ProMinent®

DULCOMETER
Aegis-II® Cooling Tower and Boiler Controller

Use your Tablet or Smartphone. I'm WiFi ready!

Please carefully read these operating instructions before use! – Do not discard this manual!   The operator shall be responsible for any damage caused by installation or operating errors! Technical changes reserved.

AEGIS II Browser

Sidebars: Are used to explain typical uses for feed and control functions.

Contents

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1 Day-to-Day Browsing

The purpose of this manual is the show the user how to connect to the Aegis II controller using an Ethernet connection, or wirelessly via WiFi from a PC, tablet or smart phone. Secondly, to give examples of how to program the outputs, calibrate sensors and/or view the process.
The Installation and Operation manual has detailed sensor information, keypad instruction and controller details and specification.
The following sections detail connecting your smart device or PC to the controller. WiFi has the advantage of not requiring a physical cable. LAN setup follows this chapter, then the Home screen is explained as it is common to either connection method.

1.1 The WiFi Connection

A **WiFi** connection eliminates cables and the need to change your IP address.
There are two steps needed to fully connect to the controller. **Step 1**: Connect your device to the wireless network that includes your controller. **Step 2**, Enter the IP address of the controller in a browser app. There could be multiple devices on this network.

Step 1 is provided in two parts, **1.1.1 Using a PC or Tablet** and **1.1.2 Using a Smartphone**

1.1.1 Using a PC or Tablet:

Click on the **WiFi** icon on your desktop.

Click on the AegisII_123 choice and press the Connect button.
The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.
Further differentiate your controller WiFi name. Edit the name in the System pages. See **10.3.1 LAN IP, Netmask, MAC, Gateway, Wifi IP**

You are now on the Aegis II **WiFi** network.
Continue with section **1.1.3 Opening the Browser page**
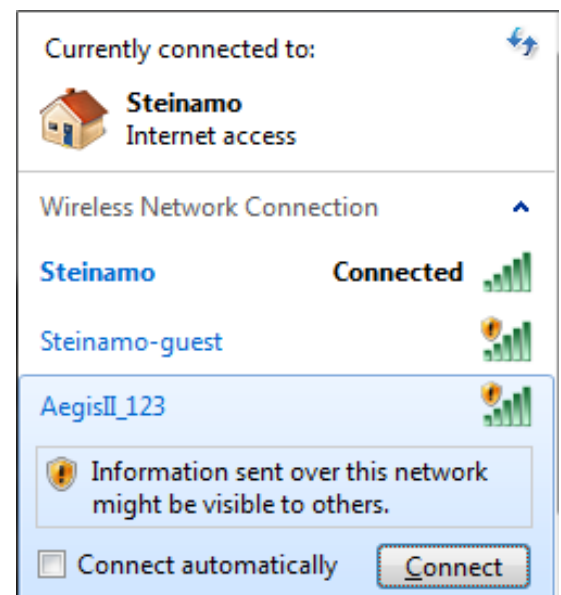
Sidebar:
Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits.
See section **10.3 Communications** to make this change.

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1.1.2 Using a Smartphone

Navigate to your Smartphone setting page. Select the WiFi page. Select the AegisII_123 choice.

NOTE: The number 123 will be different on each controller. These 3 digits will be the same as the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within WiFi range.

Sidebar:
Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits.
See section **10.3 Communications** to make this change.

Here are examples using Android and IPhone;

