Technical Publication

GE Hangwei Medical Systems

Liquid Cooling System

GE Part # 5332027

Lytron Part# LCS7594G1

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Manual# 820-0280 Rev D, 3/3/15

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REVISION HISTORY

REV	REASON FOR CHANGE	DATE	APPRV'D
A	Initial release	5/7/10	
B	ECN# 17257 – Added additional PM requirements	6/22/10	M. Golini
C	ECN# 17737 – Update tank level, troubleshooting	4/12/11	H. Bufe
D	ECN# 101842 – Removed Appendix F, removed key labels, removed Navigating Pages and Menus section. Section 8, remove "A list of …Appendix D).	3/3/15	P. Ambler

1.0 INTRODUCTION

Receiving the Liquid Cooling System

Inspect the Liquid Cooling System immediately upon receiving it. If the unit shows shipping damage, contact the transportation company and file a freight damage claim. Retain all cartons and packing material until the unit is operated and found to be in good condition. The system has been fully tested at the Lytron factory with clean water. Although the system has been drained, some residual fluid may remain. This will not hinder the performance of the system.

About the Warranty

All units returned for warranty claims must have an RMA (Return Material Authorization) number on the outside of the container. Call Lytron Customer Service at +1-781 933-7300 for an RMA number. Refer to the end of manual for the Modular Cooling System warranty. The system should be drained of all fluids and packaged in its original packaging prior to return shipment to Lytron.

Customer Service Support

Lytron is committed to servicing the customer, both during and after the sale. If there are questions concerning the operation of the system, contact our Application Engineering Department at +1-781 933-7300. To facilitate your call, please have the **model number** and **serial number** (located on the nameplate of the system) of the system for the Lytron Application Engineer.

Email:

Lytron's service department can be reached by sending an e-mail to Service@Lytron.com.

Service Hotline

Lytron has a 24 hour per day, 7 day per week service hotline to assist with questions on the startup and operation of the Liquid Cooling System. Lytron service can be reached by dialing +1-781-933-7300. To facilitate your call please have the model number and serial number (located on the nameplate of the system) of the system for the Lytron Service Engineer.

2.0 SAFETY PRECAUTIONS

This system is designed to provide fluid cooling only as specified in this manual. Using this system in a manner other than as specified may impair the safety protection of the system.

Warnings are posted throughout the manual. Read and follow these important instructions. Failure to observe these instructions or use the system other than as specified may impair safety protection, void the warranty, or result in permanent damage to the unit, property damage, and/or personal injury.

Prior to operating the system, be sure to read, understand, and follow all instructions and safety precautions listed in this manual. If there are questions concerning the operation of the system or the information in this manual, please contact Lytron's Applications Engineering Department at +1-781-933-7300.

1. Do not operate the system without fluid in the reservoir.
2. Never place the system in a location where excessive heat, moisture, or corrosive materials are present. The system must be installed in the vertical position so that the reservoir access cover is on the top of the unit and the text of the all labels is upright.
3. The system is not suitable for use in the presence of flammable mixtures.
4. The system is classified as Class 1 equipment and must be supplied with a properly grounded power source.
5. The system is not supplied with a power cord. The power cord supplying power to the system must be in accordance with local code and from a circuit that provides protection against excessive current draw.
6. In the event of electromagnetic or other interference with nearby equipment, move the system an appropriate distance from the nearby equipment to eliminate the interference.
7. Attach building water supply or another pressurized source to the Facility Water In and Facility Water Out connections respectively.
8. Do not use or maintain the system outdoors. This system was not designed to withstand outdoor weather conditions.
9. Performance of installation, operation or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the Lytron warranty.
10. Transport the system with care. Sudden jolts or drops may result in damage the system.
11. Observe all warning labels. Never remove warning labels.
12. Do not operate damaged or leaking equipment.
13. Always disconnect the power source prior to performing any service, maintenance procedures or before moving the system. When the system is energized the green indicator light on the front panel will be illuminated.
14. Do not operate the system with damaged power cords.
15. A qualified technician should perform all system service and repairs.
16. Once the system has reached the end of its useful life, the system components should be recycled in accordance with the appropriate local code.

3.0 SPECIFICATIONS

LCS7594G1		
Cooling Capacity*	Watts	4,000
	Btu/Hr	13,650
Physical Data	Width	15 Inches (381mm)
	Depth	25 Inches (635mm)
	Height	27 Inches (686mm)
	Dry Weight	86 lbs (39 kg)
Operating Temperature	°C	+10°C to +32°C
Operating Relative Humidity	% RH	30% to 75%
Storage Temperature	°C	-40°C to +70°C
Storage Relative Humidity	% RH	5% to 100%
Fluid Connections	Facility	½" MNPT Barbed Nylon
	Process	½" MNPT Barbed Nylon
Reservoir Capacity	Gallons Liters	6.0 22.7
Full Load Amps	200VAC, 50 Hz, 1Ph 230VAC, 60 Hz, 1Ph	3.9 A 3.6 A
Max Pressure Rating	Facility loop	100 psi
	Process loop	100 psi
Facility Loop Water Quality	Particle size	Largest particle not to exceed 200 microns
	Suspended matter	Not to exceed 10 mg/L
Recommended Coolant	Concentration	Water w/ 35% Ethylene Glycol

* - Cooling capacity assumed with a facility water temperature of 15°C and flow rate of 2.6-4.5 GPM (10-17 LPM)

Functional Description

The Liquid Cooling System (LCS) can be used to cool a variety of applications. This particular model was designed to provide coolant to the gradient coil of an MRI scanner. The LCS process coolant is pumped from the reservoir at a flow rate of approximately 4.3 gallons per minute to the Supply and ultimately the MRI scanner's gradient coil. Upon return from the gradient coil, the process coolant is cooled in the LCS's liquid-to-liquid heat exchanger before returning to the reservoir. The reservoir tank is vented and maintained at ambient atmospheric pressure.

The process coolant removes the approximate 4 kW heat load applied by the application. This heat is exchanged from the process coolant to the facility water through the LCS's liquid-to-liquid heat exchanger.

4.0 DEFINITION OF SYSTEM LABELS

Tells maintenance personnel and users to consult the manual for more information.

Disconnect power warning.

RETURN

Identifies the port where heated fluid returning from the customer's machine is connected.

SUPPLY

Identifies the connection where chilled fluid is supplied to the user's machine.

FACILITY WATER IN

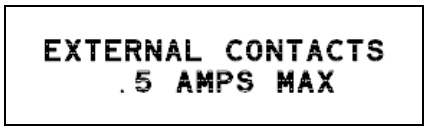
Identifies the connection where facility fluid is supplied to the LCS.

FACILITY WATER OUT

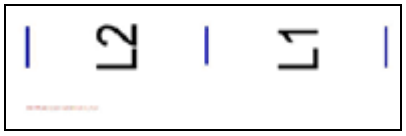
Identifies the connection where facility fluid returned from the LCS.

Identifies positive earth (ground) terminal.

