SCC Inc.

Installation Instructions

Document No. TS-3300

October 30, 2023

TS-D Series

Eight Pumps Deaerator, Surge, or Condensate Control Panel, or Combination Deaerator/Surge or Deaerator/Condensate Panel, For Up to Four Groups

Description

A TS-… series control system manages lead/lag operation of an individual deaerator (DA), DA with two separate feedwater manifolds, surge, condensate, or a combination DA/Surge, DA/Condensate, Surge/Condensate tanks with up to eight pumps and up to four groups of feedwater and/or transfer pumps.

Each TS-D… control system includes a pre-programmed 10” touchscreen, programmable logic controller (PLC), and digital and analog inputs/outputs for monitoring and control.

Flexible communication interface options to the building management system (BMS) provide streamlined data collection, monitoring, and control.

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Caution

The SCC DA, surge, and condensate tank control system is a proprietary system. SCC Inc. will not assume responsibility for damage resulting from unauthorized modification to the system.

All activities such as mounting, installation, service work, etc. must be performed by qualified staff.

Before performing any work in the connection area of the DA, surge, and condensate tank control system, turn off the power by turning off the panel main disconnect switch.

Protection against electrical shock hazard on the DA, surge, and condensate tank control system, as well as all connected electrical components, must be ensured through proper wiring and grounding practices.

Fall or shock can adversely affect the functionality of the DA, surge, and condensate control system. The technician is solely responsible for verifying the correct field wiring practices.

Introduction

A TS-D… series control system manages lead/lag operation of an individual deaerator (DA), surge, condensate, or a combination DA/Surge, DA/Condensate tank with up to eight pumps, and up to four groups of pumps.

The DA, surge, and condensate tank control system is set to manage the operation, lead/lag, and rotation of the feedwater and/or transfer water pumps, for up to eight pumps, with up to four separate PID loop controllers. It is also set to maintain a PLC based, or via RWF55 load controllers, adjustable water level setpoints, with backup secondary control. The system can start and stop feedwater or transfer water pumps based on adjustable pressure setpoints. Also, could start and stop the pumps based on water demand from the boilers via a dry contact to start the related feedwater pump. The system will provide appropriate information about the functionality and status of all pumps by monitoring the current switches, tank pressures, temperature, feedwater, and transfer water pressures.

Pumps Lead/Lag Sequence of Operation

1. Each pump motor has a status monitoring current switch and a Hand-Off-Auto selector switch. Pump status and run mode are displayed on the HMI, indicating pump availability and readiness.
2. If the system's pumps are placed in HAND position, the pumps will continuously run, unless there is an alarm present or low/low water level is detected by the low water cutoff float.
3. If the pumps are placed in the AUTO position, then the DA and/or Surge control system will monitor, start, and modulate all pump VFDs to maintain feedwater or transfer water pressure setpoints.
4. Pumps lead/lag with motor starters:
    - When all pumps are placed in AUTO position, the lead pump will be commanded ON, and will stay ON as long as there is no alarm or pump rotation.
    - If the feedwater or transfer water pressure drops below the minimum pressure setpoint for an adjustable time delay of 1 to 1800 seconds, lag 1 pump will start. With the lead and lag pumps running, if the feedwater pressure drops below the minimum water pressure setpoint again, lag 2 pump will start.
    - The system will continue adding pumps whenever the feedwater or transfer water pressure drops below the minimum allowable pressure setpoint.
    - When the combination of lead and lag pumps raise the feedwater pressure above an adjustable pressure setpoint for an adjustable time delay, the last lag pump will be dropped offline. If the pressure rises again above the high pressure setpoint, then the second to last lag pump will be dropped offline.
    - The system keeps on shutting down lag pumps whenever the feedwater or transfer water pressure rises above the high pressure setpoint.
    - The lead pump will be alternated based on lead pump operating run hours.
    - The lead pump rotation sequence is as follows: 1,2,3,4,5,6,7,8 – 2,3,4,5,6,7,8,1 – 3,4,5,6,7,8,1,2 etc.
    - If the lead pump fails, the first lag pump in the sequence will assume the lead position and start to run.
    - If the running lag pump fails, the next lag pump in line will start automatically.

Pumps Lead/Lag Sequence of Operation (continued)

5. Pumps lead/lag with VFD (variable frequency drive):
   - When all pumps are placed in AUTO position, the lead pump drive will be commanded ON, and will stay ON as long as there is no alarm or pump rotation. If the feedwater or transfer water pressure is below setpoint, the system PLC executes a PID algorithm and determines a new output value for the lead pump drive.
   - The lead pump drive will receive a modulating signal determined by the PID output. This signal will be between 4 and 20mA, 0 to 100%. The lead pump drive will modulate the feedwater pump to maintain feedwater or transfer water pressure setpoint.
   - If the PID output reaches above the add pump percent setpoint for an adjustable time delay of 1 to 1800 seconds, the lag 1 pump drive will be started and receive the same modulating signal as the lead pump drive. The lag 1 pump drive will start modulating up, and continue to modulate up, as long as the actual feedwater pressure remains below setpoint. When the actual feedwater pressure approaches setpoint, the lead pump drive will start to modulate down to reach the lag pump drive modulating output.
   - With the lead and lag pumps running, the pump VFDs will start to modulate the pumps up or down in unison to maintain setpoint. If the PID output reaches above the add pump percent setpoint again, the lag 2 pump drive will start up and receive the same modulating signal as the lead and lag 1 pump drives. The system will keep adding pumps whenever the PID output reaches above the add lag pump percent setpoint for the adjustable time delay. The PID will modulate the pump VFDs up or down to maintain the setpoint.
   - The combination of the lead and lag pumps will continue to modulate up or down in unison to maintain feedwater or transfer water pressure setpoint.
   - If feedwater valves start to close, and feedwater or transfer water pressure starts to rise, the PID output will start to modulate down all running pump VFDs in unison to maintain feedwater pressure setpoint. If the PID output drops below the drop pump percent setpoint for an adjustable time delay of 1 to 1800 seconds, the last lag pump will be turned off. If the PID output is still below the drop pump percent setpoint, then the second to last lag pump will be turned off.
   - The system will keep shutting down lag pumps whenever the PID output stays below the drop pump percent setpoint for the adjustable time delay.

Feedwater Pumps Lead/Lag Operation

1. The feedwater pump control system for the DA is designed to have at least one pump always running.
2. The addition or subtraction of a lag pump from the feedwater supply header is controlled by the feedwater pump discharge pressure and/or the motor load current switch. To set up the lead/lag operation, the following data needs to be entered on the Configuration Screen of the touchscreen display:
   - Desired high pressure setpoint for the feedwater manifold.
   - Allowable minimum pressure in the feedwater manifold. This will provide the required flow through the feedwater valve. This is determined by noting the desired boiler operating pressure and the designed pressure drop across the modulating feedwater valve and associated piping. The minimum feedwater flow rate is determined by multiplying the boiler horsepower (hp) by .069 GPM / BHP - a 100 hp boiler needs a minimum of 6.9 GPM of feedwater. It is best to multiply this number by 2 to allow for errors, unknown losses, and pump wear. Check your boiler operating pressure and feedwater valve Cv to make this calculation.
     - As an example, a 300 hp boiler will require (.069 x 300 x 2) or 41.4 GPM across the modulating feedwater valve when operating at design pressure. Using the Cv for the feedwater valve and boiler operating pressure, calculate the minimum feedwater pressure at the inlet of the modulating feedwater valve to achieve the desired flow. Cv is the flow for 1 psi pressure drop across the valve. If the Cv for the feedwater valve is 10, then the DP across the valve at 41.4 GPM will be approximately 16 psi. Using this calculation, the minimum pressure that will deliver the 41.4 GPM across the feedwater valve is 100 psi (desired boiler operating pressure) + 16 psi (pressure drop across the feedwater valve at 41.4 GPM) or 116 psi.

Transfer Pumps Lead/Lag Operation

1. The transfer pump control system for the surge tank is designed to have at least one pump always running.
2. The addition or subtraction of a lag pump from the transfer supply header is controlled by the transfer pump discharge pressure and/or the motor load current switch. To set up the lead/lag operation, the following data needs to be entered on the Configuration Screen of the touchscreen display:
   - Desired high pressure setpoint for the transfer manifold.
   - Allowable minimum pressure in the transfer manifold. This will provide the required flow through the transfer valve. This is determined by noting the desired Deaerator operating pressure and the designed pressure drop across the modulating transfer valve and associated piping. The minimum transfer flow rate is determined by the flow rate of the feedwater from the DA. See feedwater pumps lead lag section for the feedwater flow rate calculations.

Feedwater Pumps Lead/Lag Alternation

- The lead pump will be alternated based on the lead pump operating runtime.
- The lead pump rotation sequence is as follows: 1,2,3,4,5,6,7,8 – 2,3,4,5,6,7,8,1 – 3,4,5,6,7,8,1,2 etc.
- If the lead pump or lag pump online fails, the next pump in the sequence will be started.
- The lead pump will run for the entire runtime duration.
- If no lag pumps are running and the runtime reaches the lead pump alternating time, the lag 1 pump will start and receive the same modulating signal as the lead pump. The lead and lag 1 pump will modulate up or down to maintain the setpoint for the entire duration of the overlap time.
- When the overlap time expires, the lag 1 pump will assume the lead pump position, and the lead pump will assume the last lag position. If the system has a total of three pumps, the lead pump will assume the lag 2 pump position. If lag 2 pump is not needed to maintain feedwater pressure setpoint, it will be turned off.

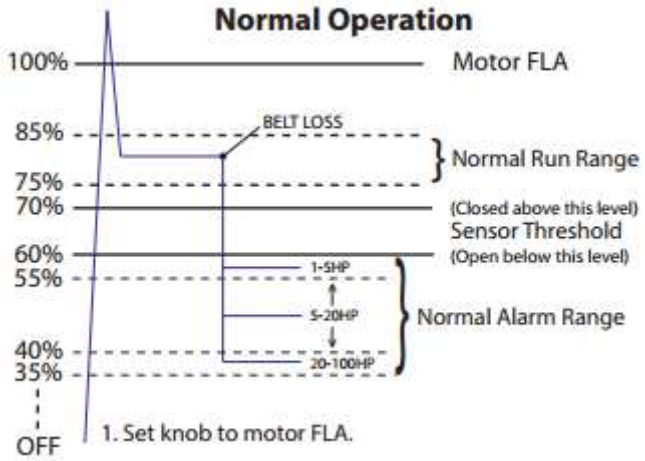
General Setup

1. Make sure the inlet and outlet manual isolation valves on the feedwater pump are open.
2. Ensure all feedwater pump Hand-Off-Auto (H-O-A) switches are in the "OFF" position.
3. Check the rotation of the feedwater pump by following the pump manufacturer's procedure. The pump can be "bumped" by momentarily turning the H-O-A selector switch to the "HAND" position, and back to "OFF".
   - If the pump is rotating in the proper direction, proceed to the next pump.
   - If the pump is rotating backwards, make sure to shut the pump down and open the main disconnect switch to shut the power down. More than one disconnects may be needed to completely turn the power off.
   - Switch the position of any two pump motor leads on the motor starter load terminals.
   - Ensure that the terminals are tight. Then close the main disconnect switch and place the pump switch in Hand position. Make sure that the pump's rotation is verified. Do the same for the rest of the system's pumps.
   - The pump rotation can be checked again by following the instructions in step 1.
4. Following the same procedure, check the rotation of the remaining pumps.
5. Calibrate and check the tank level control by following the supplied instructions for setup of the Siemens differential pressure (DP) transmitter and RWF55 loop controller.
   - Determine the desired DA operating water level and set the desired level on the RWF55 loop controller setpoint.
   - If there are low and high water alarm points to be determined from the RWF55 input, set the alarm points in the RWF55 following the manufacturer's supplied procedure, see RWF55 and DP setup illustration below.
6. To prevent the pumps from running dry, ensure that the low/low water cutoff level control removes control power from the pump starters.
7. Open the isolation valve(s) between the surge tank transfer pumps and the DA tank level control valve.
8. Start the transfer pumps on the surge tank and allow the DA to settle to its normal operating level. Adjust the RWF55 setpoint and PID algorithm to maintain the desired level. The adjustment of the PID will configure the allowable deviation above and below setpoint, as well as configure the rate of valve operation. The adjustment should be such that the valve does not rapidly cycle open or closed, nor deviate significantly above or below the desired water level before the valve responds. This adjustment will most likely have to be modified after the boilers are online and the system comes into equilibrium.
9. Check for proper operation and indication of high and low water float controls, which are hardwired to the control panel.

Current Switch Calibration

Note: Please read current switch installation instructions for detailed information.

1. Adjust knob on current switch fully clockwise to maximum full load amp (FLA).
2. With the motor operating normally, adjust knob SLOWLY counterclockwise until LED is lit.
3. Adjust the knob counterclockwise a few degrees more to prevent nuisance alarms.



Example how to calibrate current switch with 10 FLA motor:

1. Adjust knob clockwise on current switch to 10 FLA.
2. With the motor operating normally, adjust knob SLOWLY counterclockwise until LED is lit, about 8 amps.
3. Adjust knob counterclockwise to about 7 amps.

Alarms and Touchscreen Annunciations

1. Tank 1 DA high water level warning annunciation on the Overview Screen with red indicator.
2. Tank 1 DA low water level warning annunciation on the Overview Screen with red indicator.
3. Tank 1 DA low/low water level alarm. Pumps shut down.
4. Tank 1 SGR high water level warning annunciation on the Overview Screen with red indicator.
5. Tank 1 SGR low water level warning annunciation on the Overview Screen with red indicator.
6. Tank 1 SGR low/low water level. Pumps shut down.
7. Tank 2 DA high water level warning annunciation on the Overview Screen with red indicator.
8. Tank 2 DA low water level warning annunciates on the Overview Screen with red indicator.
9. Tank 2 DA low/low water level alarm. Pumps shut down.
10. Tank 2 SGR high water level warning annunciation on the Overview Screen with red indicator.
11. Tank 2 SGR low water level warning annunciation on the Overview Screen with red indicator.
12. Tank 2 SGR low/low water level. Pumps shut down.
13. Pump 1 Fail alarm. Annunciates when the current switch is not on.
14. Pump 2 Fail alarm. Annunciates when the current switch is not on.
15. Pump 3 Fail alarm. Annunciates when the current switch is not on.
16. Pump 4 Fail alarm. Annunciates when the current switch is not on.
17. Pump 5 Fail alarm. Annunciates when the current switch is not on.
18. Pump 6 Fail alarm. Annunciates when the current switch is not on.
19. Pump 7 Fail alarm. Annunciates when the current switch is not on.
20. Pump 8 Fail alarm. Annunciates when the current switch is not on.
21. Up to five RWF55 control water levels with low or high limit alarms
22. Up to four PLC control water levels with low or high limit alarms
23. Eight analog inputs with low or high limit alarms

Devices, Modbus Setup, and Parameters

Modbus RS-485 details: 19200 baud, 8 stop bits, 1 data bit, no parity.

Addressing:

RWF55 Controller 1 - address 1
RWF55 Controller 2 - address 2
RWF55 Controller 3 - address 3
RWF55 Controller 4 - address 4
RWF55 Controller 5 - address 5

Standard Modbus TCP/IP, Modbus RTU, BACnet/IP, and BACnet MS/TP for BMS interface.

Additional configuration details for each device are provided as separate Appendixes at the end of this manual.

Control System Nomenclature

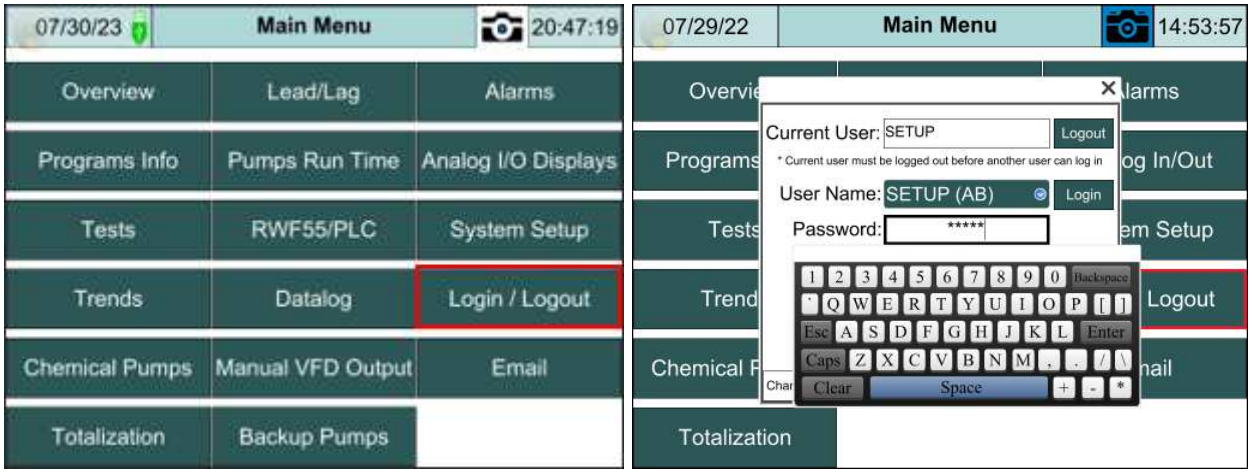
24ACH	24V AC Hot
24ACN	24V AC Neutral
485; RS485	RS-485 Serial Protocol
AH	Alarm Horn
AI	Analog Input Field Terminal
AIBI	Analog Input Built-In (PLC AI)
ALM-SIL	Alarm-Silence
AO	Analog Output Field Terminal
AOBI	Analog Output Built-In (PLC AO)
BC	BMS/Boiler Start Ctrl field Terminal
BMS	Building Management System
BU	Backup
BUP	Backup Pump Field Terminal
CB	Circuit Breaker
COND	Condensate
CPMP	Chemical Pump Field Terminal
CR	Control Relay
CS	Current Switch
CTRL	Control
DA	Deaerator
DC-	24VDC Negative Supply Terminal
DIDC	Digital Input Field Terminal
DIDC 24+	Digital Input 24 VDC Supply Terminal
DP	Differential Pressure
DS1	Disconnect Switch 1
ES	Ethernet Switch
FG	Frame Ground
FLA	Full Load Amperage
FLT	Flow Switch
FW	Feedwater
FWP	Feedwater Pump
G1, G2	Group1, Group2
GND	Ground Terminals
H, H1	Hot 120 VAC
HI	Water Level High
HMI	Human Machine Interface
HOA	Hand-Off-Auto
H, H1	Hot 120 VAC
L1	Line 120VAC

Control System Nomenclature (continued)

LO LO	Water Level Low/ Low Low
LT-P1_LT-P8	Pump Run Light Terminals
MAX	Maximum
MIN	Minimum
MUV	Make Up Valve
N, N1	Neutral
P-1_P-8	Pump 1 through Pump 8
P1A	Pump 1 in Auto Position
P1CS—P8CS	Pumps Current Switches
P1H	Pump 1 in Hand Position
P1HA	Pump 1 Hand Auto
PBLT	Push Button with Light
PC	Protocol Converter
PE	Potential Earth
PLC	Programmable Logic Controller
PMP	Pump Field Terminal
PS	Power Supply
PWR	Power
RTD	Resistance Temperature Detector
RWF	RWF55 Controller
SH, SHLD	Shield
SH-N	Not Grounded Shield Terminal
SRG	Surge
SS	Selector Switch
STR	Start
SYSR	System Relay
T1L/T1R HI	Tank 1 Left/Right High Water Level
T1L/T1R LO	Tank 1 Left/Right Low Water Level
T1L/T1R LO LO	Tank 1 Left/Right Low Low WL
T2L/T2R HI	Tank 2 Left/Right High Water Level
T2L/T2R LO	Tank 2 Left/Right Low Water Level
T2L/T2R LO LO	Tank 2 Left/Right Low Low WL
TP	Transfer Pump
VFD	Variable Frequency Drive
WL	Water Level
WLC	Water Level Control Field Terminal
XFMR	Transformer

Logging In

When the touchscreen is powered up, the OVERVIEW screen will appear. Press the **MAIN MENU** button to navigate to the MAIN MENU screen. Press **LOGIN/LOGOUT** to enter a Username and password.

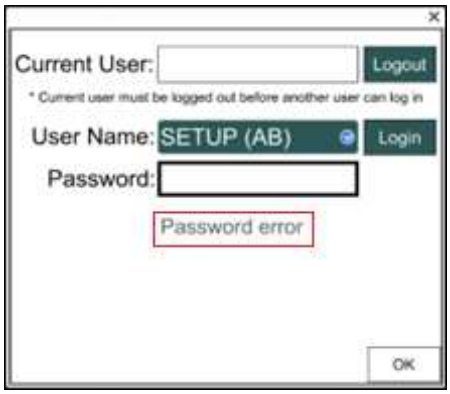


There are four access levels available based on the Username. Each access level grants different levels of access to the program and setup of the panel:

- TECH: Allows access to viewing data, changing setpoints, operational parameters, and password. Username and password required. The Username is TECH. The default password is 9876.
- SETUP: Same access as TECH level as well as access to programming touchscreen configuration settings. Username and password required. The Username is SETUP. The default password is START.
- MASTER: Same access as SETUP level as well as access to set passwords for all users. The Username is MASTER. The default password is MASTER.
- ADMIN: For factory use only.

Logging In (continued)

When the LOGIN/LOGOUT screen appears, tap the arrow down button to the left of Login to select the Username from the drop-down list. Next, tap the box next to 'Password' and a keypad will appear. Use the keypad to enter the password, press ENTER, and then press the 'Login' button.
The Login successful or Password error message will display below the password input box. If successful, the Current User will display the access level. Press the 'OK' button to leave the LOGIN/LOGOUT screen.

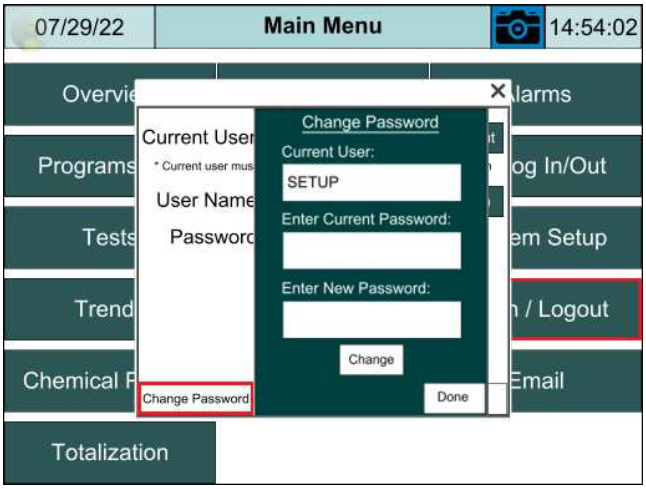


Note: **The current user must be logged out before another user can log in.**

Changing Passwords

Access level: TECH and SETUP and MASTER
The default passwords can be changed by pressing the **Change Password** button on the LOGIN/LOGOUT screen.

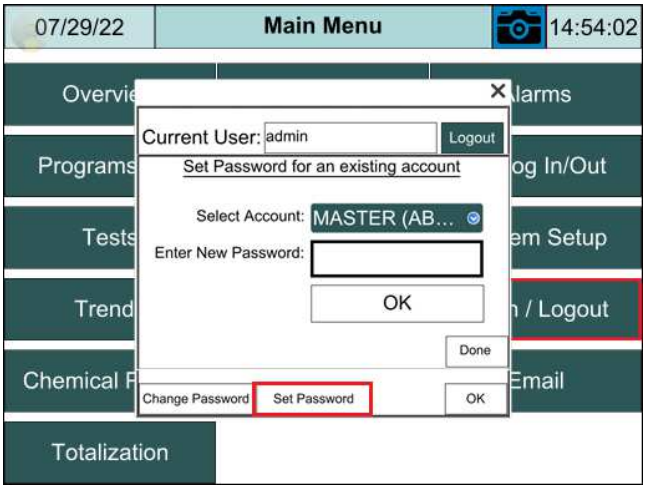
Logging In (continued)



The Change Password screen will appear with the current user. To change the password, enter the current and new password. Then press the **Change** button to accept the new password. Once the new password is accepted press **Done** to leave the screen.

Master Password

Access level: MASTER
The MASTER access level can set passwords for all access levels. To set passwords, press 'LOGIN/LOGOUT' from main menu. After logging in, press 'Set Password'.



Password screen will appear. Press the 'arrow down' button to select the account to enter the password. Enter the new password and press 'OK' to set new password, press 'Done' to exit the screen.

System Setup

The touchscreen for each system will be factory configured for the features and options based on the system selected part number (See SCC Technical Instructions TS-3200). It could be configured as a single tank or dual tank with up to eight pumps and four groups. A single tank can be Deaerator, Surge, Condensate, split Deaerator/Surge, or split Surge/Deaerator. The second tank (TANK 2) can be configured based on the first tank as below:

TANK 1	**TANK 2**
Deaerator	Deaerator
Deaerator	Surge
Deaerator	Condensate
Deaerator	Split Deaerator/Surge
Deaerator	Split Surge/Deaerator

TANK 1	**TANK 2**
Surge	Deaerator
Surge	Surge
Surge	Condensate
Surge	Split Deaerator/Surge
Surge	Split Surge/Deaerator

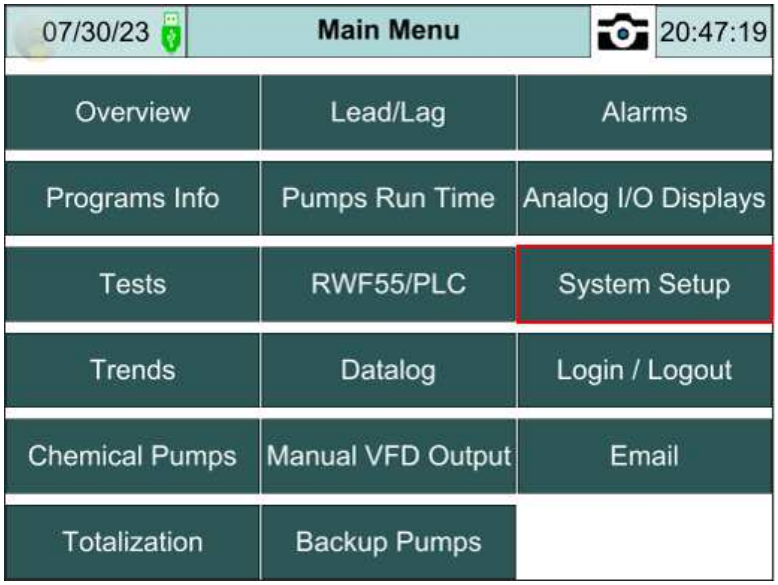
TANK 1	**TANK 2**
Split Deaerator/Surge	Deaerator
Split Deaerator/Surge	Surge
Split Deaerator/Surge	Condensate
Split Deaerator/Surge	Split Deaerator/Surge
Split Deaerator/Surge	Split Surge/Deaerator

TANK 1	**TANK 2**
Split Surge/Deaerator	Deaerator
Split Surge/Deaerator	Surge
Split Surge/Deaerator	Condensate
Split Surge/Deaerator	Split Deaerator/Surge
Split Surge/Deaerator	Split Surge/Deaerator

System Setup (continued)

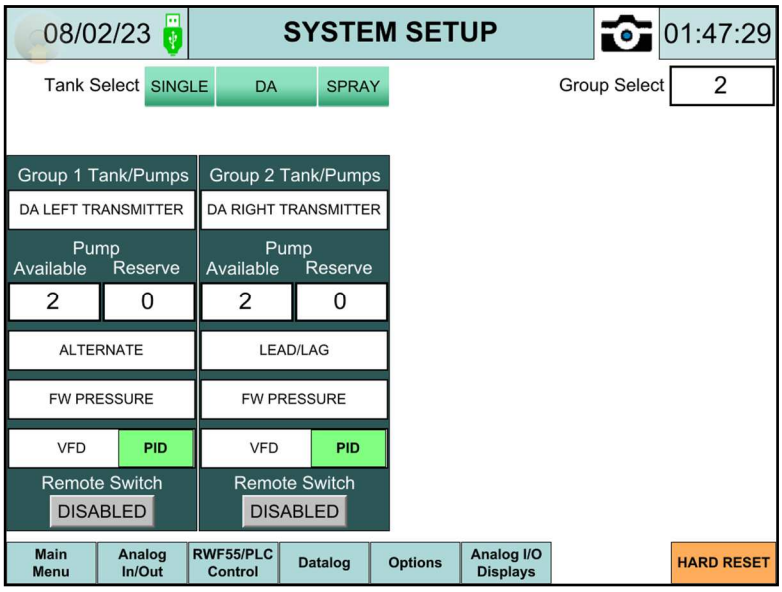
WARNING!
Please note: the PUMPS CONTROL selector switch located on the front of the control panel should be placed in the **OFF** position while configuring and setting up the lead/lag system. To operate the system after configuration is completed place the PUMPS CONTROL switch to the **ON** position.

The panel needs to be configured for the connected equipment. Press **System Setup** to display the SYSTEM SETUP screen.

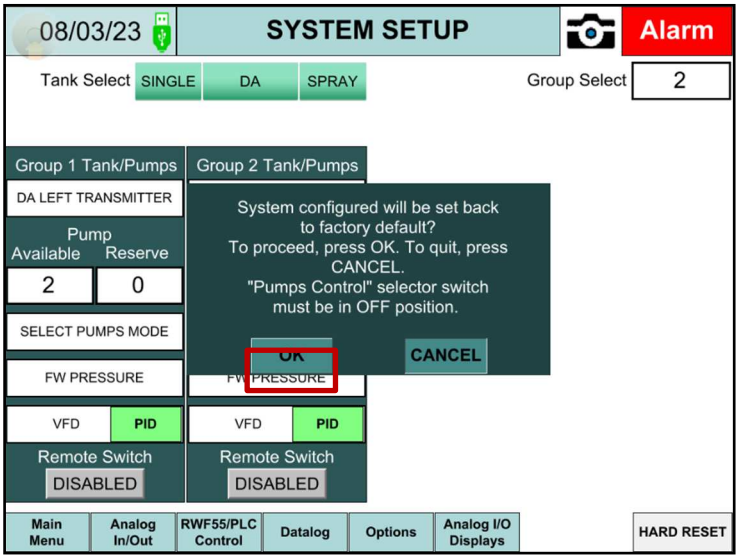


System Setup (continued)

Single Tank Setup



HARD RESET - A 'HARD RESET' must be only performed for the intial factory setup to clear the system configuration, and set the system timers to default parameters. The HARD RESET must be performed before configuring the system for the related system part number. The physical PUMPS CONTROL selector switch must be placed in the OFF positoin before pressing the 'HARD RESET' Button. A pop up window will appear. To clear the exsisting system configuration, reset the timers to default, and to confirm the hard reset press **OK**.