1.1.2.1 Setting up WiFi using an Android phone

From your home page, press the settings button then choose Wi-Fi.
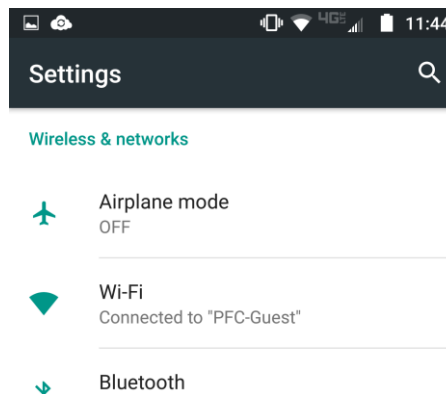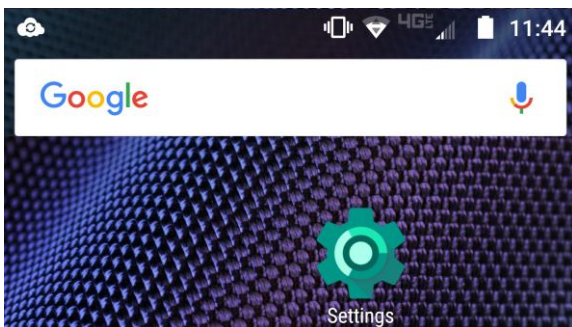
There may be more than one controller nearby. Choose your controller by comparing the serial numbers last 3 digits with the options on the phone. Select your controller. The status should change for that choice. See example picture below; AegisII_060 is 'Connected, no Internet'.
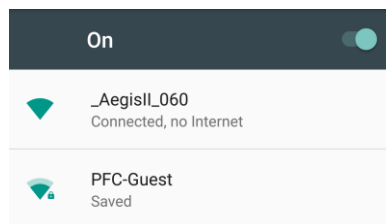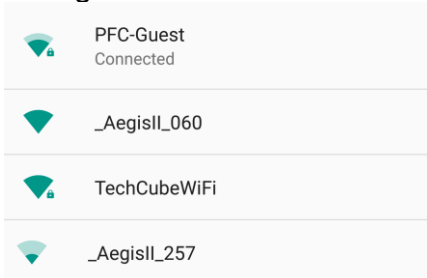
Continue with section **1.1.3 Opening the Browser page using WiFi**

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1.1.2.2 Setting up WiFi using an IPhone

To connect your IPhone to an AegisII controller, make a **WiFi** connection; Select the Settings button from your desktop.

Select the **WiFi** button.   Choose your controller.   Note the connection status.
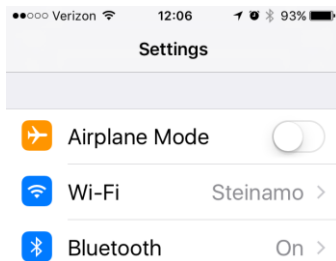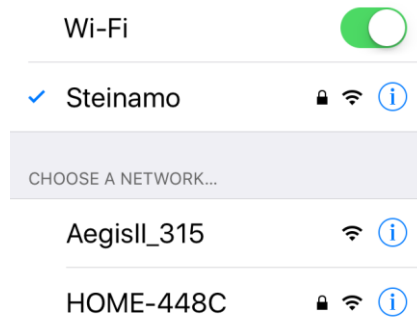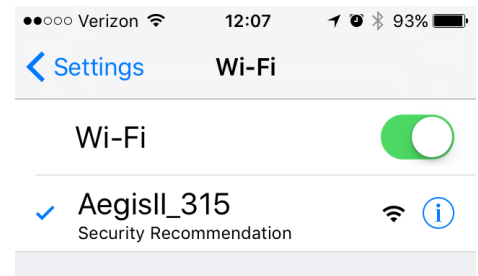
If you have more than one Aegis choice, the number on the screen represents the last 3 digits of the AegisII controller serial number.

1.1.3   Opening the Browser page using WiFi

Once a WiFi connection is established, continue here with step 2.
To connect to the controller and see the screen, open a browser and enter the controller's **WiFi** IP address. (Not the LAN IP). The default address is 192.168.1.1. If you do not see the connection status followed by the main page, it could be due to the WiFi address having been changed on the controller.
Find the controller **WiFi** IP address using the controller keypad.

1) Press the Menu key

2) Press the up arrow (scroll up) until you see System. Press OK

3) You should be at the Communications menu. Press OK.

