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# Operator Guide

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## Refrigerated Recirculating Chillers

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<b>Introduction</b>	<b>5</b>
General Safety Information	6
Safety Recommendations	7
Unpacking Your Chiller	8
Package Contents	8
Regulatory and Compliance Testing	9
Controls and Components	10
Front View	10
Rear View	10
Quick Start	11
<b>Installation</b>	<b>12</b>
Site Requirements	12
Ambient Temperature and Relative Humidity	12
Location	12
Clearance	12
Electrical Power	12
Optional Signal Inputs/Outputs	13
External Control / Ambient Tracking Temperature Probe	13
RS232 Serial Output	13
Remote I/O Port	13
USB Serial / TMC Output	13
Plumbing	13
Process Piping	13
Closed System or Cooling Coil Setup	14
Open Bath System Setup	14
<b>Startup</b>	<b>15</b>
Process Coolant	15
Suitable Fluids	15
Recommended Fluids	16
Fluid Compatibility Table	16
Filling the Reservoir	17
Electrical Power	17
Starting Process Fluid Flow	17
<b>Normal Operation</b>	<b>18</b>
Standby Screen	18
Home Screen (Default Operation with Internal Probe Only)	18
Liquid Level Sensor & Pump Pressure Adjust	19
Setting a Temperature	19
Access Settings and Other Functions in the Menu	20
Selecting the Temperature Unit (°C or °F)	20
List of Chiller Menu Parameters	21
<b>Routine Maintenance and Troubleshooting</b>	<b>24</b>
Routine Maintenance	24
Inlet Fuse Replacement	24
Condenser, Air Vents and Reusable Filter	24
Air Filter Access	25
Cleaning Exterior Surfaces	25
UV Anti-Growth Light (Optional)	25
Fluid Level Sensor	25
Fluid Properties	25
Draining the Fluid	26
Temperature Calibration	26
Diagnostic Self Test	26
Troubleshooting	28
Restoring Factory Default Settings	28
Recommended Troubleshooting Procedures	29
Display, Alarm, and Error Messages	31
Diagnostic Mode	33

<b>Technical Information .....</b>	<b>34</b>
General Specifications (all Chillers) .....	34
Pump Performance .....	34
R134a / R513a Performance Specifications — 60Hz Chillers.....	35
R134a / R513a Performance Specifications — 50Hz Chillers.....	35
R290 Performance Specifications — 60Hz Chillers .....	36
R290 Performance Specifications — 50Hz Chillers .....	36
Diagrams and Schematics .....	37
Electrical Wiring Diagram – High Voltage .....	37
Electrical Wiring Diagram – Low Voltage .....	38
Process Flow Schematic (Air Cooled Chiller) .....	39
Replacement Parts.....	40
Communications .....	42
Connector Pinout.....	42
Serial Port Protocol Definitions and Commands .....	43
Installing Firmware Update.....	44
Certificate of Compliance .....	46
<b>Equipment Disposal (WEEE Directive).....</b>	<b>47</b>
<b>Service and Technical Support .....</b>	<b>47</b>
<b>Warranty .....</b>	<b>48</b>



## Introduction

Your Recirculating Chiller provides cooling power for demanding applications and serves as an economical alternative to tap water cooling systems. Extremely easy to use and maintain, it combines technological innovation with precise temperature control to deliver reliable heat removal for a wide variety of applications.

Here are some of the features that make your Chiller so operator-friendly:

- Microprocessor-based temperature controller
- Large, easy to read touch screen display (temperature readout in °C or °F)
- Multi-Language Interface
- Touch keypad temperature set point adjustment
- Cool Command™ modulated refrigeration system for enhanced temperature stability and extended compressor life
- WhisperCool® Environmental Control System with variable speed fan to reduce operational noise and decrease energy consumption
- Chillers with standard reservoir configuration feature continuous level sensing for pump protection
- Diagnostic Self-Test routine allows operators to test the Chiller's performance against a factory baseline
- USB Port for data logging
- Optional UV Anti-Growth Light inhibits production of biological material in the Chiller's process fluid









This manual is designed to guide you quickly through the process of installing and operating your Recirculating Chiller. We recommend that you read it thoroughly before you begin.

## General Information

### General Safety Information

When installed, operated and maintained according to the directions in this manual and common safety procedures, your Chiller should provide safe and reliable heat removal. Please ensure that all individuals involved in the installation, operation or maintenance of this unit read this manual thoroughly prior to working with the unit.


The safety of any system incorporating the Chiller is the responsibility of the assembler of the system.

	This symbol alerts you to a wide range of potential dangers.
	This symbol advises you of danger from electricity or electric shock.
	This symbol advises you of danger from flammability or explosions.
	This symbol marks information that is particularly important.
	This symbol indicates alternating current.
	This symbol on the Power Switch indicates that it places the unit in a standby mode. It DOES NOT fully disconnect the unit from the power supply.
	These symbols on the Power Switch indicate that they place the main power supply ON / OFF.
	This symbol indicates a protective conductor terminal.


**Read all instructions pertaining to safety, set-up and operation.  
Proper operation and maintenance is the operator's responsibility.**

### Safety Recommendations

To prevent injury to personnel and/or damage to property, always follow your workplace's safety procedures when operating this equipment. You should also comply with the following safety recommendations:

	<ul style="list-style-type: none"><li>• Always connect the power cord on this unit to a grounded (3-prong) power outlet. Make certain that the outlet is the same voltage and frequency as your unit.</li><li>• Never operate the unit with a damaged power cord.</li><li>• Always turn the unit OFF and disconnect Mains power before performing any maintenance or service.</li></ul>
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### Additional Safety information for Models BA05E/BA06E (R290 Refrigerant)

	<ul style="list-style-type: none"><li>• WARNING: Risk of fire or explosion. Flammable refrigerant used.</li><li>• Ensure all ventilation openings are not obstructed. Place in well ventilated area to prevent accumulation of refrigerant.</li><li>• Repair and disposal must be carried out by trained service personnel.</li><li>• Do not puncture or damage the refrigeration circuit. No naked flame during service or repair.</li><li>• This unit is intended for use in commercial, industrial, or institutional occupancies as defined in the Safety Standard for Refrigeration Systems, ANSI/ASHRAE 15</li></ul>
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## Unpacking Your Chiller

Your Chiller is shipped in a special carton. Retain the carton and all packing materials until the unit is completely installed 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.



**CAUTION:** Keep unit upright when moving. Be sure to follow your company's procedures and practices regarding the safe lifting and relocation of heavy objects.

### Additional Safety information for Models BA05E/BA06E (R290 Refrigerant)



- WARNING: Risk of fire or explosion. Flammable refrigerant used
- Place in well ventilated area to prevent accumulation of refrigerant.
- Do not damage the refrigeration circuit.

## Package Contents

The following items have been included with your Chiller:

- Operator's Manual
- IEC Power Cord (select models)
- Two sets of Inlet/Outlet Adapters: 1/2 inch male NPT x 1/2 inch hose barb and 1/2 inch male NPT x 3/8 inch hose barb (select models)



## Regulatory and Compliance Testing

### North America (Canada, USA) (60Hz units)

CAN/CSA C22.2 No. 61010-1-12 Ed 3 +U1;U2; A1 — Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part I: General Requirements

CAN/CSA C22.2 No. 61010-2-012- 2019 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use – Part 2-012: Particular Requirements for Climatic and Environmental Testing and Other Temperature Conditioning Equipment.

UL Std No. 61010-1:2012 Ed. 3 +R19Jul2019 — Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part I: General Requirements and Amendment: 2019

UL Std No. 61010-2-012 (2017) – Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 2: Particular Requirements for Climatic and Environmental Testing and Other Temperature Conditioning Equipment.

Product meets CAN ICES-1/NMB-1 and FCC (Part 15)

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

**WARNING: This is a Class A Product. In a domestic environment this product may cause harmful interference to radio communications in which case the operator may be required to take adequate measures.**

### Europe (50Hz units)/CE

Machinery Directive 2006/42/EC

EC Electromagnetic Compatibility Directive 2014/30/EU

RoHS Directive 2011/65/EU

EN 61010-1:2010, EN 61010-1:2010/A1:2019/AC:2019-04, EN 61010-1:2010/A1:2019

EN IEC 61010-2-012:2022, EN IEC 61010-2-012/A11:2022

IEC 61326:2012 / EN 61326:2013

EN IEC 63000:2018

### Great Britain (UKCA) (50 Hz units)

Supply of Machinery (Safety) Regulations 2008

Electromagnetic Compatibility Regulations 2016

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations, 2012

EN 61010-1:2010, EN 61010-1:2010/A1:2019/AC:2019-04, EN 61010-1:2010/A1:2019

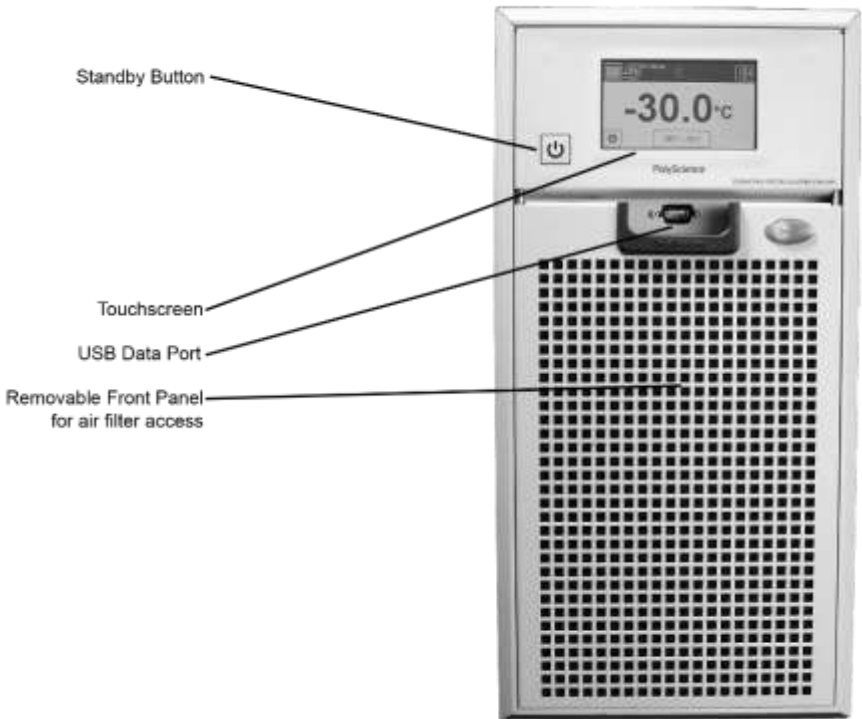
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IEC 61326:2012 / EN 61326:2013