Change the description from factory default to system unconfigured

System Setup (continued)

Press **OK** to unconfigure the system, and set the timers to default parameters, otherwise press **CANCEL**. The system must be reconfigured, after pressing the "OK" button.

Default parameters for an unconfigured system:

- Group Tank/Pumps: NONE
- All pumps are disabled
- Lead/lag pumps not selected
- Start delay: 15 seconds
- Stop delay: 15 seconds
- Minimum run time: 600 seconds
- Alternate time: 24 hours
- Overlap time: 30 seconds
- Lead pump search timer: 3 seconds
- Feedback pumps fail timer: 15 seconds

Note: Do not press '**HARD RESET'** button again unless there is a need to go back and set the system with an unconfigured control system default parameters.

Tank Select (single tank example):

Press the button next to **Tank Select** to select between and single or dual tank.

Press the button next to **SINGLE** to select the tank type. For DA tanks a **SPRAY** or **Tray** options must be selected next to the **DA** selection.

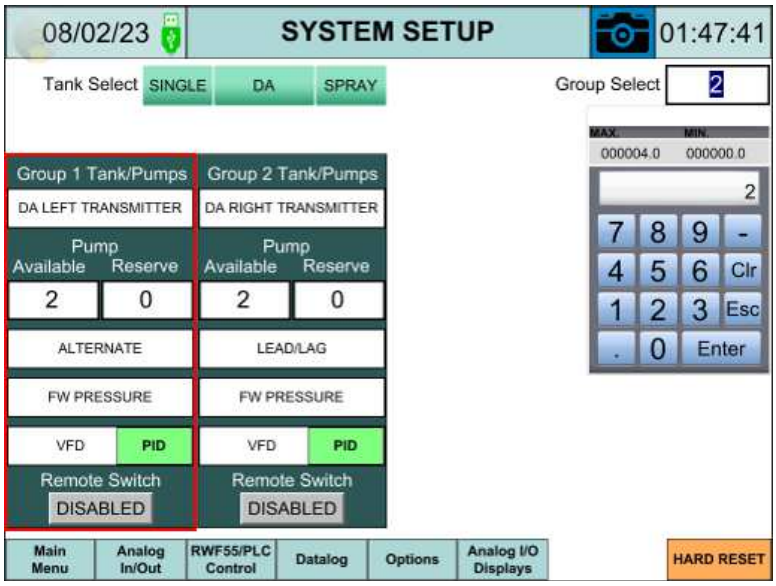
- **NONE**
- **DA** (select tank type **SPRAY** or **TRAY** with Deaerator only)
- **SRG**
- **COND**
- **DA/SRG** (select tank type **SPRAY** or **TRAY** with Deaerator only)
- **SRG/DA** (select tank type **SPRAY** or **TRAY** with Deaerator only)

The DA (Deaerator), SRG (Surge), and COND (Condensate) are single tank. The DA/SRG (Deaerator/Surge) and SRG/DA are single split tank.

System Setup (continued)

Group Select:

Press the white box next to Group Select, a keypad will appear. Enter the total number of groups for the entire system. The system could be configured for up four groups of pumps. The SYSTEM SETUP screen will vary based on the group selection.



Group 1 Tank/Pumps:

- **NONE**
- **DA LEFT TRANSMITTER**
- **DA RIGHT TRANSMITTER**
- **SG LEFT TRANSMITTER**
- **SG RIGHT TRANSMITTER**
- **COND LEFT PIPE**
- **COND RIGHT PIPE**

Select the transmitter location on the left or right side of feedwater or transfer pumps. For condensate, select the pipe on the left or on the right.

System Setup (continued)

Pump Available and Pump Reserve:

- **Pump Available**: Enter the total number of pumps for group 1, up to eight pumps.
- **Pump Reserve**: Only enter the pump reserve if there is pump for future installation or reserve an empty pump spot to keep gap between the pumps on the touchscreen overview screen. By reserving a pump for future installation, the total number of operating pumps will be reduced by the number of pumps reserved.

  For example: A single split DA/SRG tank has 3 feedwater pumps, 2 transfer pumps, and 1 feedwater pump for future installation. The setup will be 3 feedwater pumps available, and 1 feedwater pump reserved in group 1. Two transfer pumps are available, and 0 pump reserved in group 2.

Select Pumps Mode:

Press the button to select LEAD/LAG or ALTERNATE.

- **LEAD/LAG:** Pumps are controlled by lead/lag. See "Pump Lead/Lag Sequence of Operations", for details.
- **ALTERNATE:** The lead pump will initially run, and the first available lag pump will start to run when the lead pump fails or when the ALTERNATE TIME expires. The current running lag pump will become the lead pump, and the failed lead pump will switch to become the last lag pump.

Select Pumps Control:

Press the button to select the desired pump control method.

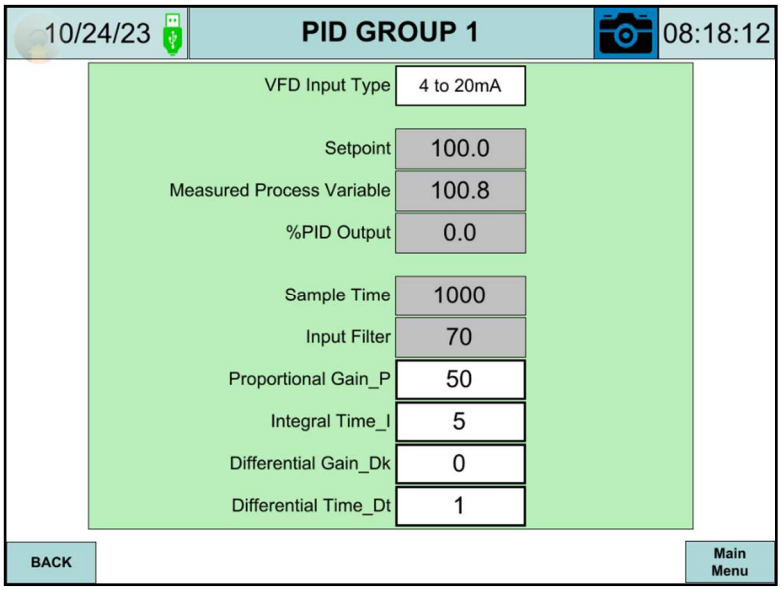
- **FW (Feedwater) PRESSURE:** Pumps lead/lag process variable is based on feedwater or transfer water pressure control.
- **HEADER:** Feedwater or transfer water control setpoint based on the main boilers steam header pressure, and a setpoint offset above the steam header pressure. The main header pressure sensor is configured in the 'System setup >> Analog In/Out' and it will be displayed next to the HEADER in gray box. The setpoint offset can be setup in 'Main Menu >> Lead/Lag >> DA Group 1'.
- **BSC (Boiler start control) NOT MANIFOLDED:** Boiler start/stop command to feedwater pumps, pump 1 start per boiler 1, pump 2 start per boiler 2, and so on.
- **MANIFOLDED:** Boiler start control with pumps manifolded. Boiler start/stop command to feedwater pumps, one pump per boiler.

  Note: When 'Condensate left pipe' or 'Condensate right pipe' is selected, the pumps control selection for Condensate tank is 'Manifolded' and cannot be adjusted.

System Setup (continued)

Motor Control: Pumps are controlled by motor starter or VFD.

- **MOTOR STARTER:** The pumps are controlled by motor starters.
- **VFD:** The pumps are controlled by VFDs. Press the **PID** button to display the PID GROUP 1 setup screen.



VFD Input Type - Select between 4 to 20mA, or 0-5V or 10V, or 0 to 20mA.
Setpoint - Displays the groups presure setpoint.
Measured Process Variable - Displays the measured process variable value.
%PID Output - Displays PID output as percentage, ranging from 0 to 100.
Sample Time - Displays the sample time.
Input Filter - Displays the input filter.
Proportional Gain_P - Sets the proportional gain P. The default setting is 100.
Integral Time_I - Sets the integral time I. The default setting is 1.
Differential Gain_Dk - Sets the differential gain Dk. The default setting is 0.
Differential Time_Dt - Sets the differential time Dt. The default setting is 1.

The PID controller continuously calculates an error value as the difference between the SETPOINT and a MEASURED PV and applies a correction based on proportional, integral, and derivative parameters. The PID control is used for both feedwater and transfer pump control.

System Setup (continued)

Proportional Response

The proportional component depends only on the difference between the setpoint and the process variable. This difference is referred to as the error term. The proportional gain determines the ratio of output response to the error signal. In general, increasing the proportional gain will increase the speed of the control system response. However, if the proportional gain is too large, the process variable will begin to oscillate. If the proportional gain is increased further, the oscillations will become larger, and the system will become unstable and may even oscillate out of control.

Integral Response

The integral component sums the error term over time. As a result even a small error term will cause the integral component to increase slowly. The integral response will continually increase over time, unless the error is zero. The effect is to drive the steady-state error to zero. Steady-state error is the final difference between the process variable and setpoint. A phenomenon called integral windup results when integral action saturates a controller without the controller driving the error signal toward zero.

Derivative Response

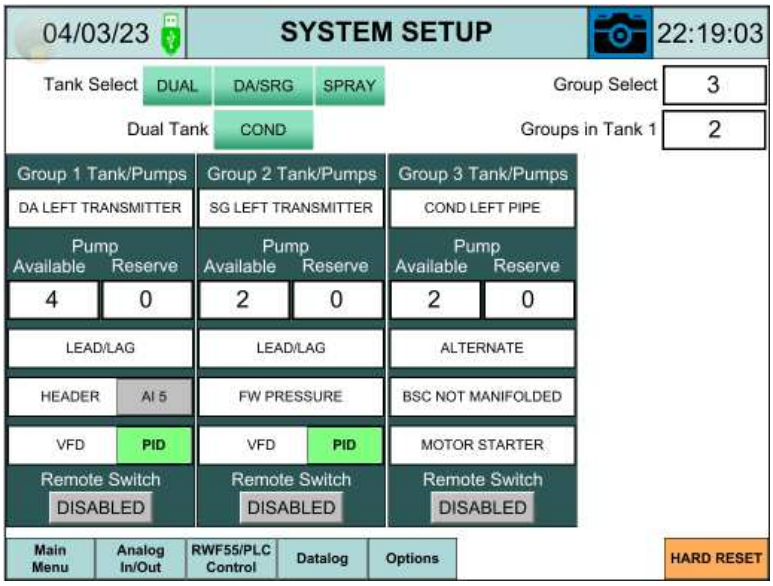
The derivative component causes the output to decrease if the process variable is increasing rapidly. The derivative response is proportional to the rate of change of the process variable. Increasing the derivative time will cause the control system to react more strongly to changes in the error term and will increase the speed of the overall control system response. Since the derivative response is highly sensitive to noise in the process variable signal, most practical control systems use a very small derivative time. If the sensor feedback signal is noisy, or if the control loop rate is too slow, the derivative response can make the control system unstable.

Remote Switch: Enabling the remote switch will display a status symbol on the overview screen. The status symbol will indicate Remote On when a BMS signal is received for the pump group to be on. This option does not apply for pump groups of condensate tanks.

System Setup (continued)

Dual Tank Setup Example

From the MAIN MENU, press **SYSTEM SETUP** to display the SYSTEM SETUP screen. The SYSTEM SETUP screen is only accessible with SETUP, MASTER, or ADMIN level access.



Tank Select:

Press the button next to **Tank Select** to select between and single or dual tank.

Press the button next to 'DUAL' to select tank and tank type for the first tank.

- **NONE**
- **DA** (select tank type **SPRAY** or **TRAY** with Deaerator only)
- **SRG**
- **COND**
- **DA/SRG** (select tank type **SPRAY** or **TRAY** with Deaerator only)
- **SRG/DA** (select tank type **SPRAY** or **TRAY** with Deaerator only)

The DA (Deaerator), SRG (Surge), and COND (Condensate) are single tank. The DA/SRG (Deaerator/Surge) and SRG/DA are single split tank.

System Setup (continued)

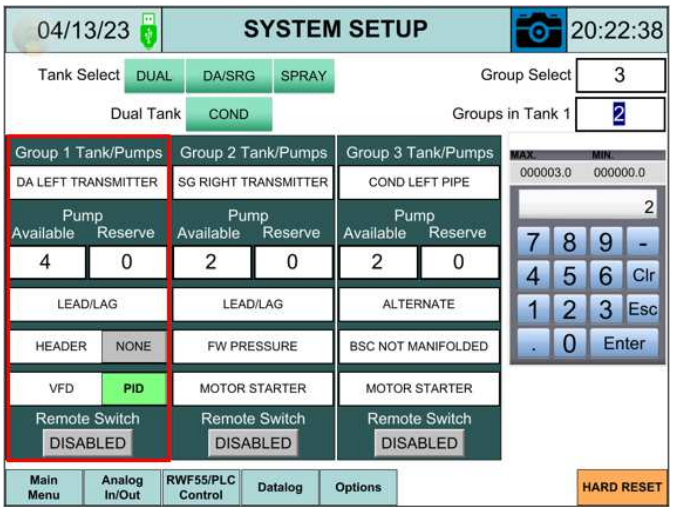
Press the button next to text **Dual Tank** to select tank and tank type for second tank.

- **NONE**
- **DA** (select tank type **SPRAY OR TRAY** with Deaerator only)
- **SRG**
- **COND**
- **DA/SRG** (select tank type **SPRAY OR TRAY** with Deaerator only)
- **SRG/DA** (select tank type **SPRAY OR TRAY** with Deaerator only)

The DA (Deaerator), SRG (Surge), and COND (Condensate) are single tank. The DA/SRG (Deaerator/Surge) and SRG/DA are single split tank.

Group Select:

Press the white box next to **Group Select** and the keypad will appear on screen. Enter the total number of groups for both tanks. There are up to four groups available for both tanks. With DUAL tanks, the minimum number of groups in **Group Select** is two groups and **Groups in Tank 1** is one. The maximum **Groups in Tank 1** is three. The SYSTEM SETUP screen will vary based on the amount of groups selected and their configuration.

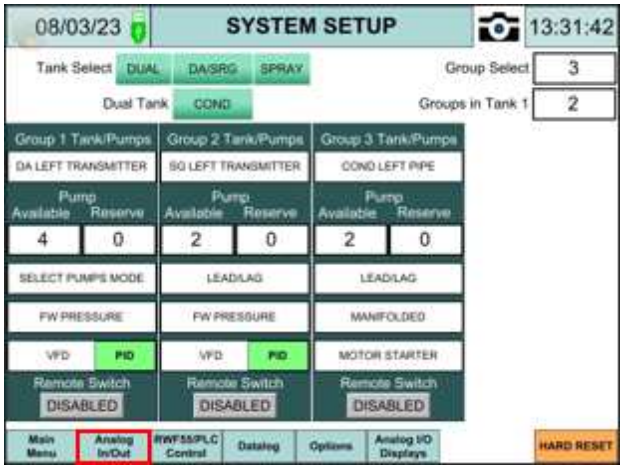


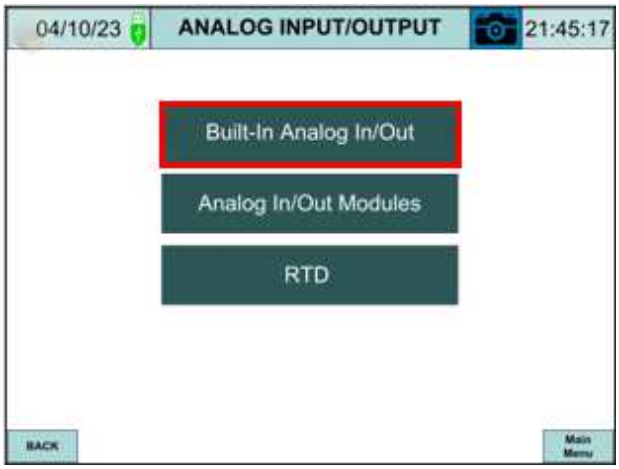
See page 24 '**Group 1 Tank/Pump'** to configure all pump groups.

System Setup (continued)

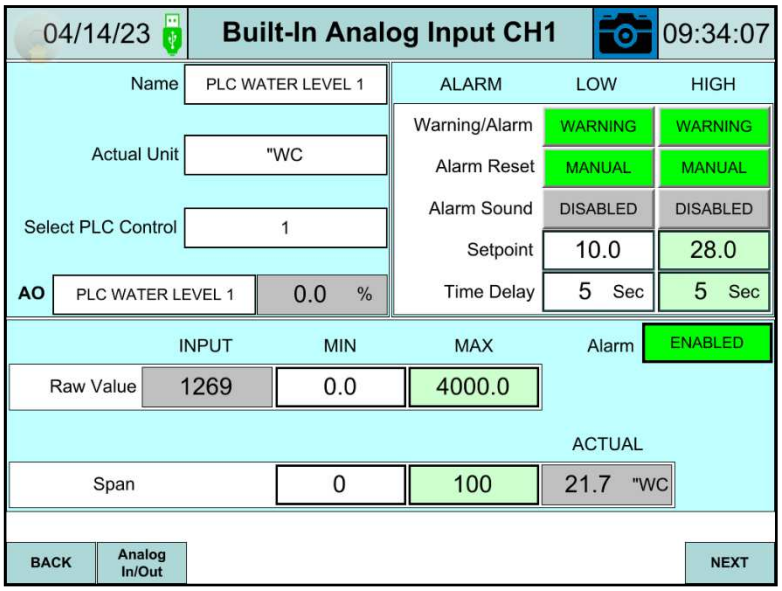
Analog In/Out

From SYSTEM SETUP, press the **ANALOG IN/OUT** button at the bottom left of the screen to display the ANALOG INPUT/OUTPUT menu. Press the **BUILT-IN ANALOG IN/OUT** button to configure the two PLC built-in analog inputs and one analog output.





Built-In Analog In/Out



System Setup (continued)

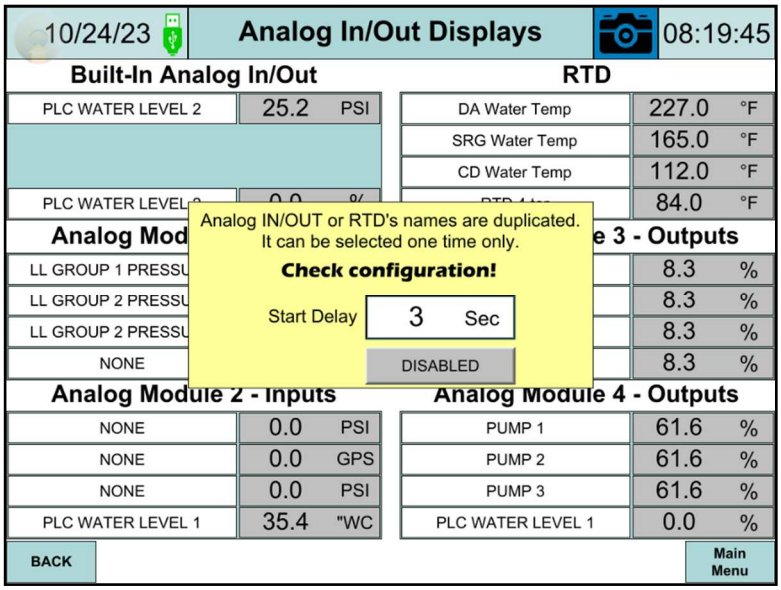
The system could include up to 10 analog inputs, two are standard analog inputs **Built-In Analog In/Out,** and eight are via two additional analog input modules **Analog In/Out Modules**. The additional analog inputs contain four additional analog inputs each. These may or may not be included with the system based on the ordered configuration of the panel.

Name – Below is a list of names that can be assigned to analog inputs. Please note that each name can only be assigned to a maximum of one analog input. Press the button next to **Name** to cycle through the options.

- **NONE**
- **LL GROUP 1 PRESSURE 1 (LL: Lead/Lag)**
- **LL GROUP 1 PRESSURE 2**
- **LL GROUP 1 PRESSURE 3**
- **LL GROUP 1 PRESSURE 4**
- **PLC WATER LEVEL 1 (PLC: Programable Logic Controller)**
- **PLC WATER LEVEL 2**
- **PLC WATER LEVEL 3**
- **PLC WATER LEVEL 4**
- **T1 DA WATER TEMP (Tank 1 Deaerator water temperature)**
- **T1 SRG WATER TEMP (Tank 1 Surge water temperature)**
- **T2 DA WATER TEMP**
- **T2 SRG WATER TEMP**
- **TOTALIZATION 1**
- **TOTALIZATION 2**
- **TOTALIZATION 3**
- **TOTALIZATION 4**
- **HEADER GROUP 1**
- **HEADER GROUP 2**
- **HEADER GROUP 3**
- **HEADER GROUP 4**
- **TANK 1 PRESSURE**
- **TANK 2 PRESSURE**

Note – Each name can only be assigned to one analog input. A ‘Check configuration!’ pop up window will appear in the ANALOG I/O DISPLAYS screen (Main Menu >> Analog In/Out Displays) when names are duplicated. Press DISABLED to close the pop-up window, seen in the following image. From this screen check what inputs are duplicated. Return to the ANALOG INPUT/OUTPUT screen to reconfigure the duplicated inputs.

System Setup (continued)



Actual Unit – Select the appropriate unit for the analog input.

- **PSI:** Pound per square inch
- **A:** Ampere (current)
- **GPS:** Gallon per second
- **GPM:** Gallon per minute
- **GPH:** Gallon per hour
- **LPS:** Litter per second
- **LPM:** Litter per minute
- **LPH:** Litter per hour
- **LbsS:** Pound per second
- **LbsM:** Pound per minute
- **LbsH:** Pound per hour
- **“WC:** Inch or water column
- **°F:** Temperature in Fahrenheit
- **°C:** Temperature in Celsius

Select PLC Control – Select the PLC control 1, 2, 3 or 4 if the analog input name is selected for PLC water level control 1, 2, 3, or 4 accordingly otherwise select NONE.

- **NONE**
- **1**
- **2**
- **3**
- **4**

System Setup (continued)

AO (Analog Output) – Select the appropriate name for the analog output. Select NONE if the PLC built-in analog output is not used.

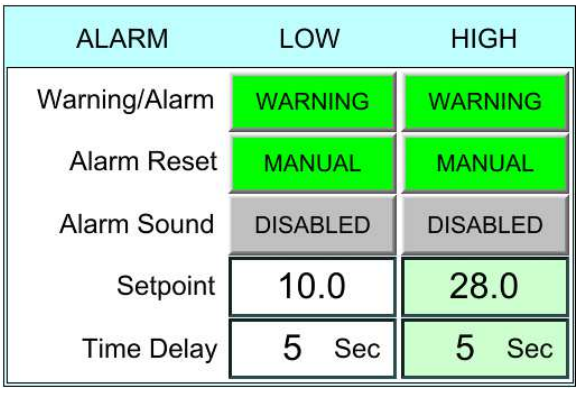
- **NONE**
- **PUMP 1**
- **PUMP 2**
- **PUMP 3**
- **PUMP 4**
- **PUMP 5**
- **PUMP 6**
- **PUMP 7**
- **PUMP 8**
- **PLC WATER LEVEL 1**
- **PLC WATER LEVEL 2**
- **PLC WATER LEVEL 3**
- **PLC WATER LEVEL 4**
- **TANK 1 PRESSURE**
- **TANK 2 PRESSURE**

Raw Value – Raw **INPUT**, raw **MIN**, and raw **MAX** are digital values in the PLC. The maximum value for PLC built-in analog input is 4000. Raw **MIN** and raw **MAX** are adjustable only if an offset is needed.

Span – Sets the range of the inputs. The first input box is the minimum value, the second input is the maximum value.

Actual – Actual measured value.

Alarm – Enables or disables alarms for the analog input. If the alarm is enabled, the following window will appear.



There are low and high alarms or warnings generated by each analog input.

System Setup (continued)

Warning/Alarm: Warnings will display the status of low/high input with no alarm sound. Alarms can be set up with manual or auto reset and with sound or without sound.

Alarm Reset: Select MANUAL reset if the alarm should be manually reset each time. Select Auto reset if the input should be automatically reset when non-alarm conditions are achieved.

Alarm Sound: Enables an audible alarm if an alarm occurs.

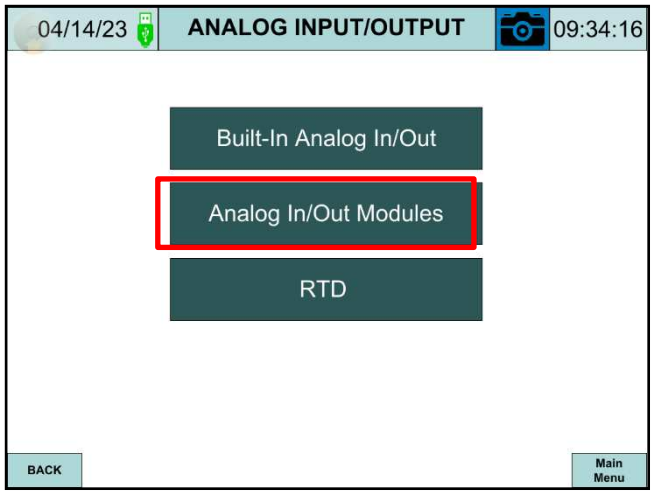
Setpoint: Sets the alarm setpoints for the analog input. When the input is below the low setpoint, it generates a low alarm and when the input is above the high setpoint, it generates a high alarm.

Time Delay: Sets the time delay for the alarm. The input must be above the high value or below the low value for the duration of the time delay for an alarm to occur.

Press the **NEXT** button to display the Built-In Analog Input Ch2 screen. Follow the same procedure for Built-In Analog Input Channel 2.

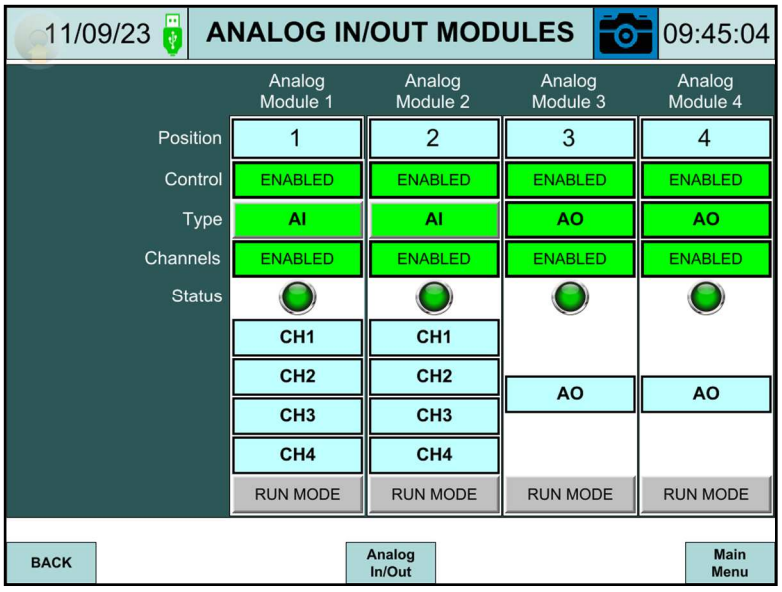
Analog In/Out Modules

Any additional analog inputs and outputs can be configured by pressing the **Analog In/Out Modules** button on the ANALOG INPUT/OUTPUT screen.



System Setup (continued)

Analog Inputs and Outputs Modules



The system could have up to four analog modules, configured for up to two analog inputs, and two analog outputs modules, or up to four anlog outputs modules. The analog input modules would be installed in the first and second slot positions to the left side of the PLC. The analog output modules would be installed at any slot position to the left of the analog input module(s). The image above shows two analog inputs, and two analog outputs modules installed with the appropriate adapter number 1 through 4, confgured, and enabled for operation.

- **Position**: For each module being used change the position number to be equal to the module number and andy unsued modules should be set for zero. For example, if three analog modules are being used the **Postion** value of **Analog Module 1** would be 1, **Analog Module 2** would be 2, **Analog Module 3** would be 3, and **Analog Module 4** would be 0. The example in the figure above displays a system containg four analog modules.

- **Control**: Must be set to ENABLED during normal operation, and DISABLED when configuring the analog module.

- **Type:** Must be set to AI for an analog input module is installed, or AO for an analog outout module. This value can only be changed if both FUNCTION BLOCK, and CH1 to CH4 are DISABLED.

- **Channels:** Must be set to ENABLED during normal operation, and DISABLED when configuring the anlog module.

System Setup (continued)

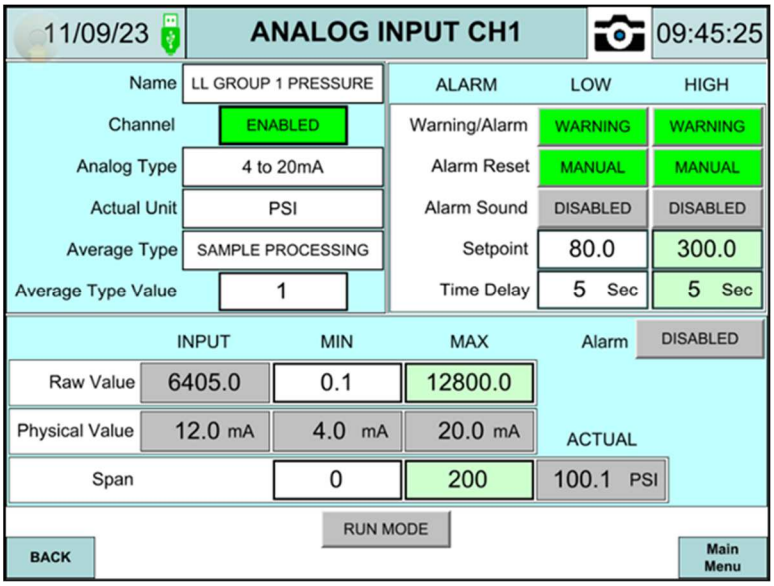
- **Status:** Flashing red/gray if the FUNCTION BLOCK is not active, solid green when active.

