

HX-1000 & HX-2000 Recirculating Chiller

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Instruction and Site Preparation Manual



HX-1000 & HX-2000 Recirculating Chiller

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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.

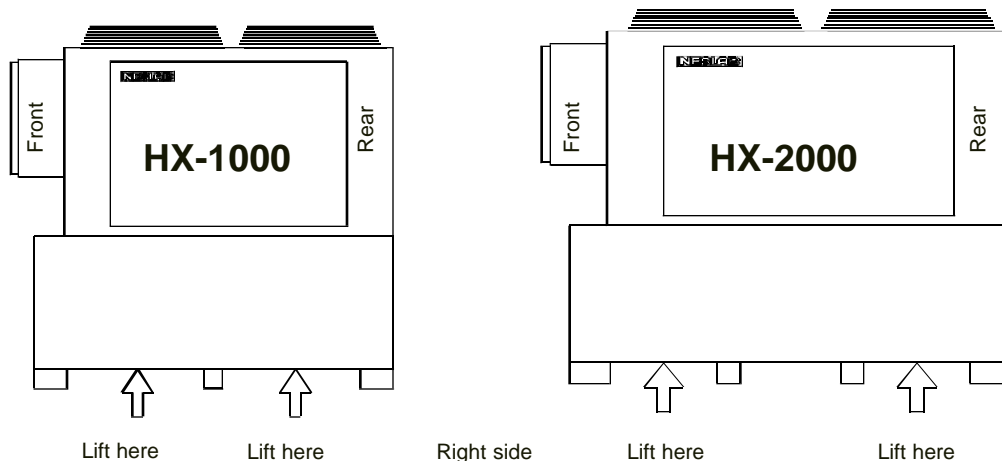
Units sold in North America are shipped on a wooden pallet and wrapped in protective plastic. Do not remove the banding or protective plastic until the unit is in its final location.

Units sold outside North America are shipped in a wooden crate. Do not disassemble the crate until the unit is in its final location.

The unit is secured to the pallet by lag bolts. HX-1000 units have 10 bolts, HX-2000 units have 12. Remove the lag bolts and the pallet before placing the unit on the foundation.

Lift Points

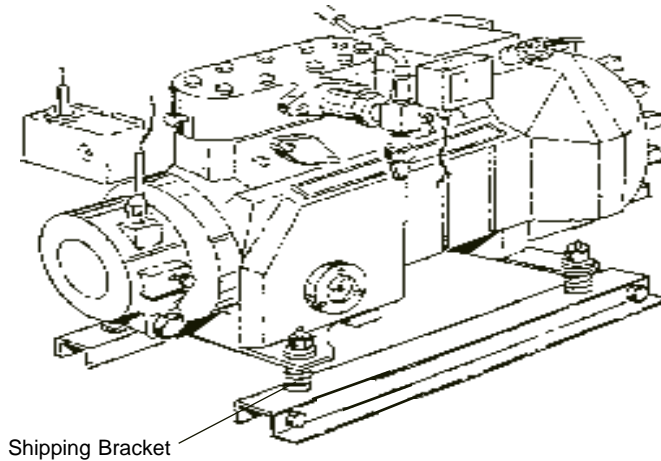
The unit is constructed on 4 inch (10.16 centimeter) high feet, each made of 14 gauge steel. HX-1000 units have 6 feet, HX-2000 units have 8. The unit construction provides a 4 inch clearance from the ground. Use a fork lift truck to lift and move the unit. Insert the forks as shown.



Pre-Start Up

Remove the panels to access the compressor area.

Loosen the four compressor mounting nuts until there is approximately 1/8" clearance between each compression mounting foot and the shipping bracket. This allows the compressor to "float" on the mounting rings.



To avoid damage to the compressor, tighten the mounting nuts before moving the unit.

Warranty

The unit has a warranty against defective parts and workmanship is 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, please contact our Sales Department. If your unit fails to operate properly, or if you have questions concerning spare parts or Service Contracts, please contact our Customer Service Department.

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.

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

Never operate the unit without cooling fluid.

Observe all warning labels.

Never remove warning labels.

Never operate damaged or leaking equipment.

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

Never operate equipment with damaged line cords.

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

Your HX Recirculating Chiller is designed to provide a continuous flow of cooling fluid at a constant temperature and pressure.