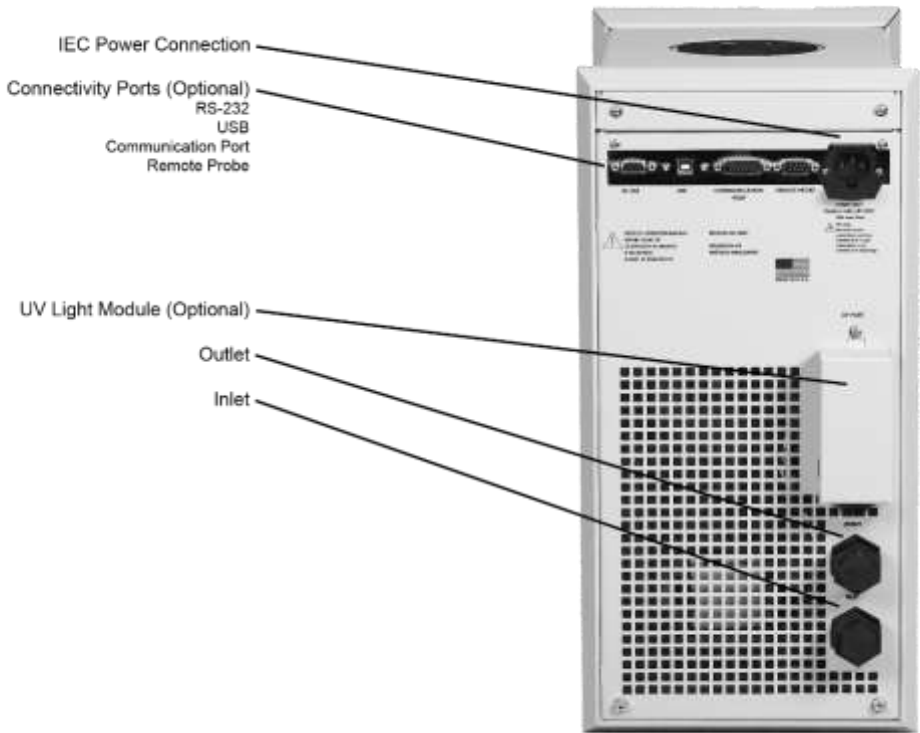
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Controls and Components

Front View

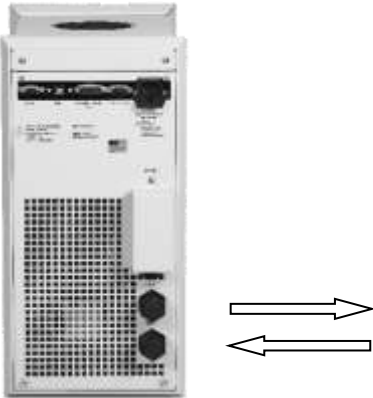
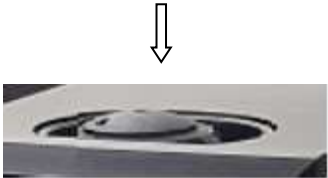
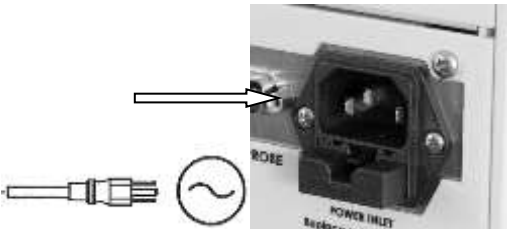







Rear View



## Quick Start

See Installation & Startup for additional information.

1	<b>All models:</b> Connect all process lines		
2	Remove reservoir cap and fill reservoir with coolant (Freeze protection is recommended for most application, see <i>Startup Process Coolant</i> on page 13 for more information)		
3	Connect electrical power cord to Mains		
4	On the front panel, press the Power Switch and then the Standby Button		
5	Add coolant to reservoir as process lines fill. Replace cap.		
6	Enter temperature set point	<p>Press "SET =" To enter Set Point Screen</p> 	<p>Use numeric keypad to enter desired set point. Press  to save set point and return to Home Screen</p> 

## Installation



**WARNING:** Be sure all power is off before proceeding.

## Site Requirements

### Ambient Temperature and Relative Humidity

The Chiller is designed for indoor installation in ambient temperatures between 5° and 40°C (41° and 104°F); relative humidity should not exceed 80% (non-condensing).

### Location

- The Chiller should be installed on a strong, level surface.
- The Chiller should be located as close as possible to the process requiring cooling.
- The Chiller 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 the Chiller where corrosive fumes, excessive moisture, excessive dust, or high room temperatures are present.
- Do not place the Chiller where access to the disconnecting device is impeded.
- 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 8 inches (21 cm) away from walls or vertical surfaces so air flow is not restricted.



**WARNING:** Do not restrict airflow or ventilation on chiller.

### Electrical Power

An IEC power cord is provided with the Chiller for select models. It should be attached to the receptacle at 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 (see *Startup* on page 14).

## Optional Signal Inputs/Outputs

### External Control / Ambient Tracking Temperature Probe

This option allows you to control the cooling fluid temperature using an external temperature measurement (ambient room/machine temperature or process temperature). A 9-pin connector is provided on the rear panel for connecting the external probe.



**NOTE:** In order to minimize process disturbance when using an external temperature probe, it is recommended that the external probe be connected to the unit before power is applied.

### RS232 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). 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 a dry contact closure to turn the Chiller on and off. Chiller status is also available from this port. A 15-pin D-connector is provided on the rear of the instrument enclosure for this optional connection. See schematic at the end of this manual.

### USB Serial / TMC Output

This option allows you to remotely control the Chiller and/or output temperature readings to an external recorder or other auxiliary device. The port can be changed to behave as either a virtual com port, or as a USB TMC device by making the appropriate selection in the Menu. A type B connector is provided on the rear of the instrument enclosure for this optional connection.

## 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 3/8 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 operator's responsibility to ensure that the tubing and fittings connected to the Chiller are compatible with the fluid, temperature, and pressure being used.

- **Threaded Connections** — Avoid overtightening fittings as it may damage or crack ports. There should be 2-3 threads still visible when complete.
- **Pressure Ratings** — Hoses should be able to withstand the largest pressure that they will encounter. For this series, this is 75 psi (518 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 1/2 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.
- **Filter** — There is no fluid filter internal to the unit. If your process or application is susceptible to debris, an external strainer is recommended to protect the unit from buildup. Adding a filter will affect pump pressure and flow.



**CAUTION:** Discharge of high pressure fluid and fluid spills may result from over-pressurization. Personal safety hazard and damage to equipment, material, or facilities may result from the discharge of high pressure fluid and spills.

### **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.

### **Open Bath System Setup**

Position the external tank at least two feet (0.6 meter) above the Chiller's inlet.

Install a shutoff valve on both the inlet and outlet of the Chiller. Place the valves in the closed position.

Connect the shutoff valves to the external tank using tubing of equal diameter (1/2 inch minimum) and length. Use the same size fittings on both the inlet and outlet; this will ensure a balanced flow.

Cut the external end of the suction (inlet) 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 (inlet) tubing must have a wall thickness that will not collapse under vacuum, particularly when going around bends.

Fill the external bath (see *Startup, Process Coolant* on page 10 for suitable fluids).

Fill the Chiller reservoir to the bottom of the reservoir's fill port neck and install the cap. Tighten the cap until it is securely sealed.

# Startup

## Process Coolant

Your Chiller must be operated with fluid in the reservoir. Always fill the reservoir before operation, to prevent damage to your unit. This section will provide you information on the selection and use of compatible fluids for your specific process.

### Suitable Fluids



**WARNING:** Only use fluids that will satisfy safety, health, and equipment compatibility requirements.



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



**WARNING:** Operation below 10°C (50°F) requires antifreeze in the circulation fluid.



**CAUTION:** Always select a fluid that is compatible with the Chiller's wetted parts (brass, stainless steel, polyethylene, EPDM rubber, and nylon).



**NOTE:** For storage purposes, a very small amount (below 25mL) of laboratory grade propylene glycol is added to the unit to avoid freezing damage to the pump. While this small amount will have no impact when mixed with other fluids, please refer to Routine Maintenance and Troubleshooting, *Draining the fluid* on page 26 for information on draining the pump.



**WARNING:** Do not use the following fluids:

- Automotive antifreeze with additives\*\*
- Hard tap water\*\*
- Deionized water with a specific resistance > 1 meg ohm (except units with the DI water compatible plumbing)
- Any flammable fluids
- Concentrations of acids or bases
- Solutions with halides: chlorides, fluorides, bromides, iodides or sulfur
- Bleach (Sodium Hypochlorite)
- Solutions with chromates or chromium salts
- Glycerin
- Syltherm fluids

\*\* Additives or mineral deposits can adhere to internal components. If deposits are allowed to build up damage may result to components such as the pump or heat exchanger. Higher temperatures and higher concentrations of additives can hasten deposit build up.



**CAUTION:** Highly viscous fluids, including but not limited to PAG 140, S150, S200, S250, and other oils are NOT recommended for use in chillers. Chiller pumps may not deliver sufficient flow for the chiller to operate, and cooling performance may be severely degraded if high viscosity fluids are used. High viscosity fluids may leak from pumps and plumbing even in systems that are water tight.

## Recommended Fluids

We recommend the following fluids be used with Chillers. Always verify fluid compatibility with the application in which the Chiller will be used and all wetted parts.

Fluid	Temperature Range	Recommended Maintenance
polyclear MIX 30 PLUS (Distilled water plus clarifier and corrosion inhibitor)	+10° to +90°C (+50° to +194°F)	Verify fluid level monthly or more frequently per application needs. Replace fluid every 3 months.
polycool MIX -25 (50/50 mix distilled water and ethylene glycol)	-25° to +80°C (-13° to +176°F)	
polycool PG -20 (50/50 mix distilled water and propylene glycol)	-20° to +100°C (-4° to +212°F)	
polycool HC -50	-50° to +100°C (-58° to +212°F)	

Disclaimer – Fluid performance and chiller operation range are stated independently.

