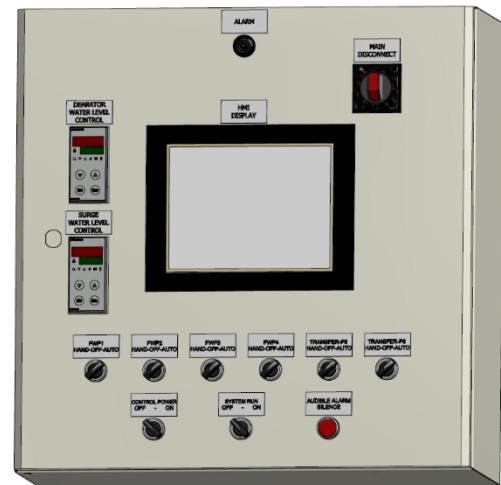


## TS-D Series

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### Deaerator, Surge, and/or Condensate Control Panel

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### Description

A TS-D... series control system manages pump lead/lag operation of an individual deaerator (DA), surge tank, condensate tank, or a combination DA and surge/condensate tank for up to six pumps.

Each TS-D... control system includes a pre-programmed 6" or 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

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, disconnect power from the main disconnect switch.

Protection against electrical shock hazard on the DA, surge, and condensate tank control system, as well as on 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

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. It is also set to maintain an adjustable water level setpoint. The system can start and stop feed or transfer water pumps based on adjustable pressure setpoints. 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.

## System Features

- Maintaining feedwater and transfer water manifold pressures
- Maintaining DA and surge water level based on an adjustable setpoint
- Monitoring high water and low water float controller status
- Monitoring pump status via current switches
- Monitoring system alarms
- Feed and transfer water pumps lead/lag and rotation based on run time in hours
- Monitoring DA steam pressure and steam pressure control (optional)
- Monitoring DA and surge tank water levels, and performing make up water controls
- Controlling pump ON/OFF
- Controlling pump with variable speed drives
- 6" or 10" touchscreen
- Modbus TCP/IP standard for BMS interface
- SCC master lead/lag system interface
- Field configured RTD and analog inputs
- Optional BacNET, LonWorks, Johnson Controls N2, and Modbus RTU

## Pump Lead/Lag Sequence of Operation

1. Each pump motor has a status monitoring current switch and an AUTO/HAND/OFF 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 at the low water cutoff.
3. If the pumps are placed in the AUTO position, then the DA and Surge control system will monitor, start, and modulate all pump VFDs to maintain feedwater or transfer water pressure setpoints.
4. Starter pump motor start sequence of operation:
  - When all pumps are placed in AUTO position, the lead pump will be commanded ON, and stays 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 feed 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 the adjustable time delay, the last lag pump will be dropped offline. If the pressure rises above the high pressure setpoint again, then the second to last lag pump will be dropped offline.
  - The system keeps on shutting down lag pumps whenever the feed or transfer water pressure rises above high pressure setpoint.
  - The RWF55 water level control will modulate the DA makeup valve to maintain the desired water level.
  - The RWF55 water level control will modulate the steam balancing valve to maintain DA steam pressure setpoint, if applicable.
  - The lead pump will be alternated based on lead pump operating time.
  - The lead pump rotation sequence is as follows: 1,2,3,4,5,6 – 2,3,4,5,6,1 – 3,4,5,6,1,2 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.

---

## Pump Lead/Lag Sequence of Operation (continued)

### 5. VFD pump motor start sequence of operation:

- When all pumps are placed in AUTO position, the lead pump drive will be commanded ON, and stays ON as long as there is no alarm or pump rotation. If the feed 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 feed 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 feed 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 running at all times.
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:
  - a. Desired high pressure setpoint for the feedwater manifold.
  - b. 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 horse power (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 error, unknown losses, and pump wear.
  - c. **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.**
  - d. Check your boiler operating pressure and feedwater valve CV to make this calculation.

## 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 – 2,3,4,5,6,1 – 3,4,5,6,1,2 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. Insure all feedwater pump Hand-Off-Auto (H-O-A) switches are in the "OFF" position.
  - a. 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 disconnect may be needed to completely turn the power off.
    - Switch the position of any two pump motor leads on the motor starter load terminals.
    - Insure 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.
3. Following the same procedure, check the rotation of the remaining pumps.
4. 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.
5. To prevent the pumps from running dry, insure that the low/low water cutoff level control removes control power from the pump starters.
6. Open the isolation valve(s) between the surge tank transfer pumps and the DA tank level control valve.
7. 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

## **General Setup (continued)**

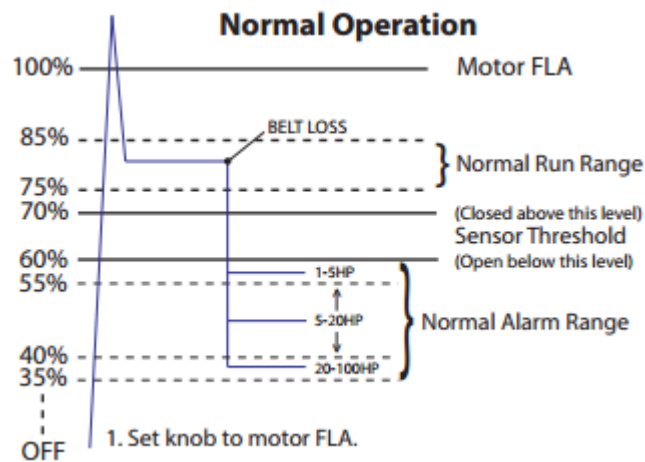
the desired water level before the valve responds. This adjustment will most likely have to be modified after the boilers are online and the system comes into equilibrium.

8. 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 sensor installation instructions for detailed information.**

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



### Example how to calibrate current sensor with 10 FLA motor:

1. Adjust knob clockwise on sensor to 10 FLA.
2. With motor operating normally, adjust knob SLOWLY counter-clockwise until LED is lit, about 8 amps.
3. Adjust knob counter-clockwise to about 7 amps.

## **Alarms and Touchscreen Annunciations**

1. DA high water level warning annunciates on the Overview Screen with red indicator.
2. DA low water level warning annunciates on the Overview Screen with red indicator.
3. DA low / low water level alarm. Pumps shut down.
4. SGR high water level warning annunciates on the Overview Screen with red indicator.
5. SGR low water level warning annunciates on the Overview Screen with red indicator.
6. SGR low / low water level. Pumps shut down.
7. Pump 1 Fail alarm. Annunciates when current switch is not on.
8. Pump 2 Fail alarm. Annunciates when current switch is not on.
9. Pump 3 Fail alarm. Annunciates when current switch is not on.
10. Pump 4 Fail alarm. Annunciates when current switch is not on.
11. Pump 5 Fail alarm. Annunciates when current switch is not on.
12. Pump 6 Fail alarm. Annunciates when current switch is not on.

## Devices, Modbus Setup, and Parameters

**Modbus RS485 details: 19200 baud, 8 stop bits, 1 data bit, no parity.**

Addressing:

PLC - address 1

RWF55 (DA water level) - address 2

RWF55 (DA tank pressure) - address 3

RWF55 (SRG water level) - address 4

Standard Modbus TCP/IP for BMS interface.

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

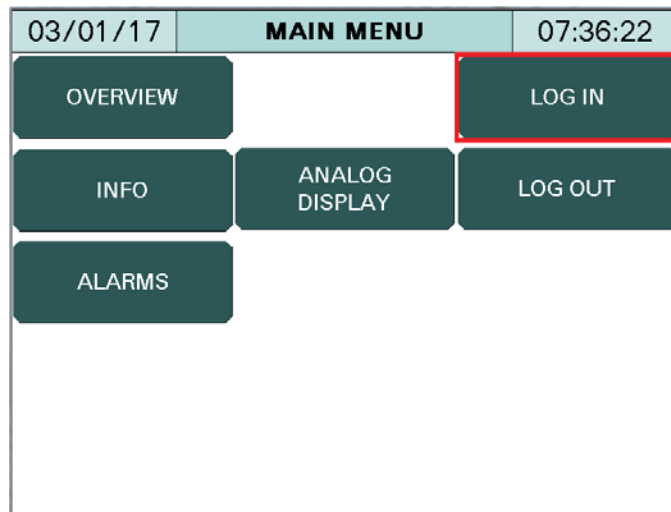
## Control System Nomenclature

24ACH	24V AC Hot
24ACN	24V AC Neutral
485	RS485 Serial Protocol
AH	Alarm Horn
AI	Analog Input
ALM-SIL	Alarm-Silence
ANAIN	Analog Input Field Terminal
ANAOUT	Analog Output PLC Terminals
ANIN	Analog Input PLC Terminal
ANOT	Analog Output Field Terminal
A-OUT	Analog Output
BMS	Building Management System
CB	Circuit Breaker
CKT	Circuit
COND	Condensate
COND-H	COND Water Level High
COND-LO	COND Water Level Low
COND-LL	COND Water Level Low/Low
CR	Control Relay
CS	Current Switch
CTL	Control
CUR	Current
DA	Deaerator
DA-H	Deaerator High Water Signal
DA-L	Deaerator Water Level Low
DA-LL	Deaerator Water Level Low/Low
DC-	24VDC Negative Supply Terminal
DCIN	Direct Current Input 24VDC
DCOT	Direct Current Output 24VDC
DIDC	Digital Input Field Terminal
DIDC 24+	Digital Input 24 VDC Supply Terminal
DP	Differential Pressure
DS1	Disconnect Switch 1
ES	Ethernet Switch
FLA	Full Load Amperage
FLT	Flow Switch
FW	Feedwater
H, H1	Hot 120 VAC

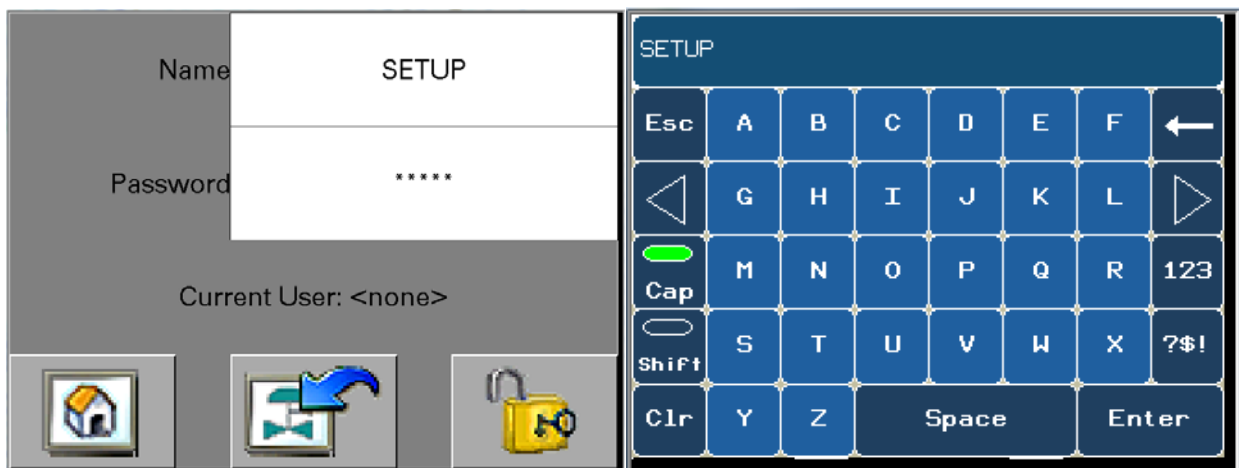
HI	Water Level High
HMI	Human Machine Interface
HOA	Hand/Off/Auto
L1	Line 120VAC
LO	Water Level Low
LT	Light
MIN	Minimum
MTR	Motor
MUV	Make Up Valve
N, N1	Neutral
P-1_P-6	Pump 1 through 6
P1A	Pump 1 in Auto Position
P1CS--P6CS	Pumps Current Switches
P1H	Pump 1 in Hand Position
P1HA	Pump 1 Hand Auto
PC	Processor
PE	Potential Earth
PLC	Programmable Logic Controller
PMP	Pump Field Terminal
PNL	Panel
PWR	Power
RTD	Resistance Temperature Detector
RTDIN	RTD Inputs Terminals
RWF	RWF55 Controller
SH, SHLD	Shield
SRG	Surge
SRG-H	Surge High Water Signal
SRG-L	Surge Water Level Low
SRG-LL	Surge Water Level Low/Low
SS1	Select Switch Control Power ON/OFF
SS204_SS210	Select Switch Pump 1 to Pump 6
STR	Start
YSR	System Relay
TP	Transfer Pump
VALV	Valve
VFD	Variable Frequency Drive
WL	Water Level
XFMR	Transformer
XMTR	Transmitter

## 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 the LOG IN button to enter user name and password.



User name is SETUP. The password is START.



When the LOG IN screen pops up, tap the area next to 'Name' and a keypad will appear. Use the keypad to enter the name, 'SETUP'. When finished, press ENTER.

Next, tap the area next to 'Password' and the same keypad will appear again. Enter the password and press ENTER.

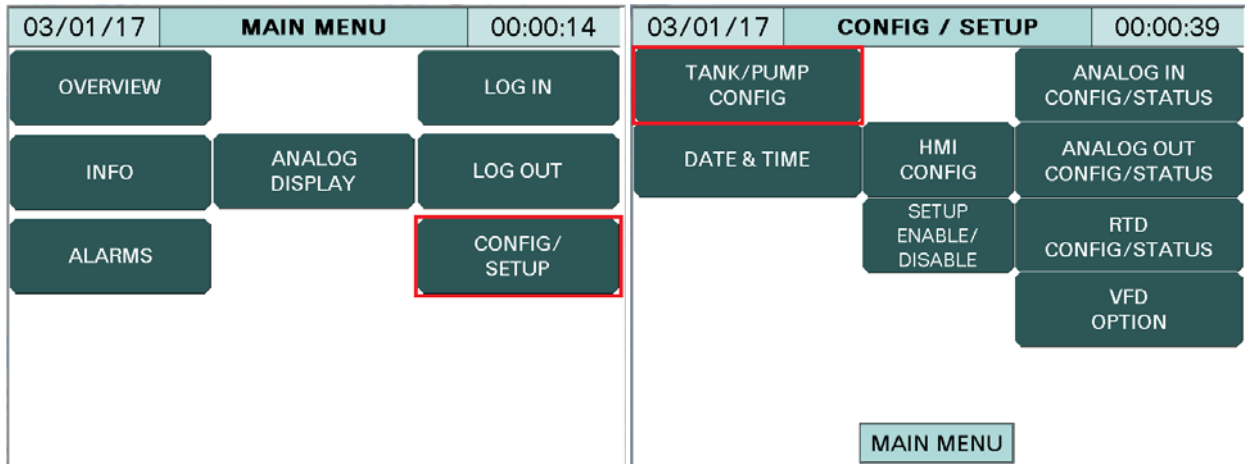
## Logging In (continued)

When both the name and password have been entered, press the unlock icon. If successful, the CURRENT USER will change from 'Current User: <none>' to 'Current User: SETUP'. The login screen will automatically close, and the CONFIG/SETUP button will be displayed on the MAIN MENU screen.

**Note:** Password is needed to access the configuration and setup screens.

## Configuration/Setup

The touchscreen needs to be configured for the equipment's features and options. Press CONFIG/SETUP, and then press TANK/PUMP CONFIG to display the TANK/PUMP CONFIG 1 screen.



The touchscreen can be configured for deaerator single tank, surge single tank, condensate single tank, or a combination of deaerator and surge, deaerator and condensate, surge and condensate, split, or dual tanks. The MAIN MENU and CONFIG/SETUP screens may vary after configurations.

### **WARNING!**

Please note: PUMPS CONTROL selector switch located on the front of the control panel should be in OFF position while configuring and setting up the lead/lag system. Switch PUMPS CONTROL switch to ON when ready to run.

## Tank/Pump Configuration

### Deaerator Tank Only

03/01/17	TANK/PUMP CONFIG 1	00:00:44
TANK SELECT:		
DA ONLY		
TANK TYPE:		
SPRAY		
DEAERATOR		
ENTER TANK NAME		
DEAERATOR		
ENTER PUMP NAME		
FW PUMP		
←	CONFIG	→

#### TANK SELECT - Select **DA ONLY**

- NOT CONFIGURED
- DA ONLY
- SRG ONLY
- DA & SRG
- DA & COND
- SRG & COND
- COND ONLY


#### TANK TYPE - Select **SPRAY** or **TRAY**


- SPRAY
- TRAY

**ENTER TANK NAME** - User configured, up to 12 characters. The default tank name for Deaerator is DEAERATOR.

**ENTER PUMP NAME** - User configured, up to 14 characters. The default pump name is FW PUMP.

## Tank/Pump Configuration (continued)

Press NEXT button  to display TANK/PUMP CONFIG 2 screen.

03/01/17	<b>TANK/PUMP CONFIG 2</b>	00:00:00
ENTER TOTAL NUMBER OF PUMPS:		6
FW PUMP		
AVAILABLE	NOT AVAILABLE	
3	3	
DA WATER LEVEL:		
RWF55		
DA TANK PRESS:		
RWF55		
DA PUMP CONFIG		
	CONFIG	HARD RESET

Picture shown is configured for 3 feedwater pumps.

**ENTER TOTAL NUMBER OF PUMPS** - For single DA tank only, the total number of pumps is always 6.

**FW PUMP AVAILABLE** - Up to 6 pumps.

**FW PUMP NOT AVAILABLE** - Total number of pumps minus feedwater pumps available.  
(Picture shown **FW PUMP NOT AVAILABLE**:  $6-3=3$ )

### DA WATER LEVEL:

- **NONE**: Select NONE if water level is not controlled by RWF55 controller.
- **RWF55**: Select RWF55 if water level is controlled by RWF55 controller.

### DA TANK PRESS:

- **NONE**: Select NONE if there is no DA tank pressure
- **RWF55**: Select RWF55 if DA tank pressure is controlled by RWF55 controller.
- **ANALOG INPUT**: Select ANALOG INPUT if DA tank pressure sensor is connected to ANALOG INPUT card 1, channel 3.

**HARD RESET** - Press the HARD RESET button to acknowledge tank/pump configuration, and to populate timers and counters with default parameters. A pop up window will appear. To acknowledge the changes, press the OK button. See screen and pop up window below.

## Tank/Pump Configuration (continued)

03/01/17	TANK/PUMP CONFIG 2	00:00:03
ENTER TOTAL NUMBER OF PUMPS:		6
FW PUMP		
AVAILABLE #	System configured will be set back to factory default?	
3	To proceed, press OK. To quit, press CANCEL.	
DA WATER		
RWF		
DA TANK		
RWF	OK	CANCEL
DA PUMP CONFIG		
←	CONFIG	HARD RESET

Press "OK" to accept the factory default parameters, otherwise press "CANCEL".

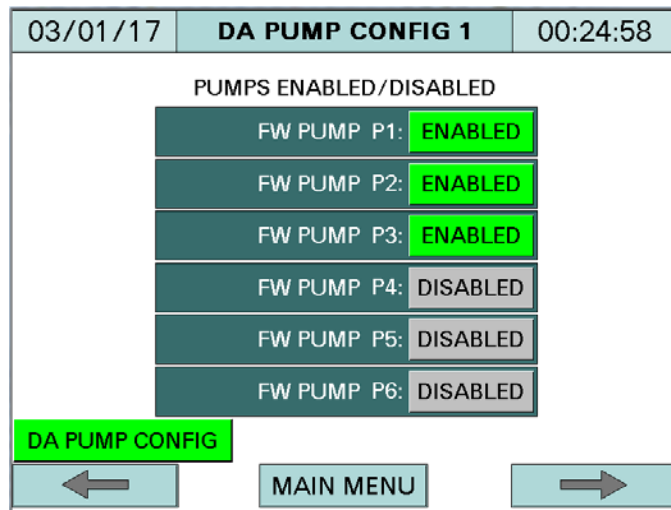
Factory default parameters:

- All pumps are disabled
- Lead/lag pumps not selected
- Start delay: 15 seconds
- Stop delay: 15 seconds
- Minimum run time: 300 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 the information on the TANK/PUMP CONFIG screen 1 and screen 2 has changed.


