Operators Manual

Refrigerated Recirculating Chillers

110-240 Rev. H

06/06

EC Declaration of Conformity

PolyScience

The Products herewith complies with the requirements, as stated below, in accordance to the EC Low Voltage Directive 73/23/EEC and EC Electromagnetic Compatibility Directive 89/336/EEC, and carries the CE marking accordingly.

We herewith declare:

PolyScience
Division of Preston Industries, Inc.
6600 West Touhy Avenue
P.O. Box 48312
Niles, Illinois 60714, USA

That the following equipment complies with the essential requirements in respect to safety and health, in accordance to the EC Directives based on its design and type, as brought into circulation by us. In case of alteration of the equipment, not agreed upon by us, this will lose its validity.

Product Description:

Refrigerated Chillers
6206, 6306, 6506, 6706, 6106, 5206, 5306, 5706, 5106; 1171, 1173, 1175, 1177, 1179, 512CR, 517CR

Low Voltage Directive 73/23/EEC & Electromagnetic Compatibility 89/336/EEC and relevant transpositions into national law of the member states, including, but not limited to the following Harmonized Standards:
EN/IEC 61010-1: 2001
EN/IEC 61010-2
EN 61326: 1997 +A1: 1998 + A2:2001
CISPR 11/EN 55011 Class A, Group I

Testing Bodies:

CSA International (Certification & Testing Division)
D.L.S. Electronic Systems Inc. (EMC approval)

Signature on Behalf of Manufacturer or Authorized Representative:

Brian Klotz

Date of Validity:

October 18, 2005

Title of Signatory:

Engineering Manager

110-266 Rev. D 10/05

WEEE Directive

A label with a crossed-out wheeled bin symbol and a rectangular bar indicates that the product is covered by the Waste Electrical and Electronic Equipment (WEEE) Directive and is not to be disposed of as unsorted municipal waste.

Any products marked with this symbol must be collected separately, according to the regulatory guidelines in your area.

or

The objectives of this program are to preserve, protect and improve the quality of the environment, protect human health, and utilize natural resources prudently and rationally.
Specific treatment of WEEE is indispensable in order to avoid the dispersion of pollutants into the recycled material or waste stream. Such treatment is the most effective means of protecting the customer's environment.

Requirements for waste collection, reuse, recycling, and recovery programs vary by regulatory authority at your location.

Contact your local responsible body (e.g., your laboratory manager) or authorized representative for information regarding applicable disposal regulations.

Contact PolyScience at the web site listed below for information.

Web address: www.polyscience.com

Customer Care: **1-800-229-7569** **(inside the USA)**
(+1) 847-647-0611 **(outside the USA)**
Fax **1-847-647-1155**

Table of Contents

Section 1 - General Information

1.1 Warranty

Thank you for purchasing this chiller. We are confident it will serve you for a long time. Our warranty to you is as follows:

The manufacturer agrees to correct for the original user of this product, either by repair, or at the manufacturer's election, by replacement, any defect that develops after delivery of this product within the period as stated on the warranty card. In the event of replacement, the replacement unit will be warranted for 90 days or warranted for the remainder of the original unit's parts or labor warranty period, whichever is longer.

If this product requires service, contact the manufacturer/supplier's office for instructions. When return of the product is necessary, a return authorization number will be assigned and the product should be shipped, transportation charges pre-paid, to the indicated service center. To insure prompt handling, the return authorization number should be placed on the outside of the package and a detailed explanation of the defect enclosed with the item.

This warranty shall not apply if the defect or malfunction was caused by accident, neglect, unreasonable use, improper service, or other causes not arising out of defects in material or workmanship. There are no warranties, expressed or implied, including, but not limited to, those of merchantability or fitness for a particular purpose which extends beyond the description and period set forth herein.

The manufacturer's sole obligation under this warranty is limited to the repair or replacement of a defective product and shall not, in any event, be liable for any incidental or consequential damages of any kind resulting from use or possession of this product. Some states do not allow: (A) limitations on how long an implied warranty lasts; or (B) the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights. You may have other rights that vary from state to state.

1.2 Unpacking

Your Chiller is shipped in a special carton. Retain the carton and all packing materials until the unit is completely assembled and working properly. Set up and run the unit immediately to confirm proper operation. Beyond one week, your unit may be warranty repaired, but not replaced. If the unit is damaged or does not operate properly, contact the transportation company, file a damage claim and contact the company where your unit was purchased immediately.

	This symbol marks chapters and sections of this instruction manual that are particularly relevant to safety. When attached to the unit, this symbol draws attention to the relevant section of the instruction manual.

	This symbol indicates that hazardous voltages may be present.

Read all instructions pertaining to safety, set-up, and operation.
Proper operation is the users' responsibility.

Section 2 -- Overview

2.1 Contents

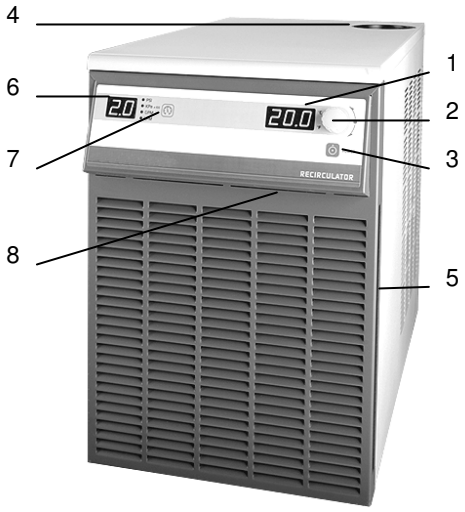
— Recirculating Chiller
— Operators Manual
— Warranty Card
— IEC Power Cord
— Two sets of Inlet/Outlet Adapters: ½ inch male NPT, 5/8 inch male NPT

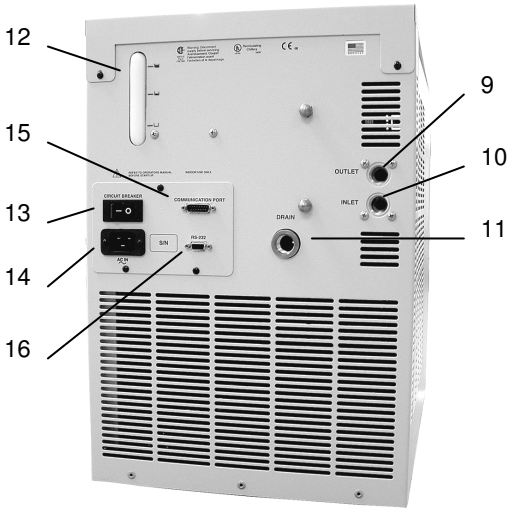
2.2 Description

These Refrigerated Recirculating Chillers provide cooling power for demanding applications and serve as an economical alternative to tap water cooling systems. All models feature a microprocessor-based controller, digital temperature display (°C or °F), one-touch set point display, and digital pressure/flow rate display (PSI, kPa, GPM, LPM) with push-button selection.

To optimize cooling efficiency and performance, these sophisticated Chillers also feature a modulated refrigeration system. As a result, temperature stability is greatly enhanced and compressor life extended.

Refrigerated Recirculating Chillers are equipped with either a centrifugal, positive displacement, or regenerative turbine pump. Wetted parts within the recirculation system are brass, stainless steel, polyethylene, EPDM rubber, and nylon.





Front/Top

1. Temperature Display
2. Select/Set Knob
3. Power Button
4. Reservoir Cap and Internal Fluid Filter (top)
5. Air Filter
6. Pressure / Flow Rate Display
7. Units / Menu Select Button
8. Ambient Tracking Probe Connection (optional)

Rear

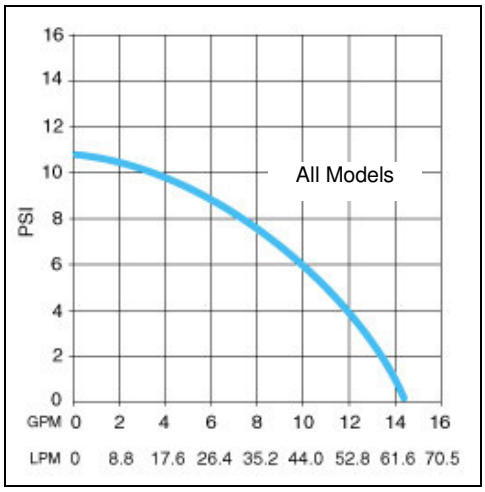
9. Fluid Outlet
10. Fluid Inlet
11. Drain
12. Reservoir Fluid Level Gauge
13. Circuit Breaker / Power Switch
14. IEC Power Connection
15. Remote I/O Connection (optional)
16. RS232 / RS 485 Connection (optional)

