Operator's Manual

DuraChill Air- and Water-Cooled 1.5 HP Chillers

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Introduction

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.

Standard and Optional Features

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 refrigerant pressure cutouts
- Process protection provided by over-temp/under-temp alarms
- Heavy-duty, locking casters provide easy maneuverability
- Stainless steel reservoir

Optional Features

- Higher-output Centrifugal and Turbine pumps
- Heater (extends process temperature range to 41° to 194°F (5° to 90°C)
- Process shutoff valves
- RS232 interface
- RS485 interface
- Tank sight glass or level indicator
- Remote temperature control probe
- Audible and Visual Alarms
- Rail or foot mounting
- Tank low level indicator/alarm
- External water filter (side stream)
- DI compatible process piping
- Heaters
- Alternate heat transfer fluids

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 temperature control. Please ensure that all individuals involved in the installation, operation, or maintenance of this Chiller read this manual thoroughly prior to working with the unit.

	This symbol alerts you to wide range of potential dangers.
	This symbol advises you of danger from electricity or electric shock.
	This symbol indicates that a hot surface may be present.
	This symbol marks information that is particularly important.
	This symbol indicates alternating current.
	This symbol on the Power Switch / Circuit Breaker indicates that it places the unit into a fully powered state.
	This symbol on the Power Switch / Circuit Breaker indicates that it disconnects power to the unit.
	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.

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

Safety Recommendations

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.

	**WARNING:** Be sure to follow your company's procedures and practices regarding the safe lifting and relocation of heavy objects.
	**WARNING:** 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.

	**WARNING:** Exercise care when unloading, loading, rigging, or moving this equipment. Be sure to follow your organization's procedures and practices regarding the safe lifting and relocation of heavy objects.
	**WARNING:** All warning labels should be carefully observed. Never remove or obstruct a warning label.
	**WARNING:** 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.
	**CAUTION:** Always operate this equipment within the stated design specifications.
	**WARNING:** Be sure to remove power from the equipment, reclaim the refrigeration charge, and relieve any residual pressure before cutting into the refrigeration system.
	**WARNING:** Do not attempt to operate leaking or damaged equipment.
	**WARNING:** Service should only be performed by fully qualified personnel.
	**WARNING:** Follow all applicable electrical and safety codes when connecting power to this equipment.
	**WARNING:** Always remove power from the equipment prior to performing any service or maintenance.
	**WARNING:** Do not move the equipment without first disconnecting power.
	**WARNING:** Make sure the equipment's main power switch is in the OFF position before connecting or disconnecting power.
	**CAUTION:** Do not attempt to operate this equipment without an appropriate cooling fluid in the reservoir. Always empty the fluid reservoir before moving the unit.

Regulatory Compliance and Testing

CSA UL (60Hz units)

CAN/CSA C22.2 No. 61010-1-04 — Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part I: General Requirements.

CAN/CSA C22.2 No. 61010-010-04 — Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 2-010: Particular Requirements for Laboratory Equipment for the Heating of Materials.

UL Std No. 61010-1 — Electrical Equipment for Laboratory Use, Part I: General Requirements.

UL Std No. 61010A-2-010 — Electrical Equipment for Laboratory Use, Part 2: Particular Requirements for Laboratory Equipment for the Heating of Materials.

CE (50Hz units)

EC Low Voltage Directive 2006/95/EC

EC Electromagnetic Compatibility Directive 2004/108/EC

IEC 61010-1-2001

IEC 61326:2005 / EN 61326 : 2006

Highly Accelerated Life Test (HALT) and Vibration Tests per ASTM D4169-8 (All units)

Unpacking

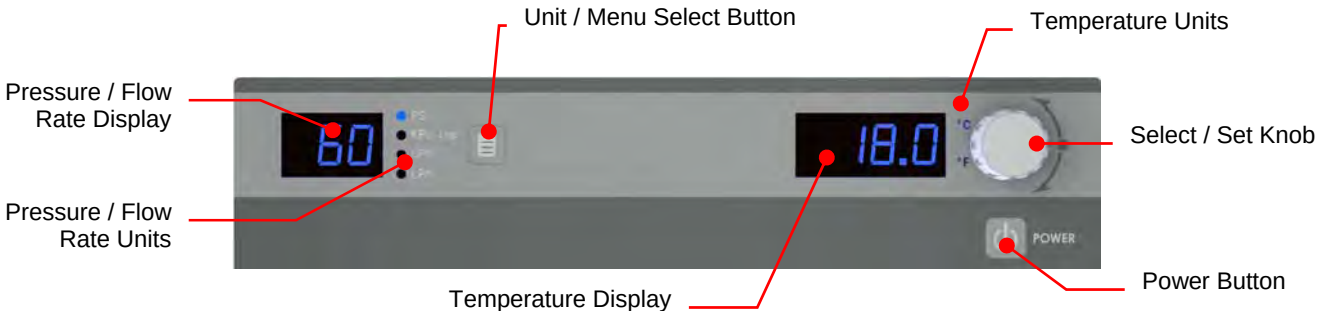
Your Chiller is shipped in a special container. Retain the container and all packing materials until the unit is completely assembled and working properly. Set up and run the unit immediately to confirm proper operation. If the unit is damaged or does not operate properly, contact the transportation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

Contents

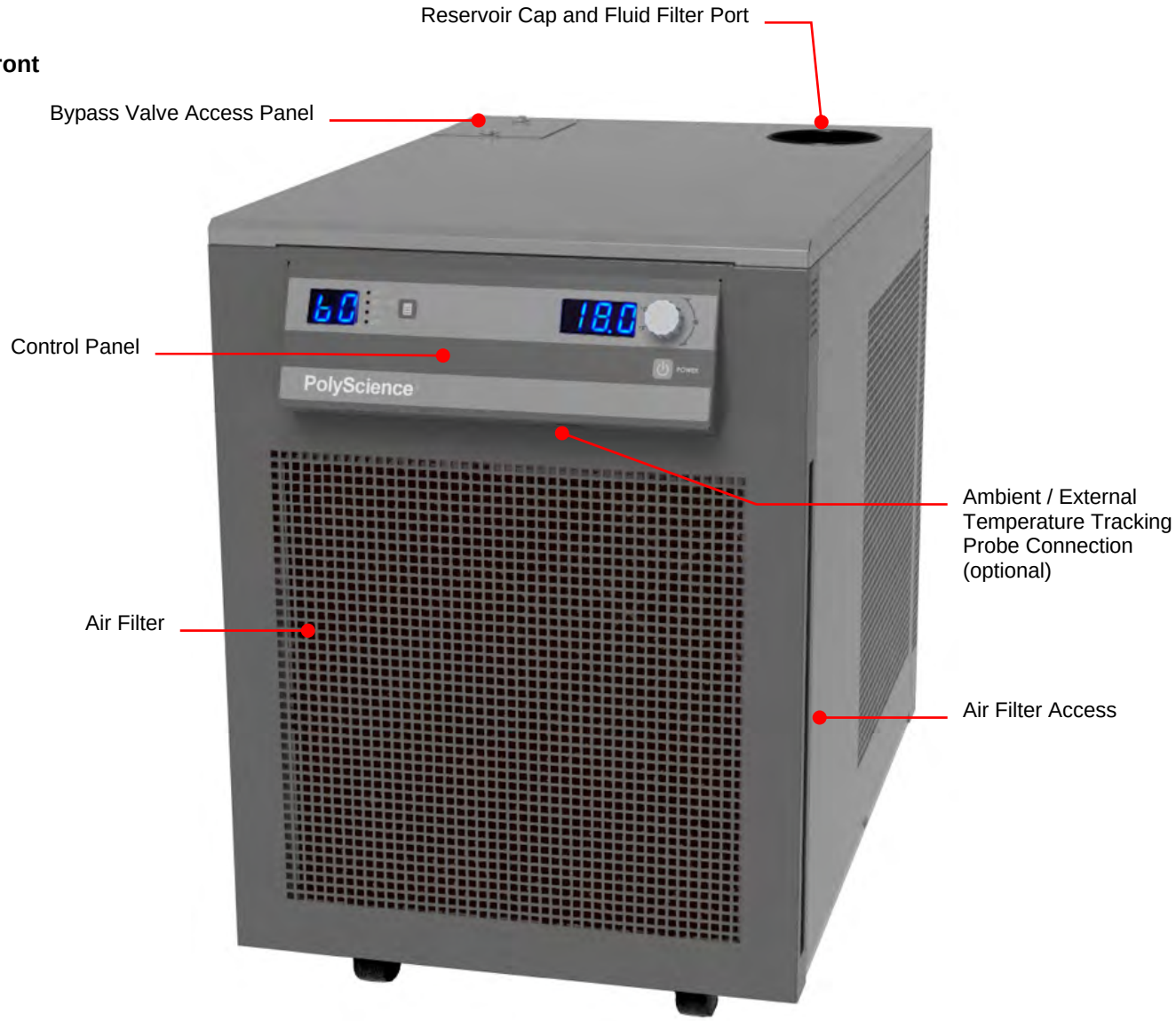
- Recirculating Chiller
- Operator's Manual
- Two sets of Inlet/Outlet Adapters, 0.5 inch male NPT
- Power Cord (single phase units only)