- **CH1 -CH4 or AO:** Press these buttons to bring up the related channel analog inputs or outputs screen to congigure each input and output.

- **Run Mode:** Press the RUN MODE button after configuring a module. The indicator color will change to green/gray, then solid green, indicating that the status is Activated. Status and CH1 -CH4 will be automatically ENABLED for that module.

Anaolog Input Configuration Example:

From the ANALAOG IN/OUT MODULES screen select the desiered input channel to be cofigured. This example shows the setup of anaolog input channel one(**CH1** button).



Name – Select a name for the analog input to set the function of the analog input. Please refer to the list on page 31 for a list of possible analog input names. Please note that each analog input name can only be assigned once.

The 'Check configuration!' pop up window will appear in the Analog In/Out screen (Main Menu >> Analog In/Out) when names are duplicated. Press **DISABLED** to close the pop-up window.

Channel – The selected analog input channel must be **DISABLED** when configured.

Analog Type – Select between **0 to 20mA**, **4 to 20mA**, or **0 to 5V or 10V**.

System Setup (continued)

Actual Unit – Select the unit for the actual monitored value.

- **PSI** **Punds Per Square Inch**
- **A** **Ampere**
- **GPS** **Gallon Per Second**
- **GPM** **Gallon Per Minute**
- **GPH** **Galon Per Hour**
- **LPS** **Liter Per Second**
- **LPM** **Liter Per Minute**
- **LPH** **Liter Per Hour**
- **Lb/S** **Punds Per Second**
- **Lb/M** **Punds Per Minute**
- **Lb/H** **Punds Per Hour**
- **"WC** **Inch Waer Column**
- **°F** **Degrees F**
- **°C** **Degrees C**

Average Type – The average processing method of the analog input signals, it is needed sometimes to dampen the incoming signal.

- **Sample Processing:** The analog inputs updates based on sample program scan.
- **Time Average:** The analog inputs updates based on time average of program scan.
- **Count Average:** The analog inputs updates based on count average of program scan.
- **Moving Average:**

Average Type Value –

- **For Sample Processing**: Default settings = 1, the analog value updates every program scan, raising the sample processing value to higher number "X", the analog input value updates every "X" scan samples.
- **For Time Average:** Default settings = 4ms, the average analog value is calculated after 4ms of program scan updates, raising the time average value to 8ms, then the average analog value is calculated after 8ms of program scan updates
- **For Count Average**: Default settings = 4 counts, the average analog value is calculated after 4 counts program scan updates, raising the time average value to 8, then the average analog value is calculated after 8 counts of program scan updates
- **For Moving Average:** Default settings = 4 counts, the average analog value is calculated after its value changed 4 times, raising the time average value to 8, then the average analog value is calculated after 8 value changes of scan updates

System Setup (continue)

Raw Value – Raw **INPUT**, raw **MIN** and raw **MAX** are the digital values of the analog signals before getting spanned for the actual MIN and MAX values. The maximum raw value for an analog input is 16000. Raw **MIM** and raw **MAX** could be adjusted if a signal offset value is desired.

Physical Value – Monitored transmitter input signal, minimum and maximum values.

Span – Sets the range of the inputs.

Actual – Actual measured value.

Press the 'RUN MODE' button when analog input is completely configured. The 'CH1 to CH4' button will be automatically switched to **ENABLED** and turns green.

Alarm – Must be ENABLED to for the analog input alarm massages window to appear.

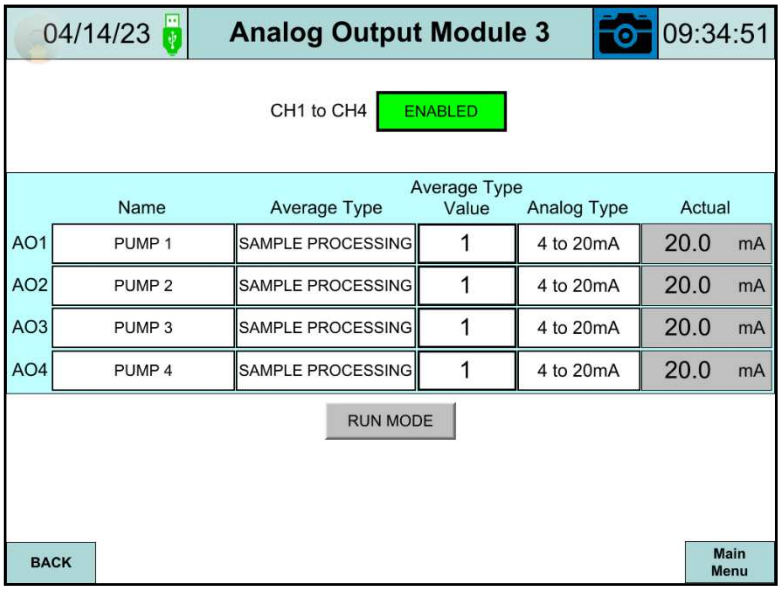
See page 35, "BUILT-IN ANALOG IN/OUT – ALARM".

To configure the additional analog inputs, press the **BACK** button to return to the ANALOG IN/OUT MODULES screen. Then select the next input or output to be configured.

Analog Output Configuration

From the ANALOG IN/OUT MODULES screen, press the **AO** button.

System Setup (continued)



CH1 to CH4 – Set value to **DISABLED** to configure the analog outputs.

Name – Select a name for each analog output channel. See page 33 for a list of all analog output options. Only one name can be assigned for each analog output channel. The 'Check configuration!' pop up window will appear in the Analog In/Out screen (Main Menu >> Analog In/Out) when names are duplicated. Press DISABLED to close the pop-up window.

Average Type – The average processing method of the analog input signals, it is needed sometimes to dampen the incoming signal. Refer to page 37 for a description of each average type.

- **Sample Processing**
- **Time Average**
- **Count Average**
- **Moving Average**

Average Type Value – Sets the value of how frequently the selected average type is processed. Refer to page 37 for a description of the **Average Type Value** for each average type.

Analog Type – Select between **0 to 20mA**, **4 to 20mA**, or **0 to 5V or 10V**.

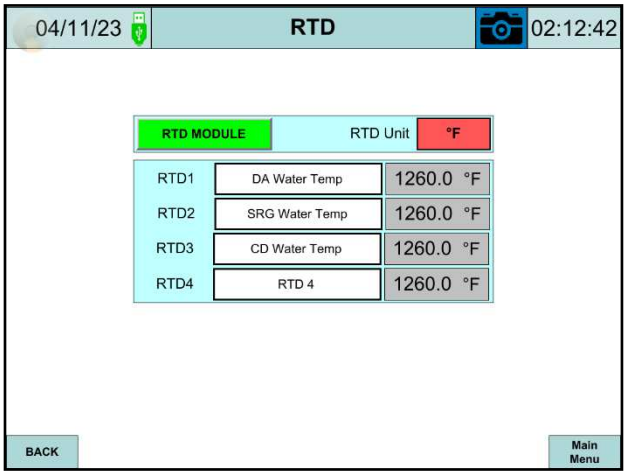
Actual – Displays the real-time output value.

Press the **RUN MODE** button to finish the analog output configuration. The button will turn green and then gray when the analog output completely setup. The CH1 to CH4 button automatically reset by turning gray (disabled) and back to green (enabled).

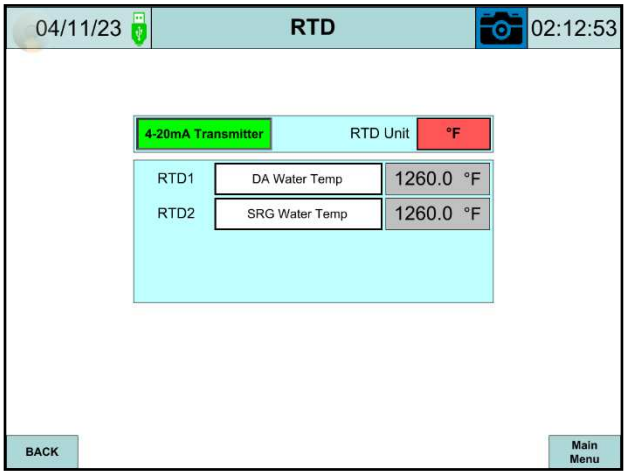
System Setup (continued)

RTD Resistance Temperature Detector

From the ANALOG INPUT/OUTPUT screen, press **RTD**.



4 RTD inputs with RTD module



2 RTD inputs with 4-20mA transmitter

RTD Unit – Select Fahrenheit or Celsius.

RTD1 – User configured RTD 1 name, up to 20 characters. The default RTD 1 label is DA Water Temp.

RTD2 – User configured RTD 2 name, up to 20 characters. The default RTD 2 label is SRG Water Temp.

RTD3 – User configured RTD 3 name, up to 20 characters. The default RTD 3 label is CD Water Temp.

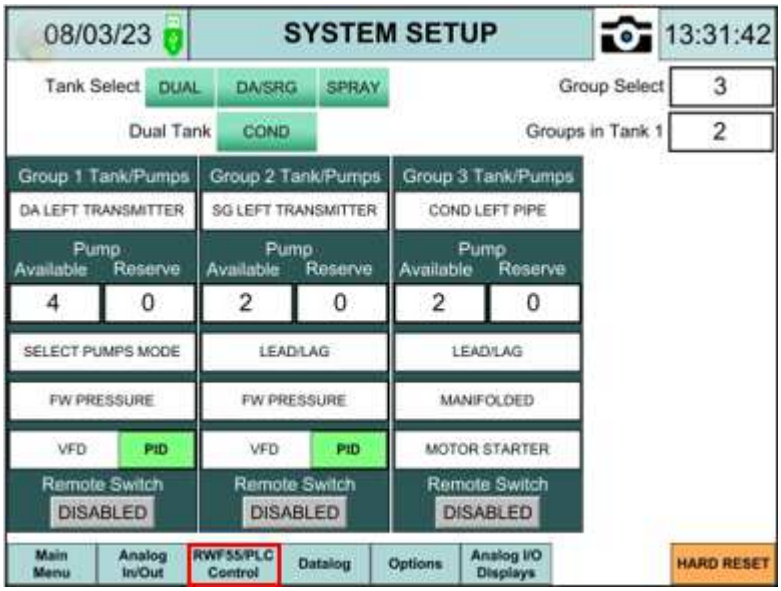
System Setup (continued)

RTD4 – User configured RTD 4 name, up to 20 characters. The default RTD 4 label is RTD 4.

RTD 1 to RTD 3 to be displayed on the overview screen, RTD1, must be used for DA water temperature, RTD 2 must be used for Surge water temperature, RTD 3, must be used for Condensate water temperature.

RWF55/PLC Control

From SYSTEM SETUP, press the **RWF55/PLC CONTROL** to display the RWF55/PLC Control screen.



System Setup (continued)

Total RWF55 Control – Sets the number of the RWF55 controllers installed. The system could have up to five RWF55 controllers.

RWF55 Address – Sets the Modbus address for the RWF55. The address is set to 1 for the first RWF55 controller, set to 2 for the second RWF55 and so on.

Name – There are 13 options that can be selected for the RWF55 function, or PLC functions. Toggle the name in the white box to select the function of each RWF55 or PLC being used.

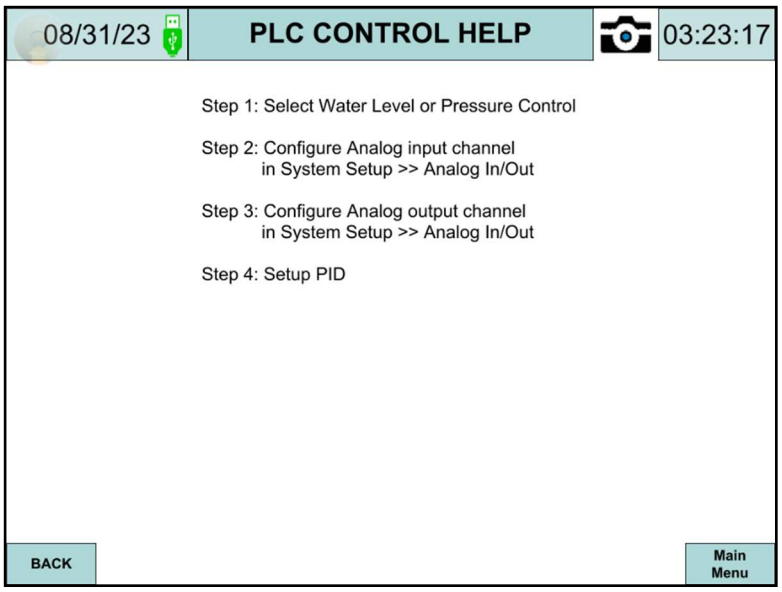
- **NONE**
- **T1 DA WATER LEVEL (Tank 1 Deaerator water level)**
- **T1 DA WATER LEVEL BU (Tank 1 Deaerator water level backup)**
- **T1 STEAM PRESSURE**
- **T1 STEAM PRESSURE BU**
- **T1 SRG WATER LEVEL (Tank 1 SURGE water level)**
- **T1 SRG WATER LEVEL BU (Tank 1 SURGE water level backup)**
- **CONDENSATE WATER LEVEL**
- **RESERVE**
- **T2 DA WATER LEVEL (Tank 2 Deaerator water level)**
- **T2 DA WATER LEVEL BU (Tank 2 Deaerator water level backup)**
- **T2 STEAM PRESSURE**
- **T2 STEAM PRESSURE BU**
- **T2 SRG WATER LEVEL (Tank 2 SURGE water level)**
- **T2 SRG WATER LEVEL BU (Tank 2 SURGE water level backup)**

SP (Setpoint) – Press the **SP** button and enter the setpoint for the RWF55.

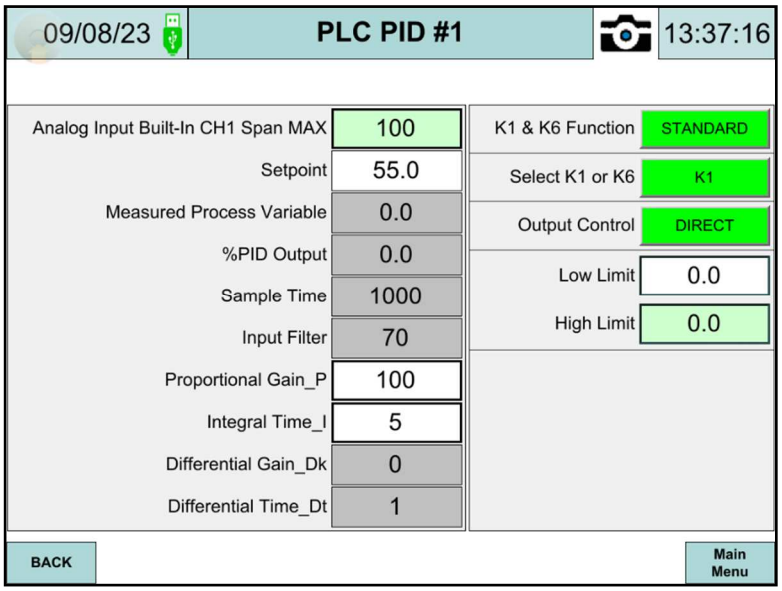
Total PLC Control – Sets the number of the functions that are controlled by the PLC, the PLC can control up to four functions.

Help – Step to setup help to set the PLC water level, or pressure control.

System Setup (continued)



PID – Press the **PID** button to display the PLC PID settings screen.



Analog Input Built-In CH1 Span Max – Sets the span MAX. This span MAX is only displayed when built-in analog input is selected.
Setpoint - Sets the water level or pressure control setpoint.
Measured Process Variable - Displays the measured process variable value.
%PID Output - Displays PID output as percentage, range from 0 to 100.
Sample Time - Displays the sample time.

System Setup (continued)

Input Filter - Displays the input filter.
Proportional Gain_P - Sets the proportional gain P. The default setting is 100.
Integral Time_I - Sets the integral time I. The default setting is 1.
Differential Gain_Dk - Displays the differential gain Dk.
Differential Time_Dt - Displays the differential time Dt.

K1 & K6 Function – Select STANDARD or PC SURGE (Process Control).

- **STANDARD:** Normal operation of K1 or K6 relay
- **PC SURGE**: Only select PC SURGE when the system has two control valves. Valve 1 will be turned ON when the first K1 or K6 is ON and Valve 2 will be turned ON when the second K1 or K6 is ON with an adjustable time delay.

Select K1 or K6 – Select K1 or K6. Only one relay is selected.
Output Control – Select DIRECT (normally open) output or INVERSE (normally closed) output.

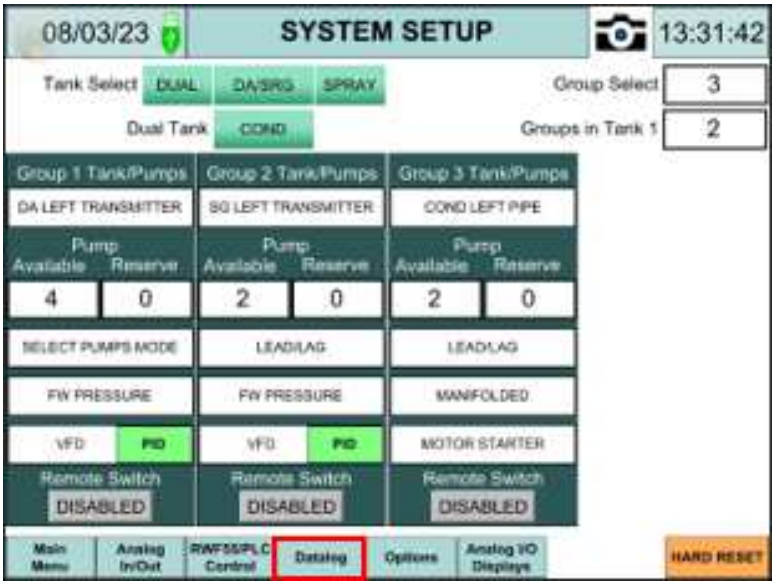
With K1 Selection:
Low Limit – Sets low limit setpoint. When the input is below the low setpoint, it generates a low alarm.
High Limit – Sets high limit setpoint. When the input is above the high setpoint, it generates a high alarm.

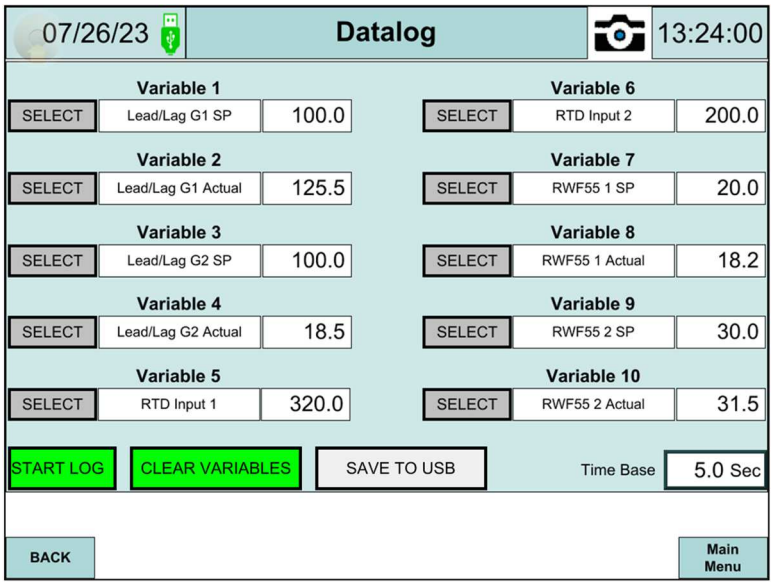
With K6 Selection:
Limit Value (AL) – Sets the alarm limit value.
Hysteresis (HYSt) – Select the hysteresis (switching difference).
Valve 2 Time Delay – The adjustable time delay, 0 to 600 seconds, for the valve 2 turn on.

System Setup (continued)

Datalogging

From SYSTEM SETUP, press the **DATALOG** button to display the DATALOG screen.



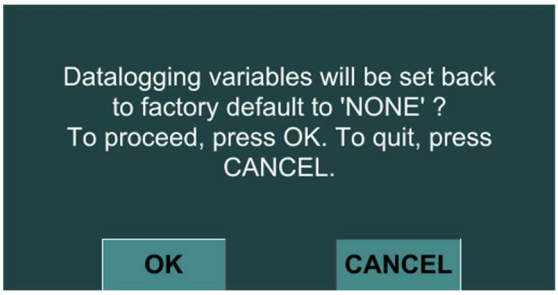


Up to 10 variables can be selected for data logging to the touchscreen memory. The data can also be saved to a USB drive in text format. Insert a USB drive to the touchscreen to be able to use the SAVE TO USB function.

System Setup (continued)

START LOG/STOP LOG – Enables or disables all data logging.

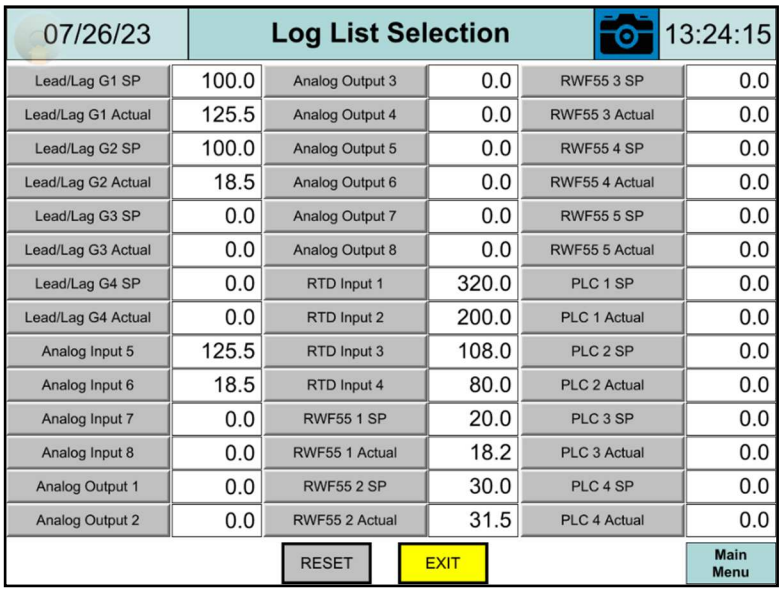
CLEAR VARIABLES – Reset all the variables back to default **NONE**. A pop-up window will appear. Press **OK** to accept the factory default parameters, otherwise press **CANCEL**.



SAVE TO USB – Press the SAVE TO USB button to save the datalogging to USB drive. A USB drive must be inserted.

Time Base – Sets an adjustable time base, 0 to 1800 seconds, for logging.

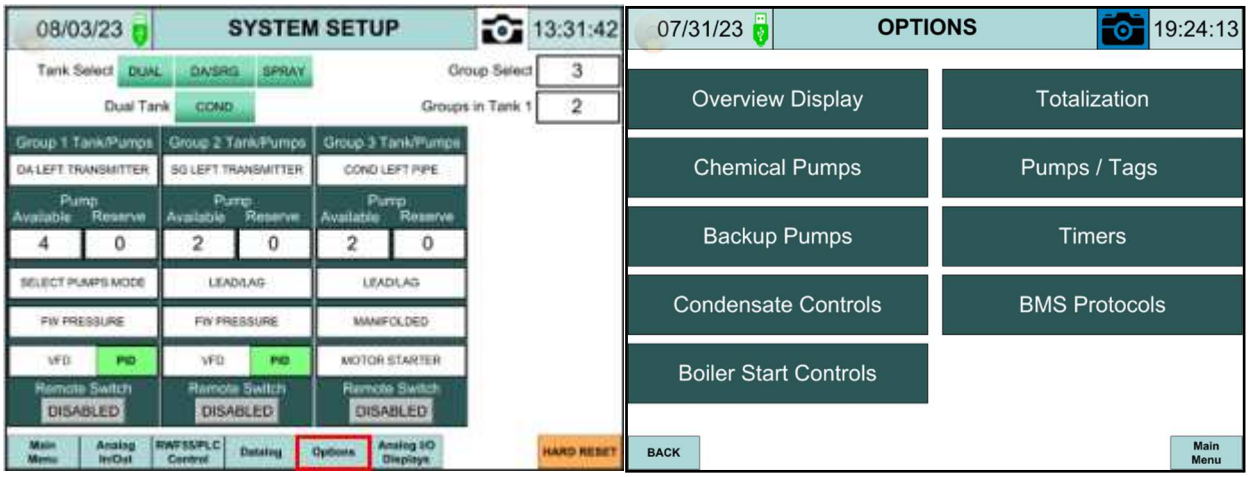
Select – Press the **SELECT** button to enter the Log List Selection screen. Choose one of the variables from the log list to be logged. Once selected the variable name will turn green and wait until the system automatically goes back to the DATALOG screen. Press **RESET** to cancel the current variable selection and press **EXIT** to go back to DATALOG screen.



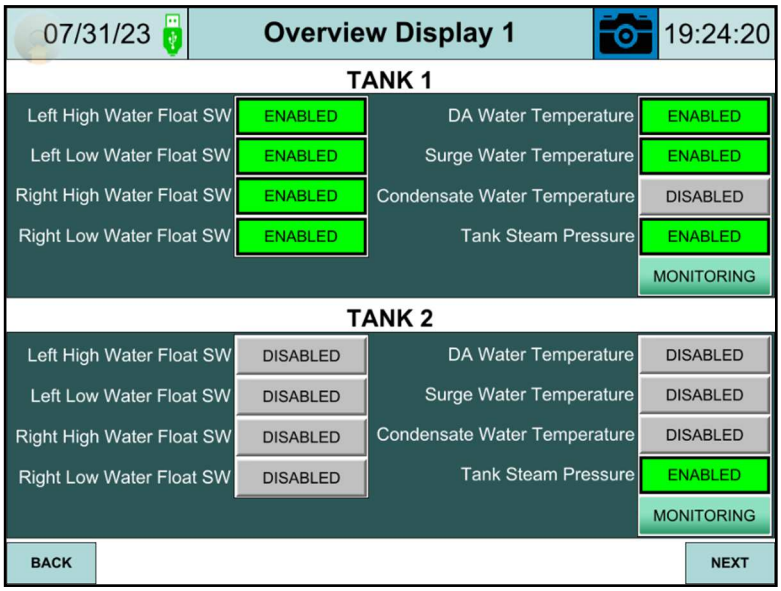
System Setup (continued)

Options

From SYSTEM SETUP, press **OPTIONS** and then press **OVERVIEW DISPLAYS**. The OVERVIEW DISPLAYS screen will appear.



Overview Displays



System Setup (continued)

Tank 1 / Tank 2 Water Level Float Switches

- **DISABLED**
- **ENABLED**: Displays the float switches on the left or right side of the tank on the OVERVIEW screen.

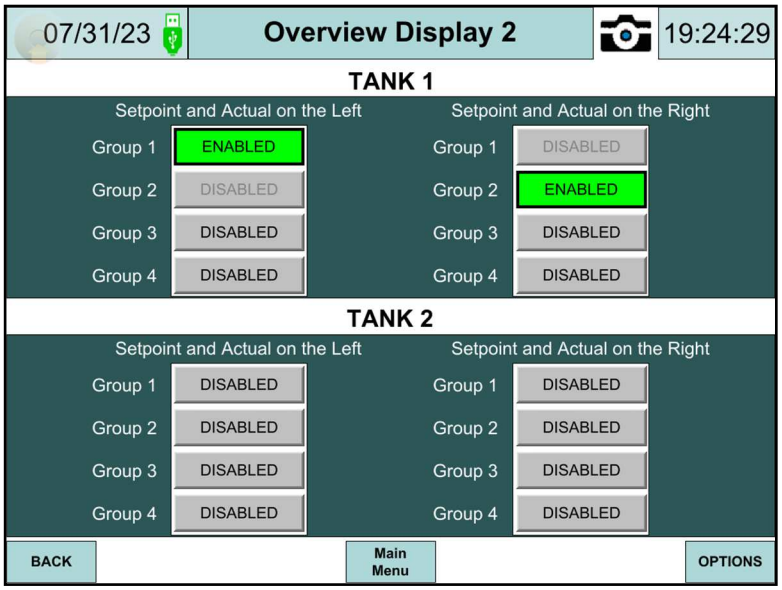
Tank 1 / Tank 2 Water Temperature (DA, SRG, and Condensate)

- **DISABLED**
- **ENABLED:** Displays the temperature on the OVERVIEW screen.

Tank 1 / Tank 2 Tank Steam Pressure

- **DISABLED**
- **ENABLED:** Displays the steam pressure on the OVERVIEW screen. Select monitoring or modulating.

Press **NEXT** to display OVERVIEW DISPLAYS 2 screen.

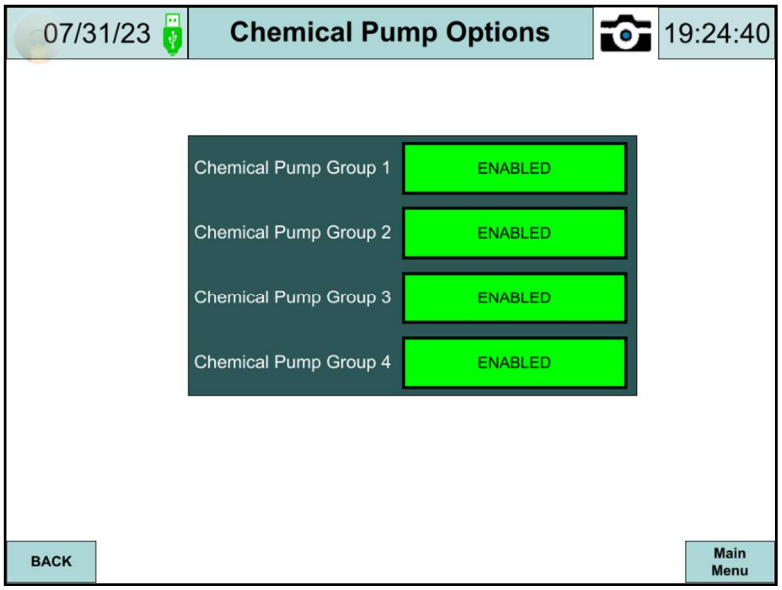


Group 1, 2, 3, 4, - To display the setpoint and actual value of a group on the OVERVIEW screen toggle the setting to **ENABLED** for the desired group. The number of available groups is dependent on the original system setup.