2.3 Chiller Specifications and Pump Performance

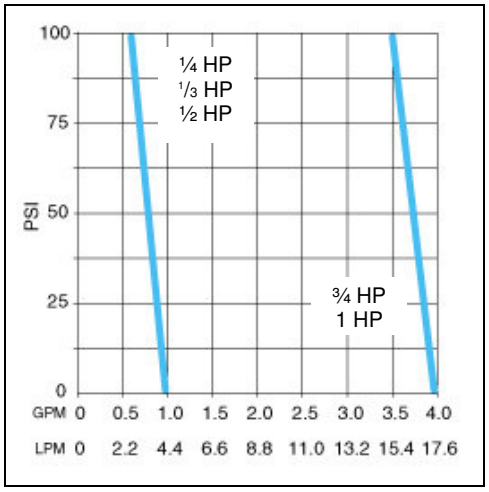
General Specifications (all Chillers)

Temperature Set Point Resolution	±0.1℃
Temperature Stability	±0.1℃
Temperature Units	℃ or ℉
Pressure Units	PSI or kPa
Pressure Display Resolution Pressure Display Accuracy	1 PSI / 6.9 kPa ±3.5% of full scale (100PSI)
Flow Rate Units	GPM or LPM
Flow Rate Display Resolution Flow Rate Display Accuracy	0.1 GPM / 1 LPM +/- 0.4 GPM / 1.5 LPM
Pump Inlet and Outlet	½ inch NPT

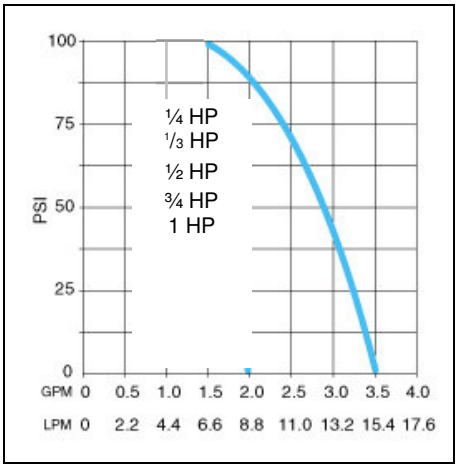
Pump Performance



Magnetic Drive Centrifugal Pump



Positive Displacement Pump



Turbine Pump

Specifications — 1/4-HP, 1/3-HP, and 1/2-HP Chillers

Model: Rfg = Refrigerating Only
Rfg / Htg = Refrigerating & Heating

Magnetic Drive Centrifugal Pump					
Model	**Rfg**	**Rfg / Htg**	**Rfg**	**Rfg / Htg**	**Rfg**
Operating Temperature	-10° to 40°C	-10° to 70°C	-10° to 40°C	-10° to 70°C	-10° to 40°C
Compressor	1/4 HP		1/3 HP		1/2 HP
Cooling Capacity @ 20°C 10°C 0°C	800 watts 2728 BTU/hr 500 watts 1705 BTU/hr 200 watts 682 BTU/hr		1200 watts 4092 BTU/hr 900 watts 3069 BTU/hr 500 watts 1705 BTU/hr		1700 watts 5797 BTU/hr 1100 watts 3751 BTU/hr 750 watts 2557 BTU/hr
Pressure at 0 Flow Rate	10 psi / 69 kPa		10 psi / 69 kPa		10 psi / 69 kPa
Flow Rate at 0 psi	4.1 gpm / 15.5 lpm		4.1 gpm / 15.5 lpm		4.1 gpm / 15.5 lpm
Reservoir Capacity	1.1 gal / 4.2 liters		1.1 gal / 4.2 liters		1.1 gal / 4.2 liters
Dimensions (h x w x d)	22-5/8 x 14-1/2 x 27-5/8 in. 57.5 x 36.8 x 70.2 cm				
Shipping Weight	131 pounds 59.4 kg		143 pounds 64.8 kg		168 pounds 76.2 kg
120 V, 60 Hz Chillers Volts Range	108 to 132V				
Amps	9.5A	10.0A	10.4A	10.7A	13.5A
240 V, 50 Hz Chillers Volts Range Over Voltage	198 to 264V Category II				
Amps	5.6A	5.9A	5.9A	6.2A	7.2A
Positive Displacement Pump ("P" Series Chillers)					
Model P Series Chillers	**Rfg**	**Rfg / Htg**	**Rfg P**	**Rfg / Htg**	**Rfg**
Operating Temperature	-10° to 40°C	-10°C to 70°C	-10° to 40°C	-10°C to 70°C	-10° to 40°C
Compressor	1/4 HP		1/3 HP		1/2 HP
Cooling Capacity @ 20°C 10°C 0°C	800 watts 2728 BTU/hr 500 watts 1705 BTU/hr 200 watts 682 BTU/hr		1200 watts 4092 BTU/hr 900 watts 3069 BTU/hr 500 watts 1705 BTU/hr		1700 watts 5797 BTU/hr 1100 watts 3751 BTU/hr 750 watts 2557 BTU/hr
Flow Rate @ 0 psi	1 gpm / 3.75 lpm		1 gpm / 3.75 lpm		1 gpm / 3.75 lpm
Pump Pressure (adjustable)	20 to 100 psi 138 to 689 kPa		20 to 100 psi 138 to 689 kPa		20 to 100 psi 138 to 689 kPa
Reservoir Capacity	1.1 gal / 4.2 liters		1.1 gal / 4.2 liters		1.1 gal / 4.2 liters
Shipping Weight	141 pounds 64 kg		153 pounds 69 kg		178 pounds 81 kg
120 V, 60 Hz Chillers Volts Range	108 to 132V				
Amps	12.2A	12.5A	13.1A	13.5A	16.0A
240 V, 50 Hz Chillers Volts Range Over Voltage	198 to 264V Category II				
Amps	6.8A	7.1A	7.3A	7.6A	8.9A

Model: Rfg = Refrigerating Only
Rfg / Htg = Refrigerating & Heating

Turbine Pump ("T" Series Chillers)					
Model T Series Chillers	**Rfg**	**Rfg / Htg**	**Rfg**	**Rfg / Htg**	**Rfg**
Operating Temperature	-10° to 40°C	-10°C to 70°C	-10° to 40°C	-10°C to 70°C	-10° to 40°C
Compressor	1/4 HP		1/3 HP		1/2 HP
Cooling Capacity @ 20°C 10°C 0°C	800 watts 2728 BTU/hr 500 watts 1705 BTU/hr 200 watts 682 BTU/hr		1200 watts 4092 BTU/hr 900 watts 3069 BTU/hr 500 watts 1705 BTU/hr		1700 watts 5797 BTU/hr 1100 watts 3751 BTU/hr 750 watts 2557 BTU/hr
Flow Rate @ 0 psi	3.5 gpm / 13.2 lpm		3.5 gpm / 13.2 lpm		3.5 gpm / 13.2 lpm
Pump Pressure (adjustable)	20 to 90 psi 138 to 621 kPa		20 to 90 psi 138 to 621 kPa		20 to 90 psi 138 to 621 kPa
Reservoir Capacity	1.1 gal / 4.2 liters		1.1 gal / 4.2 liters		1.1 gal / 4.2 liters
Shipping Weight	143 pounds 65 kg		156 pounds 71 kg		181 pounds 82 kg
120 V, 60 Hz Chillers Volts Range	108 to 132V				
Amps	12.2A	12.5A	13.1A	13.5A	16.0A
240 V, 50 Hz Chillers Volts Range Over Voltage	198 to 264V Category II				
Amps	6.8A	7.1A	7.3A	7.6A	8.9A

Specifications subject to change without notice.

Specifications — 3/4-HP and 1-HP Chillers

Model: Rfg = Refrigerating Only
Rfg / Htg = Refrigerating & Heating

Magnetic Drive Centrifugal Pump				
Model	**Rfg**	**Rfg / Htg**	**Rfg**	**Rfg / Htg**
Operating Temperature	-10° to 40°C	-10° to 70°C	-10° to 40°C	-10 to 70°C
Compressor	3/4 HP		1 HP	
Cooling Capacity @ 20°C 10°C 0°C	2500 watts 8525 BTU/hr 1700 watts 5797 BTU/hr 760 watts 2591 BTU/hr		2900 watts 9889 BTU/hr 1950 watts 6649 BTU/hr 1000 watts 3410 BTU/hr	
Pressure at 0 Flow Rate	10 psi / 69 kPa		10 psi / 69 kPa	
Flow Rate at 0 psi	4.1 gpm / 15.5 lpm		4.1 gpm / 15.5 lpm	
Reservoir Capacity	1.1 gal / 4.2 liters		1.1 gal / 4.2 liters	
Dimensions (h x w x d)	22-5/8 x 14-1/2 x 27-5/8 in. 57.6 x 36.8 x 70.2 cm			
Shipping Weight	187 pounds 84.8 kg		189 pounds 85.7 kg	
208-230 V, 60 Hz Volts Range	187 to 253V			
Amps	9.2A	9.5A	9.5A	9.8A
240 V, 50 Hz Volts Range Over Voltage	198 to 264V Category II			
Amps	9.2A	9.5A	9.5A	9.8A
Positive Displacement Pump ("P" Series Chillers)				
Model P Series Chillers	**Rfg**	**Rfg / Htg**	**Rfg**	**Rfg / Htg**
Operating Temperature	-10° to 40°C	-10° to 70°C	-10° to 40°C	-10° to 70°C
Compressor	3/4 HP		1 HP	
Cooling Capacity @ 20°C 10°C 0°C	2500 watts 8525 BTU/hr 1700 watts 5797 BTU/hr 760 watts 2591 BTU/hr		2900 watts 9889 BTU/hr 1950 watts 6649 BTU/hr 1000 watts 3410 BTU/hr	
Flow Rate @ 0 psi	3.5 gpm / 13.2 lpm		3.5 gpm / 13.2 lpm	
Pump Pressure (adjustable)	20 to 100 psi 138 to 689 kPa		20 to 100 psi 138 to 689 kPa	
Reservoir Capacity	1.1 gal / 4.2 liters		1.1 gal / 4.2 liters	
Shipping Weight	197 pounds 89 kg		199 pounds 90 kg	
208-230 V, 60 Hz Volts Range	187 to 253V			
Amps	11.9A	12.2A	12.2A	12.5A
240 V, 50 Hz Volts Range Over Voltage	198 to 264V Category II			
Amps	11.9A	12.2A	12.2A	12.5A

