

# DURACHILL™

by PolyScience



## Operators Manual

### DuraChill™ Air and Water Cooled 2 and 3 HP Chillers

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## Section 1 – Safety and Warranty Information



This symbol marks chapters and sections of this instruction manual which 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.**

### 1.1

#### Safety

It is the user's responsibility to read and understand all instructions and safety precautions included in this manual prior to installing or operating this equipment. Contact our Customer Service Department with any questions regarding the operation of this chiller or the information contained in this manual.



Installation, operation, or maintenance of this equipment should be performed in strict accordance with the instructions outlined in this manual. Failure to follow those instructions may increase the risk of personal injury, damage the equipment, and/or void the warranty.



Exercise care when unloading, loading, rigging, or moving this equipment.



All warning labels should be carefully observed. Never remove or obstruct a warning label.



Make sure that ventilation is adequate when welding or brazing around this equipment. Protect adjacent materials from flames or sparks. Keep an approved fire extinguisher close at hand.



Always operate this equipment within the stated design specifications.



Be sure to remove power from the equipment, reclaim the refrigeration charge, and relieve any residual pressure before cutting into the refrigeration system.



Do not attempt to operate leaking or damaged equipment.



Service should only be performed by fully qualified personnel.

	Follow all applicable electrical and safety codes when connecting power to this equipment.
	Do not attempt to override the power interlock switch or any other safety features on this equipment.
	Always remove power from the equipment prior to performing any service or maintenance.
	Do not move the equipment without first disconnecting power.
	Make sure the equipment's main power switch is in the OFF position before connecting or disconnecting power.

**Additional Precautions**

Do not attempt to operate this equipment without an appropriate cooling fluid in the reservoir. Always empty the fluid reservoir before moving the unit.

**1.2**

**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.

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.

Warranty on Durachill and other custom-designed products apply only to the original end-user and cannot be transferred or sold to another end-user without written consent from the manufacturer.

### 1.3

#### **Unpacking**

Your chiller is shipped in a special container. Retain the container and all packing materials until the unit is completely assembled and working properly. Set up and run the unit immediately to confirm proper operation. 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.

### 1.4

#### **Contents**

- Recirculating Chiller
- Operators Manual
- Warranty Card
- Two sets of Inlet/Outlet Adapters, 3/4 inch male NPT

## **Section 2 – Description**

### 2.1

#### **General Description**

DuraChill™ 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.

### 2.2

#### **Features - Standard and Optional**

The PolyScience DuraChill™ line of industrial chillers offers exceptional performance, reliability, and operational simplicity. Available in both air and water cooled models; these robust self-contained chillers are engineered to provide accurate temperature control in a wide range of process cooling applications.

These powerful chillers can be configured with a wide variety of standard and optional features, including:

##### Standard Features

- Process temperature: 41° to 95°F (5° to 35°C)
- Ambient temperature: 60° to 95°F (16° to 35°C)
- Temperature stability: ± 0.9°F (± 0.5°C)
- Accurate microprocessor control with a digital LED readout
- Pump protection by means of a pump bypass valve
- Compressor protection through high and low refrigerant pressure cutouts
- Process protection provided by over-temp/under-temp alarms
- Heavy-duty, locking casters provide easy maneuverability
- Magnetic Drive Centrifugal Pump (1/5 HP for DCA/W200, 1/3 HP for DCA/W300)
- Quick and easy installation with single-point power and ground wiring connections
- Power phase monitor on 2 and 3 HP

##### Optional

- Higher-output Centrifugal and Turbine pumps
- Ambient temperatures to 104°F
- Other process temperatures 5° to 185°F
- Process shutoff valves
- RS232 interface

- RS485 interface
- Tank sight glass or level indicator
- Remote temperature control probe
- Remote control panel
- Stainless steel reservoir
- High and low water pressure cutouts
- Audible and Visual Alarms
- Rail or foot mounting
- Tank low level indicator/alarm
- External water filter (side stream)
- Full flow bypass valve
- Digital LED Flow rate readout
- Auto water makeup valve
- DI compatible process piping
- Heaters
- 380V 3ph 50 Hz
- 200V 3ph 50Hz
- Alternate heat transfer fluids

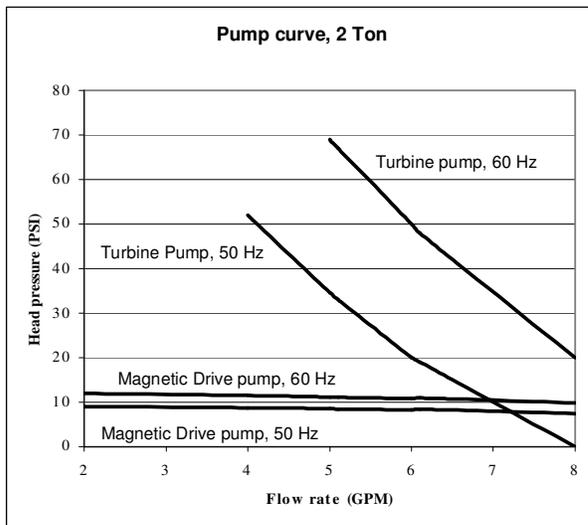
A Configuration Data Sheet showing how your chiller is equipped is included with the documentation that accompanied this manual.