Controls and Components

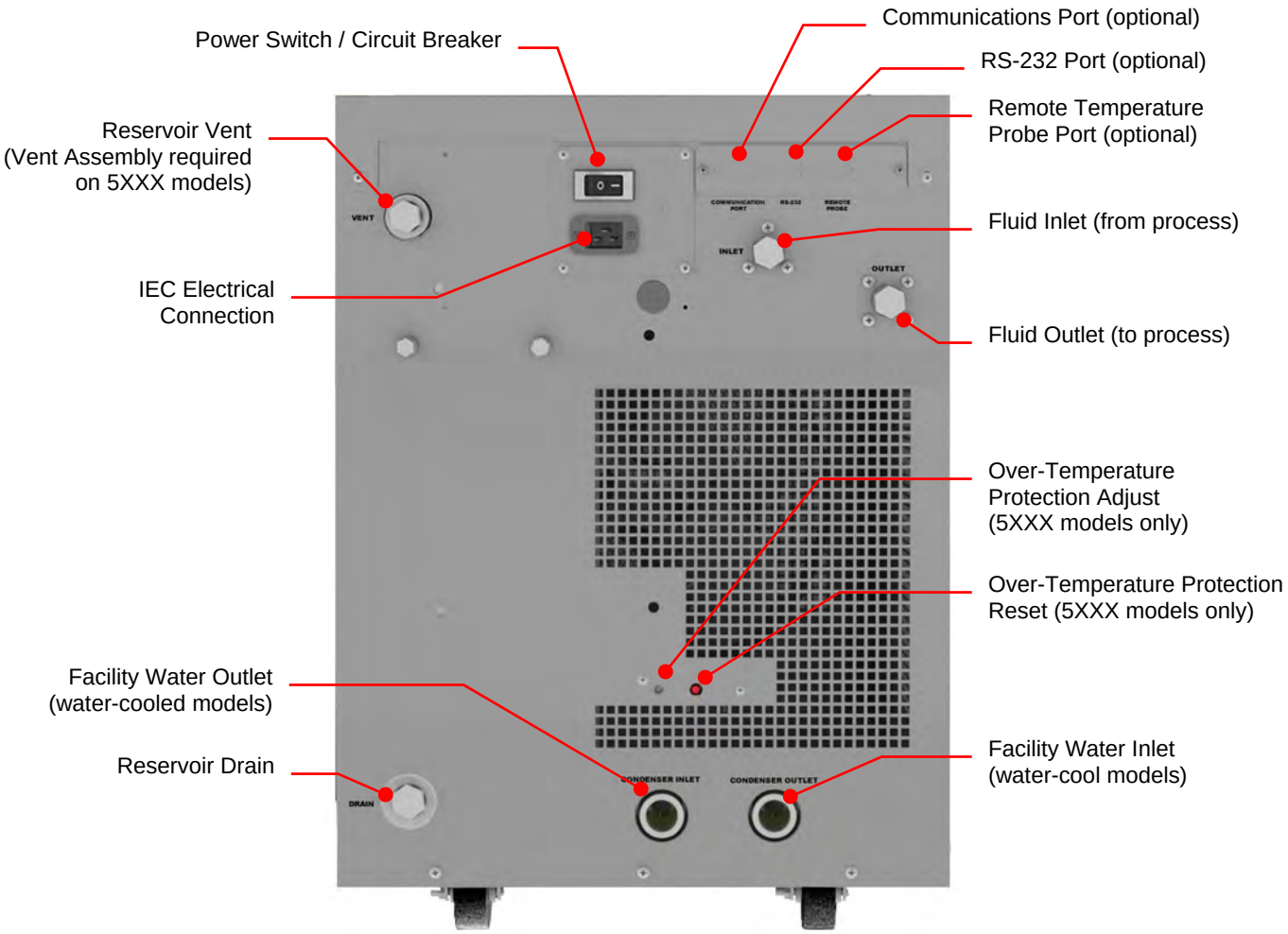
Control Panel



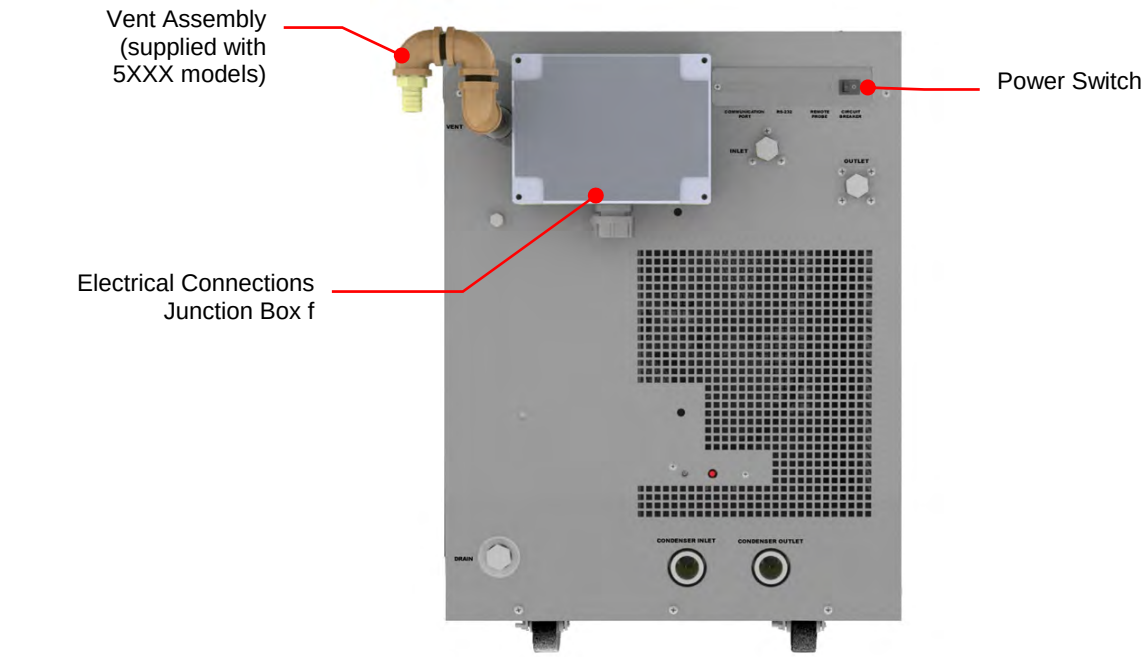
Front



Rear – 230V, 240V, and 208-230V Units

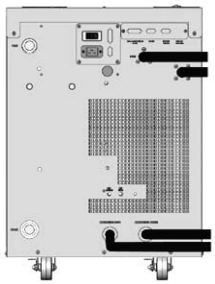
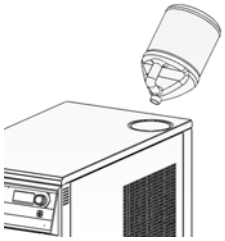
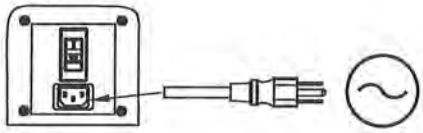
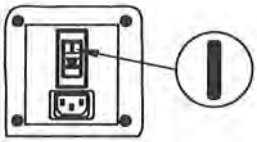
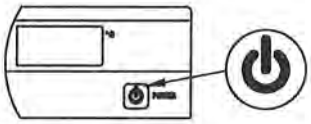
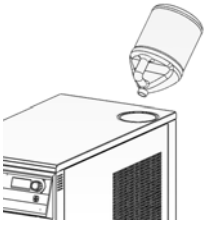


Rear – 380V and 460V Units



Quick Start

See Installation & Startup for additional information.

1	**All units:** Connect process lines **Water-cooled units:** A. Connect process lines B. Connect facility water lines C. Turn facility water ON	
2	Fill reservoir with coolant	
3	Connect electrical power to Mains	
4	Turn Power Switch / Circuit Breaker ON	
5	Turn Controller ON	
6	Add coolant to reservoir as process lines fill	
7	Enter temperature set point	

Installation and Startup

	**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 16° and 35°C (60° and 95°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.

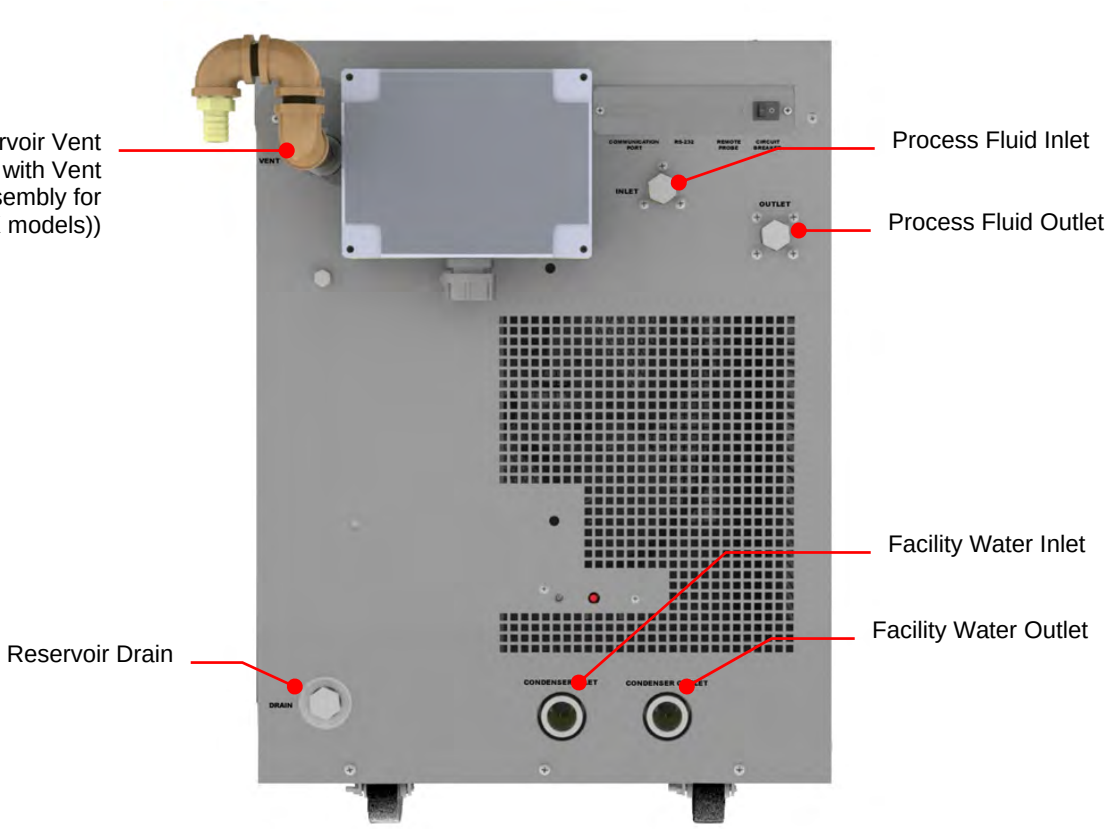
To help prevent voltage drops, position the Chiller as close as possible to the power distribution panel. Avoid voltage drops by using a properly grounded power source wired to meet electrical data plate requirements. The use of an extension cord is not recommended.

	**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.

External Piping



	**WARNING:** All facility water connections must be made by a licensed plumber.

General Considerations

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.

- Take care when selecting hoses and connections for the Chiller. All external piping, tubing, or hoses should be run full size to limit the potential for external pressure drops. The use of quick-connect fittings is not recommended, as they can cause substantial pressure drops.
- Materials of construction should be compatible with the fluid being used as well as the temperature and pressure at which the unit will operate.
- Where applicable, always use a back-up wrench when making piping connections to the Chiller.
- Pressure Ratings – Hoses should be able to withstand the highest pressure that they will encounter (100 psi / 6.9 bar).
- Flexible Tubing – Avoid tubing that will expand and increase fluid volume when operating at the desired pressure.
- Hose Diameter – The fittings on the Chiller's process fluid lines are female 0.5 in NPT. The facility water fluid inlets and outlets on water-cooled models are female 0.75 inch NPT.
- Facility Water (water-cooled models only) – Should be clean and well maintained. Ideally, the facility water should be tested monthly to ensure a pH level between 7.2 and 7.8. Add algaecide if algae growth is present.

Process Fluid Connections

The Chiller has two internally threaded (0.5 inch ID NPT) fittings on the rear of the instrument housing for the process water connections. Two sets of adapters (0.5 inch ID and 0.625 inch ID) are supplied with the unit for connecting these fittings to the process piping.

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 (Part 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.

Facility Water Connections

	**WARNING:** The incoming cooling water pressure should be 20 psi / 1.4 bar minimum and 150 psi / 10.3 bar maximum.

Water-cooled Chillers have two internally threaded (0.75 inch ID NPT) on the rear of the instrument housing for the facility water connections. The cooling water supply should be connected to the facility water inlet on the Chiller. The facility water outlet on the Chiller should be connected to the appropriate return or drain, as required.

The cooling water supply may be from city tap water or a cooling tower. The incoming water pressure should be between 20 and 150 psi / 1.4 and 10.3 bar.

Reservoir Drain

A 0.5 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 coolant in the reservoir, process, and process lines.

Reservoir Vent

A reservoir vent assembly is provided with Chillers equipped with the heater option. This vent relieves pressure within the reservoir as coolant heats and expands. A 0.5 inch NPT connection is provided on the rear of the Chiller for connecting the vent assembly.

Process Coolant

Suitable Fluids

	**WARNING**: 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 (brass, bronze, stainless steel, EPDM rubber, nylon, PVC).

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

	**WARNING:** Operation below 15°C (59°F) requires antifreeze in the circulation fluid. DO NOT use automotive antifreeze as the additives may be harmful to the Chiller's wetted parts.
	**CAUTION:** 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 ****** At temperatures above 40°C, additives or mineral deposits can adhere to the heater. If deposits are allowed to build up, the heater may overheat and fail. Higher temperatures and higher concentrations of additives can hasten deposit build up.

Electrical Power

Use the voltage and amperage requirements specified on the data plate on the back of the unit.

Connect the power cord (if) supplied with the Chiller to an appropriate electrical outlet. Avoid voltage drops by using properly grounded power outlets. If possible, locate the Chiller close to the power distribution panel or outlet.

Phase Requirements (if applicable)

For 3-phase units, be sure to connect in proper sequence, ie.: L1, L2, and L3. These Chillers are designed with a junction box on the rear of the unit to which you can connect the electrical power supply conduit. Be sure to provide suitable conduit strain relief and grounding.

3-phase units are equipped with a phase monitor that prevents startup if phase sequence is incorrect. It will also turn the Chiller off in the event of a loss of one phase and/or prevent Chiller operation if there is a voltage mismatch between any two phases greater than 8%.

You can minimize low line voltage problems by eliminating the use of extension cords or long supply conduits.

	**WARNING:** Make sure electrical connections comply with all applicable electrical codes. Ground the Chiller in accordance with NEC Article 250. Operation voltage must be within 10% of the data plate rating.

	**WARNING:** DO NOT apply power to the Chiller until the unit is ready for Startup.

Optional Signal Inputs/Outputs

Ambient / External 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 either the underside of the front control panel or on the rear panel for connecting the ambient/external tracking probe.