Press DA PUMP CONFIG button to display the DA PUMP CONFIG 1 screen.

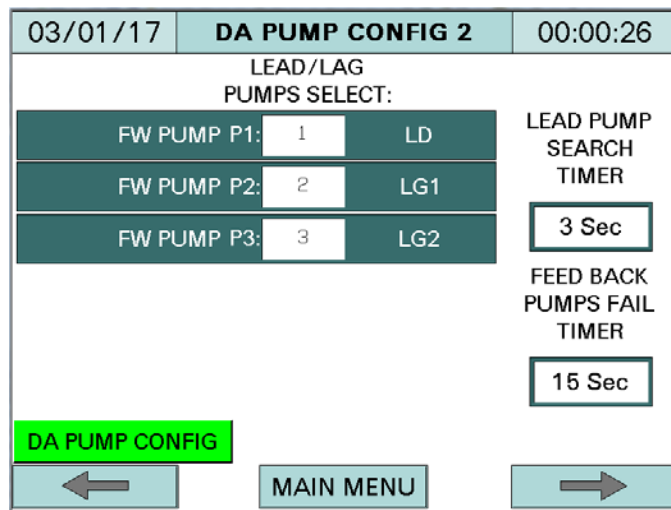
## Tank/Pump Configuration (continued)



Picture shown is configured for 3 feedwater pumps.

**PUMPS ENABLED/DISABLED** - Enable the available pumps. Press ENABLED/DISABLED button to enable or disable related pumps.

Press NEXT button  to display DA PUMP CONFIG 2 screen.



Picture shown is configured for 3 feedwater pumps.

### LEAD/LAG PUMPS SELECT:

- 1 – Lead
- 2 – Lag 1
- 3 – Lag 2
- 4 – Lag 3


## Tank/Pump Configuration (continued)

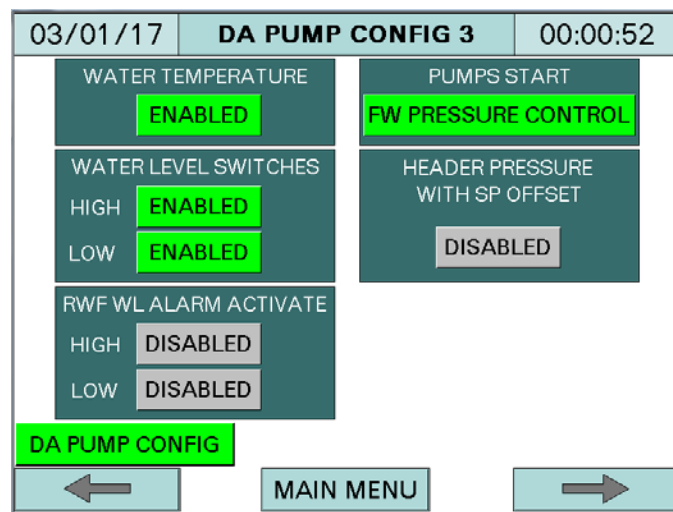
- 5 – Lag 4
- 6 – Lag 5

Any pump can be set to be the lead pump, just enter “1” in the lead/lag pumps select box. Lag pumps can be in any order within the group. If there are four pumps, the first four numbers (1, 2, 3, and 4) can be entered in any order (2-1-3-4, 3-1-2-4, 4-1-3-2, and so on).

**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** - The adjustable time delay when the pumps’ current switches fail to energize. The default setup time is 15 seconds. A pump fail alarm will appear after the FEEDBACK PUMP FAIL TIMER expires. The system will search for and start the next available pump.

Press NEXT button  to display DA PUMP CONFIG 3 screen.



**WATER TEMPERATURE** - To display the water temperature on the OVERVIEW SCREEN, press ENABLED/DISABLED button to ENABLED.

**WATER LEVEL SWITCHES** - To display the high and low water level float switches, and to activate the water level warnings on the OVERVIEW SCREEN, press ENABLED/DISABLE button to ENABLED.


**RWF WL ALARM ACTIVATION** - High and low water level alarms can be controlled by DA high and DA low level float switches, or by soft setup in the RWF55 water level control configuration. To activate the RWF55 water level alarms, press HIGH or LOW ENALBED/DISABLED buttons to

## Tank/Pump Configuration (continued)

ENABLED. Go to page 56, “Configuration - DA Water Level Control”, to set the high and low water level alarm setpoints.

**PUMPS START** - Pumps lead/lag process variable can be based on FW PRESSURE CONTROL or BOILER START CONTROL. Press FW PRESSURE CONTROL/BOILER START CONTROL button to select the control method.

**HEADER PRESSURE WITH SP OFFSET** - Press ENABLED/DISABLED button to ENABLED if the boiler header pressure sensor is connected to ANALOG INPUT card 1, channel 4. The feedwater process variable is based on both steam header pressure, plus offset.

Press NEXT button  to display DA PUMP CONFIG 4 screen.

03/01/17		DA PUMP CONFIG 4			00:00:06	
PUMPS RUN TIME		HH	MM	SS	DAYS	
FW PUMP P1:		0:	0:	0	0	RESET
FW PUMP P2:		0:	0:	0	0	RESET
FW PUMP P3:		0:	0:	0	0	RESET

DA PUMP CONFIG

← MAIN MENU

Picture shown is configured for 3 feedwater pumps.

**PUMPS RUN TIME** - All pumps run time is displayed in hours, minutes, seconds, and then accumulated into days. The PUMPS RUN TIME could be reset to 0 (zero) by pressing 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.

## Tank/Pump Configuration (continued)

### Surge Tank Only

03/01/17	<b>TANK/PUMP CONFIG 1</b>	00:00:34
TANK SELECT: SRG ONLY		
SURGE TANK ENTER TANK NAME SURGE TANK ENTER PUMP NAME TRANSFER PUMP		
←	CONFIG	→


#### **TANK SELECT - Select **SRG ONLY****

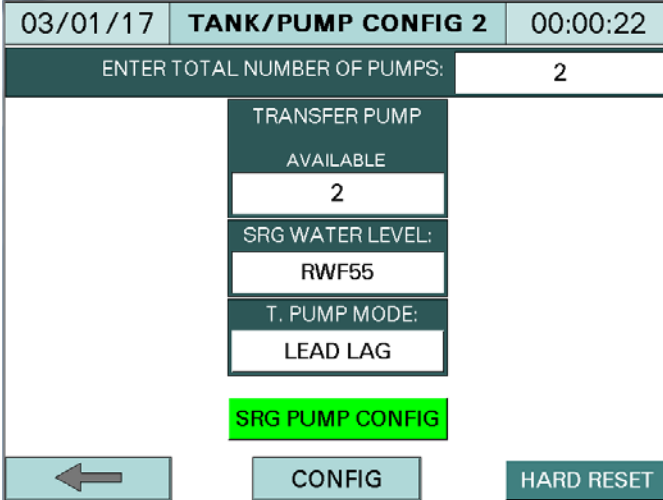
- **NOT CONFIGURED**
- **DA ONLY**
- **SRG ONLY**
- **DA & SRG**
- **DA & COND**
- **SRG & COND**
- **COND ONLY**

**ENTER TANK NAME** - User configured, up to 12 characters. The default tank name is SURGE TANK.

**ENTER PUMP NAME** - User configured, up to 14 characters. The default pump name is TRANSFER PUMP.

## Tank/Pump Configuration (continued)

Press NEXT button  to display TANK/PUMP CONFIG 2 screen.



03/01/17	TANK/PUMP CONFIG 2	00:00:22
ENTER TOTAL NUMBER OF PUMPS:		2
TRANSFER PUMP AVAILABLE		
2		
SRG WATER LEVEL:		
RWF55		
T. PUMP MODE:		
LEAD LAG		
SRG PUMP CONFIG		
←	CONFIG	HARD RESET

Picture shown is configured for the first 2 transfer pumps.

**ENTER TOTAL NUMBER OF PUMPS** - The total number of transfer pumps used in the system. Up to 6 pumps can be used.

**TRANSFER PUMP AVAILABLE** - Same as total number of pumps.

### SRG WATER LEVEL:

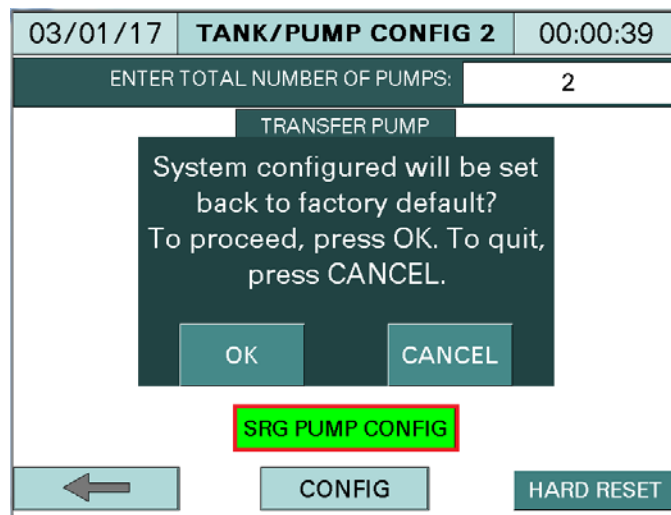
- **NONE:** Select NONE if water level is not controlled by RWF55 controller.
- **RWF55:** Select RWF55 if water level is controlled by RWF55 controller.

**TRANSFER PUMP MODE** - Choose transfer pump control mode.

- **LEAD LAG:** Pumps are controlled by lead/lag mode. See page 7, "Pump Lead/Lag Sequence of Operations", for details.
- **ALTERNATE:** With alternate mode, the lead pump will run, and the lag pump will start to run when the lead pump fails. When the ALTERNATE TIME expires, the current lead pump will switch to become the lag pump, and the lag pump will switch to become the lead pump.

**HARD RESET** - Press the HARD RESET button to acknowledge tank/pump configuration, and to populate timers and counters with default parameters. A pop up window will appear. To acknowledge the changes, press the OK button. See screen and pop up window below.

## Tank/Pump Configuration (continued)



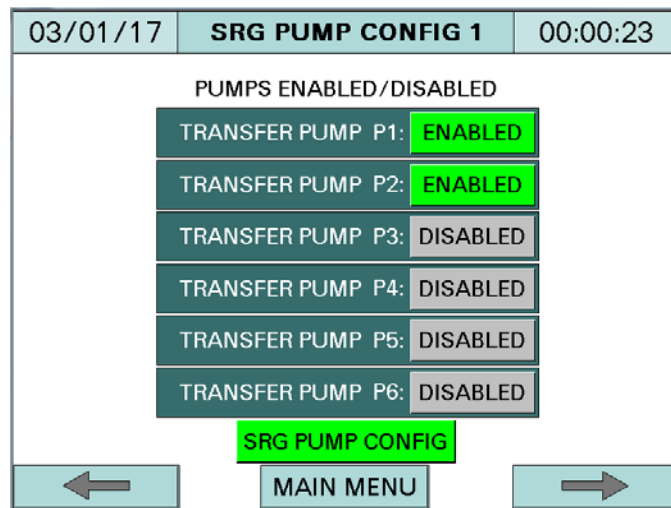
Press “OK” to accept the factory default parameters, otherwise press “CANCEL”.

Factory default parameters:

- All pumps are disabled
- Lead/lag pumps not selected
- Start delay: 15 seconds
- Stop delay: 15 seconds
- Minimum run time: 300 seconds
- Alternate time: 24 hours
- Overlap time: 30 seconds
- Lead pump search timer: 3 seconds
- Feedback pumps fail timer: 15 seconds


Press SRG PUMP CONFIG button to display the SRG PUMP CONFIG 1 screen

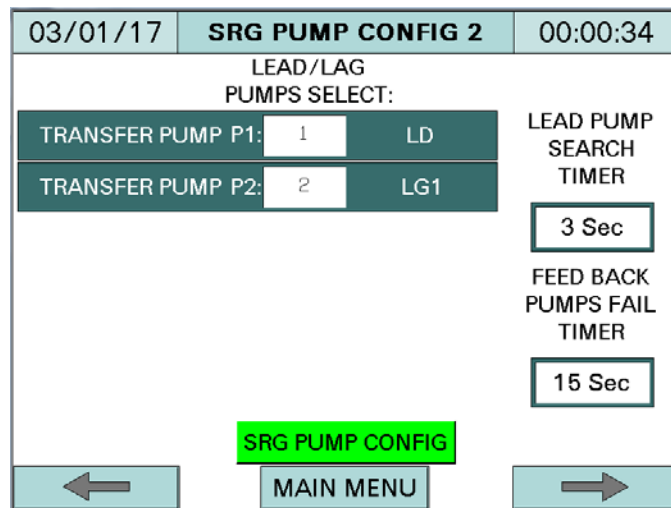
## Tank/Pump Configuration (continued)



Picture shown is configured for the first 2 transfer pumps.

**PUMPS ENABLED/DISABLED** - Enable the available pumps. Press ENABLED/DISABLED button to enable or disable each specific pump.

Press NEXT button  to display SRG PUMP CONFIG 2 screen.



Picture shown is configured for the first 2 transfer pumps.

### LEAD/LAG PUMPS SELECT:

- 1 – Lead
- 2 – Lag 1
- 3 – Lag 2


## Tank/Pump Configuration (continued)



- 4 – Lag 3
- 5 – Lag 4
- 6 – Lag 5

Any pump can be set to be the lead pump, just enter “1” in the lead/lag pumps select box. Lag pumps can be in any order within the group. If there are four pumps, the first four numbers (1, 2, 3, and 4) can be entered in any order (2-1-3-4, 3-1-2-4, or 4-1-3-2 and so on).

**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** - The adjustable time delay when the pumps’ current switches fail to energize. The default setup time is 15 seconds. A pump fail alarm will appear after the FEEDBACK PUMP FAIL TIMER expires. The system will search for and start the next available pump.

Press NEXT button  to display SRG PUMP CONFIG 3 screen.

03/01/17	SRG PUMP CONFIG 3	00:00:36
WATER TEMPERATURE		
ENABLED		
WATER LEVEL SWITCHES		
HIGH	ENABLED	
LOW	ENABLED	
RWF WL ALARM ACTIVATE		
HIGH	DISABLED	
LOW	DISABLED	
SRG PUMP CONFIG		
	MAIN MENU	


**WATER TEMPERATURE** - To display the water temperature on the OVERVIEW SCREEN, press ENABLED/DISABLED button to ENABLED.

**WATER LEVEL SWITCHES** - To display the high and low water level float switches, and to activate the water level warnings on the OVERVIEW SCREEN, press ENABLED/DISABLE button to ENABLED.




**RWF WL ALARM ACTIVATION** - High and low water level alarms can be controlled by SRG high and SRG low level float switches, or by soft setup in the SRG RWF55 water level control configuration. To activate the SRG RWF55 water level alarms, press HIGH or LOW

## Tank/Pump Configuration (continued)

ENABLED/DISABLED buttons to ENABLED. Go to page 56, "Configuration - DA Water Level Control", to set the high and low water level alarm setpoints for Surge Water Level.

Press NEXT button  to display SRG PUMP CONFIG 4 screen.

03/01/17		SRG PUMP CONFIG 4			00:00:02	
PUMPS RUN TIME		HH	MM	SS	DAYS	
TRANSFER PUMP P1:	0:	0:	0	0	0	RESET
TRANSFER PUMP P2:	0:	0:	0	0	0	RESET

Picture shown is configured for the first 2 transfer pumps.

**PUMPS RUN TIME** - All pumps run time is displayed in hours, minutes, seconds, and then accumulated into days. The PUMPS RUN TIME could be reset to 0 (zero) by pressing 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.

## Tank/Pump Configuration (continued)

### Condensate Tank Only

03/01/17	<b>TANK/PUMP CONFIG 1</b>	00:00:24
<b>TANK SELECT:</b> COND ONLY		
<b>CONDENSATE TANK</b> <b>ENTER TANK NAME</b> COND TANK <b>ENTER PUMP NAME</b> TRANSFER PUMP		
←	CONFIG	→


#### **TANK SELECT** - Select **COND ONLY**


- **NOT CONFIGURED**
- **DA ONLY**
- **SRG ONLY**
- **DA & SRG**
- **DA & COND**
- **SRG & COND**
- **COND ONLY**

**ENTER TANK NAME** - User configured, up to 12 characters. The default tank name is COND TANK.

**ENTER PUMP NAME** - User configured, up to 14 characters. The default pump name is TRANSFER PUMP.

## Tank/Pump Configuration (continued)

Press NEXT button  to display TANK/PUMP CONFIG 2 screen.

03/01/17	<b>TANK/PUMP CONFIG 2</b>	00:00:41
ENTER TOTAL NUMBER OF PUMPS:		2
TRANSFER PUMP AVAILABLE		2
COND WATER LEVEL:		NONE
<b>CD PUMP CONFIG</b>		
	CONFIG	HARD RESET

**ENTER TOTAL NUMBER OF PUMPS** - The total number of transfer pumps. This is only used for the last two pumps, pumps 5 and 6.

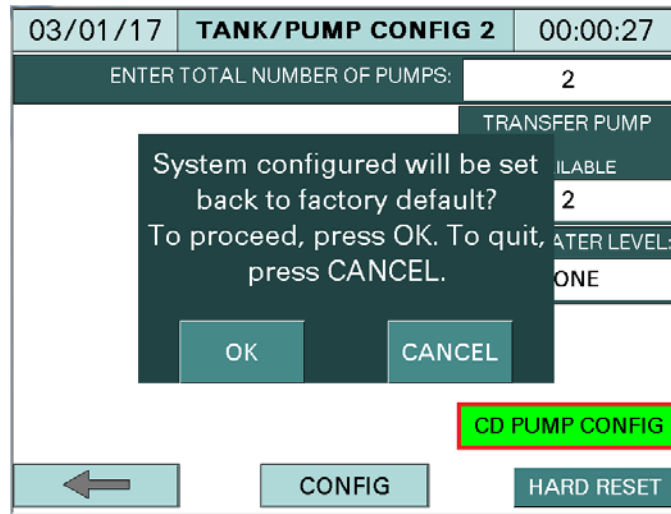
**TRANSFER PUMP AVAILABLE** - Two

**COND WATER LEVEL:**

- **NONE:** Select NONE if water level is not controlled by RWF55 controller.
- **RWF55:** Select RWF55 if water level is controlled by RWF55 controller.

**HARD RESET** - Press the HARD RESET button to acknowledge tank/pump configuration and to populate timers and counters with default parameters. A pop up window will appear. To acknowledge the changes, press the OK button. See screen and pop up window below.

## Tank/Pump Configuration (continued)

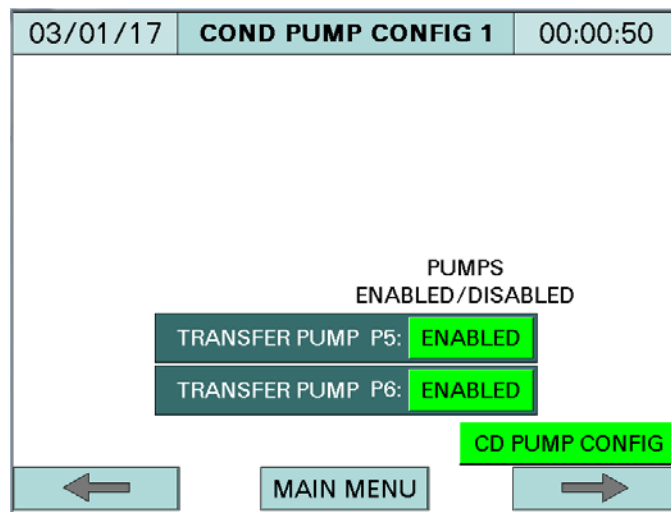


Press “OK” to accept the factory default parameters, otherwise press “CANCEL”.

