THERMAL CARE
PiovanGroup

Pump Systems

OPERATION, INSTALLATION AND MAINTENANCE MANUAL

PT Series

Where water means business.

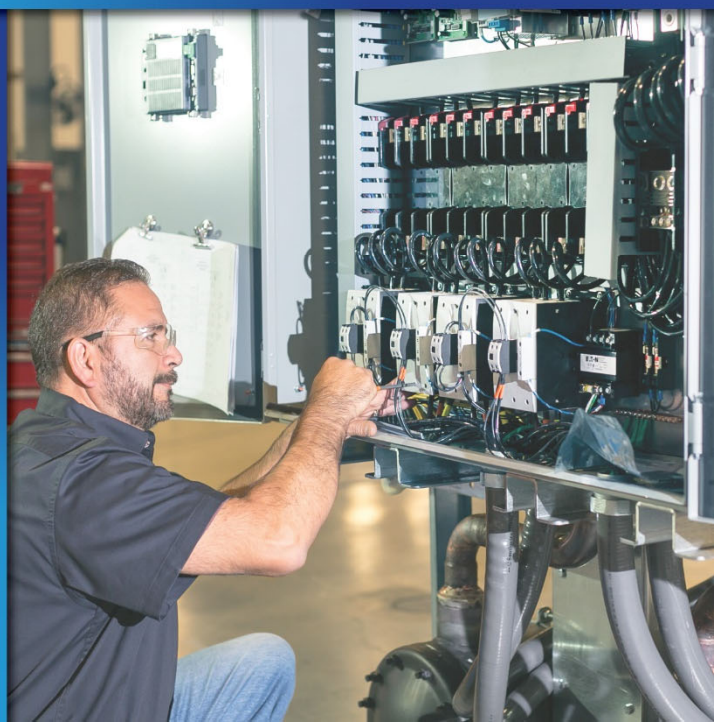


Table of Contents

Foreword

The pumping system is a packaged pump skid with or without a reservoir, which typically includes a fluid pump or pumps and a system control panel. The purpose is to provide circulation and temperature control of a cooling fluid.

This manual is to serve as a guide for installing, operating, and maintaining the equipment. Improper installation, operation, and maintenance can lead to poor performance and/or equipment damage. Use qualified installers and service technicians for all installation and maintenance of this equipment.

This manual is for our standard product and the information is general in nature. Unit-specific drawings and supplemental documents are included with the equipment as needed. Additional copies of documents are available upon request.

Due to the ever-changing nature of applicable codes, ordinances, and other local laws pertaining to the use and operation of this equipment, we do not reference them in this manual.

Safety Guidelines

Observe all safety precautions during installation, start-up, and service of this equipment. The following is a list of symbols used in this manual and their meaning.

General Warning

Electricity Warning

Sharp Element Warning

Hot Surface Warning

Flammable Material Warning

Explosive Material Warning

General Mandatory Action

Wear Eye Protection

Wear Protective Gloves

Wear Ear Protection

Disconnect Before Carrying Out Maintenance or Repair

Connect an Earth Terminal to Ground

Only qualified personnel should install, start-up, and service this equipment. When working on this equipment, observe precautions in literature, and on tags, stickers, and labels located on the equipment.

WARNING: Any use or misuse of this equipment outside of the design intent may cause injury or harm.

WARNING: This equipment contains hazardous voltages that can cause severe injury or death.

WARNING: This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.

WARNING: The exposed surfaces of motors, piping, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.

CAUTION: Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. Shut off the electric power at the main disconnect before opening access panels for repair or maintenance.

CAUTION: Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

CAUTION: The equipment will exceed 70 dBA sound pressure at 1 meter distance and 1 meter elevation when operating. Wear ear protection as required for personal comfort when operating or working in close proximity to the chiller.

CAUTION: Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

Pre-Installation

Receiving Inspection

When the unit arrives, verify the information on the unit nameplate agrees with the order acknowledgement and shipping papers. Inspect the equipment for any visible damage and verify all items shown on the bill of lading are present. If damage is evident, document it on the delivery receipt by clearly marking any item with damage as "unit damage" and notify the carrier. In addition, notify our Customer Service Department and they will provide assistance with preparing and filing freight damage claims, including arranging for an estimate on repair costs; however, filing the shipping damage claim is the responsibility of the receiving party. Do not install damaged equipment without getting the equipment repaired.

Shipping damage is the responsibility of the carrier. To protect against possible loss due to damage incurred during shipping and to expedite payment for damages, it is important to follow proper procedures and keep records. Photographs of damaged equipment are excellent documentation for your records.

Start unpacking the unit, inspect for concealed damage, and take photos of any damage found. Once received, equipment owners have the responsibility to provide reasonable evidence that the damage did not occur after delivery. Photos of the equipment damage while the equipment is still partially packed will help in this regard. Check for broken lines, oil leaks, damaged controls, or any other major component torn loose from its mounting point.

Record any signs of concealed damage and file a shipping damage claim immediately with the shipping company. Most carriers require concealed damages be reported within 15 days of receipt of the equipment. In addition, notify our Customer Service Department and they will provide assistance with preparing and filing freight damage claims, including arranging for an estimate on repair costs; however, filing the shipping damage claim is the responsibility of the receiving party.

Unit Storage

When storing the unit, it is important to protect it from damage. Blow out any water from the unit; cover it to keep dirt and debris from accumulating on or getting in and store in an indoor sheltered area that does not exceed 145°F.

Installation - Mechanical

Foundation

Install the unit on a rigid, non-warping mounting pad, concrete foundation, or level floor suitable to support the full operating weight of the equipment. When installed the equipment must be level within ¼ inch over its length and width.

Unit Location

The unit is available in many different configurations for various environments. Refer to the proposal and order acknowledgement document for the equipment to verify the specific design conditions in which it can operate.

To ensure proper airflow and clearance space for proper operation and maintenance allow a minimum of 12 inches of clearance between the sides of the equipment and any walls or obstructions. Avoid locating piping or conduit over the unit to ensure easy access with an overhead crane or lift to lift out heavier components during replacement or service.

Rigging

Pumps decks and reservoir systems typically have a structural steel frame to facilitate easy movement and positioning. Follow proper rigging methods to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the reservoir. Use pads where abrasive surface contact may occur. Use the frame supporting the unit for positioning it with a crane or a forklift.

Water Piping

Proper insulation of chilled process fluid piping is crucial to prevent condensation. The formation of condensation adds a substantial heat load to the cooling system.

The importance of properly sized piping cannot be overemphasized. See the ASHRAE Handbook or other suitable design guide for proper pipe sizing. In general, run full size piping out to the process and then reduce the pipe size to match the connections on the process equipment. One of the most common causes of unsatisfactory unit performance is poor piping system design. Avoid long lengths of hoses, quick disconnect fittings, and manifolds wherever possible as they offer high resistance to water flow. When manifolds are required, install them as close to the use point as possible. Provide flow-balancing valves at each machine to assure adequate water distribution in the entire system. Install shut-off valves at each machine to allow for isolation of the unit.

CAUTION: Do not use the reservoir as a means of supporting piping. Supporting piping on the reservoir can result in fiberglass fractures, sidewall stresses, and piping deflections that could develop into a leak or a complete loss of the water reservoir structural integrity.

Installation - Electrical

All wiring must comply with local codes and the National Electric Code. Minimum circuit amps (MCA) and other unit electrical data are on the unit nameplate. A unit specific electrical schematic ships with the unit. Measure each leg of the main power supply voltage at the main power source. Voltage must be within the voltage utilization range given on the drawings included with the unit. If the measured voltage on any leg is not within the specified range, notify the supplier and correct before operating the unit. Voltage imbalance must not exceed two percent. Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. Voltage imbalance is determined using the following calculations.

%Imbalance = (Vavg – Vx) x 100 / Vavg

Vavg = (V1 + V2 + V3) / 3

Vx = phase with greatest difference from Vavg

For example, if the three measured voltages were 442, 460, and 454 volts, the average would be:

(442 + 460 + 454) / 3 = 452

The percentage of imbalance is then:

(452 – 442) x 100 / 452 = 2.2 %

This exceeds the maximum allowable of 2%.

There is a terminal block for main power connection to the main power source. The main power source should be connected to the terminal block through an appropriate disconnect switch. There is a separate lug in the main control panel for grounding the unit. Check the electrical phase sequence at installation and prior to start-up. Operation with incorrect electrical phase sequencing will result in mechanical damage to components. Check the phasing with a phase sequence meter prior to applying power. The proper sequence should read "ABC" on the meter. If the meter reads "CBA", open the main power disconnect and switch two line leads on the line power terminal blocks (or the unit mounted disconnect). Do not interchange any load leads that are from the unit contactors or the motor terminals.

WARNING: This equipment contains hazardous voltages that can cause severe injury or death.

WARNING: This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.

WARNING: The exposed surfaces of motors, piping, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.

CAUTION: Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.

CAUTION: Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

CAUTION: Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

CAUTION: Wire the unit ground in compliance with local and national codes.

Control Operation

The unit uses a Programmable Logic Controller (PLC) and color touch-screen operator interface display that serves as the Human to Machine Interface (HMI).

Screen Navigation

The overall menus structure allows for quick access and navigation to each section of the control monitoring and control system. The following are the main buttons used to navigate through the various screens.

Menu Button *– This button is located on the top left of the screen. Touch this button to go to Menu 1.*

Home Button *– This button is located on the bottom of the screen. Touch this button to go to the Home Overview Screen.*

Alarm Button *– This button is located on the bottom of the screen. This button shows the number of alarms active. Touch this button to go to the HMI Alarm Handler Screen.*

Alarm Reset Button *– This button is located on the bottom of the screen. Touch this button to acknowledge and silence active alarms.*

Start/Stop Button *– This button is located at the bottom right of the screen. Touch this button to start and stop the Pump Tank System. When stopped, the button outline is red, when running the button outline is green.*

Arrow Button *– These buttons appear in multiple areas of the screen. Touch these buttons to navigate forward, back, up or down in menus and screens.*

Some screens are password protected to prevent unintended changes. There are two levels of security (*Username is case sensitive*):

"User" Level Password = 9999
"Supervisor" Level Password = 7720

When navigating screens any user adjustable areas appear in a slightly different color. Touching one of these areas brings up a keypad. Use the keypad to enter the appropriate user and password to gain access.

The user-level password allows access to the most common functions; however, there are a few screens protected with a Supervisor-level password. Changing items in Supervisor-level menus without fully understanding the impact can lead to improper or poor performance of the unit. Contact our Customer Service department for assistance with any questions before making changes.

There is a reset function to restore the factory default settings. When this is done you will need to follow the on-screen prompts to reconfigure the Pump Tank system based on the options present. For assistance with this process, please contact our Customer Service Department and have the unit Serial Number ready for reference.

System Initialization

Upon power-up, the first screen to appear is the Start-Up Screen. This screen will display while the Programmable Logic Controller (PLC) and Human Machine Interface (HMI) establish communications. The PLC/HMI version shows on the screen.

Figure 1– Start-Up Splash

Once control communication is established, the HMI screen automatically switches to the Home Screen.

Home – Pump Tank Home Screen

System Overview

This screen provides an overall synopsis of the pump tank system, quick links to other views, as well as other additional information.

Figure 2 – Pump Tank Home

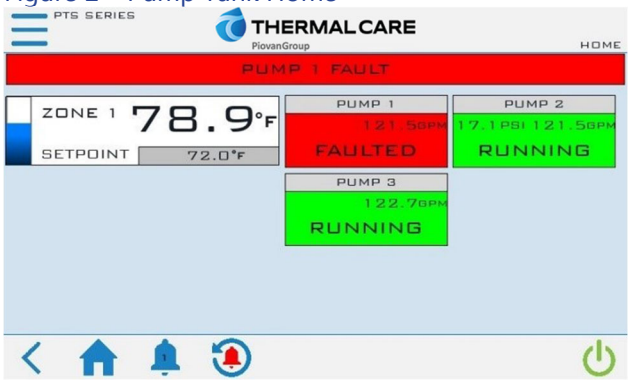
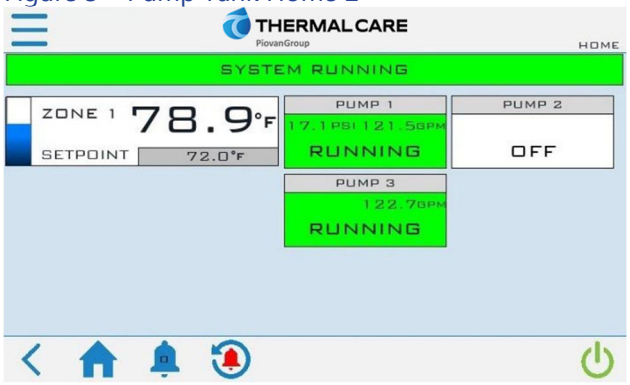
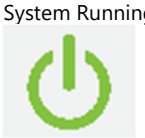


Figure 3 – Pump Tank Home 2



Note: This is an example of a pump tank with the most common set of options; your screen may appear slightly different based on your actual pump tank configuration.

Table 1 – System Overview Functions

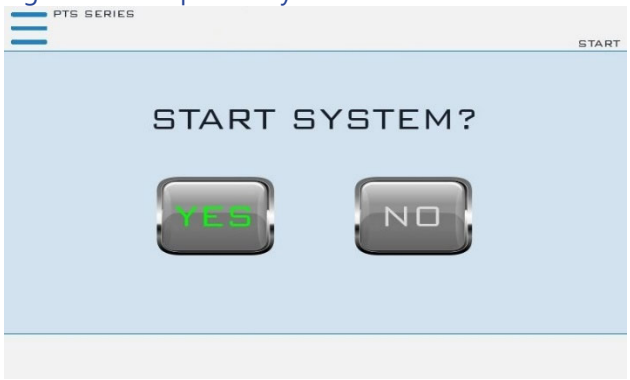
Function	Description	Screen Reference
Visual Tank Level	Shows visual representation of tank level reading	None
Actual Temperature	Shows the temperature in active zone(s)	
Status Messaging	Provides information about any warnings or alarms which may have occurred.	None
Setpoint	Modify the Setpoint by touching the current Setpoint on the HMI. An authorized security level password is required to enter a new Setpoint.	None
Actual Pressure	Displays actual pressure associated to each pump	None
Actual Flow	Displays actual flow associated to each pump	None
Pump Name(s)	Custom name for each pump can be displayed	None
Menu Button	Changes to the Menu 1 screen	Figure 6
		N/A
Alarms	A listing of active and prior alarm history. The number displayed on the bell indicates the number of active alarms.	Figure 8 Figure 9
		N/A
Alarm(s) Reset	Will both silence and reset any alarms	None
		N/A
Start / Stop	Pressing the Start button will provide the ability to start or stop the chiller as well as any other networked chillers attached to this system.	Figure 4 Figure 5
	System Off 	N/A
	System Running 	N/A

Starting and Stopping Pump Tank

Starting the Pump Tank

This screen provides the ability to start pump tank operation.

Figure 4 – Pump Tank System Start



Stopping the Pump Tank System

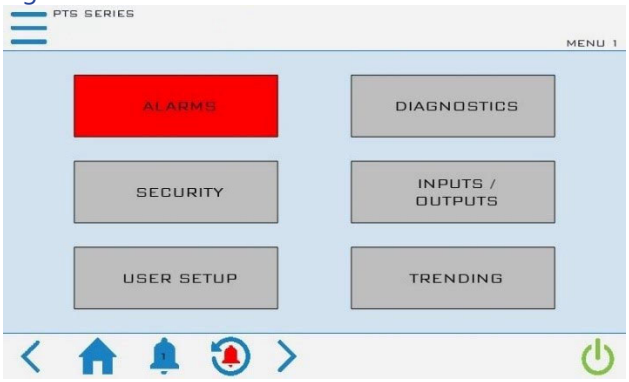
This screen provides the ability to stop Pump Tank System operation.