### Section 3 – Chiller Specifications

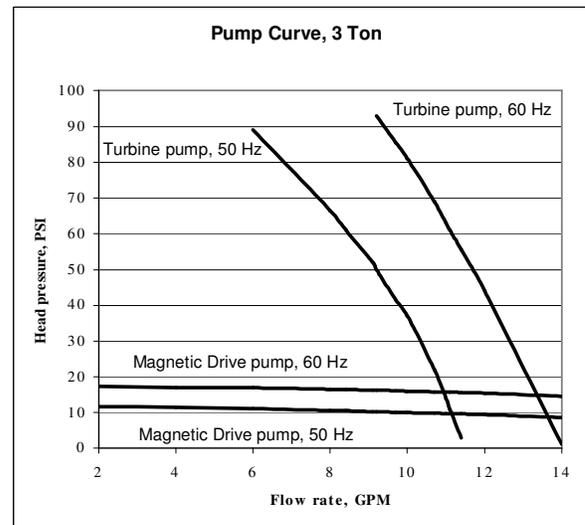
#### 3.1 Controller Specifications

Temperature Set Point Resolution	±1.0 °C
Temperature Stability	±0.9 °F / ±0.5 °C
Temperature Units	°C or °F
Pressure Units	PSI or kPa
Pressure Display Resolution	1 PSI / 0.1 kPa
Flow Rate Units	GPM or LPM
Flow Rate Display Resolution	0.1 GPM / 1 LPM

#### 3.2 Pump Performance



Magnetic Drive Centrifugal Pump  
DCA/W200



6

Magnetic Drive Centrifugal Pump  
DCA/W300

### 3.3

### General Specifications

#### 2 HP

MODEL		DCA200	DCW200
Compressor	Nom. HP	2	2
Cooling Capacity <sup>(1)</sup>	Tons	1.99	2.02
	Watts	7000	7087
	BTU/hr	23,885	24,189
Nominal Evaporator Flow <sup>(2)</sup>	USGPM	4.82	4.84
Pressure <sup>(3)</sup>	PSIG	7.5	7.5
Pump Horse Power <sup>(3)</sup>	H.P.	1/5	1/5
Fan(s)	H.P.	2 @ 1/6	N/A
Condenser Discharge Air Flow	CFM	2470	N/A
Water Condenser Flow-Tower Water	US GPM	N/A	6.05 (20-40 PSI)
Water Condenser Connections	Inches	N/A	3/4
Process Connections (To & From)	Inches	3/4	3/4
Reservoir Tank Capacity	US gallons	7	7
Dimensions (d x w x h)	Inches	30.5 x 37 x 42	30.5 x 37 x 42
Shipping Weight	Pounds	570	535
Temperature Range	°F	41° to 95°F	41°F to 95°F
	°C	5°C to 35°C	5°C to 35°C
Temperature Stability	°F	± 0.9°F	± 0.9°F
	°C	± 0.5°C	± 0.5°C
Nominal Rated Amps	460V/3/60	8.5	7.6
	230V/3/60	14	12.2
	230V/1/60	22	-

- Notes:**
1. Capacity based on 68°F (20°C) entering air, and leaving water 68°F. Allowance made for heat gain from pump.
  2. Chiller flow rate based on 2.4 USGPM/ton (0.54m<sup>3</sup>/hr/ton).
  3. Based on standard magnetic drive centrifugal pump. Refer to pump performance charts for information on other pump types. Specifications and dimensions subject to change without notice.

### 3 HP

MODEL		DCA300	DCW300
Compressor	Nom. HP	3	3
Cooling Capacity <sup>(1)</sup>	Tons	2.99	3.11
	Watts	10,500	10,936
	BTU/hr	35,827	37,326
Nominal Evaporator Flow <sup>(2)</sup>	USGPM	6.92	7.46
Pressure <sup>(3)</sup>	PSIG	14	14
Pump Horse Power <sup>(1)</sup>	H.P.	1/3	1/3
Fan(s)	H.P.	2 @ 1/6	N/A
Condenser Discharge Air Flow	CFM	2170	N/A
Water Condenser Flow-Tower Water	US GPM	N/A	9.33 (20-40 PSI)
Water Condenser Connections	Inches	N/A	3/4
Process Connections (To & From)	Inches	3/4	3/4
Reservoir Tank Capacity	US gallons	7	7
Dimensions (d x w x h)	Inches	30.5 x 37 x 42	30.5 x 37 x 42
Shipping Weight	Pounds	580	545
Temperature Range	°F °C	41° to 95°F 5°C to 35°C	41°F to 95°F 5°C to 35°C
Temperature Stability	°F °C	± 0.9°F ± 0.5°C	± 0.9°F ± 0.5°C
Nominal Rated Amps	460V/3/60	13.3	17.8
	230V/3/60	20	27.8
	230V/1/60	29	-

**Notes:** 1. Capacity based on 68°F (20°C) entering air, and leaving water 68°F. Allowance made for heat gain from pump.  
2. Chiller flow rate based on 2.4 USGPM/ton (0.54m<sup>3</sup>/hr/ton).  
3. Based on standard magnetic drive centrifugal pump. Refer to pump performance charts for information on other pump types.  
Specifications and dimensions subject to change without notice.

## Section 4 – Installation and Startup



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

### 4.1

#### 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 to meet the electrical data plate requirements. 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.

### 4.2

#### Electrical Power

Use the voltage and amperage requirements specified on the serial tag on the back of the unit. Total running amps for your unit are also found in the specification table in section 3.

Remove 3 screws securing top panel at rear. Remove top panel. Remove right side panel by pushing up from bottom to unhook latching tabs. Remove insulating cover over electrical compartment.

Bring properly sized power leads and ground from a fused disconnect (installed by a qualified electrician) to the unit. Use dual-element fuses in the disconnect switch, sized according to the National Electrical Code recommendations.