System Setup (continued)

Chemical Pumps

From the OPTIONS menu, press **CHEMICAL PUMPS** to display the CHEMICAL PUMP OPTIONS screen.

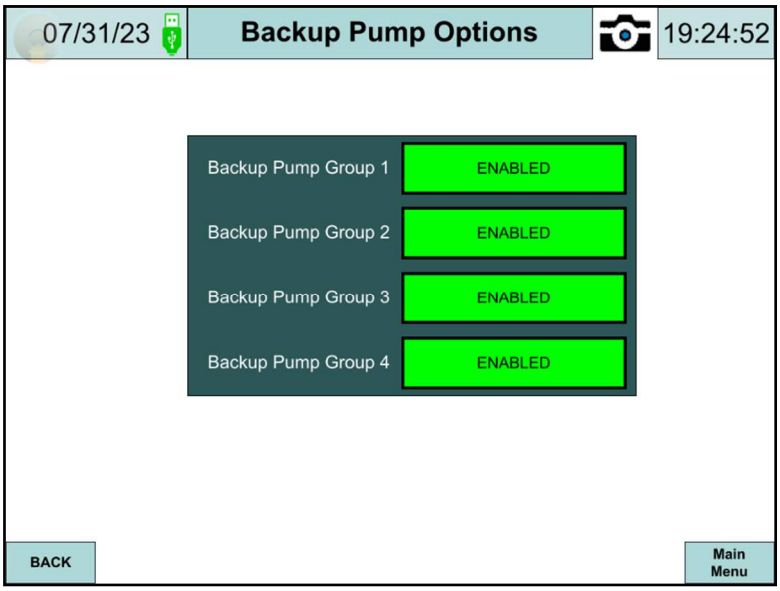


Chemical Pump Group 1, 2, 3, 4 – Enables or disables the chemical pumps for each group. The **Chemical Pumps** button will be displayed on the MAIN MENU screen when chemical pump option is enabled.

System Setup (continued)

Backup Pumps

From the OPTIONS menu, press **BACKUP PUMPS** to display the BACKUP PUMP OPTIONS screen.



Backup Pump Group 1, 2, 3, 4 – Enables or disables the backup pumps. The **Backup Pumps** button will display on the MAIN MENU screen when backup pump is enabled.

Condensate Controls

From the OPTIONS menu, press **CONDENSATE CONTROLS** to display the Condensate Tank Control screen.

System Setup (continued)

Control Type – Condensate transfer pumps are controlled ON/OFF based on the RWF55/PLC Water Level Control or Float Switch

- **RWF55/PLC Water Level**: RWF55 or PLC controller needs to before configured for Condensate Water Level in SYSTEM SETUP >> RWF55/PLC CONTROL.
- **Float Switch**

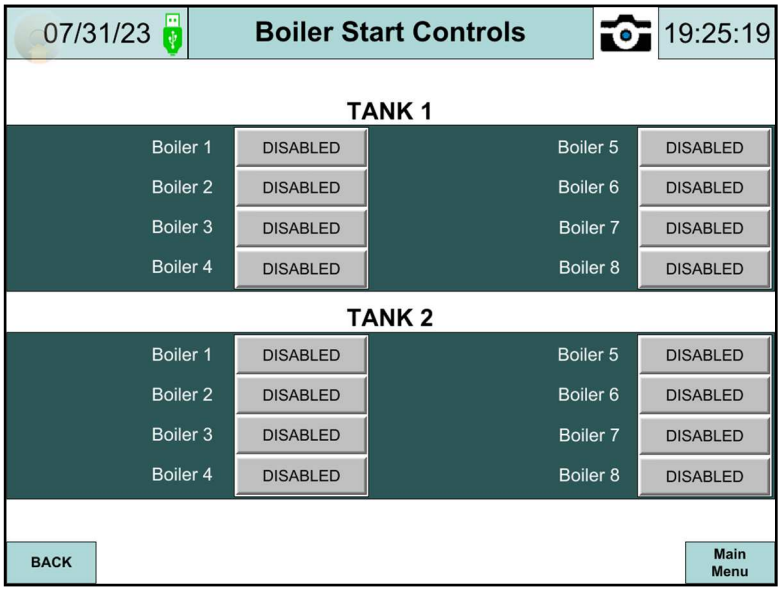
Float Switch – Only displayed if the Control Type **FLOAT SWITCH** is selected.

- **LOW:** Lead (first) pump turns ON above the low water level.
- **HIGH**: Lead (first) pump turns ON above the high water level.

Overview Screen Display Water Level – Enable to display the Condensate water level information on the OVERVIEW screen.

Boiler Start Controls

From the OPTIONS menu, press **BOILER START CONTROLS** to display the BOILER START CONTROLS screen.

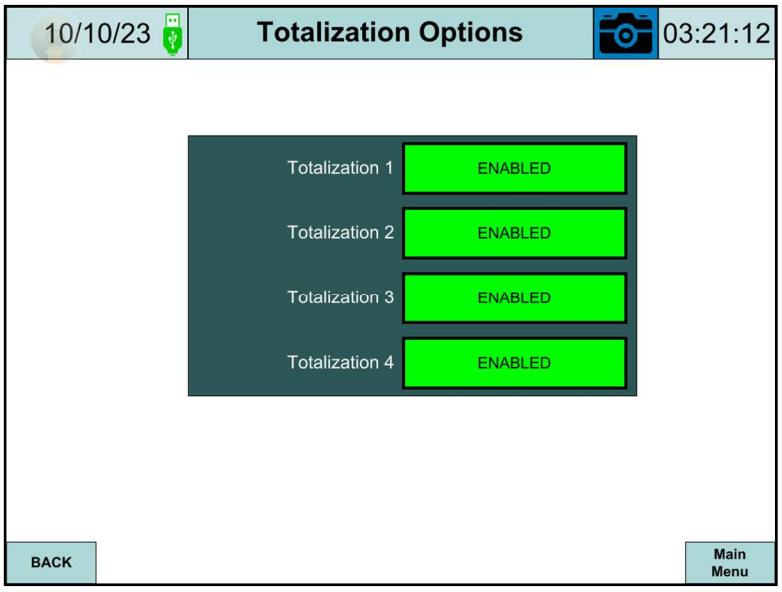


There are up to eight pumps available for boiler start controls. The boiler status B1, B2… will be displayed on the OVERVIEW screen when they are ENABLED.

System Setup (continued)

Totalization

From the OPTIONS menu, press **TOTALIZATION OPTIONS** to display the TOTALIZATION OPTIONS screen.

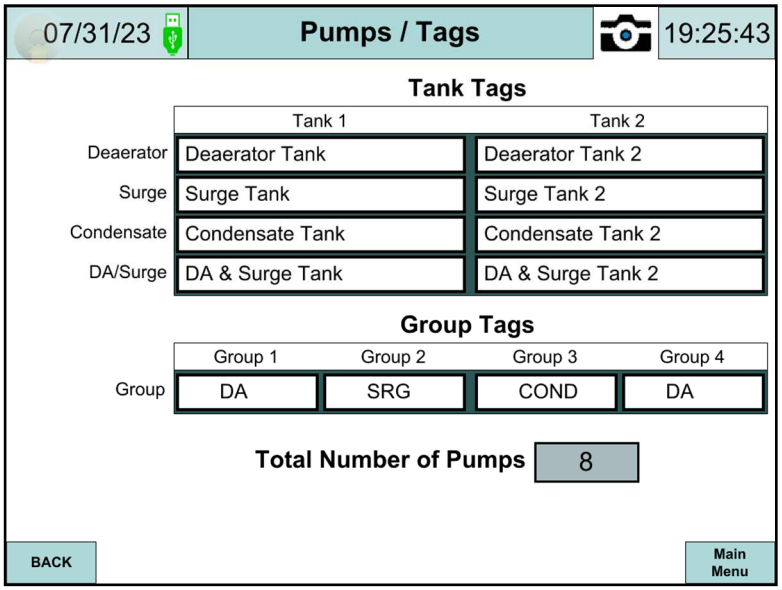


Totalization 1, 2, 3, 4 – Set to **ENABLED** if there are analog inputs that are configured for totalization. The **Totalization** button will display on the MAIN MENU screen when totalization is enabled.

System Setup (continued)

Pumps/Tags

From the OPTIONS menu, press **PUMPS / TAGS** to display the PUMPS / TAGS screen.



Tank Tags – User configured, up to 20 characters. The tank name is displayed on the title bar of the OVERVIEW screen.

Group Tags – User configured, up to 4 characters. The group name is displayed in Main Menu >> Lead/Lag.

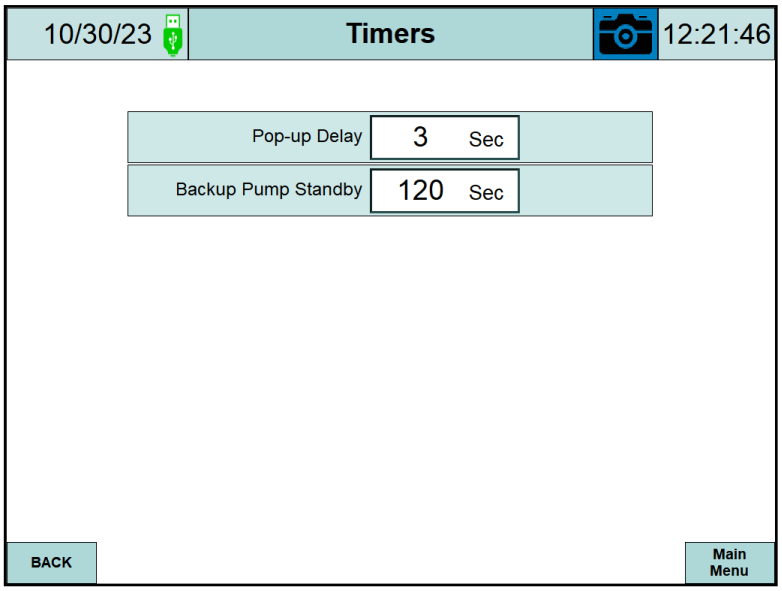
The default tank and group tags are shown above.

Total Number of Pumps – Set to 6 if the system controls up to 6 pumps and set to 8 if the system controls up to 8 pumps.

System Setup (continued)

Timers

From the OPTIONS menu, press **TIMERS** to display the TIMERS screen.



Pop-up Delay – The adjustable time delay, 0 to 300 seconds, for all pop-up windows.

Backup Pump Standby – When the backup pump is running and then turns OFF, the backup pump standby timer will start to count. If the timer expires, the backup pump will be available in Manual mode. See 'Backup Pump', page 82. If the timer is not expired, the backup pump can turn ON and run again.

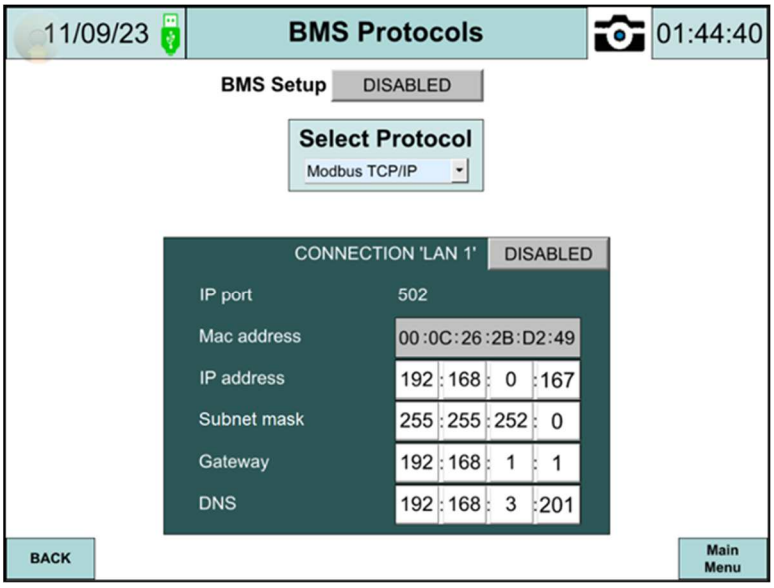
BMS (building management system) Protocols

The touchscreen panel has two ports available for BMS communication. An RS-485 connection type and Ethernet connection type. See page 96 "Gateway/BMS Modbus TCP/IP, Modbus RTU, BACnet/IP, and BACnet MS/TP Standard Interface" for addional connection settings.

From the OPTIONS menu, press **BMS PROTOCOLS** to display the BMS PROTOCOLS screen.

System Setup (continued)

Modbus TCP/IP setup example:



BMS Setup – Set to **ENABLED** to configure protocol type.

Select Protocol: Choose the type of BMS communication needed.

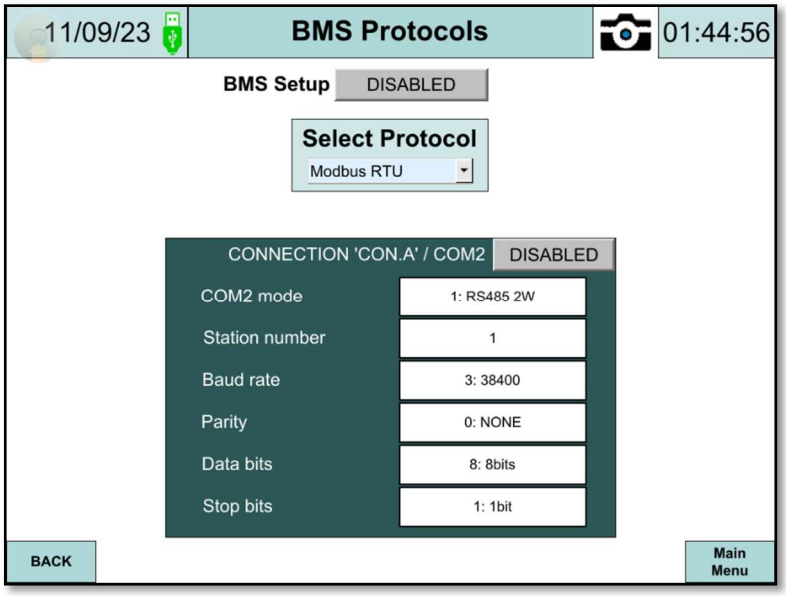
- **Modbus TCP/IP**
- Modbus RTU
- BACnet/IP
- BACnet/MSTP

Connection 'LAN1'- Set to **ENABLED** to configure BMS settings. After configuring parameter change back to **DISABLED.**

IP port - Port 502
Mac address - Displays the Mac address.
IP address - Sets the IP address.
Subnet Mask - Sets the Subnet mask.
DNS - Sets the Domain name server.

System Setup (continued)

Modbus RTU setup example:



BMS Setup – Set to **ENABLED** to configure protocol type.

Select Protocol - Choose the type of BMS communication needed.

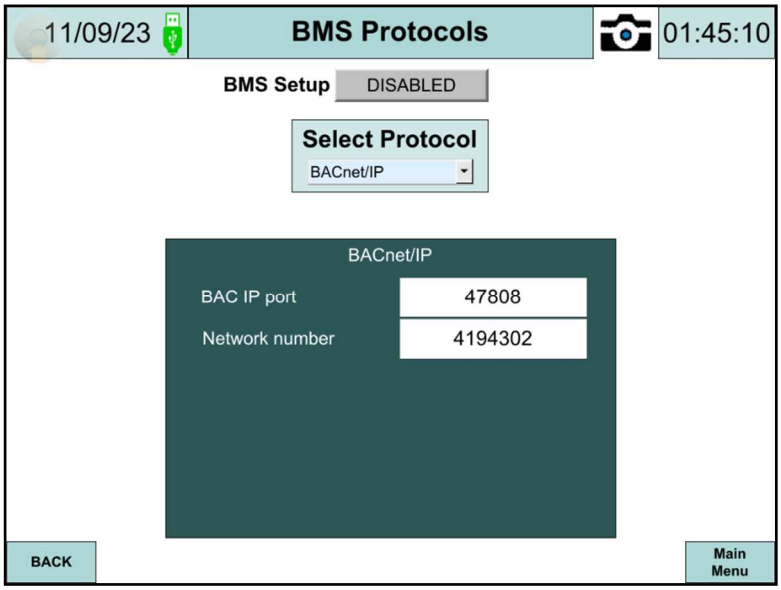
- Modbus TCP/IP
- **Modbus RTU**
- BACnet/IP
- BACnet/MSTP

Connection 'CON.A'/COM2 – Set to **ENABLED** to configure BMS settings. After configuring parameter change back to **DISABLED.**

COM2 mode - Sets COM2 mode (NONE/RS-485 2W/RS-485 4W)
Station number - Sets station number (1 or 2).
Baud rate - Sets baud rate (9600/19200/38400/57600).
Parity - Sets parity (NONE/Even/Odd).
Data bits - Sets data bits (7 or 8).
Stop bits - Sets stop bits (1 or 2).

System Setup (continued)

BACnet/IP setup example:



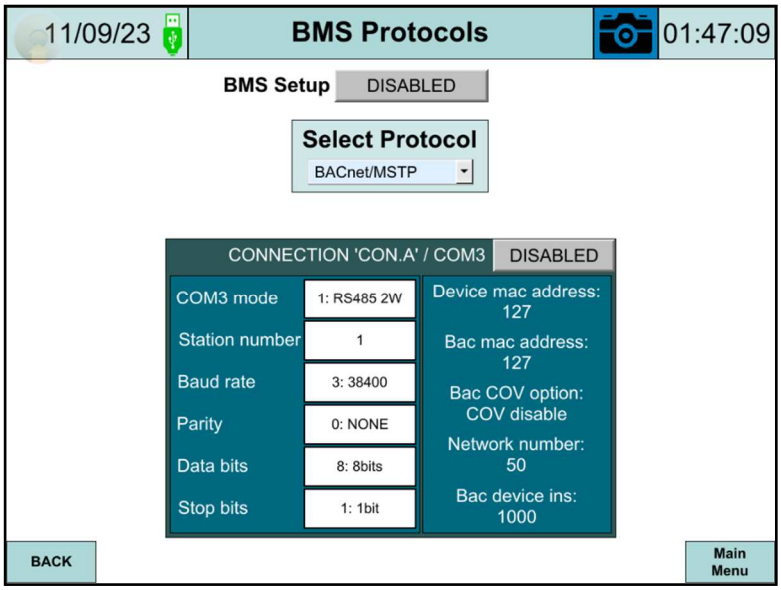
BMS Setup – Set to **ENABLED** to configure protocol type.

Select Protocol - Choose the type of BMS communication needed.

- Modbus TCP/IP
- Modbus RTU
- **BACnet/IP**
- BACnet/MSTP

BAC IP port - Sets THE BAC IP port. The default port is 47808.
Network number – Sets the network number. The default number is 4194302.

System Setup (continued)



BMS Setup – Set to **ENABLED** to configure protocol type.

Select Protocol: Choose the type of BMS communication needed.

- Modbus TCP/IP
- Modbus RTU
- BACnet/IP
- **BACnet/MSTP**

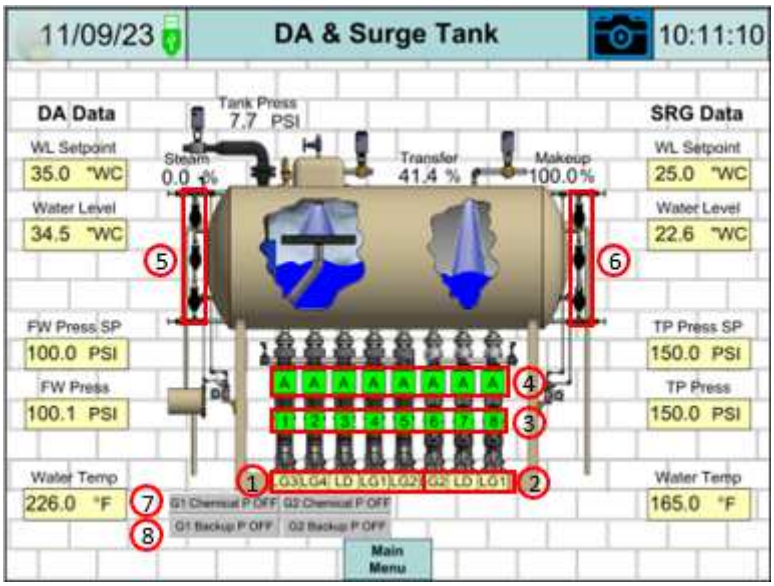
Connection 'CON.A'/COM3: Set to **ENABLED** to configure BMS settings. After configuring parameter change back to **DISABLED.**

COM3 mode – Sets the COM3 mode (NONE/RS-485 2W/RS-485 4W)
Station number – Sets the station number (1 or 2).
Baud rate – Sets the baud rate (9600/19200/38400/57600).
Parity – Sets parity (NONE/Even/Odd).
Data bits – Sets the data bits (7 or 8).
Stop bits – Sets the stop bits (1 or 2).
Device mac address (127)
Bac mac address (127)
Bac cov option (COV_DISABLE)
Bac device ins (1000)

System Overview

From the MAIN MENU screen, press **OVERVIEW** to display the configured system overview. The following pages include some examples of main system configurations including a split DA/SRG tank, single DA, SRG, Condensate tank with one group of pumps, and single DA with two groups of pumps.

System Configuration Example 1: General single split tank with a DA that has five feedwater pumps, and a surge with three transfer pumps. This system also includes water level controllers.



1 Group 1 Pump lead or lag designation
- Yellow rectangles designate feedwater (FW) pumps
  - LD: FW lead pump
  - LG1, LG2, … LG4: FW lag 1 pump, FW lag 2 pump,

2 Group 2 Pump lead or lag designation
- Yellow rectangles designate transfer pumps
  - LD: transfer lead pump
  - LG1, LG2: transfer lag 1 pump, transfer lag 2 pump

3 Square indicator: pump feedback
- Green: pump proven, current switch energized, or VFD run dry contact closed
- White: pump not proven, current switch not energized, or VFD run dry contact open
- Numbers indicate pump order number

System Overview (continued)

4 Square indicator: pump status based on hand/off/auto switch; Letter: H-O-A, position indication

- Green square: pump on
- Gray square: pump off
- Letter A: Auto (pump in auto lead/lag mode)
- Letter H: Hand (pump continuously running with low water cut off 'LWCO' satisfied)
- Letter O: Off (pump off)
- Letter F: pump failed

5 Left water level float switches

- Top float switch: high water level
- Middle float switch: low water level
- Bottom float switch: low/low water level

6 Right water level float switches

- Top float switch: high water level
- Middle float switch: low water level
- Bottom float switch: low/low water level

7 Chemical pumps: One indicator per chemical pump activated. Each pump group can have one chemical pump assigned to it.

- Green: chemical pump on
- Gray: chemical pump off

8 Backup pumps: One indicator per active backup pump. Each pump group can have one backup pump assigned to it.

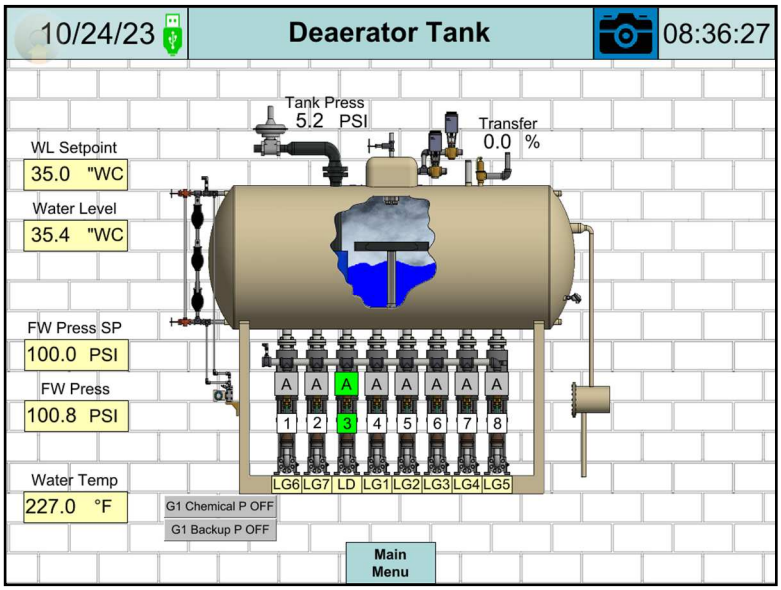
- Green: backup pump on
- Gray: backup pump off

Note:

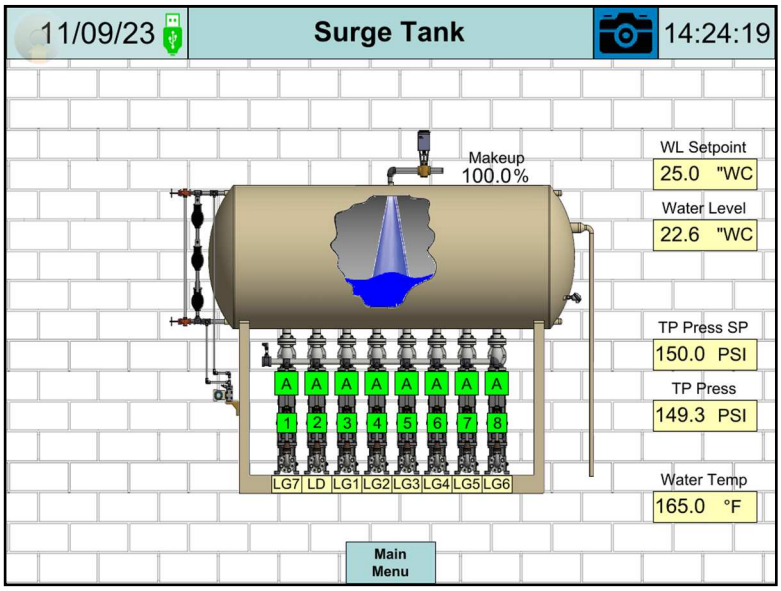
- The actual OVERVIEW SCREEN may vary based on system configuration.
- All labels on the OVERVIEW screens are text inputs with password protection. Log in and tap on the text to be edited and a keypad will appear. Use the keypad to enter the desired text. To update the tank name can be updated in Main Menu >> System Setup >> Options >> Pumps/Tags.

System Overview (continued)

Stystem Configuration Example 2: Single tank DA with eight feedwater pumps and water level control.

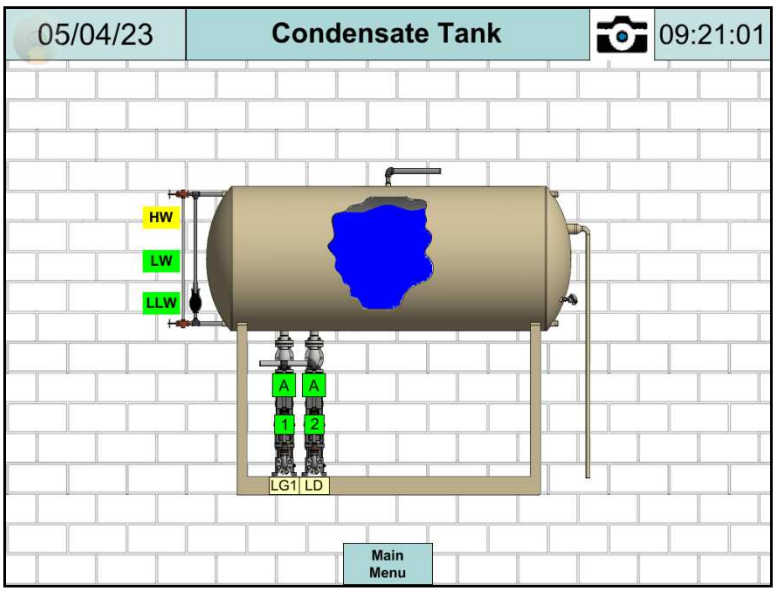


Stystem Configuration Example 3: Single tank surge with eight transfer pumps and water level control.

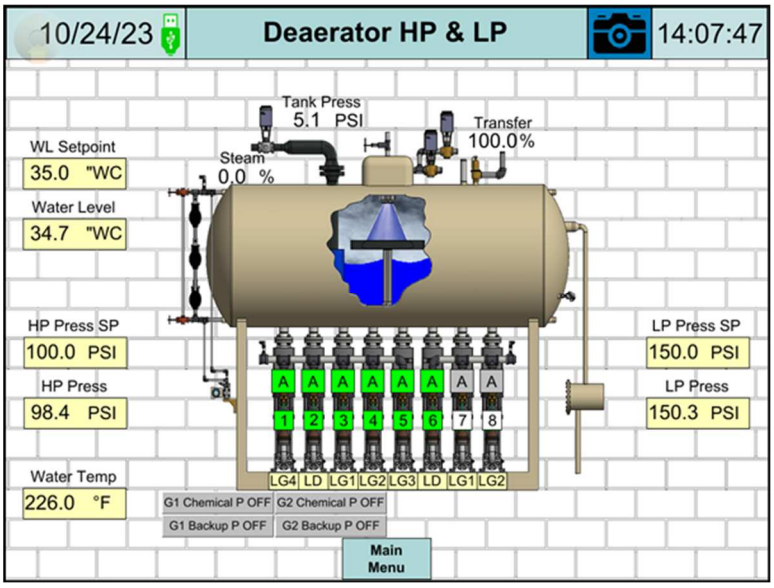


System Overview (continued)

System Configuration Example 4: Single condesnate tank with two transfer pumps.



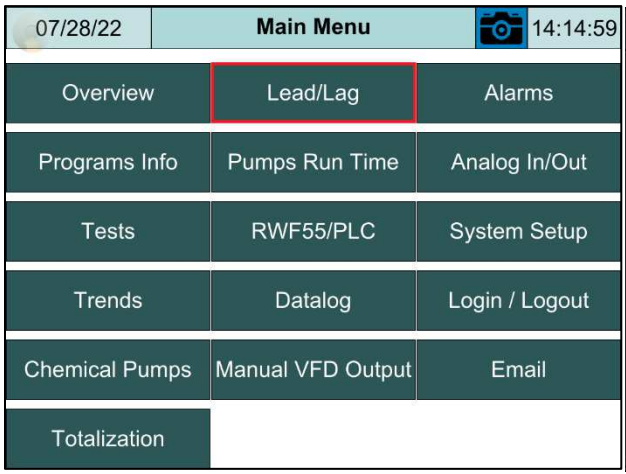
System Configuration Example 5: Single tank DA with two groups of pumps and water level control. There are two high pressure pumps in group one and two low pressure pumps in group two.