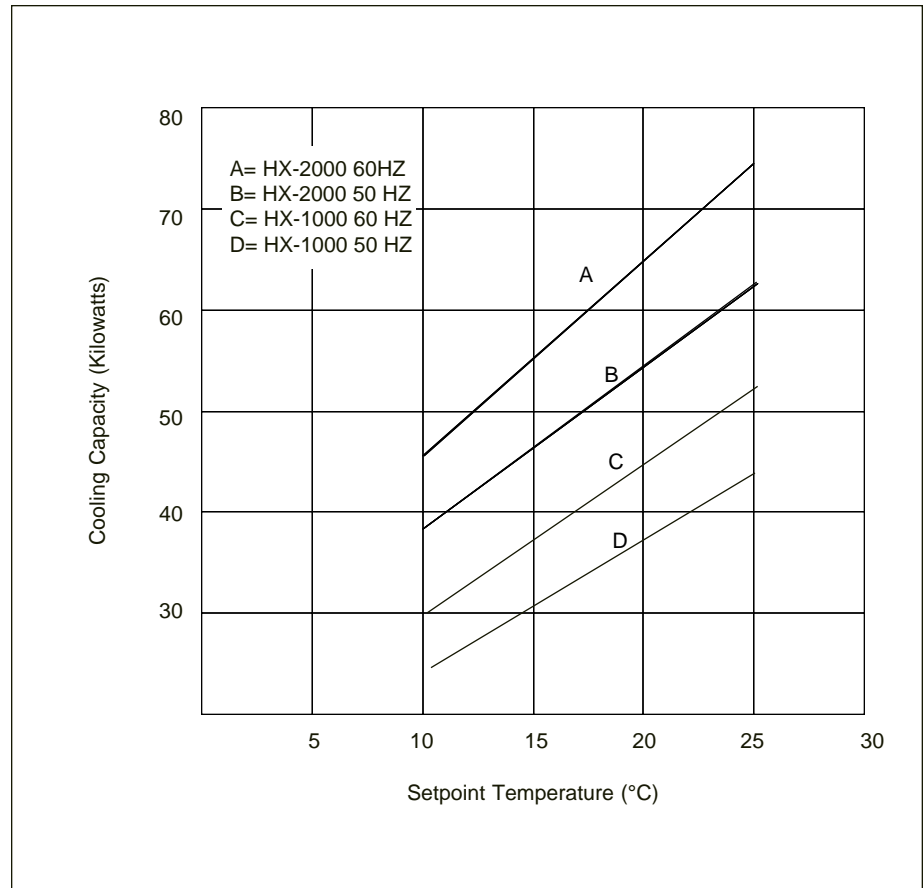
The unit consists of a reservoir, circulating pump, air-cooled refrigeration system, and a digital temperature controller.

The unit is designed for all-weather use. This allows heat produced by the instrument being cooled to be discharged outdoors. The high capacity pump allows the unit to be located a great distance from the instrument being cooled. The pump flow is adjustable at the unit.

The unit can be modified to run from a remote monitoring/controlling device.

Specifications

Cooling Capacity



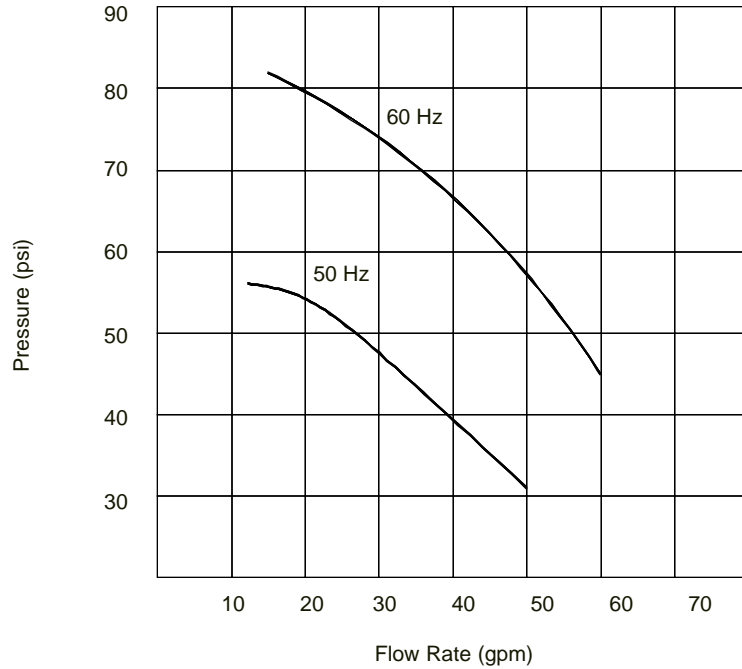
Temperature Range

+10°C to +25°C

Temperature Stability

±1.0°C

Pump Capacity



Compressor

HX-1000

10 hp

HX-2000

20 hp

**Dimensions
(H x W x D)**

Inches
Centimeters

73 ½ X 58 X 30
186.7 x 147.3 x 76.2

76 x 67 ¼ x 34
193 X 170.8 X 86.4

Shipping Weight

Pounds
Kilograms

1612
731

2061
945

1. Specifications listed for units circulating at 25°C, ambient 21°C, with 50% water and 50% Ethylene Glycol as coolant. Specifications will be affected by changes in temperature, ambient, or fluids.

Controls

POWER

Power is supplied to the unit.

ON

The unit is operating.

REFRIG

The refrigeration system is on.

PUMP

The pump is operating.

IDLE

The unit is in hot gas by-pass mode of operation.