Connect proper phase sequence. You may want to turn power on to verify before putting the panels back on.

**Make sure all electrical connections are tight.**



#### Caution!

- Make sure electrical connections comply with all applicable electrical codes
- Ground the chiller in accordance with NEC Article 250
- Operation voltage must be within  $\pm 10\%$  of the nameplate rating
- Phase imbalance must be below 5%

With the chiller plugged in (before pressing the On button), the display responds by showing standby (...). If there is no response, check that the circuit breaker on the rear of the chiller is in the ON position. An extension cord is not recommended.

## Phase Monitor and Phase Failure Protection

The 2 HP and 3 HP Chillers with three-phase compressor and pump motor have a phase monitor interlock that prevents the chiller from starting if the phase rotation is wrong.

If the chiller will not start, check out phase rotation first. Disconnect the chiller from its power supply, remove the right side panel and reverse any two-power wires on the inlet power terminal. This chiller will shut off when the power supply loses one phase and it will remain off until the power recovers.

**Do NOT remove the ground wire when diagnosing the power supply problem!**



**WARNING: DO NOT plug the Chiller into the electrical outlet until the unit is ready for Startup (Section 4.5 below).**

### 4.3

#### Optional Signal Inputs/Outputs

##### Ambient Tracking Probe

This option allows you to control cooling fluid temperature based on room or machine temperature. A 4-pin connector is provided on the underside of the local control panel for connecting the remote probe.

**NOTE:** In order for the Chiller to properly recognize the presence of the Ambient Tracking 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 connect a remote on/off switch or other remote control device to the Chiller. A 9-pin D-connector is provided on the rear of the instrument enclosure for this connection.

### 4.4

#### Plumbing

##### 4.4.1 Air-Cooled units (DCA200 & DCA300)

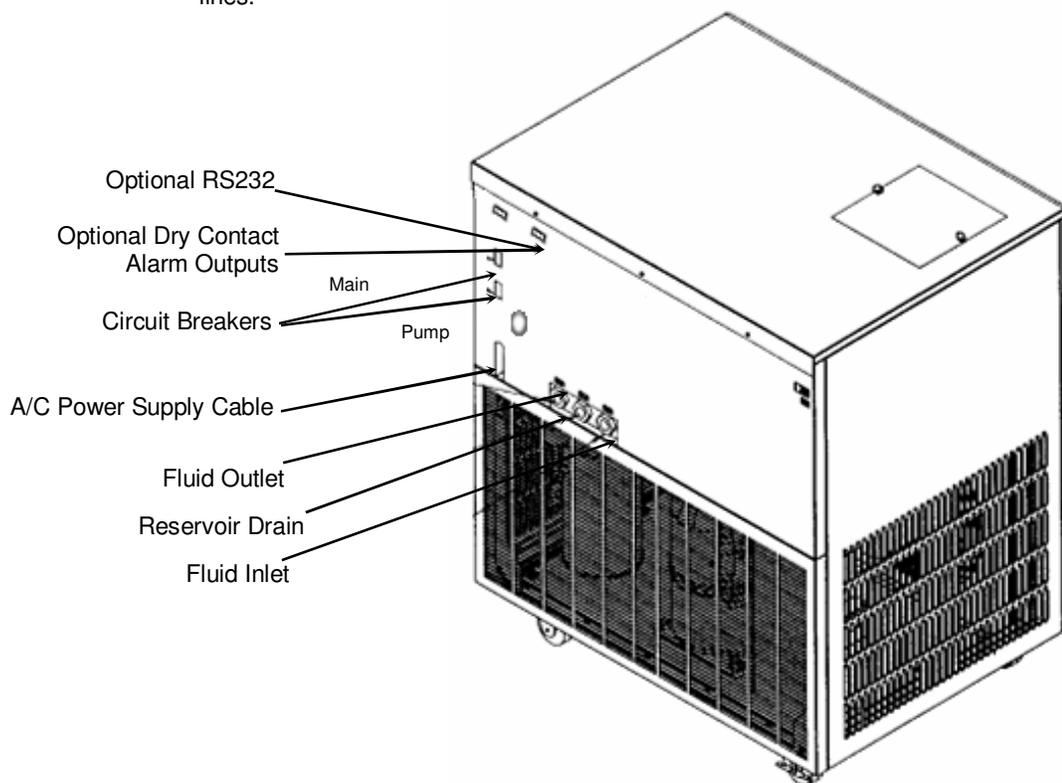
The Chiller has two internally threaded (3/4 inch ID NPT) fittings on the rear of the instrument housing for the process water connections. Two sets of adapters (1/2 inch ID and 5/8 inch ID) are supplied with the unit for connecting these fittings to the process piping.

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 (20 psi for magnetic drive centrifugal pumps and 100 psi for turbine pumps.)
- 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.

### Reservoir Drain

- A 3/4 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.



#### **4.4.2**

#### **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.

#### **4.4.3 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.

## 4.5

### Startup

#### 4.5.1 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 15°C (59°F), distilled water is satisfactory. For operation below 15°C (59°F), the Chiller must be protected with an antifreeze solution. Ethylene glycol (laboratory grade) and water in a 50/50 mixture is satisfactory from +15° to -15°C (59° to 5°F). Select a fluid that is compatible with the Chiller's wetted parts (see Section 2.2).