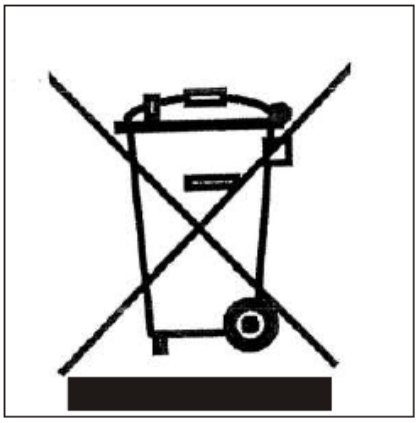
Identifies the model number, serial number, electrical information and pump type.



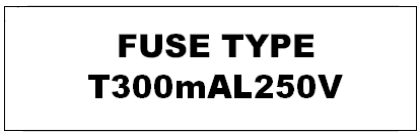
Identifies the location for the customer to connect for external monitoring.



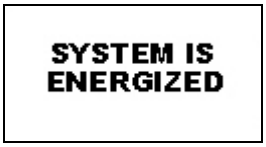
Identifies terminal block.



Identifies the WEEE directive.



Identifies the fuse location and type.



This label identifies when the system is energized. When power is connected to the system the green light above this label will illuminate.

5.0 MAJOR COMPONENTS DESCRIPTION

Pump

The pump is a high volume rotary vane, positive displacement pump constructed of brass that features an internal bypass valve and ½" FNPT connections. The pump is designed to deliver the following flow with a by-pass pressure of 85 psi:
At 50Hz operation: 3.6 GPM
At 60Hz operation: 4.3 GPM

Motor

The motor is ½ HP, Single Phase, 50/60 Hertz, 115/230 Volt and mechanically coupled to a standard NEMA 48Y frame.

Heat Exchanger/Mixing Valve Assembly

The heat exchanger is a brazed plate type constructed with stainless steel plates and a copper brazed alloy. The fittings on the heat exchanger are (2) ½" FNPT and (2) ¾" FNPT. The mixing valve is an electromechanical valve connected to the facility side of the heat exchanger. This valve operated by an actuator in response to the PID settings of the controller.

Controller

The controller is a PID controller with parameters preset by Lytron. Please see section 8.0 of this manual for instructions on how to use this controller.

Reservoir

The reservoir has a 20 liter capacity. The reservoir cover has a vent hole to vent the system. The reservoir is filled by removing the reservoir access panel and cover and filling through the opening. A sight indicator can be viewed through the sheet metal of the LCS to view water level.

Fluid Connectors

The hose assemblies are constructed from flexible reinforced PVC tubing. The internal fittings are made with the flexible reinforced PVC tubing on plastic barbs. The working pressure of the hose assembly is 100 psi @ 21°C water. The SUPPLY, RETURN, FACILITY IN and FACILITY OUT fluid connectors are ½" MNPT barbed nylon fittings.

Strain Relief Connector

The strain relief is a HEYCO P/N 3222 that will secure the power cord providing single phase power into the unit.

Flow Switch

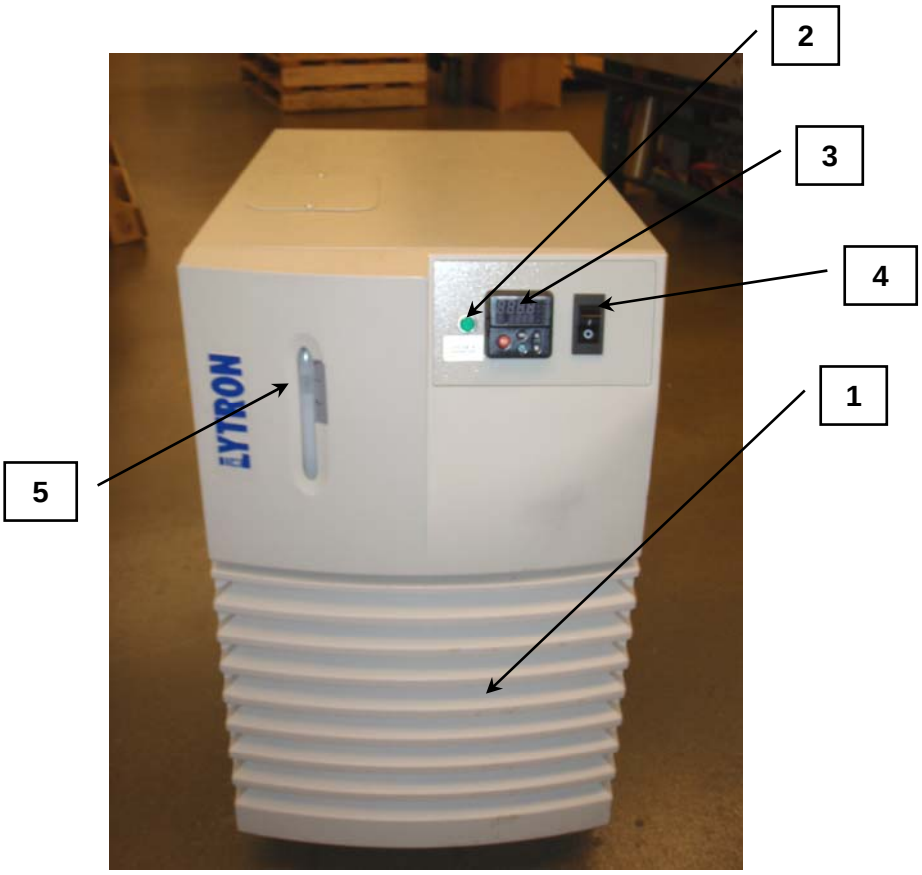
The flow switch is a Gems P/N 186228, 1.5 GPM, normally closed pilot duty 20 VA, SPST switch rated for 120-240 VAC. The connectors on the flow switch are ¾" FNPT. If the flow rate of the system approaches 1.5 GPM (5.7 LPM) the flow switch will trip causing the switch to open.

Level Switch

The level switch is a Gems LS-7 Series, normally closed, 20 VA, SPST switch. The switch is horizontally mounted in the reservoir as part of the tank sub-assembly. If the reservoir level reaches approximately 3.5 gallons (13.2 liters) the level switch will trip causing the switch to close.