## Fluid Compatibility Table

Fluid	Material of Construction					
	Buna N Tubing	Viton® Tubing	Braided Teflon® Tubing	Nylon Fittings	Brass Fittings	Stainless Steel Fittings
polycool MIX -25 (50/50 premix of distilled water and ethylene glycol)	✓	✓	✓	✓	✓	✓
polyclear MIX 30 PLUS (Distilled water plus clarifier and corrosion inhibitor)	✓	✓	✓	✓	✓	✓
polycool EG -25 concentrate (Ethylene glycol)	✓	✓	✓	✓	✓	✓
polycool PG -20 concentrate (Propylene glycol)	✓	✓	✓	✓	✓	✓
polycool HC -50	✓	✓*	✓	✓	✓	✓
✓ = compatible ✓* = compatible up to 100F (37C)						

The most common and acceptable coolant is a mixture of 50% distilled water and 50% ethylene glycol (laboratory grade), such as premix polycool MIX -25. This fluid mix will provide the best results for set points between -25° and +80°C (-13° and +176°F). Ethylene glycol helps lubricate pump seals and protects against freezing (the fluid temperature inside the Chiller may be below freezing even if the temperature at the outlet is over 0°C / +32°F).

We offer ethylene glycol (polycool EG -25) and propylene glycol (polycool PG -20) that can be mixed with an equal volume of distilled water to create a 50/50 water/glycol mix. Also available is a fluid clarifier to control inanimate organic particles (polyclean CLARIFIER).



## Filling the Reservoir

Remove the filler cap from the reservoir and, using a funnel, add fluid until it reaches the bottom of the reservoir's fill port. Once the reservoir is 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. Press the front power switch and a standby screen will appear on the Chiller's display.

## Starting Process Fluid Flow

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

1. The Home Screen will now be shown on the display along with level and pump operation status.
2. The pump may initiate a priming sequence to review flow and fluid level while beginning to circulate liquid through the system.
3. The operator should check for visible leaks under the unit and any of the connections.
4. 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:
5. **Closed Systems**: Slowly add fluid to the reservoir until the liquid level remains stable
6. **Open Bath Systems**:
  - A. Open the inlet and outlet valves on the Chiller; the suction created by the pump should begin drawing fluid through the inlet tubing into the Chiller reservoir.
  - B. Once flow is established (no air bubbles in inlet tubing), close the inlet and outlet valves and turn the Chiller "Off".
  - C. Remove the reservoir cap and check the level of the fluid in the reservoir. Add coolant until it is level with the bottom of the reservoir's fill port neck.



**CAUTION:** Always close the inlet and outlet valves before turning power to the Chiller "Off" or removing the reservoir cap to prevent the external reservoir from flooding the Chiller.

- D. Replace the reservoir cap, open the inlet and outlet valves, and restart the Chiller.
- E. Observe the liquid level in the external reservoir; adjust the valve on the Chiller outlet as required to maintain a stable fluid level.



**CAUTION:** When running an open loop system for extended periods, the fluid level and (if applicable) glycol concentration in the Chiller reservoir should be checked periodically to avoid low fluid conditions.

To check the reservoir fluid level, close the inlet and outlet valves, turn the Chiller 'off', and remove the reservoir cap. Slowly open the inlet and outlet valves and allow fluid to drain from the external reservoir into the Chiller reservoir. Close the valves when the fluid level within the Chiller reservoir reaches the top of the filler neck. Add fluid to the external reservoir as required. Replace the reservoir cap, open the inlet and outlet valves, and turn the Chiller back on.

## Normal Operation

This section provides information on all basic functions and normal operations involved in the daily use of your Chiller. Please familiarize yourself with all screens and functions before operating.




**SPECIAL FEATURE:** Air-cooled Chillers are equipped with the WhisperCool® Environmental Control System, which controls fan speed based on the heat load. You will notice the fan speed changing gradually during operation. This is especially beneficial in an environment where a low noise level is desirable.

### Additional Safety information for Models BA05E/BA06E (R290 Refrigerant)



- **WARNING:** Risk of fire or explosion. Flammable Refrigerant Used
- Do not damage the refrigeration circuit or increase the risk of a leak

## Standby Screen

After plugging it in and engaging the front power switch, the Chiller will enter Standby Mode. In Standby, the fluid pump, refrigeration compressor, and condenser fan are all disabled. You may adjust Chiller settings in this mode by pressing  from this screen. Press the Chiller's Standby Button to begin operation. You will be taken to the Home Screen, and the Chiller's fluid pump, refrigeration and fluid temperature control functions will all be enabled.



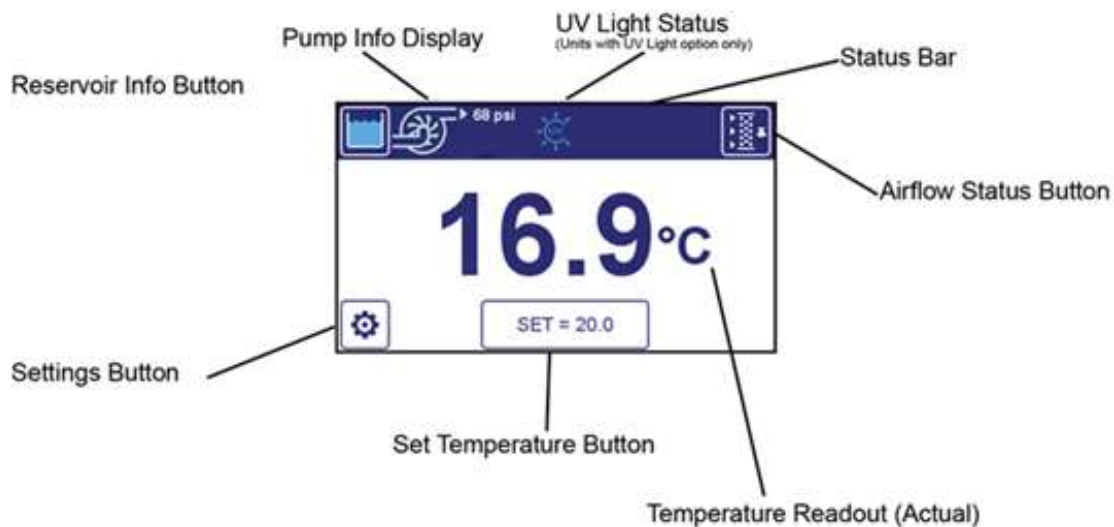
**NOTE:** In the event of a power surge, when the unit is reenergized, it will return to the pre-surge operating state. In the event of a power loss, when the unit is reenergized, it will return to the pre-power outage operating state.

## Home Screen (Default Operation with Internal Probe Only)

The Chiller's Home Screen displays the readout of fluid temperature, temperature unit of measure, temperature set point, Chiller fluid pressure at the outlet, reservoir fill level, and airflow status. If there is an active Alarm or Warning, it will be displayed in the Status Bar.

Press the Set Temperature Button to adjust the fluid temperature set point.

Press the Settings Button  to adjust other operating parameters such as Fahrenheit/Celsius selection.



### Liquid Level Sensor & Pump Pressure Adjust

The reservoir icon at the top of the Home Screen indicates reservoir fill level. When the fluid display is orange, the fill level is lower than normal, but the pump and compressor will continue to run. When the fluid display is red, the pump and compressor will stop running because the reservoir fluid level is critically low. If the reservoir fluid level is low, check for leaks and re-fill the reservoir.

To the right of the reservoir display is a pump icon with measured output pressure. This unit is equipped with a variable speed pump and will attempt to keep the measured fluid pressure five psig less than the High Fluid Pressure Alarm setting. The operator can adjust this setting based on the applications need.





### Setting a Temperature


Press the Set Button from the Home Screen. Alternatively, you may adjust the set point from the Menu. A numeric keypad will be displayed on the screen.




Enter the desired temperature set point. The value will be reflected in the left box. If you wish to set a value less than zero, press the +/- button to switch between positive and negative set point values. The set point limits are displayed underneath the set point. Values outside of the set point limits will not be accepted. You may also use

the arrows to raise or lower the set point without using the number pad. Acknowledge and save the selection by pressing , or discard the selection by pressing .




**Access Settings and Other Functions in the Menu**

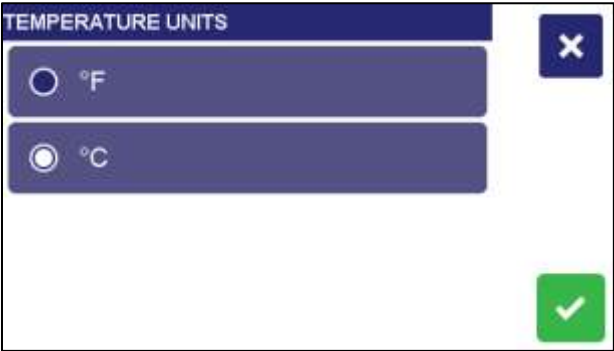
Access the Menu by pressing  from the Home Screen or Standby Screen. In the menu, you will see the active settings for various parameters such as Temperature Units, Display Language, Set Point Limits, Alarm Settings, and Maintenance Reminders. Data Logging, Diagnostics and Chiller Self Test are all accessible from the Menu.

Press any of the Menu items to access and adjust functions associated with that item. Use the up and down arrow keys to display additional Menu items. Press  to return to the Home Screen.



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

Access the Menu by pressing  from the Home Screen or Standby Screen. The active Temperature Units selection will be displayed in the menu. Press "TEMPERATURE UNITS" to access the Temperature Units Selection Screen. Press the desired selection. Acknowledge and save the selection by pressing , or discard the selection by pressing .