Model: Rfg = Refrigerating Only
Rfg / Htg = Refrigerating & Heating

Turbine Pump ("T" Series Chillers)				
Model T Series Chillers	**Rfg**	**Rfg / Htg**	**Rfg**	**Rfg / Htg**
Operating Temperature	-10° to 40°C	-10° to 70°C	-10° to 40°C	-10° to 70°C
Compressor	3/4 HP		1 HP	
Cooling Capacity @ 20°C 10°C 0°C	2500 watts 8525 BTU/hr 1700 watts 5797 BTU/hr 760 watts 2591 BTU/hr		2900 watts 9889 BTU/hr 1950 watts 6649 BTU/hr 1000 watts 3410 BTU/hr	
Flow Rate @ 0 psi	3.5 gpm / 13.2 lpm		3.5 gpm / 13.2 lpm	
Pump Pressure (adjustable)	20 to 90 psi 138 to 621 kPa		20 to 90 psi 138 to 621 kPa	
Reservoir Capacity	1.1 gal / 4.2 liters		1.1 gal / 4.2 liters	
Shipping Weight	197 pounds 89 kg		199 pounds 90 kg	
208-230 V, 60 Hz Volts Range	187 to 253V			
Amps	11.9A	12.2A	12.2A	12.5A
240 V, 50 Hz Volts Range Over Voltage	198 to 264V Category II			
Amps	11.9A	12.2A	12.2A	12.5A

Specifications subject to change without notice.

Notes: Refer to the serial number plate on the rear of the Chiller for model and electrical data.
Cooling capacity (watts x 3.41) = BTU/hour. Performance specifications determined at ambient temperature of 20°C (68°F).
For 50Hz models, derate cooling capacity 17%.
Positive Displacement Pump Models: External pressure reducing assembly (Cat. No. 060302) steps down high outlet pressure to 10 to 45psi.

Environmental Conditions

Indoor use only
Maximum Altitude: 2000 meter
Operating Ambient: 5° to 30°C
Relative Humidity: 80% for temperatures to 30°C
Pollution Degree: 2
Class 1: Residential, Commercial, Light Industrial
Class 2: Heavy Industrial

Section 3 – Installation and Startup

WARNING: Be sure all power is off before proceeding.

3.1 Site Requirements

Ambient Temperature and Relative Humidity

The Chiller is designed for indoor installation in ambient temperatures between 5° and 30°C (41° and 86°F); relative humidity should not exceed 80% (non-condensing).

Location

The Chiller should be installed on a strong, level surface. It should be located as close to possible to the process requiring cooling. It should not be installed closer than 4 feet (1.4 meters) to a heat-generating source, such as heating pipes, boilers, etc. If possible, the Chiller should be located near a suitable drain to prevent flooding in the event of leaks. Do not place it where corrosive fumes, excessive moisture, excessive dust, or high room temperatures are present.

For ease of positioning and maneuverability, the Chiller is supplied with casters. The front wheels can be locked to keep the Chiller in place while in use.

To help prevent voltage drops, position the Chiller as close as possible to the power distribution panel. Avoid voltage drops by using a properly grounded power outlet wired with 14 gauge or larger diameter wire. The use of an extension cord is not recommended.

NOTE: The Chiller may be located at a level below that of the equipment being cooled. As long as the process remains closed, overflow will not occur when adding cooling fluid to the Chiller reservoir.

Clearance

Adequate clearance should be allowed on the front, sides, and rear of the Chiller for access to connections and components. The front and rear vents of the Chiller must be a minimum of 24 inches (61 cm) away from walls or vertical surfaces so air flow is not restricted.

3.2 Electrical Power

An IEC power cord is provided with the Chiller. It should be attached to the receptacle on the rear of the enclosure. Make sure that the power outlet used for the Chiller is properly grounded and matches the voltage and frequency indicated on the identification label on the back of the Chiller.

The use of an extension cord is not recommended. However, if one is necessary, it must be properly grounded and capable of handling the total wattage of the unit. The extension cord must not cause more than a 10% drop in voltage to the Chiller.

WARNING: DO NOT plug the Chiller into the electrical outlet until the unit is ready for Startup (Section 3.7 below).

3.3 Optional Signal Inputs/Outputs

External Temperature Probe

This option allows you to control cooling fluid temperature using an external temperature measurement (ambient room/machine temperature or process temperature). A 4-pin connector is provided on the underside of the local control panel for connecting the external temperature probe.

NOTE: In order for the Chiller to properly recognize the presence of the external temperature probe, the probe must be connected to the unit before power is applied.

RS232 / RS-485 Serial Output

This option allows you to remotely control the Chiller and/or output temperature readings to an external recorder or other auxiliary device. The maximum communications distance for Chillers equipped with the RS232 option is 50 feet (15 meters). The maximum distance for units equipped with the RS485 option is 4000(1200 meters). A 9-pin D-connector is provided on the rear of the instrument enclosure for this connection.

Remote I/O Port

This option allows you to use an external 12 VDC signal to turn the Chiller on and off. A 9-pin D-connector is provided on the rear of the instrument enclosure for this connection.

3.4 Plumbing

Process Piping

The Chiller has two internally threaded (1/2 inch ID NPT) fittings on the rear of the instrument housing for the process water connections. Two sets of adapters (1/2 inch ID and 5/8 inch ID) are supplied with the unit for connecting these fittings to the process piping.

To maintain a safe workplace and avoid leaks, special care should be taken when choosing hoses and connectors for the Chiller. It is the user's responsibility to ensure that the tubing and fittings connected to the Chiller are compatible with the fluid, temperature, and pressure being used.

- Pressure Ratings — Hoses should be able to withstand the largest pressure that they will encounter. For "P" Series (positive displacement pump) and "T" Series (turbine pump) Chillers, this is 100 psi (689 kPa).
- Flexible Tubing — Avoid tubing that will expand and take up fluid volume when operating at the desired pressure.
- Hose Diameter — Process piping/hosing with a diameter smaller than ½ inch ID can be used if desired. However, keep in mind that using smaller diameter hosing increases pressure in the circulating system.
- Couplings and Clamps — The use of screw-tightened hose clamps is necessary on all joints to insure good, tight connections. Quick connectors are not recommended as they have the potential for restricting flow rate.

Reservoir Drain

- A ½ inch NPT connection is provided for the reservoir's gravity drain. It should be piped to a drain or receptacle positioned below the bottom of the reservoir. If a receptacle is used, be sure it is of sufficient volume to hold all the water in the reservoir, process, and process lines.

3.5 Closed System or Cooling Coil Setup

Connect the Chiller's inlet and outlet to the external apparatus with hoses or pipes. The direction of the flow through the system can be controlled by the way the connections are made. Fluid is drawn into the Chiller through the "Inlet" connection; fluid is pumped out of the Chiller through the "Outlet" connection.

NOTE: When Chillers with the standard magnetic drive centrifugal pump are connected to an external apparatus with a built-in shutoff, an external bypass loop assembly (Cat. No. 510-147) may be needed if operating below 20°C (68°F). This bypass assembly continues flow circulation to and from the pump even though the main flow to the external apparatus has been blocked.

3.6 Open Bath System Setup

Connect the Chiller's inlet and outlet to the external bath using tubing of the same diameter and length. The same size fittings should also be used on both the inlet (suction) and outlet (pressure). This helps ensure a balanced flow. A restricting valve or pinch clip should be installed in the outlet tubing and adjusted to match the return (inlet) flow rate.

Cut the external end of the suction tube into a "V" shape so that the tube will not seal itself against the wall of the external tank. Both the pressure and suction tubing should be securely fastened to the external tank to prevent movement during use.

When using flexible tubing, the suction tubing must have a wall thickness that will not collapse under vacuum, particularly when going around bends.