6.0 PARTS DESCRIPTION (REFER TO VIEW)

ITEM #	DESCRIPTION
1	PANEL, BOTTOM
2	ENERGIZED INDICATOR LIGHT
3	CONTROLLER
4	CIRCUIT BREAKER
5	LIQUID LEVEL INDICATOR
6	CASTER, 2" DIA SWIVEL W/BRAKE
7	CASTER, 2" DIA SWIVEL
8	PUMP, POSITIVE DISPLACEMENT 4.3 GPM
9	MOTOR, SINGLE PHASE 115/230V 50/60Hz
10	DRAIN HOSE AND CAP
11	SWITCH, FLOW 1.5 GPM
12	RESISTANCE TEMPERATURE DETECTOR
13	ACTUATOR, VALVE
14	VALVE, ELECTROMECHANICAL MIXING
15	HEAT EXCHANGER, COMPACT BRAZED
16	STRAINER, PUMP
17	TERMINAL BLOCK
18	FUSE, 0.3 AMP
19	TRANSFORMER, 24V
20	CABLE ASSY, LEVEL SWITCH
21	POWER IN STRAIN RELIEF
22	EXTERNAL DRY CONTACTS
23	FACILITY WATER OUT ½” NYLON FITTING
24	FACILITY WATER IN ½” NYLON FITTING
25	PROCESS SUPPLY ½” NYLON FITTING
26	PROCESS RETURN ½” NYLON FITTING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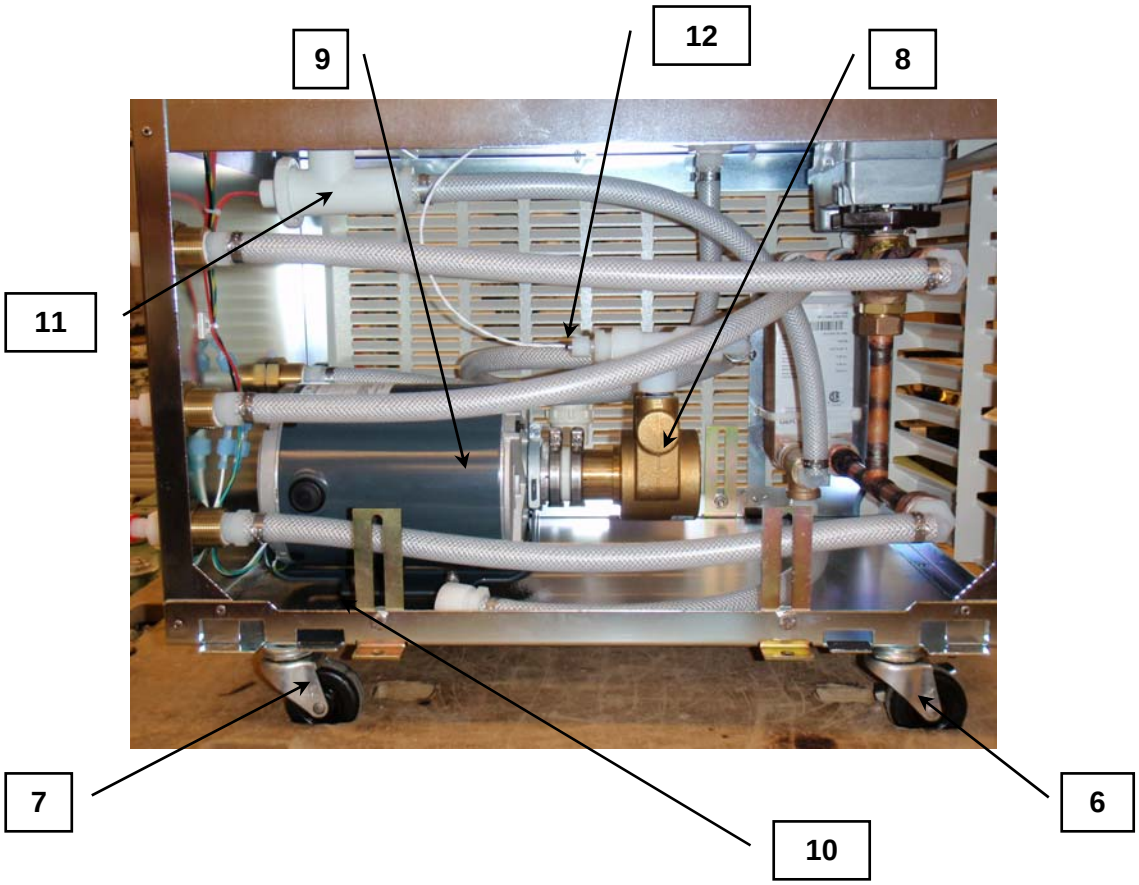
LYTRON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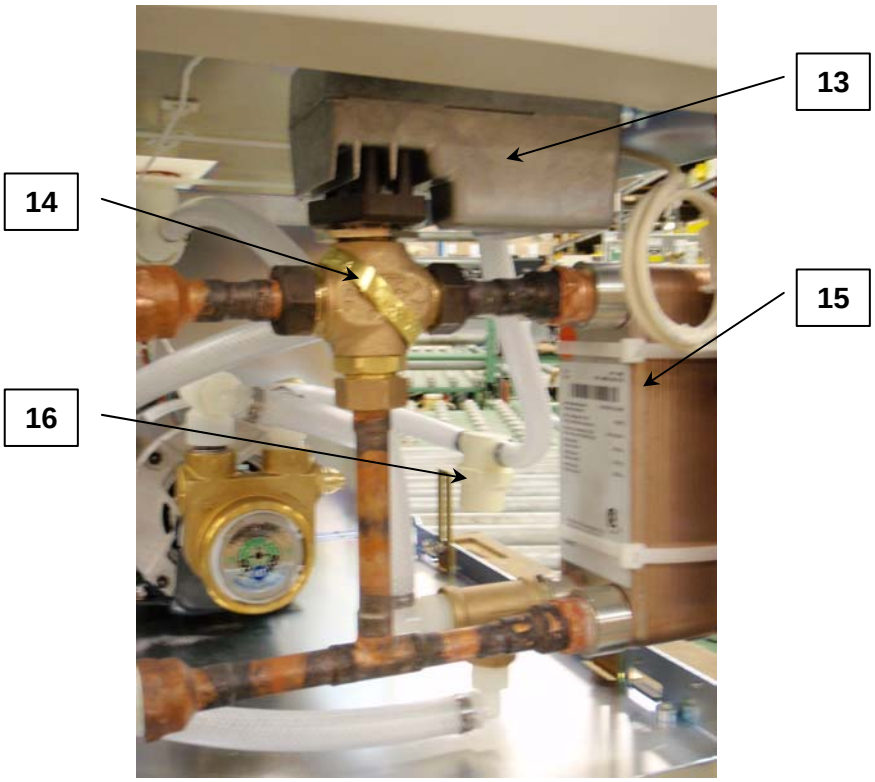
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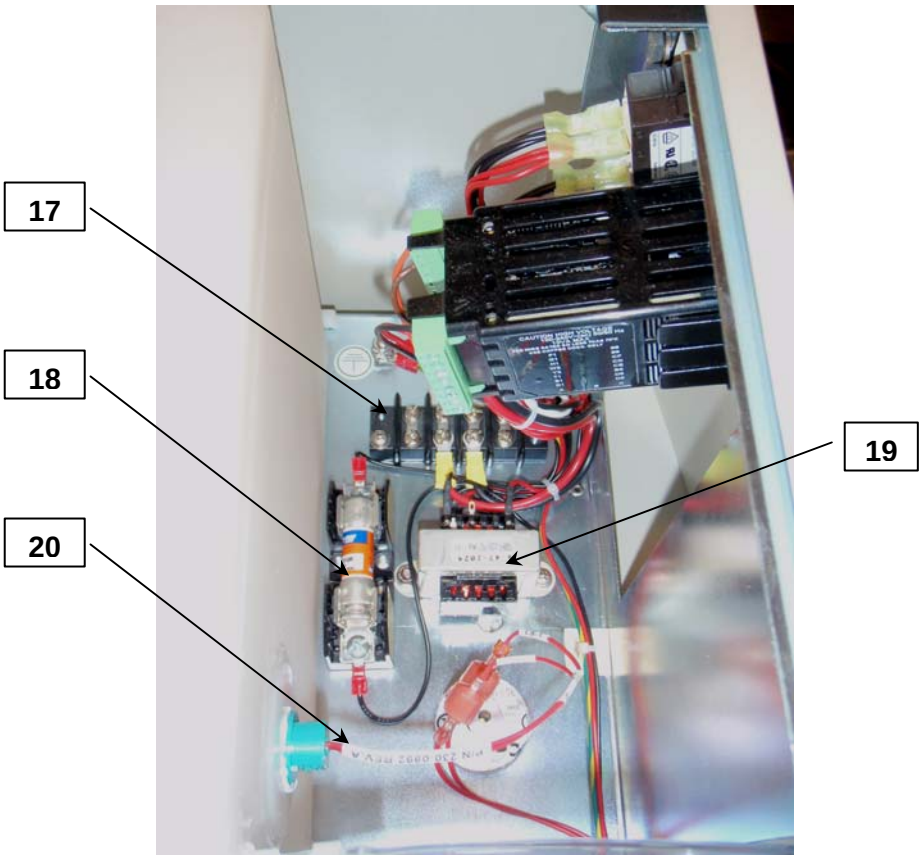
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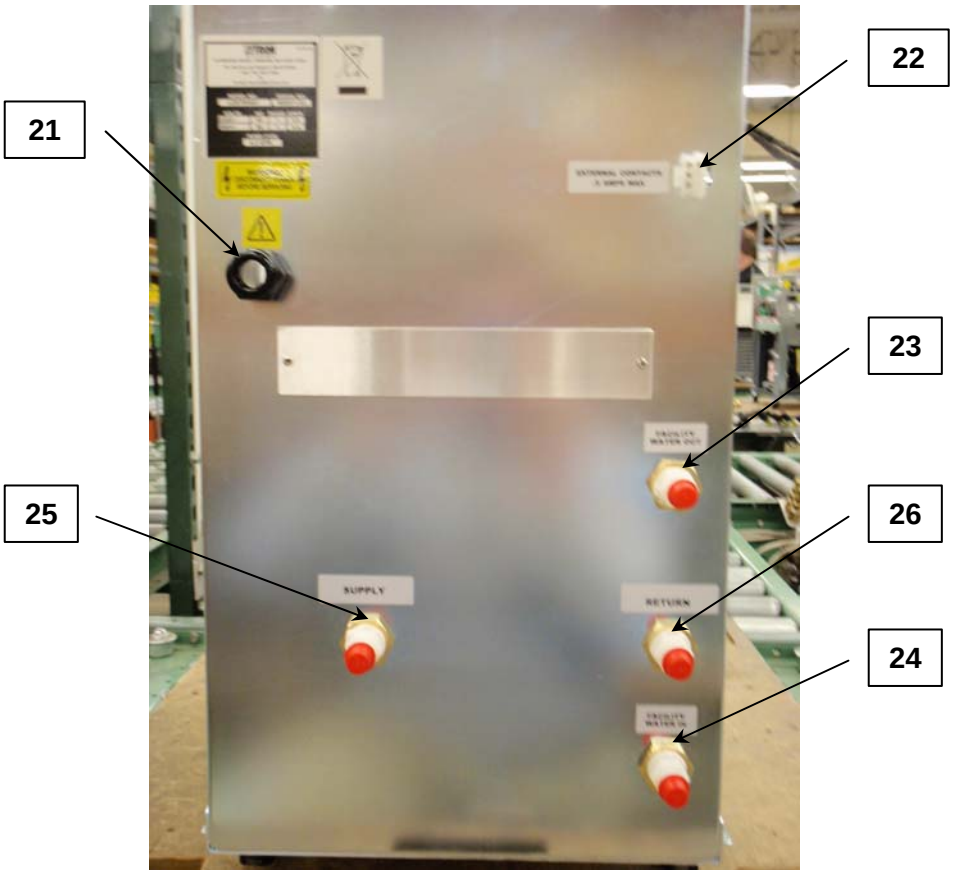