## List of Chiller Menu Parameters

Menu Items and Settings	Description
User Settings	Access Operator Settings Menu
Setpoint	Adjust the Chiller's set temperature
Temperature Units	Select Celsius or Fahrenheit display
Pressure Units	Select psi or kPa display
Air Filter	Access air filter maintenance screen. Use this screen to set up maintenance reminders for the air filter.
Fluid Maintenance	Access fluid maintenance screen. Use this screen to set maintenance reminders for fluid. If applicable, inspect/replace any customer added fluid filters.
Setpoint Limits	Set the high and low limits for the Chiller set temperature
Temperature Alarms	Continuous Chiller operation outside of these settings will cause the Chiller to alarm. These settings can be used to protect equipment connected to the Chiller, or the fluid, from extreme temperatures.
Fluid Pressure Alarms	Continuous operation outside these settings will cause the Chiller to alarm. These settings can be used to protect equipment connected to the Chiller. Furthermore, adjusting the High Fluid Pressure Alarm setting will change the variable speed pump output to be five psig less than the alarm set point.
Specific Heat Capacity	If the Chiller's process fluid has a specific heat that is vastly different than water, temperature stability may be affected. The operator can improve stability by adjusting the Chiller's Specific Heat Capacity setting to match that of the fluid.
Remote Control Switch	The operator may choose how a remote contact is used to start and stop the Chiller. The operator can choose to disable remote control, start the Chiller when the remote contact opens, or start the Chiller when the remote contact closes.
External Monitor / Control	<p>This setting determines how a remote P2 probe or the internal ambient P3 probe are used. When only the ambient P3 probe is present with no external probe, the operator may use "P3 SETPOINT MODE" so that the set temperature tracks the ambient temperature. When a remote P2 probe is connected, the operator may select the following additional modes:</p> <p>"MONITOR MODE" displays the P2 reading without using it for control.</p> <p>"CONTROL MODE" uses the external P2 sensor as the process temperature. In Control Mode, the Chiller will act to maintain the P2 reading at setpoint. This will typically be used when the Chiller is connected to reactors, jacketed vessels, heat exchangers, and similar equipment.</p> <p>"P2 SETPOINT MODE" will use the external P2 sensor to determine set temperature. This is commonly used for ambient tracking applications.</p>
Setpoint Offset	This setting is only used in P2 SETPOINT MODE or P3 SETPOINT MODE. The Setpoint offset is added to the P2 or P3 reading, resulting in the effective set temperature. The Setpoint Offset may be positive or negative.


Menu Items and Settings	Description
P1 – P2   Max	<p>This setting is only used in CONTROL MODE when controlling with an external P2 sensor.</p> <p>This setting helps establish the cooling/heating rate when the remote temperature control probe is being used. 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.</p>
Calibration OFFSET P1 INTERNAL	This menu item allows adjustment of the Chiller's internal temperature reading to match that of a traceable standard.
Calibration Offset P2 External	This menu item allows adjustment of the Chiller's external temperature reading to match that of a traceable standard.
Maintenance Reminder	The operator may set a periodic maintenance reminder for any purpose.
Ambient Air Alarms	Measured air temperature outside these settings will cause the chiller to alarm.
Fluid Flow Units (For units with optional Flow Meter only.)	Select gpm or lpm display
Fluid Flow Minimum (For units with optional Flow Meter only.)	Set fluid flow minimum from 1 to 3 gpm (4 to 11 lpm). Continuous operation below this value will result in alarm and pump and compressor shutoff.
Fluid Flow Calibration (For units with optional Flow Meter only.)	Set from -0.5 to 0.5 gpm (-1.9 to 1.9 lpm) to agree with a calibrated external flow meter.
Diagnostics	<p>Enter Diagnostics menu. View operating conditions, including compressor and pump current draw, line voltage and frequency, ambient temperature, relative humidity, barometric pressure, cumulative running time, number of on/off cycles, fluid level, remote control switch status, and firmware version. From the Diagnostics Menu, the operator may run a Diagnostic Self-Test, View the last Diagnostic Self Test, and perform a Factory Reset to default settings.</p>

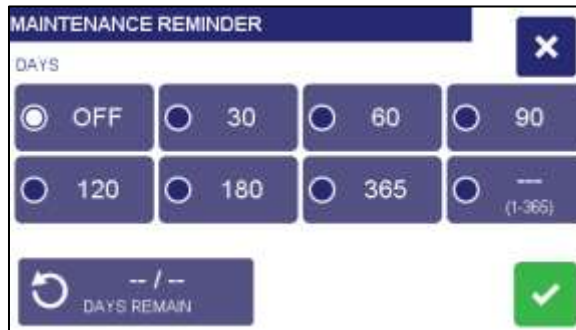
User Settings	Description
Language Selection	Sets the language used throughout the Chiller's interface.
Data Log	Sets the frequency at which data is logged to a USB drive
Fluid Level Sensor Enable	Certain fluids and operating points may affect the performance of the level sensor. In this case the level sensor may be disabled. If the sensor is disabled, the operator must be responsible for maintaining fluid level.
Buzzer Enabled	The operator may disable the audible indication of alarms.
USB Device Mode	When fitted with the optional USB-B port, this setting will determine whether the port acts as a USB Virtual Serial Port or a USBTMC device.
Screen Brightness	The operator may adjust the screen's brightness level
RS232	Sets the baud rate for RS232 communications

# Routine Maintenance and Troubleshooting

## Routine Maintenance

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

For convenience, a maintenance reminder can be set on the unit. This can be found by navigating to the Maintenance Reminder item in the menu. Select one of the preset values, or create your own using the Custom option. Press  to reset an existing timer.





MAINTENANCE REMINDER

DAYS

☒ OFF ☐ 30 ☐ 60 ☐ 90

☐ 120 ☐ 180 ☐ 365 ☐ --- (1-365)

 --/-- DAYS REMAIN 

To create a custom reminder, select the button marked "---" and enter a value from 1 up to 365 days. Once you have selected a custom value, the "---" value will be replaced with the selected value. Select that button again to choose a different custom maintenance interval.

## Inlet Fuse Replacement



Warning: Risk of Electric Shock: Disconnect power before replacing any fuse. Unplug the power cord from the inlet before replacing any fuse.

To access the fuses in the fuse holder, use a tool (if needed) to depress the lever in between the two fuse holders. Remove the fuse holder drawer. Replace only with 600Vac, 10A maximum, slow blow fuse, 5 x 20 mm maximum. Replace only with same type of fuse. Insert the fuse into the withdrawn fuse holder drawer. Ensure that the fuse is secured in place. Insert the fuse holder drawer into the inlet until it clicks into place.



## 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 regular basis and cleaned as required.



### Air Filter Access

To access the filter, grasp the handle at the top of the Chiller's front access panel and pull outwards. The filter is located behind the panel.

This filter should be checked on a regular basis and cleaned as required. Use a mild detergent and water solution to wash off any accumulated dust and dirt. Rinse and dry thoroughly before reinstalling.



### Cleaning Exterior Surfaces

Only mild detergents and water or an approved cleaner should be used on the painted surfaces of the Chiller. Do not allow cleaning liquids or sprays to come in direct contact with the digital display.

### UV Anti-Growth Light (Optional)

Certain Chillers are equipped with a UV Anti-Growth light to inhibit the growth of biologicals in the fluid stream. The light will be energized while the pump is running, and an indicator will be shown on the Chiller's Home Screen.



**CAUTION:** The UV light is enclosed in a shroud designed to block UV rays from being emitted. Do not use the UV light if the enclosure has been damaged, modified, or otherwise tampered with.

\*UV Anti-growth light EPA Establishment number 104271-IL-1

### Fluid Level Sensor

Your Chiller is equipped with a sensor that continuously monitors fluid level in the reservoir. The fluid level will be shown on the Home Screen. Generally, fluid should be added whenever the display fluid level indicates "LOW FLUID LEVEL".

### Fluid Properties

The circulating fluid in your Chiller is vital to the cooling system. If you are using an antifreeze fluid, it should be checked regularly to ensure that it hasn't lost any of its cooling and/or antifreeze properties. In certain applications, dirt and other particulate can make its way into the circulating fluid of your Chiller. This is bad for the Chiller, especially for the pump. If large amounts of debris are present the fluid should be drained, and the Chiller flushed.

## Draining the Fluid

The following information applies when draining the fluid.



**CAUTION:** Depending on the application, the process fluid may be very hot or cold. Contact with skin should be avoided.

1. Power off the unit and (if applicable) auxiliary equipment to ensure the system is not run dry.
2. Disconnect the Chiller from the process. Note, a drip pan is recommended
3. Aim the outlet tube down a drain or into a collection container, and allow the fluid to empty out.

Further cleaning steps may be warranted

- A. Flush the system with clean tap water to wash out remaining deposits. Do not use hard water or water with solid particulates to flush the system. If clean tap water is not available, use distilled water.
  - B. It may be necessary to flush abundantly with clean tap water first and then run a longer closed cycle clean up with distilled water.
  - C. If algae growth is present, run a closed cycle (connect a hose between the inlet and the outlet to circulate the fluid inside the chiller) with polyclear Mix 30 PLUS.
4. Once the system is clean, reconnect the Chiller to the process and fill the reservoir with clean fluid. Turn the Chiller on and continue to fill until the fluid returns to the reservoir.

## 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.

## Diagnostic Self Test

You may periodically wish to check the performance of the Chiller against its original metrics. To start the Diagnostic Self Test, select "DIAGNOSTICS" from the main menu. In the Diagnostics menu, select "RUN DIAGNOSTIC SELF TEST" and follow the on-screen prompts. If you wish to save your test data, you may insert a USB Storage Device in the front port at the beginning of the test process.



A series of prompts will guide you through the process. The Diagnostic Self Test process will take approximately 20 minutes. During this time, pump flow and temperature control to your process will be interrupted.



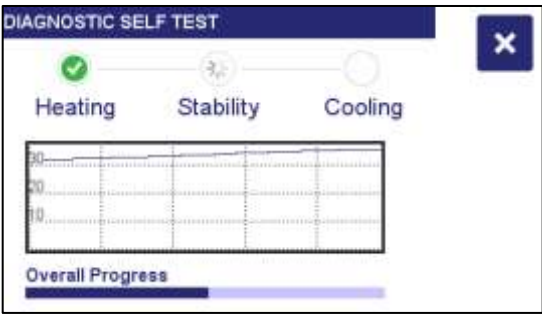
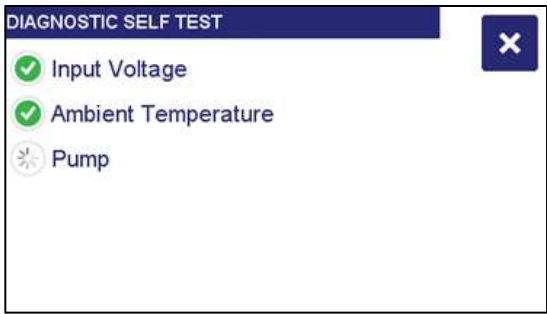
**CAUTION:** Do not start the Diagnostic Self Test if the equipment or process being cooled by the Chiller is running or if it may start. Damage may result if the equipment being cooled is allowed to run during a Diagnostic Self Test.