Figure 5 – Pump Tank System Stop

Menu 1 - Overview

The Menu 1 Screen contains buttons to allow navigation to various sections of the control system. Some parameters are password protected. The main User level password is for gaining access to changing the main system set point and various other warning and alarm settings. A few higher-level areas require a high-level "Supervisor" password. Contact our Customer Service Department for assistance in accessing any restricted menus.

Figure 6 – Menu 1



Menu 2 - Overview

The Menu 2 Screen contains additional functionality. This includes the ability to show a full screen view as well as updating the HMI program via thumb drive.

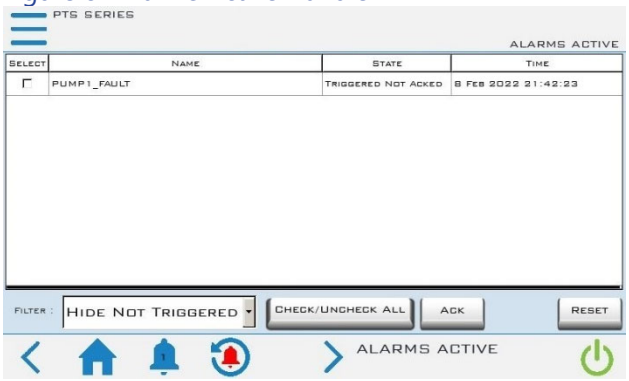
Figure 7 – Menu 2

Menu 1 - Alarms

Alarms Active

When a critical system fault occurs, the controller logs the faults to the HMI alarm handler. To silence this alarm, press the ALARM SILENCE button. If multiple alarms are active at once, use the DOWN and UP buttons to view all alarms. All alarms must be resolved and then reset using the RESET ALARM button.

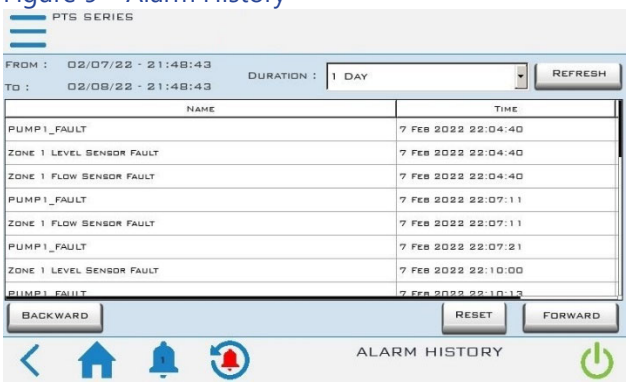
Figure 8 –Alarms Active Handler



Note: The above shows there is one alarm present.

Alarms History

Figure 9 – Alarm History



Menu 1 – Diagnostics

Diagnostics Menu

The diagnostics screens provide detailed information about the various portions of the system.

Figure 10 – Diagnostics Menu

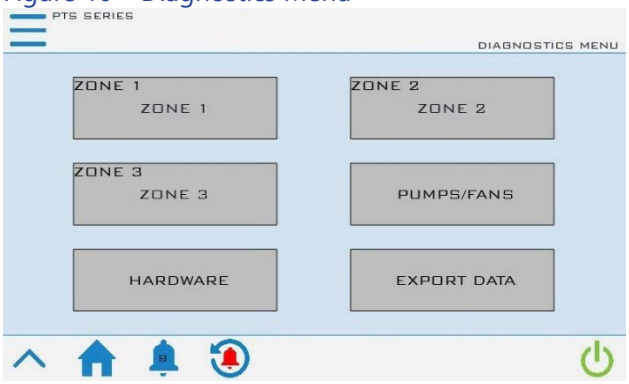


Figure 11 – Diagnostics Circuit Details

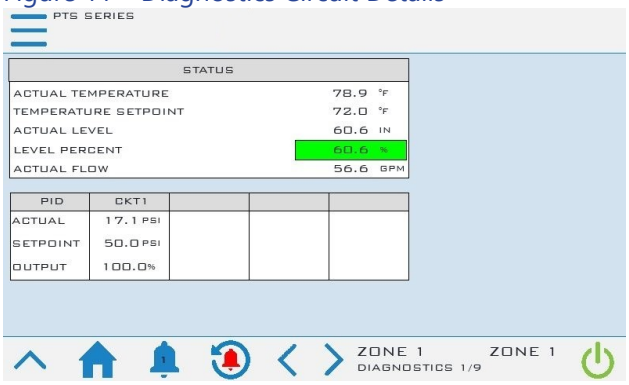


Figure 12 – Diagnostics Circuit Interlock

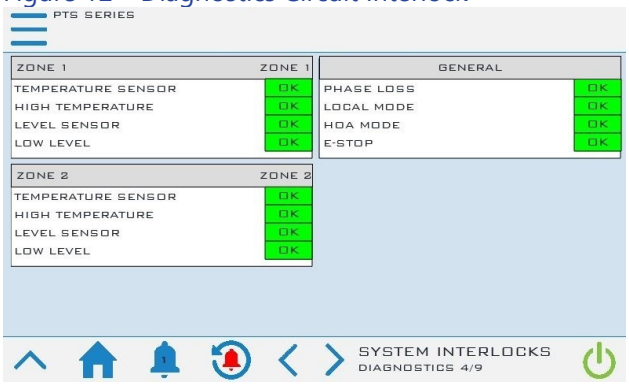


Figure 13 – Diagnostics Pumps

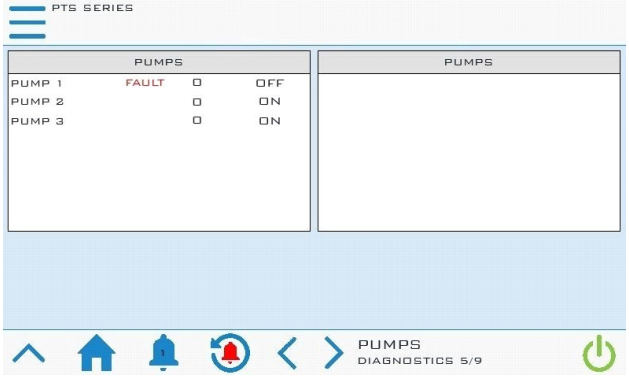


Figure 14 – Diagnostics Fans

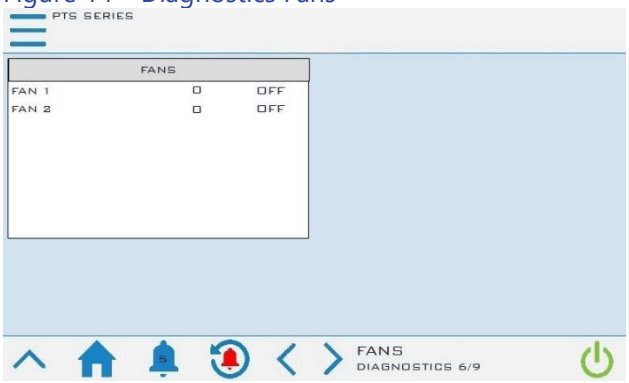


Figure 15 – Diagnostics Hardware

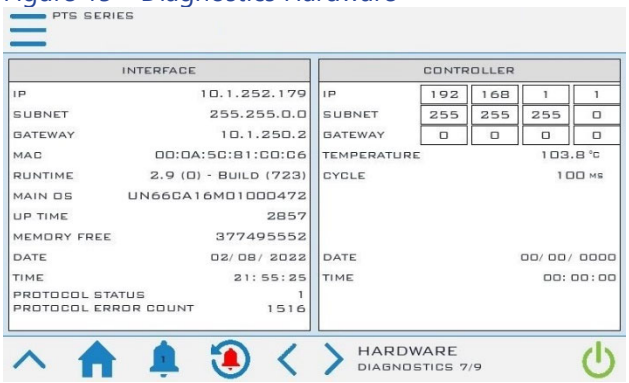


Figure 16 – Diagnostics Import/Export Data

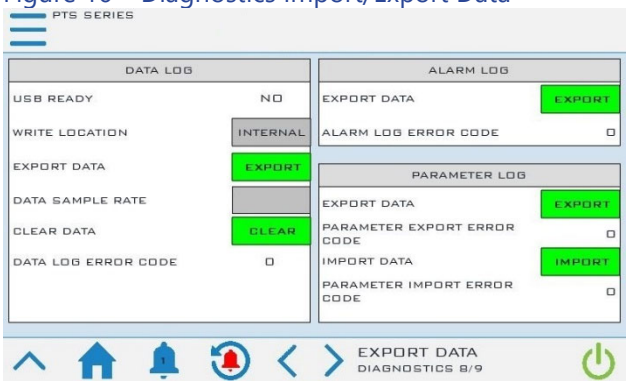


Figure 17 – Free Cooling Static Common Source

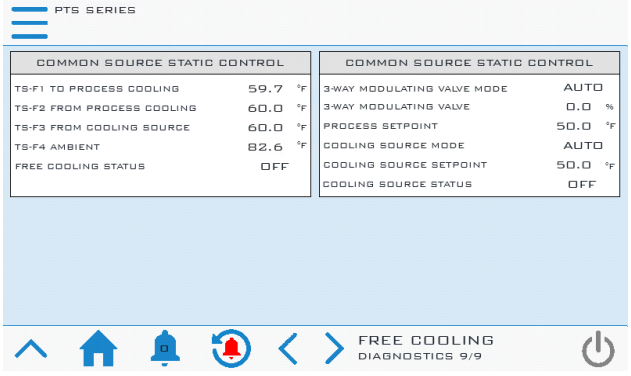


Figure 18 – Free Cooling Static Isolated Source

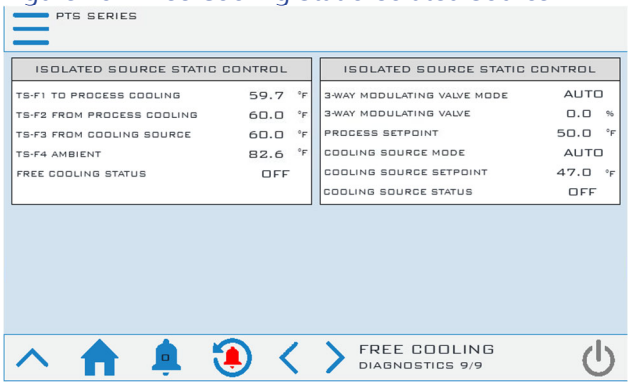
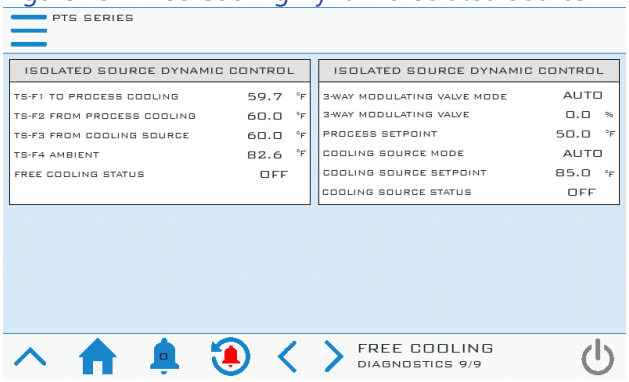


Figure 19 – Free Cooling Dynamic Isolated Source



Menu 1 – Security

Security Menu

To add protection to sensitive areas of the control program and provide a level of supervisory control to some operating parameters, the control system includes security level protections.

Figure 20 – Security Menu

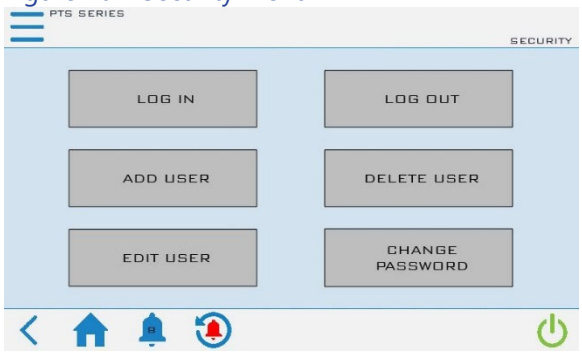


Figure 21 Security – Log In

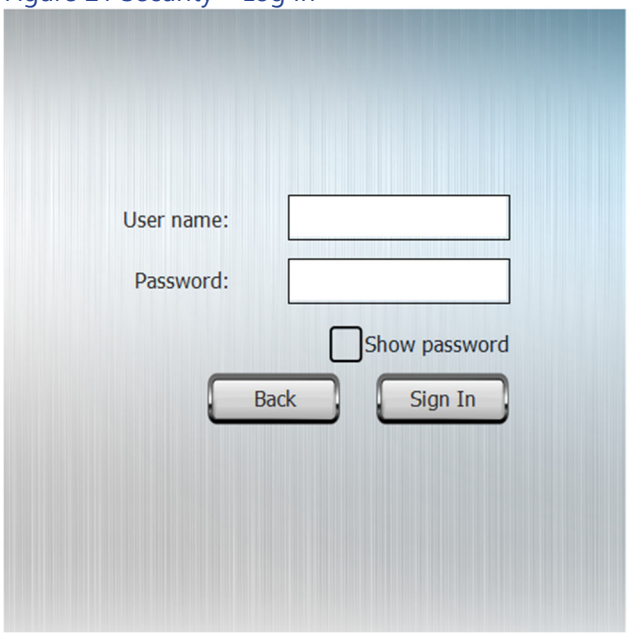


Figure 22 Security – Add User

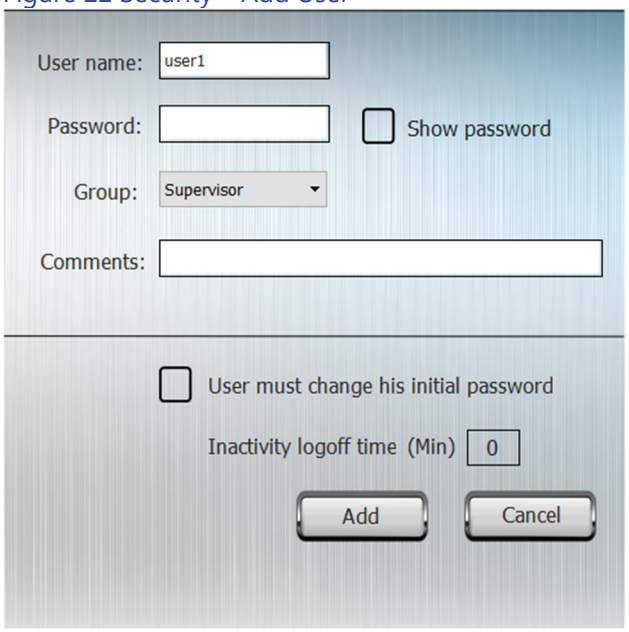


Figure 23 Security – Edit User

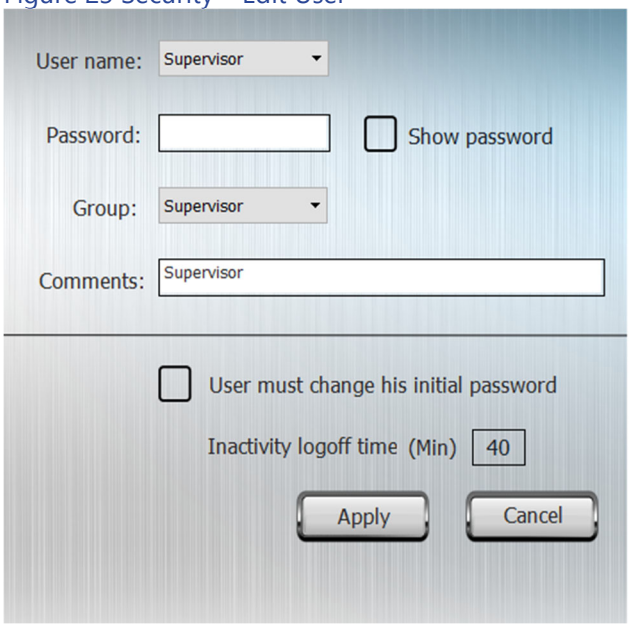


Figure 24 Security – Delete User

Figure 25 Security – Change Password

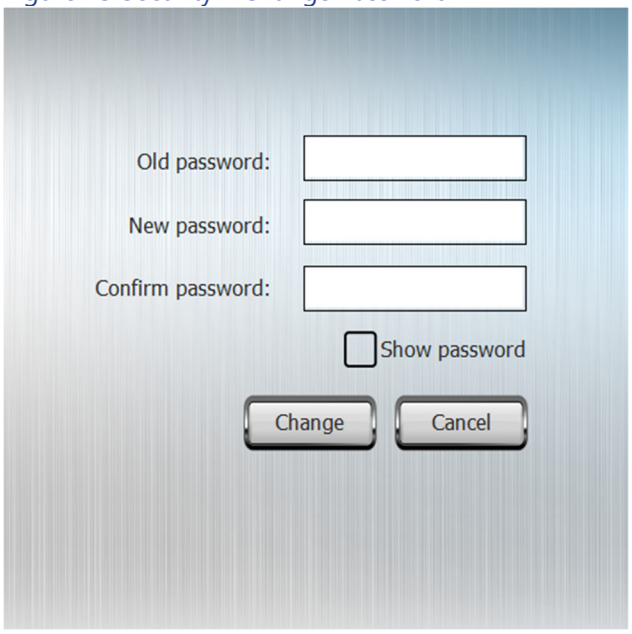


Table 2 Security – Users and Passwords

User Name	Password	Screen Reference
User	9999	None
Supervisor	7720	None
Admin		None

Menu 1 – Inputs / Outputs

The Input / Output screens display the status of the various system inputs and outputs. This provides a detailed level of information for monitoring system operation and for diagnosing any performance issues or alarms that arise.