Factory default parameters:


- All pumps are disabled
- Start delay: 10 seconds
- Stop delay: 10 seconds
- Start lag pump base on timer: 10 seconds
- Start lead pump base on timer: 10 seconds
- Feedback pump 5 fail timer: 10 seconds
- Feedback pump 6 fail timer: 10 seconds

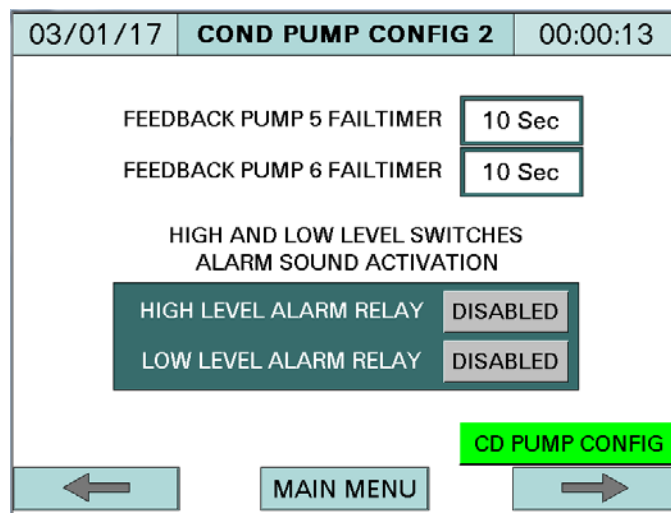
Press COND PUMP CONFIG button to display COND PUMP CONFIG 1 screen



## Tank/Pump Configuration (continued)


**PUMPS ENABLED/DISABLED** - Enable the available pumps. Press ENABLED/DISABLED button to enable or disable related pumps.

Press NEXT button  to display COND PUMP CONFIG 2 screen.

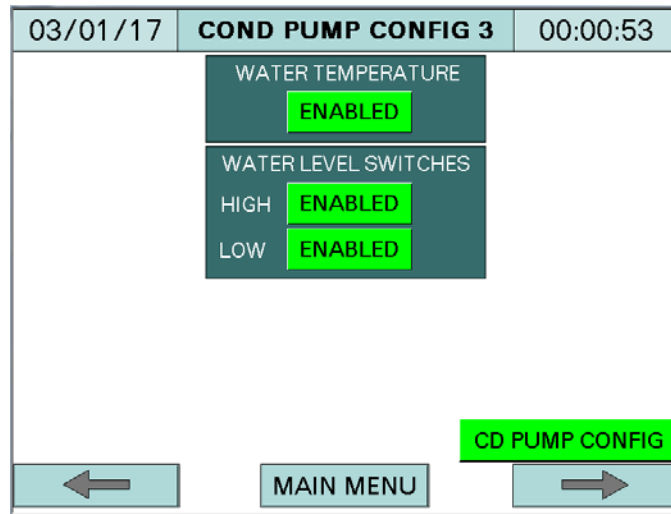


**FEEDBACK PUMP5 AND PUMP6 FAIL TIMER** - The adjustable time delay when the pumps' current switches fail to energize. The default setup time is 10 seconds. A pump fail alarm will appear after the FEEDBACK PUMP FAIL TIMER expires. The system will search for and start the next available pump.

**HIGH AND LOW LEVEL SWITCHES ALARM SOUND ACTIVATION** - Press ENABLED/DISABLED button to ENABLED to activate the buzzer's sound for high and low level alarms.


Press NEXT button  to display COND PUMP CONFIG 3 screen.

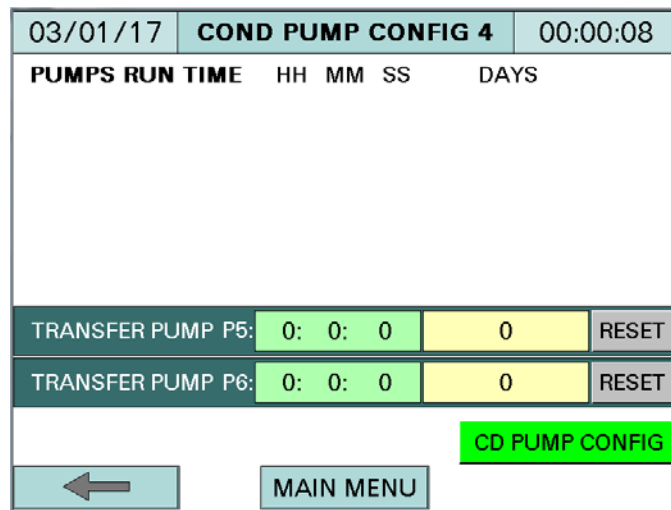
## Tank/Pump Configuration (continued)



**WATER TEMPERATURE** - To display the water temperature on the OVERVIEW SCREEN, press ENABLED/DISABLED button to ENABLED.

**WATER LEVEL SWITCHES** - To display the high and low water level float switches, and to activate the water level warnings on the OVERVIEW SCREEN, press ENABLED/DISABLE button to ENABLED.

Press NEXT button  to display COND PUMP CONFIG 4 screen.



Picture shown is configured for the last 2 transfer pumps.

**PUMPS RUN TIME** - All pumps run time is displayed in hours, minutes, seconds, and then accumulated into days. The PUMPS RUN TIME could be reset to 0 (zero) by pressing 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.

## Tank/Pump Configuration (continued)

### Split or Dual Tank Deaerator and Surge

For DA/SRG combination system, the first four pumps are dedicated for feedwater, and the last two pumps are dedicated for transfer water. Note: always configure DA feedwater pumps first, and then configure the surge tank transfer water pumps.

03/01/17	<b>TANK/PUMP CONFIG 1</b>	00:00:45
TANK SELECT:		
DA & SRG		
TANK TYPE:		
SPLIT   SPRAY		
DEAERATOR		SURGE TANK
ENTER TANK NAME	ENTER TANK NAME	
DEAERATOR	SURGE TANK	
ENTER PUMP NAME	ENTER PUMP NAME	
FW PUMP	TRANSFER PUMP	
←	CONFIG	→

#### TANK SELECT - Select **DA & SRG**

- NOT CONFIGURED
- DA ONLY
- SRG ONLY
- DA & SRG
- DA & COND
- SRG & COND
- COND ONLY


#### TANK TYPE - Select **SPLIT** or **DUAL**; **SPRAY** or **TRAY**


- **SPLIT**: The combination of deaerator and surge, deaerator and condensate, or surge and condensate in one split tank.
- **DUAL**: Two separate tanks.
- **SPRAY**
- **TRAY**

**ENTER TANK NAME** - User configured, up to 12 characters. The default tank name for deaerator is DEAERATOR, and the default name for surge tank is SURGE TANK.

## Tank/Pump Configuration (continued)

**ENTER PUMP NAME** - User configured, up to 14 characters. The default pump name for deaerator is FW PUMP, and the default name for surge tank is TRANSFER PUMP.

Press NEXT button  to display TANK/PUMP CONFIG 2 screen.

03/01/17		<b>TANK/PUMP CONFIG 2</b>		00:00:08	
ENTER TOTAL NUMBER OF PUMPS:				6	
FW PUMP NOT AVAILABLE AVAILABLE		TRANSFER PUMP AVAILABLE			
2 2		2			
DA WATER LEVEL:		SRG WATER LEVEL:			
RWF55		RWF55			
DA TANK PRESS:		T. PUMP MODE:			
RWF55		LEAD LAG			
DA PUMP CONFIG		SRG PUMP CONFIG			
		CONFIG		HARD RESET	

Picture shown is configured for 2 feedwater and 2 transfer water pumps.

**ENTER TOTAL NUMBER OF PUMPS** - For split or dual tank, always enter 6 for total number of pumps. The actual number of pumps will be configured in FW PUMP AVAILABLE, FW PUMP NOT AVAILABLE, and TRANSFER PUMP AVAILABLE.

All feedwater pumps and transfer pumps need to be configured. There are always 4 pumps allocated for feedwater. If there are only two actual feedwater pumps, enter “2” in the FW PUMP AVAILABLE and enter “2” in the FW PUMP NOT AVAILABLE.

**ENTER TOTAL NUMBER OF PUMPS** - Always 6 pumps.

**FW PUMP AVAILABLE** - Up to 4 pumps.

**FW PUMP NOT AVAILABLE** - 4 feedwater pumps minus feedwater pumps available.

**TRANSFER PUMP AVAILABLE** - Up to 2 pumps.

**DA WATER LEVEL or SRG WATER LEVEL:**

- **NONE:** Select NONE if water level is not controlled by RWF55 controller.
- **RWF55:** Select RWF55 if water level is controlled by RWF55 controller.

## Tank/Pump Configuration (continued)

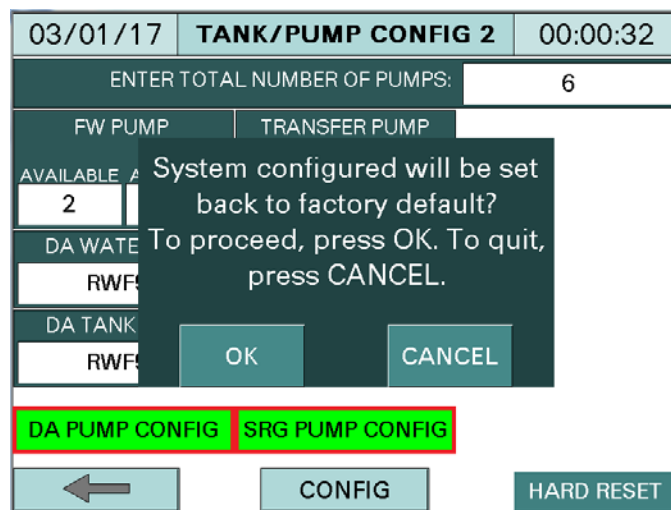
### DA TANK PRESS:

- **NONE:** Select NONE if there is no DA tank pressure.
- **RWF55:** Select RWF55 if DA tank pressure is controlled by RWF55 controller.
- **ANALOG INPUT:** Select ANALOG INPUT if DA tank pressure sensor is connected to ANALOG INPUT card 1, channel 3.

### TRANSFER PUMP MODE - Choose transfer pump control mode.

- **LEAD LAG:** Pumps are controlled by lead/lag mode. See page 7, “Pump Lead/Lag Sequence of Operations”, for details.
- **ALTERNATE:** With alternate mode, the lead pump will run, and the lag pump will start to run when the lead pump fails. When the ALTERNATE TIME expires, the current lead pump will switch to become the lag pump, and the lag pump will switch to become the lead pump.

**HARD RESET** - Press the HARD RESET button to acknowledge tank/pump configuration and to populate timers and counters with default parameters. A pop up window will appear. To acknowledge the changes, press the OK button. See screen and pop up window below.



Press “OK” to accept the factory default parameters, otherwise press “CANCEL”.

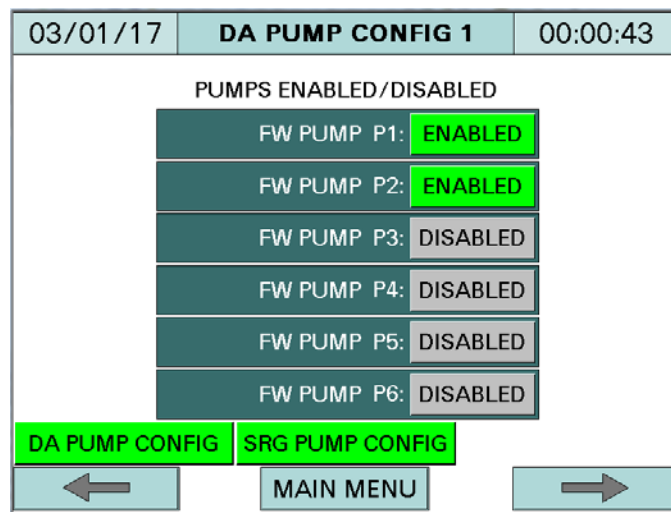
### Factory default parameters:

- All pumps are disabled
- Lead/lag pumps not selected
- Start delay: 15 seconds
- Stop delay: 15 seconds
- Minimum run time: 300 seconds

## Tank/Pump Configuration (continued)

- Alternate time: 24 hours
- Overlap time: 30 seconds
- Lead pump search timer: 3 seconds
- Feedback pumps fail timer: 15 seconds

Press DA PUMP CONFIG button to configure for DA feedwater pumps. When finished, press SRG PUMP CONFIG to configure for surge tank transfer pumps.



Picture shown is configured for 2 feedwater pumps.

**PUMPS ENABLED/DISABLED** - Enable the available pumps. Press ENABLED/DISABLED button to enable or disable related pumps.

Press NEXT button  to display next DA PUMP CONFIG 2 screen.

## Tank/Pump Configuration (continued)

03/01/17	<b>DA PUMP CONFIG 2</b>	00:00:18
LEAD/LAG PUMPS SELECT:		
FW PUMP P1:	1	LD
FW PUMP P2:	2	LG1
		LEAD PUMP SEARCH TIMER
		3 Sec
		FEED BACK PUMPS FAIL TIMER
		15 Sec
DA PUMP CONFIG	SRG PUMP CONFIG	
←	MAIN MENU	→

Picture shown is configured for 2 feedwater pumps.

### LEAD/LAG PUMPS SELECT:


- 1 – Lead
- 2 – Lag 1
- 3 – Lag 2
- 4 – Lag 3
- 5 – Lag 4
- 6 – Lag 5

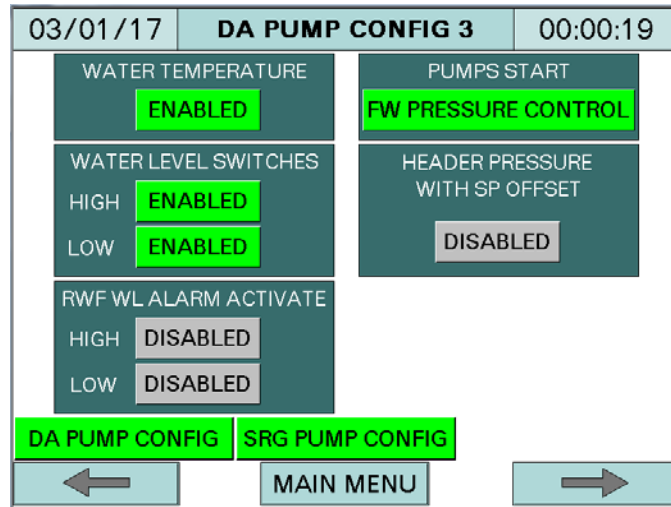
Any pump can be set to be the lead pump, just enter “1” in the lead/lag pumps select box. Lag pumps can be in any order within the group. If there are four pumps, the first four numbers (1, 2, 3, and 4) can be entered in any order (2-1-3-4, 3-1-2-4, or 4-1-3-2 and so on).

**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** - The adjustable time delay when the pumps’ current switches fail to energize. The default setup time is 15 seconds. A pump fail alarm will appear after the FEEDBACK PUMP FAIL TIMER expires. The system will search for and start the next available pump.

## Tank/Pump Configuration (continued)

Press NEXT button  to display DA PUMP CONFIG 3 screen.



**WATER TEMPERATURE** - To display the water temperature on the OVERVIEW SCREEN, press ENABLED/DISABLED button to ENABLED.


**WATER LEVEL SWITCHES** - To display the high and low water level float switches, and to activate the water level warnings on the OVERVIEW SCREEN, press ENABLED/DISABLE button to ENABLED.


**RWF WL ALARM ACTIVATION** - High and low water level alarms can be controlled by DA high and DA low level float switches, or by soft setup in the RWF55 water level control configuration. To activate the RWF55 water level alarms, press HIGH or LOW ENALBED/DISABLED buttons to ENABLED. Go to page 56, "Configuration - DA Water Level Control" to set the high and low water level alarm setpoints.

**PUMPS START** - Pumps lead/lag process variable could be based on FW PRESSURE CONTROL or BOILER START CONTROL. Press FW PRESSURE CONTROL/BOILER START CONTROL button to select the control method.

**HEADER PRESSURE WITH SP OFFSET** - Press ENABLED/DISABLED button to ENABLED if a boiler header pressure sensor is connected to ANALOG INPUT card 1, channel 4. The feedwater process variable is based on both steam header pressure, plus offset.

## Tank/Pump Configuration (continued)

Press NEXT button  to display DA PUMP CONFIG 4 screen.

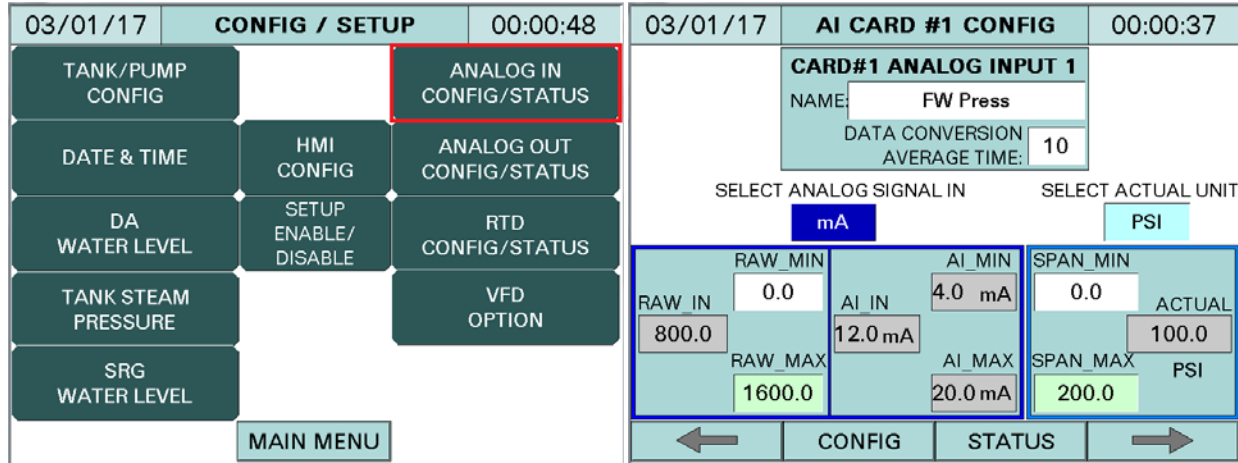
03/01/17	<b>DA PUMP CONFIG 4</b>	00:00:27
<b>PUMPS RUN TIME</b>	HH MM SS	DAYS
FW PUMP P1:	0: 0: 0	0
		RESET
FW PUMP P2:	0: 0: 0	0
		RESET
<b>DA PUMP CONFIG</b>		<b>SRG PUMP CONFIG</b>
	MAIN MENU	

**PUMPS RUN TIME** - All pumps run time is displayed in hours, minutes, seconds, and then accumulated into days. The PUMPS RUN TIME could be reset to 0 (zero) by pressing 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.

Press SRG PUMP CONFIG button, and follow all SRG PUMP CONFIG screens on pages 27 to 32 to configure the transfer pumps.

## Configuration - Analog Inputs

From CONFIG/SETUP screen, press ANALOG IN CONFIG/STATUS to display the AI CARD #1 CONFIG screen.



There are four configurable analog inputs per analog input card. The configuration on this screen is for a 4-20mA pressure transmitter, connected to analog input number one. It must be used for feedwater pressure.

Note: Analog input channel 1 is dedicated for feedwater pressure, analog input channel 2 is dedicated for transfer pump pressure, analog input channel 3 is dedicated for DA tank pressure, and analog input 4 is dedicated for boiler header pressure, if applicable.

**NAME** - Label for analog input channel 1.

**DATA CONVERSION AVERAGE TIME** - Sets the data conversion average time used to average the incoming signal. This is useful when the signal is not steady.