Once the Diagnostic Self Test has stopped pump flow, you will be asked to connect a short piece of hose (about 1m or 3.3ft) between the inlet and outlet of the Chiller. This allows for Chiller performance to be measured in isolation from external equipment or long lengths of process tubing.



**NOTE:** If you do not connect the inlet directly to the outlet, the results of the Diagnostic Self Test may not be valid.

Test progress will be indicated on screen:



## Troubleshooting

### Restoring Factory Default Settings

Many problems can be resolved by restoring the factory defaults. If this solves the problem, be careful when restoring your operational settings in order not to repeat the problem.

Factory Default settings can be restored through the Menu Screen. The Chiller must be in Standby in order to restore factory defaults.



*In the main menu, select "DIAGNOSTICS"*



*Select "FACTORY RESET"*



*At the prompt, select "YES" to reset defaults.*

## Recommended Troubleshooting Procedures



**WARNING:** Refer servicing to qualified service personnel.




**WARNING:** When electrical power is ON, dangerous voltages exist within chassis components. Use extreme care when measuring voltages on live circuits.

## Additional Safety information for Models BA05E/BA06E (R290 Refrigerant)



- **WARNING:** Risk of fire or explosion. Flammable refrigerant used.
- Ensure all ventilation openings are not obstructed. Place in well ventilated area to prevent accumulation of refrigerant.
- Repair and disposal must be carried out by trained service personnel.
- Do not puncture or damage the refrigeration circuit. No naked flame during service or repair.
- This unit is intended for use in commercial, industrial, or institutional occupancies as defined in the Safety Standard for Refrigeration Systems, ANSI/ASHRAE 15

Problem	Possible Causes	Corrective Action
Unit does not run (display is blank)	No power to unit	Check that the electrical cord is secure and connected to an operating electrical outlet. Check front power switch Check inlet fuses and replace them as necessary
Unit does not run (display shows "Press  to start")	Unit in Standby mode	Press Standby Button on front panel.
No fluid circulation	Insufficient fluid in reservoir Blockage in circulating system Pump is not operating	Add fluid to reservoir. Remove blockage. Check PCB pump fuse and replace as necessary. Check for electrical short circuits before replacing fuse. Replace pump.
Insufficient circulation	Fluid viscosity too high External tubing diameter too small Restrictions in fluid lines Low line voltage	Replace with lower viscosity fluid. Replace with larger diameter tubing. Check and correct as required. Check fittings. Check and correct as required.

<b>Problem</b>	<b>Possible Causes</b>	<b>Corrective Action</b>
Unit does not cool or cooling is insufficient	Dust build up on air filter or condenser	Clean air filter and/or condenser as required. Condenser fan rotating?
	Blocked air ventilation screens	Remove blockages as required. Open space around unit
	Excessive heat load	Check that heat load does not exceed capacity of Chiller; correct as required.
	Ambient air temperature too high	Decrease ambient air temperature.
	Low or high line voltage (should be within +/- 10% of nameplate)	Check and correct as required.
	Blown fuse	Check fuse on PCB and rear of unit, replace as required. Check for electrical short circuits before replacing fuse.
	Faulty temperature sensor	Check the temperature sensor readings (see "Diagnostic Mode" on page 33). If any of these temperature readings is "-", the sensor needs to be replaced.
	Refrigerant leak	Call a local HVAC service technician to check the unit for refrigerant leaks
	Compressor is not operating	Perform a Diagnostic Self Test (refer to "Diagnostic Self Test" on page 26)

## Display, Alarm, and Error Messages

Error Message	Warnings and Faults	Corrective Actions	Device Behavior	Fault Code for Remote Communications
DISCHARGE TEMPERATURE SENSOR FAILURE	Discharge temperature sensor has failed.	Replace the discharge temperature sensor	Warning only	1
SUCTION PRESSURE SENSOR FAULT	Suction pressure sensor has failed.	Replace the suction pressure sensor	Compressor, fan, and pump are turned off.	2
P1 FAILURE	P1 temperature sensor has failed.	Replace the internal fluid temperature sensor	Compressor, fan, and pump are turned off.	3
P2 FAILURE	P2 temperature sensor has failed.	Check connection Replace the external temperature sensor	Compressor, fan, and pump are turned off.	4
P3 FAILURE	P3 temperature sensor has failed	Replace the P3 sensor assembly	Compressor, fan, and pump are turned off.	5
SETPOINT ABOVE HIGH TEMPERATURE SETTING	Temperature set point is higher than the high temperature limit.	Lower the set point or raise the High Temperature Alarm	Warning only	6
SETPOINT BELOW LOW TEMPERATURE SETTING	Temperature set point is lower than the low temperature limit.	Raise the set point or lower the Low Temperature Alarm	Warning only	7
LOW FLUID LEVEL	Liquid level in the reservoir is below 35% for over 10 seconds.	Check the fluid connections for leaks Add fluid to the reservoir	Compressor, fan, and pump are turned off.	8
LEVEL LESS THAN 35% ON STARTUP	Fluid level is less than 35% on startup.	Check the fluid connections for leaks Add fluid to the reservoir	Compressor, fan, and pump remain off.	9
LOW FLUID FLOW	Internal fluid flow has fallen below the factory determined minimum rate for more than 10 seconds.	Check pump fuse, and replace as necessary Check that the fluid being used is appropriate for the operating temperature Cycle power and audibly check that the stepper valves are functioning properly	Compressor, fan, and pump are turned off.	10
HIGH FLUID PRESSURE	Fluid outlet pressure has exceeded the high pressure limit for more than 10 seconds.	Check process fluid lines for restrictions Increase the high fluid pressure alarm setting	Compressor, fan, and pump are turned off.	11

<b>Error Message</b>	<b>Warnings and Faults</b>	<b>Corrective Actions</b>	<b>Device Behavior</b>	<b>Fault Code for Remote Communications</b>
LOW FLUID PRESSURE	Fluid outlet pressure has fallen below the low pressure limit for more than 10 seconds.	Check the pump fuse  Lower the low fluid pressure limit	Compressor, fan, and pump are turned off.	12
HIGH FLUID TEMPERATURE	Fluid temperature is higher than the high temperature limit value.	Check the compressor fuse  Cycle power and audibly check that the stepper valves are functioning properly  Raise the high limit	Compressor, and fan are turned off; pump remains on.	13
LOW FLUID TEMPERATURE	Fluid temperature is lower than the low temperature limit value.	Cycle power and audibly check that the stepper valves are functioning properly  Lower the low limit	Compressor, and fan are turned off; pump remains on.	14
MAINTENANCE REMINDER	Maintenance reminder timer has expired.	Reset as necessary	Warning only	16
CHECK FILTER REMINDER	External fluid filter timer has expired.	Check the external fluid filter and replace as needed	Warning only	17
REPLACE FLUID REMINDER	Fluid replace timer has expired.	Change the fluid	Warning only	18
MANUAL AIR FILTER REPLACEMENT REMINDER	Manual air filter timer has expired	Clean the air filter	Warning only	19
UV LED FAILURE	UV module has failed.	Replace the UV module	Warning only	21



## Diagnostic Mode

The Chiller incorporates a display of diagnostic information. To access Diagnostics, enter the Menu and press the DIAGNOSTICS item.



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

DIAGNOSTICS	
P1	15.0 °C
P2	21.8 °C
MAX SET DIFFERENTIAL	5 °C
SETPOINT	15.0 °C

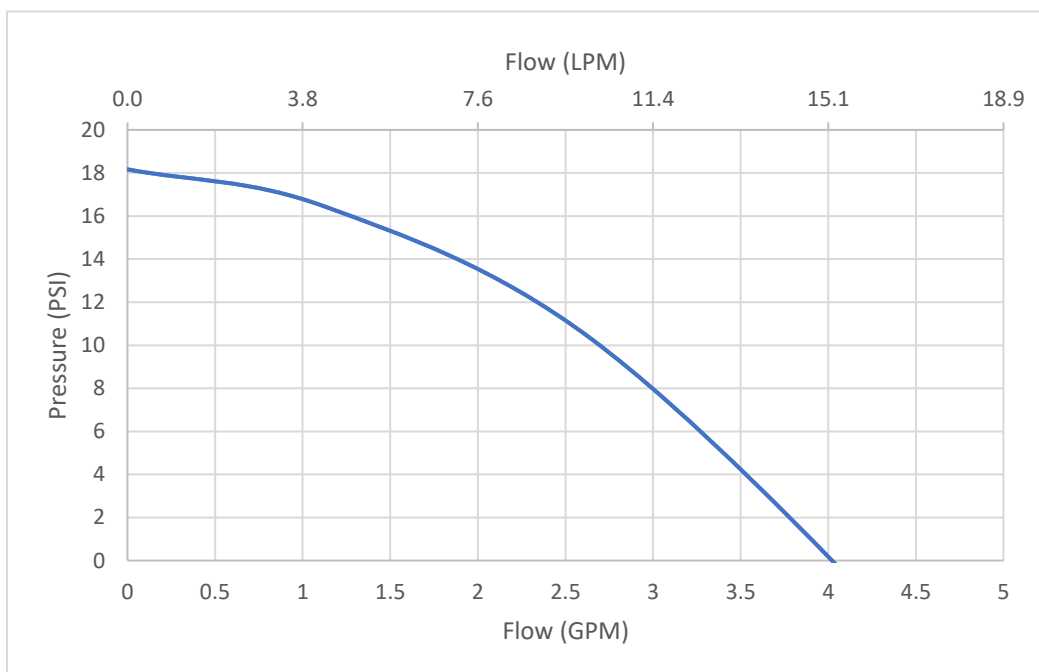
## Technical Information

### General Specifications (all Chillers)

Flow Rate @ 0 PSI	4 GPM / 15 LPM
Temperature Set Point Resolution	0.1°C
Temperature Stability	±0.1°C
Temperature Units	°C or °F
Pressure Units	psi or kPa
Pressure Display Resolution Pressure Display Accuracy	1 psi / 6.9 kPa ±3.5% of full scale (75PSI)
Pump Inlet and Outlet	½ inch NPT
Pump Pressure (Varies with Speed)	Up to 18 PSI / 124 kPa
Reservoir Capacity	0.4 gal / 1.5 liters
Unit Dimensions (L x W x H)	18.25" x 9.1" x 18.5" (463 x 231 x 470 mm)