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

RS-232 / 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 feet (1200 meters). A 9-pin D-connector is provided on the rear of the instrument enclosure for this connection.

Remote On / Off Port

This option allows you to connect a remote on/off switch or other remote control device to the Chiller. A 15-pin D-connector is provided on the rear of the instrument enclosure for this connection. See *Appendix, Options* for wiring information.

4-20mA Set Point Control

This option allows you to change set point per customer supplied current value. A 15-pin D-connector is provided on the rear of the instrument enclosure for this connection. See *Appendix, Options* for wiring information.

Startup

Facility Water Flow (water-cooled units only)

1. Open the valves to the facility water supply and return.
2. Check for leaks.

Filling the Reservoir

1. Remove the reservoir cap located on the top of the Chiller and, using a funnel, add fluid until it is approximately 2 inches (5.1 cm) below top of reservoir.
2. Once the fluid level is about 2 inches (5.1 cm) below the top of the reservoir, remove the funnel but do not replace the cap at this time.

Starting Process Fluid Flow

1. Place the circuit breaker located on the rear panel of the Chiller to the ON position. The display on the front panel will respond by showing standby (....). If there is no response, check that the unit is connected to working electrical power and that circuit breaker on the rear of the Chiller is in the ON position.
2. 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.
   - 15 to 20 seconds after power up, the compressor will begin operating.
3. Check for leaks.
4. With the pump running, the reservoir's fluid level will drop as the process and/or process cooling lines fill with fluid. Slowly add fluid to the reservoir until the liquid level remains stable.
5. Replace the reservoir cap.

Normal Operation

	**NOTE:** The Chiller incorporates a special "lockout" feature that can be enabled to prevent unauthorized or accidental set point and other operational changes. This feature is described in detail under "*Enabling and Disabling the Local Lockout*." It should not be enabled until all operational parameters have been set.

Selecting the Temperature Unit (°C or °F)

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

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

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

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

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 that the temperature can be changed.

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

	**NOTE:** Temperature set point cannot be changed when the local lockout is enabled or when the optional ambient temperature tracking feature is installed and enabled. See "*Enabling and Disabling the Local Lockout, Displaying and Adjusting the Ambient Tracking Offset"* and *" Setting Operational Parameters, Remote Probe*".

Selecting the Internal / External Temperature Display

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

When the ambient tracking probe is selected (AtC, see "*Setting Operational Parameters, Remote Probe*"), the Chiller normally displays the internal outlet fluid temperature. To display the external ambient temperature, press and release the Units/Menu Select Button until P2 appears on the Pressure/Flow Rate Display.

When the remote temperature control probe is selected (rPC, see "*Setting Operational Parameters, Remote Probe*"), the Chiller normally displays the external process temperature. To display the internal outlet fluid temperature, press and release the Units/Menu Select Button until P1 appears on the Pressure/Flow Rate Display.

	**NOTE:** P1 or P2 will remain on the Pressure/Flow Rate Display until the Units/Menu Select Button is pressed and released. The displayed temperature will revert to the default condition (internal temperature for the ambient probe, external temperature for the remote temperature control probe).

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 fluid temperature based on room or machine temperature plus or minus a user-adjustable offset temperature.

When the optional ambient tracking probe is installed and enabled (AtC, see "*Setting Operational Parameters, Remote Probe*"), 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°C to +5.0°C (-9.0° to +9.0°F) may be entered. The setting is accepted after the Select/Set Knob is pressed a second time or automatically after a few seconds of inactivity.

Displaying and Adjusting the Remote Control Temperature

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

When the optional remote control external probe is installed and enabled (rP, see *Setting Operational Parameters, Remote Probe*), the external temperature set point is displayed when the Select/Set Knob on the front panel is pressed.

To change the external temperature set point, press and then rotate the Select/Set Knob until the desired set point temperature is displayed. The setting is accepted after the Select/Set Knob is pressed a second time or automatically after a few seconds of inactivity.

Selecting the Pressure / Flow Rate Display and Units

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

	**NOTE:** Metric pressure reading output is displayed in kPA and must be multiplied by 100 for kPa.

	**NOTE:** If there is no flow sensor fitted, the display will show "- -" when GPM or LPM is selected.

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

Setting Operational Parameters / Limits

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

Operational parameter limit alarms will shut down the compressor, fan, pump and heaters. Some temperature values are only displayed and settable in ºC

	**NOTE:** Some parameters listed may not be included in your version of software.

	**NOTE:** The Ranges and Default Settings shown are for standard models. Ranges and Default Settings for your unit may differ depending on the options selected.

Menu Item	Description	Choices / Ranges	Default Setting
HL	**High Temperature Limit —** Limits the maximum allowable set point temperature. Audio and visual alarm indicators are activated when the measured fluid temperature reaches the HL temperature setting. **NOTE:** EHL will appear on the display if the High Limit value is set below the current set point.	Units without heater option (6xxx) = +20 to 40 ºC (68 to 104ºF) Units with heater option (5xxxx) = +20 to 95 ºC (68 to 203ºF)	6xxx = 40 ºC 5xxx = 95 ºC
LL	**Low Temperature Limi**t — Limits the minimum allowable set point temperature. Audio and visual alarm indicators are activated when the measured fluid temperature reaches the LL temperature setting. **NOTE:** ELL will appear on the display if the Low Limit value is set above the current set point.	0.0 to +15 ºC (32 to 59 ºF)	5.0ºC
HA	**High Ambient Temperature Limit —** Maximum ambient temperature limit. Displayed and settable only in ºC. Should the ambient temperature rise above the HA value, the audio and visual alarms will activate and the compressor, heater, fan, and pump will turn off. **NOTE:** Chiller's rated cooling capacity is dependent on an ambient temperature of 20°C (68ºF). Performance will decrease as the ambient temperature rises. Continuous operation at ambient temperatures above 40ºC (104ºF) is not recommended.	+30 to 50ºC	40 ºC

Menu Item	Description	Choices / Ranges	Default Setting
FP	**Maximum Fluid Pressure —** Maximum allowable fluid pressure; settable in either PSI or kPa. 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. **NOTE:** The Chiller also incorporates a built in pressure regulated bypass valve. It will maintain a maximum outlet pressure by diverting flow of the process fluid to the reservoir. The bypass valve may be adjusted by the customer. **CAUTION:** Maximum operating pressure for the Chiller is 100 PSI / 6.9 bar. Different pumps have different maximum operating pressures.	20 to 100 PSI 13 to 680 kPa (display value x 100)	80 PSI 5.5 x 100 = 550 kPa
FL	**Minimum Flow Rate** — Minimum allowable flow rate; settable in either GPM or LPM. Should the fluid flow rate drop below the minimum value, the audio and visual alarms will activate, and the compressor, heater, fan, and pump will turn off.	0 and 1.5 to 3 GPM 0 and 6 to 11 LPM	1.5 GPM 6.0 LPM
AF	**Auto-Refrigeration Set Point —** The upper temperature at which the refrigeration system will activate; displayed and settable in °C only. There will be no refrigeration or cooling at set points above the AF setting.	+20° to 40°C	35°C
Sd	**Maximum External / Internal Temperature Differential** (optional) **—** Establishes the cooling/heating rate when the remote temperature control probe is installed and enabled.	4° to 20°C	5°C
rP	**Ambient Tracking / Remote Probe** (optional) **AtC — Ambient tracking probe enabled.** Chiller controls fluid temperature based on room or machine temperature (wherever the ambient tracking probe is located) plus or minus a user-set offset (±5.0°C / ±9.0°F). **rPC — Remote probe enabled.** Chiller controls fluid temperature based on the process fluid temperature at an external location. **nO — Ambient tracking / remote probe disabled.** **nRP — Ambient tracking probe not installed.**	Dependent on option and software installed.	nAP
C1 / C2	**Calibration Offset** — Allows adjustment of the displayed temperature to match that of an independent traceable standard; displayed and settable in °C only. **C1 — Internal calibration offset** **C2 — External calibration offset**	±2.9°C	0.0°C
Fc	**Flow Rate Calibration —** Allows adjustment of the displayed flow rate to match that of a known standard.	Note value here for reference/replacement of PCB or flow sensor	Varies

Menu Item	Description	Choices / Ranges	Default Setting
CC	**Current Control** (optional) — Allows setting of the set point temperature via a 4-20 mA analog signal. **yES — Enables current control.** **NO — Disables current control.**	Yes or No	No
PC	**Communications Baud Rate** — Selects the baud rate for serial (RS232/RS485) communication.	24 (2400), 48 (4800), 96 (9600) or 192 (19200)	9600

The current Fuse Bits (Fb) setting appears after the PC setting and can be viewed, but not changed. To change Fuse Bits (Fb) operational parameters, electrical power must be turned OFF and a special key stroke combination entered. See *Fuse Bits (Fb)* for detailed instructions.

	Input	Logic State	h00	h01	h02	h04	h05	h06
Fb Fuse Bits	Remote ON / OFF dry contact	Closed	Off	On	N/A	Off	On	N/A
		Open	On	Off		On	Off	
	24 VDC Remote Control Voltage	24 VDC	Off	Off	On	Off	N/A	On
		0 VDC	On	On	Off	On		Off
	Water Level Float Switch	Open	OK	OK	OK	Low	Low	Low
		Closed	Low	Low	Low	OK	OK	OK

You can adjust the following settings for your particular application or simply accept the default values.

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 selecting a temperature set point above a pre-established value. Secondly, it serves as a high temperature alarm, automatically activating both audio and visual alarm indicators if the measured fluid temperature reaches the HL setting. This also causes the compressor, heater, fan, and pump to turn off.

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

HL		40	

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 selecting a temperature set point below a pre-established value. Secondly, it serves as a low temperature alarm, automatically activating both audio and visual alarm indicators if the measured fluid temperature drops to the LL setting. This also causes the compressor, heater, fan, and pump to turn off.

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

LL		5	

High Ambient Temperature Limit (HA)

	**NOTE:** This value is always set in °C.

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 value is displayed on the Temperature Readout.

HA		40	

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 value is displayed on the Temperature Readout.

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

FP	PSI		80	

FP	kPa x 100		5.5	

	**NOTE:** Chillers with positive displacement and turbine pumps also incorporate 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 "*Adjusting the High Pressure Bypass Setting*" for information on changing the maximum outlet pressure value.

Minimum Flow Rate (FL)

	NOTE: If flow rates are below 1.5 GPM (6 LPM), this feature is not recommended as nuisance alarms may result.

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 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.

With FL set to “0”, the flow alarm is disabled, and the Chiller will continue to operate with the output flow blocked.

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

FL	• GPM		1.5	

FL	• LPM		06	

Auto-Refrigeration Temperature (AF)

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

This menu item allows you to select the temperature at which refrigeration is activated. When the set point exceeds the auto-refrigeration temperature by more than 1.0°C, the cooling and the fan are turned off.

To change the auto-refrigeration temperature, rotate the Select/Set Knob until the desired value is displayed.

AF			35	

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

	NOTE: This menu item (Sd) is only applicable when the remote temperature control probe is installed and enabled.

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

Sd			5.0	

Remote Probe (rP)

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

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

If you wish to operate the Chiller using the ambient tracking probe, rotate the Select/Set Knob until AtC is displayed. When this setting is selected, the effective set point for the cooling fluid temperature will be the temperature sensed by the ambient tracking probe (this may be room or machine temperature) plus or minus an offset specified by the user (see "*Displaying and Adjusting the Ambient Tracking Offset*").

rP		AtC	

If you wish to operate the Chiller using the remote temperature probe, rotate the Select/Set Knob until rPC is displayed. When this setting is selected, the fluid temperature is controlled according to the temperature sensed by the external probe. The rate of cooling is controlled through the maximum differential temperature setting (Sd) (see "*Maximum External / Internal Temperature Differential*").

rP		rPC	

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

rP		NO	

Internal Calibration Offset (^{C}1)

	IMPORTANT: To prevent the operator from accidentally changing the calibration offset, a special keystroke sequence is required to access this function.

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

	NOTE: Calibration offset values are always set and displayed in °C.