21
22
23
25
26
24
SUPPLY
RETURN

7.0 START-UP INSTRUCTIONS

1. Remove the Liquid Cooing System (LCS) from the shipping crate and visually inspect for damage. Use the lifting straps shipped with the unit to lift the system. Caution, the LCS weighs approximately 86 lbs (39 kg) and is to be removed from its shipping container by two people.

2. Position the LCS in its place of installation. The LCS must be installed in the vertical position so that the reservoir access cover is on the top of the unit and the text of the all labels is upright.

3. Assemble both facility and process water lines to the LCS. All fluid connectors are ½" MNPT barbed nylon fittings.

4. Fill the reservoir with approximately 20 liters of coolant. Refer to Section 9.0 for detailed procedure and exact coolant level.

5. The system is not supplied with a power cord. The power cord supplying power to the system will be a 3/10 AWG, SJT cable with agency approval relative to the country of intended use and from a circuit that provides protection against excessive current draw. The power cord should be installed through the strain relief connector on the back of the system and installed onto the single phase terminal block and the ground stud. Once energized, the green indicator light on the front panel of the system will illuminate.

6. Start the unit by switching the panel mounted circuit breaker to the ON position. The pump motor will start and the controller screen will illuminate.

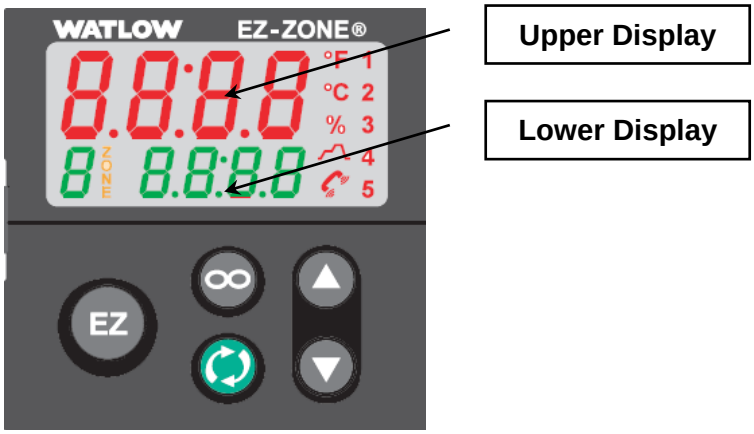
7. Once the pump has circulated cooling fluid to the process outside of the LCS air will be displaced back into the LCS and vented through the reservoir cap. It will be necessary to refill the reservoir with coolant until the level in the reservoir is to the top of the sight indicator located on the front panel.

8. Visually check the unit and all plumbing connections for water leaks.

9. Top off reservoir per Section 9.0

8.0 CONTROLLER

The LCS will be shipped from Lytron with the panel mounted controller programmed and ready for use. The following information is provided if the user wishes to alter a factory setting.



Displaying the Set Point

1. The controller set point will be displayed in the lower, smaller display with a factory setting of 20°C. The actual temperature being read by the RTD will be shown in the upper, larger display. This is considered to be the Home Page of the controller.

9.0 TANK FILL / REFILL PROCEDURE

To fill the Liquid Cooling System (LCS) reservoir with coolant follow procedure below:

1. Turn off the LCS by switching the panel mounted circuit breaker to the OFF position.

2. De-energize power to the LCS by disconnecting the power source that feeds the unit. The green indicator light located on the front panel should NOT be illuminated.