Fill the external bath (see Section 3. 7 below for suitable fluids). The bath fluid must be at a level at least slightly above the opening of the inlet tubing.

3.7 Startup

Process Coolant

Suitable Fluids

IMPORTANT: Only use fluids that will satisfy safety, health, and equipment compatibility requirements. Caustic, corrosive, or flammable fluids must never be used.

The Chiller is designed to accommodate a variety of coolant fluids (water, glycol mixtures, etc). For most applications above 20°C (68°F), distilled water is satisfactory. For operation at or below 20°C (68°F), the Chiller must be protected with an antifreeze solution. Ethylene glycol (laboratory grade) and water in a 50/50 mixture is satisfactory from +20° to -15°C (68° to 5°F). Select a fluid that is compatible with the Chiller's wetted parts (see Section 2.2).

	**WARNING: Do not use caustic, corrosive, or flammable fluids.**

	**WARNING: Operation below 20°C (68°F) requires antifreeze in the circulation fluid.**

	**WARNING: FOR CHILLERS WITH MAGNETIC DRIVE PUMPS ONLY. A low temperature fluid, such as a mixture of 50% ethylene or propylene glycol / 50% water, or equivalent, must be used under all operating conditions.**

Filling the Reservoir

Remove the filler cap from the reservoir and, using a funnel, add fluid until it reaches the MAX line on the reservoir's fluid level gauge. When full, remove the funnel, but do not replace the cap at this time.

Electrical Power

Plug the Chiller's power cord into an appropriate electrical outlet (see Section 3.2).

Place the Circuit Breaker/Power Switch on the rear of the instrument enclosure in the "On" position. Three decimal points will appear on the Temperature display; two decimal points will appear on the pressure/flow rate display.

Starting Process Fluid Flow

Press the Power Button on the front panel. The system startup sequence will begin and proceed as follows:

The pump will turn on and fluid will begin circulating through the system. The set point temperature will appear briefly on the Temperature display; after a few seconds, it will be replaced by the actual fluid temperature. Fifteen to 20 seconds after power up, the compressor will begin operating.

Check for leaks.

With the pump running, the reservoir's fluid level will drop as the process and/or process cooling lines fill with fluid. Add fluid as follows:

Closed Systems: Slowly add fluid to the reservoir until the liquid level remains stable.

Open Bath Systems: Adjust the restriction (pinch) valve until the liquid level in both the bath and the reservoir remain stable. Add fluid as needed to bring liquid levels in the bath and reservoir up to the desired level. Make sure the fluid level in the bath is above the opening on the Chiller's inlet hose.

Replace the reservoir cap.

Section 4 –Operation

NOTE: The Chiller incorporates a special "lockout" feature that can be enabled to prevent unauthorized or accidental changes to set point and other operational values. This feature is described in detail in Section 4.8. It should not be enabled until all operational parameters are set.

4.1 Selecting the Temperature Unit (°C or °F)

The LEDs adjacent to the Temperature Display indicate the unit (°C or °F) used for temperature displays. To change from °C to °F or vice versa, proceed as follows:

To change to °F — Place the Circuit Breaker/Power Switch on the rear of the instrument in the "Off" position. Press and hold the Units/Menu Select Button while returning the Circuit Breaker/Power Switch to the "On" position.

To change to °C — Place the Circuit Breaker/Power Switch on the rear of the instrument in the "Off" position. Press and hold the Power Button on the front panel while returning the Circuit Breaker/Power Switch to the "On" position.

IMPORTANT: All user settings, except baud rate and calibration offset, return to the original factory defaults when the unit in which temperature is displayed is changed. The Chiller's temperature set point and various alarm settings should be reset to the desired values.

4.2 Displaying and Adjusting the Set Point

Press the Select/Set Knob on the front panel. The current set point temperature will be displayed and the decimal point at the bottom right of the display will flash, indicating the temperature can be changed.

Rotate the Select/Set Knob until the desired set point temperature is displayed. The setting is accepted after either pressing the Select/Set Knob a second time or will be accepted automatically after a few seconds of inactivity.

NOTE: This function is not available when the optional ambient tracking probe or remote temperature control probe is installed and enabled. See Sections 4.3, 4.4, and 4.7.8.

4.3 Displaying and Adjusting the Ambient Tracking Offset

NOTE: Ambient tracking is an optional function that may or may not be available on your Chiller. It permits you to control cooling fluid temperature based on room or machine temperature plus or minus a user-adjustable offset temperature.

When the optional ambient tracking probe is installed and enabled (AtC) (see Section 4.7.8), the ambient tracking offset rather than the set point temperature is displayed when the Select/Set Knob on the front panel is pressed.

To change the displayed offset value, rotate the Select/Set Knob until the desired offset value is displayed. An offset value from -5.0° to +5.0°C (-9.0° to +9.0°F) may be entered. The setting is accepted after either pressing the Select/Set Knob a second time or will be accepted automatically after a few seconds of inactivity.

4.4 Displaying and Adjusting Remote Control Temperature

NOTE: Remote temperature control is an optional function that may or may not be available on your Chiller. It permits you to control cooling based on the temperature of an external process.

When the optional remote control external probe is installed and enabled (rPC) (see Section 4.7.8), the external temperature set point is displayed when the Select/Set Knob on the front panel is pressed.

To change the external temperature set point, rotate the Select/Set Knob until the desired set point temperature is displayed. The setting is accepted after either pressing the Select/Set Knob a second time or will be accepted automatically after a few seconds of inactivity.

4.5 Selecting the Pressure / Flow Rate Display and Units

The Chiller can be set up to display either fluid pressure (in PSI or kPa) or flow rate (in GPM or LPM). Pressing the Units/Menu Select button briefly toggles through the available selections.

Note: The flow readout is intended as a reference only. If accurate flow readings are required an external flow meter is recommended.

NOTE: Metric pressure reading output must be multiplied by 100 for kPa.

4.6 Selecting the Internal/External Temperature Display

NOTE: This section applies only when the ambient tracking probe or remote temperature control are installed and enabled. It allows the user to check or continuously display either the Chiller's internal outlet fluid temperature or the external ambient/process temperature.

When the ambient tracking probe is selected (AtC) (see Section 4.7.8), the Chiller normally displays the internal outlet fluid temperature. To display the external ambient temperature, press and release the Units/Menu Select button until P2 appears on the pressure/flow rate display.

When the remote temperature control probe is selected (rPC) (see Section 4.7.8), the Chiller normally displays the external process temperature. To display the internal outlet fluid temperature, press and release the Units/Menu Select button until P1 appears on the pressure/flow rate display.

NOTE: P1 or P2 will remain on the pressure/flow rate display until the Units/Menu Select button is pressed and released. The displayed temperature will revert to the default condition (internal temperature for the ambient probe, external temperature for the remote temperature control probe).

4.7 Setting Operational Parameters

The Chiller's various operational parameters, such as temperature, flow rate, and pressure alarm values, are all user-adjustable. They are accessed by pressing and holding the Units/Menu Button until HL appears on the pressure/flow rate display. Pressing and releasing the Units/Menu Button once HL appears allows you to scroll through the various parameters; rotating the Select/Set Knob allows you to change the displayed setting. You can accept the displayed value by either pressing the Select/Set Knob or allowing the display to timeout.

Menu Item	Description	Choices / Ranges / Comments	Default Setting
HL	High Temperature Limit Alarm Set Point	+20° to 42°C / 68° to 108°F (Refrigerating Chillers)	35ºC
		+20° to 72°C / 68° to 162°F (Refrigerating / Heating Chillers)	50ºC
LL	Low Temperature Limit Alarm Set Point	-14°C to +15°C / 7° to 59°F (all units)	0.0ºC
HA	Front Panel High Ambient Temperature Alarm Set Point	+30° to 45°C. Always displayed and set in °C.	40ºC
FP w/psi LED lit	Maximum Fluid Pressure Alarm Set Point	40 to 100 PSI	80 PSI
FP w/kPa LED lit	Maximum Fluid Pressure Alarm Set Point	270 to 680 kPa	550 kPa
FL w/gpm LED lit	Minimum Flow Rate Alarm Set Point	0 or 0.8 to 2.0 GPM	0.0 GPM
FL w/lpm LED lit	Minimum Flow Rate Alarm Set Point	0 or 3 to 7 LPM	0.0 LPM
Sd	Establishes the cooling and heating rate by setting a desired differential between the measured internal and external temperature.	4°C to 20°C Always displayed and set in °C NOTE: Sd is displayed only if the optional remote temperature control probe is installed.	5°C
AF	Auto-Refrigeration Temperature Set Point	+20° to 40°C (Refrigerating Chillers)	40ºC
		+20° to 50°C (Refrigerating / Heating Chillers) Always displayed/set in °C.	50ºC
rP	External temperature probe status	AtC (ambient temperature control probe enabled) rPC (remote temperature control probe enabled) NO (external temperature control probe disabled)	NO (optional)
		NAP (external temperature control probe not installed)	NAP
$^{c}1$	Internal Probe Calibration Offset	±2.9°C. Always displayed/set in °C. Special access procedure required. See Section 4.7.9.	0.0ºC
$^{c}2$	External Probe Calibration Offset	±2.9°C. Always displayed/set in °C. Special access procedure required. See Section 4.7.10.	0.0ºC
F^{c}	Fluid Flow Rate Calibration Gain Coefficient	0.2 to 50.0 See Section 4.7.11.	1.0
PC	Communications Baud Rate	0, 2400, 4800, 9600, 19200. Zero should be entered if RS232 is not being used.	9600

4.7.1 High Temperature Limit (HL)

This menu item serves two functions. First, it establishes the maximum allowable set point temperature and thus helps prevent an operator from inadvertently setting the temperature set point above a pre-established temperature. Secondly, it serves as a high temperature alarm, automatically activating both audio and visual alarm indicators when the measured fluid temperature reaches the HL setting. The compressor, heater, fan, and pump will also turn off.