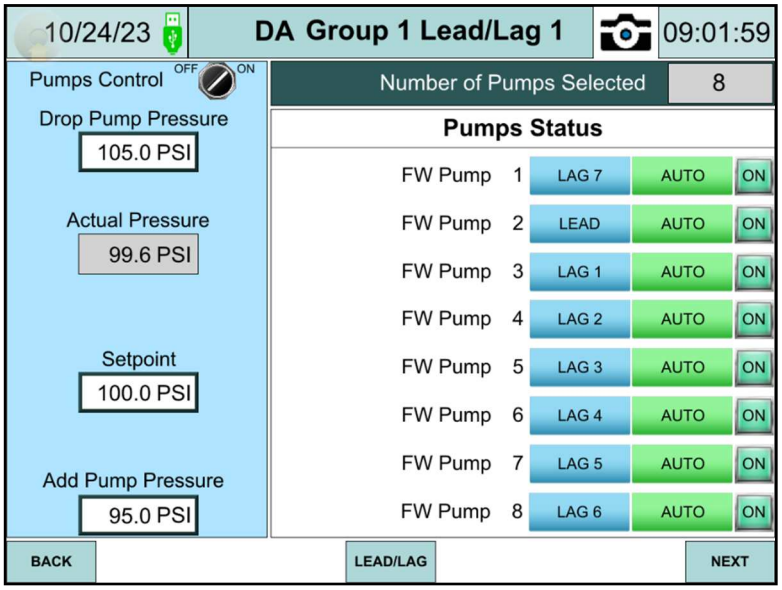
Lead/Lag

From the MAIN MENU, press **LEAD/LAG** and then press **DA GROUP 1** to setup the Deaerator's lead/lag control. Group 1 lead/lag is configured for Deaerator tank with feedwater pumps.

Note: The group 1 lead/lag setup is available for all configurations. The names shown in the example may be different based on the system configuration. If there are multiple groups available the same instructions apply to the configuration of each one.



Deaerator Group 1 Lead/Lag Setup Based on Feedwater Pressure with Starter Control



Lead/Lag (continued)

Pumps Control – Displays the status of pumps control selector switch on the front of the control panel.

Drop Pump Pressure - Sets the drop pump pressure. If the feedwater pressure rises above the DROP PUMP PRESSURE with an adjustable stop time delay, the last lag pump will be turned off.

Actual Pressure - Feedwater pressure is displayed when one of the analog input channels is configured for the feedwater pressure transmitter.

Setpoint - Sets the feedwater pressure setpoint.

Add Pump Pressure - Sets the add pump pressure. If the feedwater pressure drops below the ADD PUMP PRESSURE with an adjustable start time delay, the first or next lag pump will be started.

Number of Pumps Selected - Displays the total number of available pumps.

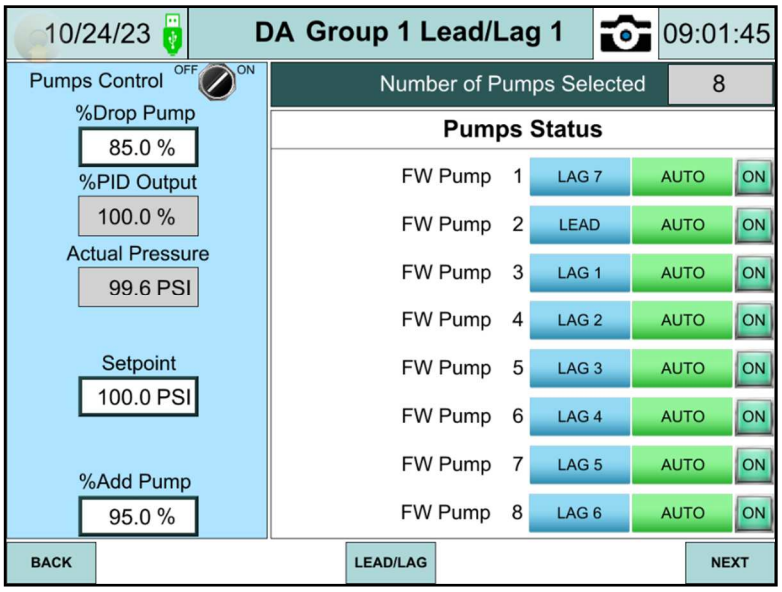
Pumps Status - Display the status of pump lead/lag, HAND-OFF-AUTO, and pumps ON/OFF. The default pump name is FW Pump 1, FW Pump 2, … and FW Pump 8. The Name **FW Pump** is user configured up to 16 characters and the number **1** next to **FW Pump** up to 2 characters.

HAND-OFF-AUTO selector switches status:

- **HAND**: pump continuously running with LWCO (low water cutoff) satisfied
- **OFF**: pump off
- **AUTO**: pump in auto lead/lag mode

Lead/Lag (continued)

Deaerator Group 1 Lead/Lag Setup Based on Feedwater Pressure with VFD



Pumps Control – Displays the status of pumps control selector switch on the front of the control panel.

%Drop Pump - Sets the drop pump percentage. If the %PID Output drops below the %Drop Pump, with an adjustable stop time delay, the last lag pump will be turned off.

%PID Output – Displays the current PID output percentage. The actual reading of PID output is displayed as a percentage, and is a representation of a 4 to 20mA output signal; 0% = 4mA and 100% = 20mA.

Actual Pressure - Feedwater pressure is displayed when one of the analog input channels is configured for the feedwater pressure transmitter.

Setpoint - Sets the feedwater pressure setpoint.

%Add Pump - Sets the add pump percentage. If the %PID Output is above %Add Pump, for the duration of the adjustable start time delay, the next lag pump will be added.

Number of Pumps Selected - Displays the total number of available pumps.

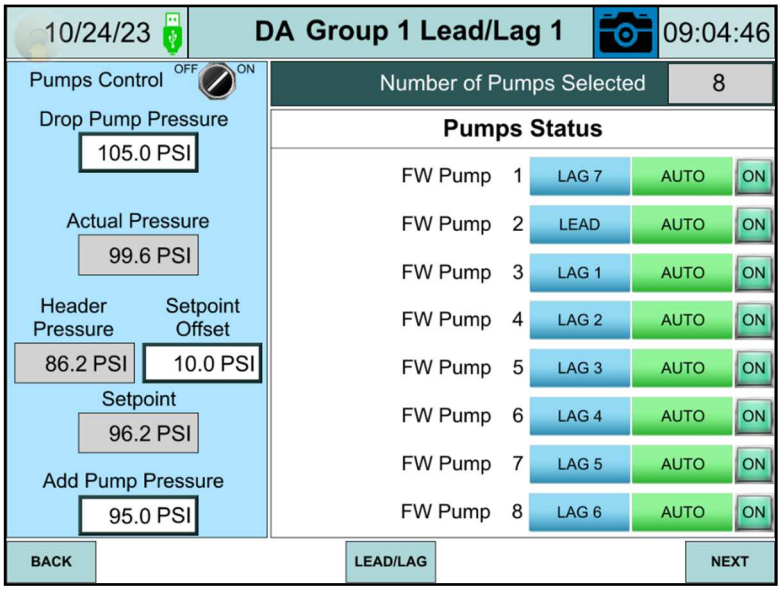
Pumps Status - Display the status of pump lead/lag, HAND-OFF-AUTO, and pumps ON/OFF. The default pump name is FW Pump 1, FW Pump 2, … and FW Pump 8. The Name **FW Pump** is user configured up to 16 characters and the number **1** next to **FW Pump** up to 2 characters.

Lead/Lag (continued)

HAND-OFF-AUTO selector switches status:

- **HAND**: pump continuously running with LWCO (low water cutoff) satisfied
- **OFF**: pump off
- **AUTO**: pump in auto lead/lag mode

Deaerator Group 1 Lead/Lag, based on header pressure and offset with starter control



Pumps Control – Displays the status of pumps control selector switch on the front of the control panel.

Drop Pump Pressure - Sets the drop pump pressure. If the feedwater pressure rises above the DROP PUMP PRESSURE with an adjustable stop time delay, the last lag pump will be turned off.

Actual Pressure - Current feedwater pressure is displayed when one of the analog input channels is configured for the feedwater pressure transmitter.

Header Pressure - Header pressure is displayed when an analog input is configured for “HEADER GROUP 1” in System setup >> Analog In/Out.

Setpoint Offset - Sets the setpoint offset. This value is added to the header pressure to keep the setpoint above the header pressure.

Lead/Lag (continued)

Setpoint – Displays feedwater pressure setpoint. The feedwater pressure setpoint is a dynamic setpoint automatically calculated based on the boiler's actual steam header pressure and setpoint offset.

Add Pump Pressure - Sets the add pump pressure. If the feedwater pressure drops below the ADD PUMP PRESSURE with an adjustable start time delay, the next lag pump will be started.

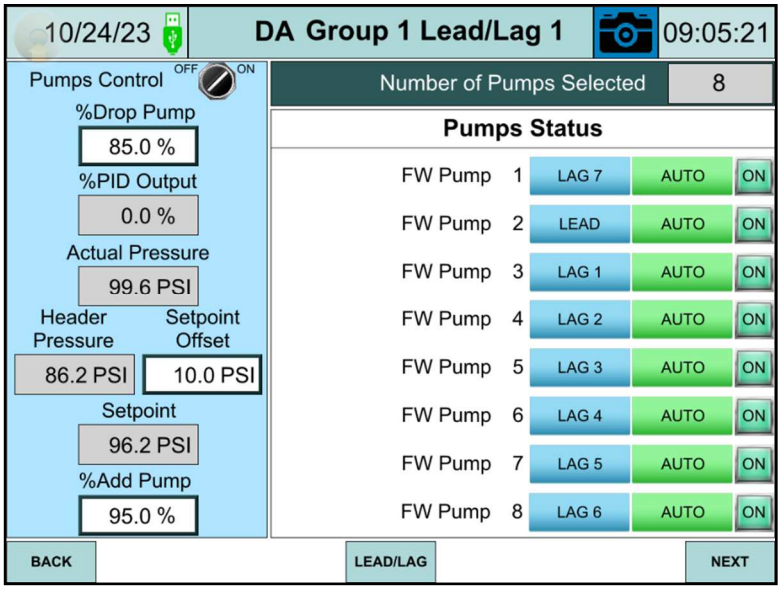
Number of Pumps Selected - Displays the total number of available pumps.

Pumps Status - Display the status of pump lead/lag, HAND-OFF-AUTO, and pumps ON/OFF. The default pump name is FW Pump 1, FW Pump 2, … and FW Pump 8. The Name **FW Pump** is user configured up to 16 characters and the number **1** next to **FW Pump** up to 2 characters.

HAND-OFF-AUTO selector switches status:

- **HAND**: pump continuously running with LWCO (low water cutoff) satisfied
- **OFF**: pump off
- **AUTO**: pump in auto lead/lag mode

Deaerator Group 1 Lead/Lag setup, based on header pressure and offset with VFD



Lead/Lag (continued)

Pumps Control – Displays the status of pumps control selector switch on the front of the control panel.

%Drop Pump - Sets the drop pump percentage. If the %PID Output drops below the %Drop Pump, with an adjustable stop time delay, the last lag pump will be turned off.

%PID Output – Displays the PID output percentage. The actual reading of PID output is displayed as a percentage, and is a representation of a 4 to 20mA output signal; 0% = 4mA and 100% = 20mA.

Actual Pressure - Feedwater pressure is displayed when one of the analog input channels is configured for the feedwater pressure transmitter.

Header Pressure - Header pressure is displayed when an analog input is configured for "HEADER GROUP 1" in System setup -> Analog In/Out.

Setpoint Offset - Sets the setpoint offset. This value is added to the header pressure to keep the setpoint above the header pressure.

Setpoint – Displays feedwater pressure setpoint. The feedwater pressure setpoint is a dynamic setpoint automatically calculated based on the boiler's actual steam header pressure and setpoint offset.

%Add Pump - Sets the add pump percentage. If the %PID Output is above %Add Pump, for the duration of the adjustable start time delay, the next lag pump will be added.

Number of Pumps Selected - Displays the total number of available pumps.

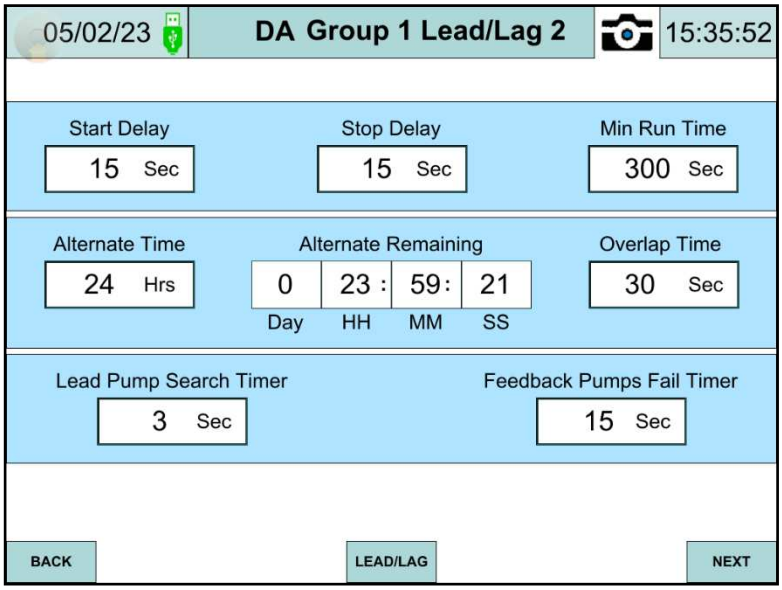
Pumps Status - Display the status of pump lead/lag, HAND-OFF-AUTO, and pumps ON/OFF. The default pump name is FW Pump 1, FW Pump 2, … and FW Pump 8. The Name **FW Pump** is user configured up to 16 characters and the number **1** next to **FW Pump** up to 2 characters.

HAND-OFF-AUTO selector switches status:

- **HAND**: pump continuously running with LWCO (low water cutoff) satisfied
- **OFF**: pump off
- **AUTO**: pump in auto lead/lag mode

Press **NEXT** button to display DA Group 1 Lead/Lag 2 screen.

Lead/Lag (continued)



Start Delay – Sets the time delay for a pump to start after receiving a run command. Can be set from 1 to 1800 seconds.

Stop Delay – Sets the stop delay time for a pump to stop after receiving and off command. Can be set from 1 to 1800 seconds.

Minimum Run Time – Sets the minimum time a pump will run before the system will tell a pump to stop. Can be set from 1 to 1800 seconds.

Alternate Time – Sets the amount of time before the lead pump changes. Can be set from 1 to 720 hours

Alternage Time Remaining - The time remaining until automatic lead pump alternation occurs.

Overlay Time - Following a lead pump change, the former lead pump will still be enabled for this duration of time before shutting down.

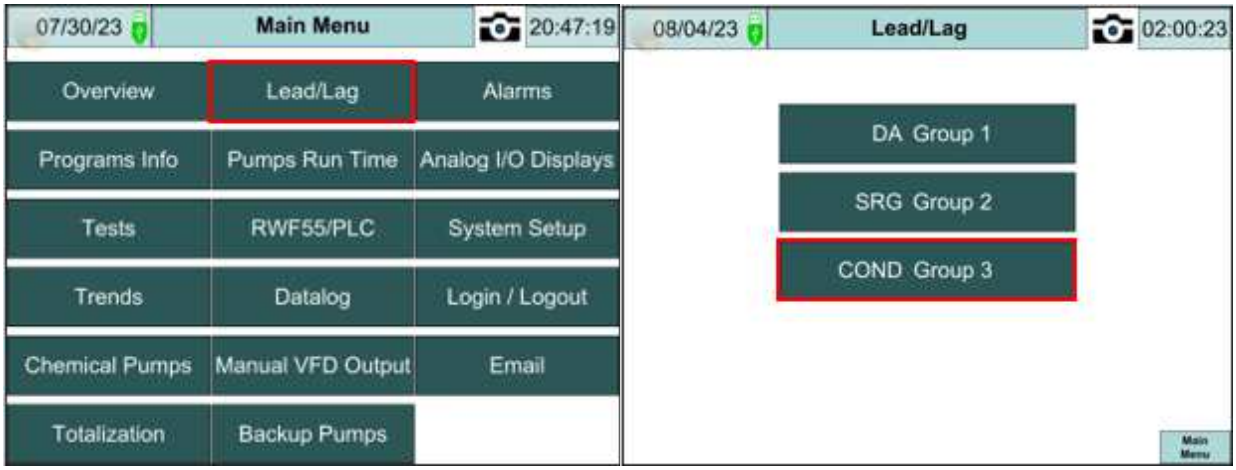
Lead Pump Search Timer - The adjustable time delay allows for the selected lead pump's status and availability to be detected. The default setup time is 3 seconds.

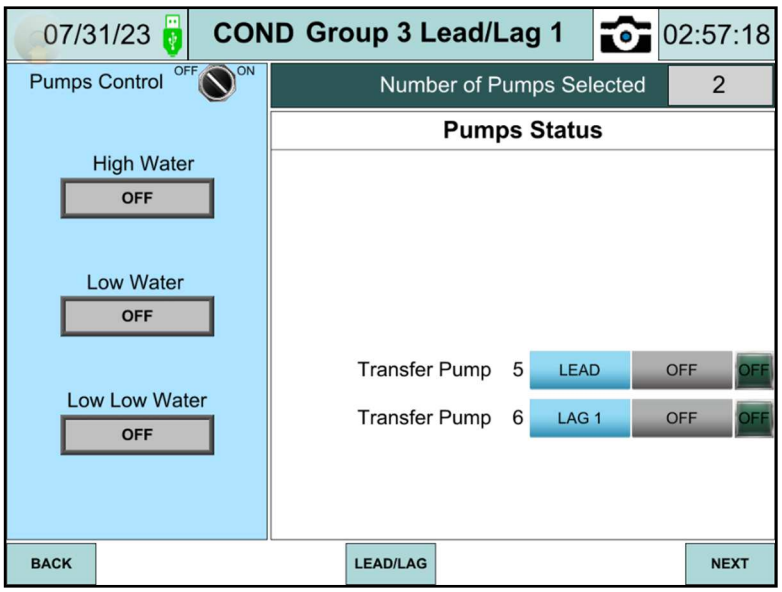
Feedback Pumps Fail Timer – Sets the time delay for system to create an alarm when feedback from a pump's current switch is not detected for the set amount of time. The default setting is 15 seconds.

Lead/Lag (continued)

Condensate Tank Lead/Lag setup

From MAIN MENU, press **LEAD/LAG** and then press COND GROUP 3 to setup the Condensate pumps control. Group 3 lead/lag is configured for Condensate tank with transfer pumps. For other system configurations the **COND Group #** may be labeled with a different group number.





Lead/Lag (continued)

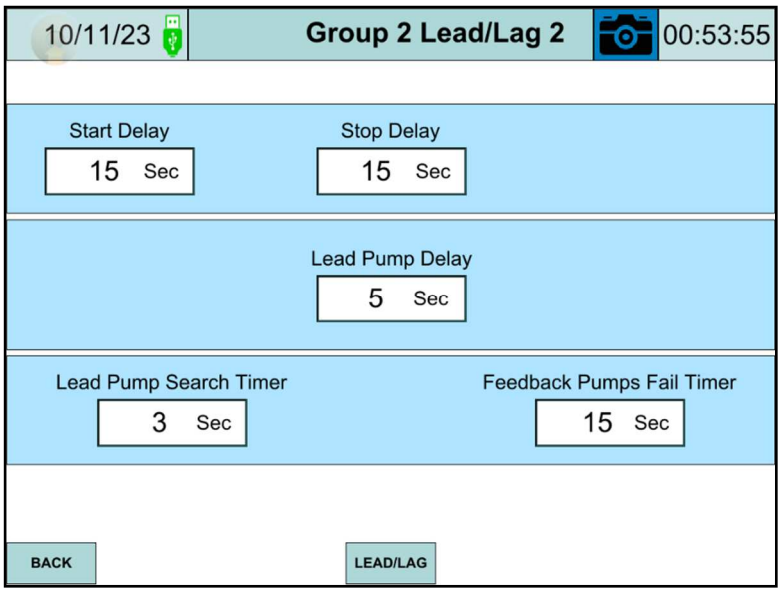
Pumps Control – Displays the status of pumps control selector switch on the front of the control panel.

High Water - Displays ON when transfer water is above the high water level.

Low Water - Displays ON when transfer water level is above the low water level.

Low Low Water - Displays the status of low low water. It is ON when water level rises above the low/low water level switch. Displays OFF when both lead and lag pumps are off.

Press NEXT button to display COND GROUP 3 LEAD/LAG 2



Start Delay - Sets the time delay for a pump to start after receiving a run command. Can be set from 1 to 1800 seconds.

Stop Delay - Sets the stop delay time for a pump to stop after receiving and off command. Can be set from 1 to 1800 seconds.

Lead Pump Delay – Sets the delay time for the lead pump to start or stop after receiving a command. Can be set from 1 to 1800 seconds.

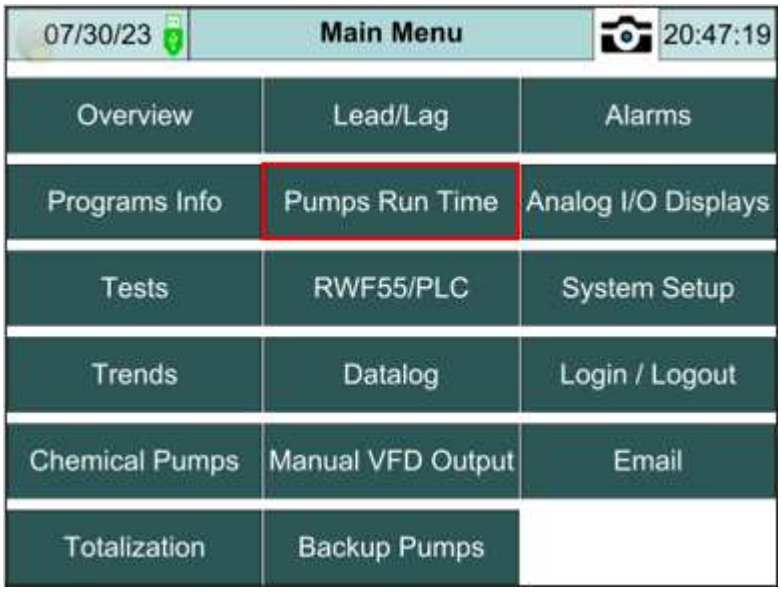
Lead/Lag (continued)

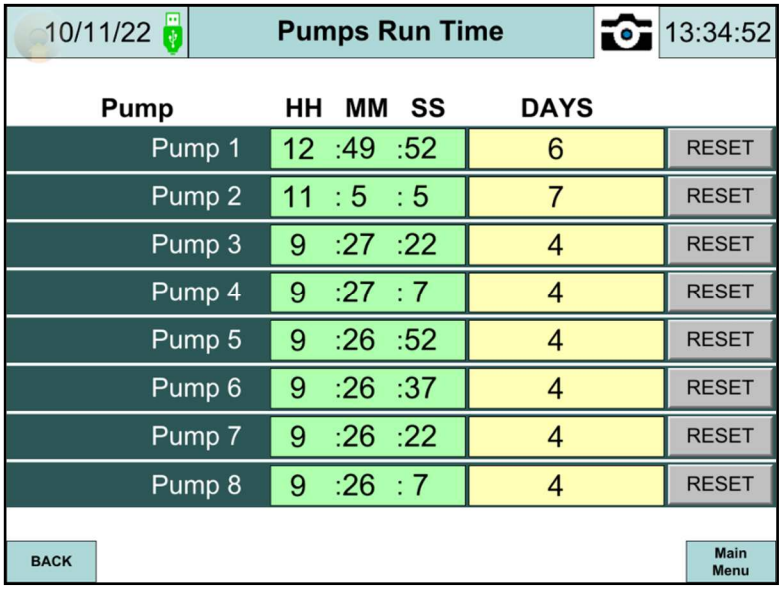
Lead Pump Search Timer - The adjustable time delay allows for the selected lead pump's status and availability to be detected. The default setup time is 3 seconds.

Feedback Pumps Fail Timer - Sets the time delay for system to create an alarm when feedback from a pump's current switch is not detected for the set amount of time. The default setting is 15 seconds.

Pumps Run Time

The Main Menu and Pumps Run Time screens may vary based on the system setup. From MAIN MENU, press **PUMPS RUN TIME.**

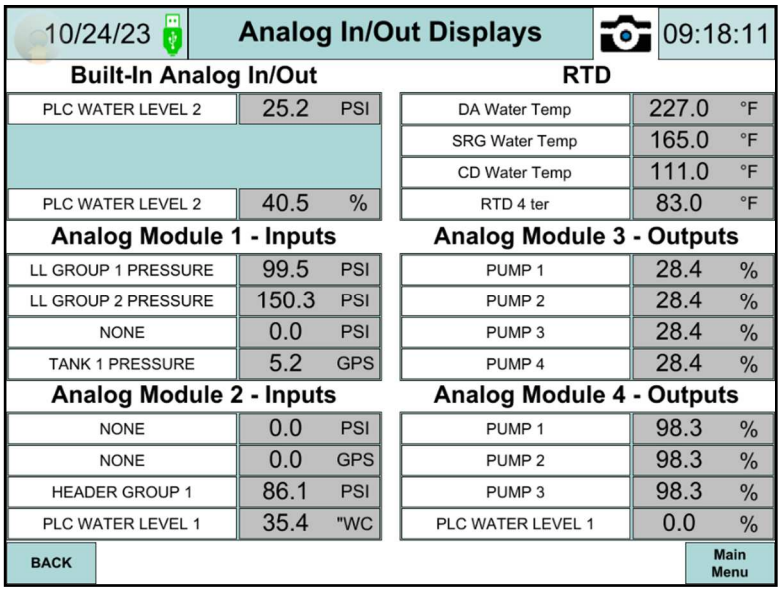




Runtime for all pumps are displayed in hours, minutes, seconds,and days. The PUMPS RUN TIME could be reset to 0 (zero) by pressing and holding the **RESET** button until it turns green. Pressing the **RESET** button again will start the pump run time clock, and change the button color to gray.

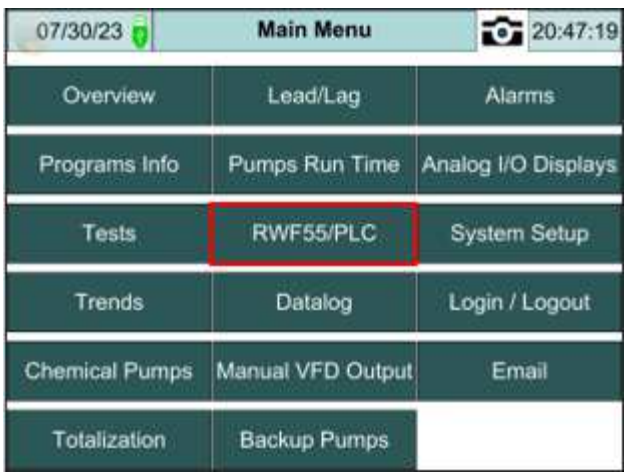
Analog I/O Displays

The Analog I/O Displays screen may vary based on the system setup. From the MAIN MENU, press **ANALOG I/O DISPLAYS**. All analog inputs and outputs are displayed on this screen.



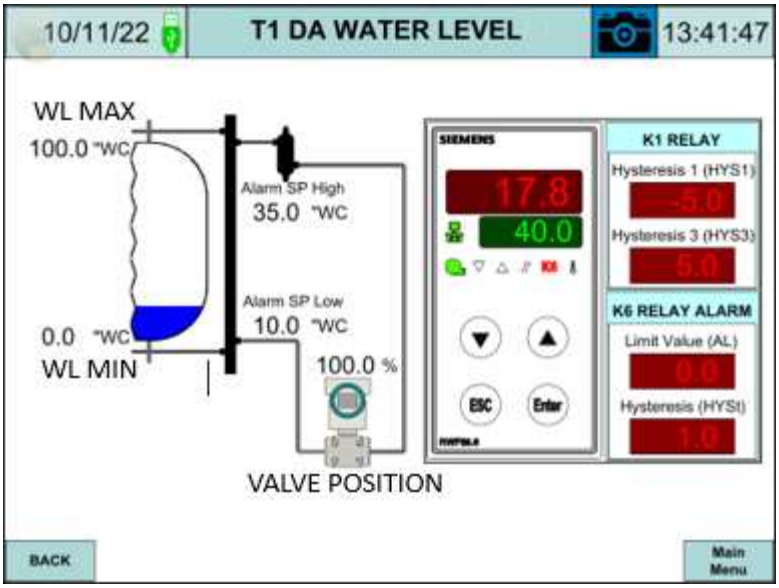
RWF55/PLC

The RWF55/PLC Controls screen may vary based on the system setup. From the MAIN MENU, press **RWF55/PLC**, and then press T1 (tank 1) DA WATER LEVEL to display the DA Water Level screen.



RWF55/PLC (continued)

DA Water Level with RWF55 Control



Water Level Maximum – Sets the maximum water level.

Water Level Minimum – Sets the minimum water level.

Valve Position – Displays the actual makeup water valve position.

Alarm Setpoint High – Displays the high water level limit. A warning light or alarm will be blinking on the OVERVIEW and DA WATER LEVEL screens if water level is at or above the high limit.

Alarm Setpoint Low – Displays the low water level limit. A warning light or alarm will blink on OVERVIEW and DA WATER LEVEL screens if water level is at or below the low limit.

Actual Value – Displays the actual water level in red text on the RWF.

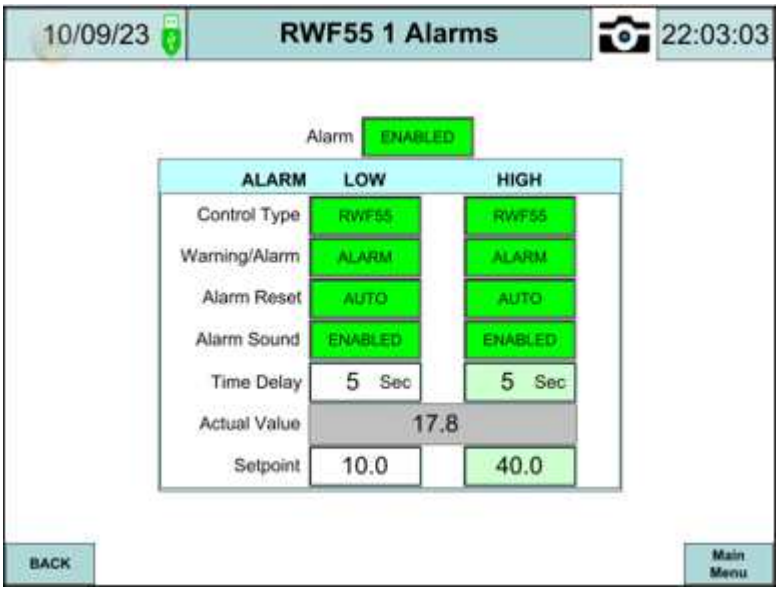
Setpoint – Displays the water level setpoint in green text on the RWF.

