



Operation and Installation Manual  
Liquid Temperature Control Unit

Model 4250T51BT31D

Powerful High Capacity  
Cooling

Microprocessor Controller

Digital Set & Read

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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.

## Section 1 - General Information

### 1.1 Warranty

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

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

If this product should require service, contact the manufacturer/suppliers' 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 that 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 the manufacturer shall not, in any event, be liable for any incidental or consequential damages of any kind resulting from use or possession of this product.

Some states do not allow: (A) limitations on how long an implied warranty lasts or (B) the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights. You may have other rights that vary from state to state.

### 1.2 Unpacking

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

### 1.3 Package Contents

- Liquid Temperature Control Unit
- Operation and Installation Manual
- Power Cord (100 Kilowatt 3-Phase units require hard wiring – no line cord provided)

### 1.4 Description

The Liquid Temperature Control Unit , LTCU, has a microprocessor control, digital set/read and readout in °C or °F. The control software is designed with proprietary control algorithms that allow for maximum performance under a variety of operating conditions. Wetted parts can be brass, copper, polypropylene, PVC, nylon and stainless steel.

#### Indirect Cooling

An indirect-cooling LTCU controls the process fluid temperature by passing facility cooling fluid through a liquid to liquid brazed plate heat exchanger to cool the process fluid loop. Heat is rejected to facility fluid and temperature is controlled by a proportional valve that bypasses a portion of the process fluid around the heat exchanger.

## 1.5 Specifications

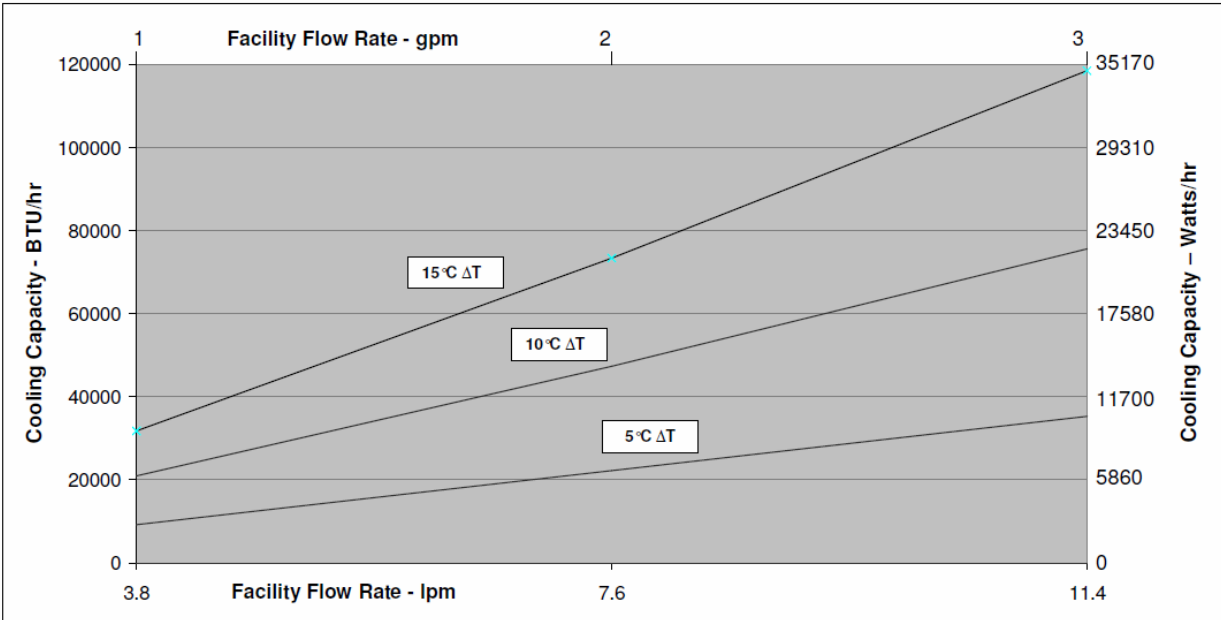
Model 4250	
Controller Operating Temperature	5° to 50°C (41° to 122°F)
Temperature Stability	±0.4°C (0.7°F)
Reservoir Size	4.16 Liters - 1.1 Gallon
Readout Selectability	°C or °F
Pump	Turbine, 3/4 HP
Cooling Capacity @ 30°C	20,000 Watts – 68,200 BTU/hr
Facility Water In @ 20°C	10 Liters per minute (LPM) – 2.64 Gallons per minute (GPM)
Pump Bypass Pressure Setting	275.8 kilopascals (kPa) - 40 psi
Piping Connections	½ inch NPT
Typical Flow Rate	60Hz: 18.9 Liters per minute (LPM) – 5 Gallons per minute (GPM) 50Hz: 17.8 Liters per minute (LPM) – 4.7 Gallons per minute (GPM)
Dimensions , h x w x d	57.4 x 36.8 x 70.1 cm – 22.6 x 14.5 x 27.6 inches
Unit Weight	76 kg - 168 lbs
Volts, Hz, Amps (Volts Range)	200 - 240V, 50/60Hz, 7.0A
Model Number	4250T51BT31D
Environmental Conditions Over Voltage: Category II <ul style="list-style-type: none"> <li>• Maximum Altitude : 2000 meter</li> <li>• Relative Humidity : 80% for temperatures to 30°C</li> <li>• Class 1 : Residential, Commercial, Light Industrial</li> <li>• Indoor Use Only</li> <li>• Operating Ambient : 5°to 30°C</li> <li>• Pollution Degree : 2</li> <li>• Class 2 : Heavy Industrial</li> </ul>	