3. Remove access panel from the top of LCS using a Phillips screwdriver to turn the two quarter-turn fasteners counter-clockwise.

4. Remove the reservoir cover by turning cover counter-clockwise.

5. Fill reservoir with coolant until the level in sight indicator is at FULL. Note that the reservoir has vent holes in the overflow collar. Avoid overfilling the reservoir as coolant may leak out from vent hole.

6. Reinstall the cover to the reservoir turning the cover clockwise until it is tight.

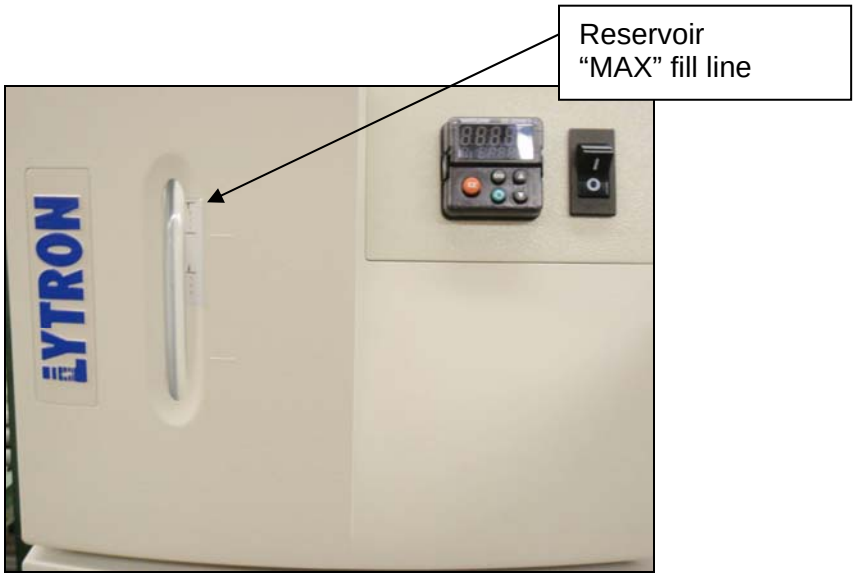
7. Reinstall the access panel to the top of LCS using a Philips screwdriver to turn the two quarter-turn fasteners clockwise.

8. Energize the LCS by connecting the power source to the unit. Once energized, the green indicator light on the front panel of the system will illuminate.

9. Start the unit by switching the panel mounted circuit breaker to the ON position.

10. When the pump is turned on the system will fill with coolant and the air will be purged through the vent holes in the reservoir. As the coolant fills the system the level in the reservoir will drop. Repeat the procedure above until the system is filled with coolant.

11. After all air is purged from lines, fill reservoir with coolant to top line of “MAX” lines.



10.0 DRAINING THE PROCESS COOLANT

To drain the process coolant from the system, follow the procedure below:

1. De-energize power to the LCS by disconnecting the power source that the unit. The green indicator light located on the front panel should NOT be illuminated.

2. Using a Philips screwdriver, remove the screws securing the top panel to the frame of the LCS and gently slide it back until you can lift off the panel. Once the top panel is removed the screws securing the side panels will be exposed. Remove the left panel (when facing front) to reveal the drain line on the heat exchanger.

3. Open the heat exchanger drain line by turning the cap on the drain fitting counter-clockwise and allow coolant to drain into a bucket or attach to a vacuum in order to remove coolant. The drain line will allow the contents of the reservoir and heat exchanger to drain.

4. The drain line will remove a majority of the coolant however in order to ensure all coolant has been removed from the system a wet/dry vacuum should be used.

11.0 PERIODIC MAINTENANCE

The Liquid Cooling System (LCS) has been designed so that the periodic maintenance procedures are uncomplicated and minimize down time. The periodic maintenance includes the following:

1. The system cabinet should be cleaned annually using a mild soap mixed with water. Moisture on the system should be minimized by using a cloth immersed in the solution that has had excess liquid squeezed out of the cloth.

2. Weekly verify the proper process water level in the reservoir by observing the water level in the sight indicator located on the front of the system. When the level is below the recommended level, tap water should be added to the reservoir in accordance with section 9.0 of this manual. Fill to "**MAX**" line.

3. Verify the noise level of the system weekly. Any abnormal sounds or substantial increase in nose level since the last weekly inspection may indicate an impending pump or coolant blockage problem. Investigate the cause and perform necessary service by referring to the troubleshooting section located in section 12.0 of this manual.

4. Remove the cover and side panels and inspect the system for internal leaks weekly. Focus on the deck and the case, as this is where fluid will collect. If fluid is detected then disconnect the power and repair the leaks. If fluid is found on the floor surrounding the system then disconnect the power immediately and repair the leaks.

5. The level switch protects the pump in the event of accidental fluid loss. Since this switch is "open" during normal operation it is suggested to verify its functionality every six months. Do this by opening the tank cover and gently pushing down on the switch to see if the low level alarm is activated.

6. Periodically inspect the coolant inside the reservoir. If the coolant appears dirty then drain it per section 10.0 of this manual, flush the reservoir, replace the drain cap and refill per 9.0 of this manual.

PREVENTIVE MAINTENANCE (PM) SCHEDULE

The preventive maintenance schedule listed below will help contribute to the overall health of the system. Special consideration should be given to the environmental conditions the unit will be subjected. This includes coolant quality, air quality, as well as temperature and humidity ranges.