COOL

The refrigeration system is removing heat from the cooling fluid.

TEMPERATURE °C

Indicates operating or setpoint temperature in degrees Celsius.

LOW LEVEL

A low level fault has occurred.

START

Activates unit (only when the ON OFF REMOTE switch is in the ON position).

ON OFF REMOTE

ON position, the unit can be monitored and controlled only from the control panel on the unit.

OFF position, the unit is off.

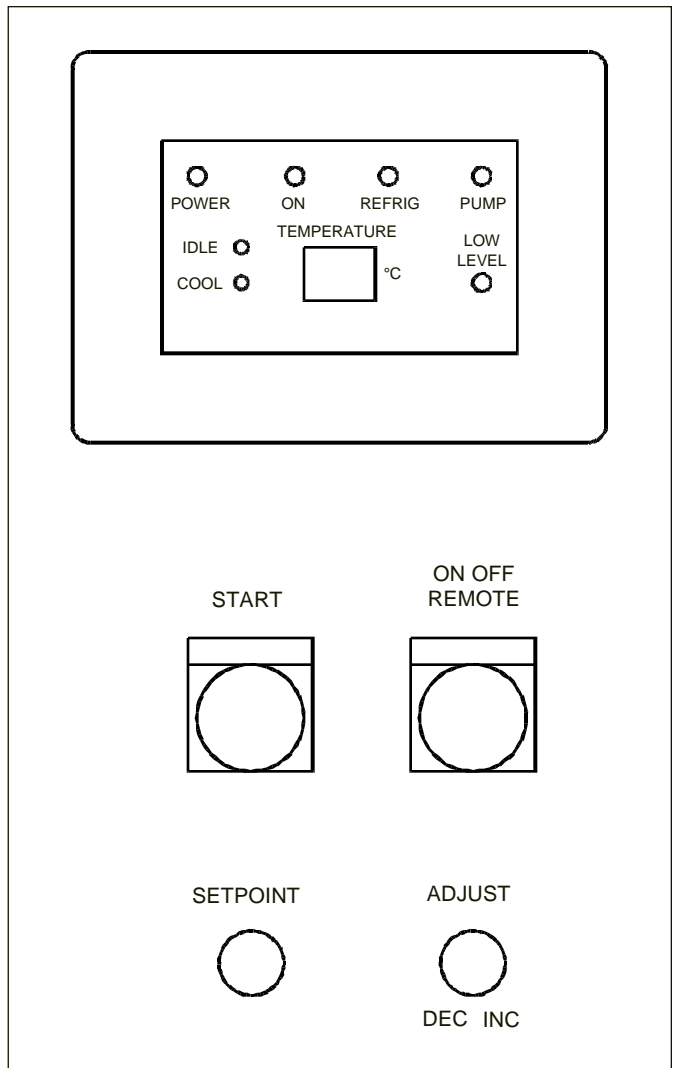
REMOTE position, the unit can be switched on and off from a remote control device.

SETPOINT

When pressed, TEMPERATURE °C display will indicate the temperature setpoint. When released, display will indicate operating temperature.

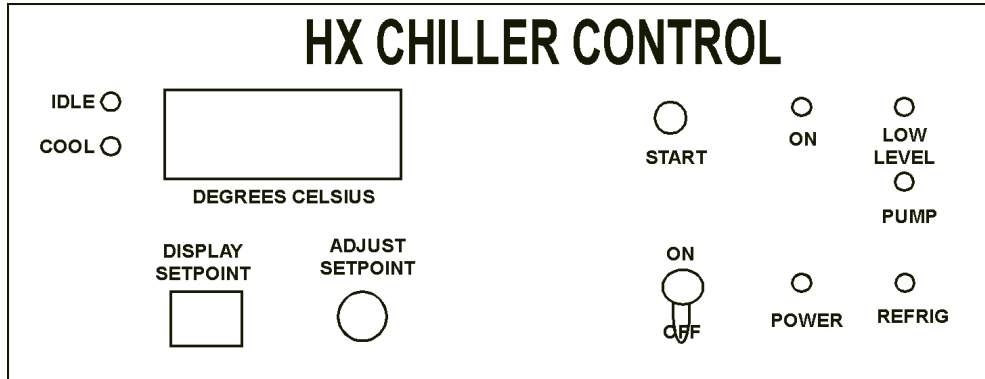
ADJUST

Adjusts the temperature setpoint.



Remote Controller

The control box should be located in a laboratory or clean industrial environment. Never place the control box in a location where excessive heat, moisture, or corrosive materials are present.



Controls

IDLE

The unit is in hot gas by-pass mode of operation.

COOL

The refrigeration system is removing heat from the cooling fluid.

DEGREES CELSIUS

Indicates operating or setpoint temperature.

DISPLAY SETPOINT

When pressed, TEMPERATURE °C display will indicate the temperature setpoint. When released, display will indicate operating temperature.

ADJUST SETPOINT

Adjusts the temperature setpoint.