Notes: Refer to the serial number plate on rear of the temperature control unit for model and electric data.

Performance specifications determined at ambient temperature of 20°C / 68°F.

# 1.6 Cooling Capacity vs. Facility Water Flow Rate

## 1.6 Cooling Capacity vs. Facility Water Flow Rate



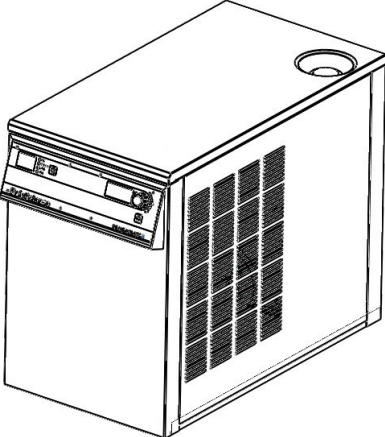
Note: Graph shows performance with full flow to process (no bypass).  
 Facility water pressure drop through unit is 5 psi / 34.5 kPa at 16 GPM / 60.5 LPM.  
 Facility water supply temperature is shown at 5°C, 10°C and 15°C below process temperature

## Section 2 - Set Up

Before proceeding, be sure all power is off.

### 2.1 Location

Locate the LTCU on a strong level surface. The front wheels can be locked to keep the LTCU in place while in use. Insure easy access to the reservoir tank and external piping connections. The maximum ambient condition for the LTCU is 45°C (113°F).



## 2.2 External Piping



All facility chilled water connections must be made by a licensed plumber.



### IMPORTANT!



The LTCU is equipped with a high-pressure centrifugal pump. An adjustable full flow bypass valve is inside of the LTCU. To access this valve remove the top cover, the valve is located on the process outlet (See Fig 2). The valve is FACTORY SET at 60psi. If you do NOT want to operate at this pressure, or do not know what your operating pressure should be, start at a lower operating pressure. Reduce the pressure by turning the valve counterclockwise (unscrew outward) before starting the LTCU.

To maintain a safe workplace and to avoid leaks, special care should be taken when choosing hoses and connectors for the LTCU. All external piping, tubing, or hose should be run full size to limit the potential for external pressure drop. Quick disconnects may be used, but they can cause substantial pressure drops. Materials of construction should be compatible with the fluid being used, and the temperature and pressure at which the unit is to operate.

1. Pressure ratings - Hoses should be able to withstand the greatest pressure that they will encounter. 150 psi minimum is recommended. Unit will alarm if default value of 80 PSI (maximum setting is 100 PSI) is exceeded.
2. Flexible tubing - Avoid tubing that will expand and take up fluid volume when operating at the desired pressure.
3. Hose diameter - The fittings on the LTCU Fluid To / From Process and Facility Water In / Out lines are internally threaded, 1/2" NPT.
4. Facility water – Should be clean and well maintained. Ideally it should be tested monthly to ensure a PH level between 7.2 and 7.8. Add algaecide if algae growth is present.