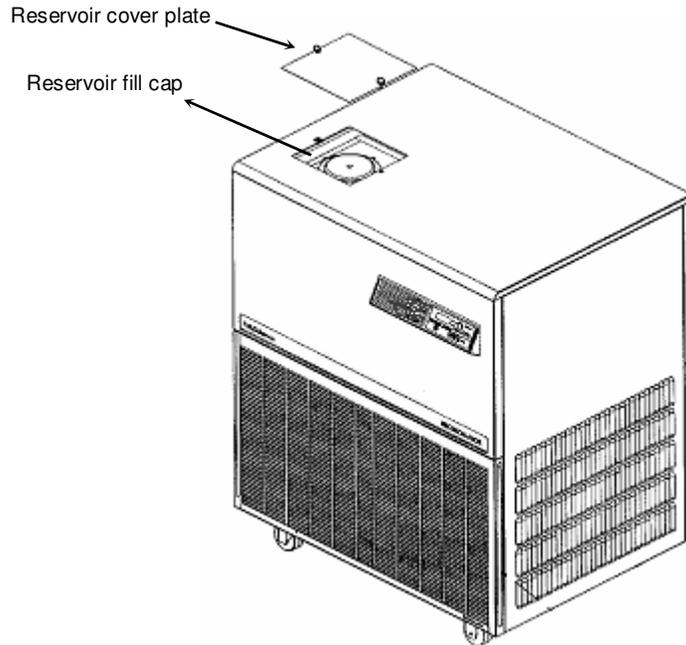
**WARNING: Do not use caustic, corrosive, or flammable fluids.**



**WARNING: Operation below 15°C (59°F) requires antifreeze in the circulation fluid.**

#### 4.5.2 Filling the Reservoir

Remove the reservoir cover plate and reservoir cap. Add fluid until it is approximately 2" below top of reservoir. Do not replace the cap at this time.



#### 4.5.3 Starting Process Fluid Flow

Apply main power. Turn circuit breaker on.

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:

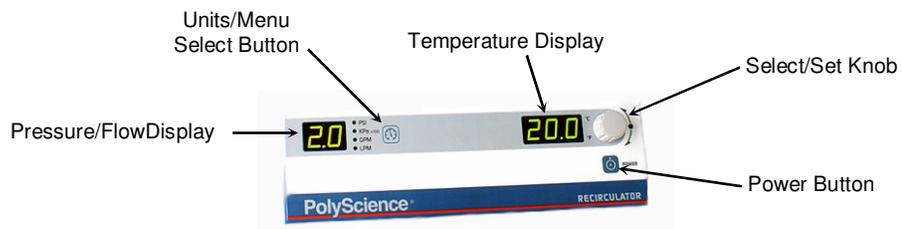
Closed Systems: Slowly add fluid to the reservoir until the liquid level remains stable.

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 5 –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 5.9. It should not be enabled until all operational parameters are set.



### 5.1 Selecting the Temperature Unit (°C or °F)

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

To change to °F — Place the main 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 main 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.

### 5.2 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 is installed and enabled. See Sections 5.3 and 5.5.7.

### 5.3 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 (see Section 5.5.7), 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.

#### 5.4 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.

#### 5.5 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 Select Button until HL appears on the pressure/flow rate display. Pressing and releasing the Units/Menu Select 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)  +20° to 72°C / 68° to 162°F (Refrigerating / Heating Chillers)	35°C 50°C
LL	Low Temperature Limit Alarm Set Point	-12°C to +15°C / 10° to 59°F (all units)	0.0°C
HA	Front Panel High Ambient Temperature Alarm Set Point	+30° to 45°C. Always displayed and set in °C.	40°C
FP w/psi LED lit	Maximum Fluid Pressure Alarm Set Point	10 to 100 PSI	80 PSI
FP w/kPa LED lit	Maximum Fluid Pressure Alarm Set Point	0.69 to 69 kPa	5.5 kPa
FL w/gpm LED lit	Minimum Flow Rate Alarm Set Point	0 to 2.0 GPM	0.0 GPM (0.2 GPM optional)
FL w/lpm LED lit	Minimum Flow Rate Alarm Set Point	0 to 7.5 LPM	0.0 LPM (0.1 LPM optional)
Fc	Flow Rate Calibration	0 to 99.9 gain	Nominal Flow
AF	Auto-Refrigeration Temperature Set Point	+20° to 40°C (Refrigerating Chillers) +20° to 50°C (Refrigerating / Heating Chillers) Always displayed/set in °C.	40°C 50°C
Cb	Compressor Band	-06 to -03°C	-06°C
AP	Ambient Tracking Probe (optional)	YES (ambient tracking enabled) NO (ambient tracking disabled) NAP (ambient tracking probe not installed)	NO
°C	Calibration Offset	±1.9°C. Always displayed/set in °C. Special access procedure required. See Section 4.3.6.	0.0°C
PC	Communications Baud Rate	0, 2400, 4800, 9600, 19200. Zero should be entered if RS232 is not being used.	9600

### 5.5.1 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.

HL		35.0	
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### 5.5.2 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.

LL		0.0	
----	---	-----	---

### 5.5.3 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.

HA		40	
----	---	----	---

### 5.5.4 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.

FP	PSI		80	
----	-----	---	----	---

FP	kPa		5.5	
----	-----	---	-----	---

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 4.7 for information on changing the maximum outlet pressure value.

### 5.5.5 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 FP value in LPM, press the Units/Menu Button again. The FP will remain on the display and the LPM LED will light.

FL	GPM		0.2	
----	-----	---	-----	---

FL	LPM		1.0	
----	-----	---	-----	---

### 5.5.6 Flow Rate Calibration – single point

This menu item allows you to calibrate the flow rate in GPM. Flow rate is calibrated at the factory at nominal flow value for this chiller. Further adjustment should not be necessary. If, however, you wish to calibrate flow rate against a known standard then proceed as follows.