START

Activates unit (when the main unit's ON OFF REMOTE switch is in the REMOTE position and the remote's ON/OFF switch is in the ON position).

ON

The unit is operating (START button depressed).

LOW LEVEL

A low level fault has occurred.

PUMP

The pump is operating.

ON/OFF

Used to start or stop the unit from the remote.

POWER

Power is supplied to the unit (ON/OFF switch in the ON position).

REFRIG

The refrigeration system is on.

Section III Installation

Site

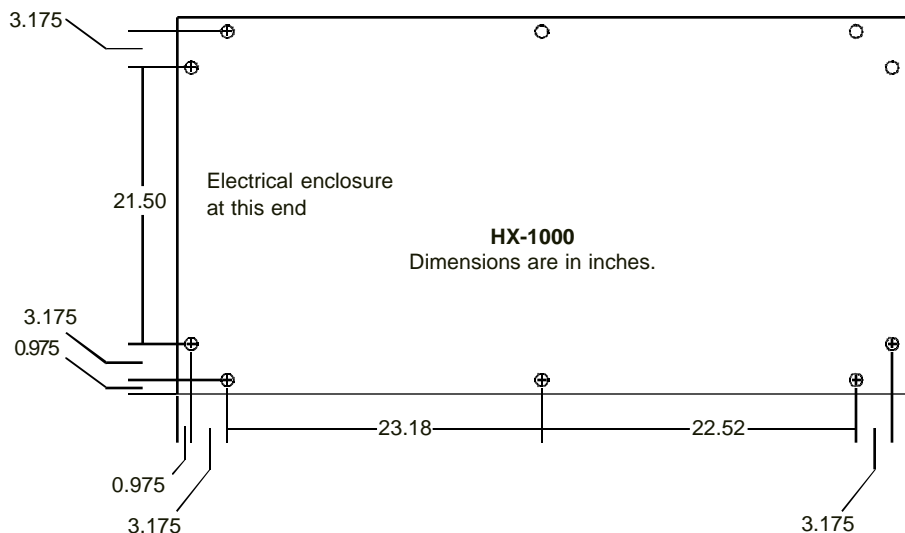
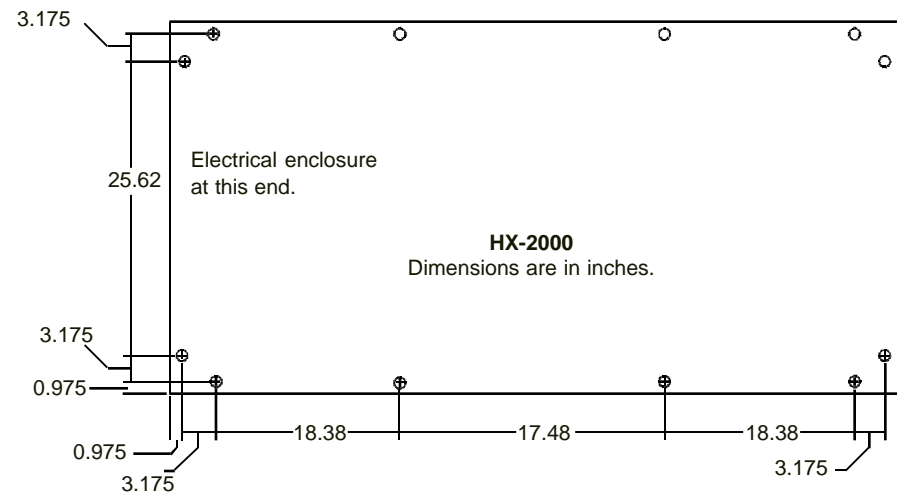
Install the unit on a well-constructed level surface, able to withstand a distributed load of 3000 pounds (1360 kilograms) for HX-2000 units, 1700 pounds (770 kilograms) for HX-1000 units.

The unit has an air-cooled refrigeration system. Air is drawn through the slotted metal grilles on either side of the unit, and exhausted through the fans on top of the unit. Air flow through the fans is 12300 feet³/minute for HX-2000 units, 6500 feet³/minute for HX-1000 units.

The unit should be placed in an area where the air intake and discharge are not impeded. A minimum clearance of 3.5 feet (1 meter) on all four sides and 7 feet (2 meters) above the unit is necessary for adequate air flow and easy access to the side panels for service and maintenance.

The ambient range of the unit is -10°F to +110°F (-22°C to +43°C).

Lag bolting the unit to the foundation is recommended. Each of the metal support feet have 0.625 X 1.500 slots that allow the unit to be lag bolted.



Pre-Start Up

Remove the two side access panels and the rear access panel (opposite end from the electrical enclosure) to access the compressor area.

Check the compressor oil level through the sight glass on the compressor crankcase. It is identified as the glass port hole in the compressor wall. The oil level should be no less than $\frac{1}{2}$ full. If the oil is below $\frac{1}{2}$, contact our Service Department.