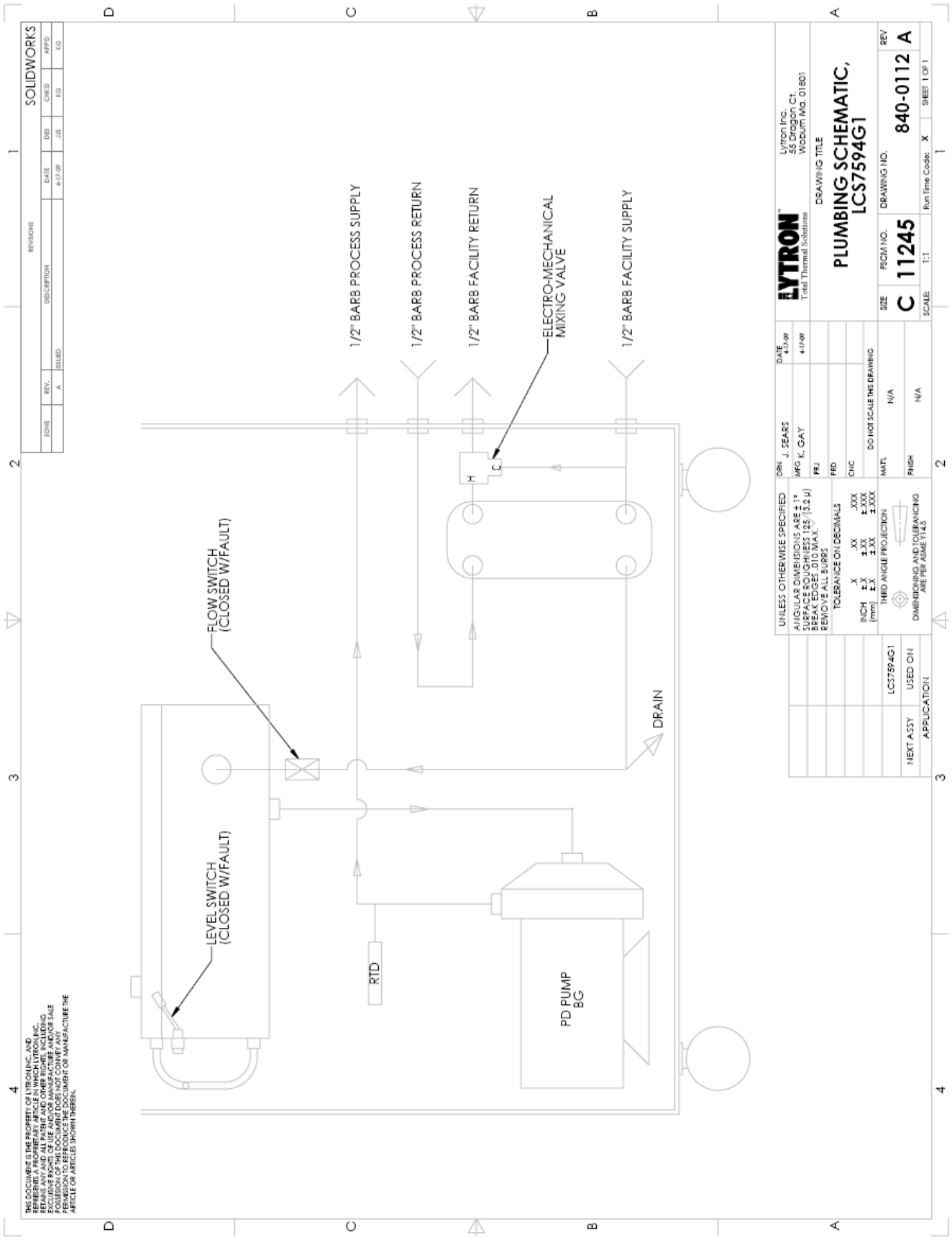
1. Positive Displacement (PD) Pump – the pump strainer (either internal or external) should be cleaned once every 6 months or sooner if coolant conditions demand it.

12.0 TROUBLE SHOOTING GUIDE

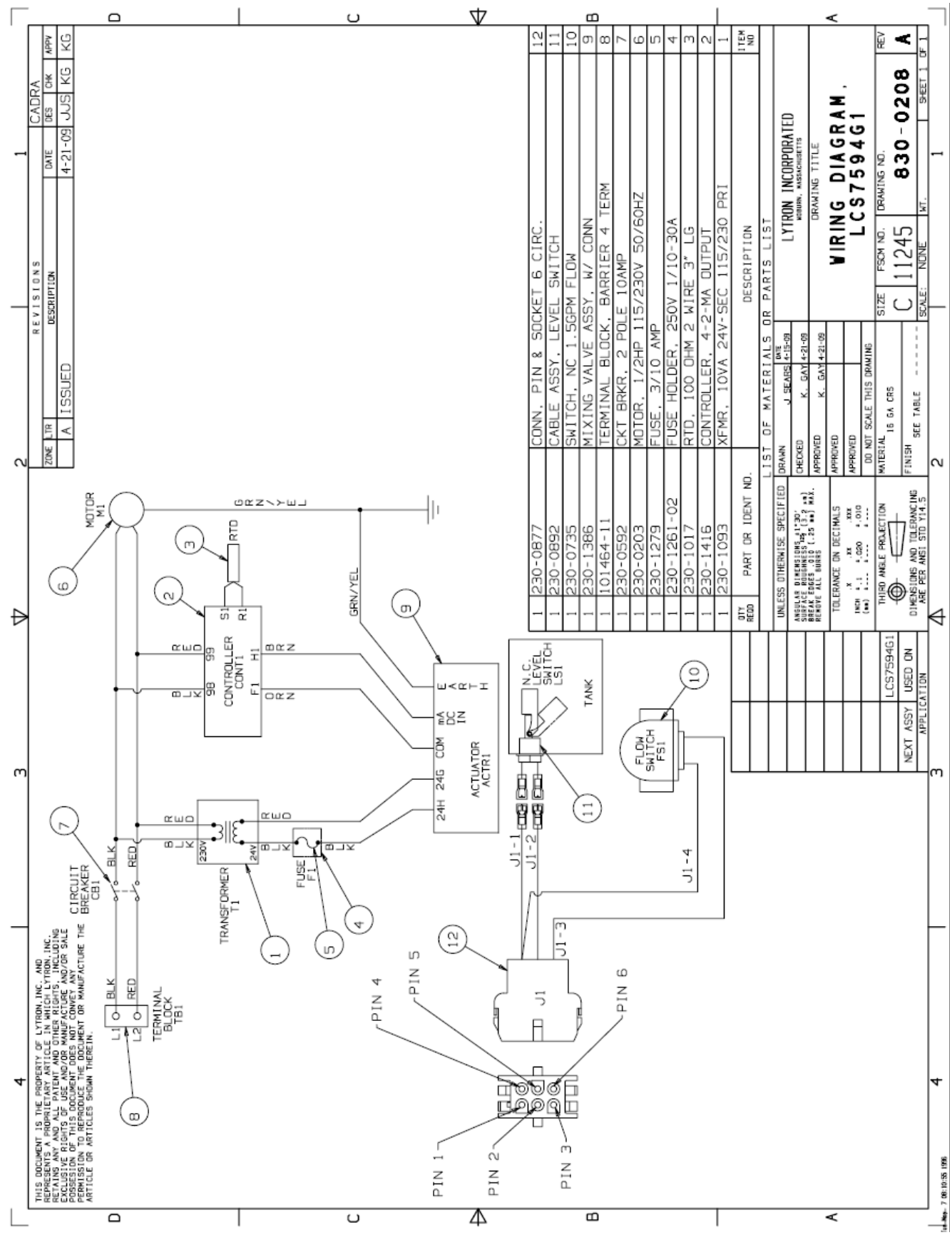
Problem	Possible Cause	Recommended Remedy
Unit does not start	No power to the unit	Make sure the unit is plugged in. Verify power to the unit by checking if green indicator light is illuminated.
	Low voltage	Have a qualified electrician check the electrical service to the unit; check the voltage on the power source; make sure it is within the rated voltage of the unit ±10%
	Circuit breaker is switched to OFF position	Switch the panel mounted circuit breaker to the ON position
Noisy Pump Motor	Pump shaft seal damaged	Replace pump
Pump motor overheats	Improper voltage to the system	Verify and correct the voltage to the unit
Leaking Pump	Pump Seal or O-Rings leaking	Replace pump; contact Lytron for spare part
Low coolant flow	Low coolant level or no coolant in the reservoir	Check for leaks; repair any leaks and fill reservoir
Supply pressure is too high	Restriction in coolant lines external to the unit	Eliminate restrictions in the lines; open any valves
Low coolant level alarm	Low coolant level or no coolant in the reservoir.	Check for leaks, repair leaks and fill reservoir to **"MAX"** line.
	Unit not level	Place unit on level floor.
	Level switch sticking	Clear debris from switch or replace the switch.
Diminished system performance	The controller is not calling for the appropriate set point	Set the controller set point to 20°C
	The facility coolant is low flow or high temperature	Check facility coolant flow and temperature
	Leaks in external piping	Repair leaks
	Electronic Controller faulty	Contact Lytron Service Department
	Mixing Valve Assembly faulty	Contact Lytron Service Department
	Temperature Sensor faulty	Contact Lytron Service Department

