Algae

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

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

Phase Rotation



Check the pump for proper rotation.

Disconnect the unit from its power source, open the rear electrical junction box. Reverse any two line conductors on the line side of the relay.



Never remove the green ground wire.

Close the electrical box. Reconnect the unit to its power source. If the unit will not start, contact our Customer Service Department.

Section VII Troubleshooting

Checklist

Unit will not start

Verify main power circuit is energized. The white Main Power light on the controller panel should be lit when the unit is energized.

Some units are equipped with a flow switch. On these units the flow control valve must be opened slightly to allow the fluid to circulate through the flow switch that monitors the flow rate. A flow rate of more than 0.3 gallons per minute (1.0 liters per minute) is necessary. If the flow is completely shut off, or if flow is not adequate, a low flow fault will occur and the unit will not start.

The phase rotation may be reversed (see Section VII, Phase Rotation).

Check power source for correct voltage output. Refer to the serial number label on the rear of the unit for the specific electrical requirements of your unit. Power source must be specified voltage, $\pm 10\%$.

The unit has high and low refrigeration pressure switches which require manual reset if activated. Both switches are located directly behind the rear panel. Depress the reset button located on each switch. If the button does not "click" when pressed the switch was not activated and the unit shut down for another reason.

Unit will not circulate fluid

Check the tubing between the unit and your application for obstructions or for cleaning/replacement.

The unit will not circulate if the back pressure of your application is too high (>50psi).

Inadequate temperature control

Make sure the installation of the unit is in compliance with the conditions described in Section III.

Make sure the heat load of the instrument being cooled is not greater than the cooling capacity of the unit.

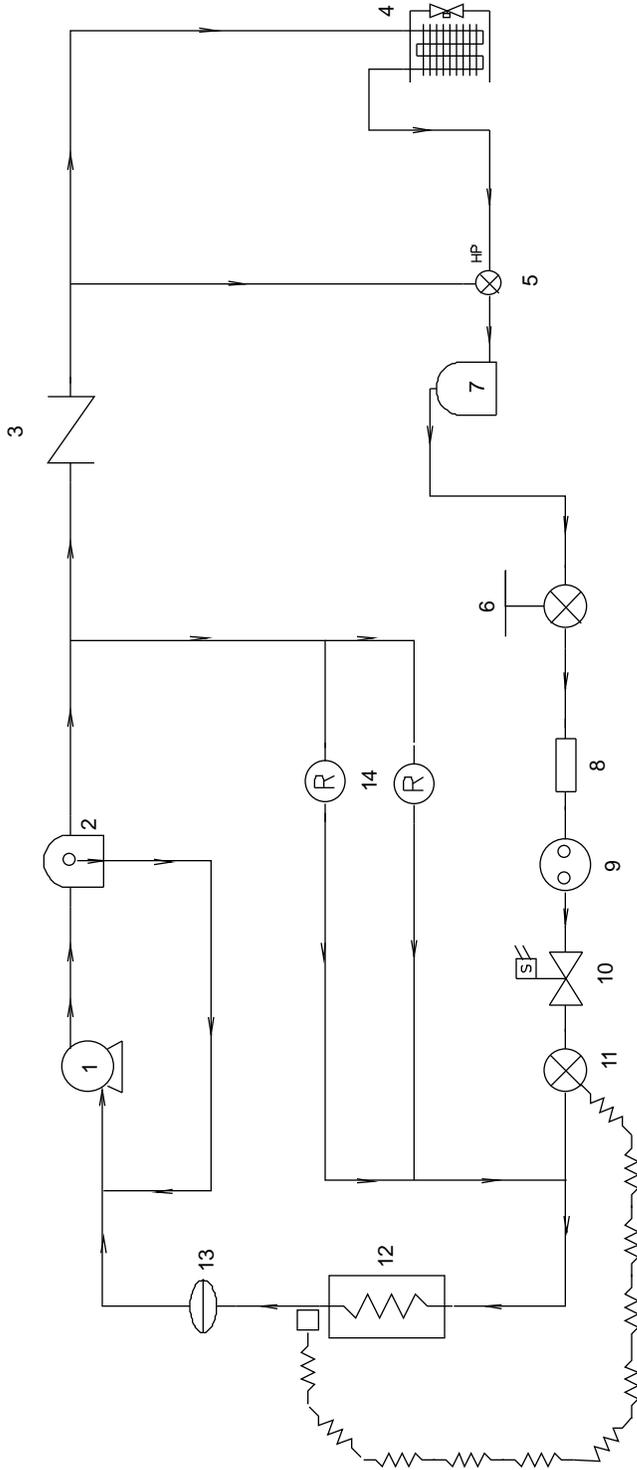
Service Assistance

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:

- *BOM number*
- *Serial number*

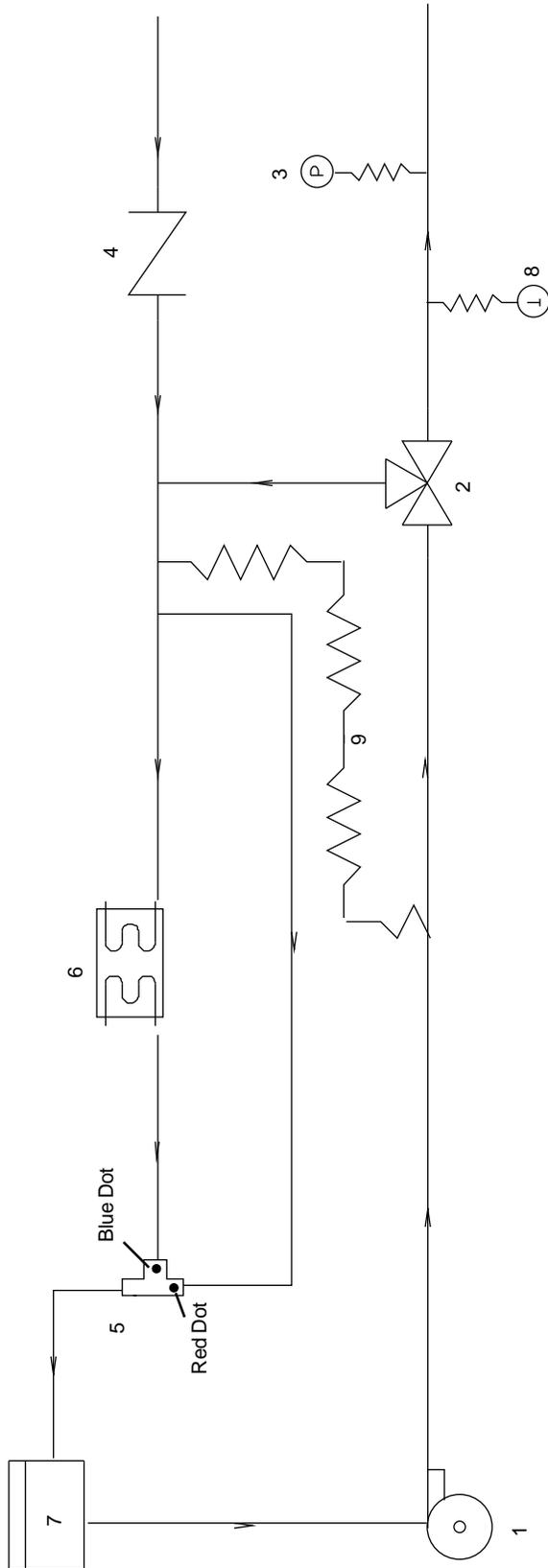
Refrigeration Flow Diagram

Section VIII Diagrams



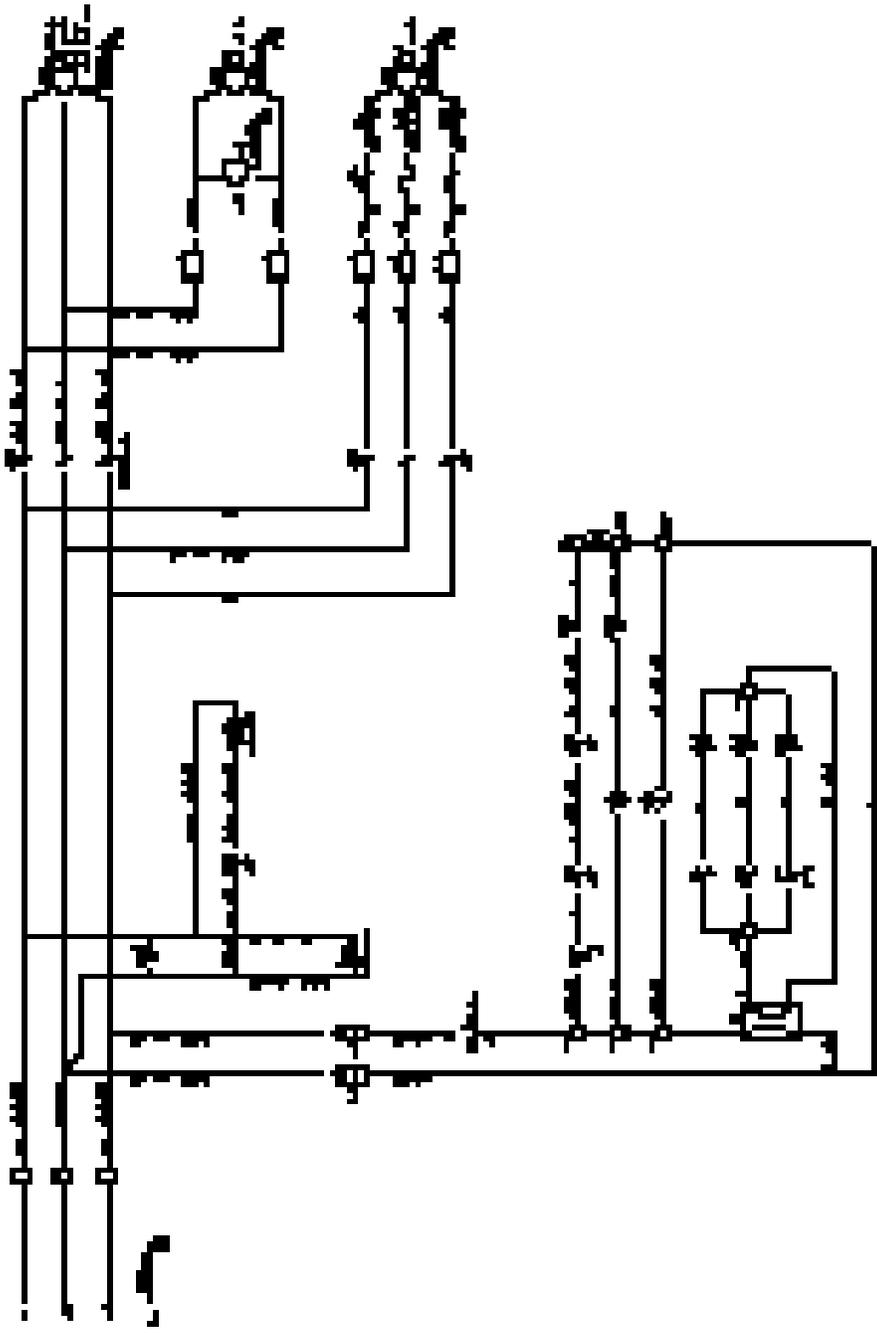
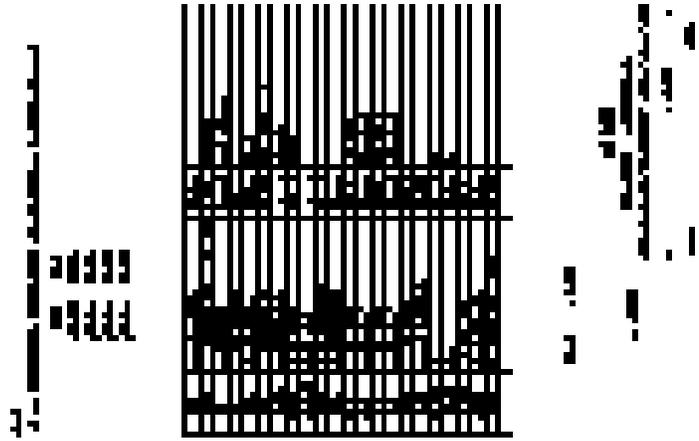
Symbol	Quantity	Part #	Description
14	2	009164	ADR HE-6 Bypass Valve
13	1	009327	Suction Filter
12	1	009295	Evap. Plate CB-26/70
11	1		TXV
10	1	009624	Sol. Valve
9	1	009604	Sight Glass
8	1	009627	Dryer
7	1	009850	Receiver
6	1		Base Valve
5	1		Head Pressure Control
4	1	007601	Condenser
3	1	009530	Check Valve
2	1	009791	Oil Separator
1	1	007746	Compressor

Pump Flow Diagram



Symbol	Quantity	Part #	Description
9	2 Ft	012122	Cap Tube 0.085 ID
8	1	000989	Temp Gauge, Analog
7	1		Tank, 8 Gallon
6	1	See RA	Evap, Plate CB26/70
5	1		Mixing Valve, Thermostatic
4	1	008901	Check Valve, 3/4" SWT
3	1	009212	Press Gauge, 0-100psi
2	1	003156	Valve, 3-way
1	1	008596	Pump, CP-55

Wiring Diagram



Spare Parts List

Condenser	007848
High Pressure Switch (Auto Reset)	005866
Crankcase Heater	001898
Compressor, 5 Ton, R134a	007746
Head Pressure Control Valve	007849
Hot Gas Bypass Valve	009164
TXV	007850
Fan Motor	007851
Dual HPC/LPC (Manual Reset)	007852
Solenoid Valve, ½" ODF	009624
Solenoid Valve Coils 220VAC	009015
Suction Filter	009327
Dryer	009627
Fuse, 8A	006031
Fuse, 6A	001143
Temp Gauge/Sensor	000989
3-Way Valve	003156
Hose, 1" ID	004998
Pressure Gauge	009212
Thermal Mixing Valve	024672
Pump, CP-55	008596
Contactora, Compressor	001803
Contactora, Pump	006062
Switch, On/Off	006311

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.