**SELECT ANALOG SIGNAL IN** - Select VOLT for voltage input or mA for current input.

**SELECT ACTUAL UNIT** - Select the unit for the actual monitored value.


**RAW\_IN, RAW\_MIN, and RAW\_MAX** - Digital values in the PLC. RAW\_MIN and RAW\_MAX are adjustable only if an offset is needed.

**AI\_IN, AI\_MIN, and AI\_MAX** - Monitored transmitter input signal, minimum and maximum values.

**SPAN\_MIN, SPAN\_MAX** - Minimum and maximum transmitter span.

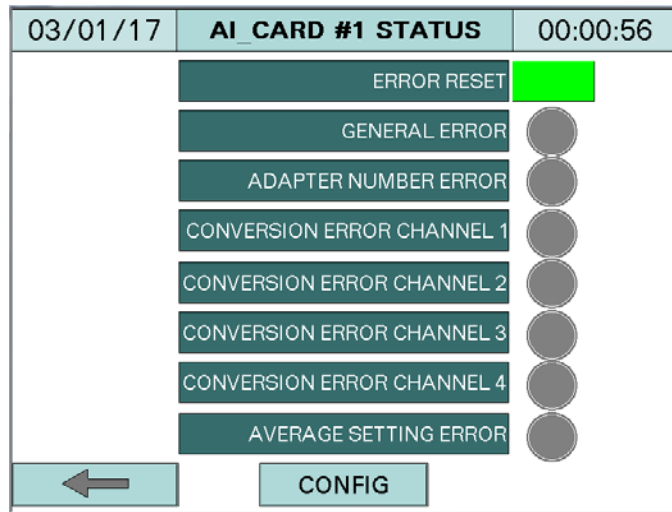
**ACTUAL** - Actual measured value.

## Configuration - Analog Inputs (continued)

Press NEXT button  to configure the remaining analog inputs.

Press CONFIG button to navigate back to CONFIG/SETUP screen.

Press STATUS button to display AI\_CARD #1 STATUS screen. This is used for troubleshooting purposes only.



**ERROR RESET** - Press momentary error reset button once all errors are acknowledged.

**GENERAL ERROR** - The gray/red indicator will turn red if any error occurs for analog input channel 1 through analog input channel 4, or analog input adapter number.

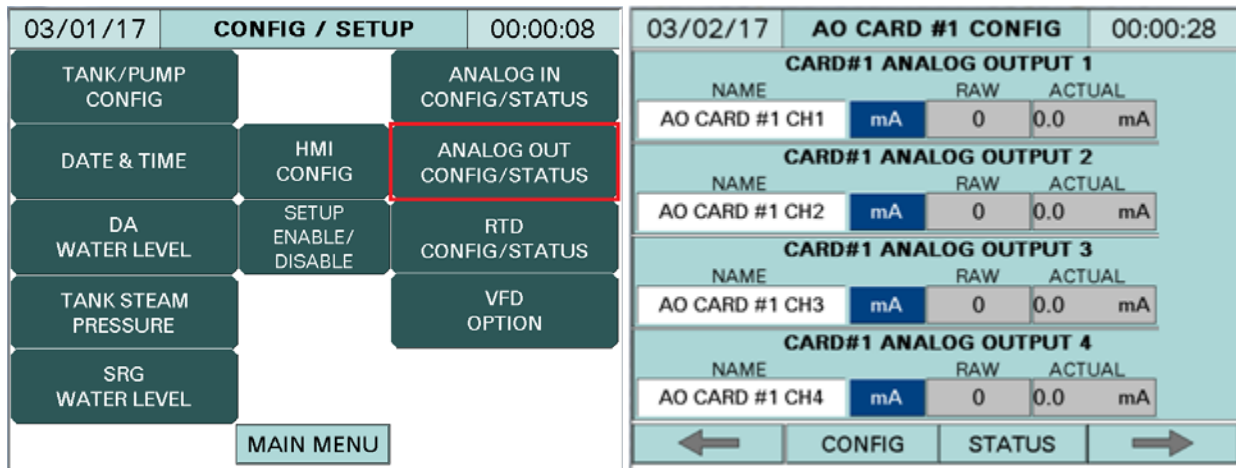
**ADAPTER NUMBER ERROR** - The gray/red indicator will turn red if ANALOG INPUT CARD 1 is installed in a different location than its assigned location.

**CONVERSION ERROR CHANNEL 1, CHANNEL 2, CHANNEL 3, and CHANNEL 4** - The gray/red indicator will turn red when conversion data fails.

**AVERAGE SETTING ERROR** - The gray/red indicator will turn red when data conversion average time setting fails.

## Configuration - Analog Outputs

From CONFIG/SETUP screen, press ANALOG OUT CONFIG/STATUS.



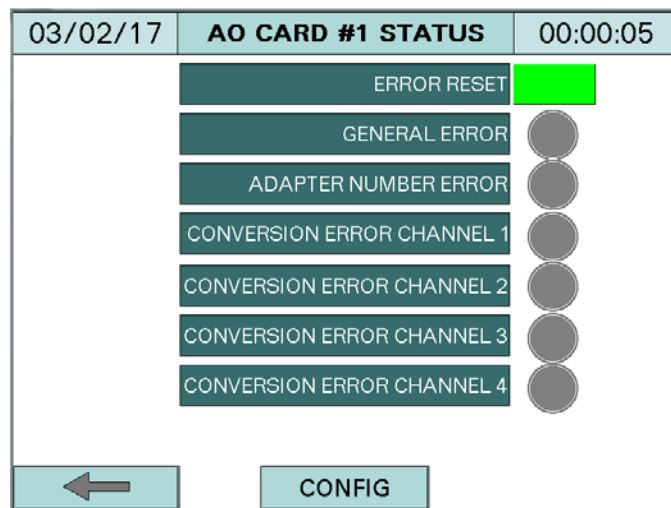
**NAME** - Label for each analog output.

**VOLT/mA** - Select VOLT for voltage output or mA for current output signal.

Press CONFIG button to navigate back to CONFIG/SETUP screen.

Press NEXT button  to continue for the second ANALOG OUT CARD.

Press STATUS button to display AO\_CARD #1 STATUS screen. This is used for troubleshooting purposes only.



## **Configuration - Analog Outputs (continued)**

**ERROR RESET** - Press momentary error reset button once all errors are acknowledged.

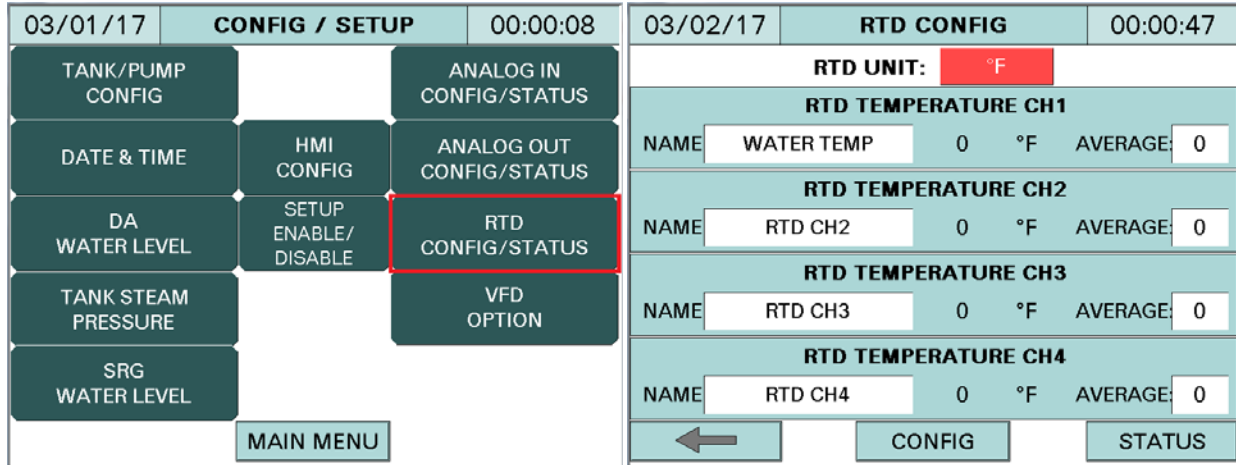
**GENERAL ERROR** - The gray/red indicator will turn red if any error occurs to analog output channel 1 through analog output channel 4, or analog output adapter number.

**ADAPTER NUMBER ERROR** - The gray/red indicator will turn red if ANALOG OUTPUT CARD 1 is installed in a different location than its assigned location.

**CONVERSION ERROR CHANNEL 1, CHANNEL 2, CHANNEL 3, and CHANNEL 4** - The gray/red indicator will turn red when conversion data fails.

## Configuration - RTD Inputs

From CONFIG/SETUP screen, press RTD CONFIG/STATUS.



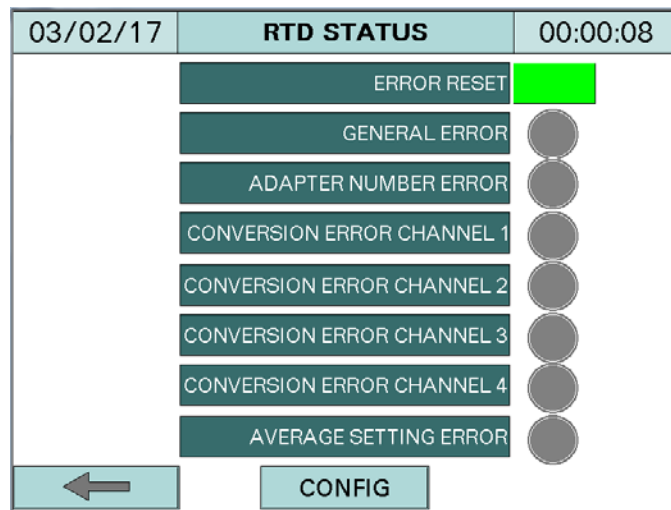
Note: RTD input 1 is dedicated for DA water temperature, RTD input 2 is dedicated for surge water temperature, and RTD input 3 is dedicated for condensate water temperature. All RTDs are 1000 Ohm.

**RTD UNIT** - Select Fahrenheit or Celsius.

**NAME** - Label for each RTD input.

**AVERAGE** - Sets the data conversion average time, used to average the incoming signal. This is useful when the signal is not steady.

Press STATUS button to display RTD STATUS screen. This is used for troubleshooting purposes only.



## **Configuration - RTD Inputs (continued)**

**ERROR RESET** - Press momentary error reset button once all errors are acknowledged.

**GENERAL ERROR** - The gray/red indicator will turn red if any error occurs from RTD channel 1 through RTD channel 4, or RTD adapter number.

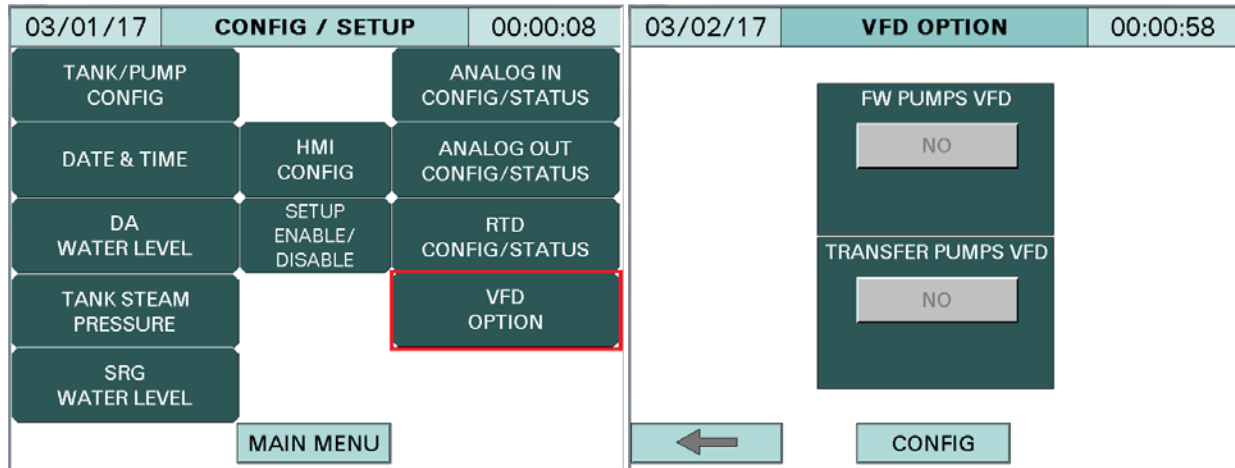
**ADAPTER NUMBER ERROR** - The gray/red indicator will turn red if RTD CARD 1 is installed in a different location than its assigned location.

**CONVERSION ERROR CHANNEL 1, CHANNEL 2, CHANNEL 3, and CHANNEL 4** - The gray/red indicator will turn red when conversion data fails.

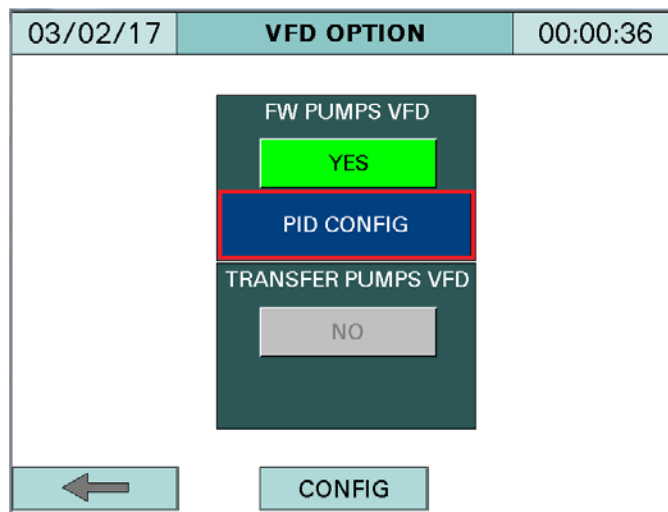
**AVERAGE SETTING ERROR** - The gray/red indicator will turn red when data conversion average time setting fails.

## VFD Option and PID Setup

From CONFIG/SETUP screen, press VFD OPTION.



Toggle the FW PUMPS VFD YES/NO to YES if there are variable frequency drives connected to DA feedwater pumps. Toggle the TW PUMPS VFD YES/NO to YES for transfer water pumps. The PID CONFIG buttons will appear on the screen if FW PUMPS VFD and/or TW PUMPS VFD buttons are set to YES.



Press CONFIG button to navigate to CONFIG/SETUP screen.

Press PID CONFIG button to display the FWP\_PID SETUP 1 screen.

## VFD Option and PID Setup (continued)

03/10/17		FWP_PID SETUP 1		00:00:32	
VFD INPUT TYPE	4-20mA	SETPOINT	100.0	MEASURED PV	94.0
PID OUTPUT	4000	SAMPLE TIME	1000	INPUT FILTER	70
%PID OUTPUT	100 %	PROPORTIONAL GAIN _P	100	INTEGRAL TIME _I	1
		DIFFERENTIAL GAIN _Dk	0	DIFFERENTIAL TIME _Dt	1
←		T.PUMP_PID	CONFIG		

**VFD INPUT TYPE** - Select between 4-20mA, 0-10V, or 0-5V.

**PID OUTPUT** - Displays PID output as digital number, range from 0 to 4000.

**%PID OUTPUT** - Displays PID output as percentage, range from 0 to 100.

**SETPOINT** - Displays the feedwater pump setpoint.

**MEASURED PV** - Displays the measured process variable value.

**SAMPLE TIME** - Sets the sample time. The default setting is 1000.

**INPUT FILTER** - Sets the input filter. The default setting is 70.

**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.

**PID Controller:** A PID controller continuously calculates an error value as the difference between a SETPOINT and a MEASURED PV and applies a correction based on proportional, integral, and derivative terms.

### 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.

## **VFD Option and PID Setup (continued)**

### **Integral Response**

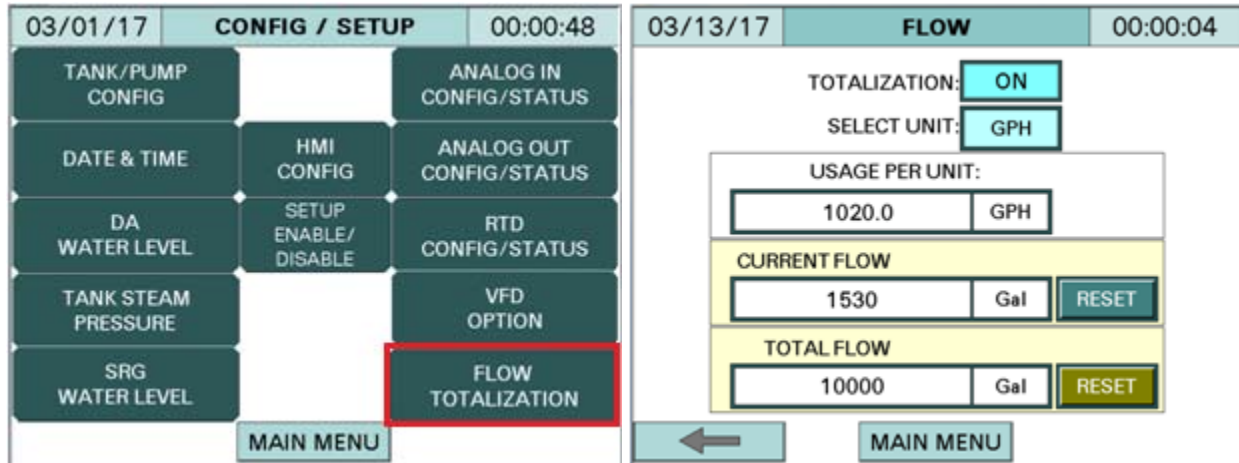
The integral component sums the error term over time. The result is that even a small error term will cause the integral component to increase slowly. The integral response will continually increase over time, unless the error is zero. The effect is to drive the steady-state error to zero. Steady-state 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. The same applies for the transfer water pumps' PID.

## Configuration - Flow Totalization

From CONFIG/SETUP screen, press FLOW TOTALIZATION to display FLOW TOTALIZATION screen.



The FLOW TOTALIZATION button is displayed only when the flow totalization option is enabled in configuration SETUP EN\_DIS screen.

### TOTALIZATION:

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

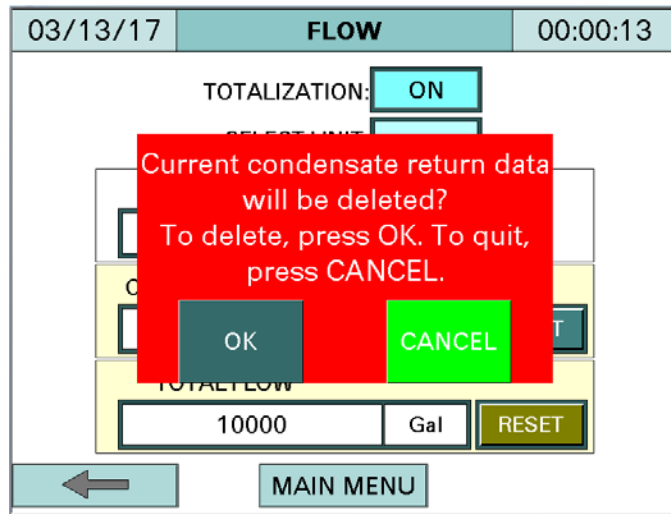
### SELECT UNIT:

- **GPM** - Gallon per minute
- **GPH** - Gallon per hour
- **LbsM** - Pound per minute
- **LbsH** - Pound per hour

**USAGE PER UNIT** - Displays the usage per unit.

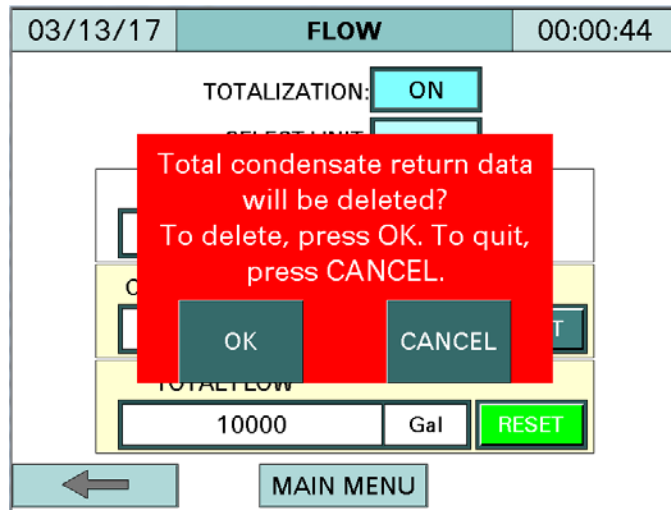
**CURRENT FLOW** - Displays the current flow. The current flow could be reset to 0 (zero) by pressing the RESET button. A pop up window will be displayed, as seen below.