1. Press and hold the Units/Menu Button until HL appears on the display.
2. Press and release the Units/Menu Button until rP appears on the display.
3. Press and hold the Units/Menu Button.
4. While holding the Units/Menu Button, press and release the Select/Set Knob.
5. When CL1 appears on the Temperature Readout, release the Units/Menu Button. The current calibration offset value will appear on the Temperature Readout and alternate with the fluid temperature reading (enabling you to simultaneously adjust the offset and see the effect on the temperature).
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.

C1		0.0	

External Calibration Offset (C2)

	**IMPORTANT:** To prevent the operator from accidentally changing the calibration offset, a special keystroke sequence is required to access this function.

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

	**NOTE:** Calibration offset values are always set and displayed in °C.

1. Press and hold the Units/Menu Button until HL appears on the display.
2. Press and release the Units/Menu Button until C1 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 CL2 appears on the Temperature Readout, release the Units/Menu Button. The current calibration offset value will appear on the Temperature Readout and alternate with the fluid temperature reading (enabling you to simultaneously adjust the offset and see the effect on the temperature).
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.

C2		0.0	

Flow Rate Calibration (Fc)

	**NOTE:** Your Chiller's flow rate is calibrated at the factory at the nominal flow value for the installed pump. Further adjustment is not necessary.

This menu item allows you to adjust the flow rate display to match that of a known standard.

1. Press and hold the Units/Menu Button until HL appears on the display.
2. Press and release the Units/Menu Button until the second FL appears (LPM LED will be lit – Fc will be the next parameter).
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.
6. Rotate the Select/Set Knob until the desired offset is displayed. Press the Select/Set Knob or simply allow the display to time out to accept the displayed value.

Fc		0.0	

Current Control (CC) (Optional)

This optional menu item allows you to adjust the temperature set point using a 4-20 mA analog signal. To change the displayed setting, rotate the Select/Set Knob until the desired selection is displayed (yES = enabled; NO = disabled).

CC		NO	

Baud Rate (PC)

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

To change the displayed setting, rotate the Select/Set Knob until the desired baud rate is displayed.

Press the Select/Set Knob or allow the display to time out to accept the displayed value.

PC		96	

Fuse Bits (Fb)

This menu item allows you to select the logic settings for remote control and the water level float switch. To set fuse bits, proceed as follows:

1. Turn electrical power OFF at the rear of the unit.
2. Press and hold the Select/Set Knob and Power Button simultaneously.
3. While holding the Select/Set Knob and Power Button, turn electrical power ON at the rear of the unit.
4. Fb will appear on the Pressure/Flow Rate Display; h followed by two digits will appear on the Temperature Display.
5. Rotate the Select/Set Knob to the desired setting (h00, h01, h02, h04, h05, or h06).
6. Press and release the Select/Set Knob or simply allow the display to time out to accept the displayed setting.

Fb		h00	

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 the condition is rectified, push the front panel Power Button or turn the circuit breaker off then on to clear the fault or error.

Message Code	Description	Action Required
EFL	**Low fluid level warning** — units with fluid level float switch. **Fluid flow too low warning** — units with flow switch (PO - no pump – no reservoir option).	**Warning / Alarm** — Fluid level or flow switch is open. Alarm will sound once every 8 seconds for 5 occurrences. If problem has not been corrected after 40 seconds, Fault 05 occurs. Add fluid to the reservoir.
EHA	**High ambient temperature warning**	**Warning / Alarm** - The ambient temperature (as measured on the Control PCB) is higher than the set ambient limit. The display alternates between EHA and the fluid temperature; the unit continues normal operation. If the ambient temperature stays over 5°C above the high ambient limit for more than 5 seconds, Fault 16 occurs. Lower ambient temperature or raise high ambient temperature limit.
EHL	**High limit temperature alarm**	**Warning / Alarm** — The temperature set point is higher than the high temperature limit value. The display alternates between EHL and the fluid temperature; the unit continues normal operation. If the fluid temperature stays above the HL value for more than 25 seconds, Fault 03 occurs. Lower temperature set point or increase high limit value.
ELL	**Low temperature limit alarm**	**Warning / Alarm** — The temperature set point is lower than the low temperature limit value. The display alternates between ELL and the fluid temperature; the unit continues normal operation. If the fluid temperature stays below the LL value for 25 seconds, Fault 02 occurs. Increase temperature set point or decrease low limit value.
LO-H2O	**No fluid flow and no fluid pressure**	**Warning / Alarm** — LO is displayed alternately with H2O and fluid temperature if the fluid pressure exceeds the high pressure limit or if the fluid flow is less than the low flow limit. If either error lasts for more than 10 seconds, Fault 08 or Fault 07 (respectively) occurs.
LLO	**Local Lockout**	**Normal** — Indicates that Local Lockout feature (see *Enabling / Disabling the Local Lockout*) is enabled. Appears momentarily when Select/Set Knob is pressed to view/change set point value.
CAn	**Cancel Local Lockout**	**Normal** — Indicates the Local Lockout feature (see *Enabling / Disabling the Local Lockout*) has been disabled. Appears momentarily when Local Lockout status is changed from enabled (LLO) to disabled.
EC	**External remote control active**	**Normal** — Chiller is in Standby mode until remotely activated (optional).

If a fault should occur, the left display will show Ft, and the right display will show one of the fault codes shown below.

Fault Code	Description	Action Required
02	**Low limit temperature alarm**	**Alarm** — Process fluid temperature is below the low temperature limit value for more than 25 seconds. Compressor, heater, and fan are turned off; pump remains on. To clear the fault, turn the unit off then on using the front panel Power Button, and decrease the LL value.
03	**High limit temperature alarm**	**Alarm** — Process fluid temperature is above the high temperature limit value for more than 25 seconds. Compressor, heater, and fan are turned off; pump remains on. To clear the fault, turn the unit off then on using the front panel Power Button, and increase the HL value.
04	**Over-temperature alarm**	**Alarm** — Process fluid temperature is above Chiller's factory set high temperature safety cutoff. Heater, compressor, and fan turned off; pump remains on. Lower process temperature.
05	**Low liquid level alarm** (select models only)	**Delayed Alarm** — Activated when the liquid level in the reservoir falls below an acceptable level for over 40 seconds. Compressor, heater, fan, and pump are turned off. Add fluid to reservoir.
07	**Low flow alarm**	**Alarm** — Flow rate has dropped below minimum flow rate setting for more than 10 seconds. Compressor, heater, fan, and pump are turned off. Note: Disabled during first 2 minutes of operation. Correct cause of low flow rate or decrease minimum flow rate setting.
08	**High pressure alarm**	**Alarm** — Fluid outlet pressure has exceeded high-pressure limit value for over 10 seconds. Compressor, heater, fan, and pump are turned off. Decrease outlet pressure by removing blockage or increase high-pressure limit value.
09	**Internal software fault**	**Fault** — One or more settings are out of range. Compressor, heater, fan, and pump are turned off. Default unit to °C or °F; if fault persists, contact service representative.
10	**Electronic power component fault (Triac)**	**Fault** — Heater triac has failed for more than 10 seconds. Compressor, heater, fan, and pump are turned off. Contact service representative.
11	**Internal probe fault**	**Fault** — Main temperature control probe has failed for more than 4 seconds. Compressor, heater, fan, and pump are turned off. Contact service representative.
12	**External temperature probe fault** (select models only)	**Fault** — External temperature control probe has failed for more than 4 seconds. Compressor, heater, fan, and pump are turned off. Replace ambient tracking probe or operate instrument using internal temperature probe. Contact service representative if fault persists.
18	**Input – Out of Range**	**4-20 mA Option** — Input for temperature set point too high or too low. Correct input or switch to standard control.

Adjusting the High Pressure Bypass Setting

Chillers with a positive displacement or turbine pump incorporate an automatic safety to maintain outlet pressure below a valve-regulated pressure. This valve is adjustable and is located inside the Chiller housing.

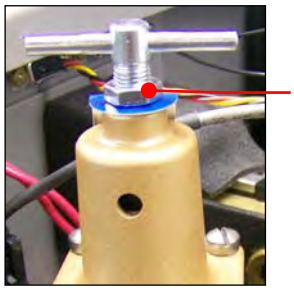
	**WARNING:** There are exposed fan blades inside the Chiller housing. Exercise extreme care when accessing or adjusting any interior components.

	**WARNING:** Hazardous voltages are present.

To access the high-pressure bypass valve, remove the access panel on the top of the unit (rear left).

The high-pressure bypass is adjusted as follows:

1. Set the low flow rate alarm value to zero (see *Setting Operational Parameters, Minimum Flow Rate*). This will prevent the unit from activating the flow alarm while you are adjusting the maximum pressure setting.
2. Completely block the Chiller's outlet flow. This should cause the outlet pressure to rise.
3. Set the Pressure/Flow Rate Display to read either PSI or kPa.
4. Rotate the handle on the pressure valve until the desired maximum pressure setting is shown on the Pressure/Flow Rate Display.
5. Secure the Locknut.
6. Reset the flow alarm value to the previous setting.
7. Return the Pressure/Flow Rate Display to the previous setting.
8. Replace the access panel.



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 following functions can be displayed, but not changed:

- Temperature unit
- Temperature set point
- Ambient tracking offset
- Pressure / flow rate units

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).

	**IMPORTANT:** The Local Lockout feature does not prevent set point changes entered via the RS232 interface or 4-20 mA inputs.

Over-Temperature Protection

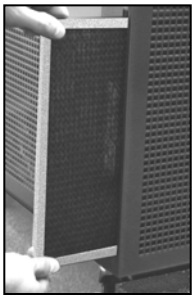
Chillers with the heater option are equipped with an adjustable OTP which disconnects power to the heater should the liquid level in the reservoir drop too low. The OTP is factory set to disconnect power at a temperature of 60°C for 6XXX models and 95°C for 5XXX models. Consult factory for instructions on setting the OTP to trip at a lower temperature.

Routine Maintenance and Troubleshooting

Routine Maintenance

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

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.

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. Rinse and dry thoroughly before reinstalling.

Fluid Filter

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

Fluid Level

The fluid level 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 2 inches (5.1 cm) below the top of the reservoir.

	**NOTE:** On units equipped with the heater option, check fluid level when operating at maximum temperature and allow for fluid expansion. Use of a venting assembly (see *Controls and Components*) is recommended.

Cleaning

Only mild detergents and water or an approved cleaner should be used on the painted and stainless steel surfaces of the Chiller. Do not allow cleaning liquids or sprays to enter the Controller vents.

Temperature Calibration

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

Troubleshooting

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.

To restore the factory default settings:

1. Place the Power Switch/Circuit Breaker on the rear of the unit in the OFF position.
2. Press and hold the Power Button on the front panel while returning the Power Switch/Circuit Breaker to the ON position.

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.

Problem	Possible Causes	Corrective Action
Unit does not run (digital displays blank)	No power to unit	Check that the electrical cord or wiring is secure and connected to an operating electrical source. Check that Power Switch / Circuit Breaker on rear of unit is ON.
Unit does not run (three decimal points appear on Temperature Display, two decimal points on Pressure/Flow Rate Display)	Unit in Standby mode	Press Power 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. 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 and correct as required.
Unit does not cool or cooling is insufficient	Dust build up on air filter or condenser Blocked air ventilation screens Excessive heat load Ambient air temperature too high Low or high line voltage Faulty temperature sensor	Clean air filter and/or condenser as required. Remove blockages as required. Check that heat load does not exceed capacity of Chiller; correct as required. Decrease ambient air temperature. Check and correct as required. Check the compressor upper, evaporator inlet and evaporator outlet temperature sensor readings (see “Diagnostic Mode”). If any of these temperature readings is -50°C, the sensor needs to be replaced.
Unit does not heat	OTP has tripped due to Insufficient fluid in reservoir	Add fluid to reservoir and reset OTP.
Fault code 10 on display	Extreme electrical line interference Triac failure	Plug unit into another power source. If problem persists, triac has failed. Replace triac or triac driver as required.

Problem	Possible Causes	Corrective Action
Fault code 11 on display	Internal probe failure	Contact service representative.
Fault code 12 on display	Loose external probe connection Faulty external temperature probe	Check and correct as required. Replace as required. NOTE: Chiller may be operated using internal probe until problem is corrected.