Check the refrigerant sightglass. If the dot in the middle of the sightglass is green, the refrigerant is normal. If the dot is yellow, the refrigerant is contaminated. Contact our Service Department for assistance.

Close the COOLING WATER INLET and OUTLET by turning the valve handles fully clockwise.

Make sure the grilles on the sides of the unit (covering condensers) and the fans on the top of the unit are free of obstructions.

After all electrical and plumbing connections have been completed, close the enclosure door and secure the door latch arm (disconnect).

The unit is equipped with a set of valves on the tank inlet and outlet which prevent the tank from overflowing when the pump is off.

The unit has an automatic compressor crankcase heater. The crankcase heater warms the oil in the compressor and prevents refrigerant and the crankcase oil from mixing. Before initial start up, or after storage, the unit must be connected to the power source for at least 12 hours before turning the unit on. This will allow time for the crankcase oil to be heated and the refrigerant to separate from the oil.

Electrical Requirements

Refer to the serial number label on the inside of the electrical enclosure for the specific electrical requirements of your unit.

Electrical Connections



For personal safety and equipment reliability, this procedure should be performed by a qualified service technician familiar with the safety procedures required for working inside an energized disconnect box.

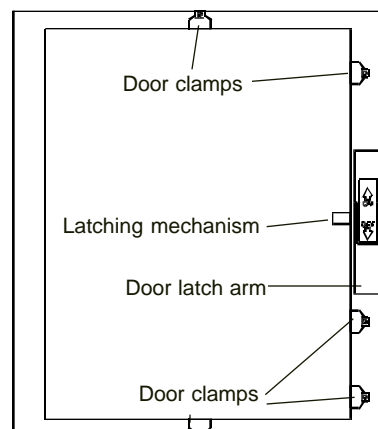
A unit wiring diagram is located in the document sleeve inside the door of the electrical enclosure. Wire the unit in conformance to local, state and federal electrical codes. Check all wiring to make sure it is properly connected and protected from the elements.

Install a conduit connector in the wall of the electrical enclosure; a hole must be drilled in the enclosure to accommodate the connector. The location of the hole is user-defined; the hole can be drilled in any of the four enclosure wall (except the upper left side wall, where the control panel is located). This allows the power supply to be installed in the enclosure at a point that is convenient for the user.

Use four-wire cable to connect the appropriate power supply (see Electrical Requirements) to the main circuit breaker located on the right side of the enclosure. Install a second circuit breaker at the power source. This second circuit breaker prevents exposure to “live” wires during installation.

The door latch arm on the enclosure activates the main disconnect for the power supply to the unit. When the door is closed, the disconnect is engaged when the latch arm is pulled up to the ON position. The POWER lamp on the control panel indicates the status of the disconnect.

The five door clamps must be secured for the enclosure to be weather-tight.



Electrical enclosure (the door has been omitted for clarity)

Remote Electrical Connections (Optional)



For personal safety and equipment reliability, this procedure must be performed by a qualified service technician familiar with the safety procedures required for working inside an energized disconnect box.

Wiring diagrams are located inside the document sleeve inside the electrical enclosure. Wire the unit in conformance to all local, state and federal electrical codes. Check all wiring and make sure it is properly connected and protected from the elements.

Install a conduit connector in the wall of the unit's electrical enclosure and in the wall of the control box. A hole must be drilled in both the electrical enclosure and the control box to accommodate the connectors. The location of these holes is user-defined; this allows the connecting cable to be installed in both the electrical enclosure and the control box at a point that is convenient to the user. The hole can be drilled in any of the four enclosure walls (except the upper left side wall, where the control panel is located). Similarly, the hole can be drilled in any of the control box walls as long as it does not interfere with the controls and lamps on the front panel.

Connect the terminal strips in the remote control box to the terminal strip located in the upper right corner of the electrical enclosure (wire number to wire number).

Plumbing Requirements

The inlet and outlet of the unit are labelled COOLING WATER INLET and OUTLET. These connections are 1¼ inch FPT.

Follow good plumbing practices to minimize unnecessary bends and restrictions that will increase the pressure drop through the circulating lines. Refer to Pressure Drop Chart on the next page to estimate the pressure drop through various diameter tube lengths.