K1 Relay – Displays the Hysteresis 1 (switch-on threshold) and the Hysteresis 3 (switch-off threshold)

K6 Relay Alarm – Displays the alarm limit value and Hysteresis (switching difference)

RWF55/PLC (continued)

From the RWF55/PLC Controls screen, press **ALARM OPTIONS** for RWF55 1 Alarms, the alarm option screen will appear.



Alarm – Set to enabled to enable alarms and disabled to disable alarms.

Alarm Control Type – Selects float switch or RWF55.

Warning/Alarm: Warnings will display the status of low/high input with no alarm sound. Alarms can be set up with manual or auto reset and with sound or no sound.

Alarm Reset: Setting to Manual will require a manual reset of each alarm. Setting to Automatic will allow the alarm to be reset after alarm free conditions are achieved.

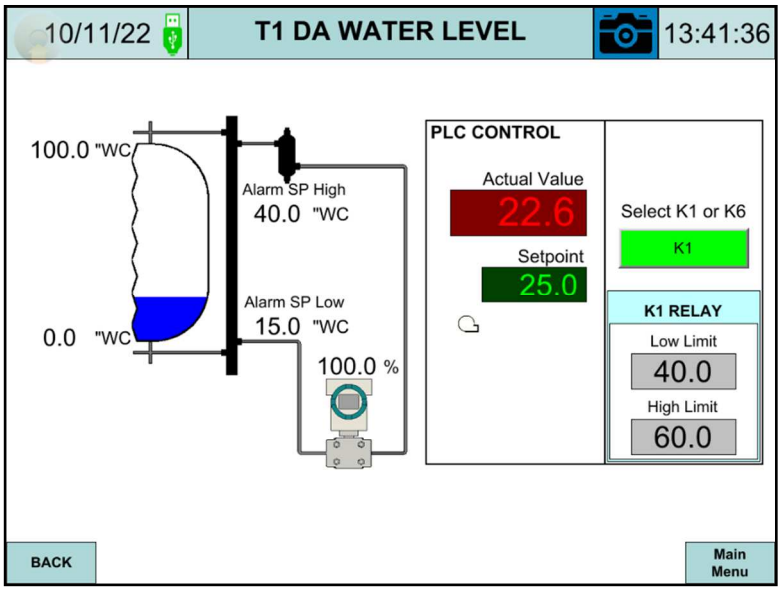
Alarm Sound: Set to **ENABLED** to enable an audible alarm during alarm conditions.

Time Delay: The adjustable time delay for an alarm to occur once alarm conditions are met, 0 to 300 seconds.

Setpoint: Sets the alarm setpoints. When the input (water level) is below the low setpoint, it generates a low alarm and when the input is above the high setpoint, it generates a high alarm.

RWF55/PLC (continued)

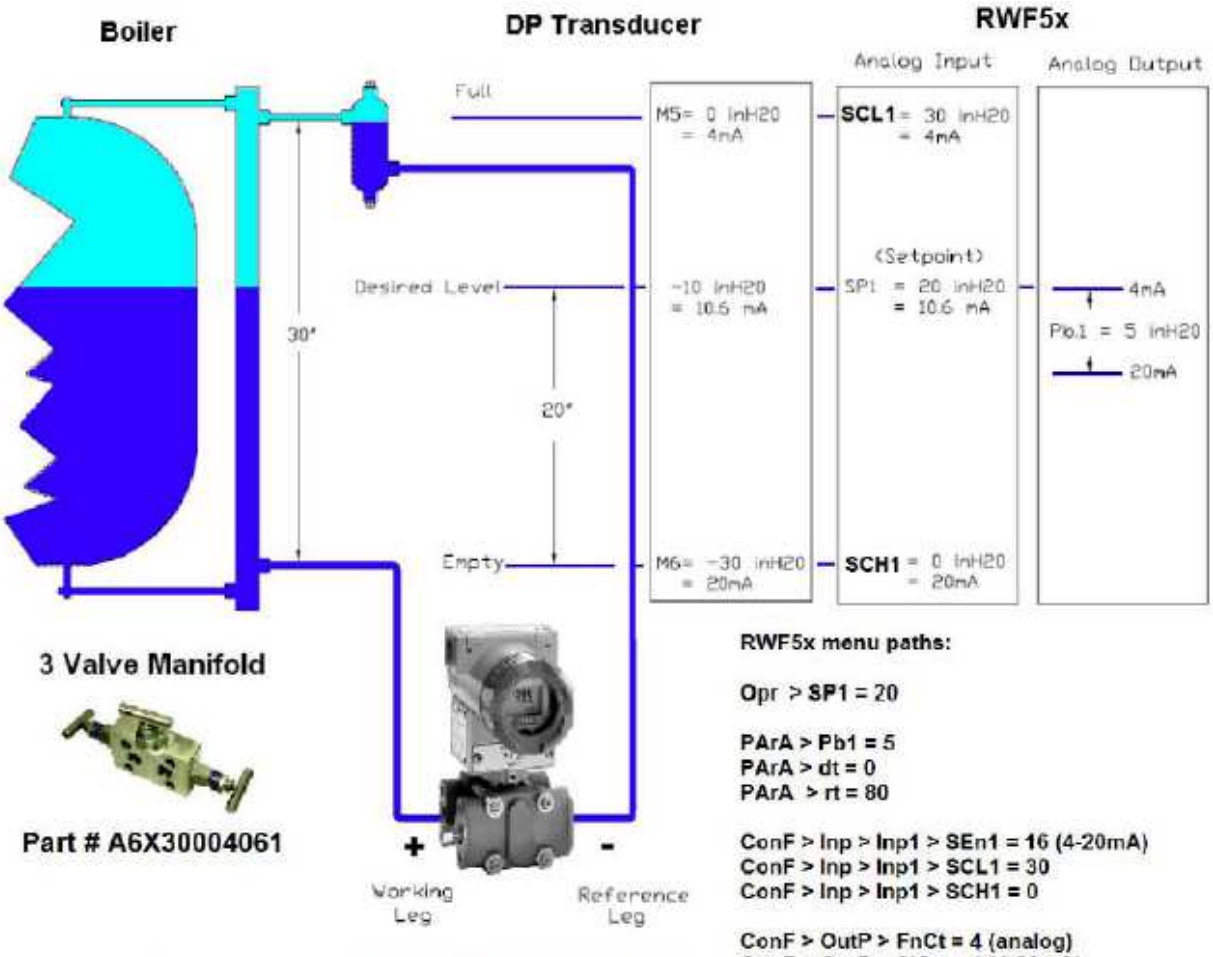
DA Water Level with PLC Control



The DA water level with PLC Control is like DA water level with RWF55 control except only one K1 or K6 relay is selected.

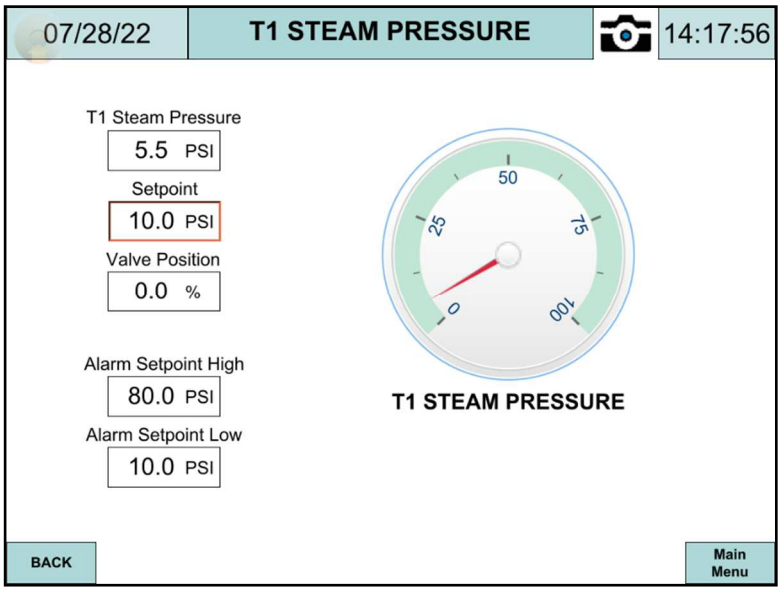
RWF55/PLC (continued)

General information for system settings for water level control can be seen below. Please refer to the RWF55 and DP pressure transmitter manuals for proper settings.
Water level controls with Siemens DP pressure transmitter and RWF55.
The same configuration applies for surge tank water level.



RWF55/PLC (continued)

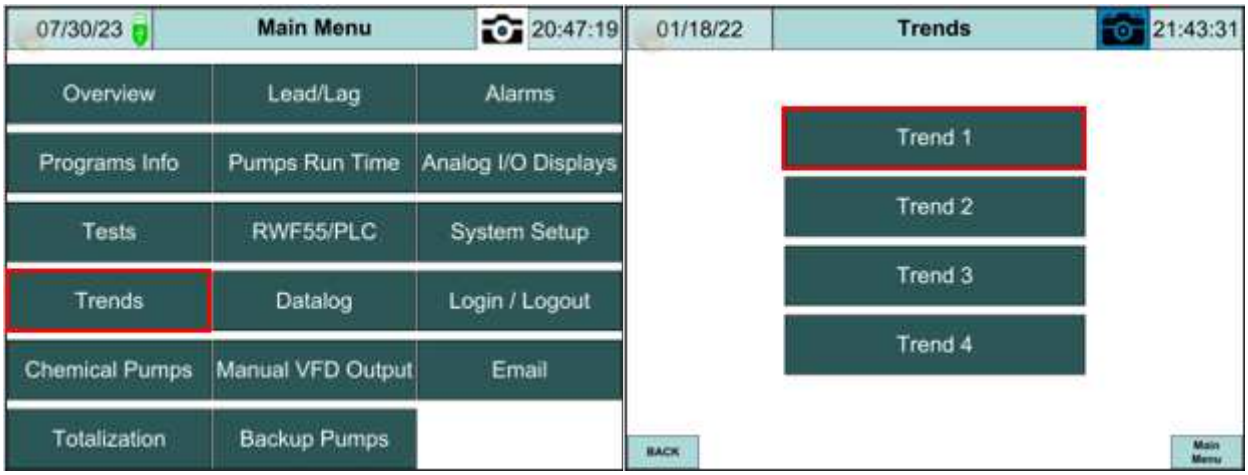
T1 (Tank 1) Steam Pressure with RWF55 or PLC Control



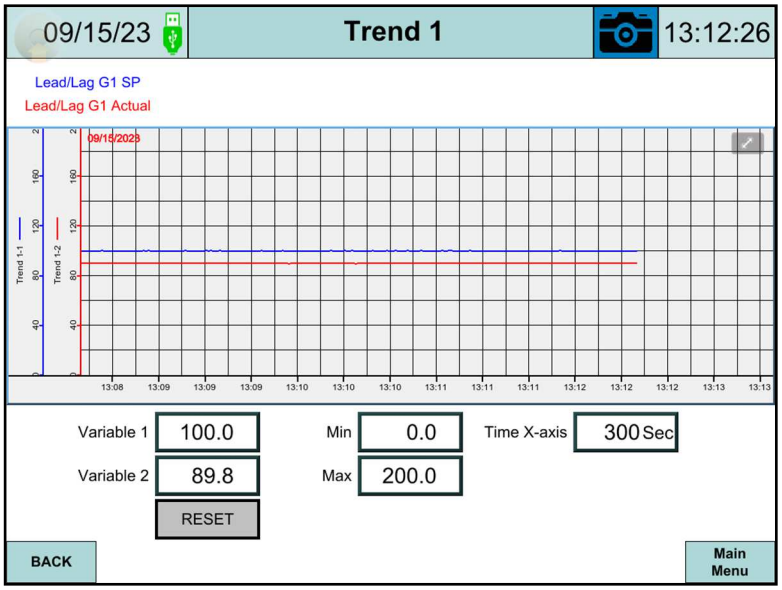
T1 Steam Pressure - Displays actual steam pressure.
Setpoint – Sets the steam pressure setpoint.
Valve Position - Displays the actual steam valve position.
Alarm Setpoint High - Displays the high alarm setpoint.
Alarm Setpoint Low - Displays the low alarm setpoint.

Trends

From the MAIN MENU, press **TRENDS** and then press trend to be adjusted or viewed.



Trends (continued)

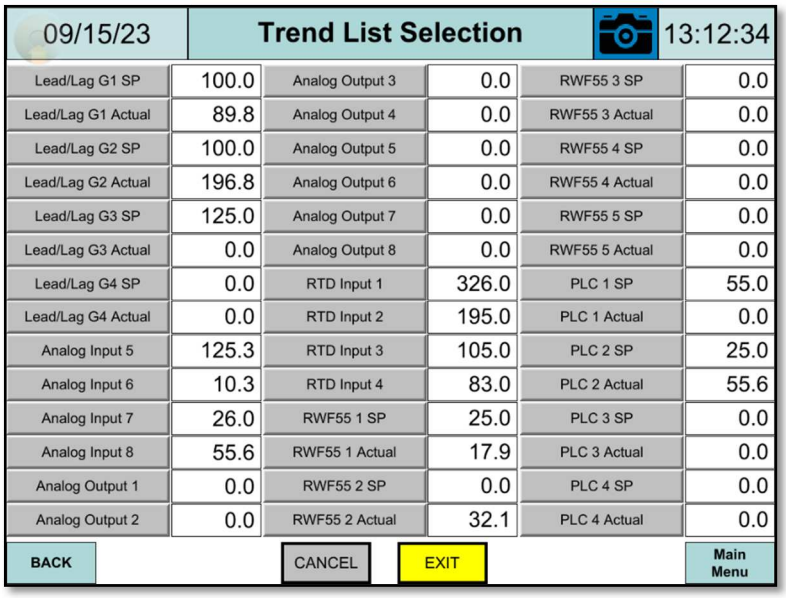


Variable 1 – Displays the value of variable 1 with the name in blue at the left top corner.
Variable 2 – Displays the value of variable 2 with the name in red at the left top corner.

To select the variable to trend, touch the box next to the variable and the Trend List Selection screen will appear. Select the variable from the list. Press CANCEL to cancel the current selection and EXIT to exit the Trend List Selection screen.

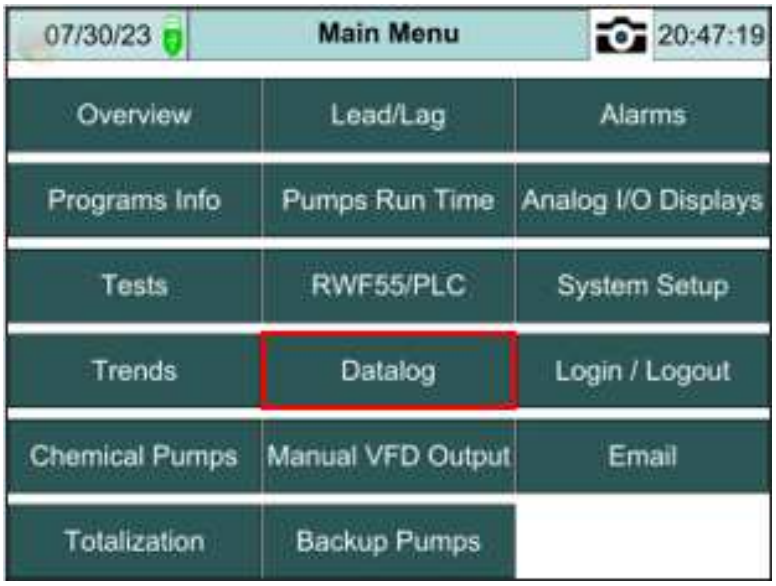
RESET – Both variables set to zero.
MIN, MAX – Sets the range for the trend data (y-axis).
Time X-axis – Sets the time base for X-axis.

Trends (continued)

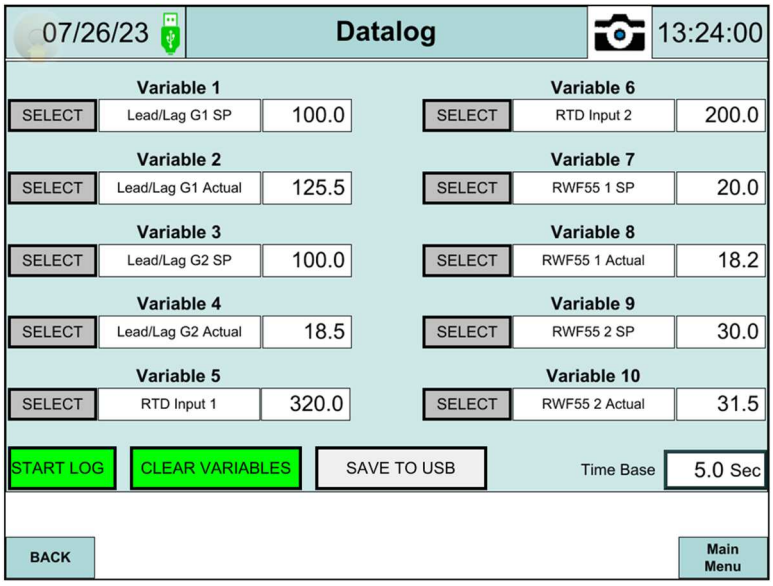


Datalog

From the MAIN MENU, press **DATALOG** to display the DATALOG screen. See page 49, “SYSTEM SETUP >> DATALOG”, for details.

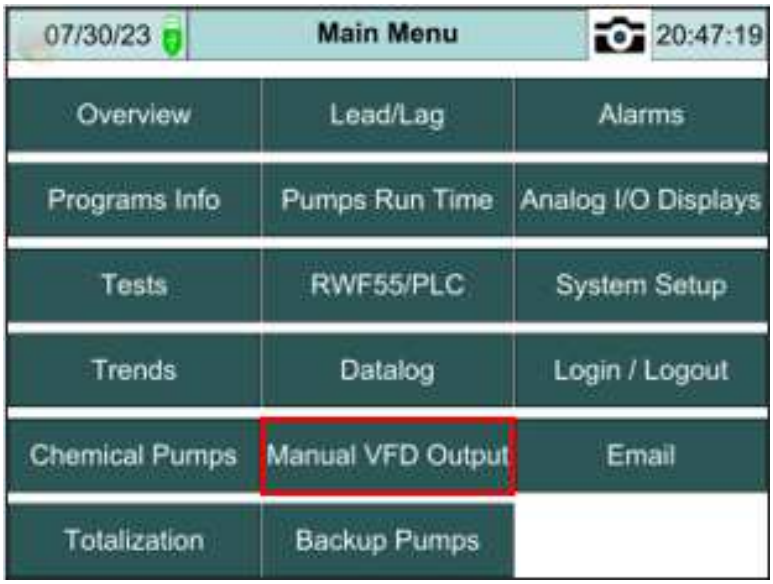


Datalog (continued)

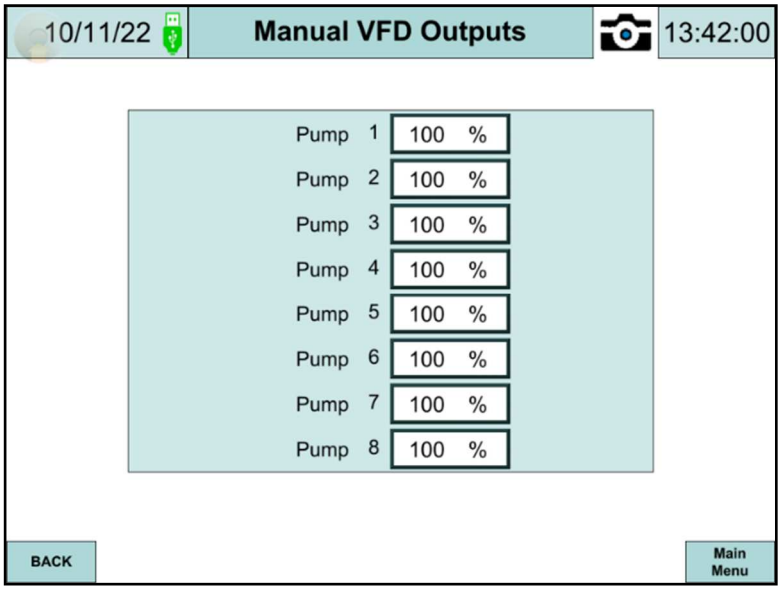


Manual VFD Output

From MAIN MENU, press **MANUAL VFD OUTPUT**.



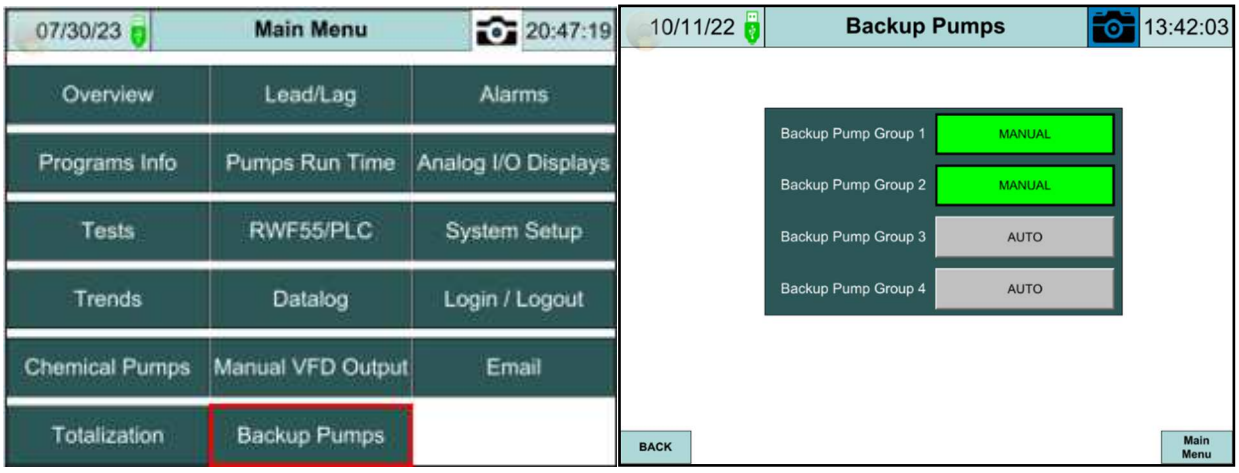
Manual VFD Output (continued)



Manual VFD Output - Sets the manual VFD output for each pump. When HAND-OFF-AUTO switch is set to **HAND**, the VFD will drive to the set percentage.

Backup Pumps

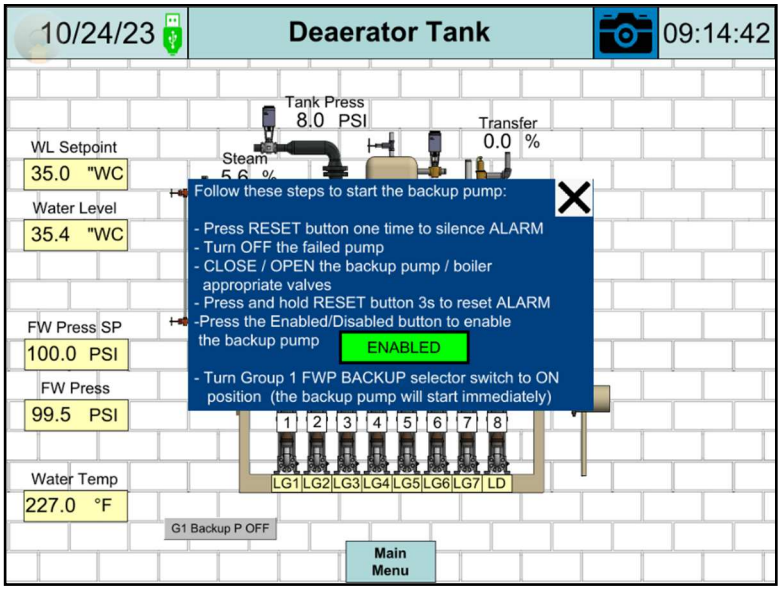
From MAIN MENU, press **BACKUP PUMPS**.



Backup Pumps (continued)

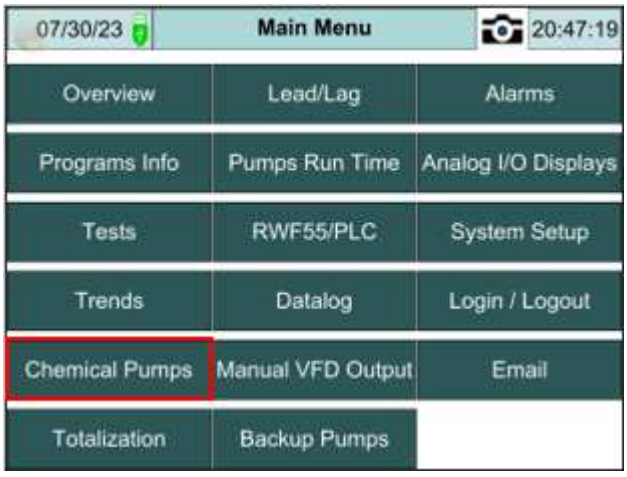
Backup Pump Group 1, 2, 3, 4 – Select AUTO or MANUAL

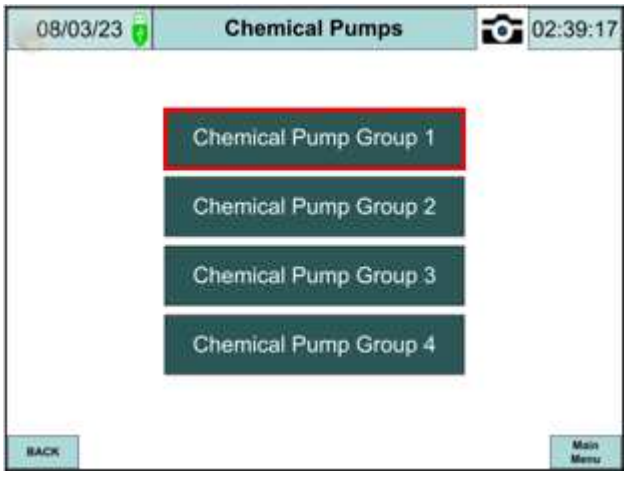
- MANUAL: Backup pump continuously running when LWCO satisfied
- AUTO: Backup pump will start to run after the current running pump fails and the backup pump is set up to run. See the pop-up window below for the steps to start the backup pump.



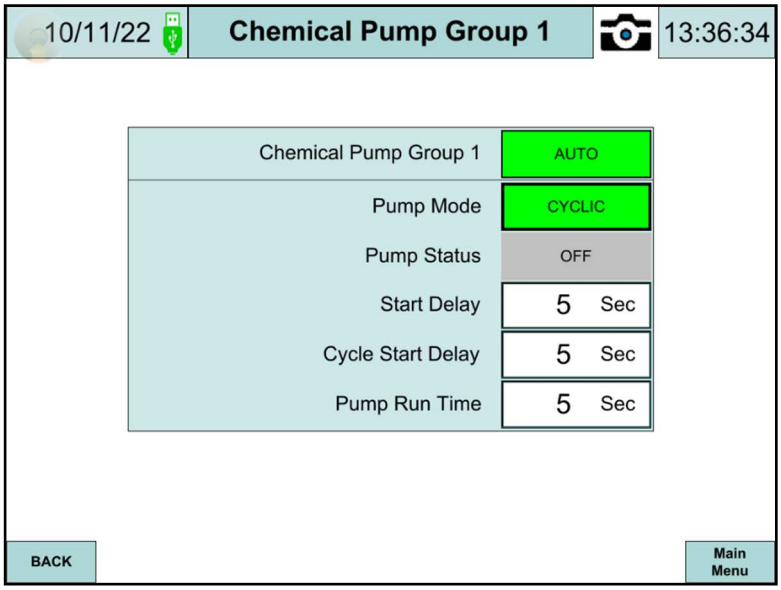
Chemical Pumps

From MAIN MENU, press **CHEMICAL PUMPS**, and then press CHEMICAL PUMP GROUP 1.





Chemical Pumps (continued)



Chemical Pump Group 1 - Chemical pump status ON/OFF

Pump Mode - Select cyclic or continuous.

- **CYCLIC:** Chemical pump starts to run after the start time delay elapses and stops after the PUMP RUN TIME expires. The pump will start to run again after the **Cycle Start Delay** and keep running in cycles repeatedly, based on the **Cycle Start Delay** and **Pump Run Time.**
- **CONTINUOUS:** Chemical pump starts to run continuously after start time delay and stop with stop time delay.

Pump Status - Chemical pump status ON/OFF

- **ON:** Chemical pump will be on when lead pump is on with start time delay.
- **OFF:** Chemical pump will be off when lead pump is off with stop time delay.

Start Delay - The adjustable time delay, 1 to 1800 seconds, for the chemical pump to start.

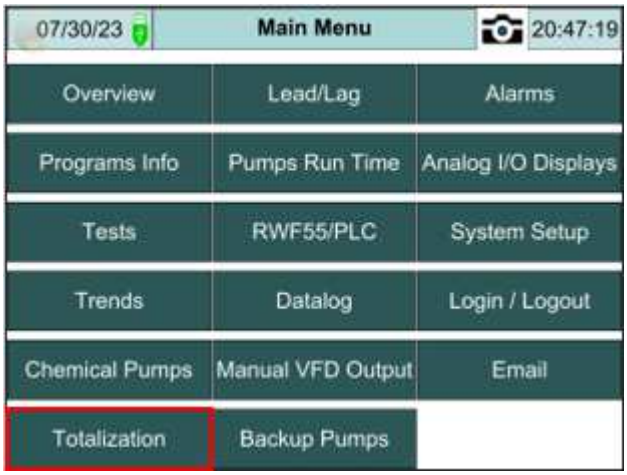
Stop Delay - The adjustable time delay, 1 to 1800 seconds, for the chemical pump to stop.