Diagnostic Mode

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

The Chiller incorporates a Diagnostic mode, which displays important operational information that can aid in troubleshooting. To access the Diagnostic mode, place the Circuit Breaker/Power Switch in the “OFF” position and then return it to the “ON” position while pressing and holding the Select/Set Knob. The diagnostic menu appears on the Pressure/Flow Rate Display; the current value for the diagnostic item appears on the Temperature Readout.

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

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

Technical Information

Controller Specifications

Temperature Set Point Resolution	±0.1°C
Temperature Stability	±0.5°C (±0.9°F)
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

General Specifications

Model		**Air-Cooled** 58XX & 68SS Series	**Water-Cooled** 59XX & 69XX Series
Compressor	Nominal HP	1.5	
Temperature Range (without heater option)	°F °C	41° to 95°F 5° to 35°C	
Temperature Range (with heater option)	°F °C	41° to 194°F 5° to 90°C	
Temperature Stability	°F °C	±0.9°F ±0.5°C	
Cooling Capacity [1]	Tons Watts BTU/hour	1.48 5200 17,732	1.8 6328 21,600
Nominal Evaporator Flow [2]	US GPM	3.72	4.3
Refrigerant		R134A	
Pressure [3]	PSIG	60	
Pump [3]	HP	1/3	
Fan(s)	HP	1/6	N/A
Condenser Discharge Air Flow	CFM	1070	N/A
Water Condenser Flow – Tower Water	US GPM	N/A	5.4
Water Condenser Connections	Inches	N/A	0.75
Process Connections (inlet / outlet)	Inches	0.5	
Reservoir Tank Capacity	US Gallons (liters)	3.5 (13.25)	
Dimensions (L x W x H)	Inches cm	30.5 x 19 x 26” 78 x 48 x 66 cm	
Shipping Weight	Pounds kg	340 154	
Nominal Rated Amps [3]	Without heater option		
	230V/1/60 240V/1/50	20.8A 21.5A	19.7A 20.4A
	208-230V/3/60	14.8A	13.7A
	380V/3/50-60	7.5A	6.95A
	460V/3/50-60	7.5A	6.95A

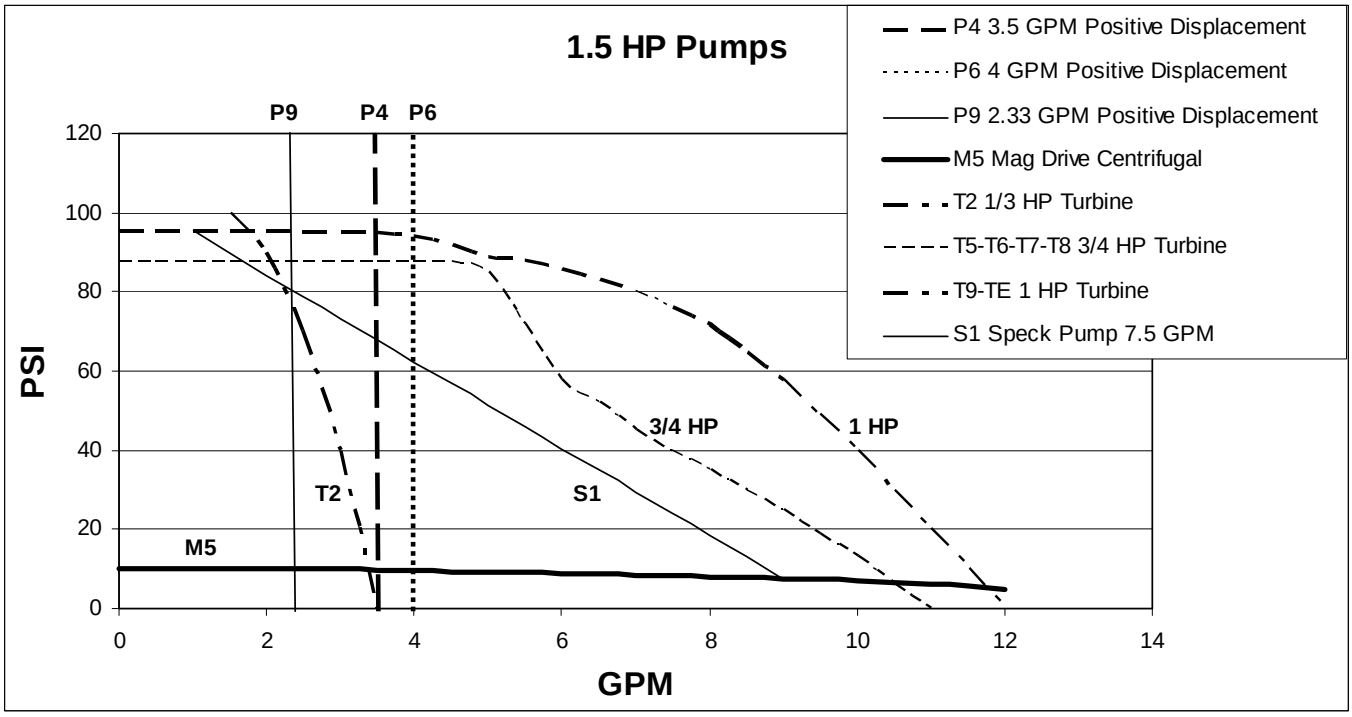
Nominal Rated Amps [3]	With heater option		
	240V/1/60 (3000W heater)	29A	27.9A
	208-230V/3/50-60 (7500W heater)	37.1A	36A
	208-230V/3/50-60 (9000W heater)	42.6A	41.5A
	380V/3/50-60 (9000W heater)	22.7A	22.15A
	460V/3/50-60 (9000W heater)	22.7A	22.15A

1. Capacity of air-cooled units based on 68°C (20°C) entering air and 68°F (20°C) leaving water; capacity of water-cooled units based on 85°F (29°C entering water.
2. Chiller flow rate based on 2.4 US GPM ton (0.54m^3/hr/ton).
3. Based on positive displacement pump for 1PH units and 3/4 HP turbine pump for 3 phase units. Refer to pump performance chart for other pumps. See data plate on rear panel for amperage of your Chiller with factory installed configuration and options.

Environmental Conditions Indoor use only

Maximum Altitude:	2000 meters
Operating Ambient:	5° to 35°C
Relative Humidity:	80% for temperatures to 30°C
Installation Category:	II
Pollution Degree:	2

Pump Performance



Specifications subject to change without notice.

RS-232 / RS-485 Communications

Serial Connector — A 9-pin D-connector (optional) is provided on the back panel of the Chiller for RS232 / RS485 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

RS-232 / RS-485 Protocol — The controller uses the following RS-232 / RS-485 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] (carriage return). Be sure to follow character case exactly. 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 followed by an exclamation point (!) indicates that a command was executed correctly. 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 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	C[CR] or F[CR]
Read status	RW[CR]	1 = Run 0 = Standby	1[CR] or 0[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 remote temperature probe	RR[CR]		![CR]
Read ambient temperature on PCB	RA[CR]		![CR]
Read fault status	RF[CR]		![CR]
Read line voltage	RV[CR]		![CR]
Read internal temperature	R1[CR]		![CR]
Read external temperature	R2[CR]		![CR]

Equipment Disposal (WEEE Directive)

or

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.

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

Replacement Parts

Description	Part Number
Controller PCB **NOTE:** When replacing the Controller PCB, it is important to note the software version. You can obtain the software version by pressing and holding the Power Button on the controller while the unit is in "Standby". For our standard software the left display will read "**T3**" and the right display will read "**003**" or software version T3-003. If you are unable to obtain the software version, your model number and serial number will be required.	500-251
RTD Temperature Sensor	200-430
Remote / Ambient Tracking Probe, 10' cable, DB9 Female Plug	060101
Remote / Ambient Tracking Probe, 25' cable, DB9 Female Plug	060105
Remote / Ambient Tracking Probe, 50' cable, DB9 Female Plug	060110
Fluid Pressure Sensor, Standard	750-381
Fluid Pressure Sensor, SS, DI units	750-384
Switch, Circuit Breaker, 20 Amp, 1PH	215-388
Flow Sensor, Hall Effect, Honeywell	330-087
Float Switch, Water Level, Single Float @ 7.0"	235-061
Float Switch, Water Level, Dual Float, @ 6.8/8.0"	235-064
Compressor,1.5HP,COP#CS18K6E-PFV-230, 230/1/60	750-376
Compressor,02.00HP,COP#CS18K6E-PFJ-230, 200-240/1/50	750-413
Compressor,02.00HP,COP#CS18K6E-TF5-230, 230/3/50-60	750-333
Compressor,02.00HP,COP#CS18K6E- TFD-230, 380-460/3/50-60	750-773
Motor, Fan, 230V, Emerson # 050-0265-00	215-519
Motor, Fan, 380-460V, Emerson # 950-0265-01	215-629
Heater Cartridge, 240V, 1000W	215-459
Heater Cartridge, 240V, 2500W	215-564
Heater Cartridge, 240V, 3000W	215-567
Heater Cartridge, 460V, 1000W	215-654
Heater Cartridge, 480V, 3000W	215-644
Solid State Relay, 50 Amp, Crydom HA6050-10 (for Heaters)	200-343
Solid State Relay, 25 Amp, 48-600V, 3-32CV (Compressor)	200-225
Contactor, ABB A9-30-10-36	215-468
Contactor, ABB A26-30-10-36	215-674
Capacitor, Start, Compressor, 145-174MFD, 250v, COP#914-000-607	750-336
Capacitor, Run, Compressor, 35MFD,370V, COP#914-0037-11 (60HZ)	750-337
Capacitor, Run, Compressor, 45MFD,370V, COP#914-0037-18 (50HZ)	750-414
Relay, Compressor, COP#040-0166-15, COP#040-0166-15	750-338
PCB, 4-20mA Set Point Control	500-342

Description	Part Number
High Pressure Control, Penn#P100CC-9C, 275/175	215-473
Compressor Pressure Regulator Valve, SP#CRO-T-6-30/110-5/8ODF	750-766
Valve, Refrigeration, Liquid and Hot Gas Bypass, PK#DS1100,240VAC	750-179
Filter Dryer, SP#C-053-S, 3/8ODF	750-075
Air Filter, Condenser	750-387
Operator's Manual	110-392

Pumps

Description	Part Number
P4 – Positive Displacement, Rotary Vane, Bronze, 3.5 GPM, 240V/1PH/50-60HZ	Pump – 215-106 Motor – 215-217
P6 – Positive Displacement, Rotary Vane, Stainless Steel 4 GPM, 240V/1PH/50-60HZ	Pump – 215-280 Motor – 215-217
P9 – Positive Displacement, Rotary Vane, Bronze, 2.33 GPM,240V/1PH/50-60HZ	Pump – 215-218 Motor – 215-217
M5 – Mag-Drive Centrifugal Pump, 240V/1PH/50-60HZ	525-552
S1 – Speck Centrifugal, Stainless Steel, 7.5 GPM, 240V/1PH/50-60HZ	215-306
T2 – 1/3HP Turbine, Bronze 3.5 GPM, 240V/1PH/50-60HZ	215-305
T5 – 3/4HP Turbine, Bronze, 240V/1PH/50-60HZ	215-499
T6 – 3/4HP Turbine, Stainless Steel, 240V/1PH/50-60HZ	215-474
T7 – 3/4HP Turbine, Stainless Steel, 208-230V/3PH/50-60HZ	215-475
T8 – 3/4HP Turbine, Bronze, 208-230V/3PH/50-60HZ	215-487
T9 – 1HP Turbine, Stainless Steel, 208-230V/3PH/50-60HZ	215-568
TC – 1/3HP Turbine, Bronze, 208-230V/3PH/50-60HZ	215-364
TD – 1HP Turbine, Bronze, 208-230V/3PH/50-60HZ	215-651
TE – 1HP Turbine, Bronze, 240V/1PH/50-60HZ	215-655

Pump assemblies include motor unless listed separately.

PolyScience Chiller Fluids

Circulating Bath Fluids	Quantity	Part Number
polyclean Algaecide	8 oz / 236 ml	004-300040
polyclean Algaecide	Twelve 8 oz / 236 ml bottles	004-300041
polycool EG -25 (ethylene glycol)	1 gal / 4.5 liter	060340
polycool PG -20 (propylene glycol)	1 gal / 4.5 liter	060320
polycool HC -50 (water-based heat transfer fluid)	1 gal / 4.5 liter	060330
polycool MIX -25 (50/50 blend polycool EG -25 / H_2O plus polyclean algaecide)	Five 0.5 gal / 2.27 liter bottles	004-300060

Warranty

NOTE: The Warranty on DuraChill and other custom-designed products applies only to the original end user and cannot be transferred or sold to another end user without written consent from the manufacturer.