### Pump Performance

#### Magnetic Drive Pump



## R513A Performance Specifications — 60Hz Chillers

Model	BA05 (60Hz)	BA06 (60Hz)
Operating Temperature	-10° to 30°C	-20° to 30°C
Cooling Capacity @ 20°C	475 watts 1620 BTU/hr	800 watts 2728 BTU/hr
10°C	425 watts 1449 BTU/hr	525 watts 1790 BTU/hr
0°C	290 watts 989 BTU/hr	325 watts 1108 BTU/hr
-10°C	140 watts 478 BTU/hr	130 watts 443 BTU/hr
Shipping Weight	78.2 pounds 35.5 kg	78.2 pounds 35.5 kg
Voltage Range	120V	
Full Load Amps	8A	8A

## R513A Performance Specifications — 50Hz Chillers

Model	BA05 (50Hz)	BA06 (50Hz)
Operating Temperature	-10° to 30°C	-20° to 30°C
Cooling Capacity @ 20°C	425 watts 1449 BTU/hr	800 watts 2728 BTU/hr
10°C	350 watts 1194 BTU/hr	550 watts 1875 BTU/hr
0°C	225 watts 767 BTU/hr	325 watts 1108 BTU/hr
-10°C	75 watts 255 BTU/hr	140 watts 478 BTU/hr
Shipping Weight	78.2 pounds 35.5 kg	78.2 pounds 35.5 kg
Voltage Range	220 to 240V	
Full Load Amps	5A	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).

Environmental Conditions	Indoor use only	
	Maximum Altitude:	2000 meters
	Operating Ambient:	5° to 40°C
	Relative Humidity:	80% for temperatures to 40°C
	Installation Category	II
	Pollution Degree:	2
Refrigerant Information	Sound Level:	Less than 70 dB(A) A-weighted emission sound pressure level
	Product type	Hermetically sealed
	R513A refrigerant	BA05: GWP = 629, 155g, CO <sub>2</sub> e = 0.1t
	R513A refrigerant	BA06: GWP = 629, 205g, CO <sub>2</sub> e = 0.1t

Notes: refrigerant charge may vary. Always check label on unit for refrigerant charge. R513A is an unsaturated hydro(chloro)fluorocarbon refrigerant.

## R290 Performance Specifications — 60Hz Chillers

Model	BA05 (60Hz)	BA06 (60Hz)
Operating Temperature	-10° to 30°C	-20° to 30°C
Cooling Capacity @ 20°C	400 watts      1364 BTU/hr	1150 watts      3922 BTU/hr
10°C	350 watts      1194 BTU/hr	900 watts      3069 BTU/hr
0°C	200 watts      682 BTU/hr	600 watts      2046 BTU/hr
-10°C	75 watts      255 BTU/hr	400 watts      1364 BTU/hr
Shipping Weight	78.2 pounds 35.5 kg	78.2 pounds 35.5 kg
Voltage Range	120V	
Full Load Amps	8A	8A

## R290 Performance Specifications — 50Hz Chillers

Model	BA05 (50Hz)	BA06 (50Hz)
Operating Temperature	-10° to 30°C	-20° to 30°C
Cooling Capacity @ 20°C	425 watts      1449 BTU/hr	1150 watts      3922 BTU/hr
10°C	350 watts      1194 BTU/hr	900 watts      3069 BTU/hr
0°C	200 watts      682 BTU/hr	600 watts      2046 BTU/hr
-10°C	75 watts      255 BTU/hr	400 watts      1364 BTU/hr
Shipping Weight	78.2 pounds 35.5 kg	78.2 pounds 35.5 kg
Voltage Range	220 to 240V	
Full Load Amps	5A	5A

Specifications subject to change without notice.

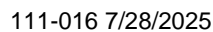
**Notes:** Refer to the serial number plate on the rear of the Chiller for model and electrical data.  
Cooling capacity (watts x 3.41) = BTU/hour. Performance specifications determined at ambient temperature of 20°C (68°F).

Environmental Conditions	Indoor use only	
	Maximum Altitude:	2000 meters
	Operating Ambient:	5° to 40°C
	Relative Humidity:	80% for temperatures to 40°C
	Installation Category	II
	Pollution Degree:	2
	Sound Level:	Less than 70 dB(A) A-weighted emission sound pressure level

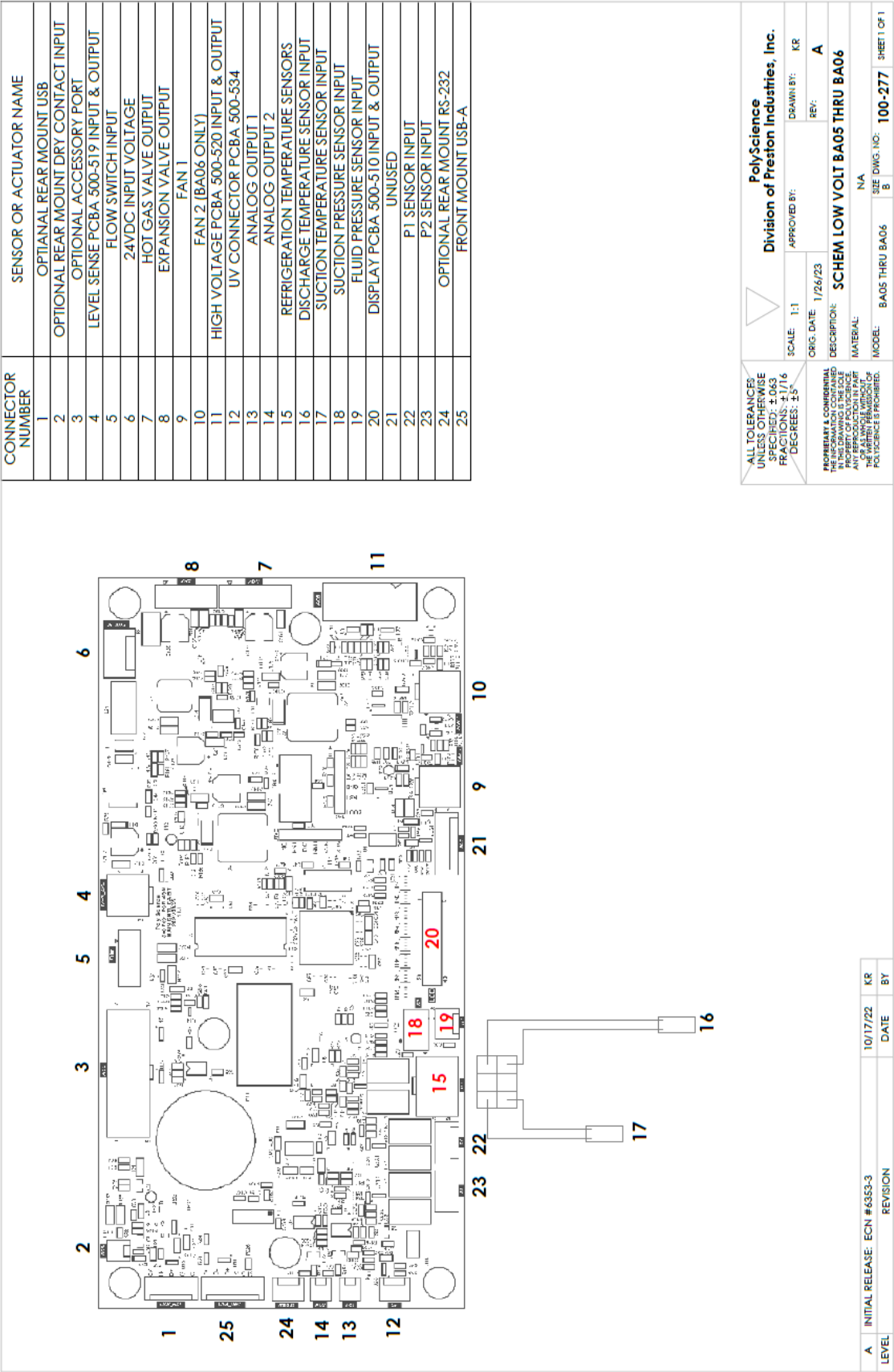
Refrigerant Information	Product type	Hermetically sealed
	R290 refrigerant	BA05: GWP = 0.02, 99g, CO <sub>2</sub> e = 0.0t
	R290 refrigerant	BA06: GWP = 0.02, 99g, CO <sub>2</sub> e = 0.0t

Notes: refrigerant charge may vary. Always check label on unit for refrigerant charge. R290 is a non-fluorinated, environmentally friendly refrigerant.