4) You will see the LAN IP address. Press the down arrow twice to see the WiFi IP Address.
This is the address you need to use in the browser URL box. No need to add the WWW or Http. Just enter as shown here. 192.168.1.1 and press your return key.
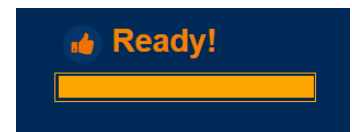
Connection status
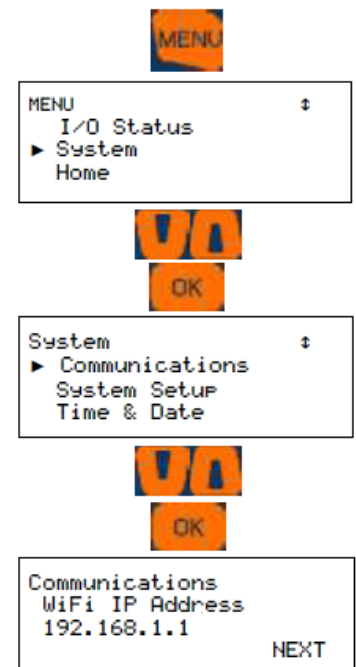
Once connected, you can see values and status of many I/O point but you will not be able to edit or make programming changes without logging in. This is the **HOME** screen.

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See section **1.3 The Home Screen**

1.2 The LAN Connection

The most common connection is via a Local Area Network (LAN) connection. This requires an Ethernet cable and you will need to set up your Ethernet port to match the address of the controller.

The Ethernet cable no longer needs to be a 'crossover' type unless you are running a Windows version earlier than VISTA. WIN7 onward will determine which wires need to be transmit and receive and adjust to match the signals on the cable.

Attach the cable to the LAN port on your PC and to the LAN port inside the controller. (Lower left-hand corner). A green light should be seen on both ports. The amber light will blink with each packet that passes by in either direction.

1.2.1.1 Determine the LAN IP address of the controller

The default LAN IP address is 10.10.6.106. If you have not changed it and if the controller has not been placed on the customers network, try this address. If it does not work, find the LAN address;

    Press the menu key on the controller
    Use the up arrow to System and press Enter
    Press Enter for Communication
    The LAN IP address is shown

Once you have determined the IP address of the controller, you need to set a static IP address on your PC that is compatible with the controller address.

1.2.1.2 Setup the Local Area Connection on your PC

Depending on which version of Windows you are using, these instructions will vary. The idea is to set a compatible static IP address on your PC for the Ethernet port you will use to physically connect to the controller.

Use the following instructions for VISTA, WIN7, WIN8 and WIN10.

Hold down the Windows key   while you press the letter 'r'.