To change the high limit value, rotate the Select/Set Knob until the desired high limit value is displayed on the temperature display.

4.7.2 Low Temperature Limit (LL)

This menu item also serves a dual function. First, it establishes the minimum allowable set point temperature and thus helps prevent an operator from inadvertently setting the temperature set point below a pre-established temperature. Secondly, it serves as a low temperature alarm, automatically activating both audio and visual alarm indicators when the measured fluid temperature drops to the LL setting. The compressor, heater, fan, and pump will also turn off.

To change the low limit value, rotate the Select/Set Knob until the desired low limit value is displayed on the temperature display.

4.7.3 High Ambient Temperature Limit (HA)

This menu item protects the Chiller from overheating due to a high ambient temperature. Should the ambient temperature rise above the limit value, the audio and visual alarms will activate and the compressor, heater, fan, and pump will turn off.

To change the high ambient temperature value, rotate the Select/Set Knob until the desired high ambient temperature limit value is displayed on the temperature readout.

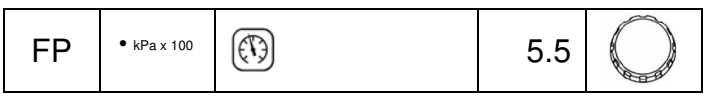
NOTE: This value is always displayed/set in °C.

4.7.4 Maximum Fluid Pressure (FP)

This is the maximum allowable fluid pressure and can be set in either PSI or kPa (the LED adjacent to the display indicates the active unit of measure). Should the fluid pressure rise above the maximum fluid pressure value, the audio and visual alarms will activate and the compressor, heater, fan, and pump will turn off.

To change the fluid pressure limit value, rotate the Select/Set Knob until the desired maximum fluid pressure value is displayed on the temperature readout.

NOTE: When FP first appears, the PSI LED will be lit. To view or change the FP value in kPa, press the Units/Menu Button again. The FP will remain on the display and the kPa LED will light.



NOTE: The Chiller also incorporates a built-in safety that automatically maintains fluid pressure below a valve-regulated pressure value. It maintains this maximum outlet pressure by diverting the flow of process fluid to the reservoir (i.e., begin internally recirculating the fluid). A maximum

pressure value is set at the factory, but is user-adjustable. See Section 4.9 for information on changing the maximum outlet pressure value.

4.7.5 Minimum Flow Rate (FL)

This is the minimum allowable flow rate and can be set in either GPM or LPM (the LED adjacent to the display indicates the active unit of measure). Should the fluid flow rate drop below the minimum flow rate value, the audio and visual alarms will activate and the compressor, heater, fan, and pump will turn off.

To change the minimum flow rate value, rotate the Select/Set Knob until the desired flow rate value is displayed on the temperature readout.

NOTE: When FL first appears, the GPM LED will be lit. To view or change the FL value in LPM, press the Units/Menu Button again. The FL will remain on the display and the LPM LED will light.

With FL set to "0" the flow alarm is disabled and the chiller will continue to operate with the output flow blocked.

Note: If flow rates are below 1.5 GPM this feature is not recommended as nuisance alarms may result.

4.7.6 Maximum External / Internal Temperature Differential (Sd) (optional)

NOTE: This menu item (Sd) appears only when the remote temperature control probe is installed and enabled (see Section 4.7.8). Values are always displayed in °C.

This value helps establish the cooling/heating rate when the remote temperature control probe is being used. Maximum external/internal differential temperature values from 4° to 20°C may be entered. The higher the setting, the more rapidly the Chiller will achieve the external temperature set point. Low differential temperature settings minimize the amount of temperature overshoot/undershoot that occurs when the measured external temperature reaches the external set point temperature.

4.7.7 Auto-Refrigeration Temperature (AF)

This menu item allows you to select the temperature at which refrigeration is activated. To change the displayed value, rotate the Select/Set Knob until the desired auto-refrigeration temperature is displayed.

NOTE: This value is always displayed/set in °C.

4.7.8 Remote Probe (rP)

NOTE: If an external temperature probe is not installed, NAP will be displayed when this menu item is selected.

This menu item allows you to enable/disable the Chiller's optional ambient temperature probe (AtC) or remote temperature control probe (rPC).

If you wish to operate the Chiller using the ambient tracking probe, rotate the Select/Set Knob until AtC is displayed. When this setting is selected, the cooling fluid temperature will be controlled at the

temperature sensed by the ambient tracking probe (this may be room or machine temperature) plus or minus a user-set offset temperature (see Section 4.3).

If you wish to operate the Chiller using the remote temperature probe, rotate the Select/Set Knob until rPC is displayed. When this setting is selected, the temperature will be controlled using the temperature sensed by the external probe. The rate of cooling will be controlled using the maximum differential temperature setting (Sd) (see Section 4.7.6).

If you do not wish to operate the Chiller using either of these external probes, rotate the Select/Set Knob until NO is displayed.

4.7.9 Internal Calibration Offset ($^{C}1$)

This menu item allows you to adjust the Chiller's internal temperature reading to match that of a traceable standard. It allows you to offset the displayed temperature value by as much as ±2.9°C.

NOTE: Calibration offset values are always set and displayed in °C. To prevent the operator from accidentally changing the calibration offset, a special sequence of keystrokes is required to access this function.

1. Press and hold the Units/Menu Button until HL appears on the display.
2. Press and release the Units/Menu Button until rP appears on the display.
3. Press and <u>hold</u> the Units/Menu Button.
4. While holding the Units/Menu Button, press and release the Select/Set Knob.
5. When CAL appears on the temperature readout, release the Units/Menu Button. The current calibration offset value will appear on the temperature readout.
6. Rotate the Select/Set Knob until the desired calibration offset is displayed. Press the Select/Set Knob or simply allow the display to time out to accept the displayed value.

4.7.10 External Calibration Offset ($^{C}2$)

This menu item allows you to adjust the Chiller's external temperature reading to match that of a traceable standard. It allows you to offset the displayed temperature value by as much as ±2.9°C. It appears only if the external temperature probe is installed.

NOTE: Calibration offset values are always set and displayed in °C. To prevent the operator from accidentally changing the calibration offset, a special sequence of keystrokes is required to access this function.

1. Press and hold the Units/Menu Button until HL appears on the display.
2. Press and release the Units/Menu Button until $^{C}2$ appears on the display.
3. Press and <u>hold</u> the Units/Menu Button.
4. While holding the Units/Menu Button, press and release the Select/Set Knob.
5. When CAL appears on the temperature readout, release the Units/Menu Button. The current calibration offset value will appear on the temperature readout.

6. Rotate the Select/Set Knob until the desired calibration offset is displayed. Press the Select/Set Knob or simply allow the display to time out to accept the displayed value.

$^{C}2$		0.0	

4.7.11 Flow Rate Calibration (F^{c})

This menu item allows you to adjust the Chiller's displayed flow rate reading to match that of a traceable standard. It allows you to change the gain coefficient displayed value from 0.2 to 50.0.

1. Press and hold the Units/Menu Button until HL appears on the display.
2. Press and release the Units/Menu Button until $^{C}1$ ($^{C}2$ if the Chiller is equipped with an external temperature probe) appears on the display.
3. Press and hold the Units/Menu Button.
4. While holding the Units/Menu Button, press and release the Select/Set Knob.
5. When CAL appears on the temperature readout, release the Units/Menu Button. The current gain coefficient value will appear on the temperature readout.
6. Rotate the Select/Set Knob until the desired flow rate is displayed on the flow readout. Press the Select/Set Knob or simply allow the display to time out to accept the displayed value.

F^{c}		1.0	

4.7.12 Baud Rate (PC)

This menu item allows you to establish the baud rate for serial communication. Allowable settings are 0 (no serial communication), 24 (2400 baud), 48 (4800 baud), 96 (9600 baud), 192 (19200 baud).

To change the displayed setting, rotate the Select/Set Knob until the desired baud rate is displayed. Press the Select/Set Knob or allow the display to time out to accept the displayed value.