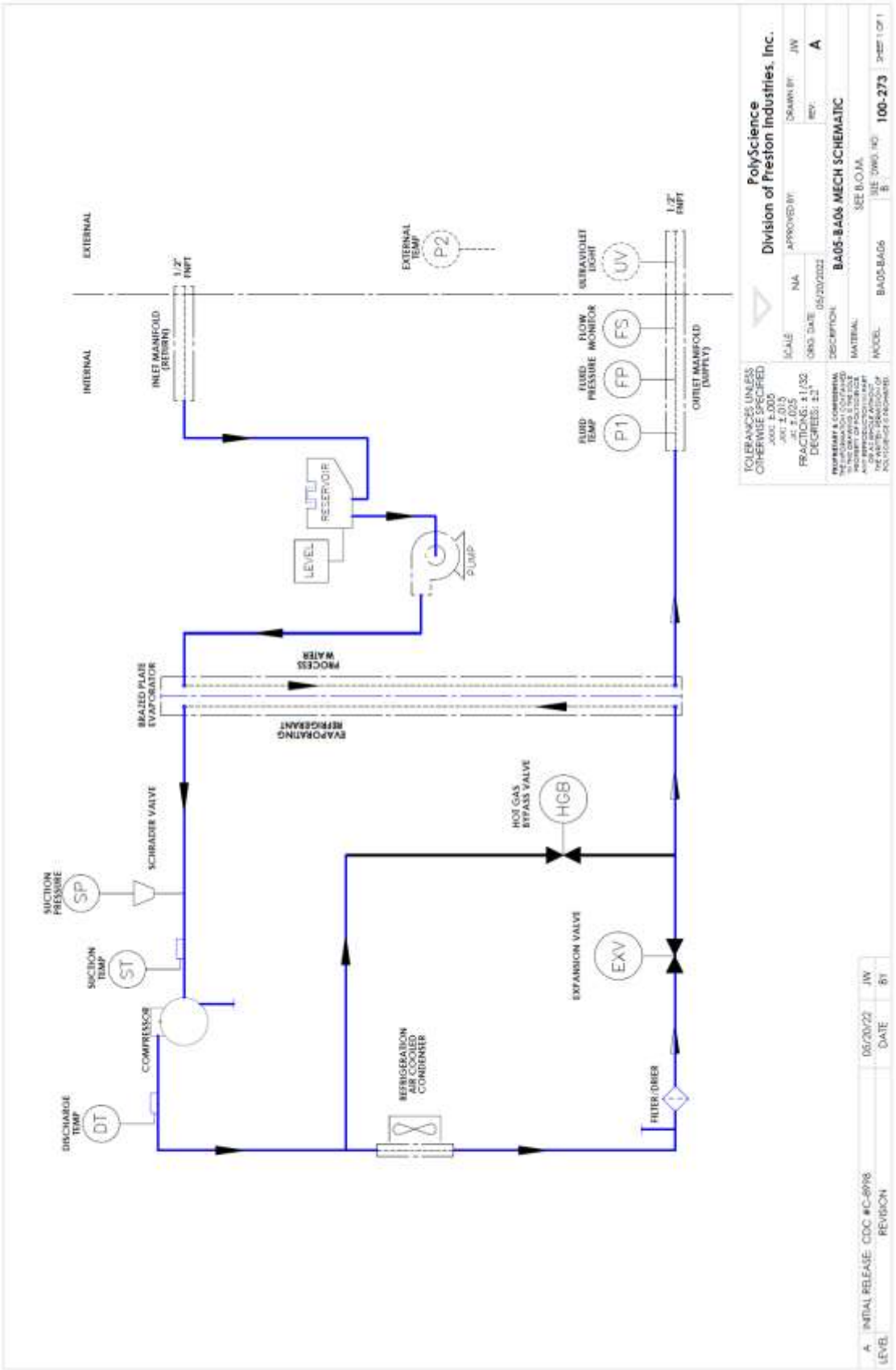
## Electrical Wiring Diagram – High Voltage



Electrical Wiring Diagram – Low Voltage




Process Flow Schematic (Air Cooled Chiller)



## Replacement Parts

### Additional Safety information for Models BA0XE (R290 Refrigerant)

	<ul style="list-style-type: none"> <li>• <b>WARNING:</b> Risk of fire or explosion. Depending on the model, a flammable refrigerant may have been used.</li> <li>• To reduce risk of possible ignition due to incorrect or improper service, servicing repair and disposal must be carried out <b>ONLY</b> by service personnel trained in the use of flammable refrigerants.</li> <li>• Component parts shall be replaced with like components only.</li> </ul>
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Major Component	120V, 60Hz	220-240V, 50Hz
Compressor, BA06 R134a / R513a	750-999	751-000
Compressor, BA05 R134a / R513a	750-997	750-998
Compressor, BA06 R290	750-977	750-975
Compressor, BA05 R290	750-994	750-974
Pump (all models)	215-955	215-955
Fan Assembly	215-966	215-966

Common Parts	
Operator's Manual	111-016
Tubing Adapter Kit	510-206
IEC Electrical Inlet	225-787
Inlet Fuse 10A Slow Blow 5x20 mm Bel Fuse 0ADKC9100 or equivalent	200-885
Air Filter, Passive	751-003
UV Module	511-579
Reservoir Cap	300-460
Power Supply	Mean-Well IRM-90-24 on PCB 500-518
Pump Fuse - 3AG	200-889
Compressor Fuse	200-878
P1 Temperature Sensor	200-430
Water Pressure Transducer	750-993 + Harness 525-986
Refrigeration Pressure Transducer	750-965



Refrigeration Discharge Temperature Sensor	200-880
Flow Sensor	776-337
Display PCB	500-510
Display Module	200-583
Main Control PCB	500-509
Motor Control AC Relay PCB	500-518
Asm, Flow Sensor w/conn	776-337 + 526-027

<b>Fluids</b>		
polycool MIX -25	Case = 5 x ½ gallon (l.9 L)	004-300060
polycool MIX 30 PLUS	Case = 5 x ½ gallon (l.9 L)	004-300063
polycool EG -25	1 gallon (3.8 L)	060340
polycool PG -20	1 gallon (3.8 L)	060320
polycool HC -50	1 gallon (3.8 L)	060330
polyclean CLARIFIER	8 oz (237 ml) Case = 12 x 8 oz (237 ml)	004-300040 004-300041

## Communications

### Connector Pinout

**Front USB** – A full-size, female USB-A socket is located at the front of the Chiller below the display. It is intended for datalogging and firmware upgrades, and should not be used for charging external devices.

Pin #	Functionality
1	+5Vdc
2	Data -
3	Data +
4	Ground

**Rear USB** – An optional full size, female USB-B socket will be located on the rear panel of the Chiller. It is intended for communicating with a PC.

Pin #	Functionality
1	+5Vdc
2	Data -
3	Data +
4	Ground

**Remote Control Switch and Status** – An optional 15-pin male d-sub connector will be located on the rear panel of the Chiller. It contains connections for a dry contact input for turning the unit off and on and for the status relay. The functionality of the dry contact input (open or close to turn the Chiller on) can be configured in the Menu, see page 21 for more information. The status relay is energized when the Chiller is running normally and de-energized when a fault condition is detected or the unit is placed in Standby. Only the pins listed below are needed.

Remote Control Switch (dry contact)	
Pin #	Functionality
1	Dry contact input #2
2	Dry contact input #1
3	Status relay Normally Open Contact
5	Status relay Normally Closed Contact
8	Dry contact input #1 alternate
11	Status relay Common contact
15	Dry contact input #2 alternate

Status Relay		
	Pin 3 to Pin 11	Pin 5 to Pin 11
Power Off		X
Standby		X
Alarm		X
Running	X	

**RS-232** – An optional 9-pin female d-sub connector will be located on the rear panel of the Chiller. Only the pins listed below are needed.

Pin #	Functionality
2	Data read (data from computer)
3	Data transmit (data to computer)
5	Signal ground

External Probe – An optional 9-pin male d-sub connector will be located on the rear panel of the Chiller. This port is only intended for connecting to a 4-wire 100-ohm platinum RTD sensor with a temperature coefficient of resistance of 0.00385 ohm/ohm/°C. Only the pins listed below are needed.

Pin #	Functionality
3	Shield
6	RTD Element Side 1
7	RTD Element Side 1
8	RTD Element Side 2
9	RTD Element Side 2

## Serial Port Protocol Definitions and Commands

RS-232 Protocol — The Chiller uses the following protocol:

Data bits — 8  
 Parity — none  
 Stop bits — 1  
 Flow control — none  
 Baud rate — Adjustable (2400, 9600\*, 19200, 38400, 57600, or 115200)  
 \*default

Virtual Serial Port Protocol — The Chiller uses the following protocol:

Data bits — 8  
 Parity — none  
 Stop bits — 1  
 Flow control — none  
 Baud rate — N/A (any baud rate selection on the PC will work)

RS-232 and Virtual Serial Port 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 command echo	SEi[CR]	Echo: i = 1	![CR] or ?[CR]
		No Echo: i = 0	
Set on / off	SOi[CR]	On: i = 1	![CR] or ?[CR]
		Off: i = 0	
Set set point	SS( x )( x ) x ( . )( x )[CR]	x = ASCII digit	![CR] or ?[CR]
Read set point temperature	RS[CR]	x = ASCII digit	+xxx.x[CR] or
			- xxx.x[CR]
Read temperature	RT[CR]	x = ASCII digit	+xxx.x[CR] or
			- xxx.x[CR]
Read probe 1 temperature	R1[CR]	x = ASCII digit	+xxx.x[CR] or
			- xxx.x[CR]
Read probe 2 temperature	R2[CR]	x = ASCII digit	+xxx.x[CR] or
			- xxx.x[CR]
Read temperature units	RU[CR]	C = °C, F = °F	C[CR] or F[CR]
Read status	RW[CR]	1 = Run	1[CR] or 0[CR]
		0 = Standby	

Command Description	Command Format	Values	Return Message
Read pressure in PSI	RP[CR]	x = ASCII digit	+ xxx.x[CR]
Read pressure in kPa	RK[CR]	x = ASCII digit	+ xxx.x[CR]
Read flow in GPM	RG[CR]	x = ASCII digit	+ xxx.x[CR]
Read flow in LPM	RL[CR]	x = ASCII digit	+ xxx.x[CR]
Read line voltage	RV[CR]	x = ASCII digit	+ xxx.x[CR]
Read remote probe temperature	RR[CR]	x = ASCII digit	+xxx.x[CR] or - xxx.x[CR]
Read ambient temperature	RA[CR]	x = ASCII digit	+xxx.x[CR] or - xxx.x[CR]
Read fluid level status	RX[CR]	0 = fluid level is ok 1 = fluid level is low	0[CR] or 1[CR]
Read fluid level	RFL[CR]	x = ASCII digit	+(x)(x)x.x[CR]
Read compressor amperage	RCA[CR]	x = ASCII digit	+(x)x.x[CR]
Read pump amperage	RPA[CR]	x = ASCII digit	+(x)x.x[CR]
Read relative humidity	RRH[CR]	x = ASCII digit	+(x)x.x%[CR]
Read barometric pressure	RBP[CR]	x = ASCII digit	+(x)xxx.x[CR]
Read hours of operation	ROC[CR]	x = ASCII digit	(x)(x)(x)(x)x[CR]
Read on/off cycle counter	RCC[CR]	x = ASCII digit	(x)(x)(x)(x)x[CR]
Read fault status (see Display, Alarm, and Error Messages)	RF[CR]	00 = System OK	xx[CR]
		01 – 25 = Warning or Fault	

**USBTC** – The Chiller is also compliant with subclass 488 of the USBTC class of instruments. Changing the menu selection from Serial to USBTC will allow the unit to use the rear USB-B port to enumerate as a USB Test & Measurement Class Device.

The following commands can be sent with or without a newline termination. Multiple commands may also be sent at once, but must have a [ ; ] separating each.