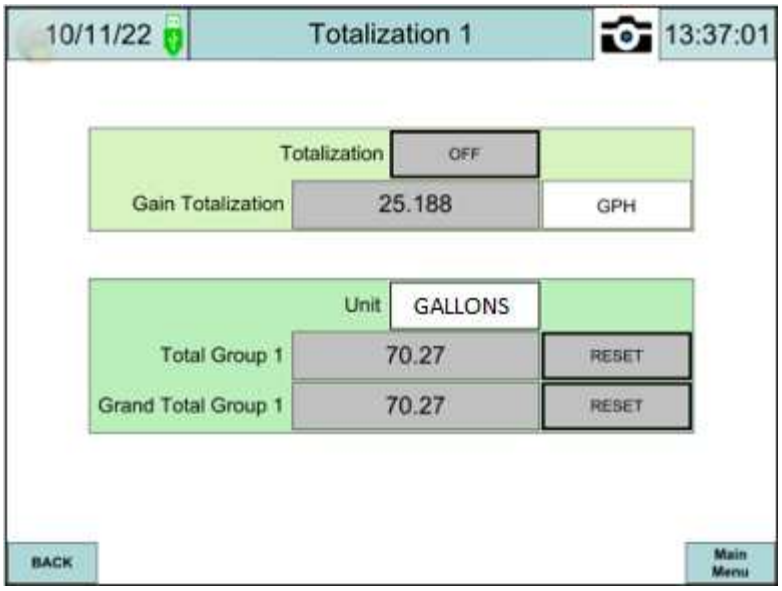
Cycle Start Delay - The adjustable time delay, 1 to 1800 second, for the chemical pump to start in cyclic mode only.

Pump Run Time - The adjustable pump run time, 1 to 1800 seconds, for the chemical pump run in cyclic mode only.

Totalization

From MAIN MENU, press **TOTALIZATION**. The Totalization button is only displayed when totalization option is enabled in System Setup >> Options >> Totalization. An analog input is needed to configure for the first totalization. Press **TOTALIZATION 1** to display the screen for totalization number one.





Totalization:

- **ON**: Activate the flow totalization.
- **OFF**: Deactivate the flow totalization.

Gain Totalization: Displays the gain totalization (actual flow). The unit is displayed next to gain totalization.

Totalization (continued)

Unit - Selects unit. The unit can only be selected if the totalization is OFF.

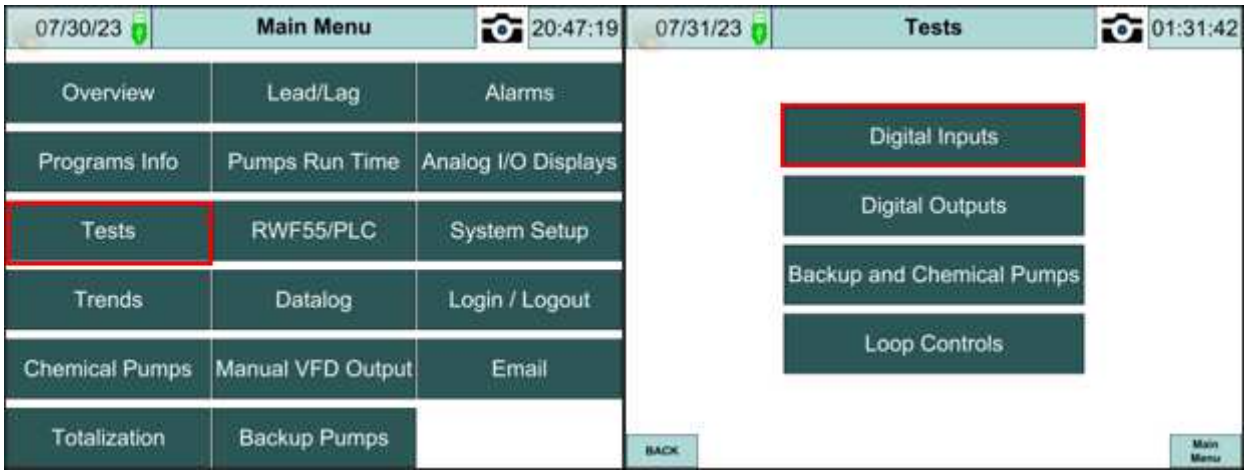
- **NONE**
- **GALLONS**
- **LITERS**
- **POUNDS**

Total Group 1: Displays the group 1 totalization. It could be reset to 0 by pressing the RESET button.

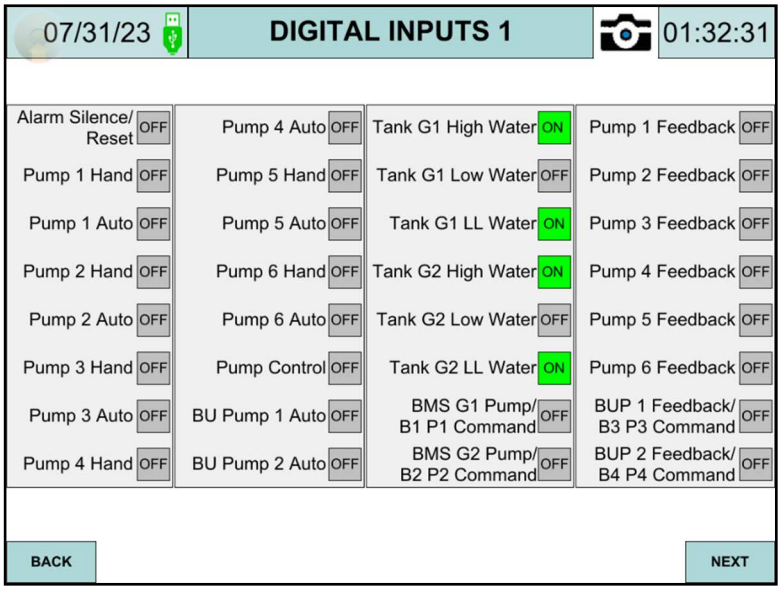
Grand Total Group 1: Displays the grand totalization of group 1. It could be reset to 0 by pressing the RESET button with password protection.

Tests

From MAIN MENU, press **TESTS**, and then press the **DIGITAL INPUTS**.

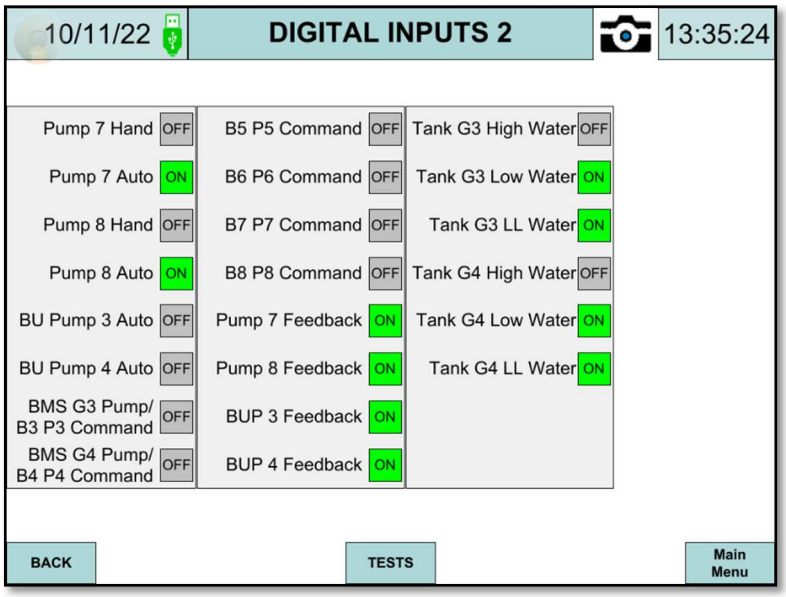


Test (continued)



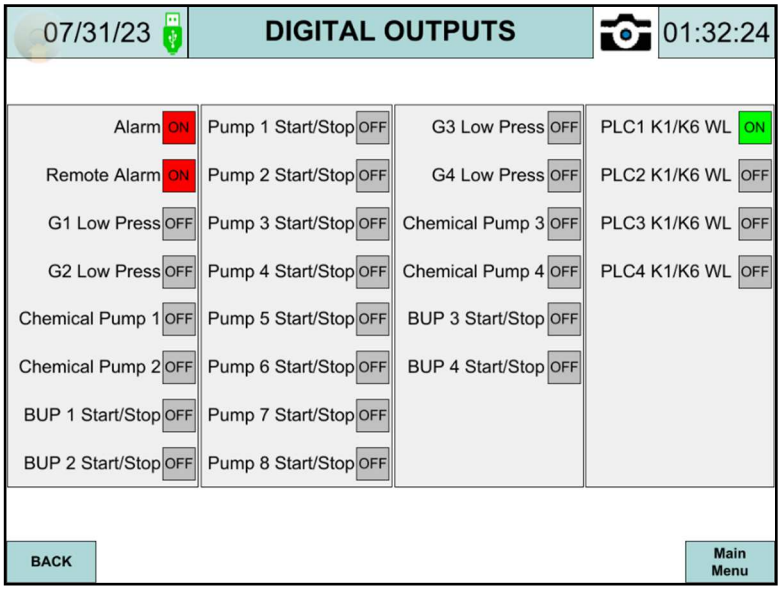
All digital inputs are displayed in DIGITAL INPUTS 1 and DIGITAL INPUTS 2 screens.

Press **NEXT** to display the DIGITAL INPUTS 2 screen.

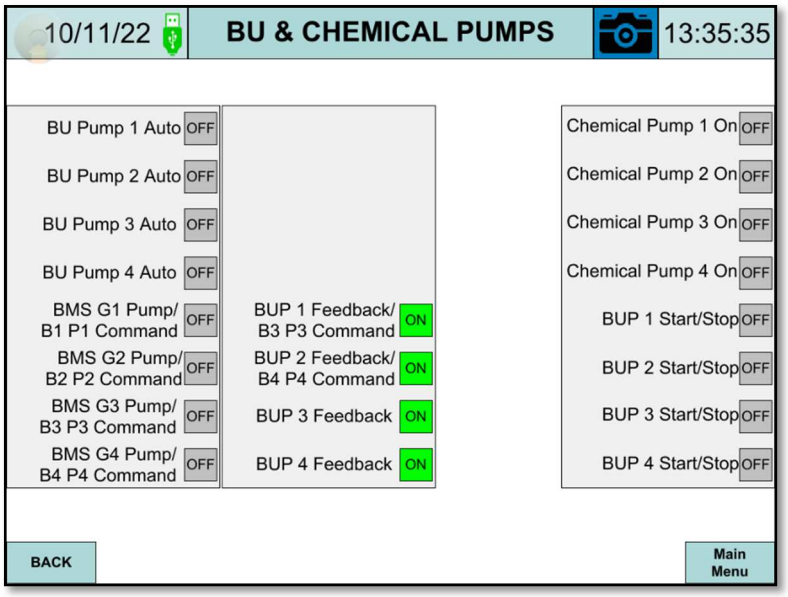


From TESTS menu, press **DIGITAL OUTPUTS**. All digital onputs are displayed on this screen.

Test (continued)

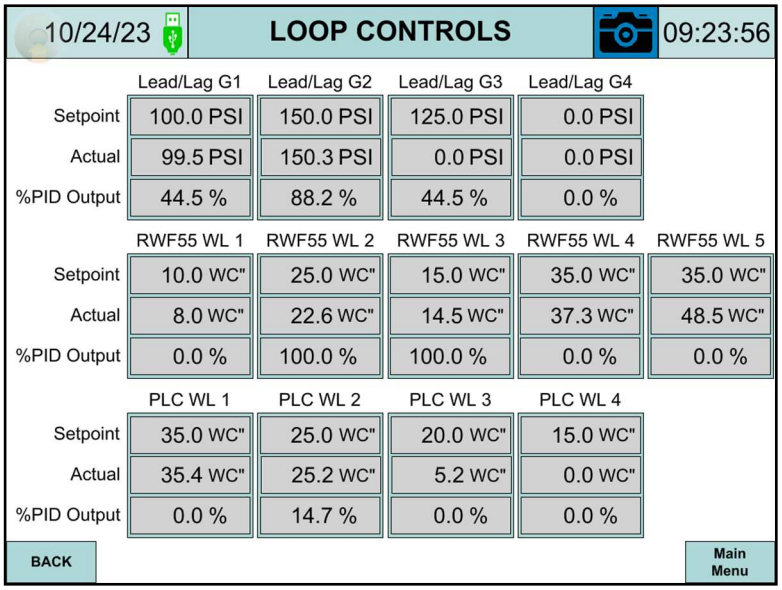


From TESTS menu, press the 'BACKUP AND CHEMICAL PUMPS'. All digital inputs and onputs for backup and chemical pumps are displayed on this screen.



From TESTS menu, press the LOOP CONTROLS. All the parameters for loop controls are displayed on this screen.

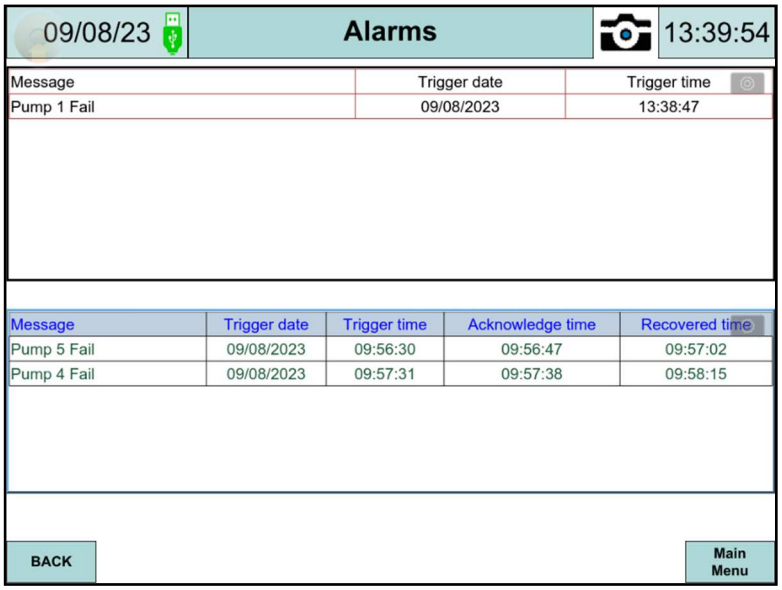
Test (continued)



Alarms

From MAIN MENU, press **ALARMS**. Alarms are displayed on the Alarm Screen. When an alarm is present, a linked button to the Alarm screen will appear and flash in red at the upper right corner of all screens.

Press and release the ALARM SILENCE/RESET red push button on the control panel door to acknowledge the alarms. Press and hold the ALARM SILENCE/RESET red push button on the control panel door for over three seconds to reset the alarms.



The upper table is for current alarms.

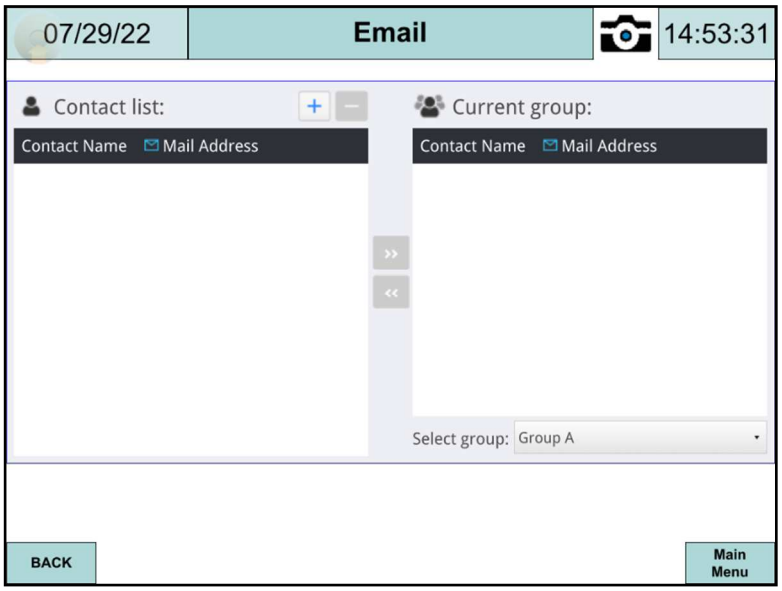
- **Message –** Displays the alarm messages.
- **Trigger date –** Displays the date that the alarm occurred.
- **Trigger time –** Displays the time that the alarm occurred.

The lower table is for history alarms.

- **Message –** Displays the alarm messages.
- **Trigger date –** Displays the date that the alarm occurred.
- **Trigger time –** Displays the time that the alarm occurred.
- **Acknowledge time –** Displays the time when the alarm was acknowledged.
- **Recovered time –** Displays the time when the alarm was returned to normal.

Email

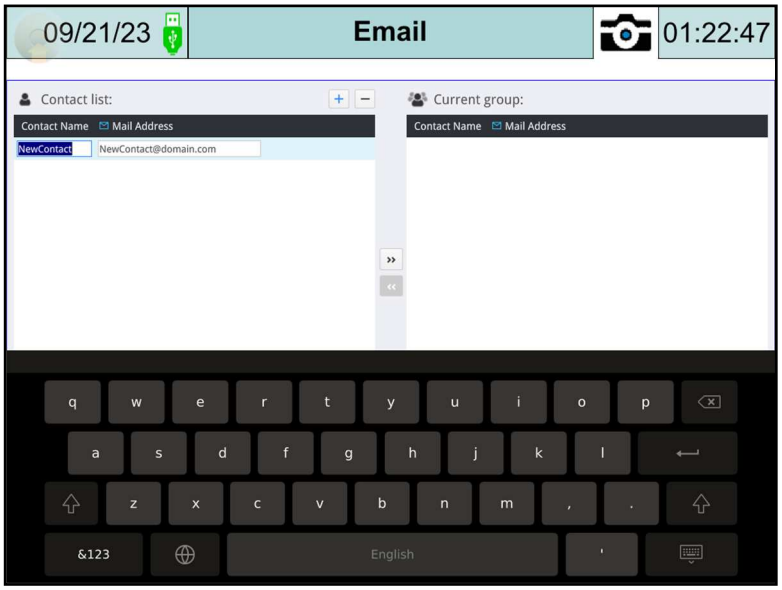
From MAIN MENU, press **EMAIL** to display the Email screen.



Contact list – List all the e-mail contacts.

Add (+) – Adds a new contact. A maximum of 256 contacts can be added.

Remove (-) – Removes a contact.



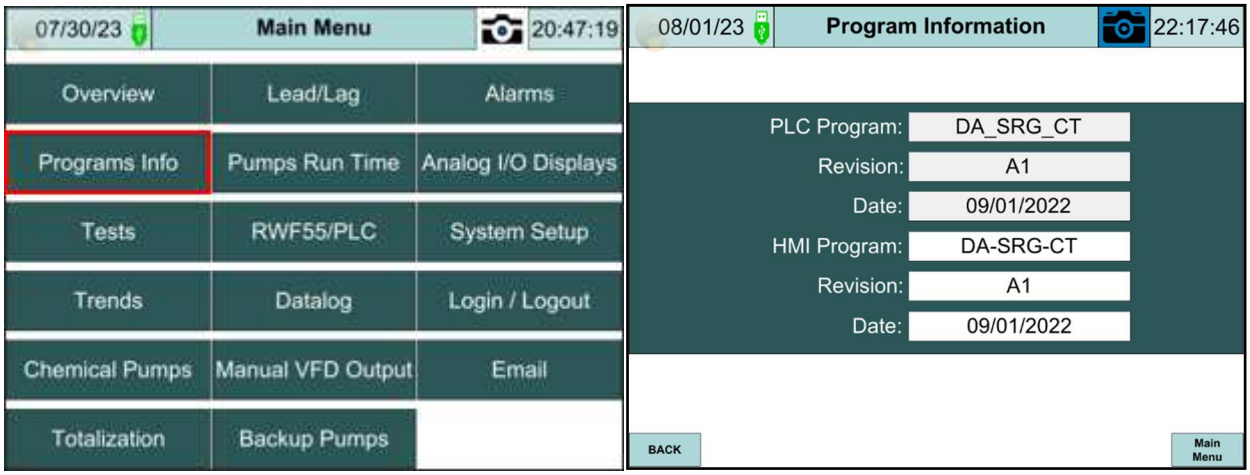
E-mail (continued)

Touch **+** to add new contact and touch **NewContact** or **NewContact@domain.com** and a keypad will appear. Use the keypad to enter the contact's name and email address.

Use the arrow right **>>** to add the contacts to the select 'Group A' and the arrow left **<<** to remove the contacts back to the contact list. All the contacts added to current group A are displayed in blue. An email will be sent to all the contacts in group A when alarms occur.

Program Information

From MAIN MENU, press **PROGRAM INFO** (information).



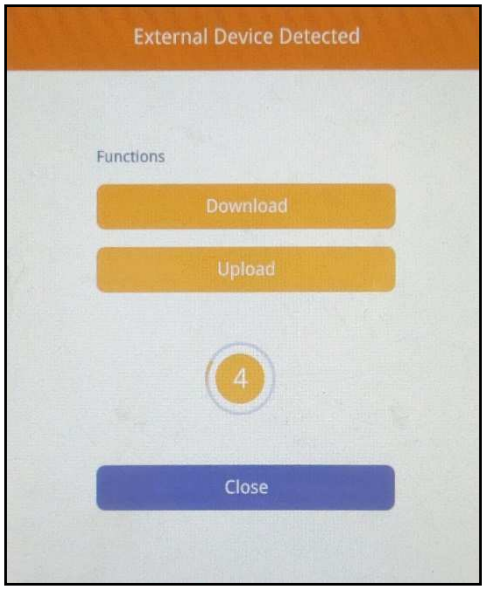
The Program Information screen displays both PLC (programmable logic controller) and HMI (human machine interface) program names, revisions, and dates.

Using External USB Drive

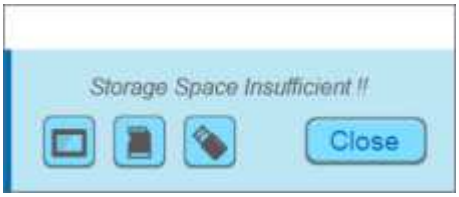
A USB drive can be used to save screen captures and datalog files.

Screen captures: The current screen image may be copied to a USB drive by touching the camera icon at the right corner of the screen. Insert a USB drive before capturing the screen image. When inserting a USB drive, a 'External Device Detected' pop-up window will display with a ten second count down timer. Press 'Close' or just wait for the timer to elapse.

Using External USB Drive (continued)



If there is no USB drive inserted, a ‘Storage Space Insufficient!!’ pop-up window will display.

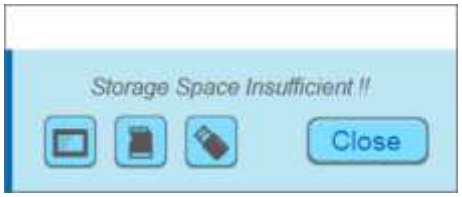


Datalog Files: Go to System setup >> Datalog. Press ‘SAVE TO USB’ to save the datalog files.

System message Window

Device No Response: When the communication between device and HMI is disconnected, this message window will pop up automatically right on the base window currently opened.

Password Protected! Access Denied!!: When attempting to control an object without authorization, this window may pop up as a warning depending on the settings of the object.



Storage Space Insufficient!!: When HMI flash memory, USB drive or DS card is out of storage space, this message window will pop up automatically.

Gateway/BMS MB TCP/IP, MB RTU, BACnet/IP, and BACnet MS/TP Standard Interface

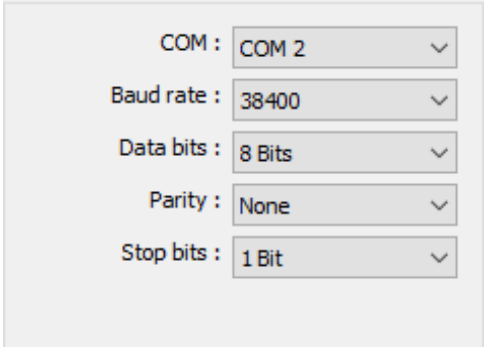
The standard BMS interface offered are via Modbus TCP/IP, Modbus RTU, BACnet /IP, and BACnet MS/TP. **The Modbus TCP/IP and BACnet/IP connections are not available when connected to the Lead/Lag Master.**

Modbus TCP/IP uses the standard port 502 connection. The connection to the BMS is via the Ethernet port 'LAN 1' on the HMI or Ethernet switch.

BACnet/IP uses the port 47808 connection. The connection to the BMS is via the Ethernet port 'LAN 1' on the HMI or Ethernet switch.

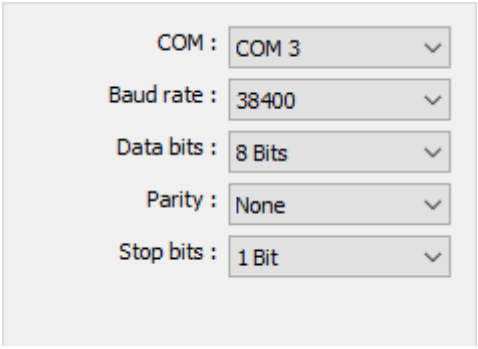
Modbus RTU uses 'Con.A' COM2 connection. The connection to the BMS is via the serial connection RS-485.

COM Port Setting:



BACnet MS/TP use 'Con.A' COM3 connection. The connection to the BMS is via the serial connection RS-485.

COM Port Setting:



Point List Modbus TCP/IP or Modbus RTU

MODBUS 3X<--8001	ACCESS	DESCRIPTION	FORMAT	UNIT	STATUS
38001	Read	Pump 1 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38002	Read	Pump 2 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38003	Read	Pump 3 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38004	Read	Pump 4 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38005	Read	Pump 5 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38006	Read	Pump 6 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38007	Read	Pump 7 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38008	Read	Pump 8 Hand-Off-Auto	Unsigned Int 16	N/A	2 = Hand; 4 = Off; 8 = Auto;
38009	Read	GR_1 Lead/Lag Setpoint	Unsigned Int 16	PSI	
38010	Read	GR_1 Lead/Lag Header	Unsigned Int 16	PSI	
38011	Read	GR_1 Lead/Lag Offset	Unsigned Int 16	PSI	
38012	Read	GR_1 Actual Pressure	Unsigned Int 16	PSI	
38013	Read	GR_1 Drop Pump MS	Unsigned Int 16	PSI	
38014	Read	GR_1 Add Pump MS	Unsigned Int 16	PSI	
38015	Read	GR_1 Drop Pump VFD	Unsigned Int 16	PSI	
38016	Read	GR_1 Add Pump VFD	Unsigned Int 16	PSI	
38017	Read	GR_1 Lead/Lag PID	Unsigned Int 16	%	
38018	Read	GR_1 Low Pressure	Unsigned Int 16	PSI	
38019	Read	GR_1 Start Delay	Unsigned Int 16	S	
38020	Read	GR_1 Stop Delay	Unsigned Int 16	S	
38021	Read	GR_1 Min Run Time	Unsigned Int 16	S	
38022	Read	GR_1 Alternate Time	Unsigned Int 16	H	
38023	Read	GR_1 Overlap Time	Unsigned Int 16	S	
38024	Read	GR_2 Lead/Lag Setpoint	Unsigned Int 16	PSI	
38025	Read	GR_2 Lead/Lag Header	Unsigned Int 16	PSI	
38026	Read	GR_2 Lead/Lag Offset	Unsigned Int 16	PSI	
38027	Read	GR_2 Actual Pressure	Unsigned Int 16	PSI	
38028	Read	GR_2 Drop Pump MS	Unsigned Int 16	PSI	
38029	Read	GR_2 Add Pump MS	Unsigned Int 16	PSI	
38030	Read	GR_2 Drop Pump VFD	Unsigned Int 16	PSI	
38031	Read	GR_2 Add Pump VFD	Unsigned Int 16	PSI	
38032	Read	GR_2 Lead/Lag PID	Unsigned Int 16	%	
38033	Read	GR_2 Low Pressure	Unsigned Int 16	PSI	
38034	Read	GR_2 Start Delay	Unsigned Int 16	S	
38035	Read	GR_2 Stop Delay	Unsigned Int 16	S	

Point List Modbus TCP/IP or Modbus RTU (continued)

38036	Read	GR_2 Min Run Time	Unsigned Int 16	S	
38037	Read	GR_2 Alternate Time	Unsigned Int 16	H	
38038	Read	GR_2 Overlap Time	Unsigned Int 16	S	
38039	Read	GR_3 Lead/Lag Setpoint	Unsigned Int 16	PSI	
38040	Read	GR_3 Lead/Lag Header	Unsigned Int 16	PSI	
38041	Read	GR_3 Lead/Lag Offset	Unsigned Int 16	PSI	
38042	Read	GR_3 Actual Pressure	Unsigned Int 16	PSI	
38043	Read	GR_3 Drop Pump MS	Unsigned Int 16	PSI	
38044	Read	GR_3 Add Pump MS	Unsigned Int 16	PSI	
38045	Read	GR_3 Drop Pump VFD	Unsigned Int 16	PSI	
38046	Read	GR_3 Add Pump VFD	Unsigned Int 16	PSI	
38047	Read	GR_3 Lead/Lag PID	Unsigned Int 16	%	
38048	Read	GR_3 Low Pressure	Unsigned Int 16	PSI	
38049	Read	GR_3 Start Delay	Unsigned Int 16	S	
38050	Read	GR_3 Stop Delay	Unsigned Int 16	S	
38051	Read	GR_3 Min Run Time	Unsigned Int 16	S	
38052	Read	GR_3 Alternate Time	Unsigned Int 16	H	
38053	Read	GR_3 Overlap Time	Unsigned Int 16	S	
38054	Read	GR_4 Lead/Lag Setpoint	Unsigned Int 16	PSI	
38055	Read	GR_4 Lead/Lag Header	Unsigned Int 16	PSI	
38056	Read	GR_4 Lead/Lag Offset	Unsigned Int 16	PSI	
38057	Read	GR_4 Actual Pressure	Unsigned Int 16	PSI	
38058	Read	GR_4 Drop Pump MS	Unsigned Int 16	PSI	
38059	Read	GR_4 Add Pump MS	Unsigned Int 16	PSI	
38060	Read	GR_4 Drop Pump VFD	Unsigned Int 16	PSI	
38061	Read	GR_4 Add Pump VFD	Unsigned Int 16	PSI	
38062	Read	GR_4 Lead/Lag PID	Unsigned Int 16	%	
38063	Read	GR_4 Low Pressure	Unsigned Int 16	PSI	
38064	Read	GR_4 Start Delay	Unsigned Int 16	S	
38065	Read	GR_4 Stop Delay	Unsigned Int 16	S	
38066	Read	GR_4 Min Run Time	Unsigned Int 16	S	
38067	Read	GR_4 Alternate Time	Unsigned Int 16	H	
38068	Read	GR_4 Overlap Time	Unsigned Int 16	S	
38069	Read	Manual VFD % Output Pump 1	Unsigned Int 16	%	
38070	Read	Manual VFD % Output Pump 2	Unsigned Int 16	%	
38071	Read	Manual VFD % Output Pump 3	Unsigned Int 16	%	
38072	Read	Manual VFD % Output Pump 4	Unsigned Int 16	%	
38073	Read	Manual VFD % Output Pump 5	Unsigned Int 16	%	
38074	Read	Manual VFD % Output Pump 6	Unsigned Int 16	%	