Enter 'ncpa.cpl' in the **Open** box.
Press **OK**.
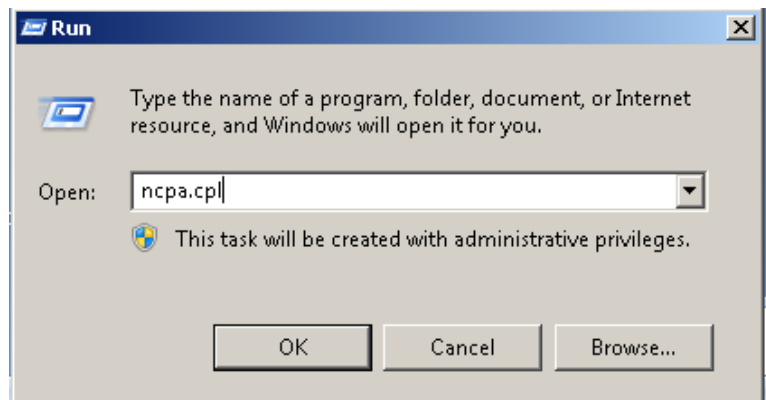
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Double click on **Local Area Connection** and select **Properties**
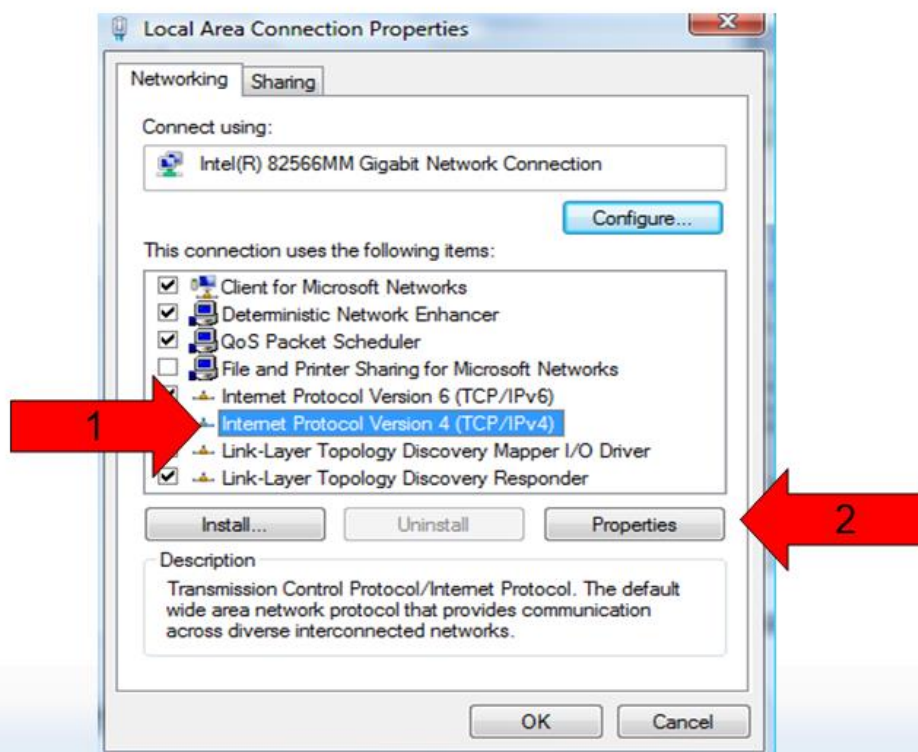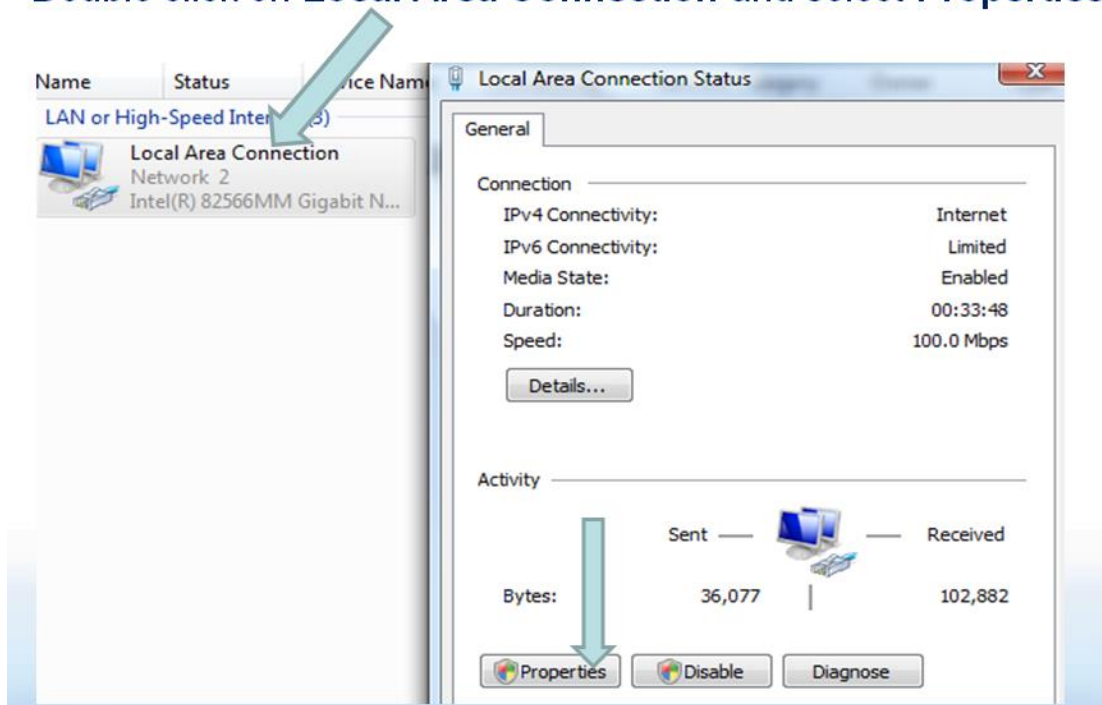
(1) Highlight Internet Protocol **Version 4** (TCP/IPv4)

(2) Select Properties

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Select the 'Use the following IP address': circle (1)

Enter the first three numbers of the controller's IP address (2)