Process Fluid In and Out connections – Process fluid flows from the "PROCESS OUT" connection to the process and back to the "PROCESS IN" connection of the LTCU.

Facility Water In and Out connections – Cooling facility water flows into the "FACILITY WATER IN" connection through a "normally closed" solenoid valve and the heat exchanger, and back out the "FACILITY WATER OUT" connection of the LTCU. The cooling supply water may be from a chiller, city tap water, or a cooling tower. The incoming water pressure should be limited to 125 psi. The solenoid valve will cut off flow if unit is turned of or an alarm condition exists and the pump is shut down.

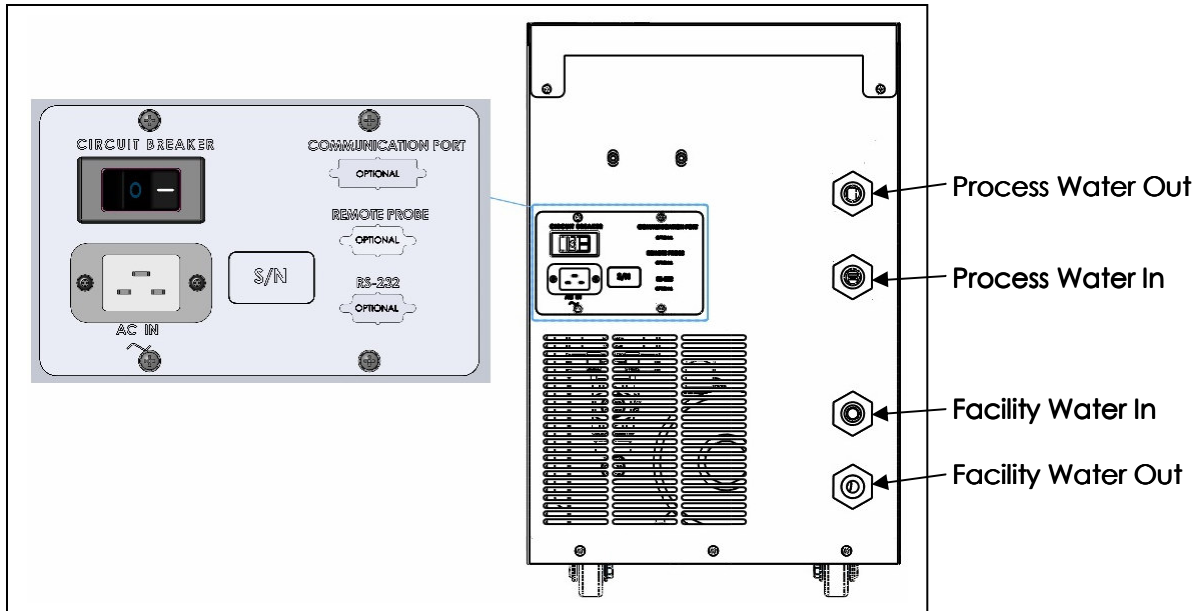




Fig. 1 Rear Panel

### 2.3.1 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 LTCU 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 LTCU 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 LTCU wetted parts (brass, bronze, stainless steel, EPDM rubber, nylon and PVC).


	<p><b>WARNING:</b> Do not use caustic, corrosive, or flammable fluids.</p>
	<p><b>WARNING:</b> Operation below 15°C (59°F) requires antifreeze in the circulation fluid. <b>DO NOT</b> use automotive antifreeze as the additives may be harmful to the LTCU wetted parts.</p>

### 2.3.2 Connecting your System

1. Connect your system to the LTCU with hoses or pipes.
2. Filling: Turn the filler cap and lift up to remove. Use a funnel to fill the reservoir with fluid. When 2/3 full, remove the funnel, but do not replace the cap at this time. Check hoses and fittings for tightness and be sure there are no bends or crimps in the hoses.

3. Plug the LTCU into the proper AC outlet (unit's electrical requirements on rear of unit). Refer to Section 2.4 for more electrical information. Switch the breaker to the ON position. Press the Power button on the front of the unit. The LTCU will begin pumping liquid through your system. Check for leaks.
4. With the pump running, the reservoir's fluid level will decrease as the closed system begins to fill. Add a little fluid at a time until the level in the reservoir stops going down and maintains at 2/3 full. This means that your system is filled and the air has been purged from it. Replace the reservoir cap and turn it clockwise to lock it.