Figure 26 Main Inputs/Outputs

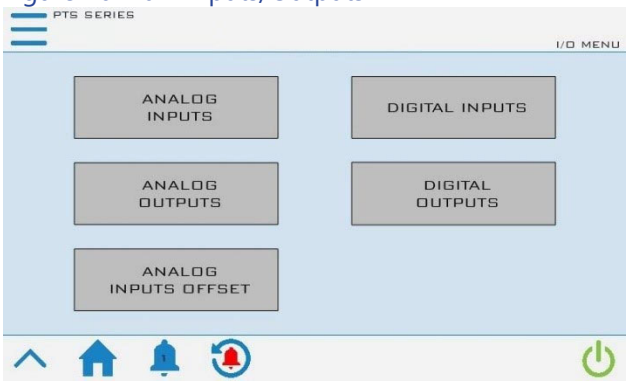


Figure 27 Inputs/Outputs – Temperature Inputs

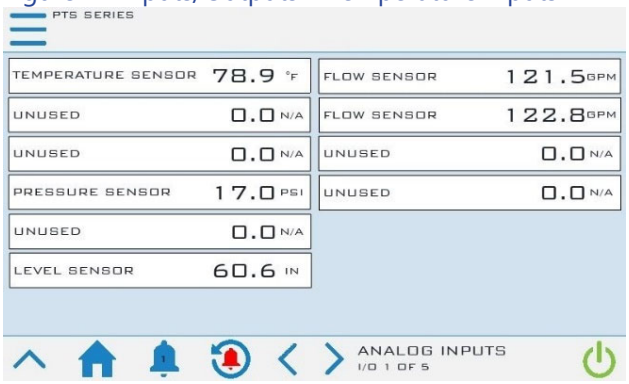


Figure 28 Inputs/Outputs – Pressure Inputs

Figure 29 Inputs/Outputs – Digital Inputs

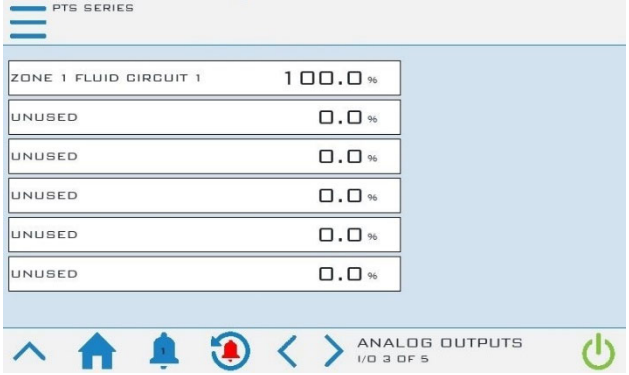


Figure 30 Inputs/Outputs – Analog Outputs

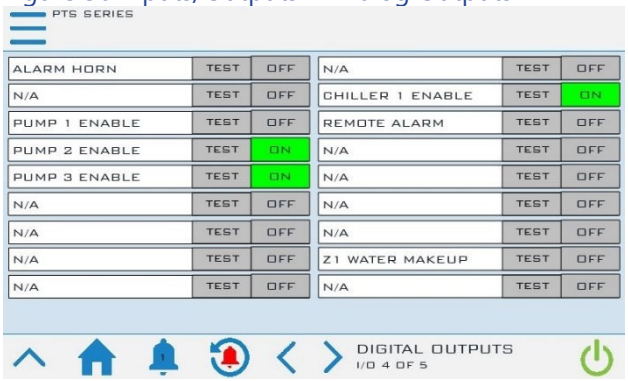
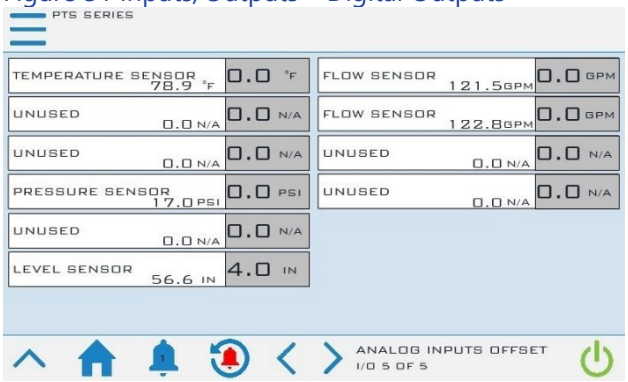


Figure 31 Inputs/Outputs – Digital Outputs



Menu 1 – User Setup

The control system allows for customization and adjustment of many parameters. In most cases, the factory default settings are sufficient; however, adjustment of parameters and settings is possible through the User Setup menus.

Figure 32 User Setup - Menu 1

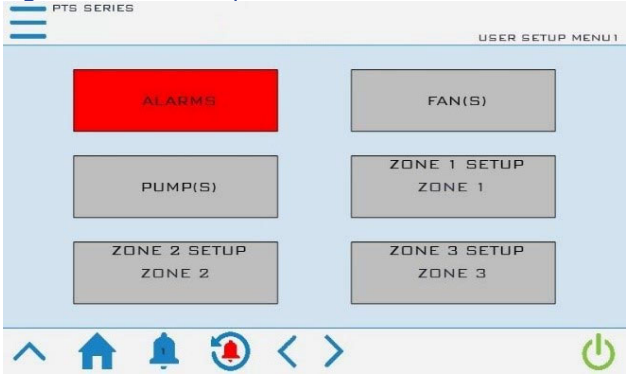


Figure 33 User Setup - Menu 2

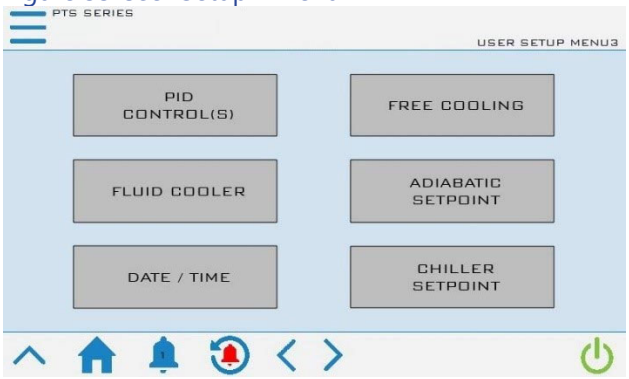


Figure 34 User Setup - Menu 3

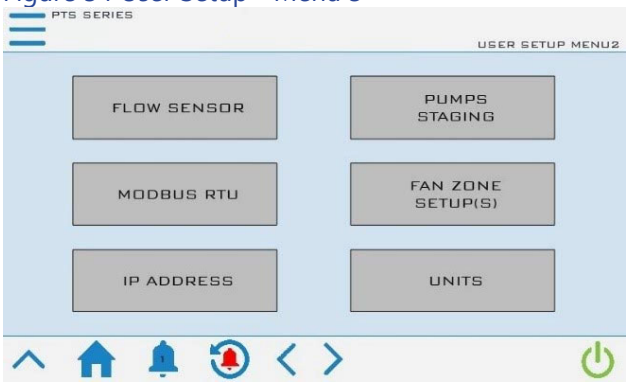
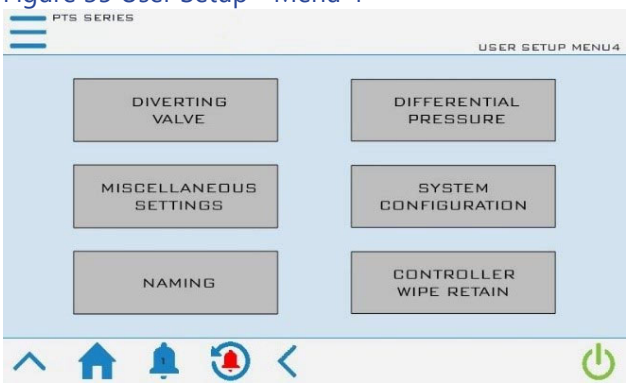


Figure 35 User Setup - Menu 4



User Setup – Alarm Setup

Figure 36 User Setup - Alarm Setup

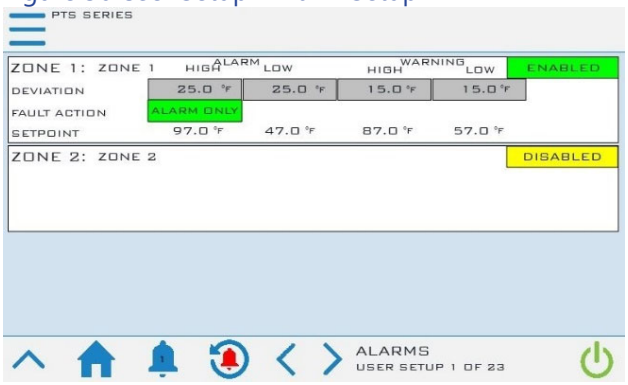


Table 7 – Alarm Setup Parameters

Menu Item	Description	Default Value
Deviation	This deviation determines the warning trigger above chiller setpoint	Supply 10.0°F Return 50.0°F
Setpoint	Displays the calculated setpoint for the high/low alarm/warning based on the deviation setpoint	
Fault Action	Action takes when high/low temp alarm occurs	Alarm & Shutdown

User Setup – Hot Gas Bypass

Figure 37 User Setup – Hot Gas Bypass Setup

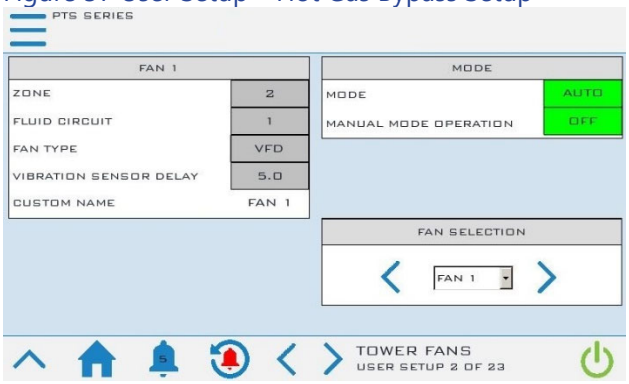


Table 4 – Tower Fan Setup Parameters

Menu Item	Description	Default Value
Mode	AUTOMATIC: Allows for automatic timer enable of the pumps. MANUAL: Requires manual enable of the pumps.	MANUAL
Manual Mode Operation	Fan operation in manual mode	OFF
Zone	Zone designation for tower fan between 1 and 3.	1
Fluid Circuit	Fluid circuit designation for zone between 1 and 4.	1
Pump Starter Type	NON-VFD: Contactor or Soft-Starter used for the pump. VFD: VFD is used for the pump.	VFD
Vibration Sensor	Vibration sensor should be enabled if exists in the system.	Disabled
Vibration Sensor Delay(Sec)	Vibration sensor delay until fault occurs given vibration sensor is enabled.	0
Fan Selection	Changes to next pump screen.	

User Setup – Pump Control

Pump Control Screen

This screen displays pertinent pump status information for a system with the optional integral pump controls and provides the ability to change mode selection.

Figure 38 User Setup – Pumps Screen (Primary)

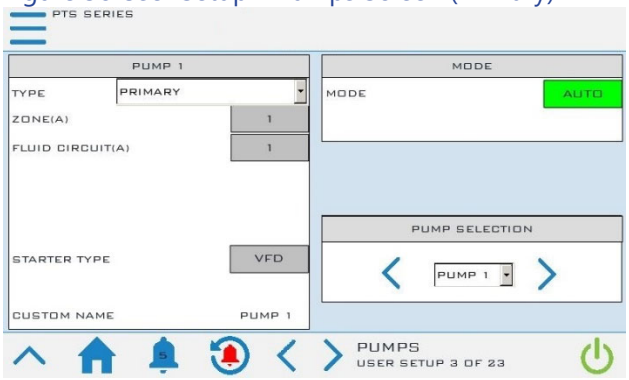


Figure 39 User Setup – Pumps Screen (Dual Standby)

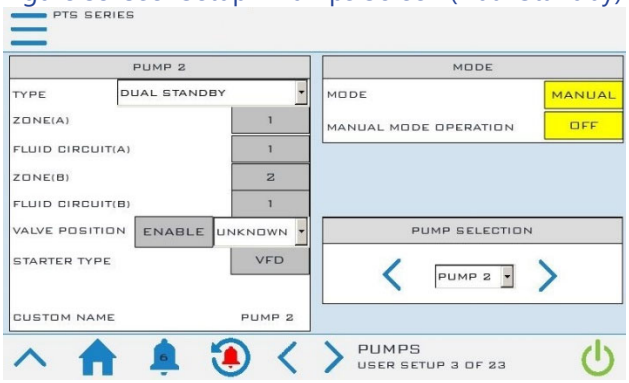


Table 5 – Pump Setup Parameters

Menu Item	Description	Default Value
Pump Mode	AUTOMATIC: allows for automatic timer enable of the pumps. MANUAL: Requires manual enable of the pumps.	MANUAL
Manual Mode Operation	Pump operation in manual mode	OFF
Pump Name	Allows for customization of the pump name.	Pump xx
Pump Type	PRIMARY: Pump will act as primary pump in the chosen Zone (A) and Circuit (A) DEDICATED STANDBY: Pump will act as a dedicated standby pump in the chosen Zone (A) and Circuit (A) DUAL STANDBY: Pump will act as a dual standby pump between chosen Zone (A), Circuit (A) and Zone (B), Circuit (B)	Primary
Pump Zone (A)	Zone designation for the pump between 1 and 3.	1
Pump Fluid Circuit (A)	Fluid circuit designation for Zone (A) between 1 and 4.	1
Pump Zone (B)	If Dual Standby, secondary zone designation between 1 and 3.	2
Pump Fluid Circuit (B)	If Dual Standby, fluid circuit designation between 1 and 4 for Zone (B).	1
Pump Valve Position	UNKNOWN: Valve is disabled A: Dual standby pump valve is position to run as Zone (A), Circuit (A). B: Dual standby pump valve is position to run as Zone (B), Circuit (B).	Unknown
Pump Starter Type	NON-VFD: Contactor or Soft-Starter used for the pump. VFD: VFD is used for the pump.	VFD
Pump Custom Name	Click to change pump name.	Pump xx
Pump Selection	Changes to next pump screen.	

User Setup – Zone Setup

This screen provides zone related information for tank level and makeup.