Example: 010.010.006.___

Then enter a number between 000 and 255 that is different from the controller address

In this example, since the controller IP is 010.010.006.106, we used 010.010.006.101 (3)
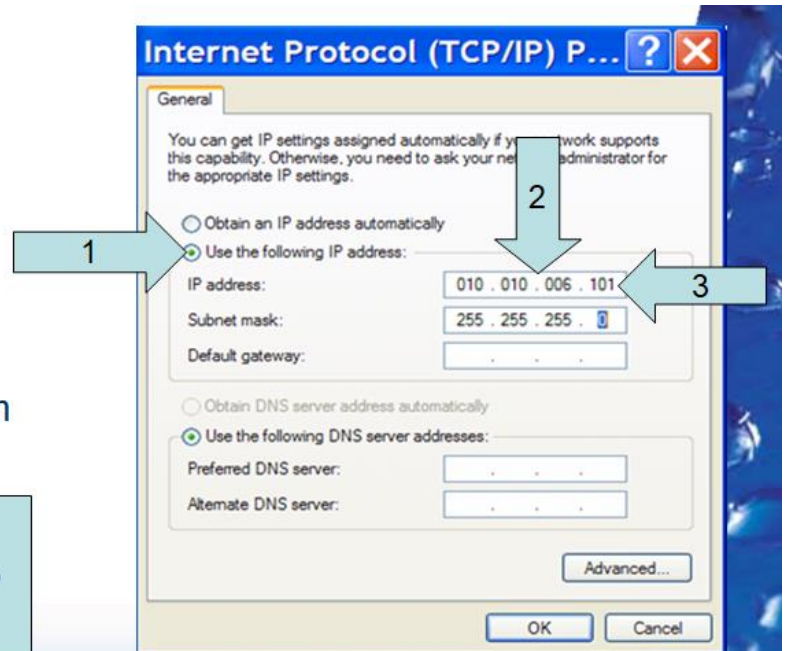
Press the Tab key and enter the Subnet mask of 255.255.255.0

Select OK here and on the Local Area Connection window

Internet Protocol (TCP/IP) P... ? ✕

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

2

○ Obtain an IP address automatically

1 ◉ Use the following IP address:

IP address: 010 . 010 . 006 . 101   3
Subnet mask: 255 . 255 . 255 . 0
Default gateway: .   .   .

○ Obtain DNS server address automatically
◉ Use the following DNS server addresses:
Preferred DNS server: .   .   .
Alternate DNS server: .   .   .

Advanced...

OK   Cancel

Sidebar:
If you change the port number from the default address of 80, the WiFi port address will be changed automatically as well.
When the port number is 80, it is implied, therefore, you do not include it in the addressing.
However, if it is other than 80, you need to include it when you try to connect to the controller.
For example: if you change the address to 100, the default LAN IP address will now be entered as such:

10.10.6.106:100

The WiFi default address is now:

192.168.1.1:100

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1.3 The Home Screen

The home screen is divided into several sections or groups. Select icons for information or other menus. The I/O sections with dark blue background each have an assigned letter or number in a circle. Select the circle for menu choices for that point. (E) (1) These menus are explored in detail throughout this manual.
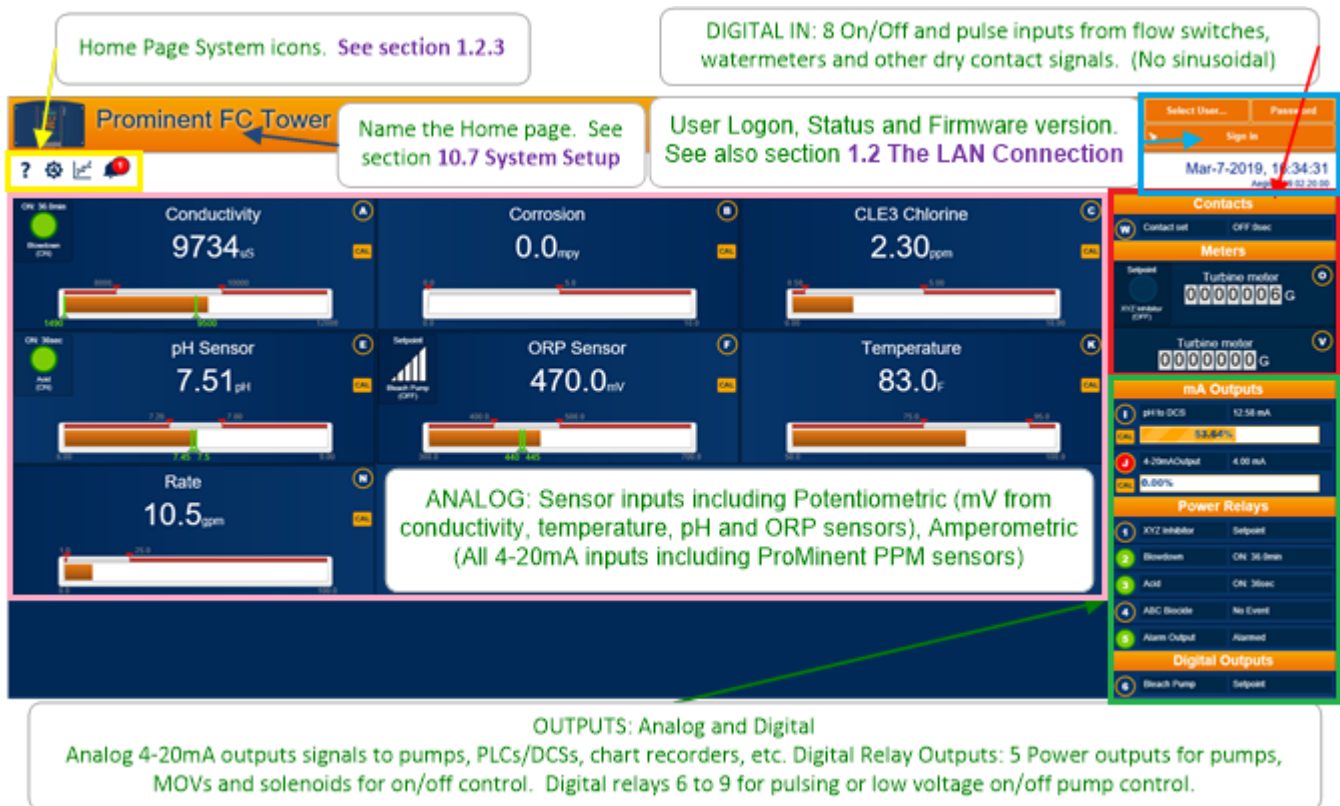
View from a Smartphone.

Scroll in any direction to access all I/O as shown in the above PC/Tablet screen.

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1.4 Home Page Services

From the home page, you can see all the enabled inputs and outputs (I/O). Log-in to gain access to three levels of programing privileges. Operator has the least benefit, while Admin has full access.

1.4.1 Log-In

Once you are connected, log in by selecting a username and enter a password.

Usernames with Default Passwords:
Operator1 = **1**   Operator2 = **2**   Operator3 = **3**   Operator4 = **4**.
Configure5 = **5** Configure6 = **6** Configure7 = **7**   Administrator = **AAAA**
Login Page: Operators can view all controller pages. No access to most System pages.
               Configure users can edit the program. No access to most System pages.

Modify Passwords:
If the controller is accessible on the site LAN, you should modify all 8 passwords.

Two users cannot share the same password because only the password is used to identify keypad users. The controller displays **Password Fail** on a duplicate password.

See section **10.8 Passwords** to learn how to change passwords.

1.4.2 Home Page Detail

Now that you are logged in, you can edit the controller as well as monitor the action.
The following pages break the Home page into sections to enhance identification.