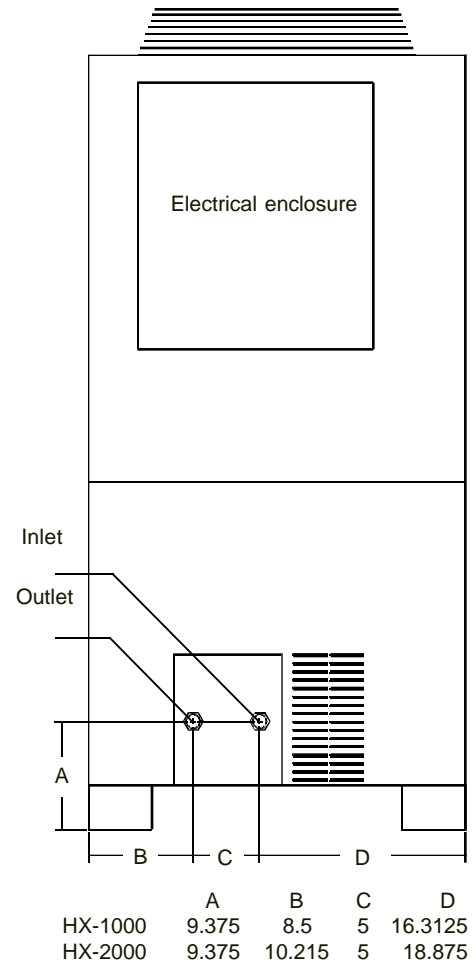
Insulate all tubes and fittings to minimize loss of cooling capacity. This is extremely important in areas of ambient extremes or when the unit is located a great distance from the instrument being cooled. All tubing and fittings should be weather resistant, able to endure high and low ambient conditions, and able to withstand a maximum pressure of 120 psi.

Insulating hose is available from NESLAB. Contact our Sales Department for more information.

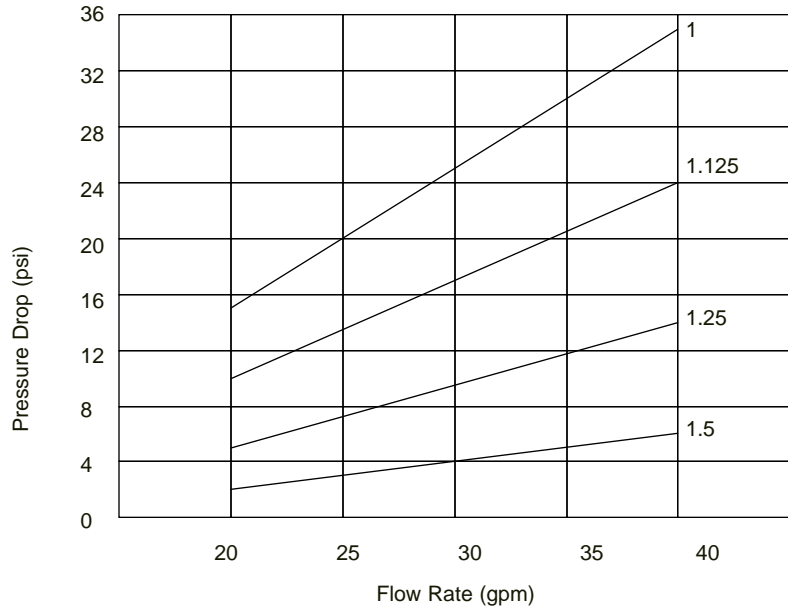
Use the Pump Capacity Chart (see Specifications) and the Pressure Drop Chart to calculate the maximum distance you can locate the unit from the system being cooled. Find the point on the Pump Capacity Chart that matches the flow and pressure requirements of the system

being cooled. From that point, estimate the pressure difference between the pump performance line, and the point you have chosen on the graph. This net pressure value, used with the Pressure Drop Chart, will help determine the maximum distance from the chiller to the system being cooled and the tubing diameter (ID).

NOTE: The unit is equipped with a set of valves on the tank inlet and outlet which prevent the tank from overflowing when the pump is off.



Dimensions of the inlet and outlet.
Dimensions are in inches.



Material: 100 feet copper tubing. Dimensions are inside diameter (ID), measured in inches.

Fluid

A non-freezing fluid is required for operation at any recirculating or ambient temperature. The selected fluid must have a viscosity of 50 centistokes or less at the lowest operating temperature.

Due to the physical nature of a plate heat exchanger, and its response to temperature changes, 100% water must not be used as a circulating fluid. Using 100% water may cause the plate heat exchanger to rupture.



Never use corrosive or flammable fluids with this unit.

Never use automobile anti-freeze. Commercial anti-freeze contains silicates that can cause permanent damage to the pump seals.

Non-compliance with the statements in the section can result in damage to the unit and will void the manufacturer's warranty. For more information contact our Sales Department (see Preface, After-sale Support).

The wetted parts are:

- *Stainless steel*
- *Bronze*
- *Brass*
- *Copper*
- *PVC Plastic*

Filling Requirements

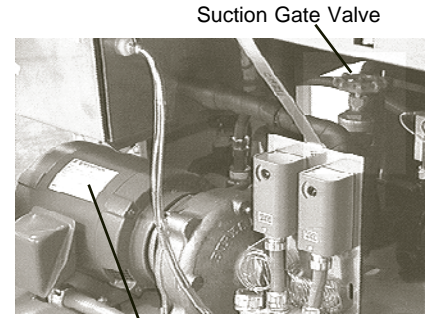
Ensure the INLET and OUTLET valves on the front of the outside of the unit are closed. Connect the INLET/OUTLET recirculation lines from the HX to your application.