PC		96	

4.8 Display, Alarm, and Error Messages

When certain conditions are detected, a message code flashes on the display and the local audio alarm sounds. Depending on the nature of the condition, power to various systems components, such as the compressor, heater, fan, and pump, is removed. When condition is rectified, push front panel Power button or turn circuit breaker off then on to clear the fault or error.

Message Code	Description	Action Required
EAF	Rear panel high ambient temperature (select models only)	Warning - The ambient temperature is higher than the set ambient limit. Lower ambient temperature.
E C	External remote control active, Chiller in standby (for units with remote control by 12 VDC option) (select models only)	Normal — Unit idle until remotely activated.
E-C	External remote control active, Chiller in standby Only appears when Chiller is equipped for remote control using a dry contact) (select models only)	Normal — Unit idle until remotely activated.
EFL	Low fluid level warning / alarm (for units with optional float switch) (select models only)	Warning/Alarm — Fluid level is too low. An alarm will sound once every 8 seconds for 5 occurrences. If the fluid level has not been raised 8 seconds after the fifth alarm, the unit will shut down.
EHA	Front panel high ambient temperature warning.	Warning - The ambient temperature is higher than the set ambient limit. Lower ambient temperature or raise temperature limit.
EHL	High temperature set point warning	Warning — The temperature set point is higher than the high temperature limit value. If not corrected, the high temperature limit alarm will be activated when fluid temperature rises above established the HL value. Lower temperature set point or increase high temperature limit value.
ELL	Low temperature set point warning	Warning — The temperature set point is lower than the low temperature limit value. If not corrected, the low temperature limit alarm will be activated when fluid temperature falls below the established LL value. Increase temperature set point or decrease low temperature limit value.
LLO	Local Lockout	Normal — Indicates that Local Lockout feature (see Section 4.10) is enabled. Appears momentarily when Select/Set Knob is pressed to view/change set point value.
CAn	Cancel Local Lockout	Normal — Indicates the Local Lockout feature (see Section 4.10) has been disabled. Appears momentarily when Local Lockout status is changed from enabled (LLO) to disabled.
LO-H2O	No fluid flow and no fluid pressure	Warning — Indicates that the Chiller did not detect any fluid flow or pressure upon startup. Unit will normally run after 5 minutes after power on.

Message Code	Description	Action Required
01	Factory Reserved	None.
02	Low limit temperature alarm	Alarm — Process fluid temperature has dropped to low temperature limit value. Compressor, heater, fan, and pump turned off. Increase heat load on Chiller or decrease low temperature limit value.
03	High limit temperature alarm	Alarm — Process fluid temperature has reached high temperature limit value. Compressor, heater, fan, and pump turned off. Decrease heat load on Chiller or increase high temperature limit value.
04	Over-temperature protection alarm	Alarm — Process fluid temperature is above Chiller's factory set high temperature safety cutoff. Power to compressor, heater, and fan turned off; pump remains on. Lower process temperature.
05	Low liquid level alarm (select models only)	Delayed Alarm — Activated when the liquid level in the reservoir falls below an acceptable level for 30 seconds of longer. Compressor, heater, fan, and pump turned off. Add fluid to reservoir.
06	High bath temperature alarm	Alarm — Fluid temperature has exceeded 82°C (180°F). Compressor, heater, fan, and pump turned off. Lower fluid temperature.
07	Low flow alarm	Alarm — Flow rate has dropped below minimum flow rate setting. Power to compressor, heater, fan, and pump turned off. Note: Disabled during first 2 minutes of operation. Correct cause of low flow rate or decrease minimum flow rate setting.
08	High pressure alarm	Delayed Alarm — Activated when fluid outlet pressure has exceeded high-pressure limit value for 30 seconds. Compressor, heater, fan, and pump turned off. Decrease outlet pressure by removing blockage or increase high-pressure limit value.
09	System fault	Fault — Power to compressor, heater, fan, and pump turned off. Contact service representative for corrective action.
10	Electronic power component fault (Triac)	Fault — Power to compressor, heater, fan, and pump turned off. Contact supplier.
11	Internal probe fault	Fault — Faulty temperature probe. Power to compressor, heater, fan, and pump turned off. Contact supplier.
12	External temperature probe fault (select models only)	Fault — Faulty external temperature probe. Power to compressor, heater, fan, and pump turned off. Replace ambient tracking probe or operate instrument using internal temperature probe. Contact supplier if fault persists.

Message Code	Description	Action Required
13	Communications fault	Fault — Internal electronics failure. Power to compressor, heater, fan, and pump turned off. Contact supplier.
14	ADC fault, internal probe	Fault — ADC for internal probe faulty. Power to compressor, heater, fan, and pump turned off. Contact supplier.
15	ADC fault, external probe	Fault — ADC for external probe faulty. Power to compressor, heater, fan, and pump turned off. Contact supplier.
16	Front panel high ambient temperature alarm	Alarm — Ambient temperature at front panel is higher than high ambient temperature limit. Compressor, heater, fan, and pump turned off. Occurs when the ambient temperature exceeds the set ambient limit by 5ºC or more. Lower temperature in area in which Chiller is located or increase high ambient temperature limit value. See “High Ambient Temperature Limit” Section.
17	Rear panel high ambient temperature alarm (select models only)	Alarm — Ambient temperature at rear panel is higher than high ambient temperature limit. Compressor, heater, fan, and pump turned off. Occurs when the ambient temperature exceeds the ambient limit. Lower temperature in area in which Chiller is located. Temperature limit is not adjustable.

4.9 Adjusting the High Pressure Bypass Setting

The Chiller incorporates an automatic safety to maintain outlet pressure below a valve-regulated pressure. This valve is adjustable and is located inside the Chiller housing.

CAUTION: There are exposed fan blades inside the Chiller housing. Exercise extreme care when accessing or adjusting any interior components.

WARNING: Hazardous voltages are present.

To access the high-pressure bypass valve, remove the two bolts at the upper left and right corners of the Chiller's rear panel, slide the top panel back about 2-3 inches, and lift off. The regulator valve is located in the left rear corner of the unit.

The high-pressure bypass is adjusted as follows:

1. Set the low flow rate alarm value to zero (see Section 4.3.5, above). This will prevent the unit from activating the flow alarm while you are adjusting the maximum pressure setting.
2. Completely block the Chiller's outlet flow. This should cause the outlet pressure to rise.
3. Set the Pressure/Flow Rate display to read either PSI or kPa.
4. Rotate the handle on the pressure valve until the desired maximum pressure setting is displayed on the Pressure/Flow Rate display.
5. Reset the flow alarm value to the previous setting.
6. Return the Pressure/Flow Rate display to the previous setting.
7. Replace the top panel of the Chiller, being sure to secure the bayonet-style prongs on the front of the panel in the openings at the front of the unit. Reinsert the two bolts that secure the top panel to the rear panel of the unit.

4.10 Enabling/Disabling the Local Lockout

This feature is used to prevent unauthorized or accidental changes to set point and other operational values. When enabled, the values for the functions described in Sections 4.1, 4.2, 4.3, and 4.5 can be displayed, but not changed.

To enable the local lockout, press and hold the Select/Set Knob until LLO is displayed (approximately 5 seconds). Once enabled, LLO will appear momentarily when the Select/Set Knob is pressed to display the set point.

To disable the local lockout, press and hold the Select/Set knob until CAn appears momentarily as local lockout status changes from enabled (LLO) to disabled (approximately 5 seconds).

NOTE: The Local Lockout feature does not prevent set point changes entered via the RS232 interface.

Section 5 - Maintenance and Calibration

The Chiller is designed to require a minimum of periodic maintenance.

5.1 Standard Magnetic Drive Centrifugal Pump

When used under continuous operating conditions, this pump should be oiled every six (6) months with SAE 20 oil. The pump incorporates two oil ports for this purpose.

To access the pump:

1. Turn both power switches off and unplug the power cord.
2. Remove the top panel of the housing (held in place with two bolts at the upper left and right corners of the rear panel).
3. Remove the housing's side panels by lifting them out of the housing frame.

5.2 Condenser, Air Vents, and Reusable Filter

To keep the system operating at optimum cooling capacity, the condenser, the air vents, and reusable filter should be kept free of dust and dirt. They should be checked on a scheduled basis and cleaned as required.

The reusable filter is easily accessed from either the left or right side of the unit. Use a mild detergent and water solution to wash off any accumulated dust and dirt and then rinse and dry thoroughly before reinstalling.

5.3 Fluid Filter

A removable, highly efficient fluid filter is integrated into the fluid reservoir. To remove it for cleaning, simply remove the reservoir cap and lift the filter out of the reservoir. Rinse off accumulated particulate and reinstall.

5.4 Fluid Level

The fluid level gauge on the rear of the Chiller should be periodically checked to determine if the fluid level needs to be topped off. Generally, fluid should be added whenever the level in the reservoir is at or near the "Low" gauge mark.