### 2.4.1 Power Requirements


	<p><b>Caution</b></p> <p><b>Be sure that the power supply is the same voltage as specified on the nameplate</b></p>
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### 2.4.2 Electrical Connections


Main Power Connection - An IEC 320 power connector is provided for the customer to connect their LTCU to their power source.


Power Circuit Breaker - A dual-function rocker switch that turns power Off / On to the LTCU components and is a current overload device. Pressing 'I' on the rocker will apply power.

Avoid voltage drops by using properly grounded power outlets wired with 14 gauge or larger diameter wire. If possible, be close to the power distribution panel. Minimize low line voltage problems by eliminating the use of extension cords.

	<p><b>All electrical connections should be made by a qualified, licensed electrician. Proper building codes and safety regulations should be followed.</b></p>
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	<p><b>Follow all applicable electrical and safety codes when connecting power to this equipment.</b></p>
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	<p><b>Make sure the equipment's main power switch is in the "OFF" position before connecting or disconnecting power.</b></p>
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	<p><b>IMPORTANT: Do not turn Controller power On until the Chiller reservoir has been filled. When Controller power is turned On, the pump automatically begins pumping. If the reservoir has not been filled, the pump could be damaged.</b></p>
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Once the power connection has been made and the Power Switch placed in the "ON" position, you are ready for Chiller startup.

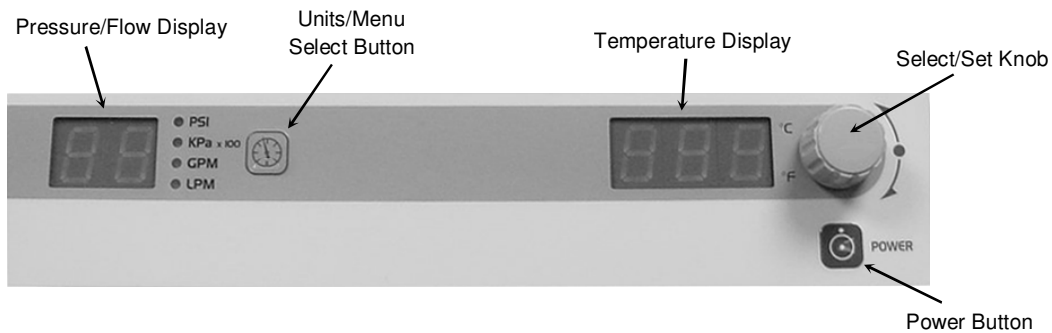
NOTE: When the Power Switch is placed in the "ON" position, five decimal points (.....) will appear on the Controller's LED displays. This signifies that the Controller is in "Standby" and ready for power up.

## Section 3 - Operation

### 3.1 Temperature Setting and Adjustments

After setting up and filling the LTCU:

1. Press the Power Button. The LED display indicates (88 888), the power up self test. 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.
2. The Set Temperature may be checked at any time by pressing and releasing the Select/Set Knob. The Set Temperature may be changed by pressing then turning the Select/Set Knob. The new Set Temperature will automatically be saved or you can press the knob again to go back to actual temperature. Allow sufficient time for the LTCU to stabilize at the desired temperature.



### 3.2 Default Selection: Celsius or Fahrenheit

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

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

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

**IMPORTANT:** All user settings, except baud rate and calibration offset, return to the original factory defaults when the unit in which temperature is displayed is changed.

### 3.3 Setting Operational Parameters

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

Menu Item	Description	Choices / Ranges / Comments	Default Setting
HL	High Temperature Limit Alarm Set Point	+21° to 60°C ( 69° to 140°F)	35°C (95°F)
LL	Low Temperature Limit Alarm Set Point	+3 to +20°C (37° to 68°F)	10°C (50°F)
HA	Front Panel High Ambient Temperature Alarm Set Point	+30° to 50°C. Always displayed and set in °C.	40°C
FP w/PSI LED lit	Maximum Fluid Pressure Alarm Set Point	40 to 100 PSI	80 PSI
FP w/KPa LED lit	Maximum Fluid Pressure Alarm Set Point	2.7 to 6.8 (x 100) kPa	5.5 (x 100) kPa
FL w/GPM LED lit	Minimum Flow Rate Alarm Set Point	0 to 8.0 GPM	2.0 GPM
FL w/LPM LED lit	Minimum Flow Rate Alarm Set Point	0 to 30 LPM	7.0 LPM
AP	Not available on this model		nAP
°C	Calibration Offset	±2.9°C. Always displayed and set in °C. Special access procedure required. See Section 3.5	0.0°C
Fc	Flow Calibration	0.01 to 50.0 (Gain setting)	Nominal Flow
PC	Communications Baud Rate	0, 2400, 4800, 9600, 19200	9600

### 3.4 Calibration Offset (°C)

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

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

Press and hold the Units/Menu Button until HL appears on the display.