Open the unit's lower-right hand side panel and locate the 1¼" suction gate valve. (It is the largest valve in the unit and is located between the reservoir and compressor.)

Ensure the suction gate valve is fully closed.

Remove the reservoir cover. Fill the reservoir approximately ¾ full. Start the unit and allow it to run 15 - 20 minutes.

Have enough fluid on hand to fill the unit's reservoir, the recirculation lines to your application, and your application itself.



Slowly open the OUTLET valve. **Opening the valve too quickly will cause water-hammering.**

A qualified technician should ensure the pump amperage draw does not exceed the stated draw on the pump motor label. (Check the amperage using either line 39, 40 or 41 on the motor thermal protector (1TOR) located at the lower left hand corner of the NEMA box.)

As the recirculation lines fill with fluid, keep the reservoir topped off to within one inch of the top. (There could be some substantial splashing from the reservoir as air is purged from the lines.)

While still monitoring the amperage draw, slowly open the INLET valve.

Your application may be started at this time.

As the recirculation lines continue to fill, keep topping off the reservoir.

When the reservoir no longer needs additional fluid, fully open the suction gate valve.

Allow the unit to run 10 to 15 minutes to purge any remaining air.

Ensure the reservoir is filled to within one inch of the top.

Close the reservoir cover.

Install the unit's lower-right hand side panel.

Section IV Operation

Off Cycle

When the unit is manually shut down, a time delay is activated that allows the refrigeration system and the pump to continue to operate. The system will run in the IDLE mode (hot gas by-pass) for two minutes. This additional run time allows all refrigerant to be removed from the heat exchanger and for the heat exchanger to warm up.

NOTE: The unit is equipped with a set of valves on the tank inlet and outlet which prevent the tank from overflowing when the pump is off.

In the event of a fault, the unit will not start the pump-down cycle but will shut down immediately.

Shutting the unit off using a circuit breaker or other device on the line side of the relay will defeat the purpose of the off cycle and is not recommended. If remote operation is desired contact our service department.

Start Up (non-Remote units)

Ensure the door latch arm (disconnect) has been secured for at least 12 hours.

Partially open the COOLING WATER INLET and OUTLET by turning the valve handles counterclockwise.

Turn ON OFF REMOTE switch to ON and push the START switch.

The unit has a time delay that bypasses the Low Pressure Cutout and allows the unit to run for approximately three minutes, regardless of the amount of pressure in the refrigeration system. If the unit runs for three minutes, then shuts down, a refrigeration leak may be present. Contact our Customer Service Department for assistance.

Remote (Optional)

The unit can be operated using an optional remote monitoring/controlling device. Follow the safety precautions and installation procedures outlined in Electrical Connections for the proper installation instructions.

To operate from a remote device, turn the ON OFF REMOTE switch to the REMOTE position.

Temperature Adjustment

The temperature controller is located below the control panel on the left side of the electrical enclosure.

To adjust the temperature setpoint, the system needs to be on, circulating cooling fluid, and under a heat load. Press and hold the SETPOINT button. Turn the ADJUST knob until the temperature setpoint is indicated on the TEMPERATURE °C display. Turn the knob counterclockwise to raise the temperature setpoint and clockwise to lower the temperature setpoint. Release the SETPOINT button. The TEMPERATURE °C display will indicate the operating temperature.

The temperature controller range is from +10°C to +25°C.

If for some reason the unit stops, allow at least 2 minutes for "Reset" before attempting restart.

Flow Rate

Adjust the flow rate to the system being cooled by turning the COOLING WATER OUTLET valve. Use a flow meter on the COOLING WATER OUTLET to adjust the desired flow rate.

High and Low Temperature Cutout

The High and Low Temperature Cutouts (HTC/LTC) monitor the temperature of the cooling fluid as it exits the heat exchanger. They prevent the cooling fluid from reaching excessively high or low temperatures that can damage the unit.

In the event of a high temperature fault, the REFRIG and PUMP lamps will go out, and the unit will shut down. The unit will remain off and must be manually restarted.

In the event of a low temperature fault, the REFRIG lamp will go out and the compressor will shut down. The compressor will remain off until the cooling fluid temperature rises above the cut off point.

The HTC is set at +80°F (+27°C). The LTC is set at +25°F (-6°C). If adjustments are needed, contact our Customer Service Department for assistance.