APPENDIX A

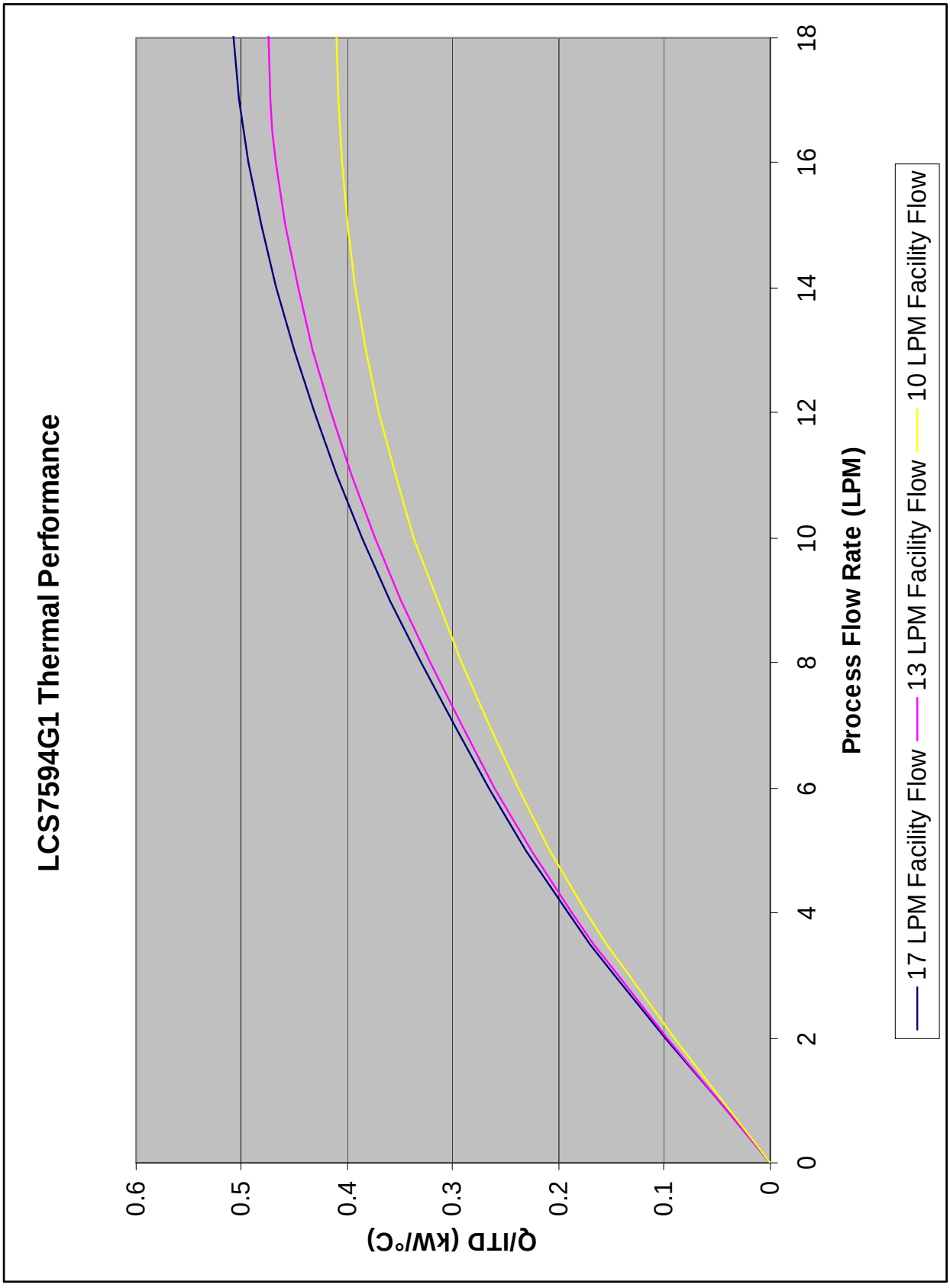
PLUMBING DIAGRAM LCS7594G1



APPENDIX B
Wiring Diagram LCS7594G1

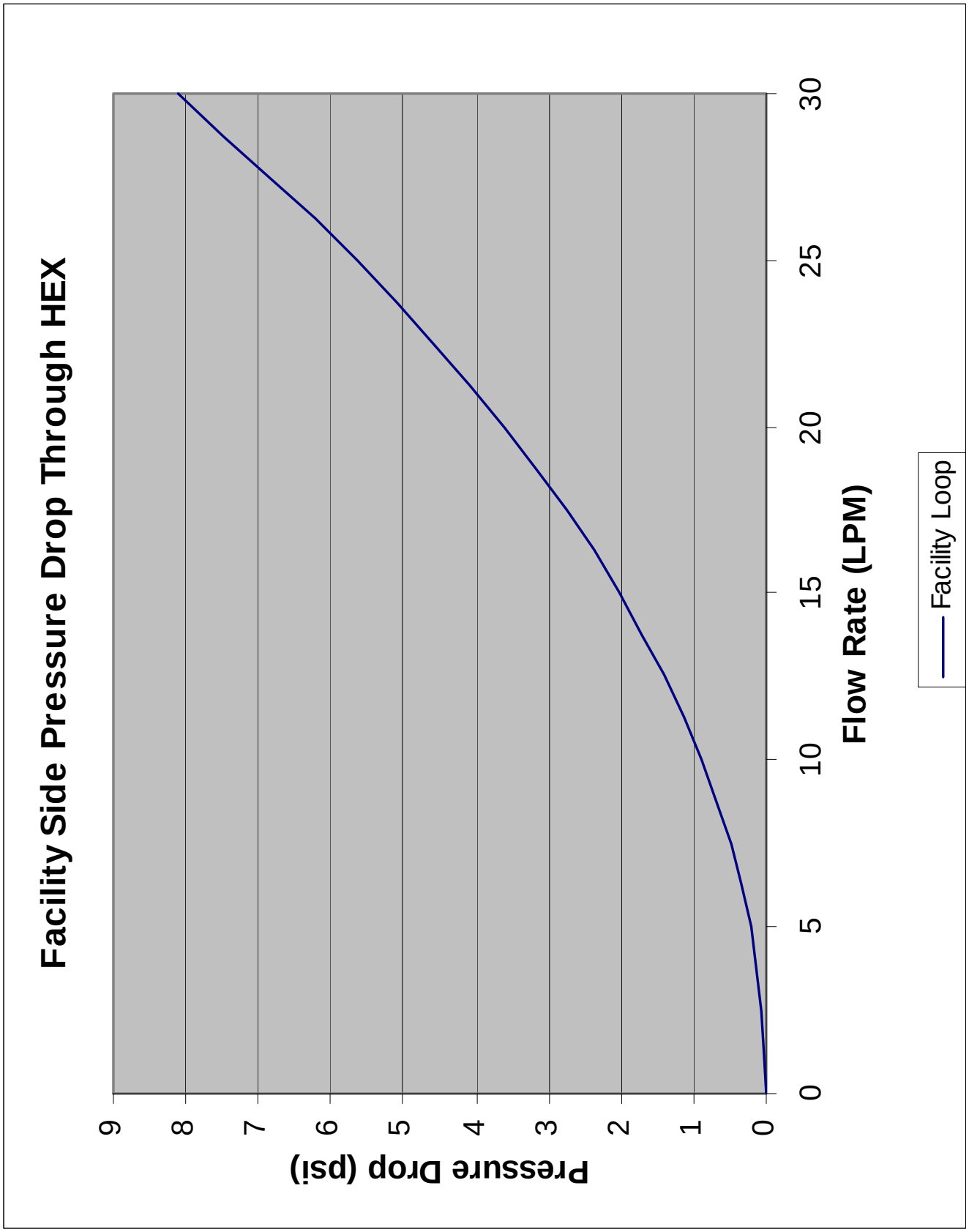


APPENDIX C
Liquid Cooling System Thermal Performance

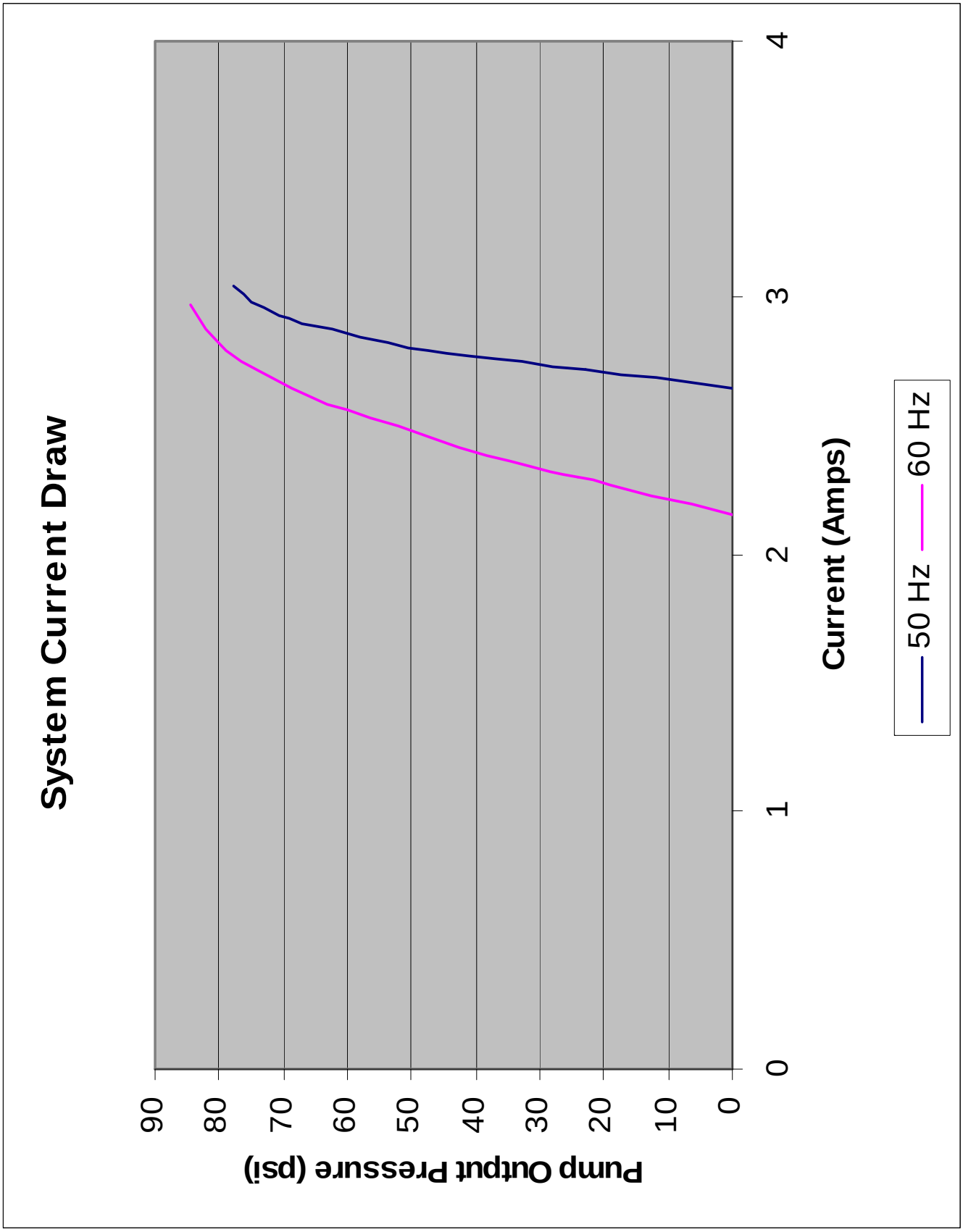


Thermal performance is assumed with a set point of 20°C and a facility water temperature of 10°C

APPENDIX D
Pressure Drop Through Heat Exchanger



APPENDIX E
System Current Draw



APPENDIX G
Lytron Warranty

Lytron agrees that the apparatus manufactured by it will be free from defects in materials and workmanship for the warranty period under normal use and service and when properly installed. The warranty period for recirculating chillers is two years from date of shipment of such apparatus to the original purchaser, maintenance items excluded, and one year from date of shipment of such apparatus to the original purchaser for all other products Lytron sells. Lytron's obligation under this agreement is limited solely to repair or replacement, at its option, at its factories, of any part or parts thereof, returned to Lytron with transportation charges prepaid, which examination shall disclose to Lytron's satisfaction to have been defective. THE FOREGOING EXPRESS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. LYTRON'S OBLIGATION UNDER THIS WARRANTY