Figure 40 User Setup – Zone 1

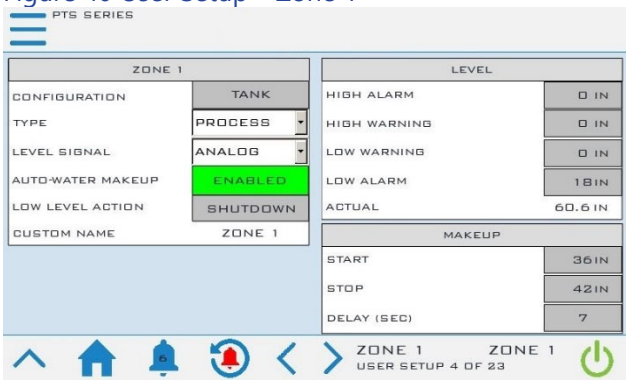


Table 6 – Zone Setup

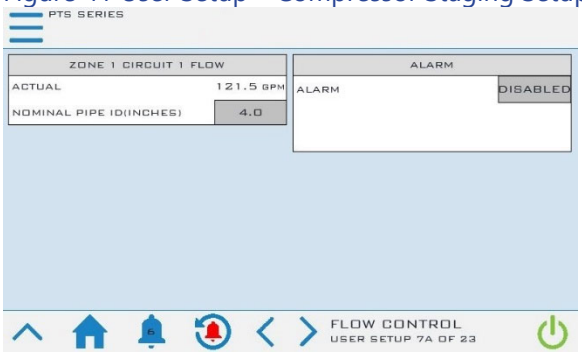
Function	Description	Default Value
Zone Configuration	Enables level sensor when "Tank" is selected, disables sensor when "Deck" is selected.	Tank
Zone Type	Designates if the zone is for process, chiller, or tower.	Process
Zone Auto-Water Makeup	Enables or disables make-up valve function.	Disabled
Zone Level Enable	Enables or disables zone level alarm.	Disabled
Zone Level Signal	Sets zone level sensor type to either digital or analog.	Analog
Zone Low Level Action	Sets alarm action to alarm only or system shutdown.	Alarm
MakeUp Fault Delay (Sec)	Time delay until Makeup fault occurs	7 seconds
Analog Function	**Description**	**Default Value**
Zone Level – High Alarm SP	High level alarm trigger setpoint for Analog sensor.	0 inches
Zone Level – High Warning SP	High level warning trigger setpoint for Analog sensor.	0 inches
Zone Level – Low Alarm SP	Low level alarm trigger setpoint for Analog sensor.	0 inches
Zone Level – Low Warning SP	Low level warning trigger setpoint for Analog sensor.	0 inches
Zone Makeup Start Setpoint	Setpoint trigger to start makeup	0
Zone Makeup Stop Setpoint	Setpoint trigger to stop makeup	0

Table 6 – Zone Setup(continued)

Digital Function	Description	Default Value
Zone High Level Alarm	High level alarm will trigger if enabled and sensor is energized for 7 seconds.	Disabled
Zone High Level Warning	High level warning will trigger if enabled and sensor is energized for 7 seconds.	Disabled
Zone Low Level Alarm	Low level alarm will trigger if enabled and sensor is de-energized for 7 seconds.	Disabled
Zone Low Level Warning	Low level alarm will trigger if enabled and sensor is de-energized for 7 seconds.	Disabled
Zone Makeup Start	If Makeup Start is enabled and the sensor has been off for over 7 seconds, the water makeup valve will energize.	Disabled
Zone Makeup Stop	If Makeup Stop is enabled and the sensor has activated, the water makeup valve will de-energize.	Disabled

User Setup – Flow Control

Figure 41 User Setup – Compressor Staging Setup



User Setup – Staging

This screen displays available pump staging options for secondary pumps, zone staging order, and stage on/off time delays in seconds. Your screen may differ depending on the number of zones in the system.

Figure 42 User Setup – Stage Order Setup

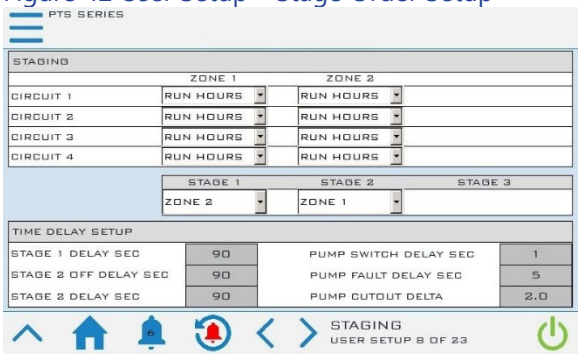


Table 7 – Staging Parameters

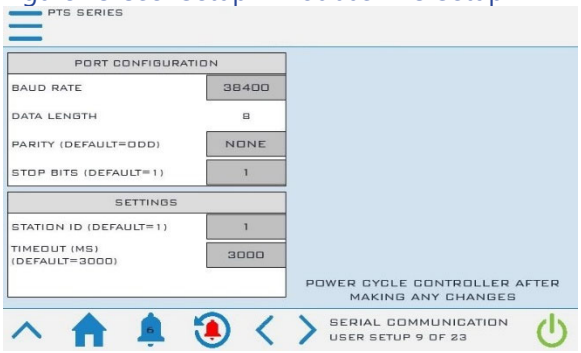
Menu Item	Description	Default Value
Zone 1-3 Circuit 1-4	MANUAL: user manually has to change pump configurations. FIFO: first in first out order is used to rotate secondary pumps. RUN HOURS: secondary pumps are rotated based on run time hours.	MANUAL
Stage 1-Stage 3	Selectable list of zone 1 to zone 3 to stage first, second, and third.	N/A
Pump Switch Delay(sec)	Delay in seconds between pump switches from one pump to another.	1 second
Pumps Fault Delay(sec)	Delay in seconds until pump fault occurs.	3 seconds
Stage 1 Delay (sec)	Stage 1 delay occurs before stage 2 zone is able to turn on.	120 seconds
Stage 2 Delay (sec)	Stage 2 delay occurs before stage 3 zone is able to turn on.	120 seconds
Stage 2 Off Delay (sec)	Stage 2 zone off delay occurs when system is in shut down mode.	120 seconds
P2ByOthers	When enabled, system will wait for feedback from chiller to turn on zone 2 pumps.	Disabled

User Setup – Serial Communications Setup

Modbus RTU Setup Screen

This Modbus RTU Setup Screen provides the ability to modify communication parameters. Default Modbus RTU Settings: Baud-57600, Data Length-8, Parity-Odd, Stop Bits-1.

Figure 43 User Setup – Modbus RTU Setup



User Setup – Fan Zone Setup

This screen shows selectable zone and circuit for up to three different tower zone PID controls. Optional VFD control, tower zone, and circuit control parameters.

Figure 44 User Setup – Tower Configuration

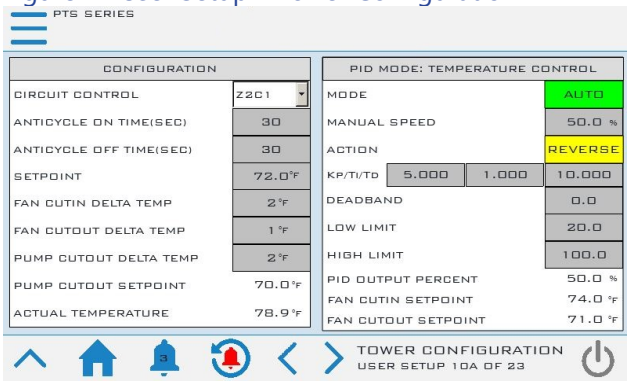
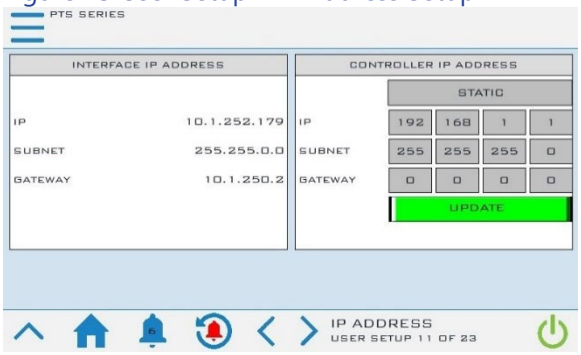


Table 8 – Zone X Fluid Circuit X Control

Function	Description	Default Value
Tower 1 Control Circuit	Tower fan control can be assigned to any zone (1-3) and any circuit (1-4).	N/A
PID Mode	DISABLED: PID is disabled for the zone x fluid circuit x. FIXED PRESSURE: pressure transducer input used to control VFD speed. DIFFERENTIAL PRESSURE: differential pressure transducer input used to control VFD speed. FLOW CONTROL: flow sensor input used to control VFD speed. TEMPERATURE CONTROL: temperature sensor input used to control VFD speed to achieve temperature setpoint.	Disabled
Mode	AUTO: PID in auto mode MANUAL: PID in manual mode	AUTO
Manual Speed	Will stay at this speed if PID mode was set to MANUAL.	50
PID low limit	Lowest output limit for the PID	0
PID High Limit	Highest output limit for the PID	100
Anticycle on time	Fan minimum run time	0 second
Anticycle off time	Fan minimum off time	0 second
PID Setpoint	Setpoint value for running PID in Auto	50
CutIn Delta Temp	Offset temperature above setpoint to start tower fans.	3
CutOut Delta Temp	Offset temperature below setpoint to stop tower fans.	2
Pump Cutout Delta Temp	Offset temperature above setpoint to start tower pumps.	2.0 F
Analog Sensor	Name will change according to the selected sensor and displays input value.	
PID Output	PID output to the VFD in 0-100%	
Temperature Setpoint (F)	Temperature setpoint to drive the PID for the system.	68 F
PID Kp	Proportional PID value	5
PID Ti	Integral PID value	100
PID Td	Derivative PID value	5
PID Deadband	Deadband for the PID	0.00

User Setup – IP Address

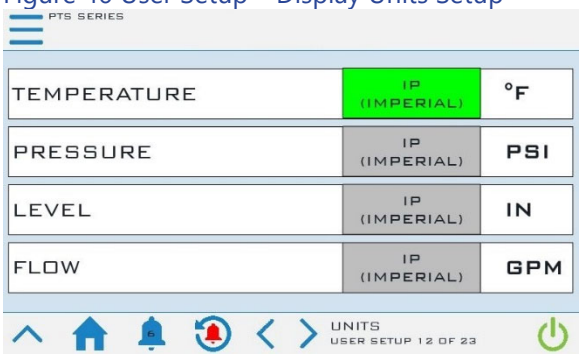
Figure 45 User Setup – IP Address Setup



User Setup – Units

Imperial or Metric units can be selected directly from this screen. Touch the UNITS button to toggle the selection between Imperial or Metric units for temperature, pressure, tank level, and flow.

Figure 46 User Setup – Display Units Setup



User Setup – PID Controls

Fluid Circuit Controls

Fluid circuit related parameters are adjustable on this screen.

Figure 47 User Setup – Zone X Fluid Circuit X Control

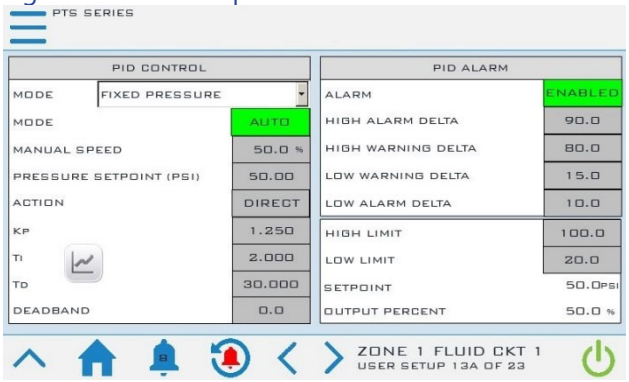


Table 9 – Zone X Fluid Circuit X Control

Function	Description	Default Value
PID Mode	DISABLED: PID is disabled for the zone x fluid circuit x. FIXED PRESSURE: pressure transducer input used to control VFD speed. DIFFERENTIAL PRESSURE: differential pressure transducer input used to control VFD speed. FLOW CONTROL: flow sensor input used to control VFD speed. TEMPERATURE CONTROL: temperature sensor input used to control VFD speed to achieve setpoint.	Disabled
Mode	AUTO: PID in auto mode MANUAL: PID in manual mode	AUTO
Manual Speed	Will stay at this speed if PID mode was set to MANUAL.	50
PID low limit	Lowest output limit for the PID	0
PID High Limit	Highest output limit for the PID	100
PID Setpoint	Setpoint value for running PID in Auto	50
PID Kp	Proportional PID value	1
PID Ti	Integral PID value	100
PID Td	Derivative PID value	1
PID Deadband	Deadband for the PID	0
PID Action	Sets action to reverse (increase in error/decrease in output) or direct (increase in error, increase in output)	Direct
Fluid Circuit Mode	Sets VFD control to manual or PID mode	Manual
Analog Sensor	Name will change according to the selected sensor and displays input value.	
PID Output	PID output to the VFD in 0-100%	
Alarm	Enables or disables high/low alarms for PID	Disabled
High Alarm Delta	User adjustable delta for PID high alarm	
High Warning Delta	User adjustable delta for PID high warning	
Low Warning Delta	User adjustable delta for PID low warning	
Low Alarm Delta	User adjustable delta for PID low alarm	

User Setup – Free Cooler

The free cooling source may be dedicated to free cooling with static control or could be the primary cooling source with dynamic control that changes based on the outdoor air temperature.

Figure 48 User Setup – Free Cooling Static Common Source

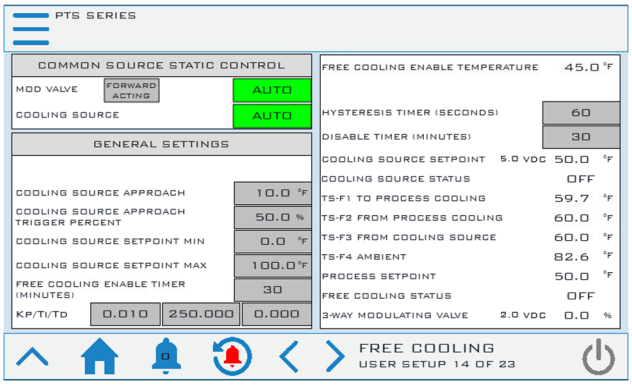


Figure 49 User Setup – Free Cooling Static Isolated Source

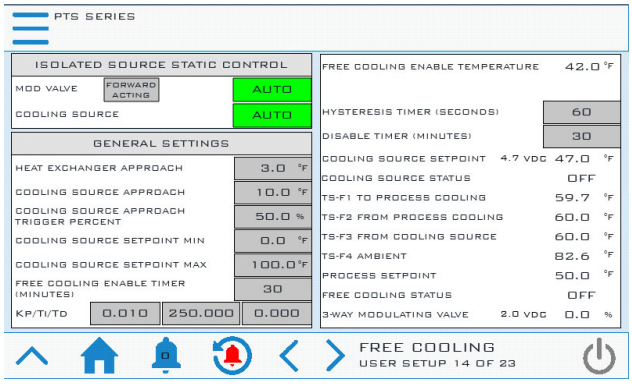
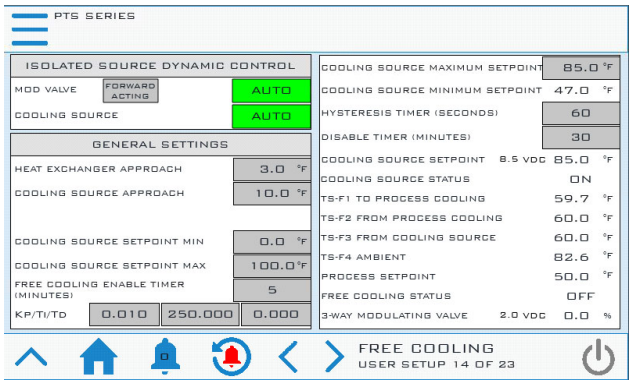


Figure 50 User Setup – Free Cooling Dynamic Isolated Source



User Setup – Fluid Cooler

Fluid Cooler Screen

When the fluid cooler is to be staged based on ambient temperature, or a pump located in a zone and a circuit, the fluid cooler control will be active as shown in figures below.