High and Low Pressure Cutout

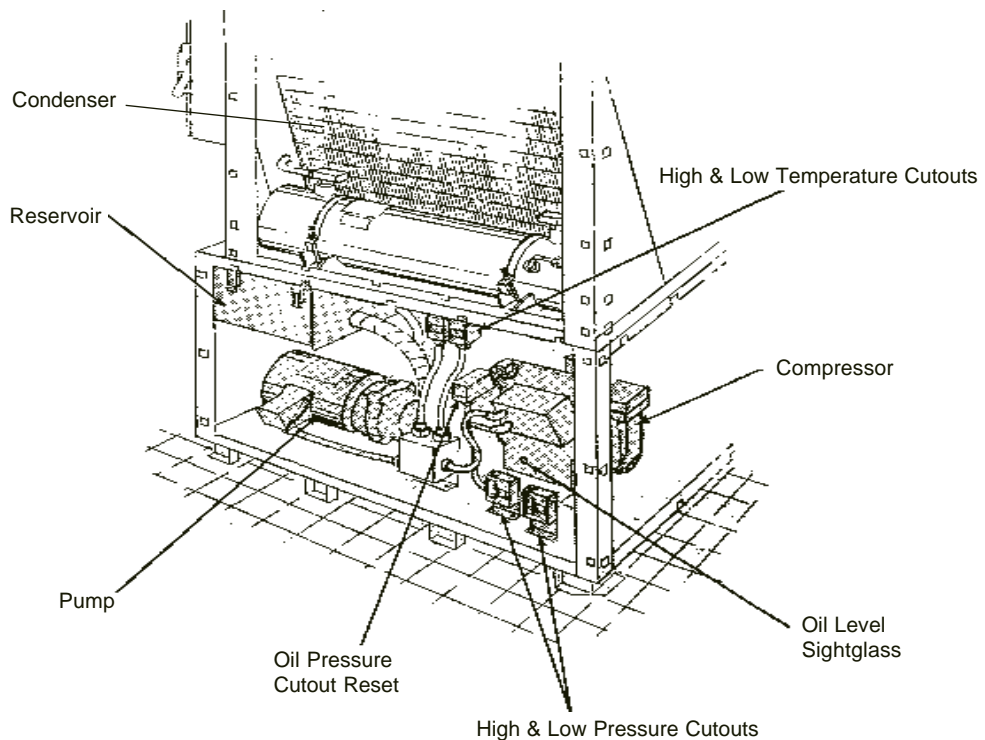
The High and Low Pressure Cutouts (HPC/LPC) monitor the refrigeration pressure at the compressor. They prevent excessively high or low pressures that can damage the unit. In the event of a high pressure fault, the REFRIG and PUMP lamps will go out and the unit will shut down until the refrigeration pressure drops below the cut in point.

During a low pressure fault, the REFRIG lamp is out and the compressor and discharge fans shut down until the refrigeration pressure rises above the cut in point.

Oil Pressure Cutout

In the event of low compressor oil pressure, the Oil Pressure Cutout will shut down the compressor and the discharge fans.

After the failure has been corrected, the cut out must be reset. Push the Oil Pressure Cutout Reset button located next to the compressor (see Figure 2).



NOTE: Refrigerant Sightglass is located on the other side of the unit (opposite to the compressor).

Section V Safety Features

Safety Features

The unit is equipped with the following safety features designed to protect the unit in case of failure. LED lamps are mounted on the control panel on the electrical enclosure, and indicate operational status.

Low Fluid Level

The Low Fluid Level monitor is connected to a float switch in the reservoir. If the reservoir level drops below a safe operating level, the LOW LEVEL lamp will light, but the unit will not shut off.

Pump

In the event of any of the following conditions, the PUMP lamp will go out and the unit will shut down. The failure must be identified and corrected before the unit can be restarted.

- *Loss of circulating flow, in the event of pump failure or ruptured pump lines.*
- *Pump motor thermal overload.*
- *High cooling fluid temperature (adjustable).*
- *High refrigeration pressure.*

Refrigeration

In the event of any of the following conditions, the REFRIG lamp will go out and the compressor and discharge fans will shut down. The pump/circulating system will remain operating until the ON OFF REMOTE switch is manually turned OFF, or until the operating temperature reaches the High Temperature Cutout setting. This allows a temporary supply of cooling fluid to the instrument being cooled until the instrument being cooled can safely be turned off.

- *Low compressor oil pressure.*
- *Low refrigeration pressure.*
- *Low cooling fluid temperature (adjustable).*
- *Compressor motor thermal overload.*

In the event of any of the following conditions, the REFRIG lamp will go out and the unit will shut down:

- *High refrigeration pressure.*
- *High cooling fluid temperature (adjustable).*

If your unit fails to operate properly, contact our Customer Service Department for assistance.

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 Customer Service Department.

Compressor Oil

Check the compressor oil level after 24 hours of operation. The minimum oil level is $\frac{1}{2}$ full. If the level is lower, contact our Customer Service Department.

Cleaning

A build up of dust and debris on the condenser can cause a loss of cooling capacity. Periodically clean the condensers by removing the expanded metal grilles and blowing compressed air through the condensers or by hosing them down with water. The frequency of cleaning depends on the operating environment.

Parts List

Our Customer Service Department can provide you with a complete list of spare parts for your unit. Phone numbers and addresses for all our NESLAB Sales Centers are located in the front of this manual (see Preface, After-sale Support). Before calling, please obtain the following information:

BOM number

Serial number

WARRANTY

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

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

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

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

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

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

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

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

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

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

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