1.4.2.1 Analog Input Display
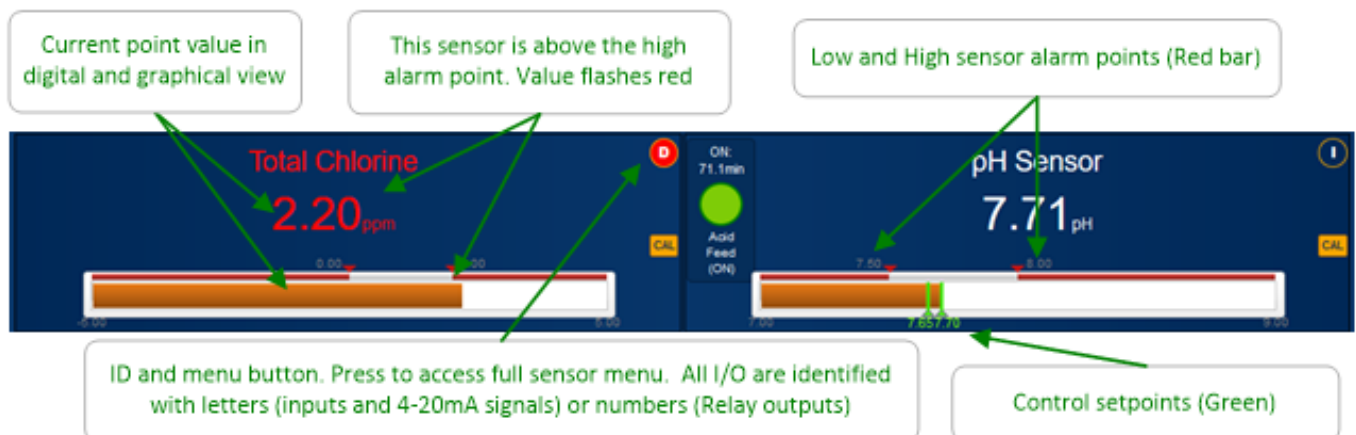
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Analog Input Display continued

Calibrate button. Or use sensor menu

Sensors linked to relay outputs include duplicate relay status. Green = On, Blue = Off, Red = Alarm

Feed@ 100.00%	ORP Sensor		J	Runtime Limit	pH Sensor		I	3	Oxidant Feed	No sensor
	715.0mv				7.70pH			4	Acid Feed	Runtime Limit
Hypochlorite (ON)			CAL	Acid Feed (OFF)			CAL	5	Biocide Timer	No Event
									Digital Outputs	
								6	Hypochlorite	Feed@ 100.00%

Sensors linked with pulse outputs include a duplicate output icon. Shows output in %

1.4.2.2 Digital I/O Display

Contacts		
S Flowswitch	ON :7.76hr	
Meters		
Makeup Meter O		
0000000 G		
Bleed Meter P		
0000000 G		
mA Outputs		
E Chlorine out	9.75 mA	
CAL 35.94%		
Power Relays		
1 Inhibitor Feed	Setpoint	
2 Bleed Valve	ON: 8.1min	
3 Oxidant Feed	No sensor	
4 Acid Feed	Runtime Limit	
5 Biocide Timer	No Event	
Digital Outputs		
6 Hypochlorite	Feed@ 100.00%	

Max of 8 Digital inputs: Can be any combination of dry contact switches or digital watermeter signals from contact head or paddle wheel models.

See section 9 for 4-20mA Output configuration

Max of 5 Digital Output Relays to power pumps, solenoids and MOV valves

Digital output configuration covered in sections 2, 3 and 4.

Max of 4 Pulse frequency or On/Off relays

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Contacts		
S	Flow switch	ON :5.8min

Meters

Setpoint
⭕
XYZ Inhibitor (OFF)

Turbine meter **O**

0 0 0 0 0 0 0 G

Bleed meter **P**

0 0 0 0 0 0 0 G

mA Outputs		
I	pH to DCS	12.59 mA
CAL	53.71%	
J	4-20mAOutput	4.00 mA
CAL	0.00%	

Power Relays		
1	XYZ Inhibitor	Setpoint
2	Blowdown	ON: 5.5min
3	Acid	Timed Cycling
4	ABC Biocide	No Event
5	Alarm Output	Alarmed

Digital Outputs		
6	Bleach Pump	Setpoint
8	EFG Biocide	No Event
9	P9 unused	No Event

1.4.3 Home Page System Icons

The home page has a variety of services unrelated to the program. These services are accessed via the icons in the upper left corner of the page.

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The User Manuals icon ❔ gives you access to the two Aegis manuals; Operating and Browser (this manual). The Operating manual explains the keypad usage, wiring and specifications. The Browser manual shows you how to connect to and program an Aegis II controller.