Scroll down the menu until FL •LPM appears. Press and hold Units/Menu Select Button; Fc will appear. Press and release Set/Select Knob. Release Units/Menu Select Button. Turn Knob to change flow reading on the left hand display (GPM). The right hand display shows the gain value and is for factory reference only. When the flow rate is calibrated press Knob to return to normal operation.

Fc		Cal	
----	---	-----	---

### 5.5.7 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.

AF		35.0	
----	---	------	---

### 5.5.8 Compressor Band (Cb)

This menu item allows you to set a temperature below setpoint at which the compressor will turn off. This protects the fluid system from dropping too low in temperature during periods of low or no load. The compressor will turn on when temperature rises above setpoint.

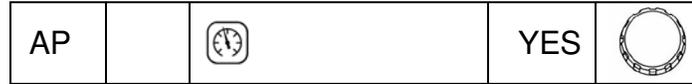
Cb		-06	
----	---	-----	---

### 5.5.9

#### Ambient Tracking Probe (AP)

This menu item allows you to enable/disable the Chiller's optional ambient tracking feature. When enabled (display set to YES), 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. To change the displayed status, rotate the Select/Set Knob until the desired status appears.

NOTE: The optional ambient tracking probe must be installed in order to enable/disable this item. If an ambient tracking probe is not installed, NAP will be displayed in the status window. Ambient tracking status cannot be changed when NAP is displayed. If the probe is installed and NAP is still displayed, turn power off at the front panel, wait 10 seconds, and reapply power.

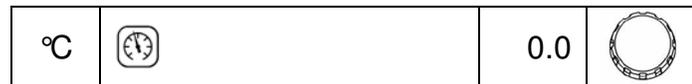


#### 5.5.10 Calibration Offset (°C)

This menu item allows you to adjust the Chiller's displayed temperature reading to match that of a traceable standard. It allows you to offset the displayed temperature value by as much as  $\pm 1.9^{\circ}\text{C}$ .

NOTE: Calibration offset values are always set and displayed in  $^{\circ}\text{C}$ . 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 AP 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 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.



#### 5.5.11 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.



## 5.6

### Serial Output (RS232 / RS485)

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	Format	Values	Return Message
Set Command 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]		![CR]
Read Temperature	RT[CR]		![CR]
Read Temperature Units	RU[CR]	C or F	![CR]
Read Status	RW[CR]	1 = Run 0 = Standby	x[CR]
Read Pressure in PSI	RP[CR]		![CR]
Read Pressure in kPa	RK[CR]		![CR]
Read Flow in GPM	RG[CR]		![CR]
Read Flow in LPM	RL[CR]		![CR]
Read Remote Control Voltage	RC[CR]		![CR]
Read Discharge point of Compressor Temperature in °C	RH[CR]		![CR]
Read Remote Probe Temperature	RR[CR]		![CR]
Read Ambient temperature on PCB	RA[CR]		![CR]

## 5.7

### 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
<b>EAF</b>	Rear panel high ambient temperature	Warning - The ambient temperature is higher than the set ambient limit.  Lower ambient temperature.
<b>EC</b>	External remote control active, Chiller in standby (for units with remote control option)	Normal — Unit idle until remotely activated.
<b>EFL</b>	Low fluid level warning / alarm (for units with optional float switch)	Warning/Alarm — Insufficient flow to heat exchanger. An alarm will sound 5 times, once every 8 seconds. If flow is still low after the fifth alarm, the unit will shut down.
<b>EHA</b>	Front panel high ambient temperature warning.	Warning - The ambient temperature is higher than the set ambient limit.  Lower ambient temperature or raise temperature limit.
<b>EHL</b>	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.
<b>ELL</b>	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.
<b>LLO</b>	Local Lockout	Normal — Indicates that Local Lockout feature (see Section 4.8) is enabled. Appears momentarily when Select/Set Knob is pressed to view/change set point value.
<b>CAn</b>	Cancel Local Lockout	Normal — Indicates the Local Lockout feature (see Section 4.8) has been disabled. Appears momentarily when Local Lockout status is changed from enabled (LLO) to disabled.

## **Ft** APPEARS ON THE LEFT HAND DISPLAY

<b>Message Code</b>	<b>Description</b>	<b>Action Required</b>
<b>01</b>	Factory Reserved	None.
<b>02</b>	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.
<b>03</b>	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.
<b>04</b>	Over-temperature protection alarm	Alarm — Process fluid temperature is above Chiller's factory set high temperature safety cutoff. Power to condenser, heater, and fan turned off; pump remains on. Lower process temperature.
<b>05</b>	Low liquid level alarm	Delayed Alarm — Activated when the liquid level in the reservoir falls below an acceptable level for 30 seconds or longer. Compressor, heater, fan, and pump turned off. Add fluid to reservoir.
<b>06</b>	High bath temperature alarm	Alarm — Fluid temperature has exceeded 82°C (180°F). Compressor, heater, fan, and pump turned off. Lower fluid temperature.
<b>07</b>	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.
<b>08</b>	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 temperature limit value.
<b>09</b>	Internal software fault	Fault — Power to compressor, heater, fan, and pump turned off. Default unit to °C or °F (see section 4.1)
<b>10</b>	Triac fault	Fault — Power to compressor, heater, fan, and pump turned off. Contact supplier.
<b>11</b>	Internal probe fault	Fault — Faulty temperature probe. Power to compressor, heater, fan, and pump turned off. Contact supplier.
<b>12</b>	External (ambient tracking) probe fault	Fault — Faulty ambient tracking 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.
<b>13</b>	Communications fault	Fault — Internal electronics failure. Power to compressor, heater, fan, and pump turned off. Contact supplier.
<b>14</b>	ADC fault, internal probe	Fault — ADC for internal probe faulty. Power to compressor, heater, fan, and pump turned off. Contact supplier.
<b>15</b>	ADC fault, external probe	Fault — ADC for external probe faulty. Power to compressor, heater, fan, and pump turned off. Contact supplier.
<b>16</b>	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 ambient temperature exceeds the set ambient limit by 5°C or more. Lower temperature in area in which Chiller is located or increase high ambient temperature limit value. Temperature limit is adjustable.
<b>17</b>	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 or increase high ambient temperature limit value. Temperature limit is not adjustable.