Press and release the Units/Menu Button until AP appears on the display.

Press and hold the Units/Menu Button.

While holding the Units/Menu Button, press and release the Select/Set Knob.

When "CAL" appears on the temperature readout, release the Units/Menu Button. The current calibration offset value will appear on the temperature readout.

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.

### 3.5 Flow Rate Calibration (Fc) – single point

This menu item allows you to calibrate the flow rate in GPM. Flow rate is calibrated at the factory at the 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 °C appears. Press and hold Units/Menu Select Button; Fc will appear. Press and release the Set/Select Knob. Release the Units/Menu Select Button. Turn the Set/Select 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 the Set/Select Knob to return to normal operation.

### 3.6 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.

During an alarm condition the left hand display will alternate between “°C” and “Ft” the right display will alternate between current process temperature and a fault code – see table below.

Message Code	Description	Action Required
EFL	Insufficient or no flow through heat exchanger	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.
EHA	Front panel high ambient temperature warning	Warning - The ambient temperature is higher than the set ambient limit. Lower ambient temperature or raise temperature limit.
EHL	High temperature set point warning	Warning — The temperature set point is higher than the high temperature limit value. If not corrected, the high temperature limit alarm will be activated when fluid temperature rises above established the HL value. Lower temperature set point or increase high temperature limit value.
ELL	Low temperature set point warning	Warning — The temperature set point is lower than the low temperature limit value. If not corrected, the low temperature limit alarm will be activated when fluid temperature falls below the established LL value. Increase temperature set point or decrease low temperature limit value.
LLO	Local Lockout	Normal — Indicates that Local Lockout feature (see Section 3.10) is enabled. Appears momentarily when Select/Set Knob is pressed to view/change set point value.
CAn	Cancel Local Lockout	Normal — Indicates the Local Lockout feature (see Section 3.10) has been disabled. Appears momentarily when Local Lockout status is changed from enabled (LLO) to disabled.
02	Low Temperature Alarm [if <16°C (60.8°F) for 5 minutes]	Alarm — Process fluid temperature has dropped to low temperature limit value. Pump turned off. Increase heat load on Chiller or decrease low temperature limit value.
03	High Limit Temperature Alarm	Alarm — Process fluid temperature has reached high temperature limit value. Pump turned off. Decrease heat load on Chiller or increase high temperature limit value.
05	Low liquid level alarm (Optional)	Delayed Alarm — Activated when the liquid level in the reservoir falls below an acceptable level for 30 seconds or longer. Pump turned off. Add fluid to reservoir.
06	High bath temperature alarm	Alarm — Fluid temperature has exceeded 82°C (180°F). Pump turned off. Lower fluid temperature.

07	Low flow alarm	Alarm — Flow rate has dropped below minimum flow rate setting. Pump turned off. Note: Disabled during first 2 minutes of operation.
08	High pressure alarm	Delayed Alarm — Activated when fluid outlet pressure has exceeded high-pressure limit value for 30 seconds. Pump turned off. Decrease outlet pressure by removing blockage or increase high-pressure temperature limit value.
09	Internal software fault	Fault — Pump turned off. Default unit to °C or °F if alarm persists, replace Control PCB.
10	Triac fault	Fault — Pump turned off. Default unit to °C or °F if alarm persists, replace Control PCB.
11	Internal probe fault	Fault — Faulty temperature probe. Pump turned off. The internal RTD platinum probe has failed or there is a problem with temperature control PCB reading the probe signal. Contact supplier.
13	Communications fault	Fault — Pump turned off. Default unit to °C or °F if alarm persists, replace Control PCB.
14	ADC fault – Temperature Probe	Fault — Faulty temperature probe. Pump turned off. The internal RTD platinum probe has failed or there is a problem with temperature control PCB reading the probe signal. Contact supplier.
16	Front panel high ambient temperature warning	Warning - The ambient temperature is higher than the set ambient limit. Lower ambient temperature or raise temperature limit.