The manufacturer's warranty is one year for parts and labor and two years for parts. Please contact your supplier for additional warranty details and service contract information.

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 for the warranty period(s) stated above. In the event of replacement, the replacement unit will be warranted for 90 days or warranted for the remainder of the original unit's parts or labor warranty period, whichever is longer. If a replacement unit is sent, the defective unit must be returned to the manufacturer within 30 days of receipt of the replacement unit. If the defective unit is not received within 30 days, the manufacturer reserves the right to bill for the replacement unit.

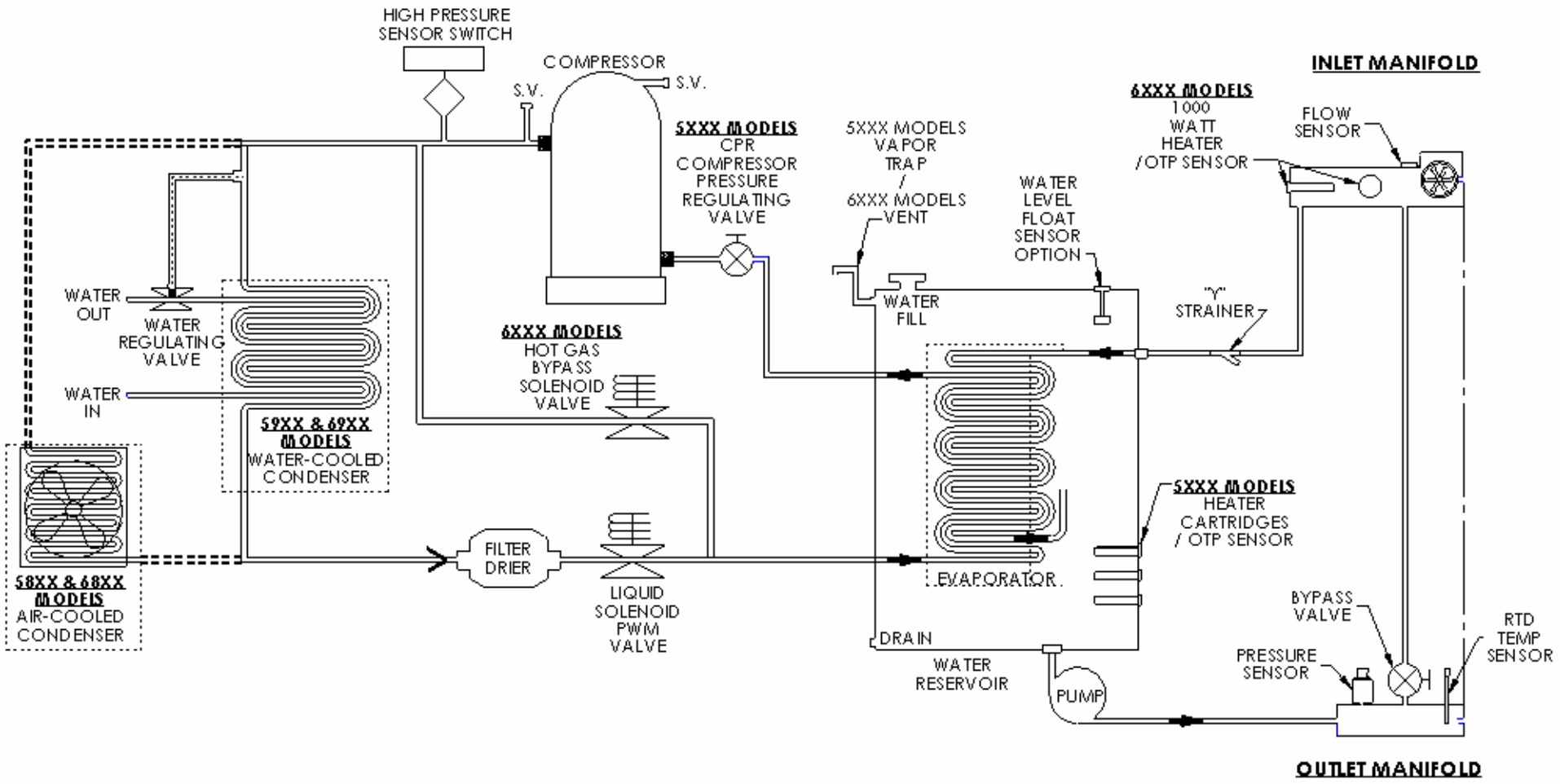
If this product requires service, contact the manufacturer/supplier's office for instructions. If return of the product is necessary, a return authorization number will be assigned and the product should be shipped, (transportation charges pre-paid), to the indicated service center. To insure prompt 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.

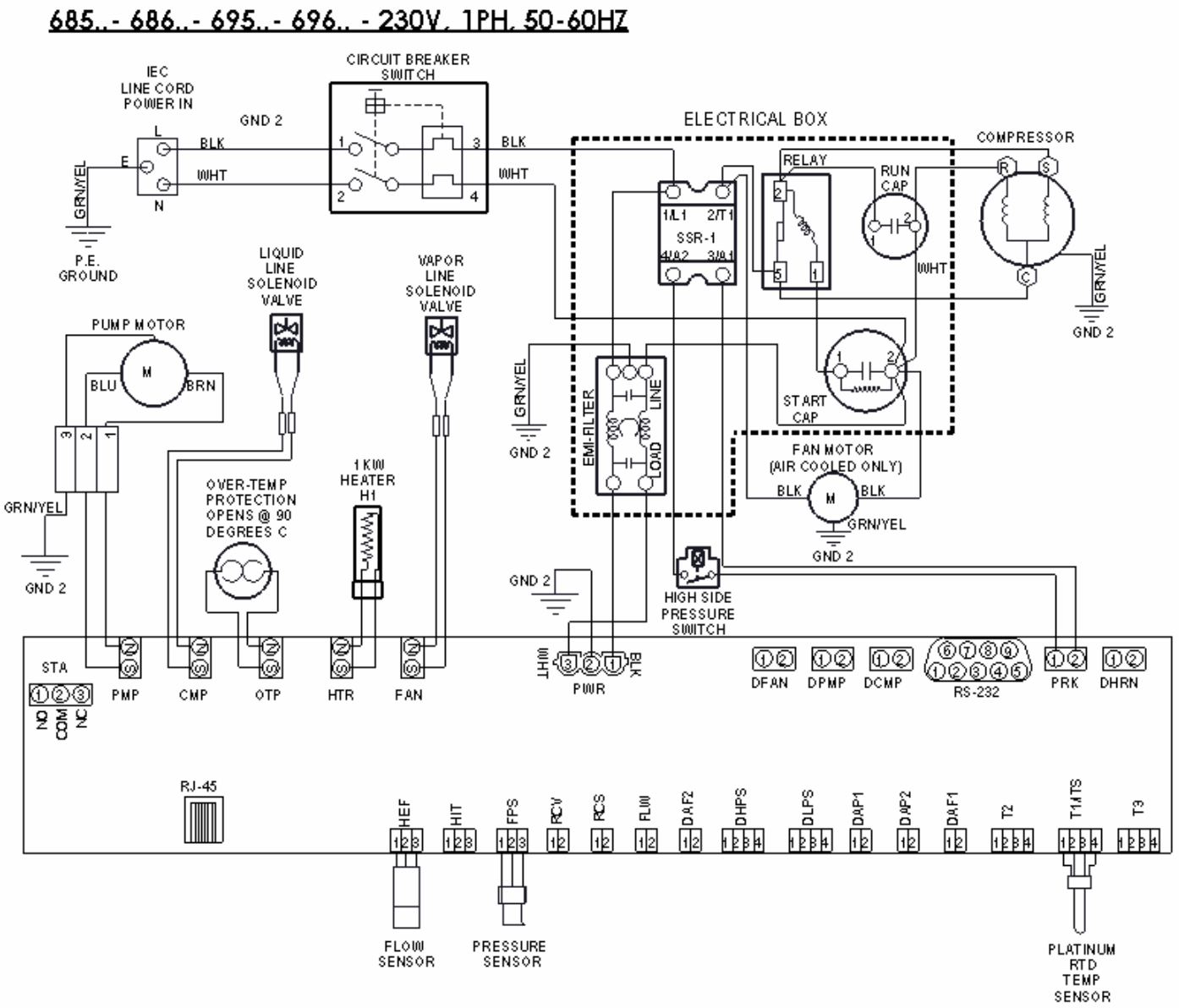
The manufacturer's sole obligation under this warranty is limited to the repair or replacement of a defective product and shall not, in any event, be liable for any incidental or consequential damages of any kind resulting from use or possession of this product. Some states do not allow: (A) limitations 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.