### Configuration - Flow Totalization (continued)



To acknowledge the changes, press the “OK” button, otherwise press “CANCEL”.

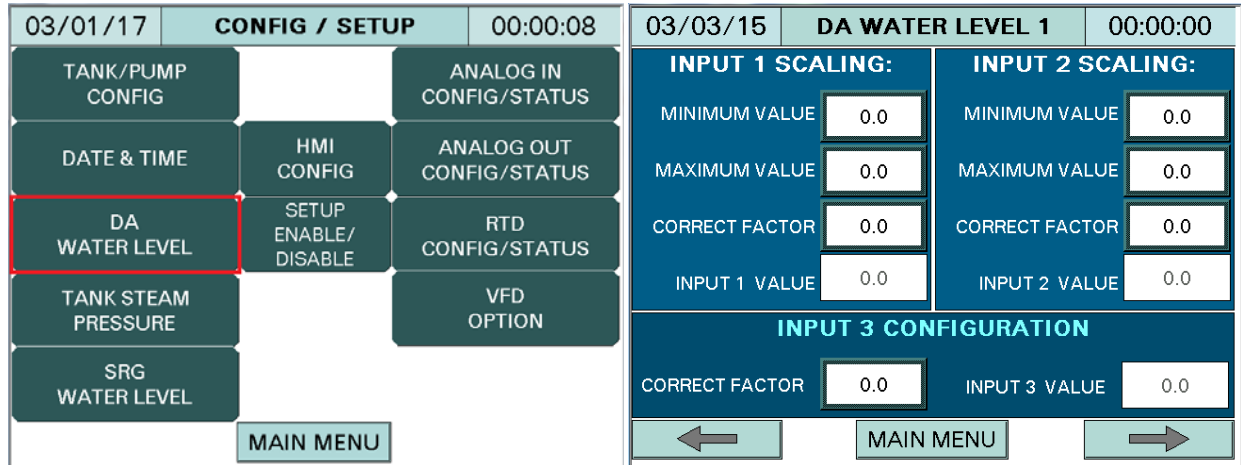
**TOTAL FLOW** - Displays the total flow. The total flow could be reset to 0 (zero) by pressing the RESET button. A pop up window will be displayed, as seen below.



To acknowledge the changes, press the “OK” button, otherwise press “CANCEL”.

## Configuration - DA Water Level Control

From CONFIG/SETUP screen, press DA WATER LEVEL to display DA WATER LEVEL 1 screen.



### INPUT 1 SCALING:


- **MINIMUM VALUE:** Sets the minimum water level setpoint.
- **MAXIMUM VALUE:** Sets the maximum water level setpoint.
- **CORRECT FACTOR:** Sets the correct factor.
- **INPUT 1 VALUE:** Displays the input, actual water level.

### INPUT 2 SCALING: (DO NOT USE)

- **MINIMUM VALUE:** Sets the minimum value.
- **MAXIMUM VALUE:** Sets the maximum value.
- **CORRECT FACTOR:** Sets the correct factor.
- **INPUT 2 VALUE:** Displays the input 2 value.

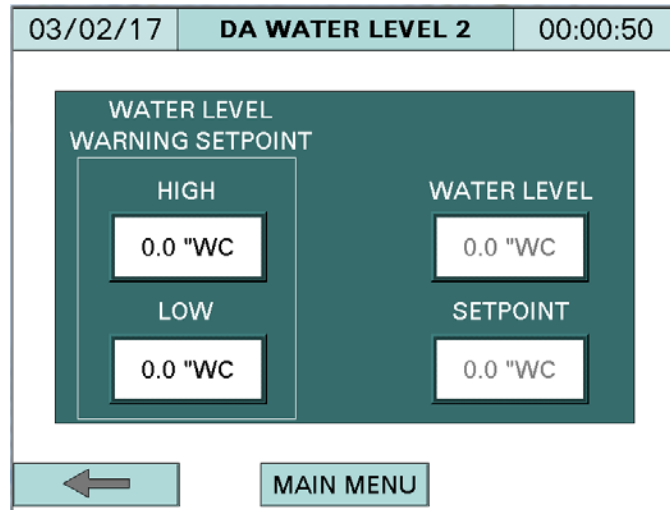
### INPUT 3 CONFIGURATION: (DO NOT USE)

- **CORRECT FACTOR:** Sets the correct factor.
- **INPUT 3 VALUE:** Displays the input 3 value.

Press NEXT button  to display DA WATER LEVEL 2 screen.

(This NEXT button appears only when DA RWF water level alarm activation for High or Low water levels is ENABLED. See DA PUMP CONFIG 3 screen.)

## DA Water Level Control (continued)



### WATER LEVEL WARNING SETPOINT:

- **HIGH:** High water level limit. Warning light HW will be blinking on OVERVIEW and DA WATER LEVEL screens if water level is at or above the high limit.
- **LOW:** Low water level limit. Warning light LW will be blinking on OVERVIEW and DA WATER LEVEL screens if water level is at or below the low limit.

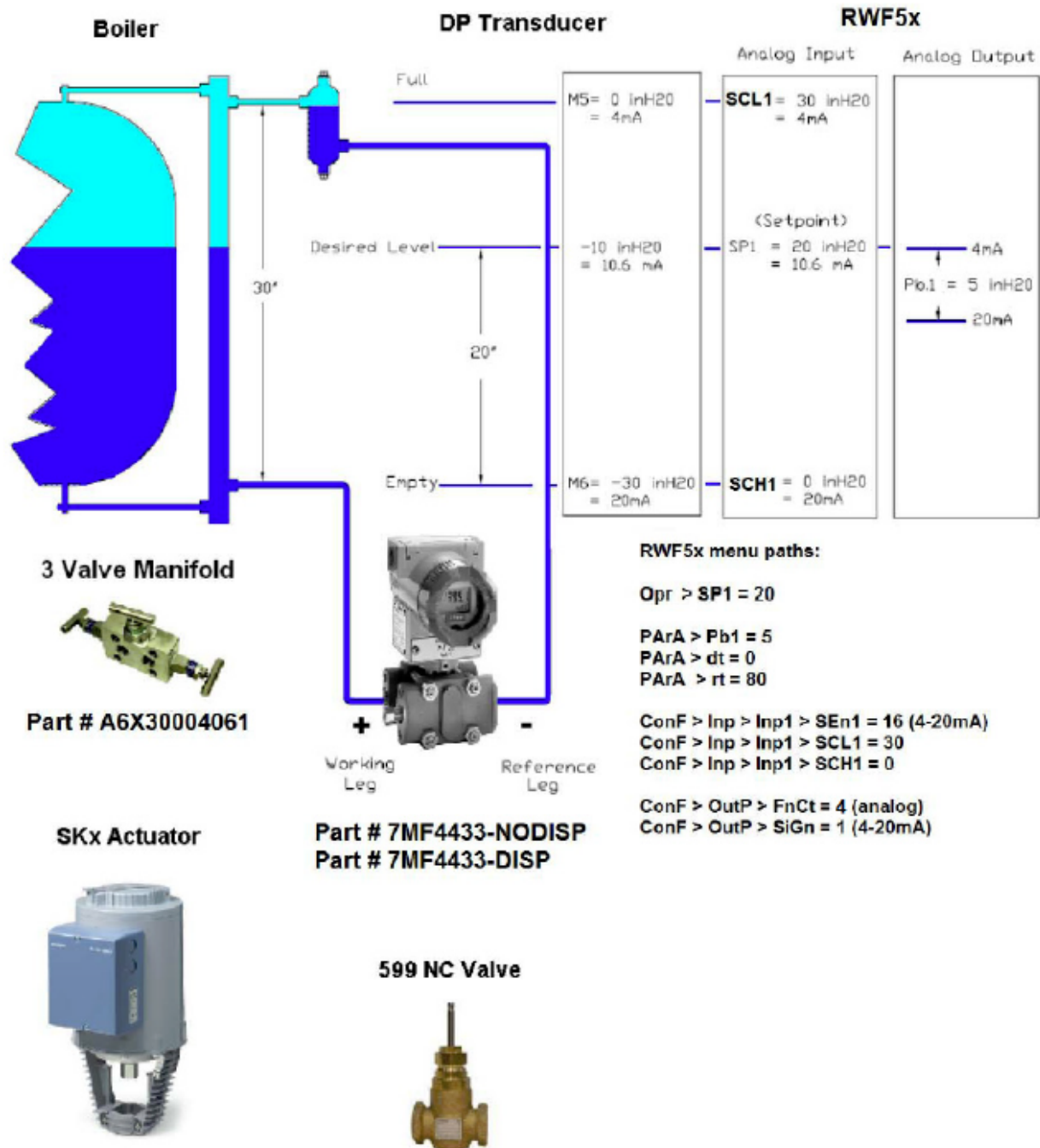
**WATER LEVEL** - Displays the actual water level.

**SETPOINT** - Displays the setpoint.

Illustration of general information for system settings can be seen below. Please refer to the RWF55 and DP pressure transmitter manuals for proper settings.

## DA Water Level Control (continued)

Water level controls with Siemens DP pressure and RWF55.



The same configuration applies for surge tank water level.

## Configuration - Tank Steam Pressure

From CONFIG/SETUP screen, press TANK STEAM PRESSURE to display STEAM PRESSURE screen.

03/01/17	CONFIG / SETUP	00:00:08	03/02/17	TANK STEAM PRESS	00:00:25
TANK/PUMP CONFIG		ANALOG IN CONFIG/STATUS	<b>INPUT 1 SCALING:</b>		
DATE & TIME	HMI CONFIG	ANALOG OUT CONFIG/STATUS	MINIMUM VALUE	0.0	<b>INPUT 2 SCALING:</b>
DA WATER LEVEL	SETUP ENABLE/DISABLE	RTD CONFIG/STATUS	MAXIMUM VALUE	0.0	MINIMUM VALUE
<b>TANK STEAM PRESSURE</b>		VFD OPTION	CORRECT FACTOR	0.0	MAXIMUM VALUE
SRG WATER LEVEL			INPUT 1 VALUE	0.0	CORRECT FACTOR
			<b>INPUT 3 CONFIGURATION</b>		
			CORRECT FACTOR	0.0	INPUT 3 VALUE
	MAIN MENU		←	MAIN MENU	

### INPUT 1 SCALING:

- **MINIMUM VALUE:** Sets the minimum pressure setpoint.
- **MAXIMUM VALUE:** Sets the maximum pressure setpoint.
- **CORRECT FACTOR:** Sets the correct factor.
- **INPUT 1 VALUE:** Displays the actual pressure.

### INPUT 2 SCALING: (DO NOT USE)

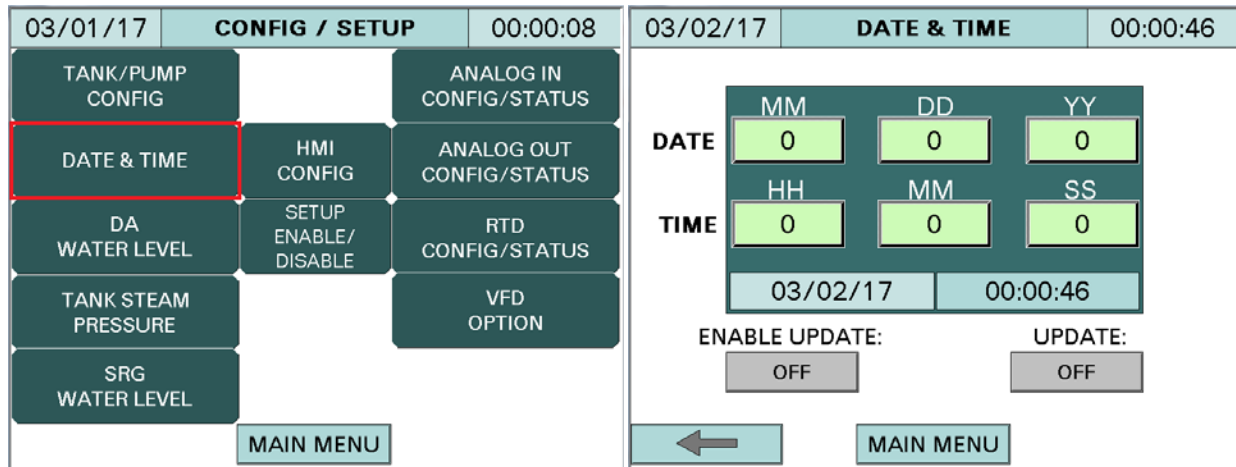
- **MINIMUM VALUE:** Sets the minimum value.
- **MAXIMUM VALUE:** Sets the maximum value.
- **CORRECT FACTOR:** Sets the correct factor.
- **INPUT 2 VALUE:** Displays the input 2 value.

### INPUT 3 CONFIGURATION: (DO NOT USE)

- **CORRECT FACTOR:** Sets the correct factor.
- **INPUT 3 VALUE:** Displays the input 3 value.

## Date and Time

From CONFIG/SETUP screen, press DATE & TIME.



### DATE:

- **MM** - Sets the month (01 = January; 02 = Feb;...12 = December)
- **DD** – Sets the day (01 to 31 days)
- **YY** – Sets the year (displaying only the last two digits)

### TIME:

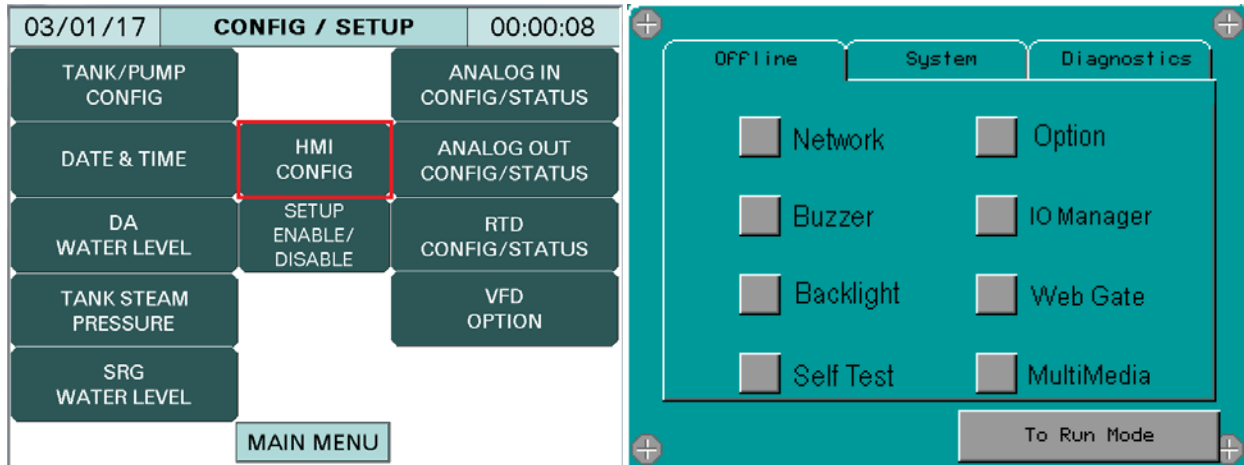
- **HH** – Sets the hour (00 to 24 hours)
- **MM** - Sets the minute (00 to 60 minutes)
- **SS** – Sets the second (00 to 60 seconds)

**To update date and time:** Set the desired date and time, and press ENABLE UPDATE to ON. Then press UPDATE to ON. The date and time will be updated within 60 seconds. Toggle the UPDATE button back to OFF.

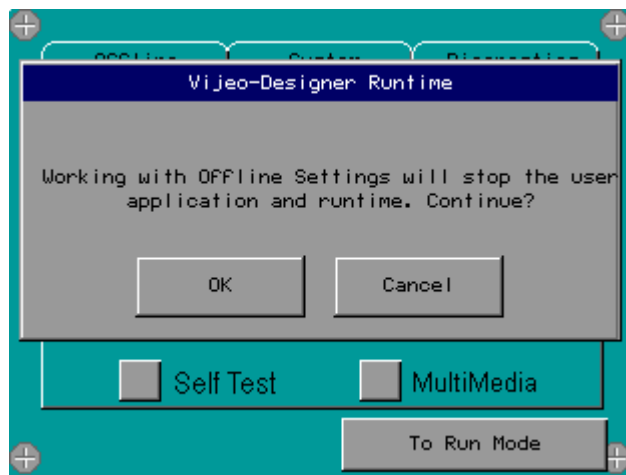
Note: The ENABLE UPDATE button will be momentary ON, and then turn OFF by itself.

## HMI (Human Machine Interface) IP Address

The runtime configuration menu allows you to change offline and system settings. To change the IP address, press HMI CONFIG on the CONFIG/SETUP screen.



Press the Offline tab, and then press the Network icon



Press "OK" when prompted to work offline. The HMI will then reboot into the network setting screen.

## HMI (Human Machine Interface) IP Address (continued)

The screenshot shows a configuration screen with three tabs: "Static IP", "DHCP", and "MAC/DNS". The "Static IP" tab is selected. Below the tabs, there are three sections for configuration:

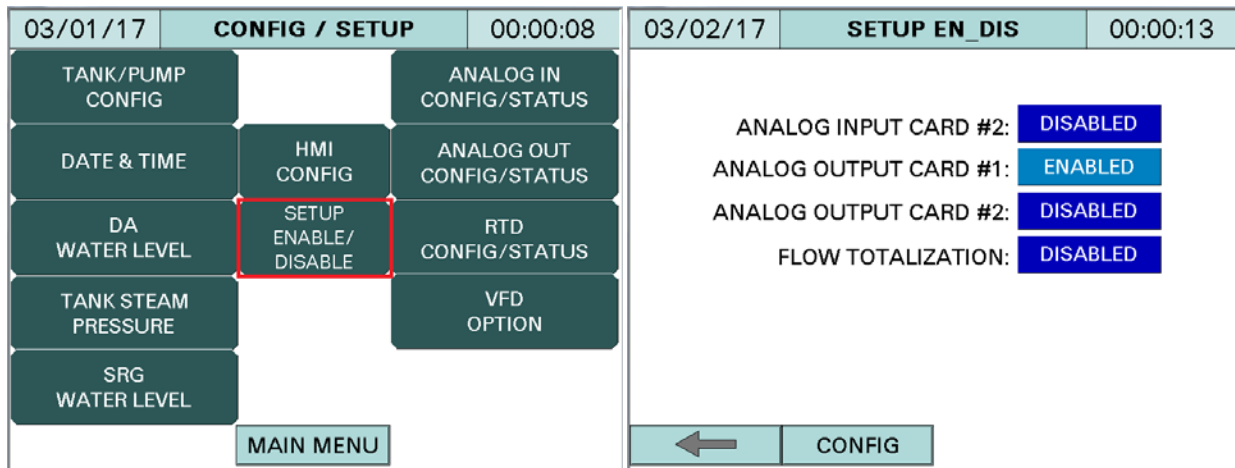
- IP Address:** Four input fields containing the values 192, 168, 1, and 58.
- Subnet Mask:** Four input fields containing the values 255, 255, 254, and 0.
- Default Gateway:** Four input fields containing the values 192, 168, 1, and 1.