## 5.8

### 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.

The bypass pressure is set at the factory to 60 psi.

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 adjustment screw on the pressure valve until the desired pressure setting is displayed on the Pressure/Flow Rate display. Rotate clockwise to increase, counterclockwise to decrease.
5. Reset the flow alarm value to the previous setting.
6. Return the Pressure/Flow Rate display to the previous setting.

## 5.9

### 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 6 - Maintenance and Calibration**

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

### **6.1 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.

### **6.2 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.

### **6.3 Fluid Filter**

A removable, highly efficient fluid filter located at the inlet to the evaporator. To remove it for cleaning, simply remove the bowl and lift the filter out. Rinse off accumulated particulate and reinstall. Check for leaks after re-installing.

### **6.4 Fluid Level**

The fluid level 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 more than 2" from the top.

### **6.5 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 calibration offset function. See Section 5.5.10.

## Section 7 – 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.

### 7.1

#### **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.

### 7.2

#### **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.

### 7.3

#### **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.

### 7.4

#### **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.

### 7.5

#### **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.

### 7.6

#### **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.

### 7.7

#### **Ambient Tracking Probe Failure**

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

## 7.8

### 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
At	Ambient temperature at front panel
EC	External voltage control
Ut	Upper (head) temperature
Li	Line voltage
Ct	Chiller type
Fb	Fuse bits (remote control voltage, contact closures, etc.)
03 (variable numeric value)	Fluid flow rate or pressure. Temperature display shows current fluid temperature.

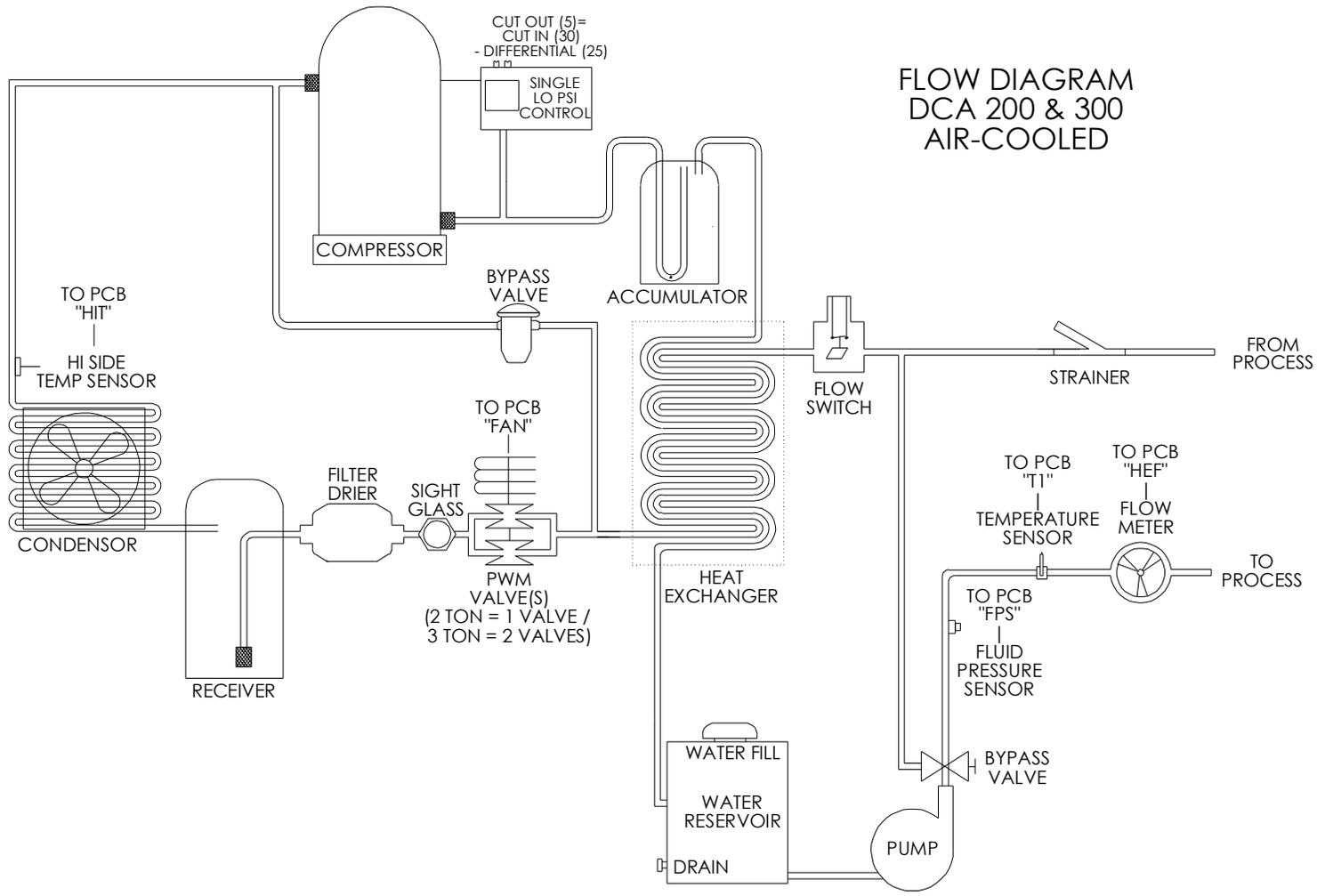
## Section 8 – Service and Technical Support