Appendix

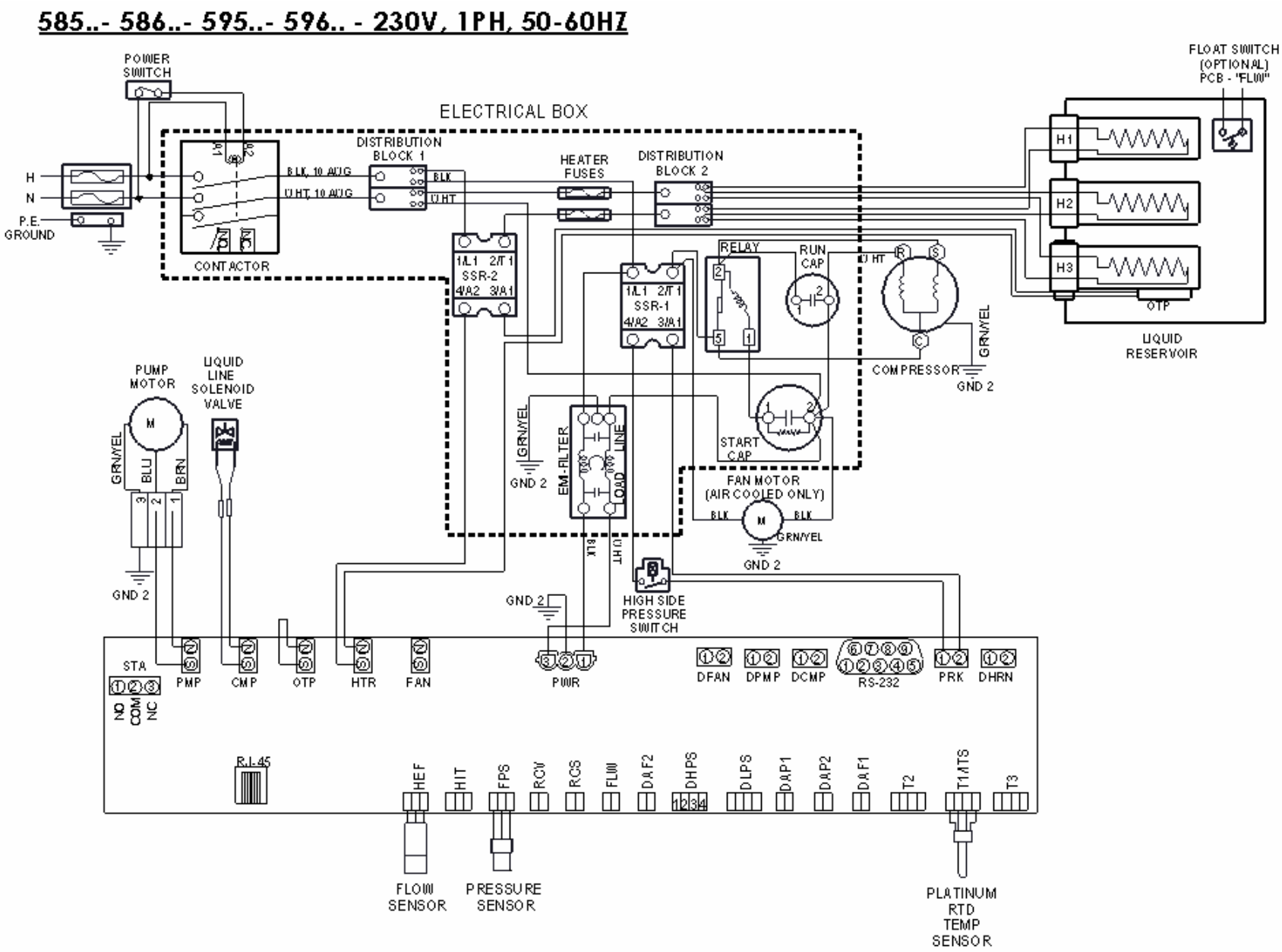
Flow Schematic - All Models



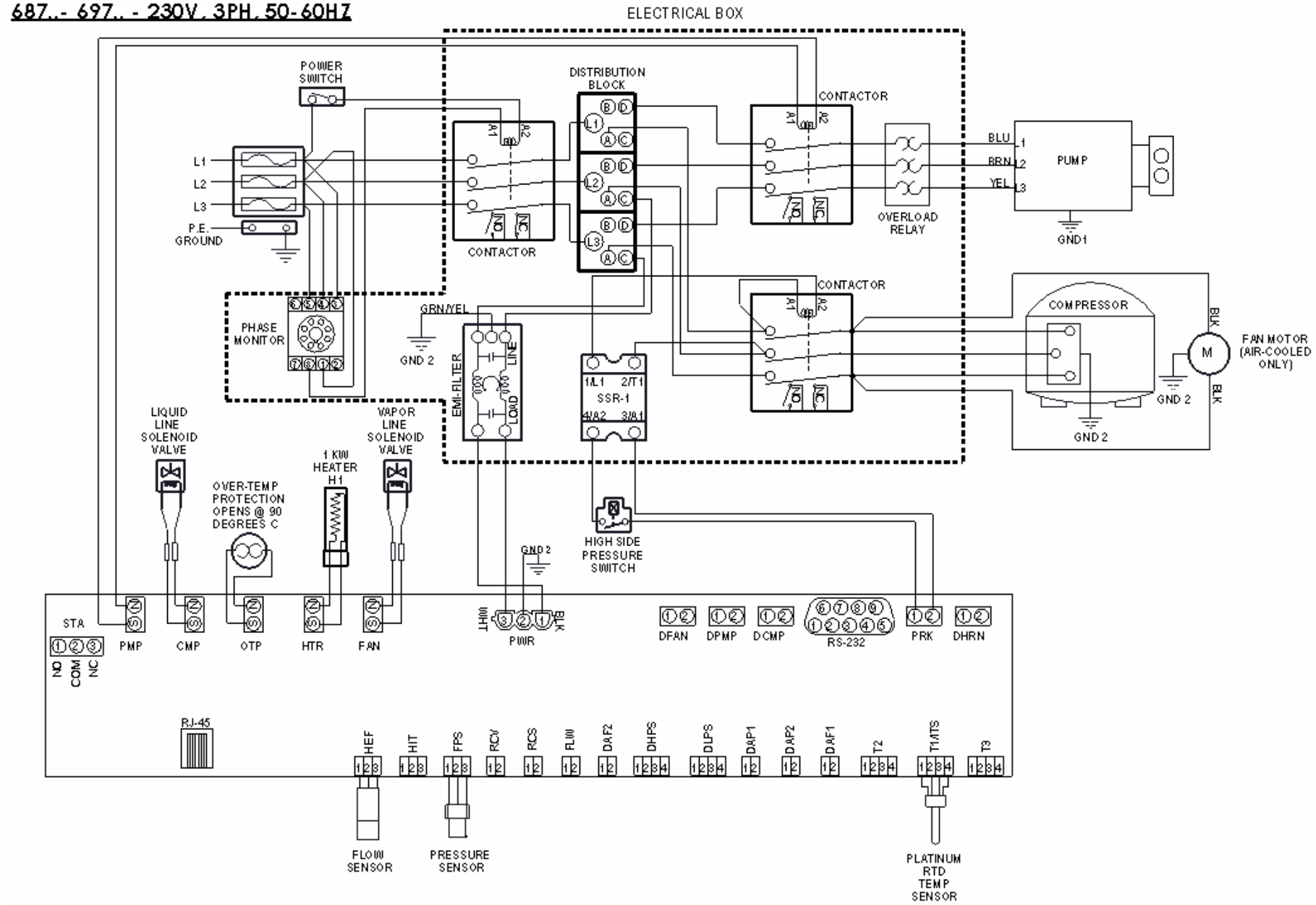
Electrical Diagram – 230V / 1PH / 50-60Hz Models without heater option



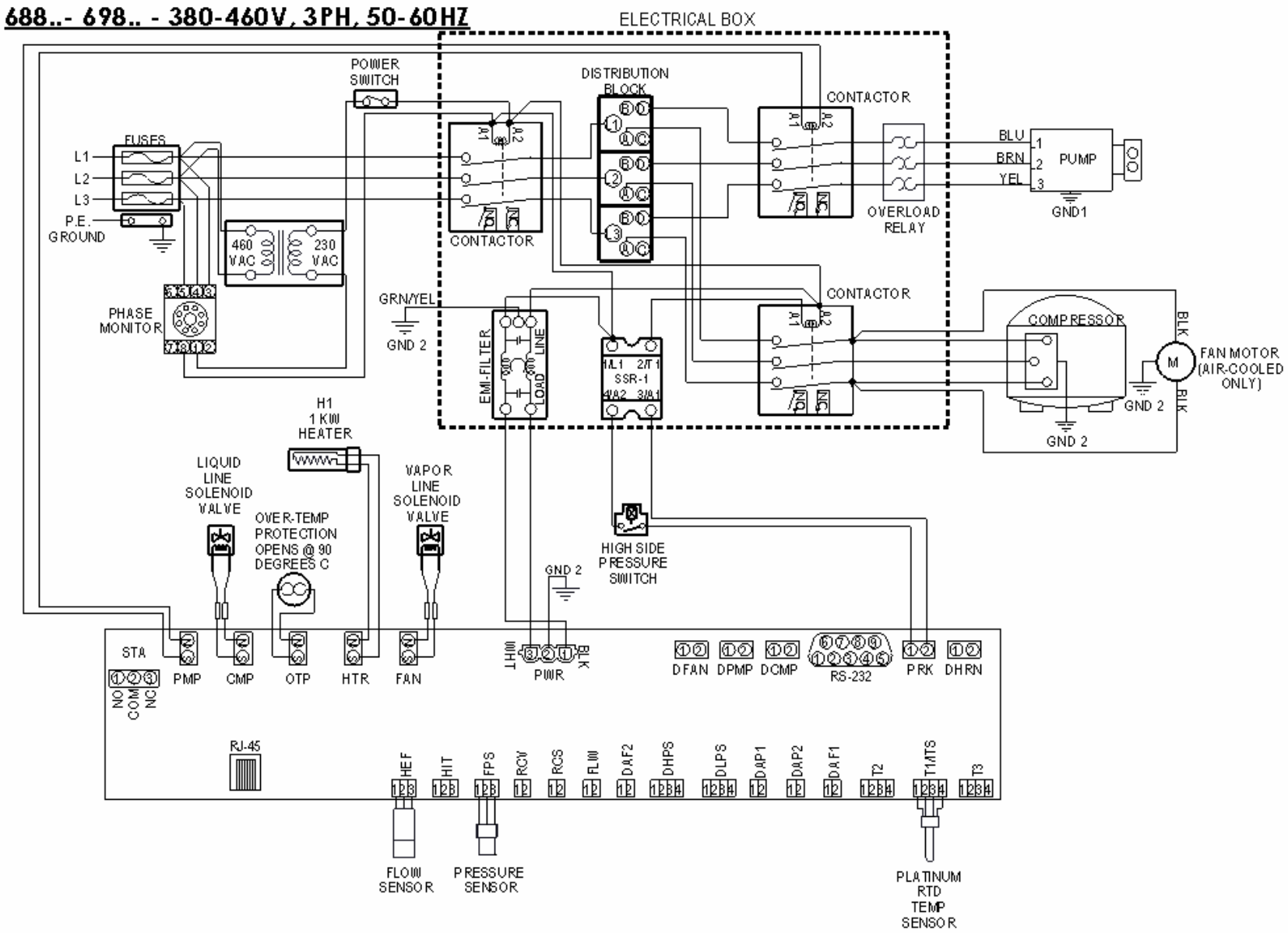
Electrical Diagram – 230V / 1PH / 50-60Hz Models with heater option