This screen will allow the IP address to be changed. When complete, press "OK". This will bring back the HMI System Configuration page. Press To Run Mode to apply any changes. The HMI will reboot with the new IP address settings.

If the DA is connected to an SCC master lead/lag panel, do not change the default IP address (192.168.1.58) in the touchscreen. Change the IP address at the master panel, if needed.

## Setup Enable or Disable

From CONFIG/SETUP screen, press SETUP ENABLE/DISABLE to display SETUP EN\_DIS screen.



**Analog input card #2** - Toggle ENABLED/DISABLED button to ENABLED if second analog input card is installed.

**Analog output card #1** - Toggle ENABLED/DISABLED button to ENABLED if first analog output card is installed.

**Analog output card #2** - Toggle ENABLED/DISABLED button to ENABLED if second analog output card is installed.

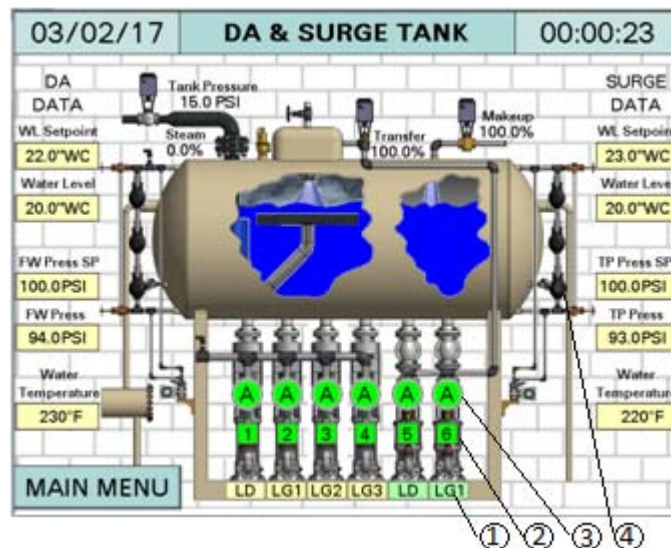
**Flow Totalization** - Toggle ENABLED/DISABLED button to ENABLED if second analog input card is installed with analog input channel 1 to be configured for flow totalization.

## Overview

From MAIN MENU screen, press OVERVIEW to display the configured system overview.

### General Split tank

DA and Surge tank with water level controllers (4 feedwater pumps and 2 transfer pumps)



- 1 Pump lead or lag designation
  - Yellow rectangle designate FW pumps
    - LD: FW lead pump
    - LG1, LG2, ... LG5: FW lag 1 pump, FW lag 2 pump, ... FW lag 5 pump
  - Green rectangle designate transfer pumps
    - LD: transfer lead pump
    - LG1: transfer lag 1 pump
- 2 Rectangle indicator: pump feedback
  - Green: pump proven, current switch energized, or VFD run dry contact closed
  - White blinking: pump not proven, current switch not energized, or VFD run dry contact open
  - Numbers indicate pump order number
- 3 Round indicator: pump status; Letter: HAND-OFF-AUTO, position indication
  - Green: pump on
  - Gray: pump off
  - Letter A: Auto (pump in auto lead/lag mode)
  - Letter H: Hand (pump continuously running with LWCO satisfied)
  - Letter O: Off (pump off)
  - Letter F: pump failed

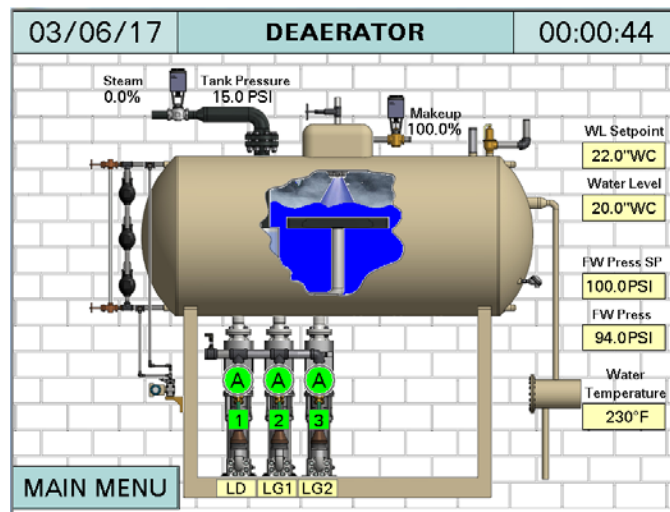
## Overview (continued)

### 4 Water level float switches

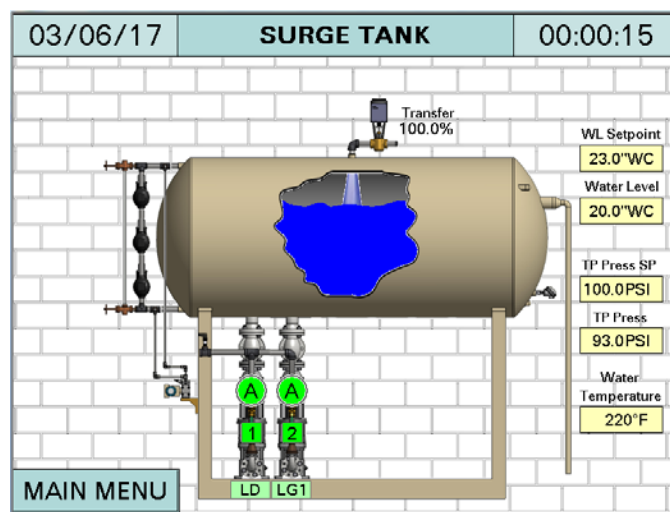
- Top float switch: high water level
- Middle float switch: low water level
- Bottom float switch: low/low water level

**Note:** The actual OVERVIEW SCREEN may vary based on system requirements.

General DA tank, spray: three feedwater pumps, water level and steam pressure controller

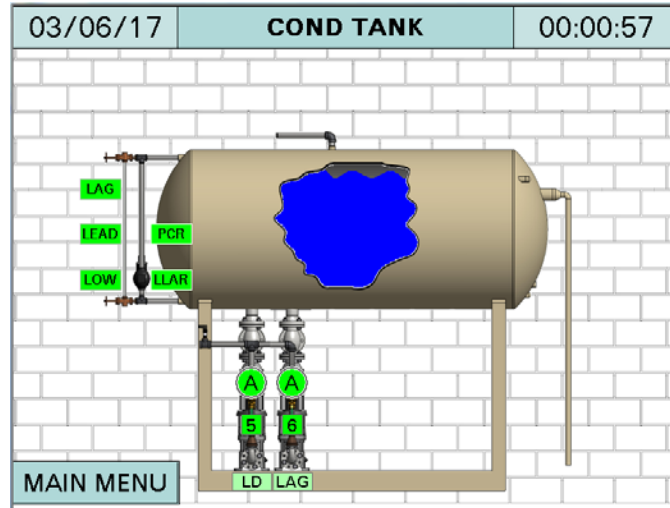


General Surge tank: two transfer pumps and water level controller



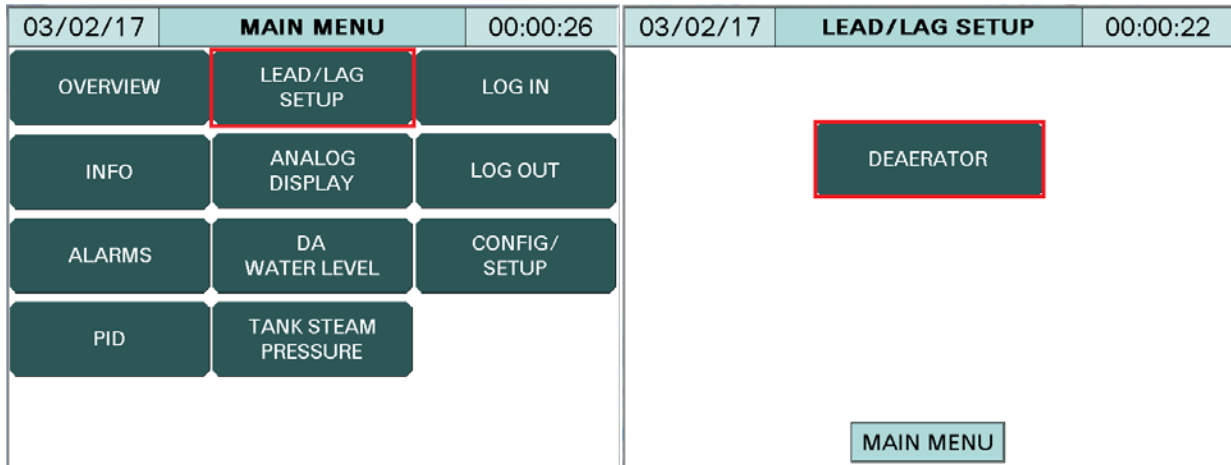
## Overview (continued)

General Condensate tank: two transfer pumps

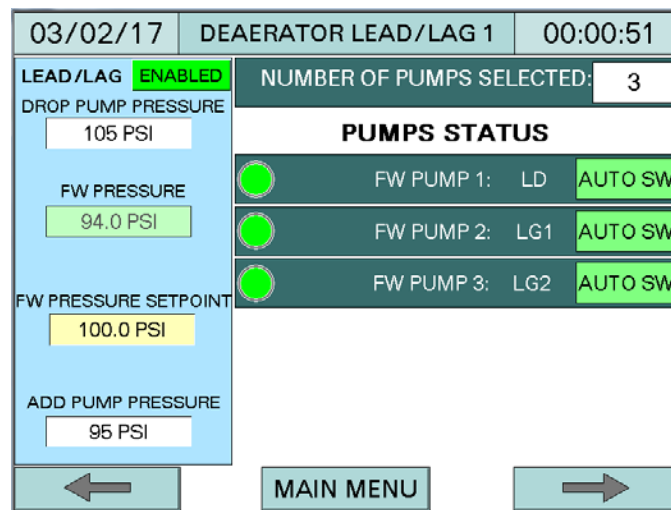


## DA Lead/Lag Setup

From MAIN MENU, press LEAD/LAG SETUP and then press DEAERATOR to setup the deaerator's lead/lag control.



DA lead/lag setup, based on feedwater pressure with starter control



**Picture shown is configured for 3 feedwater pumps.**

**LEAD/LAG** - Displays ENABLED when the PUMPS CONTROL selector switch on the front of the control panel is switched to ON.

**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 stopped.

## DA Lead/Lag Setup (continued)

**FW PRESSURE** - Feedwater pressure is displayed when Analog Input 1 is configured for the feedwater pressure transmitter.

**FEEDWATER PRESSURE SETPOINT (FW PRSR SP)** - Sets the feedwater pressure setpoint.

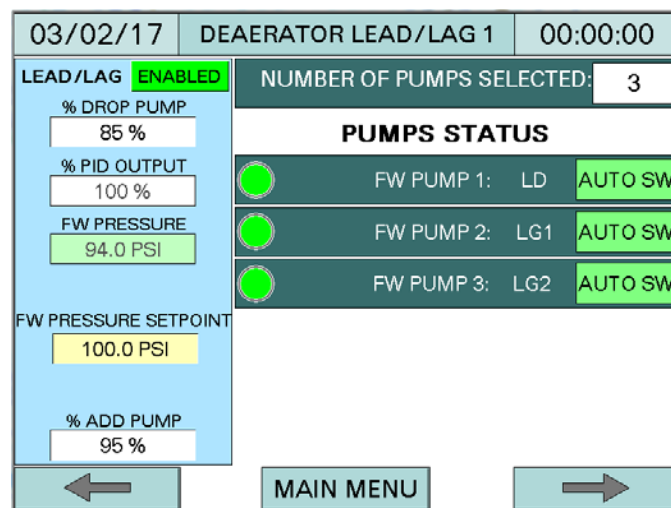
**ADD PUMP PRESSURE** - Sets the add pump pressure. If the feedwater pressure drops below the ADD PUMP PRESSURE, with an adjustable start time delay, the first lag pump will start.

**NUMBER OF PUMPS SELECTED** - Displays the total number of available pumps.

**HAND-OFF-AUTO** selector switch status:

- **HAND:** pump continuously running with LWCO satisfied
- **OFF:** pump off
- **AUTO SW:** pump in auto lead/lag mode

DA lead/lag setup, based on feedwater pressure with VFD



Picture shown is configured for 3 feedwater pumps.

**LEAD/LAG** - Displays ENABLED when the PUMPS CONTROL selector switch on the front of the control panel is switched to ON.

**% DROP PUMP** - Sets the % DROP PUMP. If the PID OUTPUT drops below the % DROP PUMP, with an adjustable stop time delay, the last lag pump will be stopped.

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

## DA Lead/Lag Setup (continued)

**FW PRESSURE** - Feedwater pressure is displayed when Analog Input 1 is configured for the feedwater pressure transmitter.

**FEEWATER PRESSURE SETPOINT (FW PRSR SP)** - Sets the feedwater pressure setpoint.

**% ADD PUMP** - Sets the % ADD PUMP. If the % PID output reaches above % ADD PUMP, with an adjustable start time delay, the lag pump will be added.

**NUMBER OF PUMPS SELECTED** - Displays the total number of available pumps.

**HAND-OFF-AUTO** selector switch status:

- **HAND:** pump continuously running with LWCO satisfied
- **OFF:** pump off
- **AUTO SW:** pump in auto lead/lag mode

DA lead/lag setup, based on header pressure and offset with starter control

03/02/17	DEAERATOR LEAD/LAG 1	00:00:24
LEAD/LAG <b>ENABLED</b>	NUMBER OF PUMPS SELECTED: 3	
DROP PUMP PRESSURE 105 PSI	<b>PUMPS STATUS</b>	
FW PRESSURE 94.0 PSI		
HEADER PRESSURE 90.0 PSI	FW PUMP 1: LD	<b>AUTO SW</b>
SETPOINT 100.0 PSI	FW PUMP 2: LG1	<b>AUTO SW</b>
OFFSET 10.0 PSI	FW PUMP 3: LG2	<b>AUTO SW</b>
FW PRESSURE SETPOINT 100.0 PSI		
ADD PUMP PRESSURE 95 PSI		
←	MAIN MENU	→

Picture shown is configured for 3 feedwater pumps.

**LEAD/LAG** - Displays ENABLED when the PUMPS CONTROL selector switch on the front of the control panel is switched to ON.

**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 stopped.

**FW PRESSURE** - Feedwater pressure is displayed when Analog Input 1 is configured for the feedwater pressure transmitter.

## DA Lead/Lag Setup (continued)

**HEADER PRESSURE** - Header pressure is displayed when Analog Input 4 is configured for boiler steam header pressure.

**SETPOINT OFFSET** - Sets the setpoint offset. The value of an offset is a number to keep feedwater pressure setpoint above the actual boiler header pressure.

**FW 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 PRESSURE** - Sets the add pump pressure. If the feedwater pressure drops below the ADD PUMP PRESSURE, with an adjustable start time delay, the first lag pump will be added.

**NUMBER OF PUMPS SELECTED** - Displays the total number of available pumps.

**HAND-OFF-AUTO** selector switch status:

- **HAND:** pump continuously running with LWCO satisfied
- **OFF:** pump off
- **AUTO SW:** pump in auto lead/lag mode

DA lead/lag setup, based on header pressure and offset with VFD

03/02/17		DEAERATOR LEAD/LAG 1		00:00:09	
LEAD/LAG <b>ENABLED</b>		NUMBER OF PUMPS SELECTED: 3			
% DROP PUMP 85 %		<b>PUMPS STATUS</b>			
% PID OUTPUT 100 %		FW PUMP 1: LD <b>AUTO SW</b>			
FW PRESSURE 94.0 PSI		FW PUMP 2: LG1 <b>AUTO SW</b>			
HEADER PRESSURE 90.0 PSI		FW PUMP 3: LG2 <b>AUTO SW</b>			
SETPOINT OFFSET 10.0 PSI					
FW PRESSURE SETPOINT 100.0 PSI					
% ADD PUMP 95 %					
←		MAIN MENU		→	

Picture shown is configured for 3 feedwater pumps.

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## DA Lead/Lag Setup (continued)

**LEAD/LAG** - Displays ENABLED when the PUMPS CONTROL selector switch on the front of the control panel is switched to ON.

**% DROP PUMP** - Sets the % DROP PUMP. If the % PID OUTPUT drops below the % DROP PUMP, with an adjustable stop time delay, the last lag pump will be stopped.

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

**FW PRESSURE** - Feedwater pressure is displayed when Analog Input 1 is configured for the feedwater pressure transmitter.

**HEADER PRESSURE** - Header pressure is displayed when Analog Input 4 is configured for boiler steam header pressure.

**SETPOINT OFFSET** - Sets the setpoint offset. The offset is a number to keep feedwater pressure setpoint above the boiler's actual header pressure.

**FW 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. If the % PID output reaches above the % ADD PUMP, with an adjustable start time delay, the lag pump will be added.

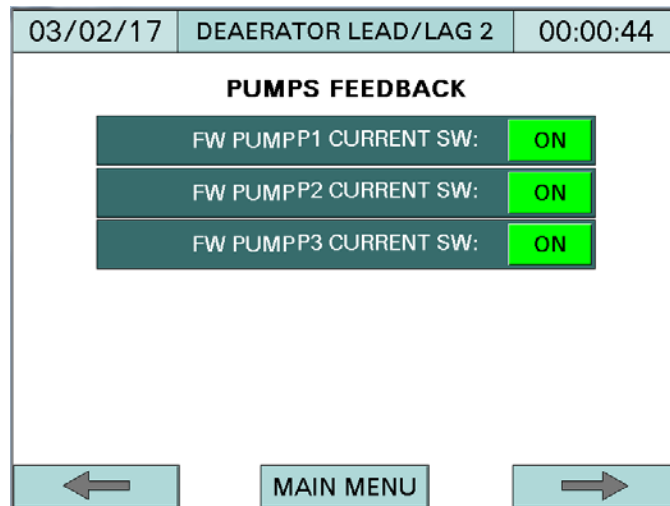
**NUMBER OF PUMPS SELECTED** - Displays the total number of pumps selected.

**HAND-OFF-AUTO** selector switch status:

- **HAND:** pump continuously running with LWCO satisfied
- **OFF:** pump off
- **AUTO SW:** pump in auto lead/lag mode

Press NEXT button  to display DEAERATOR LEAD/LAG 2 screen.

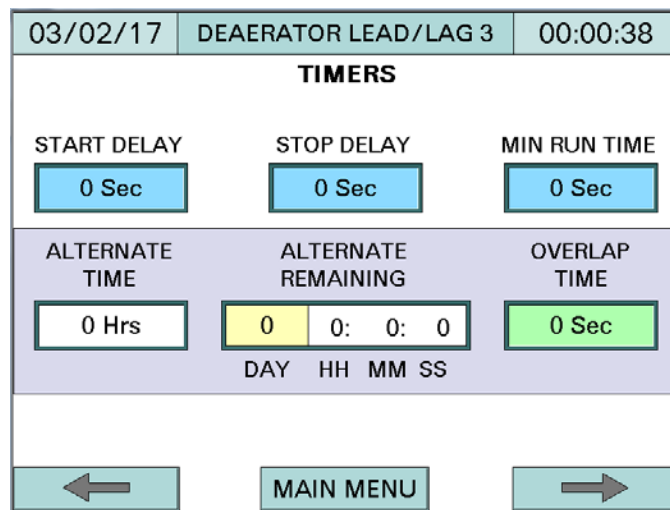
## DA Lead/Lag Setup (continued)



Picture shown is configured for 3 feedwater pumps.

**PUMPS FEEDBACK** - Pump current switches or VFD dry contacts status.

Press NEXT button  to display DEAERATOR LEAD/LAG 3 screen.