If you have followed the troubleshooting steps outlined in Section 7 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 side panel label)
- Date of purchase and purchase order number
- Supplier's order number or invoice number
- A summary of the problem

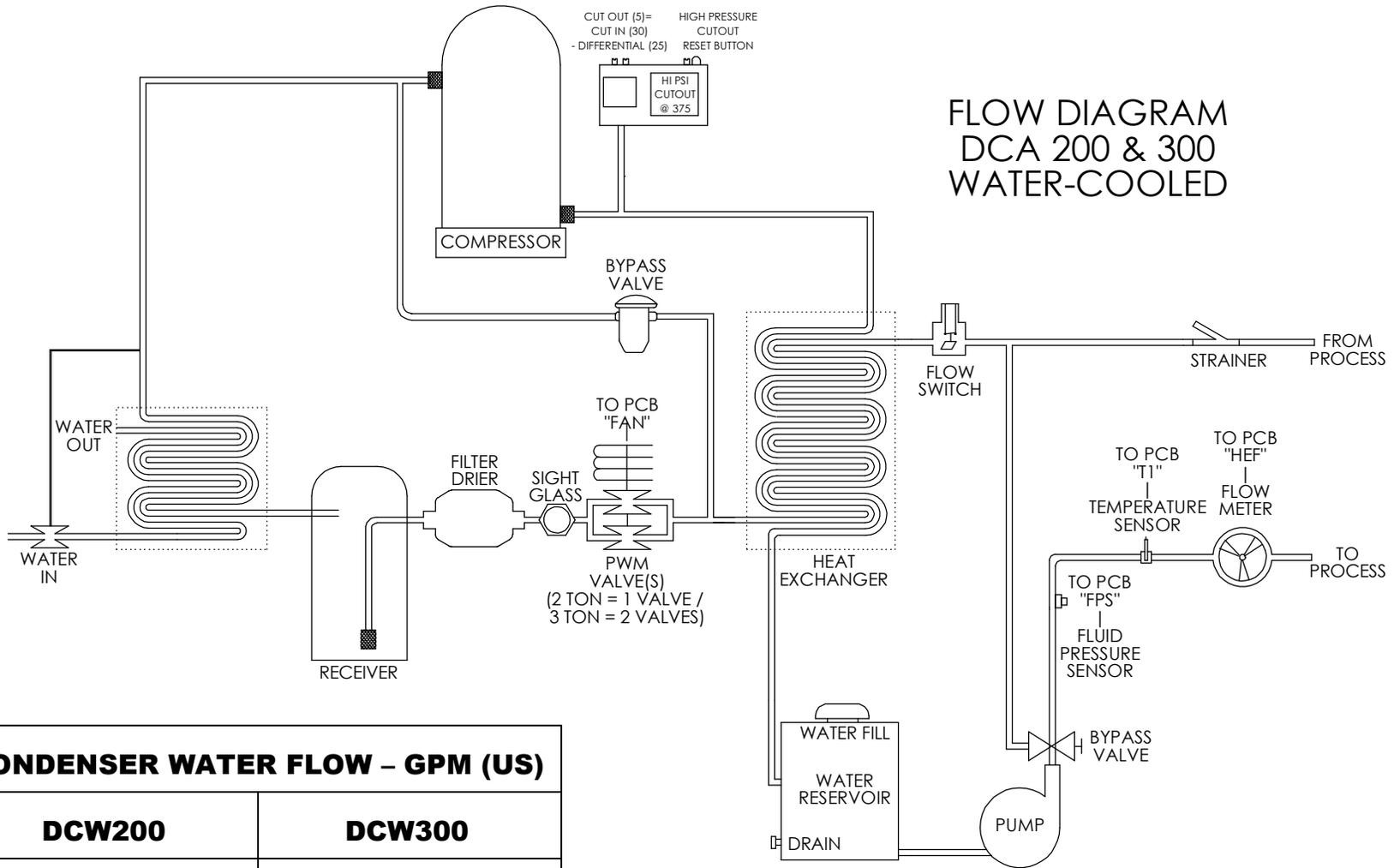
**A.1.1**

**Flow Diagram – Air-Cooled**



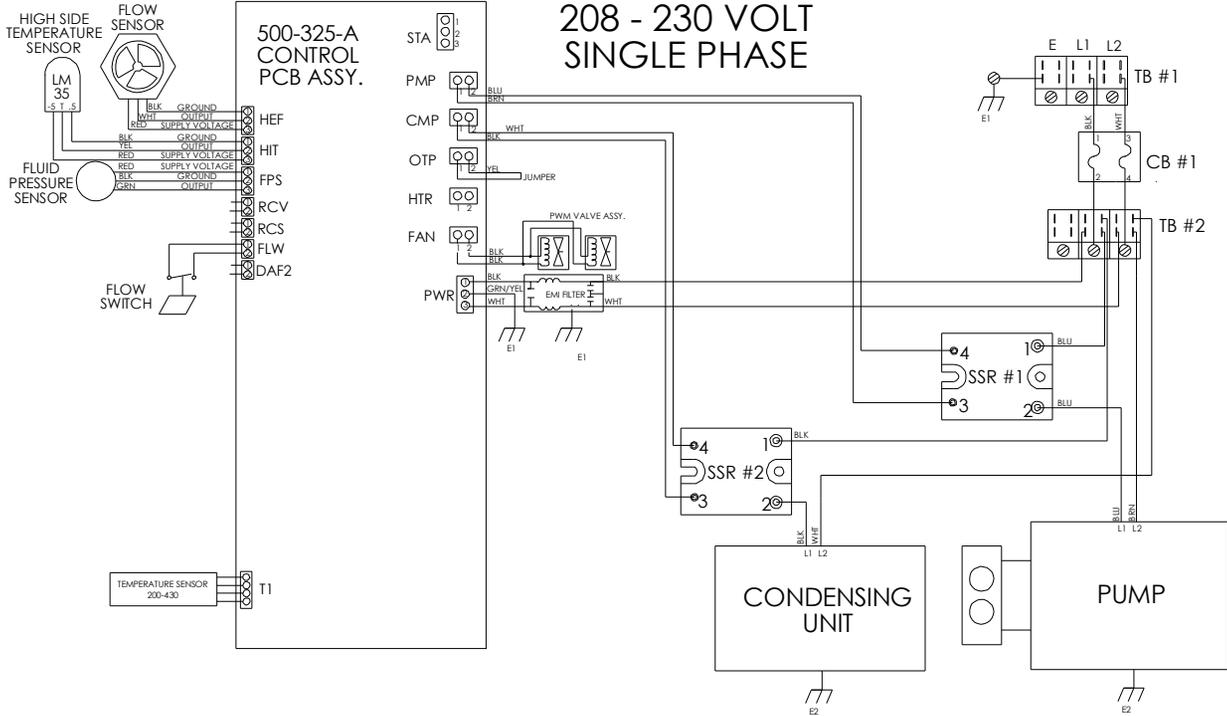