Electrical Diagram – 230V / 3PH / 50-60Hz Models without heater option

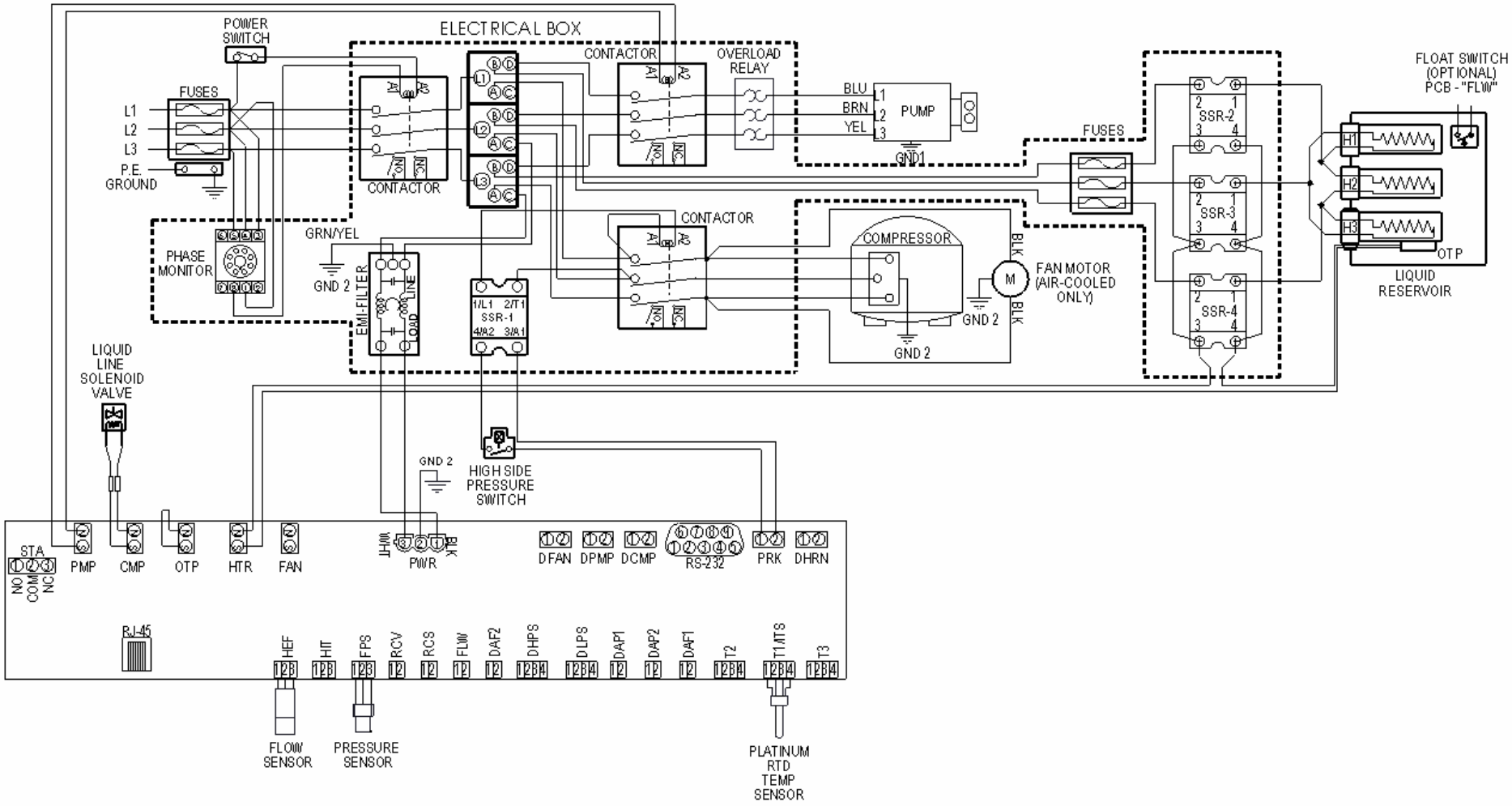


Electrical Diagram – 380-460V / 3PH / 50-60Hz Models without heater option

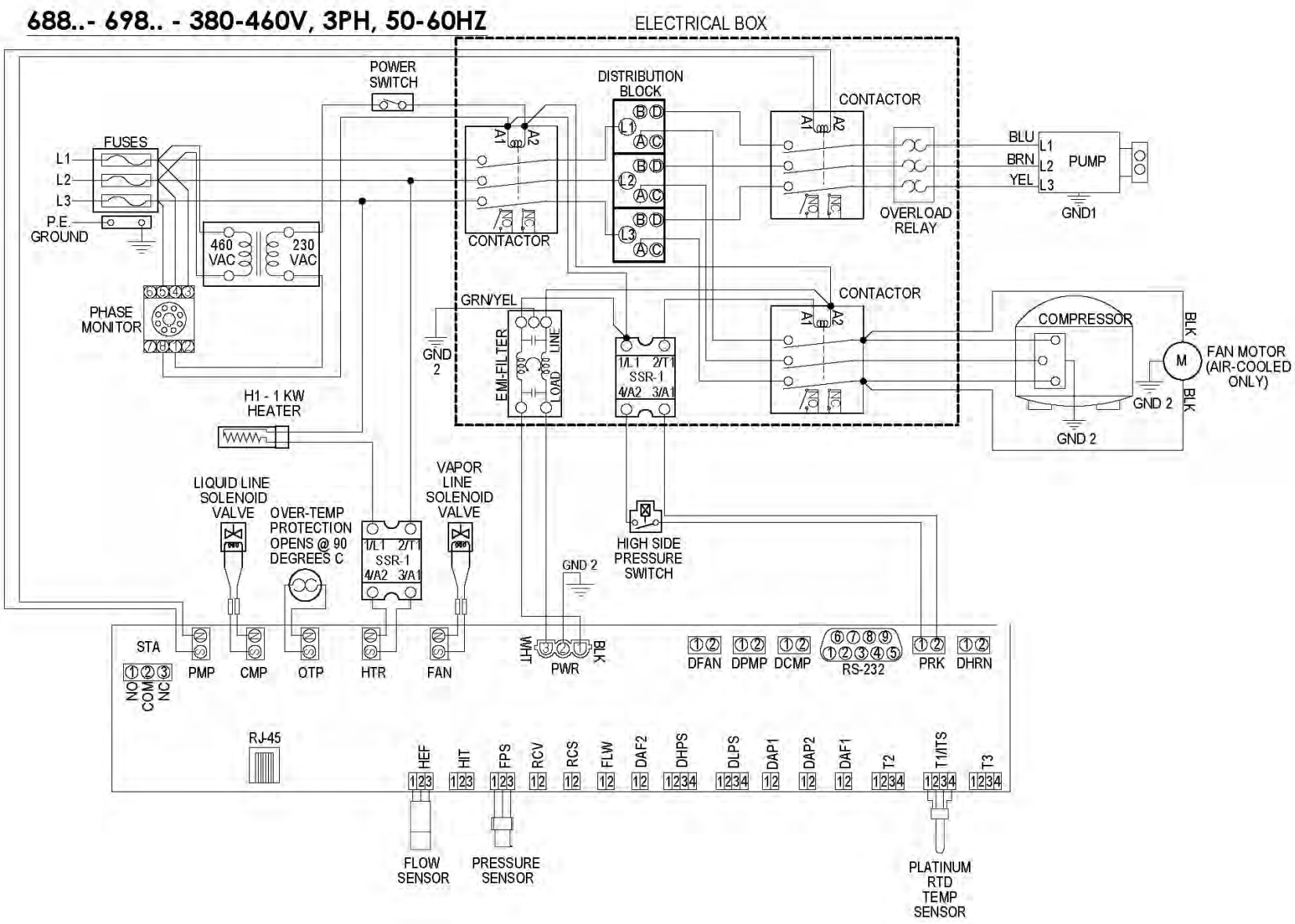


Electrical Diagram – 230V / 3PH / 50-60Hz Models with heater option

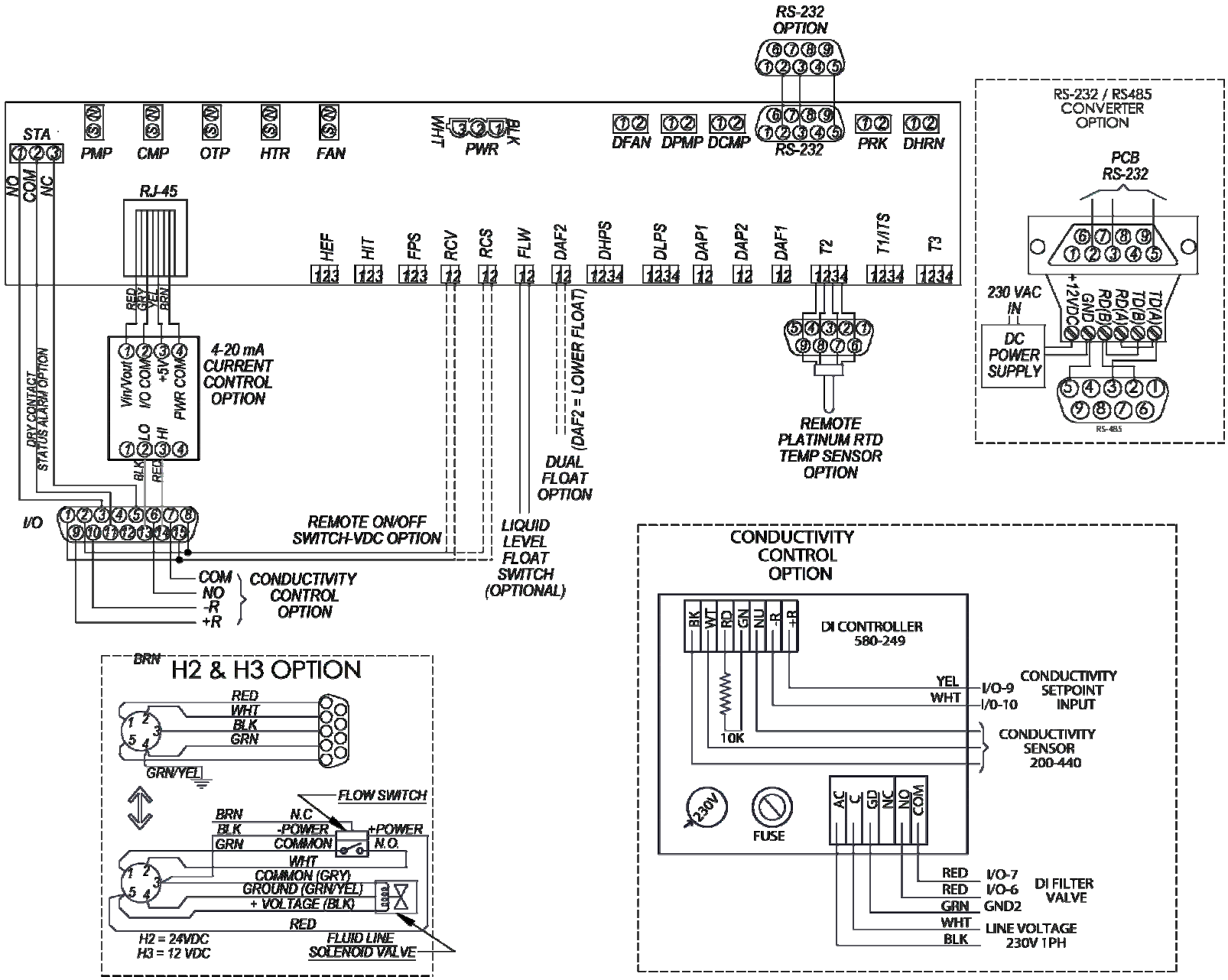
587.. - 597.. - 230V, 3PH, 50-60HZ



Electrical Diagram – 380-460V / 3PH / 50-60Hz Models with heater option



Options


RS-232
OPTION
STA
PMP
CMP
OTP
HTR
FAN
PWR
DFAN
DPMP
DCMP
RS-232
PRK
DHRN
NO
COM
NC
RJ-45
HEF
HIT
FPS
RCV
RCS
FLW
DAF2
DHPS
DLPS
DAP1
DAP2
DAF1
T2
T1/ITS
T3
RED
GRY
YEL
BRN
4-20 mA
CURRENT
CONTROL
OPTION
Vin/Vout
I/O COM
+5VDC
PWR COM
LO
HI
BLK
RED
DRY CONTACT
STATUS ALARM OPTION
I/O
REMOTE ON/OFF
SWITCH-VDC OPTION
LIQUID
LEVEL
FLOAT
SWITCH
(OPTIONAL)
DUAL
FLOAT
OPTION
(DAF2 = LOWER FLOAT)
REMOTE
PLATINUM RTD
TEMP SENSOR
OPTION
COM
NO
-R
+R
CONDUCTIVITY
CONTROL
OPTION
RS-232 / RS485
CONVERTER
OPTION
PCB
RS-232
230 VAC
IN
DC
POWER
SUPPLY
+12VDC
GND
RD(B)
RD(A)
TD(B)
TD(A)
RS-485
CONDUCTIVITY
CONTROL
OPTION
BK
WT
RD
GN
NU
-R
+R
DI CONTROLLER
580-249
YEL
WHT
I/O-9
I/O-10
CONDUCTIVITY
SETPOINT
INPUT
10K
CONDUCTIVITY
SENSOR
200-440
230V
FUSE
AC
C
GD
NC
NO
COM
RED
RED
GRN
WHT
BLK
I/O-7
I/O-6
GND2
LINE VOLTAGE
230V 1PH
DI FILTER
VALVE
BRN
H2 & H3 OPTION
RED
WHT
BLK
GRN
GRN/YEL
FLOW SWITCH
BRN
BLK
GRN
N.C
-POWER
COMMON
+POWER
N.O.
WHT
COMMON (GRY)
GROUND (GRN/YEL)
+ VOLTAGE (BLK)
RED
H2 = 24VDC
H3 = 12 VDC
FLUID LINE
SOLENOID VALVE

4-20 mA Set Point Control

This feature is optional and may not appear in your version of the software.

NOTE: Two versions are available. If the model number of your Chiller contains a G in the 11th digit (e.g., 6860T56A26**G**D), it provides 4-20mA set point control over a temperature range of 5° to 90°C; if the 11th digit is an M, the 4-20mA control range is 4° to 40°C

Go to menu item “CC” and set to “YES”.

If current input is outside of the range of the 4–20 mA, “Ft 18” will be displayed.

“G” Models – 5° to 90°C Control					
°C	mA	°F	°C	mA	°F
5	6.4	41	50	13.6	122
10	7.2	50	55	14.4	131
15	8	59	60	15.2	140
20	8.8	68	65	16	149
25	9.6	77	70	16.8	158
30	10.4	86	75	17.6	167
35	11.2	95	80	18.4	176
40	12	104	85	19.2	185
45	12.8	113	90	20	194

“M” Models – 4° to 40°C Control					
°C	mA	°F	°C	mA	°F
4	4.00	39.2	23	12.44	73.4
5	4.44	41.0	24	12.89	75.2
6	4.89	42.8	25	13.33	77.0
7	5.33	44.6	26	13.78	78.8
8	5.78	46.4	27	14.22	80.6
9	6.22	48.2	28	14.67	82.4
10	6.67	50.0	29	15.11	84.2
11	7.11	51.8	30	15.56	86.0
12	7.56	53.6	31	16.00	87.8
13	8.00	55.4	32	16.44	89.6
14	8.44	57.2	33	16.89	91.4
15	8.89	59.0	34	17.33	93.2
16	9.33	60.8	35	17.78	95.0
17	9.78	62.6	36	18.22	96.8
18	10.22	64.4	37	18.67	98.6
19	10.67	66.2	38	19.11	100.4
20	11.11	68.0	39	19.56	102.2
21	11.56	69.8	40	20.00	104.0
22	12.00	71.6			

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