IS STRICTLY AND EXCLUSIVELY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE COMPONENT PARTS AND LYTRON DOES NOT ASSUME OR AUTHORIZE ANYONE TO ASSUME FOR IT ANY OTHER OBLIGATION. LYTRON ASSUMES NO RESPONSIBILITY FOR INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES INCLUDING, BUT NOT LIMITED TO LOSS OR DAMAGE TO PROPERTY, LOSS OF PROFITS OR REVENUE, LOSS OF THE UNIT, LOSS OF TIME, OR INCONVENIENCE. Lytron's liability does not include any labor charges for replacement of parts, adjustments, repairs, or any other work done outside its factories and its liability does not include any resulting damage to persons, property, equipment, goods or merchandise arising out of any defect in or failure of its apparatus. Lytron's obligation to repair or replace shall not apply to any apparatus which shall have been repaired or altered outside of its factory in any way, or which has been subject to negligence, to misuse, or to pressures in excess of stated limits. On parts not of Lytron's manufacture, such as motors, controls, etc., Lytron extends only those warranties given to Lytron, Inc. to the extent Lytron can do so. Lytron's agreement hereunder runs only to the immediate purchaser from Lytron, Inc. and does not extend, expressly or by implication, to any other person.

Form F4.3.18 Rev E Effective June 6, 2003