5.5 Temperature Calibration

At times, there may be a minor temperature difference between the Chiller's displayed temperature and the actual temperature as determined by a certified temperature measurement device. There may also be situations where you want the displayed temperature to match a particular value to have standardization between different instruments. These adjustments can be performed using the Chiller's internal and/or external temperature calibration offset functions. See Sections 4.7.9 and 4.7.10.

5.6 Flow Rate Calibration

There may be minor differences between the Chiller's displayed flow rate and the actual flow rate as determined by a certified flow rate measurement device. The Chiller's displayed flow rate reading can be adjusted to match an external device by changing the flow rate gain coefficient setting. See Section 4.7.11.

Section 6 – Troubleshooting

WARNING: Refer servicing to qualified service personnel. When power is on, dangerous voltages exist within chassis components. Use extreme care when measuring voltages on live circuits.

6.1 Unit Will Not Operate (no cooling or pumping)

- Check that the power cord is plugged in to an operating electrical outlet.
- Check that the Circuit Breaker/Power Switch is ON.
- Check that the front panel Power Switch is ON.

6.2 No Pumping

- Check the fluid level in the whole system to make sure the pump is receiving fluid.
- Check if the pump motor is operating.
- Check for blockage within the circulating system.

6.3 Insufficient Pumping

- Check for low line voltage.
- Check for too small of a hose diameter.
- Check for too high of a fluid viscosity.
- Check for restrictions in the connecting tubing.

6.4 No Cooling or Insufficient Cooling

- Check for low or high line voltage.
- Check for blocked airflow through ventilation screens.
- Check ambient air temperature. High air temperature may cause the refrigeration compressor to temporarily shut down.
- Check for excessive heat being transferred to the cooling fluid liquid as this may exceed the cooling capacity of the refrigeration system.

6.5 Triac Failure

- Triac fault message appears on the display, indicating that the triac has failed or the line supply voltage has a source of extreme interference from other equipment. Plug the unit into another power source. If it still displays triac failure, a triac or triac driver needs replacement.

6.6 Internal Probe Failure

- The Internal Probe failure message appears on the display, indicating that the internal probe has failed or there is a problem with the circuitry reading the probe signal. Contact supplier.

6.7 External Temperature Probe Failure

- The External Temperature Probe failure message appears on the display, indicating that a problem with the probe has been detected.
- Check the integrity of the external temperature probe connection to make certain that the probe has not been unplugged.
- Replace the external temperature probe.
- If the problem persists, operate Chiller using internal temperature probe and contact supplier.

6.8 Diagnostic Mode

NOTE: The Chiller must be set up to display temperature in ℃ in order to access the diagnostic mode.

The Chiller incorporates a Diagnostic mode, which displays important operational information that can aid in troubleshooting. To access the Diagnostic mode, place the Circuit Breaker/Power Switch in the “Off” position and then return it to the “On” position while pressing and holding the Select/Set Knob. The diagnostic menu appears on the Pressure/Flow Rate display; the current value for the diagnostic item appears on the temperature readout. Pressing the Units/Menu Button toggles through the various Diagnostic menu items

NOTE: Diagnostic items are display values only; they cannot be changed.

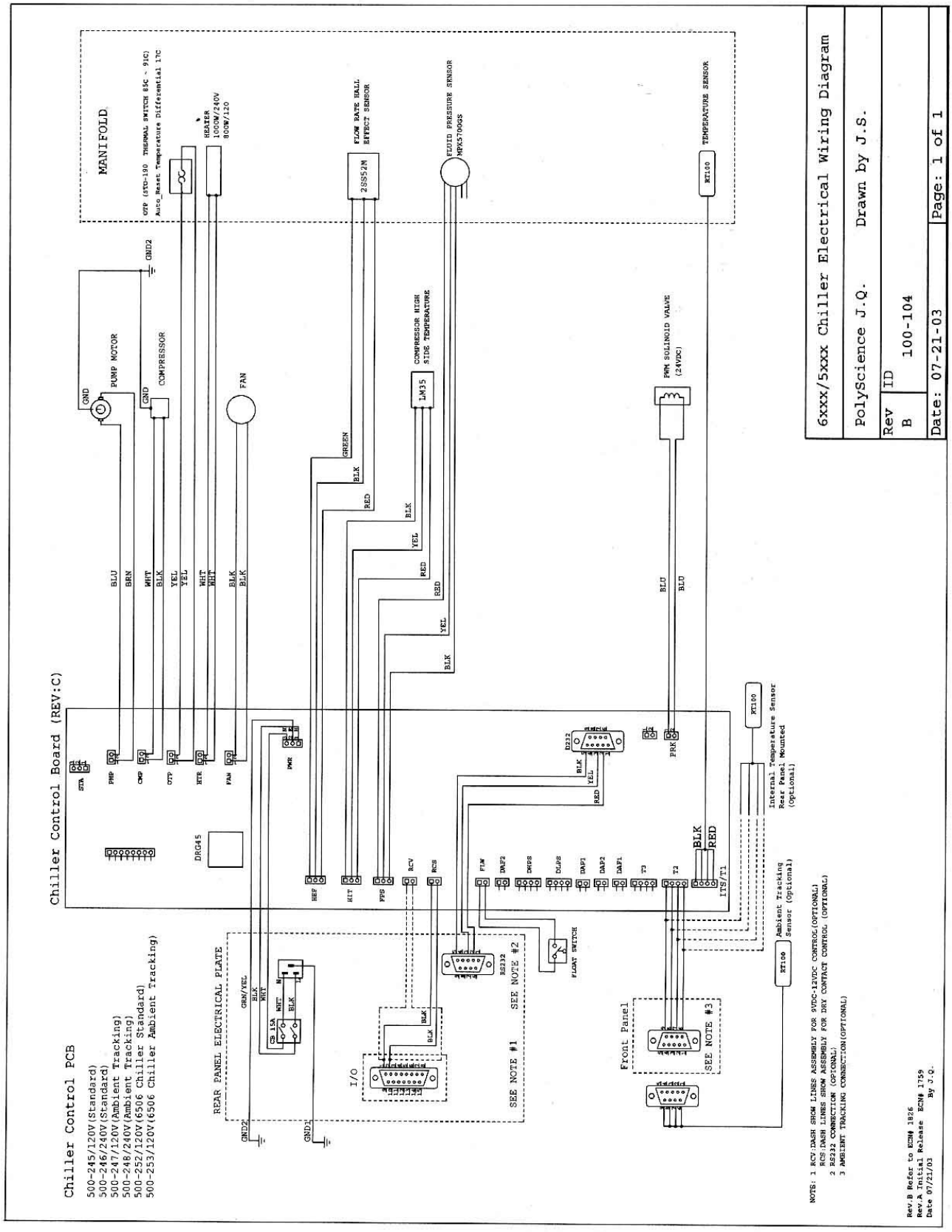
Menu Item	Description
EC	External voltage control
Ut	Upper (head) temperature
Li	Percentage of Line voltage
Ct	Chiller type
Fb	Fuse bits (remote control voltage, contact closures, etc.)
EP	External probe temperature and “---.” displayed when external probe is not installed
03 (variable numeric value)	Fluid flow rate or pressure. Temperature display shows current fluid temperature.
At	Ambient temperature at front panel