Figure 51 User Setup – Fluid Cooler Ambient Control

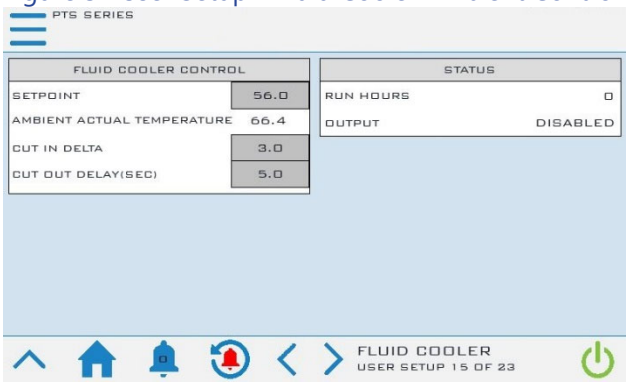
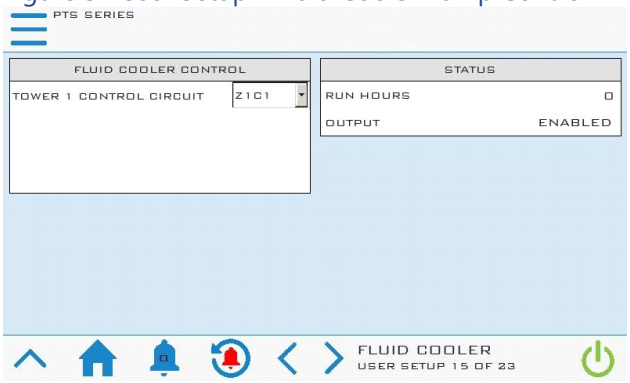


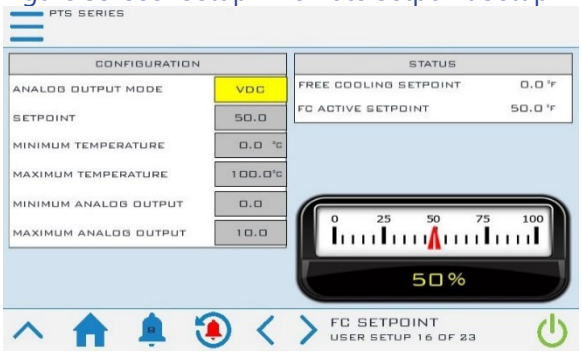
Figure 52 User Setup – Fluid Cooler Pump Control



User Setup – Remote Setpoint

When the fluid cooler setpoint option is active, the analog output signal can be adjusted by the FLUID COOLER SETPOINT. MINIMUM SETPOINT to the MAXIMUM SETPOINT are used as scaling for the current/voltage scale defined by SETPOINT VDC/mA MINIMUM to the SETPOINT VDC/mA MAXIMUM as shown.

Figure 53 User Setup – Remote Setpoint Setup

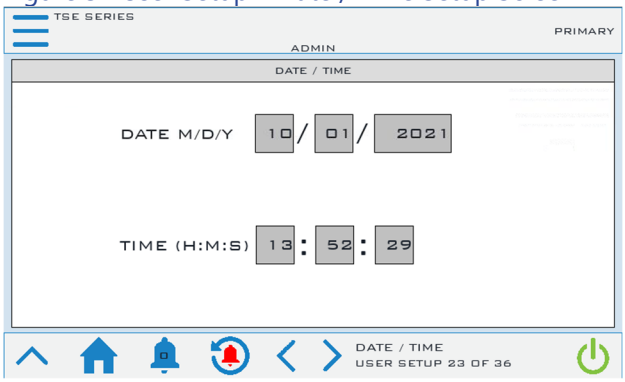


User Setup – Date/Time

Date/Time Screen

Date and Time is necessary for accurate data logging as well as fault log time stamps. Touch the fields for adjustment.

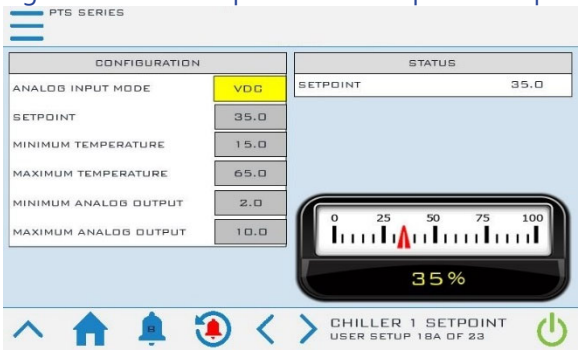
Figure 54 User Setup – Date / Time Setup Screen



User Setup – Chiller Setpoint

When the chiller setpoint option is active, 4- 20mA output signal will be adjusted by the CHILLER SETPOINT PERCENT. MINIMUM SETPOINT to the MAXIMUM SETPOINT is used as scaling for the current as defined below.

Figure 55 User Setup – Remote Setpoint Setup

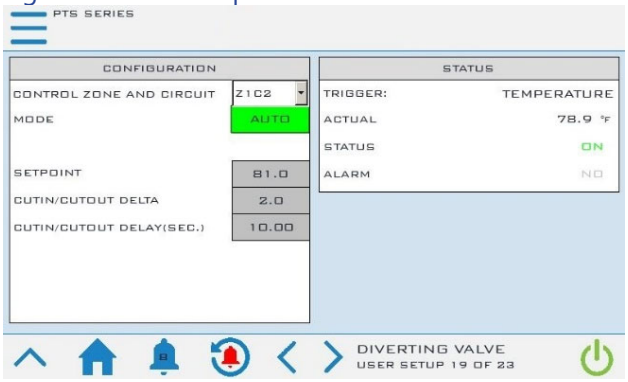


User Setup – Diverting Valve

Valve Screen

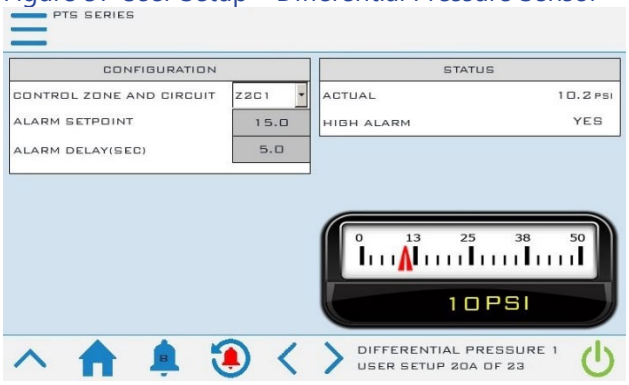
The Diverting Valve will energize when the setpoint is greater than chosen TRIGGER analog sensor's value shown below.

Figure 56 User Setup – Valve



User Setup – Differential Pressure

Figure 57 User Setup – Differential Pressure Sensor



User Setup – Digital E-STOP

Digital E-stop for the pump tank system can be changed to normally open or normally closed.

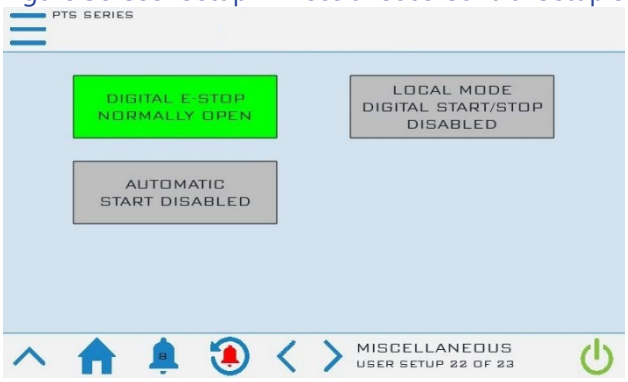
User Setup – Miscellaneous Local Mode

The Local/Remote Mode toggle indicates if the pump tank is set to use a remote contact closure for remote start/stop. When active, the Local Mode toggle will indicate Local mode Digital Start/Stop Enabled and when not active it will indicate Local Mode Digital Start/Stop Disabled.

User Setup – Miscellaneous Automatic Start

The Automatic Start toggle indicates if the pump tank is set to automatically start if a power outage has occurred during a run state. When active, the Automatic Start toggle will indicate Automatic Start Enabled and when not active it will indicate Automatic Start Disabled.

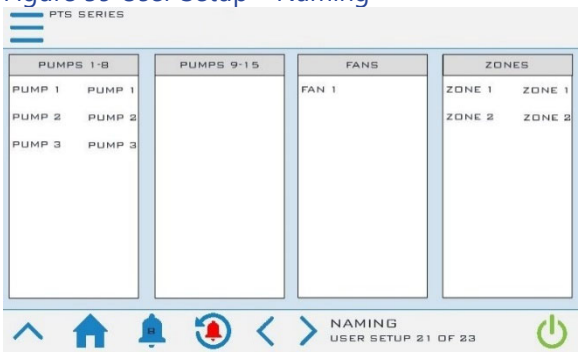
Figure 58 User Setup – Miscelaneous Control Setup S



User Setup – Naming

This screen displays user adjustable names up to seven characters long for up to 15 pumps, up to 8 fans and 3 different zones.

Figure 59 User Setup – Naming



Menu 1 – Trending

The Trending Screen displays the actual temperature for zone 1, zone 2, and zone 3 if per zone has temperature sensor. Trending is always enabled and always running.

Figure 60 System Trending 1

Modbus Registers Version 2.3

For PTS software version 6.003 and higher

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
00000	Bool	OnOffUnitMng.BmsOnOff	Bit	R/W	Unit On/Off by BMS
00001	Bool	Ethernet.IP_DHCP	Bit	R/W	IP DHCP
00002	Bool	Ethernet.Save_IP_Address	Bit	R/W	Save Ip address
00003	Bool	AlarmMng.AlrmResByBms	Bit	R/W	Alarm reset by BMS
00004	Bool	FlowUofMHMI	Bit	R/W	0 = Imperial, 1 = Metric UoM zone for mask visualization
00005	Bool	LevelUofMHMI	Bit	R/W	0 = Imperial, 1 = Metric UoM zone for mask visualization
00006	Bool	PressureUofMHMI	Bit	R/W	0 = Imperial, 1 = Metric UoM zone for mask visualization
00007	Bool	Horn_Silence	Bit	R/W	0 = Off, 1 = On
00008	Bool	Emergency_Stop_HMI	Bit	R/W	0 = Emergency Stop from HMI Inactive, 1 = Emergency Stop from HMI Active
00009	Bool	Local_Remote_Sel_HMI	Bit	R/W	0 = Local Mode, 1 = Remote Mode
00010	Bool	PumpInfo[1].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00011	Bool	PumpInfo[1].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00012	Bool	PumpInfo[2].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00013	Bool	PumpInfo[2].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00014	Bool	PumpInfo[3].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00015	Bool	PumpInfo[3].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00016	Bool	PumpInfo[4].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00017	Bool	PumpInfo[4].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00018	Bool	PumpInfo[5].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00019	Bool	PumpInfo[5].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00020	Bool	PumpInfo[6].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00021	Bool	PumpInfo[6].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00022	Bool	PumpInfo[7].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00023	Bool	PumpInfo[7].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00024	Bool	PumpInfo[8].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00025	Bool	PumpInfo[8].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00026	Bool	PumpInfo[9].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00027	Bool	PumpInfo[9].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00028	Bool	PumpInfo[10].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00029	Bool	PumpInfo[10].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00030	Bool	PumpInfo[11].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00031	Bool	PumpInfo[11].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00032	Bool	PumpInfo[12].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00033	Bool	PumpInfo[12].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00034	Bool	PumpInfo[13].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00035	Bool	PumpInfo[13].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
00036	Bool	PumpInfo[14].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00037	Bool	PumpInfo[14].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00038	Bool	PumpInfo[15].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00039	Bool	PumpInfo[15].StarterType	Bit	R/W	0= Non-VFD , 1 = VFD
00040	Bool	Pump1_Auto	Bit	R/W	0 = Manual, 1 = Auto
00041	Bool	Pump2_Auto	Bit	R/W	0 = Manual, 1 = Auto
00042	Bool	Pump3_Auto	Bit	R/W	0 = Manual, 1 = Auto
00043	Bool	Pump4_Auto	Bit	R/W	0 = Manual, 1 = Auto
00044	Bool	Pump5_Auto	Bit	R/W	0 = Manual, 1 = Auto
00045	Bool	Pump6_Auto	Bit	R/W	0 = Manual, 1 = Auto
00046	Bool	Pump7_Auto	Bit	R/W	0 = Manual, 1 = Auto
00047	Bool	Pump8_Auto	Bit	R/W	0 = Manual, 1 = Auto
00048	Bool	Pump9_Auto	Bit	R/W	0 = Manual, 1 = Auto
00049	Bool	Pump10_Auto	Bit	R/W	0 = Manual, 1 = Auto
00050	Bool	Pump11_Auto	Bit	R/W	0 = Manual, 1 = Auto
00051	Bool	Pump12_Auto	Bit	R/W	0 = Manual, 1 = Auto
00052	Bool	Pump13_Auto	Bit	R/W	0 = Manual, 1 = Auto
00053	Bool	Pump14_Auto	Bit	R/W	0 = Manual, 1 = Auto
00054	Bool	Pump15_Auto	Bit	R/W	0 = Manual, 1 = Auto
00055	Bool	Tower_Fan_Conf[1].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00056	Bool	Tower_Fan_Conf[1].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00057	Bool	Tower_Fan_Conf[2].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00058	Bool	Tower_Fan_Conf[2].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00059	Bool	Tower_Fan_Conf[3].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00060	Bool	Tower_Fan_Conf[3].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00061	Bool	Tower_Fan_Conf[4].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00062	Bool	Tower_Fan_Conf[4].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00063	Bool	Tower_Fan_Conf[5].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00064	Bool	Tower_Fan_Conf[5].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00065	Bool	Tower_Fan_Conf[6].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00066	Bool	Tower_Fan_Conf[6].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00067	Bool	Tower_Fan_Conf[7].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00068	Bool	Tower_Fan_Conf[7].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00069	Bool	Tower_Fan_Conf[8].Enabled	Bit	R/W	0 = Not Present, 1 = Enabled
00070	Bool	Tower_Fan_Conf[8].Starter_Type	Bit	R/W	0= Non-VFD , 1 = VFD
00071	Bool	Fan1_Auto	Bit	R/W	0 = Manual, 1 = Auto
00072	Bool	Fan2_Auto	Bit	R/W	0 = Manual, 1 = Auto
00073	Bool	Fan3_Auto	Bit	R/W	0 = Manual, 1 = Auto
00074	Bool	Fan4_Auto	Bit	R/W	0 = Manual, 1 = Auto
00075	Bool	Fan5_Auto	Bit	R/W	0 = Manual, 1 = Auto
00076	Bool	Fan6_Auto	Bit	R/W	0 = Manual, 1 = Auto
00077	Bool	Fan7_Auto	Bit	R/W	0 = Manual, 1 = Auto
00078	Bool	Fan8_Auto	Bit	R/W	0 = Manual, 1 = Auto