**FLOW DIAGRAM  
DCA 200 & 300  
AIR-COOLED**

**A.1.2 Flow Diagram – Water-Cooled**



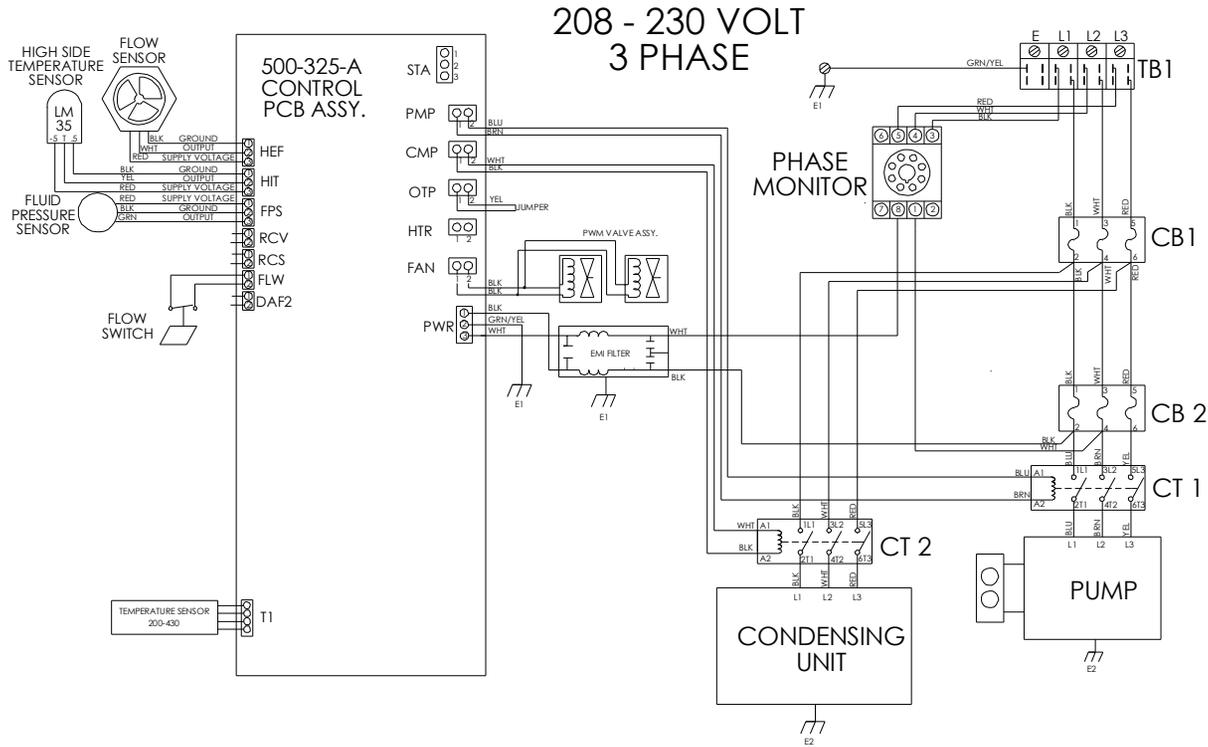
**FLOW DIAGRAM  
 DCA 200 & 300  
 WATER-COOLED**

**A.2.1 Wiring Diagram – 208-230V, 1 Phase**



**A.2.2**

**Wiring Diagram – 208-230V, 3 Phase**



**A.2.3**

**Wiring Diagram – 380-460V, 3 Phase**