Section 7 - Service and Technical Support

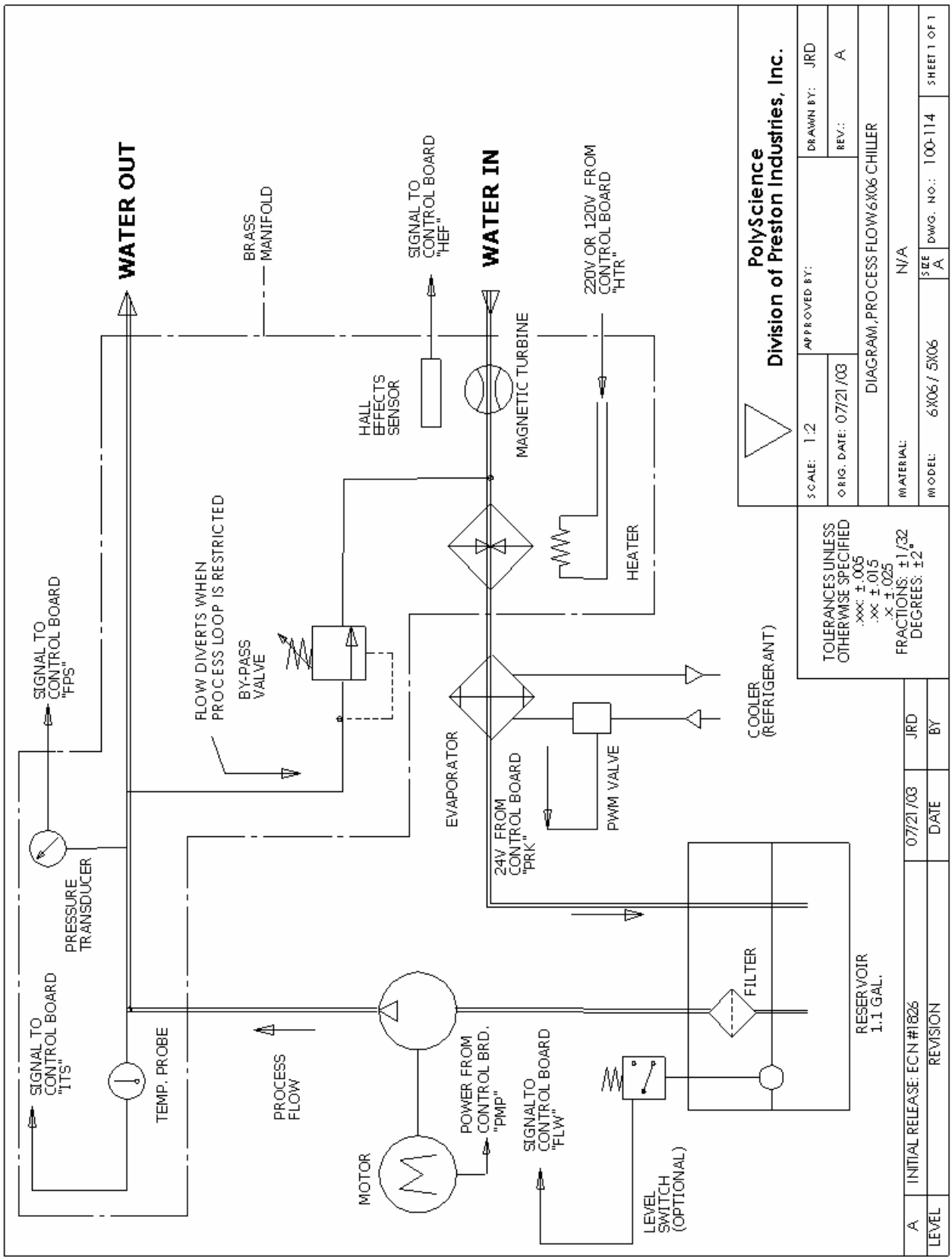
If you have followed the troubleshooting steps outlined in Section 6 and your Chiller still fails to operate properly, contact the supplier from whom the unit was purchased. Have the following information available for the customer service person:

- Model, Serial Number, and Voltage (from back panel label)
- Date of purchase and purchase order number
- Supplier’s order number or invoice number
- A summary of the problem

7.1 Electrical Wiring Diagram



7.2 Flow Diagram



Section 8 - Replacement Parts

ALL 1/4 HP UNITS	120V, 60Hz	240V, 50Hz
Part Description	**Part No.**	**Part No.**
Condensing Unit, ¼ hp	750-157	750-158
Magnetic Drive Pump (for models without heat)	525-551	525-552
Magnetic Drive Pump (for models with heat)	525-553	525-554
Positive Displacement Motor	215-102	215-102
Positive Displacement Pump (for models without heat)	215-105	215-105
Positive Displacement Pump (for models with heat)	215-099	215-099
Turbine Pump	215-305	215-308
Circuit Breaker	215-388	215-330
PC Board w/ Ambient Temperature Tracking	500-247	500-248
PC Board without Ambient Temperature Tracking	500-245	500-246

ALL 1/3 HP UNITS	120V, 60HZ	240V, 50HZ
Part Description	**Part No.**	**Part No.**
Condensing Unit, ⅓ hp	750-306	750-189
Magnetic Drive Pump (for models without heat)	525-551	525-552
Magnetic Drive Pump (for models with heat)	525-553	525-554
Positive Displacement Motor	215-102	215-102
Positive Displacement Pump (for models without heat))	215-105	215-105
Positive Displacement Pump (for models with heat)	215-099	215-099
Turbine Pump	215-305	215-308
Circuit Breaker	215-330	215-330
PC Board w/ Ambient Temperature Tracking	500-247	500-248
PC Board without Ambient Temperature Tracking	500-245	500-246

ALL 1/2 HP UNITS	120V, 60HZ	240V, 50HZ
Part Description	**Part No.**	**Part No.**
Condensing Unit, ½ hp,	750-155	750-156
Magnetic Drive Pump (for models without heat)	525-551	525-552
Magnetic Drive Pump (for models with heat)	N/A	N/A
Positive Displacement Motor	215-103	215-103
Positive Displacement Pump (for models without heat))	215-105	215-105
Positive Displacement Pump (for models with heat)	N/A	N/A
Turbine Pump	215-305	215-308
Circuit Breaker	215-388	215-388
PC Board w/ Ambient Temperature Tracking	500-247	500-248
PC Board without Ambient Temperature Tracking	500-245	500-246

ALL 3/4 HP UNITS	120V, 60HZ	240V, 50HZ
Part Description	**Part No.**	**Part No.**
Compressor, ¾ hp	750-304	750-303
Magnetic Drive Pump (for models without heat)	525-551	525-552
Magnetic Drive Pump (for models with heat)	525-553	525-554
Positive Displacement Motor	215-103	215-103
Positive Displacement Pump (for models without heat))	215-106	215-106
Positive Displacement Pump (for models with heat)	215-099	215-099
Turbine Pump	215-305	215-308
Circuit Breaker	215-330	
PC Board w/ Ambient Temperature Tracking	500-247	500-248
PC Board without Ambient Temperature Tracking	500-245	500-246
Fan	215-450	215-450
Fan motor	525-578	525-578

ALL 1 HP UNITS	120V, 60HZ	240V, 50HZ
Part Description	**Part No.**	**Part No.**
Compressor, 1 hp	750-304	750-303
Magnetic Drive Pump (for models without heat)	525-551	525-552
Magnetic Drive Pump (for models with heat)	525-553	525-554
Positive Displacement Motor	215-103	215-103
Positive Displacement Pump (for models without heat))	215-106	215-106
Positive Displacement Pump (for models with heat)	215-099	215-099
Turbine Pump	215-305	215-308
Circuit Breaker	215-330	215-330
PC Board w/ Ambient Temperature Tracking	500-247	500-248
PC Board without Ambient Temperature Tracking	500-245	500-246
Fan	215-450	215-450
Fan motor	525-578	525-578

Additional Parts (for all units)	
Operations Manual	110-240
Tubing adapter kit	510-288
Air Filter	400-643
Fluid Filter	565-102
Flow Indicator Turbine	330-082
Reservoir Cap	300-460
Reservoir Spill Cup	300-459

Section 9 - RS232

Serial Connector — A 9-pin D-connector is provided on the back panel of the Chiller for RS232 data communication. A serial cable that uses only the following pins should be used to connect the Chiller to the computer:
Pin #2 — data read (data from computer)
Pin #3 — data transmit (data to computer)
Pin #5 — Signal ground

RS232 Protocol — The Controller uses the following RS232 protocol:
Data bits — 8
Parity — None
Stop bits — 1
Flow control — None
Baud rate — Selectable (Chiller and PC baud rates must match).

Communications Commands — Commands must be entered in the exact format shown. Do not send a [LF] (line feed) after the [CR] (character return). Be sure to follow character case exactly. A response followed by an exclamation point (!) indicates that a command was executed correctly. A question mark (?) indicates that the Chiller could not execute the command (either because it was in an improper format or the values were outside the allowable range). A response must be received from the Chiller before another command can be sent. All responses are terminated with a single [CR].

Command Description	**Command Format**	**Values**	**Return Message**
Set Commend Echo	SEi[CR]	Echo: i = 1 No Echo: i = 0	![CR]
Set On / Off	SOi[CR]	On: i = 1 Off: i = 0	![CR]
Set Set Point	SSxxx[CR]	x = ASCII digit	![CR]
Read Set Point Temperature	RS[CR]		+xxx.x[CR] or -xxx.x[CR]
Read Temperature	RT[CR]		+xxx.x[CR] or -xxx.x[CR]]
Read Temperature Units	RU[CR]	C or F	C[CR] or F[CR]
Read Status	RW[CR]	1 = Run 0 = Standby	1[CR] or 0[CR]
Read Pressure in PSI	RP[CR]		+nnn.n[CR]
Read Pressure in kPa	RK[CR]		+nnn.n[CR]
Read Flow in GPM	RG[CR]		+nnn.n[CR]
Read Flow in LPM	RL[CR]		+nnn.n[CR]
Read Remote Control Voltage	RC[CR]		+nnn.n[CR]
Read Compressor Discharge Temperature (℃)	RH[CR]		+xxx.x[CR] or -xxx.x[CR]]
Read Remote Probe Temperature	RR[CR]		+xxx.x[CR] or -xxx.x[CR]]
Read Ambient temperature on PCB	RA[CR]		+xxx.x[CR] or -xxx.x[CR]]
Read internal temperature	R1[CR]		+xxx.x[CR] or -xxx.x[CR]]
Read external temperature	R2[CR]		+xxx.x[CR] or -xxx.x[CR]]
Read fault status (see Section 4.8 for fault message codes)	RF[CR]	00 = System OK 18 = Standby mode 02 – 17 = Fault	![CR]