### Software Version

#### To check the version of the software program installed in the unit:

1. Turn the unit to standby by pressing the power button once.
2. Press and hold the power button until the software version code appears. To return to normal operation, release the power button. The unit will turn on.

### 3.7 Draining the Unit

1. Remove process inlet and outlet hoses.
2. Run the unit intermittently (5 to 10 seconds each time) to pump the water from the system. Stop pumping when the fluid is reduced to a trickle. Running for a longer period will cause damage to the pump. Open the reservoir and use suction or a hand pump or use compressed air to to remove any remaining water.
3. Disconnect facility inlet and outlet hoses and use compressed air to remove any remaining water.
4. Prior to storage or shipping: Water MUST be removed from ALL parts of the LTCU system, or an ANTIFREEZE must be added to insure that internal damage doe not occur.

### 3.8 Optional Dry Contact Remote On-Off

If the unit is equipped with this option it will be fitted with a 15 pin sub D connector on the rear panel. Connect pins 1 and 2 to turn unit off. Open to turn unit on. When unit has been turned off by this means the right hand display will show "EC" for external control.

### 3.9 Optional Serial Output (RS232 )

Serial Connector— A 9-pin D-connector (optional) 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 On	SE1[CR]	1	![CR]
Set Command Echo Off	SE0[CR]	0	![CR]
Turn Unit ON	SO1[CR]	1	![CR]
Turn Unit Off	SO0[CR]	0	![CR]
Set Set Point	SSxxx[CR]	0- 30°C(32-86°F)	![CR]
Read Set Point Temperature	RS[CR]	----	XX.X
Read Temperature	RT[CR]	----	XX.X
Read Temperature Units	RU[CR]	----	C or F
Read Status	RW[CR]	----	1 = Run 0 = Standby
Read Pump Pressure in PSI	RP[CR]	----	XX.X
Read Pump Pressure in kPa	RK[CR]	----	XX.X
Read Flow in GPM	RG[CR]	----	XX.X
Read Flow in LPM	RL[CR]	----	XX.X
Read Ambient Temp on Control PCB	RA[CR]	----	XX.X
Read Fault Status (See Section 3.8 for Fault Codes)	RF[CR]	00 = System OK 02 thru 17 = Fault 18 = Standby mode	

### 3.10 Enabling/Disabling the Local Lockout

This feature is used to prevent unauthorized or accidental changes to set point and other operational values. When enabled, the values for the functions 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

## Section 4 – Maintenance



### Caution

When cleaning or servicing, disconnect power from unit when side panels are removed and electronics are exposed.

To optimize flow and prevent pump and heat exchanger damage due to scale or foreign particles, “Y” strainers are placed on the inlets of both the process and facility lines. How often the strainer requires maintenance depends on the environment and use of the LTCU. To access the strainer, remove the top cover and left side panel.

## Section 5 – Troubleshooting



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

### 5.1 Float Switch Alarm

The float switch is located in the reservoir tank to monitor process fluid level. In a low level situation, the switch will shut off the pump, sound an alarm, and display error code E-FL. This is done through the controller software. If the reservoir tank is refilled to the top, the LTCU will begin to run again.

### 5.2 Unit Disabled

Check the power to the unit. Be sure the circuit breaker on the rear panel is on. Try defaulting the LTCU per Section 3.3. Request service if the unit continues to display an error message or no message.

### 5.3 No Pumping

Check if pump motor is running. Check fluid level in the whole system to be sure the pump is receiving fluid. Check for blockage within the circulating system.

### 5.4 Insufficient Pumping

Check for low line voltage. Hose diameter may be too small. Fluid viscosity may be high. Check for restrictions in connecting tubing.

### 5.5 No Cooling or Insufficient Cooling

Check for low or high line voltage. Check to see if the facility water supply is turned on. Check to see if the Facility Water In line is blocked or contaminated (such as algae growth). Check if heat is being added within the process system in excess of the system's capacity.

## Section 6 - Service and Technical Support

If you have followed the troubleshooting steps and your LTCU fails to operate properly, contact the company where the unit was purchased. Have the following information available for the customer service person:

- Model and Serial Number
- Voltage (from back panel label)
- A summary of your problem

# Section 7 – Wiring Diagram / Flow Diagram