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
00079	Bool	Pump01_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00080	Bool	Pump02_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00081	Bool	Pump03_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00082	Bool	Pump04_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00083	Bool	Pump05_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00084	Bool	Pump06_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00085	Bool	Pump07_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00086	Bool	Pump08_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00087	Bool	Pump09_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00088	Bool	Pump10_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00089	Bool	Pump11_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00090	Bool	Pump12_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00091	Bool	Pump13_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00092	Bool	Pump14_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00093	Bool	Pump15_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00094	Bool	Fan1_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00095	Bool	Fan2_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00096	Bool	Fan3_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00097	Bool	Fan4_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00098	Bool	Fan5_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00099	Bool	Fan6_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00100	Bool	Fan7_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00101	Bool	Fan8_Start_Stop_HMI	Bit	R/W	0 = Stop, 1 = Start
00102	Bool	Chiller_Enable_1_Auto	Bit	R/W	0 = Manual, 1 = Auto
00103	Bool	Chiller_Enable_1_Manual_On	Bit	R/W	0 = Stop, 1 = Start
00104	Bool	Chiller_Enable_2_Auto	Bit	R/W	0 = Manual, 1 = Auto
00105	Bool	Chiller_Enable_2_Manual_On	Bit	R/W	0 = Stop, 1 = Start
00106	Bool	Chiller_Enable_3_Auto	Bit	R/W	0 = Manual, 1 = Auto
00107	Bool	Chiller_Enable_3_Manual_On	Bit	R/W	0 = Stop, 1 = Start
00108	Bool	Chiller_Enable_4_Auto	Bit	R/W	0 = Manual, 1 = Auto
00109	Bool	Chiller_Enable_4_Manual_On	Bit	R/W	0 = Stop, 1 = Start
10000	Bool	Pump1_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10001	Bool	Pump2_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10002	Bool	Pump3_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10003	Bool	Pump4_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10004	Bool	Pump5_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10005	Bool	Pump6_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10006	Bool	Pump7_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10007	Bool	Pump8_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10008	Bool	Pump9_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10009	Bool	Pump10_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10010	Bool	Pump11_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10011	Bool	Pump12_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
10012	Bool	Pump13_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10013	Bool	Pump14_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10014	Bool	Pump15_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10015	Bool	Fan1_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10016	Bool	Fan2_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10017	Bool	Fan3_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10018	Bool	Fan4_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10019	Bool	Fan5_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10020	Bool	Fan6_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10021	Bool	Fan7_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10022	Bool	Fan8_Call_To_Run	Bit	R	Digital Output: 0 = Off, 1 - On
10023	Bool	Zone1MakeUpValve	Bit	R	Digital output: 0 = Off, 1 = On
10024	Bool	Zone2MakeUpValve	Bit	R	Digital output: 0 = Off, 1 = On
10025	Bool	Zone3MakeUpValve	Bit	R	Digital output: 0 = Off, 1 = On
10026	Bool	CP2_Enable_DI	Bit	R	Chiller Enable Input. 0 = Off, 1 = On
10027	Bool	CP2_Enable_DI_2	Bit	R	Chiller Enable Input. 0 = Off, 1 = On
10028	Bool	CP2_Enable_DI_3	Bit	R	Chiller Enable Input. 0 = Off, 1 = On
10029	Bool	CP2_Enable_DI_4	Bit	R	Chiller Enable Input. 0 = Off, 1 = On
10030	Bool	Chiller_Status_DI	Bit	R	Chiller Status Input. 0 = Ok, 1 = Fault
10031	Bool	Chiller_Status_DI_2	Bit	R	Chiller Status Input. 0 = Ok, 1 = Fault
10032	Bool	Chiller_Status_DI_3	Bit	R	Chiller Status Input. 0 = Ok, 1 = Fault
10033	Bool	Chiller_Status_DI_4	Bit	R	Chiller Status Input. 0 = Ok, 1 = Fault
10034	Bool	Chiller_Enable	Bit	R	Digital Output: 0 = Off, 1 - On
10035	Bool	Chiller_Enable_2	Bit	R	Digital Output: 0 = Off, 1 - On
10036	Bool	Chiller_Enable_3	Bit	R	Digital Output: 0 = Off, 1 - On
10037	Bool	Chiller_Enable_4	Bit	R	Digital Output: 0 = Off, 1 - On
10038	Bool	Three_Way_Vlve_Enable	Bit	R	Valve digital output 0 = Off, 1 = On
10039	Bool	FreeCool_Enable	Bit	R	Free Cool Mode: 0 = Off, 1 = On
10040	Bool	CoolingSourceOut	Bit	R	Free Cooling Source digital output 0 = Off, 1 = On
10041	Bool	Al_PmpGroup_PMP_1.Active	Bit	R	Pump 1 Alarm status: 0 = Off, 1 = On
10042	Bool	Al_PmpGroup_PMP_2.Active	Bit	R	Pump 2 Alarm status: 0 = Off, 1 = On
10043	Bool	Al_PmpGroup_PMP_3.Active	Bit	R	Pump 3 Alarm status: 0 = Off, 1 = On
10044	Bool	Al_PmpGroup_PMP_4.Active	Bit	R	Pump 4 Alarm status: 0 = Off, 1 = On
10045	Bool	Al_PmpGroup_PMP_5.Active	Bit	R	Pump 5 Alarm status: 0 = Off, 1 = On
10046	Bool	Al_PmpGroup_PMP_6.Active	Bit	R	Pump 6 Alarm status: 0 = Off, 1 = On
10047	Bool	Al_PmpGroup_PMP_7.Active	Bit	R	Pump 7 Alarm status: 0 = Off, 1 = On
10048	Bool	Al_PmpGroup_PMP_8.Active	Bit	R	Pump 8 Alarm status: 0 = Off, 1 = On
10049	Bool	Al_PmpGroup_PMP_9.Active	Bit	R	Pump 9 Alarm status: 0 = Off, 1 = On
10050	Bool	Al_PmpGroup_PMP_10.Active	Bit	R	Pump 10 Alarm status: 0 = Off, 1 = On
10051	Bool	Al_PmpGroup_PMP_11.Active	Bit	R	Pump 11 Alarm status: 0 = Off, 1 = On
10052	Bool	Al_PmpGroup_PMP_12.Active	Bit	R	Pump 12 Alarm status: 0 = Off, 1 = On
10053	Bool	Al_PmpGroup_PMP_13.Active	Bit	R	Pump 13 Alarm status: 0 = Off, 1 = On
10054	Bool	Al_PmpGroup_PMP_14.Active	Bit	R	Pump 14 Alarm status: 0 = Off, 1 = On

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
10055	Bool	Al_PmpGroup_PMP_15.Active	Bit	R	Pump 15 Alarm status: 0 = Off, 1 = On
10056	Bool	Al_FanGroup_Fan_1.Active	Bit	R	Tower Fan 1 Alarm status: 0 = Off, 1 = On
10057	Bool	Al_FanGroup_Fan_2.Active	Bit	R	Tower Fan 2 Alarm status: 0 = Off, 1 = On
10058	Bool	Al_FanGroup_Fan_3.Active	Bit	R	Tower Fan 3 Alarm status: 0 = Off, 1 = On
10059	Bool	Al_FanGroup_Fan_4.Active	Bit	R	Tower Fan 4 Alarm status: 0 = Off, 1 = On
10060	Bool	Al_FanGroup_Fan_5.Active	Bit	R	Tower Fan 5 Alarm status: 0 = Off, 1 = On
10061	Bool	Al_FanGroup_Fan_6.Active	Bit	R	Tower Fan 6 Alarm status: 0 = Off, 1 = On
10062	Bool	Al_FanGroup_Fan_7.Active	Bit	R	Tower Fan 7 Alarm status: 0 = Off, 1 = On
10063	Bool	Al_FanGroup_Fan_8.Active	Bit	R	Tower Fan 8 Alarm status: 0 = Off, 1 = On
10064	Bool	Al_Fan1_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10065	Bool	Al_Fan2_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10066	Bool	Al_Fan3_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10067	Bool	Al_Fan4_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10068	Bool	Al_Fan5_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10069	Bool	Al_Fan6_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10070	Bool	Al_Fan7_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10071	Bool	Al_Fan8_Vibration.Active	Bit	R	Vibration Switch Alarm Status: 0 = Off, 1 = On
10072	Bool	Al_Phase_Loss.Active	Bit	R	Phase Loss Alarm Status
10073	Bool	Al_Alarms_Present	Bit	R	Active Alarm Status
10074	Bool	Al_Tank_1_HiLvl_Alrm.Active	Bit	R	Zone 1 High Level Alarm
10075	Bool	Al_Tank_1_HiLvl_Warn.Active	Bit	R	Zone 1 High Level Warning
10076	Bool	Al_Tank_1_LoLvl_Alrm.Active	Bit	R	Zone 1 Low Level Alarm
10077	Bool	Al_Tank_1_LoLvl_ Warn.Active	Bit	R	Zone 1 Low Level Warning
10078	Bool	Al_Tank_2_HiLvl_Alrm.Active	Bit	R	Zone 2 High Level Alarm
10079	Bool	Al_Tank_2_HiLvl_Warn.Active	Bit	R	Zone 2 High Level Warning
10080	Bool	Al_Tank_2_LoLvl_Alrm.Active	Bit	R	Zone 2 Low Level Alarm
10081	Bool	Al_Tank_2_LoLvl_ Warn.Active	Bit	R	Zone 2 Low Level Warning
10082	Bool	Al_Tank_3_HiLvl_Alrm.Active	Bit	R	Zone 3 High Level Alarm
10083	Bool	Al_Tank_3_HiLvl_Warn.Active	Bit	R	Zone 3 High Level Warning
10084	Bool	Al_Tank_3_LoLvl_Alrm.Active	Bit	R	Zone 3 Low Level Alarm
10085	Bool	Al_Tank_3_LoLvl_ Warn.Active	Bit	R	Zone 3 Low Level Warning
10086	Bool	Al_Zone1_Level_Flt.Active	Bit	R	Zone 1 Level Sensor Fault Status
10087	Bool	Al_Zone2_Level_Flt.Active	Bit	R	Zone 2 Level Sensor Fault Status
10088	Bool	Al_Zone3_Level_Flt.Active	Bit	R	Zone 3 Level Sensor Fault Status
10089	Bool	Al_Zone1_Makeup_Flt.Active	Bit	R	Zone 1 Liquid MakeUp Fault
10090	Bool	Al_Zone2_Makeup_Flt.Active	Bit	R	Zone 2 Liquid MakeUp Fault
10091	Bool	Al_Zone3_Makeup_Flt.Active	Bit	R	Zone 3 Liquid MakeUp Fault
10092	Bool	Al_Tank_1_HiTmp_Alrm.Active	Bit	R	Zone 1 High Temperature Alarm
10093	Bool	Al_Tank_1_HiTmp_Warn.Active	Bit	R	Zone 1 High Temperature Warning
10094	Bool	Al_Tank_1_LoTmp_Alrm.Active	Bit	R	Zone 1 Low Temperature Alarm
10095	Bool	Al_Tank_1_LoTmp_Warn.Active	Bit	R	Zone 1 Low Temperature Warning
10096	Bool	Al_Tank_2_LoTmp_Alrm.Active	Bit	R	Zone 2 High Temperature Alarm
10097	Bool	Al_Tank_2_LoTmp_Warn.Active	Bit	R	Zone 2 High Temperature Warning

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
10098	Bool	Al_Tank_2_HiTmp_Warn.Active	Bit	R	Zone 2 Low Temperature Alarm
10099	Bool	Al_Tank_2_HiTmp_Alrm.Active	Bit	R	Zone 2 Low Temperature Warning
10100	Bool	Al_Tank_3_LoTmp_Alrm.Active	Bit	R	Zone 3 High Temperature Alarm
10101	Bool	Al_Tank_3_LoTmp_Warn.Active	Bit	R	Zone 3 High Temperature Warning
10102	Bool	Al_Tank_3_HiTmp_Warn.Active	Bit	R	Zone 3 Low Temperature Alarm
10103	Bool	Al_Tank_3_HiTmp_Alrm.Active	Bit	R	Zone 3 Low Temperature Warning
10104	Bool	Al_Zone1_Temp_Sensor_Flt.Active	Bit	R	Zone 1 Temperature Sensor Fault
10105	Bool	Al_Zone2_Temp_Sensor_Flt.Active	Bit	R	Zone 2 Temperature Sensor Fault
10106	Bool	Al_Zone3_Temp_Sensor_Flt.Active	Bit	R	Zone 3 Temperature Sensor Fault
10107	Bool	Al_TS_F1_ToProcessTempFault.Active	Bit	R	Temperature Sensor F1 Fault
10108	Bool	Al_TS_F2_FromProcessTempFault.Active	Bit	R	Temperature Sensor F2 Fault
10109	Bool	Al_TS_F3_CoolingSupplyTemp.Active	Bit	R	Temperature Sensor F3 Fault
10110	Bool	Al_TS_F4_AmbientTemp.Active	Bit	R	Temperature Sensor F4 Fault
10111	Bool	Al_DP1_Fault.Active	Bit	R	Differential Pressure Sensor 1 Fault
10112	Bool	Al_DP2_Fault.Active	Bit	R	Differential Pressure Sensor 2 Fault
10113	Bool	Al_DP3_Fault.Active	Bit	R	Differential Pressure Sensor 3 Fault
10114	Bool	Al_DP1_Hi_Alarm.Active	Bit	R	Differential Pressure 1 High Alarm
10115	Bool	Al_DP2_Hi_Alarm.Active	Bit	R	Differential Pressure 2 High Alarm
10116	Bool	Al_DP3_Hi_Alarm.Active	Bit	R	Differential Pressure 3 High Alarm
10117	Bool	Al_Z1_HighFlowAlarm.Active	Bit	R	Zone 1 High Flow Alarm
10118	Bool	Al_Z1_LowFlowAlarm.Active	Bit	R	Zone 1 Low Flow Alarm
10119	Bool	Al_Z2_HighFlowAlarm.Active	Bit	R	Zone 2 High Flow Alarm
10120	Bool	Al_Z2_LowFlowAlarm.Active	Bit	R	Zone 2 Low Flow Alarm
10121	Bool	Al_Z3_HighFlowAlarm.Active	Bit	R	Zone 3 High Flow Alarm
10122	Bool	Al_Z3_LowFlowAlarm.Active	Bit	R	Zone 3 Low Flow Alarm
10123	Bool	Al_Z1_Flow_Flt.Active	Bit	R	Zone 1 Flow Sensor Fault
10124	Bool	Al_Z2_Flow_Flt.Active	Bit	R	Zone 2 Flow Sensor Fault
10125	Bool	Al_Z3_Flow_Flt.Active	Bit	R	Zone 3 Flow Sensor Fault
10126	Bool	Al_Chiller_Fault.Active	Bit	R	Chiller 1 Fault
10127	Bool	Al_Chiller_Fault_2.Active	Bit	R	Chiller 2 Fault
10128	Bool	Al_Chiller_Fault_3.Active	Bit	R	Chiller 3 Fault
10129	Bool	Al_Chiller_Fault_4.Active	Bit	R	Chiller 4 Fault
10130	Bool	Al_FC1_Alarm.Active	Bit	R	Fluid Cooler 1 Alarm
10131	Bool	Al_FC1_Warning.Active	Bit	R	Fluid Cooler 1 Warning
10132	Bool	Al_FC2_Alarm.Active	Bit	R	Fluid Cooler 2 Alarm
10133	Bool	Al_FC2_Warning.Active	Bit	R	Fluid Cooler 2 Warning
10134	Bool	Al_FC3_Alarm.Active	Bit	R	Fluid Cooler 3 Alarm
10135	Bool	Al_FC3_Warning.Active	Bit	R	Fluid Cooler 3 Warning
10136	Bool	Al_FC4_Alarm.Active	Bit	R	Fluid Cooler 4 Alarm
10137	Bool	Al_FC4_Warning.Active	Bit	R	Fluid Cooler 4 Warning
30000	Real	Zone1ActTemp	32 Bit	R	Zone 1 Actual Temperature
30002	Real	Zone2ActTemp	32 Bit	R	Zone 2 Actual Temperature
30004	Real	Zone3ActTemp	32 Bit	R	Zone 3 Actual Temperature