Point List Modbus TCP/IP or Modbus RTU (continued)

38075	Read	Manual VFD % Output Pump 7	Unsigned Int 16	%	
38076	Read	Manual VFD % Output Pump 8	Unsigned Int 16	%	
38077	Read	RWF55_1 Actual Value (E1)	Unsigned Int 16	Inch Water of Column - "WC	
38078	Read	RWF55_1 SP(R0008)	Unsigned Int 16	Inch Water of Column - "WC	
38079	Read	RWF55_1 Valve Position (#4163)	Unsigned Int 16	%	
38080	Read	RWF55_2 Actual Value (E1)	Unsigned Int 16	Inch Water of Column - "WC	
38081	Read	RWF55_2 SP(R0008)	Unsigned Int 16	Inch Water of Column - "WC	
38082	Read	RWF55_2 Valve Position (#4163)	Unsigned Int 16	%	
38083	Read	RWF55_3 Actual Value (E1)	Unsigned Int 16	Inch Water of Column - "WC	
38084	Read	RWF55_3 SP(R0008)	Unsigned Int 16	Inch Water of Column - "WC	
38085	Read	RWF55_3 Valve Position (#4163)	Unsigned Int 16	%	
38086	Read	RWF55_4 Actual Value (E1)	Unsigned Int 16	Inch Water of Column - "WC	
38087	Read	RWF55_4 SP(R0008)	Unsigned Int 16	Inch Water of Column - "WC	
38088	Read	RWF55_4 Valve Position (#4163)	Unsigned Int 16	%	
38089	Read	RWF55_5 Actual Value (E1)	Unsigned Int 16	Inch Water of Column - "WC	
38090	Read	RWF55_5 SP(R0008)	Unsigned Int 16	Inch Water of Column - "WC	
38091	Read	RWF55_5 Valve Position (#4163)	Unsigned Int 16	%	
38092	Read	PLC Water Level Control SP1	Unsigned Int 16	Inch Water of Column - "WC	
38093	Read	PLC WL Valve Position 1	Unsigned Int 16	%	
38094	Read	PLC Water Level Control SP2	Unsigned Int 16	Inch Water of Column - "WC	
38095	Read	PLC WL Valve Position 2	Unsigned Int 16	%	
38096	Read	PLC Water Level Control SP3	Unsigned Int 16	Inch Water of Column - "WC	
38097	Read	PLC WL Valve Position 3	Unsigned Int 16	%	
38098	Read	PLC Water Level Control SP4	Unsigned Int 16	Inch Water of Column - "WC	
38099	Read	PLC WL Valve Position 4	Unsigned Int 16	%	

Point List Modbus TCP/IP or Modbus RTU (continued)

38100	Read	Built In Analog Input 1	Unsigned Int 16	mA or V	
38101	Read	Built In Analog Input 2	Unsigned Int 16	mA or V	
38102	Read	Analog Input 1	Unsigned Int 16	mA or V	
38103	Read	Analog Input 2	Unsigned Int 16	mA or V	
38104	Read	Analog Input 3	Unsigned Int 16	mA or V	
38105	Read	Analog Input 4	Unsigned Int 16	mA or V	
38106	Read	Analog Input 5	Unsigned Int 16	mA or V	
38107	Read	Analog Input 6	Unsigned Int 16	mA or V	
38108	Read	Analog Input 7	Unsigned Int 16	mA or V	
38109	Read	Analog Input 8	Unsigned Int 16	mA or V	
38110	Read	Analog Input 9	Unsigned Int 16	mA or V	
38111	Read	Analog Input 10	Unsigned Int 16	mA or V	
38112	Read	Analog Input 11	Unsigned Int 16	mA or V	
38113	Read	Analog Input 12	Unsigned Int 16	mA or V	
38114	Read	Built In Analog Output 1	Unsigned Int 16	%	
38115	Read	Analog Output 1	Unsigned Int 16	%	
38116	Read	Analog Output 2	Unsigned Int 16	%	
38117	Read	Analog Output 3	Unsigned Int 16	%	
38118	Read	Analog Output 4	Unsigned Int 16	%	
38119	Read	Analog Output 5	Unsigned Int 16	%	
38120	Read	Analog Output 6	Unsigned Int 16	%	
38121	Read	Analog Output 7	Unsigned Int 16	%	
38122	Read	Analog Output 8	Unsigned Int 16	%	
38123	Read	Analog Output 9	Unsigned Int 16	%	
38124	Read	Analog Output 10	Unsigned Int 16	%	
38125	Read	Analog Output 11	Unsigned Int 16	%	
38126	Read	Analog Output 12	Unsigned Int 16	%	
38127	Read	RTD 1	Unsigned Int 16	°F or °C	DA - Water Temperature
38128	Read	RTD 2	Unsigned Int 16	°F or °C	SRG - Water Temperature
38129	Read	RTD 3	Unsigned Int 16	°F or °C	CT - Water Temperature
38130	Read	RTD 4	Unsigned Int 16	°F or °C /*FC/	Field - Configuration
38131	Read	Pump 1 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 1
38133	Read	Pump 2 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 2
38135	Read	Pump 3 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 3
38137	Read	Pump 4 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 4
38139	Read	Pump 5 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 5

Point List Modbus TCP/IP or Modbus RTU (continued)

38141	Read	Pump 6 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 6
38143	Read	Pump 7 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 7
38145	Read	Pump 8 Run Time in Hours	Unsigned Int 32	Hours	Elapsed Run Time for Pump 8
38147	Read	Totalization 1	Unsigned Int 32	Ga, L, Lbs	
38149	Read	Totalization 2	Unsigned Int 32	Ga, L, Lbs	
38151	Read	Totalization 3	Unsigned Int 32	Ga, L, Lbs	
38153	Read	Totalization 4	Unsigned Int 32	Ga, L, Lbs	
38154	Read	Status Word 1	Unsigned Int 16	N/A	
38155	Read	Status Word 2	Unsigned Int 16	N/A	
38156	Read	Status Word 3	Unsigned Int 16	N/A	
38157	Read	Status Word 4	Unsigned Int 16	N/A	
38158	Read	Status Word 5	Unsigned Int 16	N/A	

Point List Modbus TCP/IP or Modbus RTU (continued)

MODBUS 0X<--8000	ACCESS	DESCRIPTION	FORMAT	UNIT	STATUS
8000	Read	Lead/Lag	Bit	N/A	0 = OFF(DISABLE) 1 = ON (EN -Run)
8001	Read	GR_1 High Water	Bit	N/A	0 = Warning 1 = ON - Normal
8002	Read	GR_1 Low Water	Bit	N/A	0 = Warning 1 = ON - Normal
8003	Read	GR_1 Low Low Water	Bit	N/A	0 = Alarm 1 = ON - Normal
8004	Read	GR_2 High Water	Bit	N/A	0 = Warning 1 = ON - Normal
8005	Read	GR_2 Low Water	Bit	N/A	0 = Warning 1 = ON - Normal
8006	Read	GR_2 Low Low Water	Bit	N/A	0 = Alarm 1 = ON - Normal
8007	Read	GR_3 High Water	Bit	N/A	0 = Warning 1 = ON - Normal
8008	Read	GR_3 Low Water	Bit	N/A	0 = Warning 1 = ON - Normal
8009	Read	GR_3 Low Low Water	Bit	N/A	0 = Alarm 1 = ON - Normal
8010	Read	GR_4 High Water	Bit	N/A	0 = Warning 1 = ON - Normal
8011	Read	GR_4 Low Water	Bit	N/A	0 = Warning 1 = ON - Normal
8012	Read	GR_4 Low Low Water	Bit	N/A	0 = Alarm 1 = ON - Normal
8013	Read	Reserve	Bit	N/A	0 = Warning 1 = ON - Normal
8014	Read	Reserve	Bit	N/A	0 = Warning 1 = ON - Normal
8015	Read	Reserve	Bit	N/A	0 = Alarm 1 = ON - Normal
8016	Read	Pump 1 Proven	Bit	N/A	0 = OFF; 1 = ON - Run
8017	Read	Pump 2 Proven	Bit	N/A	0 = OFF; 1 = ON - Run
8018	Read	Pump 3 Proven	Bit	N/A	0 = OFF; 1 = ON - Run
8019	Read	Pump 4 Proven	Bit	N/A	0 = OFF; 1 = ON - Run
8020	Read	Pump 5 Proven	Bit	N/A	0 = OFF; 1 = ON - Run
8021	Read	Pump 6 Proven	Bit	N/A	0 = OFF; 1 = ON - Run

Point List Modbus TCP/IP or Modbus RTU (continued)

8022	Read	Pump 7 Proven	Bit	N/A	0 = OFF; 1 = ON - Run
8023	Read	Pump 8 Proven	Bit	N/A	1 = OFF; 1 = ON - Run
8024	Read	Pump 1 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8025	Read	Pump 2 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8026	Read	Pump 3 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8027	Read	Pump 4 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8028	Read	Pump 5 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8029	Read	Pump 6 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8030	Read	Pump 7 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8031	Read	Pump 8 Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8032	Read	AI_1 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8033	Read	AI_1 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8034	Read	AI_2 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8035	Read	AI_2 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8036	Read	AI_3 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8037	Read	AI_3 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8038	Read	AI_4 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8039	Read	AI_4 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8040	Read	AI_5 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8041	Read	AI_5 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8042	Read	AI_6 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8043	Read	AI_6 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8044	Read	AI_7 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm

Point List Modbus TCP/IP or Modbus RTU (continued)

8045	Read	AI_7 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8046	Read	AI_8 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8047	Read	AI_8 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8048	Read	RWF55_1 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8049	Read	RWF55_1 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8050	Read	RWF55_2 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8051	Read	RWF55_2 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8052	Read	RWF55_3 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8053	Read	RWF55_3 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8054	Read	RWF55_4 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8055	Read	RWF55_4 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8056	Read	RWF55_5 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8057	Read	RWF55_5 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8058	Read	Reserve	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8059	Read	Reserve	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8060	Read	Reserve	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8061	Read	Reserve	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8062	Read	Reserve	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8063	Read	Reserve	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8064	Read	PLC_1 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8065	Read	PLC_1 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8066	Read	PLC_2 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8067	Read	PLC_2 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm

Point List Modbus TCP/IP or Modbus RTU (continued)

8068	Read	PLC_3 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8069	Read	PLC_3 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8070	Read	PLC_4 Low Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8071	Read	PLC_4 High Limit	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8072	Read	GR_1 Low Pressure	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8073	Read	GR_2 Low Pressure	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8074	Read	GR_3 Low Pressure	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8075	Read	GR_4 Low Pressure	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8076	Read	GR_1 Backup Pump Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8077	Read	GR_2 Backup Pump Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8078	Read	GR_3 Backup Pump Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm
8079	Read	GR_4 Backup Pump Fail	Bit	N/A	0 = OFF - Normal 1 = ON - Alarm

*FC - Field Configuration Units

Point List BACnet/IP or BACnet/MSTP

ADDRESS	OBJECT_TYPE	OBJECT_NAME	UNIT	STATUS
0	AI	Pump 1 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
1	AI	Pump 2 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
2	AI	Pump 3 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
3	AI	Pump 4 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
4	AI	Pump 5 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
5	AI	Pump 6 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
6	AI	Pump 7 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
7	AI	Pump 8 Hand-Off-Auto	N/A	2 = Hand; 4 = Off; 8 = Auto;
8	AI	GR_1 Lead_Lag SP	PSI	N/A
9	AI	GR_1 Lead_Lag Header	PSI	N/A
10	AI	GR_1 Lead_Lag Offset	PSI	N/A
11	AI	GR_1 Lead_Lag Actual Pressure	PSI	N/A
12	AI	GR_1 Lead_Lag Drop Pump MS	PSI	N/A
13	AI	GR_1 Lead_Lag Add Pump MS	PSI	N/A
14	AI	GR_1 Lead_Lag Drop Pump VFD	%	N/A
15	AI	GR_1 Lead_Lag Add Pump VFD	%	N/A
16	AI	GR_1 Lead_Lag PID	%	N/A
17	AI	GR_1 Lead_Lag Low Pressure	PSI	N/A
18	AI	GR_1 Lead_Lag Start Delay	S	N/A
19	AI	GR_1 Lead_Lag Stop Delay	S	N/A
20	AI	GR_1 Lead_Lag Min run Time	S	N/A
21	AI	GR_1 Lead_Lag Alternate Run Time	H	N/A
22	AI	GR_1 Lead_Lag Overlap Time	S	N/A
23	AI	GR_2 Lead_Lag SP	PSI	N/A
24	AI	GR_2 Lead_Lag Header	PSI	N/A
25	AI	GR_2 Lead_Lag Offset	PSI	N/A
26	AI	GR_2 Lead_Lag Actual Pressure	PSI	N/A
27	AI	GR_2 Lead_Lag Drop Pump MS	PSI	N/A
28	AI	GR_2 Lead_Lag Add Pump MS	PSI	N/A
29	AI	GR_2 Lead_Lag Drop Pump VFD	%	N/A
30	AI	GR_2 Lead_Lag Add Pump VFD	%	N/A
31	AI	GR_2 Lead_Lag PID	%	N/A
32	AI	GR_2 Lead_Lag Low Pressure	PSI	N/A
33	AI	GR_2 Lead_Lag Start Delay	S	N/A
34	AI	GR_2 Lead_Lag Stop Delay	S	N/A
35	AI	GR_2 Lead_Lag Min run Time	S	N/A
36	AI	GR_2 Lead_Lag Alternate Run Time	H	N/A
37	AI	GR_2 Lead_Lag Overlap Time	S	N/A

Point List BACnet/IP or BACnet/MSTP (continued)

38	AI	GR_3 Lead_Lag SP	PSI	N/A
39	AI	GR_3 Lead_Lag Header	PSI	N/A
40	AI	GR_3 Lead_Lag Offset	PSI	N/A
41	AI	GR_3 Lead_Lag Actual Pressure	PSI	N/A
42	AI	GR_3 Lead_Lag Drop Pump MS	PSI	N/A
43	AI	GR_3 Lead_Lag Add Pump MS	PSI	N/A
44	AI	GR_3 Lead_Lag Drop Pump VFD	%	N/A
45	AI	GR_3 Lead_Lag Add Pump VFD	%	N/A
46	AI	GR_3 Lead_Lag PID	%	N/A
47	AI	GR_3 Lead_Lag Low Pressure	PSI	N/A
48	AI	GR_3 Lead_Lag Start Delay	S	N/A
49	AI	GR_3 Lead_Lag Stop Delay	S	N/A
50	AI	GR_3 Lead_Lag Min run Time	S	N/A
51	AI	GR_3 Lead_Lag Alternate Run Time	H	N/A
52	AI	GR_3 Lead_Lag Overlap Time	S	N/A
53	AI	GR_4 Lead_Lag SP	PSI	N/A
54	AI	GR_4 Lead_Lag Header	PSI	N/A
55	AI	GR_4 Lead_Lag Offset	PSI	N/A
56	AI	GR_4 Lead_Lag Actual Pressure	PSI	N/A
57	AI	GR_4 Lead_Lag Drop Pump MS	PSI	N/A
58	AI	GR_4 Lead_Lag Add Pump MS	PSI	N/A
59	AI	GR_4 Lead_Lag Drop Pump VFD	%	N/A
60	AI	GR_4 Lead_Lag Add Pump VFD	%	N/A
61	AI	GR_4 Lead_Lag PID	%	N/A
62	AI	GR_4 Lead_Lag Low Pressure	PSI	N/A
63	AI	GR_4 Lead_Lag Start Delay	S	N/A
64	AI	GR_4 Lead_Lag Stop Delay	S	N/A
65	AI	GR_4 Lead_Lag Min run Time	S	N/A
66	AI	GR_4 Lead_Lag Alternate Run Time	H	N/A
67	AI	GR_4 Lead_Lag Overlap Time	S	N/A
68	AI	Manual VFD % Output Pump 1	%	N/A
69	AI	Manual VFD % Output Pump 2	%	N/A
70	AI	Manual VFD % Output Pump 3	%	N/A
71	AI	Manual VFD % Output Pump 4	%	N/A
72	AI	Manual VFD % Output Pump 5	%	N/A
73	AI	Manual VFD % Output Pump 6	%	N/A
74	AI	Manual VFD % Output Pump 7	%	N/A
75	AI	Manual VFD % Output Pump 8	%	N/A
76	AI	RWF55_1 Actual Value	"WC	N/A

Point List BACnet/IP or BACnet/MSTP (continued)

77	AI	RWF55_1 Setpoint	"WC	N/A
78	AI	RWF55_1 Valve Position	%	N/A
79	AI	RWF55_2 Actual Value	"WC	N/A
80	AI	RWF55_2 Setpoint	"WC	N/A
81	AI	RWF55_2 Valve Position	%	N/A
82	AI	RWF55_3 Actual Value	"WC	N/A
83	AI	RWF55_3 Setpoint	"WC	N/A
84	AI	RWF55_3 Valve Position	%	N/A
85	AI	RWF55_4 Actual Value	"WC	N/A
86	AI	RWF55_4 Setpoint	"WC	N/A
87	AI	RWF55_4 Valve Position	%	N/A
88	AI	RWF55_5 Actual Value	"WC	N/A
89	AI	RWF55_5 Setpoint	"WC	N/A
90	AI	RWF55_5 Valve Position	%	N/A
91	AI	PLC 1 WL Setpoint	"WC	N/A
92	AI	PLC 1 WL Valve Position	%	N/A
93	AI	PLC 2 WL Setpoint	"WC	N/A
94	AI	PLC 2 WL Valve Position	%	N/A
95	AI	PLC 3 WL Setpoint	"WC	N/A
96	AI	PLC 3 WL Valve Position	%	N/A
97	AI	PLC 4 WL Setpoint	"WC	N/A
98	AI	PLC 4 WL Valve Position	%	N/A
99	AI	Built In Analog Input 1	mA or V	N/A
100	AI	Built In Analog Input 2	mA or V	N/A
101	AI	Analog Input 1	mA or V	N/A
102	AI	Analog Input 2	mA or V	N/A
103	AI	Analog Input 3	mA or V	N/A
104	AI	Analog Input 4	mA or V	N/A
105	AI	Analog Input 5	mA or V	N/A
106	AI	Analog Input 6	mA or V	N/A
107	AI	Analog Input 7	mA or V	N/A
108	AI	Analog Input 8	mA or V	N/A
109	AI	Analog Input 9	mA or V	N/A
110	AI	Analog Input 10	mA or V	N/A
111	AI	Analog Input 11	mA or V	N/A
112	AI	Analog Input 12	mA or V	N/A
113	AI	Built In Analog Output 1	mA	N/A
114	AI	Analog Output 1	mA	N/A
115	AI	Analog Output 2	mA	N/A

Point List BACnet/IP or BACnet/MSTP (continued)

116	AI	Analog Output 3	mA	N/A
117	AI	Analog Output 4	mA	N/A
118	AI	Analog Output 5	mA	N/A
119	AI	Analog Output 6	mA	N/A
120	AI	Analog Output 7	mA	N/A
121	AI	Analog Output 8	mA	N/A
122	AI	Analog Output 9	mA	N/A
123	AI	Analog Output 10	mA	N/A
124	AI	Analog Output 11	mA	N/A
125	AI	Analog Output 12	mA	N/A
126	AI	RTD 1	°F or °C	DA – Water Temperature
127	AI	RTD 2	°F or °C	SRG - Water Temperature
128	AI	RTD 3	°F or °C	CT - Water Temperature
129	AI	RTD 4	°F or °C	Field -Configuration
130	AI	Pump 1 Run Time	Hours	Elapsed Run Time for Pump 1
131	AI	Pump 2 Run Time	Hours	Elapsed Run Time for Pump 2
132	AI	Pump 3 Run Time	Hours	Elapsed Run Time for Pump 3
133	AI	Pump 4 Run Time	Hours	Elapsed Run Time for Pump 4
134	AI	Pump 5 Run Time	Hours	Elapsed Run Time for Pump 5
135	AI	Pump 6 Run Time	Hours	Elapsed Run Time for Pump 6
136	AI	Pump 7 Run Time	Hours	Elapsed Run Time for Pump 7
137	AI	Pump 8 Run Time	Hours	Elapsed Run Time for Pump 8
138	AI	Totalization 1		N/A
139	AI	Totalization 2		N/A
140	AI	Totalization 3		N/A
141	AI	Totalization 4		N/A
142	AI	Status Word 1		N/A
143	AI	Status Word 2		N/A
144	AI	Status Word 3		N/A
145	AI	Status Word 4		N/A
146	AI	Status Word 5		N/A

Point List BACnet/IP or BACnet/MSTP (continued)

ADDRESS	OBJECT_TYPE	OBJECT_NAME	UNITS	STATUS
0	BI	Lead Lag Control		0 = OFF(DISABLED) 1 = ON (ENABLED -Run)
1	BI	GR 1 High Water		0 = Warning 1 = ON - Normal
2	BI	GR 1 Low Water		0 = Warning 1 = ON - Normal
3	BI	GR 1 Low Low Water		0 = Alarm 1 = ON - Normal
4	BI	GR 2 High Water		0 = Warning 1 = ON - Normal
5	BI	GR 2 Low Water		0 = Warning 1 = ON - Normal
6	BI	GR 2 Low Low Water		0 = Alarm 1 = ON - Normal
7	BI	GR 3 High Water		0 = Warning 1 = ON - Normal
8	BI	GR 3 Low Water		0 = Warning 1 = ON - Normal
9	BI	GR 3 Low Low Water		0 = Alarm 1 = ON - Normal
10	BI	GR 4 High Water		0 = Warning 1 = ON - Normal
11	BI	GR 4 Low Water		0 = Warning 1 = ON - Normal
12	BI	GR 4 Low Low Water		0 = Alarm 1 = ON - Normal
13	BI	Reserve 1		0 = Warning 1 = ON - Normal
14	BI	Reserve 2		0 = Warning 1 = ON - Normal
15	BI	Reserve 3		0 = Alarm 1 = ON - Normal
16	BI	Pump 1 Proven		0 = OFF; 1 = ON - Run
17	BI	Pump 2 Proven		0 = OFF; 1 = ON - Run
18	BI	Pump 3 Proven		0 = OFF; 1 = ON - Run
19	BI	Pump 4 Proven		0 = OFF; 1 = ON - Run
20	BI	Pump 5 Proven		0 = OFF; 1 = ON - Run
21	BI	Pump 6 Proven		0 = OFF; 1 = ON - Run

Point List BACnet/IP or BACnet/MSTP (continued)

22	BI	Pump 7 Proven		0 = OFF; 1 = ON - Run
23	BI	Pump 8 Proven		1 = OFF; 1 = ON - Run
24	BI	Pump 1 Fail		0 = OFF - Normal 1 = ON - Alarm
25	BI	Pump 2 Fail		0 = OFF - Normal 1 = ON - Alarm
26	BI	Pump 3 Fail		0 = OFF - Normal 1 = ON - Alarm
27	BI	Pump 4 Fail		0 = OFF - Normal 1 = ON - Alarm
28	BI	Pump 5 Fail		0 = OFF - Normal 1 = ON - Alarm
29	BI	Pump 6 Fail		0 = OFF - Normal 1 = ON - Alarm
30	BI	Pump 7 Fail		0 = OFF - Normal 1 = ON - Alarm
31	BI	Pump 8 Fail		0 = OFF - Normal 1 = ON - Alarm
32	BI	AI 1 Low Limit		0 = OFF - Normal 1 = ON - Alarm
33	BI	AI 1 High Limit		0 = OFF - Normal 1 = ON - Alarm
34	BI	AI 2 Low Limit		0 = OFF - Normal 1 = ON - Alarm
35	BI	AI 2 High Limit		0 = OFF - Normal 1 = ON - Alarm
36	BI	AI 3 Low Limit		0 = OFF - Normal 1 = ON - Alarm
37	BI	AI 3 High Limit		0 = OFF - Normal 1 = ON - Alarm
38	BI	AI 4 Low Limit		0 = OFF - Normal 1 = ON - Alarm
39	BI	AI 4 High Limit		0 = OFF - Normal 1 = ON - Alarm
40	BI	AI 5 Low Limit		0 = OFF - Normal 1 = ON - Alarm
41	BI	AI 5 High Limit		0 = OFF - Normal 1 = ON - Alarm
42	BI	AI 6 Low Limit		0 = OFF - Normal 1 = ON - Alarm
43	BI	AI 6 High Limit		0 = OFF - Normal 1 = ON - Alarm

Point List BACnet/IP or BACnet/MSTP (continued)

44	BI	AI 7 Low Limit		0 = OFF - Normal 1 = ON - Alarm
45	BI	AI 7 High Limit		0 = OFF - Normal 1 = ON - Alarm
46	BI	AI 8 Low Limit		0 = OFF - Normal 1 = ON - Alarm
47	BI	AI 8 High Limit		0 = OFF - Normal 1 = ON - Alarm
48	BI	RWF55 1 Low Limit		0 = OFF - Normal 1 = ON - Alarm
49	BI	RWF55 1 High Limit		0 = OFF - Normal 1 = ON - Alarm
50	BI	RWF55 2 Low Limit		0 = OFF - Normal 1 = ON - Alarm
51	BI	RWF55 2 High Limit		0 = OFF - Normal 1 = ON - Alarm
52	BI	RWF55 3 Low Limit		0 = OFF - Normal 1 = ON - Alarm
53	BI	RWF55 3 High Limit		0 = OFF - Normal 1 = ON - Alarm
54	BI	RWF55 4 Low Limit		0 = OFF - Normal 1 = ON - Alarm
55	BI	RWF55 4 High Limit		0 = OFF - Normal 1 = ON - Alarm
56	BI	RWF55 5 Low Limit		0 = OFF - Normal 1 = ON - Alarm
57	BI	RWF55 5 High Limit		0 = OFF - Normal 1 = ON - Alarm
58	BI	Reserve 6		0 = OFF - Normal 1 = ON - Alarm
59	BI	Reserve 7		0 = OFF - Normal 1 = ON - Alarm
60	BI	Reserve 8		0 = OFF - Normal 1 = ON - Alarm
61	BI	Reserve 9		0 = OFF - Normal 1 = ON - Alarm
62	BI	Reserve 10		0 = OFF - Normal 1 = ON - Alarm
63	BI	Reserve 11		0 = OFF - Normal 1 = ON - Alarm
64	BI	PLC 1 Low Limit		0 = OFF - Normal 1 = ON - Alarm
65	BI	PLC 1 High Limit		0 = OFF - Normal 1 = ON - Alarm

Point List BACnet/IP or BACnet/MSTP (continued)

66	BI	PLC 2 Low Limit		0 = OFF - Normal 1 = ON - Alarm
67	BI	PLC 2 High Limit		0 = OFF - Normal 1 = ON - Alarm
68	BI	PLC 3 Low Limit		0 = OFF - Normal 1 = ON - Alarm
69	BI	PLC 3 High Limit		0 = OFF - Normal 1 = ON - Alarm
70	BI	PLC 4 Low Limit		0 = OFF - Normal 1 = ON - Alarm
71	BI	PLC 4 High Limit		0 = OFF - Normal 1 = ON - Alarm
72	BI	GR 1 Low Pressure		0 = OFF - Normal 1 = ON - Alarm
73	BI	GR 2 Low Pressure		0 = OFF - Normal 1 = ON - Alarm
74	BI	GR 3 Low Pressure		0 = OFF - Normal 1 = ON - Alarm
75	BI	GR 4 Low Pressure		0 = OFF - Normal 1 = ON - Alarm
76	BI	GR 1 Backup Pump Fail		0 = OFF - Normal 1 = ON - Alarm
77	BI	GR 2 Backup Pump Fail		0 = OFF - Normal 1 = ON - Alarm
78	BI	GR 3 Backup Pump Fail		0 = OFF - Normal 1 = ON - Alarm
79	BI	GR 4 Backup Pump Fail		0 = OFF - Normal 1 = ON - Alarm

Appendix - RWF55 configuration for Modbus

The RWF55 must be properly configured for Modbus communication.

Use the up and down arrow buttons to navigate through the menus, and the Enter button to select the desired menu. Use Esc to go back to the previous menu. When a parameter needs to be changed, the up and down arrow buttons allow values to be changed, and the Enter button confirms the changes. The parameter name will flash on the green display when parameter entry mode is entered. Press the Esc button to return after the change is made.

To enter the parameters:

1. Press **Enter** to go into the menu list. The green display should read 'OPr'.
2. **ConF >>> IntF >>> r485 >>> bdrt >>> 2** (19200 baud rate)
3. **ConF >>> IntF >>> r485 >>> dtt >>> 30** (timeout)
4. **ConF >>> IntF >>> r485 >>> Adr >>> 1** (address for RWF55 1 controller, if applicable)
   ConF >>> IntF >>> r485 >>> Adr >>> 2 (address for RWF55 2 controller, if applicable)
   ConF >>> IntF >>> r485 >>> Adr >>> 3 (address for RWF55 3 controller, if applicable) **ConF >>> IntF >>> r485 >>> Adr >>> 4** (address for RWF55 4 controller, if applicable)
   ConF >>> IntF >>> r485 >>> Adr >>> 5 (address for RWF55 5 controller, if applicable)

   Press **Esc** in four successions until you exit the parameters menus. The changes would be effective immediately. No reboot is required.