**START DELAY** - The adjustable time delay, 1 to 1800 seconds, for the pump to start after each run command.

**STOP DELAY** - The adjustable time delay, 1 to 1800 seconds, for the pump to stop after each stop command.

## DA Lead/Lag Setup (continued)

**MINIMUM RUN TIME** - The adjustable minimum pump run time, 1 to 1800 seconds, before system commands the pump to be stopped.


**ALTERNATE TIME** - The adjustable time, 1 to 720 hours, to alternate the lead pump.

**ALTERNATE REMAINING** - The time remaining until automatic alternation occurs.

**OVERLAP TIME** - Following a lead pump change, the former lead pump will still be enabled for this duration of time.

Press NEXT button  to display DEAERATOR LEAD/LAG 4 screen.

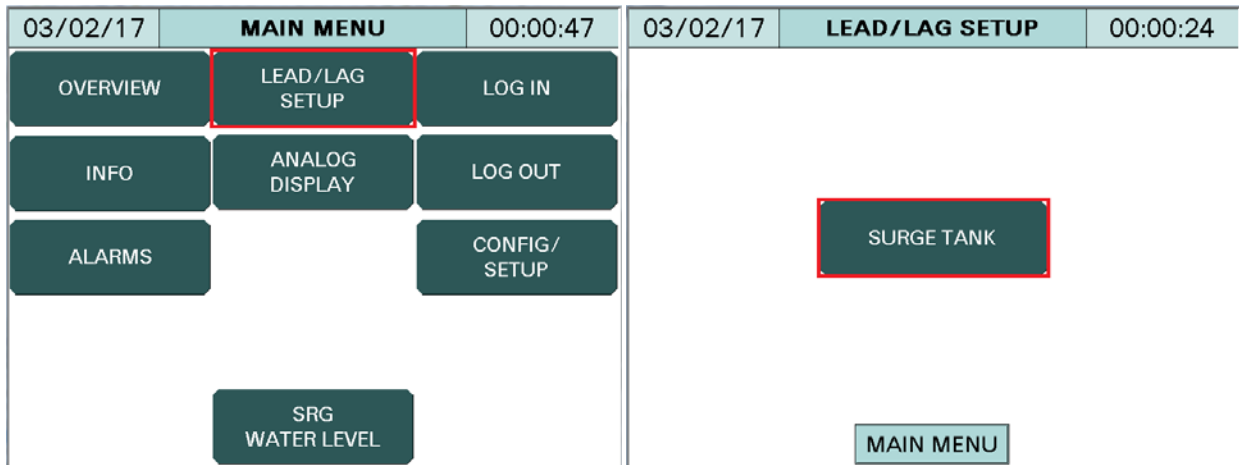
03/02/17		DEAERATOR LEAD/LAG 4			00:00:35	
PUMPS RUN TIME		HH	MM	SS	DAYS	
FW PUMP P1:		0:	0:	0	0	
FW PUMP P2:		0:	0:	0	0	
FW PUMP P3:		0:	0:	0	0	


MAIN MENU

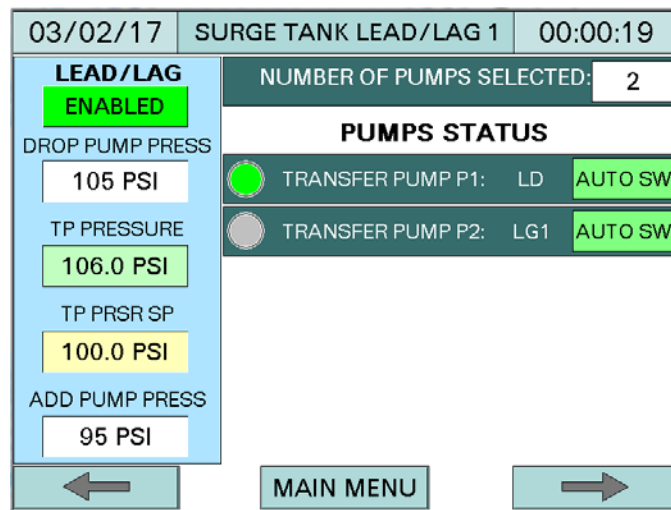
All PUMPS RUN TIME are displayed in hours, minutes, seconds, and accumulated into days.

## Surge Tank Lead/Lag Setup

Press LEAD/LAG SETUP and then press SURGE TANK to set surge tank's lead/lag control.



### SRG lead/lag setup, based on transfer pressure with starter control



Picture shown is configured for 2 transfer pumps.

**LEAD/LAG:** Displays ENABLED when the PUMPS CONTROL selector switch on the front of the control panel is switched to ON.

**DROP PUMP PRESSURE:** Sets the drop pump pressure. If the transfer pump pressure rises above the DROP PUMP PRESSURE, with an adjustable stop time delay, the last lag pump will be stopped.

**TP PRESSURE:** Transfer pump pressure is displayed when Analog Input 2 is configured.

## Surge Tank Lead/Lag Setup (continued)

**TP PRSR SP (Transfer Pump Pressure Setpoint):** Sets transfer pump pressure setpoint.

**ADD PUMP PRESSURE:** Sets the add pump pressure. If transfer pump pressure drops below the ADD PUMP PRESSURE, with an adjustable start time delay, the first lag pump will be started.

**NUMBER OF PUMPS SELECTED:** Displays the total number of pumps available.

**HAND-OFF-AUTO** selector switch status:

- **HAND:** pump continuously running with LWCO satisfied
- **OFF:** pump off
- **AUTO SW:** pump in auto lead/lag mode

SRG lead/lag setup, based on transfer pressure with VFD

03/02/17	SURGE TANK LEAD/LAG 1	00:00:54
<b>LEAD/LAG</b>		
ENABLED		
% DROP PUMP		
85 %		
% PID OUTPUT		
0 %		
TP PRESSURE		
106.0 PSI		
TP PRSR SP		
100.0 PSI		
% ADD PUMP		
95 %		
NUMBER OF PUMPS SELECTED: 2		
<b>PUMPS STATUS</b>		
<input checked="" type="radio"/>	TRANSFER PUMP P1: LD	AUTO SW
<input type="radio"/>	TRANSFER PUMP P2: LG1	AUTO SW
← MAIN MENU →		

Picture shown is configured for 2 transfer pumps.

**LEAD/LAG:** Displays ENABLED when the PUMPS CONTROL selector switch on the front of the control panel is switched to ON.

**% DROP PUMP:** Sets the % DROP PUMP. If the PID OUTPUT drop below the % DROP PUMP, with an adjustable stop time delay, the last lag pump will be stopped.

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

**TP PRESSURE:** Transfer pump pressure is displayed after Analog Input 2 is configured.

## Surge Tank Lead/Lag Setup (continued)

**TP PRSR SP (Transfer Pump Pressure Setpoint):** Sets transfer pump pressure setpoint.

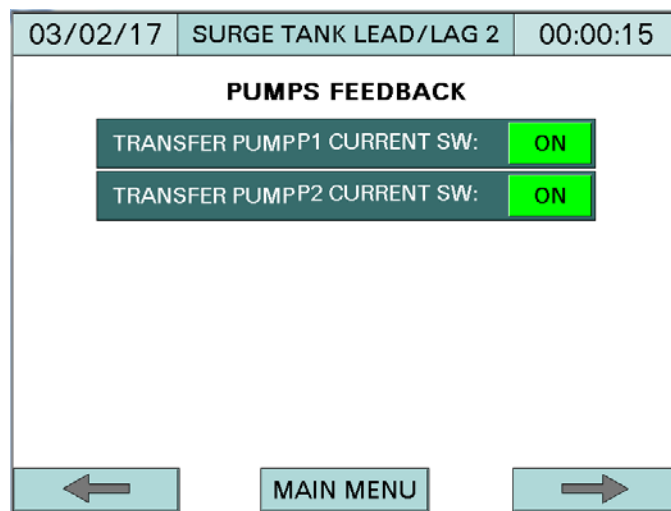
**% ADD PUMP:** Sets the % ADD PUMP. If the PID output reaches above the % ADD PUMP, with an adjustable start time delay, the lag pump will be added.

**NUMBER OF PUMPS SELECTED:** Displays the total number of pumps available.

**HAND-OFF-AUTO** selector switch status:

- **HAND:** pump continuously running with LWCO satisfied
- **OFF:** pump off
- **AUTO SW:** pump in auto lead/lag mode

Press NEXT button  to display SURGE TANK LEAD/LAG 2 screen.



**PUMPS FEEDBACK** - Pumps current switches or VFD dry contacts status.

Press NEXT button  to display SURGE TANK LEAD/LAG 3 screen.

**Surge Tank Lead/Lag Setup (continued)**

03/02/17	SURGE TANK LEAD/LAG 3	00:00:08
<b>TIMERS</b>		
START DELAY	STOP DELAY	MIN RUN TIME
15 Sec	15 Sec	300 Sec
ALTERNATE TIME	ALTERNATE REMAINING	OVERLAP TIME
24 Hrs	0 0: 0: 0	30 Sec
	DAY HH MM SS	
←	MAIN MENU	→

**START DELAY** - The adjustable time delay, 1 to 1800 seconds, for the pump to start after each run command.

**STOP DELAY** - The adjustable time delay, 1 to 1800 seconds, for the pump to stop after each stop command.

**MINIMUM RUN TIME** - The adjustable minimum pump run time, 1 to 1800 seconds, before system commands the pump to be stopped.

**ALTERNATE TIME** - The adjustable time, 1 to 720 hours, to alternate the lead pump.

**ALTERNATE REMAINING** - The time remaining until automatic alternation occurs.

**OVERLAP TIME** - Following a lead pump change, the former lead pump will still be enabled for this duration of time.

Press NEXT button  to display SURGE TANK LEAD/LAG 4 screen.

## Surge Tank Lead/Lag Setup (continued)

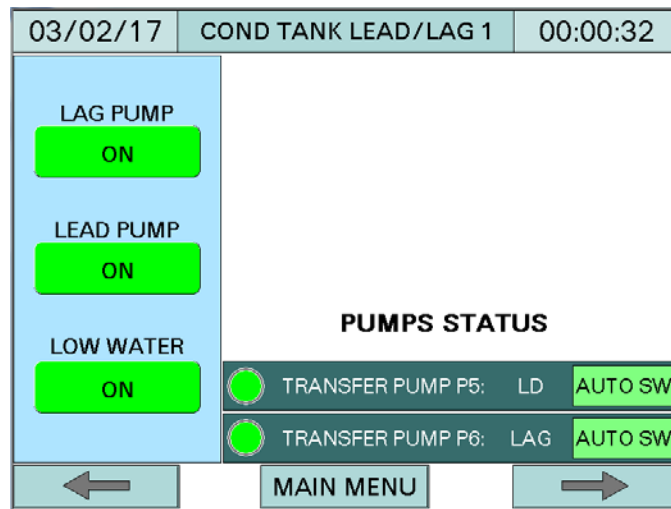
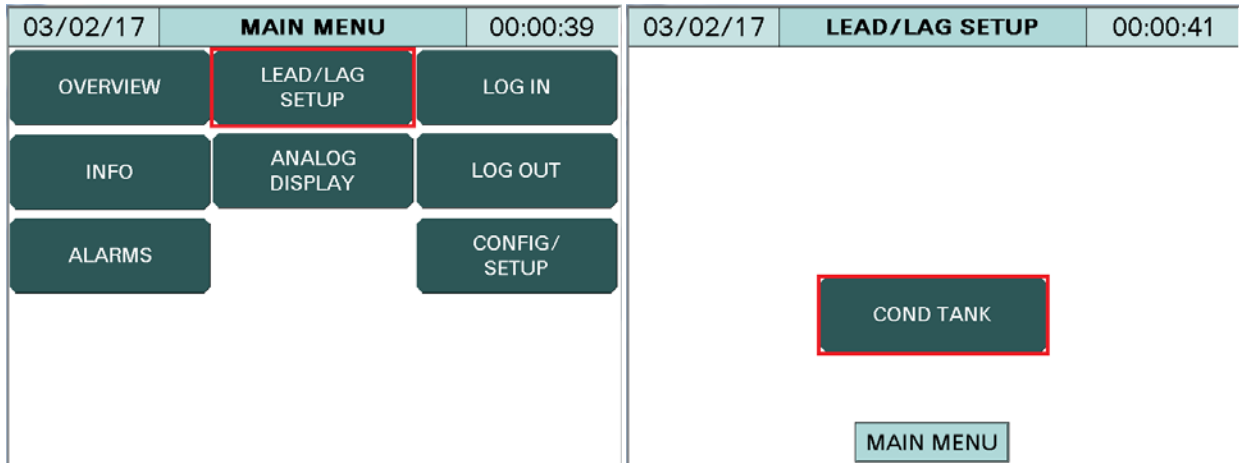
03/02/17		SURGE TANK LEAD/LAG 4			00:00:58	
PUMPS RUN TIME		HH	MM	SS	DAYS	
TRANSFER PUMP P1:		0:	0:	0	0	
TRANSFER PUMP P2:		0:	0:	0	0	

← MAIN MENU

All PUMPS RUN TIME are displayed in hours, minutes, seconds, and accumulated into days.

## Condensate Tank Lead/Lag

Press LEAD/LAG SETUP and then press COND TANK to display the condensate tank's lead/lag control.



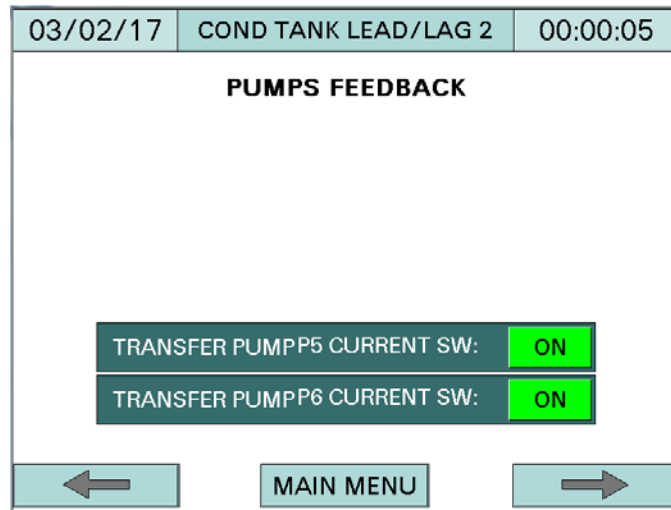
**LAG PUMP** - Displays ON when transfer water reaches the high water level switch, or when time based lag pump start expires.

**LEAD PUMP** - Displays ON when transfer water level reaches the low water level switch, or when time based lead pump start expires.

**LOW WATER** - Displays ON when water level rises above the low/low water level switch. Displays OFF when both lead and lag pumps are off.

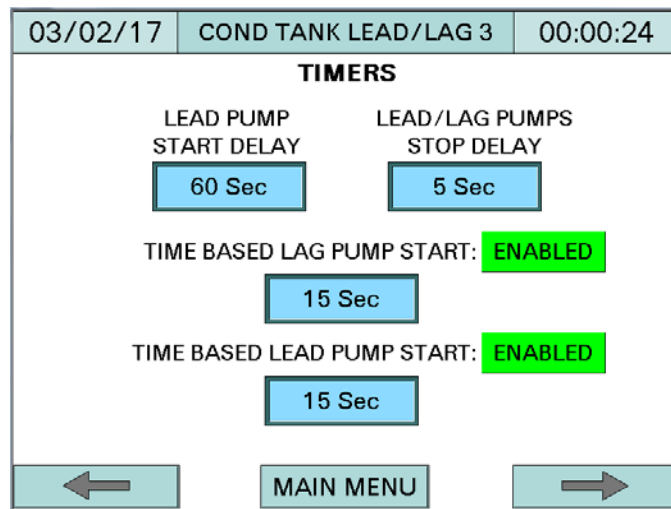
Press NEXT button  to display COND TANK LEAD/LAG 2 screen.

## Condensate Tank Lead/Lag Setup (continued)



**PUMPS FEEDBACK** - Pump current switches or VFD dry contacts status.

Press NEXT button  to display COND TANK LEAD/LAG 3 screen.




**LEAD PUMP START DELAY** - The adjustable time delay, 1 to 1800 seconds, for the lead pump to start after each run command.


**LEAD/LAG STOP DELAY** - The adjustable time delay, 1 to 1800 seconds, for the lead/lag pumps to stop after each stop command.

## Condensate Tank Lead/Lag Setup (continued)

**TIME BASED LAG PUMP START** - Press DISABLED/ENABLED button to ENABLED only when the lag pump is started based on the timer.

**TIME BASED LEAD PUMP START** - Press DISABLED/ENABLED button to ENABLED only when the lead pump is started based on the timer.

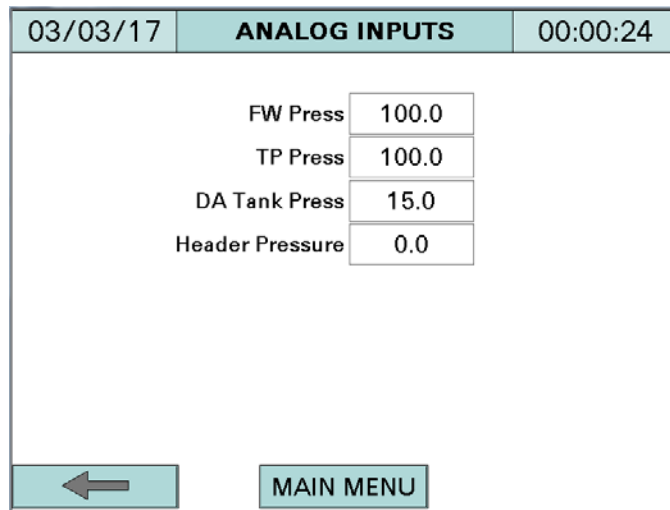
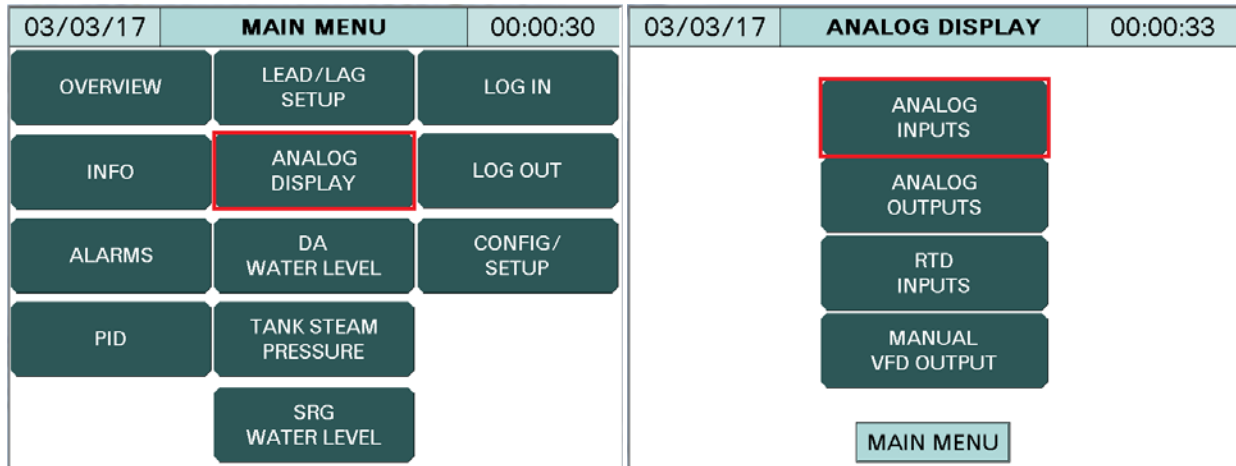
Press NEXT button  to display COND TANK LEAD/LAG 4 screen.

03/02/17	COND TANK LEAD/LAG 4	00:00:14
<b>PUMPS RUN TIME</b>		
	HH MM SS	DAYS
TRANSFER PUMP P5:	0: 0: 0	0
TRANSFER PUMP P6:	0: 0: 0	0
	MAIN MENU	

All PUMPS RUN TIME are displayed in hours, minutes, seconds, and accumulated into days.