Command Description	Command Format	Values	Return Message
Set on / off	RUNi\n	On: i = 1	N/A
		Off: i = 0	
Set set point	SET( x )( x ) x ( . )( x )\n	x = ASCII digit	N/A
Read set point temperature	SET?\n	x = ASCII digit	+xxx.x\n or - xxx.x\n
Read probe 1 temperature	TP1?\n	x = ASCII digit	+xxx.x\n or - xxx.x\n
Read probe 2 temperature	TP2?\n	x = ASCII digit	+xxx.x\n or - xxx.x\n
Read temperature units	TUNITS?\n	C = °C, F = °F	C\n or F\n
Read status	RUN?\n	1 = Run 0 = Standby	1\n or 0\n
Read pressure in PSI	PRES?\n	x = ASCII digit	+ xxx.x\n
Read flow in GPM	FLW?\n	x = ASCII digit	+ xxx.x\n
Read line voltage	VAC?\n	x = ASCII digit	+ xxx.x\n
Read remote probe temperature	TP2?\n	x = ASCII digit	+xxx.x\n or - xxx.x\n
Read ambient temperature	TAMB?\n	x = ASCII digit	+xxx.x\n
Read fluid level	LVL?\n	x = ASCII digit	+(x)(x)x.x\n
Read fault status	ERR?\n	00 = System OK	xx\n

Command Description	Command Format	Values	Return Message
(see Display, Alarm, and Error Messages)		01 – 21 = Warning or Fault	
Read Unit ID	*IDN?\n	x = ASCII digit	PolyScience,Chiller,x xxxxxx <sup>1</sup> ,xx.xx.xx <sup>2</sup> \n
Self-test query	*TST?\n	n/a	OK\n
Read event status enable register value	*ESE?\n	x = ASCII digit	x\n
Read event status register value	*ESR?\n	x = ASCII digit	x\n
Read operation complete status	*OPC?\n	1 = Complete 0 = Not Complete	1\n or 0\n
Read status byte register	*STB?\n	x = ASCII digit	xx\n
Clear status structure	*CLS\n	No Effect	
Set status enable register contents	*ESE\s( x )( x )x\n	No Effect	
Set operation complete bit	*OPC\n	No Effect	
Set service request enable register	*SRE\n	No Effect	
Read service request register	*SRE?\n	0	0\n
Individual status query	*IST?\n	0	0\n
Reset the device	*RST\n	No Effect	
Execute trigger function	*TRG\n	No Effect	
Wait to continue	*WAI\n	No Effect	
Parallel poll enable register	*PRE\n	No Effect	
Pass control back	*PCB\n	No Effect	

<sup>1</sup> - Unique ID number

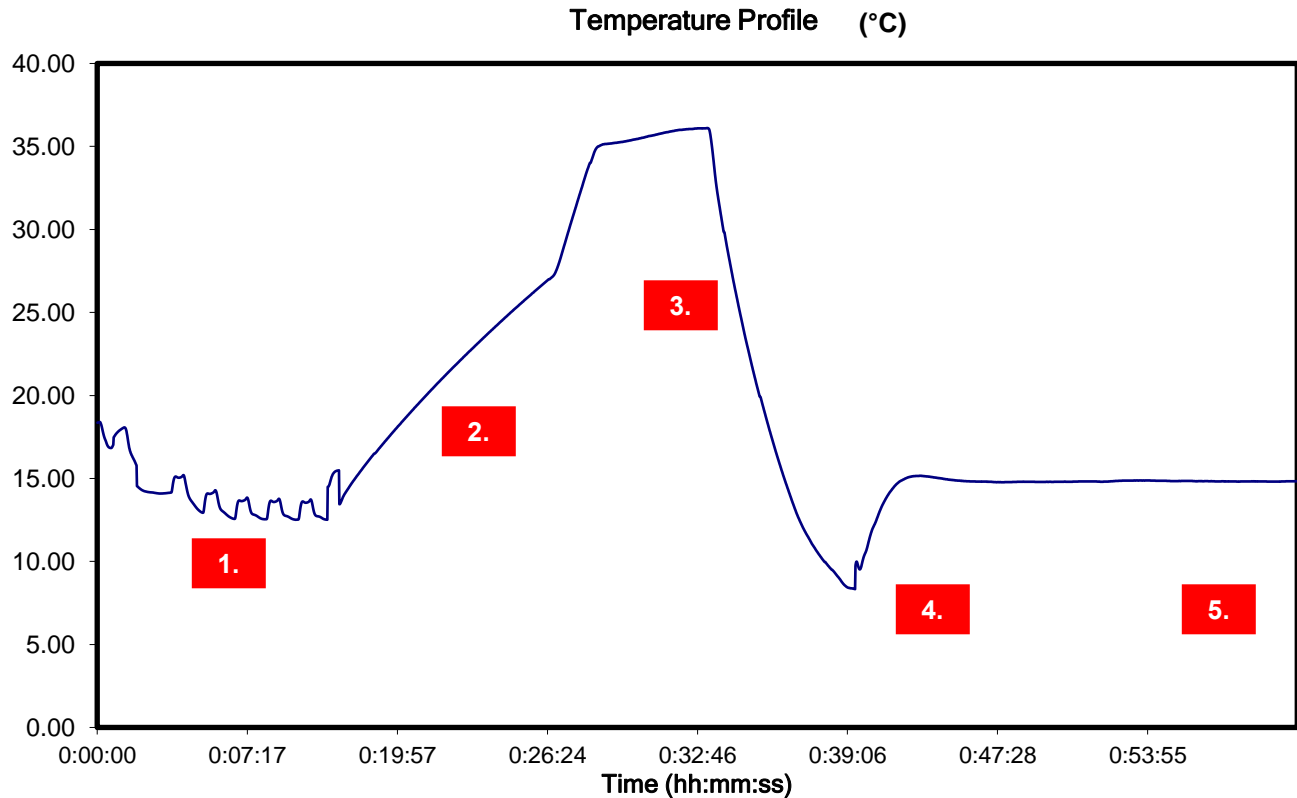
<sup>2</sup> - Firmware version

## Installing Firmware Update

1. Turn the rear switch OFF.
2. Download the latest firmware from <https://www.polyscience.com/support/software-downloads> and save it to the root of a FAT32 formatted USB flash drive. Do not place the file in a subfolder or the Chiller will not be able to locate it.
3. Please ensure this is the only file on the flash drive.
4. Insert the flash drive into the front USB port of the Chiller to be updated.
5. Turn the rear switch on.
6. The unit will now cycle through a few screens as it checks the flash drive for a valid version of firmware, erases the current version of firmware from the unit, and then programs the unit with the firmware from the flash drive. Once completed, the Chiller will enter Standby.
7. Remove the flash drive.
8. The process is complete, the Chiller can be returned to normal operation.

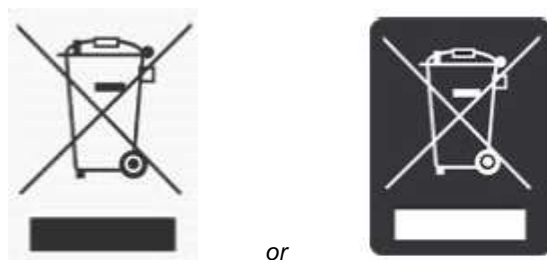
## Certificate of Compliance

All Chillers are tested after assembly to ensure that the product meets or exceeds published mechanical and safety specifications as well as your satisfaction. The Certificate of Compliance is included with the Chiller. The following graph explains the steps involved in a typical test.



1. Unit runs an On/Off cycle.
2. Heat performance of unit measured.
3. Cooling performance of unit measured.
4. Heat load applied to Chiller to simulate real application conditions. The heat load applied is based on the Chiller's cooling capacity.
5. Temperature stability of unit measured.

## Equipment Disposal (WEEE Directive)




This equipment is marked with the crossed out wheeled bin symbol to indicate it 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.**

It is your responsibility to correctly dispose of this equipment at lifecycle-end by handing it over to an authorized facility for separate collection and recycling. It is also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect the persons involved in the disposal and recycling of the equipment from health hazards. By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

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.

### Additional Disposal Safety information for Models BA05E/BA06E (R290 Refrigerant)

	<ul style="list-style-type: none"><li>• CAUTION: Risk of fire or explosion. Flammable Refrigerant Used. Dispose of properly in accordance with Federal or Local Regulations.</li><li>• Disposal must be carried out ONLY by service personnel trained in the disposal of flammable refrigerants.</li></ul>
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## Service and Technical Support

If you have followed the troubleshooting steps and your Recirculating Chiller 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)
- Date of purchase and your purchase order number
- Suppliers' order number or invoice number
- A summary of your problem

**It is recommended to perform a Diagnostic Self Test as part of the troubleshooting process. The Diagnostic Self Test will determine if the Chiller is able to match its factory validated performance in the installation environment, and the Self Test is useful for isolating the Chiller from external factors such as process piping. The Diagnostic Self Test will also provide a data log file that can be sent to and analyzed by Customer Service. Refer to Diagnostic Self Test**

## Warranty

The manufacturer agrees to correct for the original operator of the product, either by repair (using new or refurbished parts), or at the manufacturer's election, by replacement (with a new or refurbished product), any defects in material or workmanship which develop during the warranty period. The standard warranty is twenty-four (24) months after delivery of the product. In the event of replacement, the replacement unit will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer. For purposes of this limited warranty, "refurbished" means a product or part that has been returned to its original specifications. In the event of a defect, these are your exclusive remedies.

If the product should require service, contact the manufacturer's/supplier's office for instructions. When return of the product is necessary, a return authorization number is assigned and the product should be shipped, transportation charges pre-paid, in either its original packaging or packaging affording an equal degree of protection to the indicated service center. To ensure prompt handling, the return authorization number must be placed on the outside of the package. A detailed explanation of the defect should be enclosed with the item.

The warranty shall not apply if the defect or malfunction was caused by accident, neglect, unreasonable use, improper service, acts of God, modification by any party other than the manufacturer, or other causes not arising out of defects in material or workmanship.

**EXCLUSION OF IMPLIED WARRANTIES.** THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHICH EXTEND BEYOND THE DESCRIPTION AND PERIOD AS STATED IN THE OPERATOR'S MANUAL INCLUDED WITH EACH PRODUCT.

**LIMITATION ON DAMAGES.** THE MANUFACTURER'S SOLE OBLIGATION UNDER THE WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT AND THE MANUFACTURER 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 and you may have other rights that vary from state to state.

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