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
30006	Real	TS_F1_ToProcessTempAct_HMI	32 Bit	R	To Process Actual Temperature
30008	Real	TS_F2_FromProcessTemp_HMI	32 Bit	R	From Process Actual Temperature
30010	Real	TS_F3_CoolingSupplyTemp_HMI	32 Bit	R	Cooling Supply Actual Temperature
30012	Real	TS_F4_Ambient_Act_Temp_HMI	32 Bit	R	Ambient Actual temperature
30014	Real	Tank1ActLvl	32 Bit	R	Tank 1 Actual Level
30016	Real	Tank2ActLvl	32 Bit	R	Tank 2 Actual Level
30018	Real	Tank3ActLvl	32 Bit	R	Tank 3 Actual Level
30020	Real	Zone1ActDP_HMI	32 Bit	R	Zone 1 Actual Differential Pressure Value
30022	Real	Zone2ActDP_HMI	32 Bit	R	Zone 2 Actual Differential Pressure Value
30024	Real	Zone3ActDP_HMI	32 Bit	R	Zone 3 Actual Differential Pressure Value
30026	Real	Z1ActualFlow_HMI	32 Bit	R	Zone 1 Actual Flow
30028	Real	Z2ActualFlow_HMI	32 Bit	R	Zone 2 Actual Flow
30030	Real	Z3ActualFlow_HMI	32 Bit	R	Zone 3 Actual Flow
30032	Real	ModValvePIDOutput	32 Bit	R	Mod Valve Analog Output (0-100%) (0-10V)
30034	Real	Z1C1ProcVar_HMI	32 Bit	R	Z1C1 Process Variable Value
30036	Real	Z1C2ProcVar_HMI	32 Bit	R	Z1C2 Process Variable Value
30038	Real	Z1C3ProcVar_HMI	32 Bit	R	Z1C3 Process Variable Value
30040	Real	Z1C4ProcVar_HMI	32 Bit	R	Z1C4 Process Variable Value
30042	Real	Z2C1ProcVar_HMI	32 Bit	R	Z2C1 Process Variable Value
30044	Real	Z2C2ProcVar_HMI	32 Bit	R	Z2C2 Process Variable Value
30046	Real	Z2C3ProcVar_HMI	32 Bit	R	Z2C3 Process Variable Value
30048	Real	Z2C4ProcVar_HMI	32 Bit	R	Z2C4 Process Variable Value
30050	Real	Z3C1ProcVar_HMI	32 Bit	R	Z3C1 Process Variable Value
30052	Real	Z3C2ProcVar_HMI	32 Bit	R	Z3C2 Process Variable Value
30054	Real	Z3C3ProcVar_HMI	32 Bit	R	Z3C3 Process Variable Value
30056	Real	Z3C4ProcVar_HMI	32 Bit	R	Z3C4 Process Variable Value
30058	Real	Z1Tower_ProcVar_HMI	32 Bit	R	Z1 Tower Variable Value
30060	Real	Z2Tower_ProcVar_HMI	32 Bit	R	Z2 Tower Variable Value
30062	Real	Z3Tower_ProcVar_HMI	32 Bit	R	Z3 Tower Variable Value
30064	Real	PID_Output[1]	32 Bit	R	Z1C1 PID Output (0-100%) (0-10V)
30066	Real	PID_Output[2]	32 Bit	R	Z1C2 PID Output (0-100%) (0-10V)
30068	Real	PID_Output[3]	32 Bit	R	Z1C3 PID Output (0-100%) (0-10V)
30070	Real	PID_Output[4]	32 Bit	R	Z1C4 PID Output (0-100%) (0-10V)
30072	Real	PID_Output[5]	32 Bit	R	Z2C1 PID Output (0-100%) (0-10V)
30074	Real	PID_Output[6]	32 Bit	R	Z2C2 PID Output (0-100%) (0-10V)
30076	Real	PID_Output[7]	32 Bit	R	Z2C3 PID Output (0-100%) (0-10V)
30078	Real	PID_Output[8]	32 Bit	R	Z2C4 PID Output (0-100%) (0-10V)
30080	Real	PID_Output[9]	32 Bit	R	Z3C1 PID Output (0-100%) (0-10V)
30082	Real	PID_Output[10]	32 Bit	R	Z3C2 PID Output (0-100%) (0-10V)
30084	Real	PID_Output[11]	32 Bit	R	Z3C3 PID Output (0-100%) (0-10V)
30086	Real	PID_Output[12]	32 Bit	R	Z3C4 PID Output (0-100%) (0-10V)
30088	Real	T1_Module_Pwr_Req	32 Bit	R	Z1 Tower Load PID Output

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
30090	Real	T2_Module_Pwr_Req	32 Bit	R	Z2 Tower Load PID Output
30092	Real	T3_Module_Pwr_Req	32 Bit	R	Z3 Tower Load PID Output
30094	Real	Z1Tower_PID_Out	32 Bit	R	Z1 Tower Stage PID Output
30096	Real	Z2Tower_PID_Out	32 Bit	R	Z2 Tower Stage PID Output
30098	Real	Z3Tower_PID_Out	32 Bit	R	Z3 Tower Stage PID Output
30100	Real	Dual_Pump_Output[1]	32 Bit	R	CP1SB PID Output (0-100%) (0-10V)
30102	Real	Dual_Pump_Output[2]	32 Bit	R	CP4SB PID Output (0-100%) (0-10V)
40000	USInt	Ethernet.IPAddr0	1	R/W	IP Address byte 0
40001	USInt	Ethernet.IPAddr1	1	R/W	IP Address byte 1
40002	USInt	Ethernet.IPAddr2	1	R/W	IP Address byte 2
40003	USInt	Ethernet.IPAddr3	1	R/W	IP Address byte 3
40004	USInt	Ethernet.IPGateway0	1	R/W	IP Gateway byte 0
40005	USInt	Ethernet.IPGateway1	1	R/W	IP Gateway byte 1
40006	USInt	Ethernet.IPGateway2	1	R/W	IP Gateway byte 2
40007	USInt	Ethernet.IPGateway3	1	R/W	IP Gateway byte 3
40009	USInt	Ethernet.IPSubnet0	1	R/W	IP Subnet byte 0
40010	USInt	Ethernet.IPSubnet1	1	R/W	IP Subnet byte 1
40011	USInt	Ethernet.IPSubnet2	1	R/W	IP Subnet byte 2
40012	USInt	Ethernet.IPSubnet3	1	R/W	IP Subnet byte 3
40013	UInt	J25_Protocol_ID	1	R/W	Serial Communication ID
40014	UDInt	J25_Protocol_Baud_Rate_HMI	1	R/W	Serial Communication Baud Rate: Baud Rate: 1-1200, 2-2400, 3-4800, 4-9600, 5-19200, 6-38400, 7-57600, 8-76800, 9-115200, 10-375000 (Default is 19200)
40015	UInt	J25_Protocol_Parity	1	R/W	Serial Communication Parity: Parity: 0 for None, 1 for Odd, 2 for Even (Default 0)
40016	UInt	J25_Protocol_Stop_Bits	1	R/W	Serial Communication Stop Bits: Stop Bits: 1 or 2 (Default is 1)
40017	Real	Tank_InfoHMI[1].HiLvlAlrmSP	2	R/W	Analog High Level Alarm Setpt
40019	Real	Tank_InfoHMI[1].HiLvlWarnSP	2	R/W	Analog High Level Warn Setpt
40021	Real	Tank_InfoHMI[1].LoLvlAlrmSP	2	R/W	Analog Low Level Alarm Setpt
40023	Real	Tank_InfoHMI[1].LoLvlWarnSP	2	R/W	Analog Low Level Warn Setpt
40025	Real	Tank_InfoHMI[1].AutoWaterStartSP	2	R/W	Auto Water Makeup Start Level
40027	Real	Tank_InfoHMI[1].AutoWaterStopSP	2	R/W	Auto Water Makeup Stop Level
40029	Real	Tank_InfoHMI[2].HiLvlAlrmSP	2	R/W	Analog High Level Alarm Setpt
40031	Real	Tank_InfoHMI[2].HiLvlWarnSP	2	R/W	Analog High Level Warn Setpt
40033	Real	Tank_InfoHMI[2].LoLvlAlrmSP	2	R/W	Analog Low Level Alarm Setpt
40035	Real	Tank_InfoHMI[2].LoLvlWarnSP	2	R/W	Analog Low Level Warn Setpt
40037	Real	Tank_InfoHMI[2].AutoWaterStartSP	2	R/W	Auto Water Makeup Start Level
40039	Real	Tank_InfoHMI[2].AutoWaterStopSP	2	R/W	Auto Water Makeup Stop Level
40041	Real	Tank_InfoHMI[3].HiLvlAlrmSP	2	R/W	Analog High Level Alarm Setpt
40043	Real	Tank_InfoHMI[3].HiLvlWarnSP	2	R/W	Analog High Level Warn Setpt
40045	Real	Tank_InfoHMI[3].LoLvlAlrmSP	2	R/W	Analog Low Level Alarm Setpt
40047	Real	Tank_InfoHMI[3].LoLvlWarnSP	2	R/W	Analog Low Level Warn Setpt

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
40049	Real	Tank_InfoHMI[3].AutoWaterStartSP	2	R/W	Auto Water Makeup Start Level
40051	Real	Tank_InfoHMI[3].AutoWaterStopSP	2	R/W	Auto Water Makeup Stop Level
40053	Real	Z1C1ProcSetpt_HMI	2	R/W	Z1C1ProcSetpt_HMI
40055	Real	Z1C2ProcSetpt_HMI	2	R/W	Z1C2ProcSetpt_HMI
40057	Real	Z1C3ProcSetpt_HMI	2	R/W	Z1C3ProcSetpt_HMI
40059	Real	Z1C4ProcSetpt_HMI	2	R/W	Z1C4ProcSetpt_HMI
40061	Real	Z2C1ProcSetpt_HMI	2	R/W	Z2C1ProcSetpt_HMI
40063	Real	Z2C2ProcSetpt_HMI	2	R/W	Z2C2ProcSetpt_HMI
40065	Real	Z2C3ProcSetpt_HMI	2	R/W	Z2C3ProcSetpt_HMI
40067	Real	Z2C4ProcSetpt_HMI	2	R/W	Z2C4ProcSetpt_HMI
40069	Real	Z3C1ProcSetpt_HMI	2	R/W	Z3C1ProcSetpt_HMI
40071	Real	Z3C2ProcSetpt_HMI	2	R/W	Z3C2ProcSetpt_HMI
40073	Real	Z3C3ProcSetpt_HMI	2	R/W	Z3C3ProcSetpt_HMI
40075	Real	Z3C4ProcSetpt_HMI	2	R/W	Z3C4ProcSetpt_HMI
40077	Real	Z1C1Tower_Setpt_HMI	2	R/W	Tower 1 Control Setpoint
40079	Real	Z2C1Tower_Setpt_HMI	2	R/W	Tower 2 Control Setpoint
40081	Real	Z3C1Tower_Setpt_HMI	2	R/W	Tower 3 Control Setpoint
40083	Real	T1Delta_Cut_In_Temp	2	R/W	T1Delta_Cut_In_Temp
40085	Real	T1Delta_Cut_Out_Temp	2	R/W	T1Delta_Cut_Out_Temp
40087	Real	T2Delta_Cut_In_Temp	2	R/W	T2Delta_Cut_In_Temp
40089	Real	T2Delta_Cut_Out_Temp	2	R/W	T2Delta_Cut_Out_Temp
40091	Real	T3Delta_Cut_In_Temp	2	R/W	T3Delta_Cut_In_Temp
40093	Real	T3Delta_Cut_Out_Temp	2	R/W	T3Delta_Cut_Out_Temp
40095	Int	Fan_Vib_TD_HMI	1	R/W	Fan Vibration Time Delay
40096	Real	Tower_Pump_Cutout_Diff	2	R/W	Tower_Pump_Cutout_Diff
40098	Real	Tower_Pump_2_Cutout_Diff	2	R/W	Tower_Pump_2_Cutout_Diff
40100	Real	Tower_Pump_3_Cutout_Diff	2	R/W	Tower_Pump_3_Cutout_Diff
40102	Real	Zone1_Temp_Setpt	2	R/W	Zone 1 Temperature Setpoint
40104	Real	Zone2_Temp_Setpt	2	R/W	Zone 2 Temperature Setpoint
40106	Real	Zone3_Temp_Setpt	2	R/W	Zone 3 Temperature Setpoint
40108	Real	Zone1_HiTmpAlrmDiff	2	R/W	Zone1_HiTmpAlrmDiff
40110	Real	Zone1_HiTmpWarnDiff	2	R/W	Zone1_HiTmpWarnDiff
40112	Real	Zone1_LoTmpAlrmDiff	2	R/W	Zone1_LoTmpAlrmDiff
40114	Real	Zone1_LoTmpWarnDiff	2	R/W	Zone1_LoTmpWarnDiff
40116	Real	Zone2_HiTmpAlrmDiff	2	R/W	Zone2_HiTmpAlrmDiff
40118	Real	Zone2_HiTmpWarnDiff	2	R/W	Zone2_HiTmpWarnDiff
40120	Real	Zone2_LoTmpAlrmDiff	2	R/W	Zone2_LoTmpAlrmDiff
40122	Real	Zone2_LoTmpWarnDiff	2	R/W	Zone2_LoTmpWarnDiff
40124	Real	Zone3_HiTmpAlrmDiff	2	R/W	Zone3_HiTmpAlrmDiff
40126	Real	Zone3_HiTmpWarnDiff	2	R/W	Zone3_HiTmpWarnDiff
40128	Real	Zone3_LoTmpAlrmDiff	2	R/W	Zone3_LoTmpAlrmDiff
40130	Real	Zone3_LoTmpWarnDiff	2	R/W	Zone3_LoTmpWarnDiff
40132	Real	Zone1_DP_Setpt_HMI	2	R/W	Zone1_DP_Setpoint

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
40134	Real	Zone2_DP_Setpt_HMI	2	R/W	Zone2_DP_Setpoint
40136	Real	Zone3_DP_Setpt_HMI	2	R/W	Zone3_DP_Setpoint
40138	Real	ChillerSetpoint	2	R/W	Chiller 1 Setpoint Analog Out
40140	Real	ChillerSetpoint_2	2	R/W	Chiller 2 Setpoint Analog Out
40142	Real	ChillerSetpoint_3	2	R/W	Chiller 3 Setpoint Analog Out
40144	Real	ChillerSetpoint_4	2	R/W	Chiller 4 Setpoint Analog Out
40146	UDInt	PumpEtm[1]	2	R/W	Pump Running Hours
40148	UDInt	PumpEtm[2]	2	R/W	Pump Running Hours
40150	UDInt	PumpEtm[3]	2	R/W	Pump Running Hours
40152	UDInt	PumpEtm[4]	2	R/W	Pump Running Hours
40154	UDInt	PumpEtm[5]	2	R/W	Pump Running Hours
40156	UDInt	PumpEtm[6]	2	R/W	Pump Running Hours
40158	UDInt	PumpEtm[7]	2	R/W	Pump Running Hours
40160	UDInt	PumpEtm[8]	2	R/W	Pump Running Hours
40162	UDInt	PumpEtm[9]	2	R/W	Pump Running Hours
40164	UDInt	PumpEtm[10]	2	R/W	Pump Running Hours
40166	UDInt	PumpEtm[11]	2	R/W	Pump Running Hours
40168	UDInt	PumpEtm[12]	2	R/W	Pump Running Hours
40170	UDInt	PumpEtm[13]	2	R/W	Pump Running Hours
40172	UDInt	PumpEtm[14]	2	R/W	Pump Running Hours
40174	UDInt	PumpEtm[15]	2	R/W	Pump Running Hours
40176	UDInt	FanETM[1]	2	R/W	Fan Running Hours
40178	UDInt	FanETM[2]	2	R/W	Fan Running Hours
40180	UDInt	FanETM[3]	2	R/W	Fan Running Hours
40182	UDInt	FanETM[4]	2	R/W	Fan Running Hours
40184	UDInt	FanETM[5]	2	R/W	Fan Running Hours
40186	UDInt	FanETM[6]	2	R/W	Fan Running Hours
40188	UDInt	FanETM[7]	2	R/W	Fan Running Hours
40190	UDInt	FanETM[8]	2	R/W	Fan Running Hours
40192	UDInt	FluidCoolerETM	2	R/W	Fluid Cooler Running Hours
40194	UDInt	FreeCoolETM	2	R/W	Free Cooling Source Running Hours
40196	DInt	TempUofMHMI	2	R/W	1 = °C, 2 = °F
40198	Real	FluidCoolerCutout	2	R/W	FluidCooler Cutout temperature
40200	Real	AdiabaticSetpoint	2	R/W	Adiabatic Setpoint
40202	Int	PumpInfo[1].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40203	Int	PumpInfo[1].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40204	Int	PumpInfo[1].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40205	Int	PumpInfo[1].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40206	Int	PumpInfo[1].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40207	Int	PumpInfo[1].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40208	Int	PumpInfo[2].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
40209	Int	PumpInfo[2].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40210	Int	PumpInfo[2].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40211	Int	PumpInfo[2].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40212	Int	PumpInfo[2].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40213	Int	PumpInfo[2].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40214	Int	PumpInfo[3].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40215	Int	PumpInfo[3].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40216	Int	PumpInfo[3].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40217	Int	PumpInfo[3].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40218	Int	PumpInfo[3].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40219	Int	PumpInfo[3].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40220	Int	PumpInfo[4].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40221	Int	PumpInfo[4].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40222	Int	PumpInfo[4].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40223	Int	PumpInfo[4].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40224	Int	PumpInfo[4].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40225	Int	PumpInfo[4].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40226	Int	PumpInfo[5].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40227	Int	PumpInfo[5].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40228	Int	PumpInfo[5].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40229	Int	PumpInfo[5].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40230	Int	PumpInfo[5].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40231	Int	PumpInfo[5].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40232	Int	PumpInfo[6].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40233	Int	PumpInfo[6].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40234	Int	PumpInfo[6].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40235	Int	PumpInfo[6].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40236	Int	PumpInfo[6].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40237	Int	PumpInfo[6].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40238	Int	PumpInfo[7].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40239	Int	PumpInfo[7].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40240	Int	PumpInfo[7].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40241	Int	PumpInfo[7].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40242	Int	PumpInfo[7].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
40243	Int	PumpInfo[7].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40244	Int	PumpInfo[8].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40245	Int	PumpInfo[8].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40246	Int	PumpInfo[8].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40247	Int	PumpInfo[8].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40248	Int	PumpInfo[8].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40249	Int	PumpInfo[8].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40250	Int	PumpInfo[9].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40251	Int	PumpInfo[9].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40252	Int	PumpInfo[9].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40253	Int	PumpInfo[9].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40254	Int	PumpInfo[9].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40255	Int	PumpInfo[9].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40256	Int	PumpInfo[10].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40257	Int	PumpInfo[10].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40258	Int	PumpInfo[10].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40259	Int	PumpInfo[10].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40260	Int	PumpInfo[10].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40261	Int	PumpInfo[10].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40262	Int	PumpInfo[11].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40263	Int	PumpInfo[11].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40264	Int	PumpInfo[11].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40265	Int	PumpInfo[11].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40266	Int	PumpInfo[11].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40267	Int	PumpInfo[11].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40268	Int	PumpInfo[12].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40269	Int	PumpInfo[12].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40270	Int	PumpInfo[12].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40271	Int	PumpInfo[12].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40272	Int	PumpInfo[12].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40273	Int	PumpInfo[12].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40274	Int	PumpInfo[13].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40275	Int	PumpInfo[13].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40276	Int	PumpInfo[13].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby

Modbus Registers 2.3 (continued)

Modbus Ref.	Data Format	Parameter	Data	Access Level	Comment
40277	Int	PumpInfo[13].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40278	Int	PumpInfo[13].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40279	Int	PumpInfo[13].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40280	Int	PumpInfo[14].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40281	Int	PumpInfo[14].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40282	Int	PumpInfo[14].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40283	Int	PumpInfo[14].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40284	Int	PumpInfo[14].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40285	Int	PumpInfo[14].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B
40286	Int	PumpInfo[15].ZoneA	1	R/W	Assigns the pump to the primary zone 1, 2, or 3
40287	Int	PumpInfo[15].CircuitA	1	R/W	Assigns the pump to the primary circuit 1, 2, 3, or 4
40288	Int	PumpInfo[15].Duty	1	R/W	0 = primary, 1 = dedicated standby, 2 = dual standby
40289	Int	PumpInfo[15].ZoneB	1	R/W	Assigns the pump to the secondary zone 1, 2, or 3
40290	Int	PumpInfo[15].CircuitB	1	R/W	Assigns the pump to the secondary circuit 1, 2, 3, or 4
40291	Int	PumpInfo[15].VlveLoc	1	R/W	0 = none, 1 = Zone A, 2 = Zone B

Start-Up

Every unit is factory set to operate in accordance with the standard operating specifications for that particular unit. Due to variables involved with different applications and different installations, minor adjustments may be required during the initial start-up to ensure proper operation. Use a qualified technician to perform the start-up procedure in sequence. The following serves as a checklist for the initial start-up and for subsequent start-ups if the unit is out of service for a prolonged time.

WARNING: This equipment contains hazardous voltages that can cause severe injury or death.

WARNING: This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.

WARNING: The exposed surfaces of motors, piping, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands.

CAUTION: Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.

CAUTION: Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

CAUTION: Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

CAUTION: Wire the unit ground in compliance with local and national codes.

Step 1 - Connect Main Power

Connect main power properly ensuring it matches the voltage shown on the nameplate of the unit. Check the electrical phase sequence prior to start-up. Operation of the equipment with incorrect electrical phase sequencing will cause damage to components. Check the phasing prior to applying power. The proper sequence is “ABC.” If the phasing is incorrect, open the main power disconnect and switch two line leads on the main power terminal blocks (or the unit mounted disconnect). All electrical components are in-phase at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals. After making proper power connection and grounding, turn the main power on.

Step 2 - Fill Coolant Circuit

Check to make sure all piping connections are secure. Fill the coolant reservoir with the proper water or water/glycol solution following the guidelines shown below. When using a glycol solution only use glycol with a corrosion inhibitor.

System Fill Water Chemistry Requirements

The properties of water make it ideal for heat transfer applications. It is safe, non-flammable, non-poisonous, easy to handle, widely available, and inexpensive in most industrialized areas.

When using water as a heat transfer fluid it is important to keep it within certain chemistry limits to avoid unwanted side effects. Water is a “universal solvent” because it can dissolve many solid substances and absorb gases. As a result, water can cause the corrosion of metals used in a cooling system. Often water is in an open system (exposed to air) and when the water evaporates, the dissolved minerals remain in the process fluid. When the concentration exceeds the solubility of some minerals, scale forms. The lifegiving properties of water can also encourage biological growth that can foul heat transfer surfaces.

To avoid the unwanted side effects associated with water cooling, proper chemical treatment and preventive maintenance is required for continuous plant productivity

Unwanted Side Effects of Improper Water Quality

- Corrosion
- Scale
- Fouling
- Biological Contamination

Cooling Water Chemistry Properties

- Electrical Conductivity
- pH
- Alkalinity
- Total Hardness
- Dissolved Gases

The complex nature of water chemistry requires a specialist to evaluate and implement appropriate sensing, measurement and treatment needed for satisfactory performance and life. The recommendations of the specialist may include filtration, monitoring, treatment and control devices. With the ever-changing regulations on water usage and treatment chemicals, the information is usually up-to-date when a specialist in the industry is involved. Table 10 shows the list of water characteristics and quality limitations.

Table 10 – Fill Water Chemistry Requirements

Water Characteristic	Quality Limitation
Alkalinity (HCO_3^-)	70-300 ppm
Aluminum (Al)	Less than 0.2 ppm
Ammonium (NH_3)	Less than 2 ppm
Chlorides (Cl^-)	Less than 300 ppm
Electrical Conductivity	10-500µS/cm
Free (aggressive) Carbon Dioxide (CO_2)†	Less than 5 ppm
Free Chlorine(Cl_2)	Less than 1 PPM
HCO_3^-/SO_4^{2-}	Greater than 1.0
Hydrogen Sulfide (H_2S)	Less than 0.05 ppm
Iron (Fe)	Less than 0.2 ppm
Manganese (Mn)	Less than 0.1 ppm
Nitrate (NO_3)	Less than 100 ppm
pH	7.5-9.0
Sulfate (SO_4^{2-})	Less than 70 ppm
Total Hardness (dH)k	4.0-8.5

† Dissolved carbon dioxide calculation is from the pH and total alkalinity values shown below or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x $2^{[(6.3-pH)/0.3]}$ where TA = Total Alkalinity, PPM as $CaCO_3$

Table 11 - Recommended Glycol Solutions

Chilled Water Temperature	Percent Glycol By Volume
50°F (10°C)	Not required
45°F (7.2°C)	5 %
40°F (4.4°C)	10 %
35°F (1.7°C)	15 %
30°F (-1.1°C)	20 %
25°F (-3.9°C)	25 %
20°F (-6.7°C)	30 %

CAUTION: When your application requires the use of glycol, use industrial grade glycol specifically designed for heat transfer systems and equipment. Never use glycol designed for automotive applications. Automotive glycols typically have additives engineered to benefit the materials and conditions found in an automotive engine; however, these additives can gel and foul heat exchange surfaces and result in loss of performance or even failure of the unit. In addition, these additives can react with the materials of the pump shaft seals resulting in leaks or premature pump failures.

WARNING: Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

CAUTION: If the reservoir includes a make-up valve and the make-up water supply pressure is above 50 PSI, the float may have a hard time shutting off the water. If this is the case, a pressure-reducing valve will be required.

Step 3 – Adjust Valves

Adjust the suction valve of each pump to be fully open (parallel to the suction leg pipe). Adjust the discharge of each pump to be fully closed (perpendicular to discharge pipe). Also, adjust the valve to each pump pressure gauge to be fully open (parallel to the pilot tube).

Step 4 – Turn On Control Power

Turn on the control power by touching the operator interface. The panel displays should illuminate. For systems provided without a control panel, make sure the control system is powered and ready for operation.

Step 5 – Check Pump Rotation

Check to make sure all suction valves are still open (parallel to suction leg) and then open the discharge

valve to about the 10% open position (100% open position is parallel to discharge pipe).

Momentarily start each pump individually. Cooling tower reservoir systems typically control the Cooling Tower Pump thermostatically. To start the Cooling Tower Pump, make sure the control system is set so the pump is activated and lower the set point of the cooling tower reservoir system setpoint until the Cooling Tower Pump energizes. Note the pressure reading of each pump discharge pressure gauge. If the pressure reading is lower than design, it may be an indication that the pump is running backwards. If the pump is running backwards, you can correct rotation by performing the following:

1. Stop the pump
2. Shut off disconnect
3. Switch any two leads of the three-phase power to the pump motor
4. Reconnect wiring
5. Switch on disconnect
6. Start the pump again and check for proper rotation. If pump rotation is correct and the pressure is still too low, contact the Customer Service Department for assistance before proceeding further.

Once the proper pump rotation and operation is verified, proceed to the next step. If you encounter problems getting the pump(s) to produce the pressure, stop the start-up procedure and contact our Customer Service Department for assistance.

Step 6 – Start Pumps

Check to make sure all suction valves are still open (parallel to suction leg) and open the discharge valve to about the 10% open position (100% open position is parallel to discharge pipe).

Run each pump circuit for short periods to allow the system to slowly fill. Slowly filling the system will remove air in the system piping. Failure to do so can result in excessive water hammer and broken piping connections.

Note: Monitor the water level in the reservoir during system pipe filling to ensure the water level always remains above the suction legs of the pumps. Operating a pump without water will cause cavitation and pump seal failure.

Once water starts to return to the reservoir from the system return lines, turn the pump on, and leave it on.

Open the discharge valve slowly until the pump discharge pressure gauge is at the desired pressure. Refer to the pump curves to help in determining the proper pressure associated with the desired flow.

Allow the system to operate for about 15 minutes. During this period, carefully monitor the water level in the reservoir to ensure the pump suction legs remain under water. If a low-level condition occurs, stop the pumps and add fluid to the reservoir.

After the system has been operating for 15 minutes, check for leaks, vibration, or excessive noise in the pumps or system piping. If there are signs of these, stop the system and make repairs before proceeding.

Before turning off the pumps, measure the amperage on each power lead for each pump (and cooling tower fan motor if applicable). The measured amperage on any lead must not exceed the amperage listed on the motor nameplate(s).

The unit is now ready to be placed into service.

Operation

Each reservoir system is custom designed for a particular application and therefore the control and operation of the reservoir system cannot be universally described in this manual. The reservoir system is typically provided with a suggested piping schematic, wiring diagram and mechanical layout diagram. These drawings are usually shipped inside the control panel of the unit. If the system was ordered without a control panel these drawings would have been shipped with the unit. Please refer to these drawings for specific information about the system design and operation of your particular system.

Preventive Maintenance

Once the pump reservoir system is in service, the following maintenance procedures should be adhered to as closely as possible. The importance of a properly established maintenance program cannot be over emphasized. Taking the time to follow these simple procedures will result in substantially reduced down time, reduced repair cost, and an extended useful lifetime for the equipment. Any monetary costs associated with implementing these procedures will usually more than pay for themselves.

To help make the preventive maintenance as simple as possible, a checklist should be prepared which lists the recommended service operations and the time at which they are to be performed. With this information, maintenance personnel may be able to correct a potential problem before it causes significant down time. For best results, these readings should be taken with a full heat load from process, preferably with similar operating conditions each time.

The following is a list of suggested periodic maintenance.

Once a Week

1. Check the interior of the reservoir for dirt and debris.

2. Check all pumps in the system for signs of leaks in the pump seal area. Replace pump seal if necessary.

3. Check the pump discharge pressure on the gauges of each pump in the system. Investigate further if the pump discharge pressure starts to stray away from the normal operating pressure. This could be a sign that the pump impeller is worn or damaged. Replace if necessary.

4. Check the coolant level in the reservoir. Replenish if necessary making sure to take proper precautions to maintain the appropriate glycol concentration for chilled water system reservoirs.

Repeat items 1 through 4 listed above and continue with the following.

Once a Month

5. With the main disconnect shut off and locked out, check the condition of all electrical connections at the contactors, starters and controls. Check for loose or frayed wires and make repairs as necessary.

6. Check the incoming voltage to make sure it is within 10% of the design voltage for the system.

7. Check the amp draws to each leg of all motors in the system and confirm that they are drawing the proper current.

Repeat items 1 through 7 listed above and continue with the following.

Once Every 6 Months

8. Close the isolation valve for the fluid level pressure sensor, remove pressure sensor and clear sensor and/or sensor port to remove any dirt or debris to ensure proper fluid level sensing.

Troubleshooting

Problem	Cause	Remedy
Pump does not produce enough discharge pressure	Pressure gauge defective	Replace pressure gauge
	Pump operating at the end of the operating curve	Throttle back the discharge valve until the gauge reads design pressure
	Backwards pump rotation	Check rotation and change any two wires to reverse rotation
Pump runs rough and makes pinging sound indicating cavitation	Water level too low in the reservoir	Fill to proper level
	Debris in suction line	Clean suction line of any debris
	Suction valve partially closed	Make sure suction valve is fully open
Motor runs excessively hot	Overload	Reduce number of starts per hour or increase motor size
	Blocked ventilation	Clean external ventilation system
	TEFC Motor	Check fan
	ODP Motor	Blow out internal ventilation passages
	Ambient temperature over 105°F	Reduce ambient temperature or provide source of cooler air
	Unbalanced current draw	Balance supply voltage
	Single-phasing	Eliminate single-phasing
Pump will not start (hums and heats up)	Single-phasing	Eliminate single-phasing
	Rotor bearings locked	Check motor and replace if needed
Pump runs noisy under load (excessive electrical noise or chatter under load)	Single-phasing	Be sure proper sized overload relays are in each of the three phases
Excessive pump vibration	Motor mount loose	Check motor mount is tight
	Motor bearing failure	Replace motor
	Coupling loose	Check coupling to ensure it is tight and properly aligned (if base-mount pump coupling)
Intermittent or faulty fluid level readings.	Debris in the pressure transducer well.	Close isolation valve, remove level sensor, and clean transducer and transduce well.

Drawings

We have prepared a custom set of drawings for your unit and placed them inside the control panel prior to shipment. Please refer to these drawings when troubleshooting, servicing, and installing the unit. If you cannot find these drawings or wish to have additional copies sent, please contact our Customer Service Department and reference the serial number of your unit.

THERMAL CARE
PiovanGroup

5680 W. Jarvis Ave. • Niles, IL 60714
www.thermalcare.com

New Equipment Sales
847.966.2260
sales@thermalcare.com

Customer Service
847-966-2636
tcservice@thermalcare.com

Parts Department
847.966.8560
tcparts@thermalcare.com