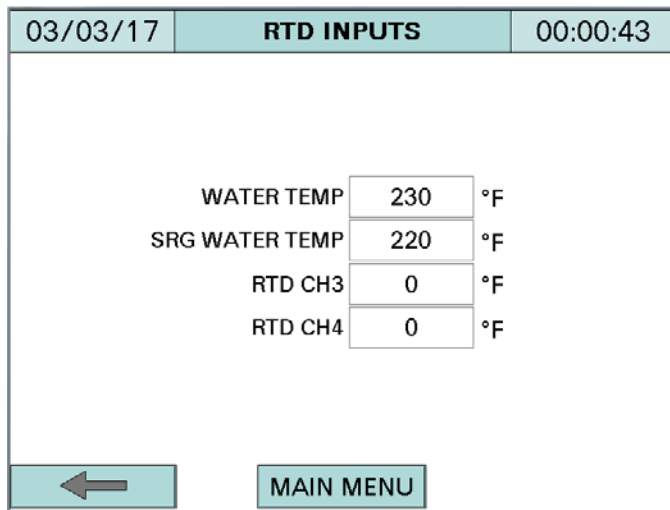
## Analog Display

The MAIN MENU and ANALOG DISPLAY may vary based on your system configuration. From MAIN MENU, press ANALOG DISPLAY, and then press ANALOG INPUTS. All analog inputs are displayed on this screen.

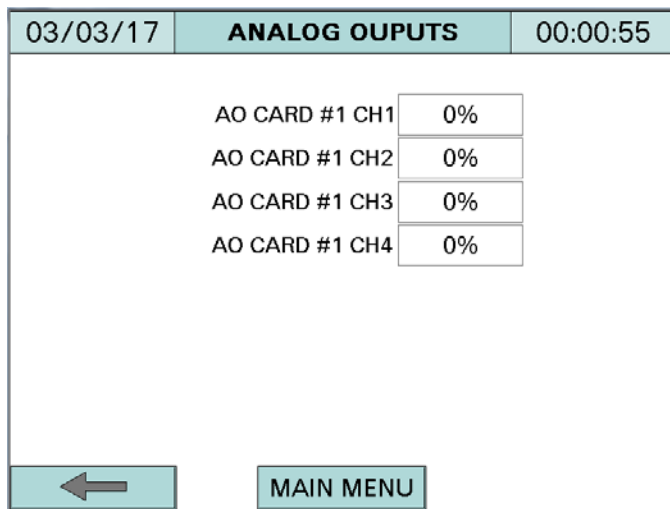


## Analog Display (continued)

From MAIN MENU, press ANALOG DISPLAY, and then press RTD INPUTS. All RTD inputs are displayed on this screen.

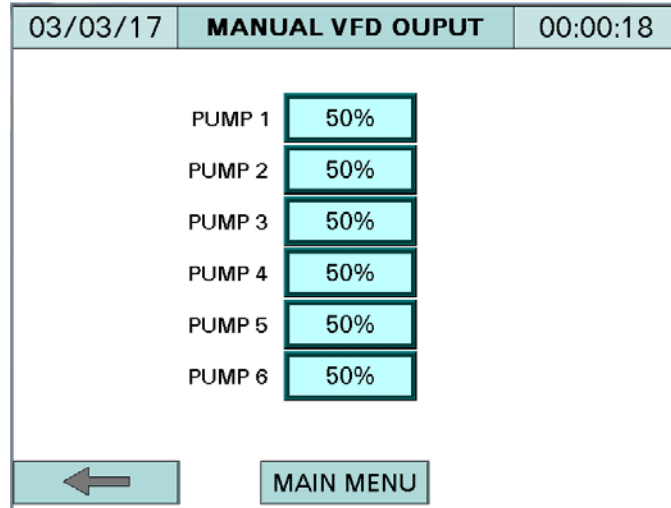


From MAIN MENU, press ANALOG DISPLAY, and then press ANALOG OUTPUT. All analog outputs are displayed on this screen.



## Analog Display (continued)

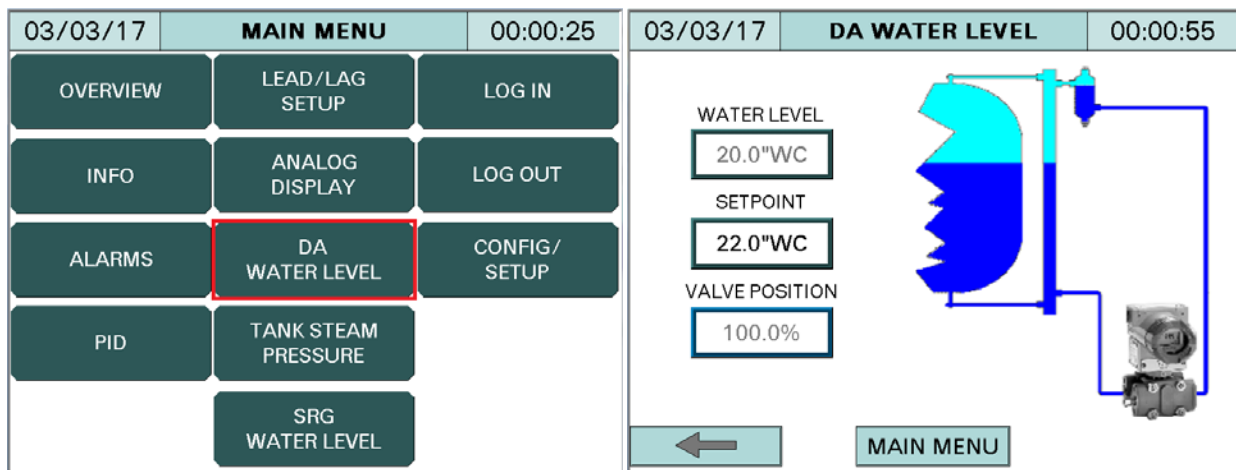
From MAIN MENU, press ANALOG DISPLAY, and then press MANUAL VFD OUTPUT.



**Manual VFD Output** - Sets the manual VFD output. When HAND-OFF-AUTO SW is set to HAND, the manual VFD output percentage will be the variable frequency drive manual setpoint.

## DA Water Level

From MAIN MENU, press DA WATER LEVEL.



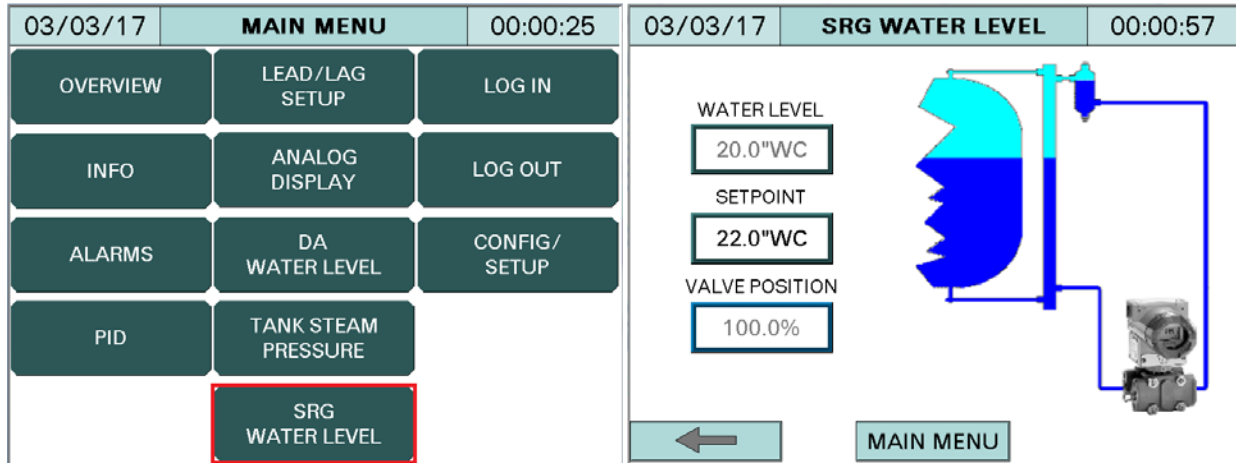
**WATER LEVEL** - Displays the actual water level.

**SETPOINT** - Sets the water level setpoint.

**VALVE POSITION** - Displays the actual makeup water valve position.

## Surge Tank Water Level

From MAIN MENU, press SRG WATER LEVEL.



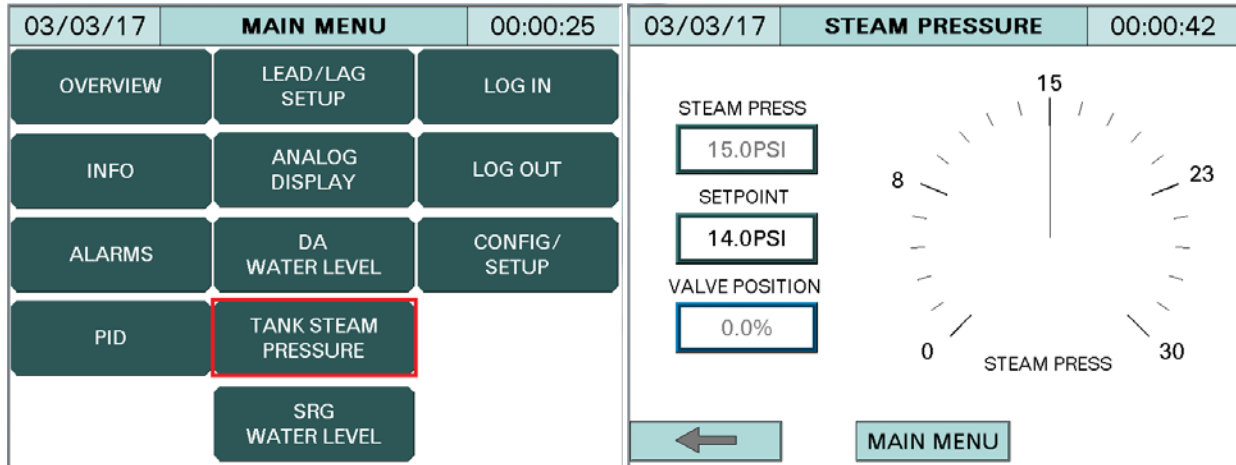
**WATER LEVEL** - Displays the actual water level.

**SETPOINT** - Sets the water level setpoint.

**VALVE POSITION** - Displays the actual makeup water valve position.

## DA Tank Steam Pressure

From MAIN MENU, press TANK STEAM PRESSURE.



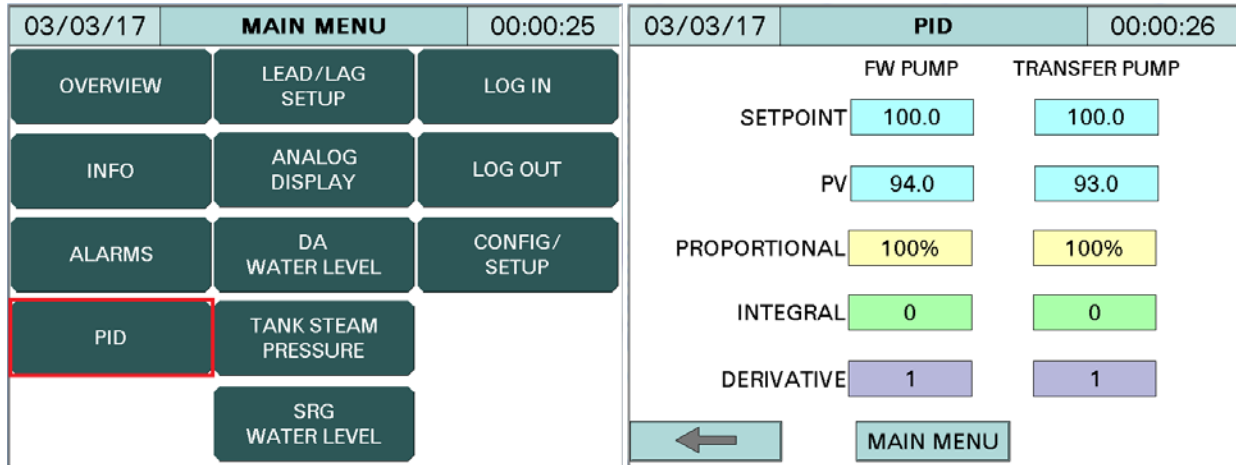
**STEAM PRESS** - Displays actual steam pressure.

**SETPOINT** - Sets the steam pressure setpoint.

**VALVE POSITION** - Displays the actual steam valve position.

## PID

From MAIN MENU, press PID.



Based on the VFD option from the configuration menu, the PID screen displays either feedwater pumps, transfer pumps, or both. The PID screen above displays both feedwater and transfer pumps.



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## Alarms (continued)

The icons at the top of the screen may be used to navigate through the list of alarms:



Acknowledge the selected alarm.



Acknowledge all alarms.



Move up one alarm on list.



Move down one alarm on list.



Navigate up one page on list.



Navigate down one page on list.



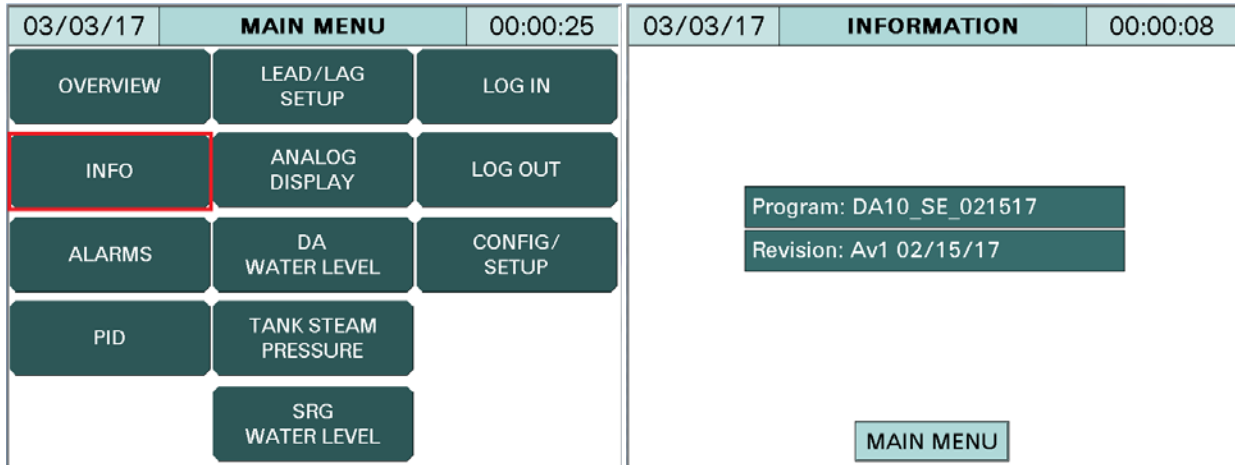
Delete the selected alarm.



Delete all alarms.

## Program Information

From MAIN MENU, press INFO.



Displays program name and revision.

## Gateway/BMS Modbus TCP/IP Standard Interface

The standard BMS interface offered is via Modbus TCP/IP. The standard port 502 is used for this connection. The connection to the BMS is via the Ethernet port on the HMI. **This connection is not available when connected to the Lead/Lag Master.**

ADDRESS	ACCESS	DESCRIPTION	FORMAT	ADDITIONAL
00001	Read	Pump 1 proven	Bit	0 = off; 1 = on
00002	Read	Pump 2 proven	Bit	0 = off; 1 = on
00003	Read	Pump 3 proven	Bit	0 = off; 1 = on
00004	Read	Pump 4 proven	Bit	0 = off; 1 = on
00005	Read	Pump 5 proven	Bit	0 = off; 1 = on
00006	Read	Pump 6 proven	Bit	0 = off; 1 = on
00007	Read	DA high water	Bit	0 = warning; 1 = normal
00008	Read	DA low water	Bit	0 = warning; 1 = normal
00009	Read	DA low low water	Bit	0 = alarm; 1 = normal
00010	Read	SRG high water	Bit	0 = warning; 1 = normal
00011	Read	SRG low water	Bit	0 = warning; 1 = normal
00012	Read	SRG low low water	Bit	0 = alarm; 1 = normal
00013	Read	Pump 1 fail	Bit	0 = normal; 1 = alarm
00014	Read	Pump 2 fail	Bit	0 = normal; 1 = alarm
00015	Read	Pump 3 fail	Bit	0 = normal; 1 = alarm
00016	Read	Pump 4 fail	Bit	0 = normal; 1 = alarm
00017	Read	Pump 5 fail	Bit	0 = normal; 1 = alarm
00018	Read	Pump 6 fail	Bit	0 = normal; 1 = alarm
40001	Read	Pump 1 Hand-Off-Auto	Unsigned Int 16	2 = hand; 4 = off; 8 = auto
40002	Read	Pump 2 Hand-Off-Auto	Unsigned Int 16	2 = hand; 4 = off; 8 = auto
40003	Read	Pump 3 Hand-Off-Auto	Unsigned Int 16	2 = hand; 4 = off; 8 = auto
40004	Read	Pump 4 Hand-Off-Auto	Unsigned Int 16	2 = hand; 4 = off; 8 = auto
40005	Read	Pump 5 Hand-Off-Auto	Unsigned Int 16	2 = hand; 4 = off; 8 = auto
40006	Read	Pump 6 Hand-Off-Auto	Unsigned Int 16	2 = hand; 4 = off; 8 = auto
40008	Read	RWF pressure control actual pressure (E1)	Float 32	
40010	Read	RWF pressure control actual (E2)	Float 32	
40012	Read	RWF pressure control current setpoint	Float 32	
40014	Read	RWF water level actual pressure (E1)	Float 32	
40016	Read	RWF water level actual (E2)	Float 32	
40018	Read	RWF water level current setpoint (R0008)	Float 32	
40020	Read	Pump 1 run time in hours	Unsigned Int 32	
40022	Read	Pump 2 run time in hours	Unsigned Int 32	
40024	Read	Pump 3 run time in hours	Unsigned Int 32	
40026	Read	Pump 4 run time in hours	Unsigned Int 32	
40028	Read	Pump 5 run time in hours	Unsigned Int 32	
40030	Read	Pump 6 run time in hours	Unsigned Int 32	
40032	Read	RTD 1 (DA water temperature)	Unsigned Int 16	
40033	Read	RTD 2 (SRG water temperature)	Unsigned Int 16	
40034	Read	RTD 3	Unsigned Int 16	

40035	Read	RTD 4	Unsigned Int 16	
40036	Read	Analog input 1 (feedwater pressure)	Float 32	
40038	Read	Analog input 2 (transfer water pressure)	Float 32	
40040	Read	Analog input 3	Float 32	
40042	Read	Analog input 4	Float 32	
40044	Read	Analog input 5	Float 32	
40046	Read	Analog input 6	Float 32	
40048	Read	Analog input 7	Float 32	
40050	Read	Analog input 8	Float 32	
40052	Read	Analog output 1	Unsigned Int 16	Pump 1 VFD modulation signal
40053	Read	Analog output 2	Unsigned Int 16	Pump 2 VFD modulation signal
40054	Read	Analog output 3	Unsigned Int 16	Pump 3 VFD modulation signal
40055	Read	Analog output 4	Unsigned Int 16	Pump 4 VFD modulation signal

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## Appendix B - RWF55 configuration for Modbus (if applicable)

The RWF55 must be properly configured for Modbus operation.

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 >>> 2** (address for feedwater level controller, if applicable)  
**ConF >>> IntF >>> r485 >>> Adr >>> 3** (address for DA tank pressure controller, if applicable)  
**ConF >>> IntF >>> r485 >>> Adr >>> 4** (address for transfer water level controller, if applicable)
5. Press **Esc** in four successions, or until the parameter menus are completely exited. The changes are effective immediately. No reboot is required.

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