The System Settings icon ⚙ has the following menus:
These menus are explained in sections **10 System Settings.**

The change display icon allows users with dual systems to select how I/O points are displayed. See section **10.7 System Setup**

The report icon opens the report page. See section **1.4.4 Create a Report**

Finally, the alarm icon 🔔 displays current alarms. Clear them from this menu page.

1.4.4 Create a Report

To create a report, select the report icon from the main screen.

Follow the three steps as shown.

1. Choose a date range.

The 'Custom' selection lets you create a graph of any range that exist in the database. There is a 31-day limit.

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1. Choose a date range

Today ▼

2. Choose up to four I/O's

🔔 Sensors (1) ⇕

CT1
☐ 🔔Fluorescent - [G]

CT2

CT1 | CT2
☑ 🔔Tower Cond. - [A]
☐ 🔔PAA - [C]
☐ 4-20mA Input - [D]
☐ ORP Sensor - [J]
☐ Unassigned - [K]
☐ 🔔Rate - [L]
☐ Makeup Cond. - [M]
☐ 🔔Calculate ppm - [N]

Meters (1) ⇕

CT1

CT2

CT1 | CT2
☑ Water meter - [O]
☐ Turbine meter - [P]
☐ Water meter - [Q]
☐ Water meter - [R]
☐ GMX Total - [W]

Contacts (1) ⇕

CT1

CT2

CT1 | CT2
☑ Flowswitch - [S]
☐ Contact set - [T]
☐ Contact set - [U]

Outputs ⇕

CT1

CT2

CT1 | CT2
☐ Chlorine Pump - [1]
☐ Bleed - [2]
☐ Acid Pump - [3]
☐ PAA Run Time AI - [4]
☐ Alarm out - [5]
☐ Alarm out - [6]
☐ No Flow Alarm - [7]
☐ PAA Feed - [8]
☐ P9 unused - [9]

mA Outputs ⇕

CT1

CT2
☐ pH Output - [F]

CT1 | CT2
☐ Conductivity Out - [E]

---

2   Select the I/O you wish to graph. Four points maximum. Checked boxes turn orange. After four boxes are checked, the remaining choices grey out and cannot be selected without un-checking one of the four.

2. Choose up to four I/O's

🔔 Sensors (1) ⇕

T1
☐ 🔔Fluorescent - [G]

CT2

CT1 | CT2
☑ 🔔Tower Cond. - [A]
☐ 🔔PAA - [C]
☐ 4-20mA Input - [D]
☐ ORP Sensor - [J]
☐ Unassigned - [K]
☐ 🔔Rate - [L]
☐ Makeup Cond. - [M]
☐ 🔔Calculate ppm - [N]

Meters (1) ⇕

CT1

CT2

CT1 | CT2
☑ Water meter - [O]
☐ Turbine meter - [P]
☐ Water meter - [Q]
☐ Water meter - [R]
☐ GMX Total - [W]

Contacts (1) ⇕

CT1

CT2

CT1 | CT2
☑ Flowswitch - [S]
☐ Contact set - [T]
☐ Contact set - [U]

Outputs (1) ⇕

CT1

CT2

CT1 | CT2
☐ Chlorine Pump - [1]
☑ Bleed - [2]
☐ Acid Pump - [3]
☐ PAA Run Time AI - [4]
☐ Alarm out - [5]
☐ Alarm out - [6]
☐ No Flow Alarm - [7]
☐ PAA Feed - [8]
☐ P9 unused - [9]

mA Outputs ⇕

CT1

CT2
☐ pH Output - [F]

CT1 | CT2
☐ Conductivity Out - [E]

---

3   Press the Download button.

3. Download and view

Download data and create report

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Once the graph is open, the icons have the following properties.

? Access the controller manuals

🏠 Exit from the report menu back to the Live view

▤ Show/hide the report menu

🗄 Manage the report database

🗗 Show/hide the controller header

🔔 Show/acknowledge current alarms

Note the trend zoom tools.   Click on this icon to export as a picture

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1.4.5 Manage the report database

When you create a graph by selecting I/O points, the browser downloads the data for the chosen points. This data is stored on your device (PC, smart phone, etc). Different browsers allow different amounts of memory to this file. The graph page keeps track of previous selections and expresses the total size of all downloaded data in a bar graph.
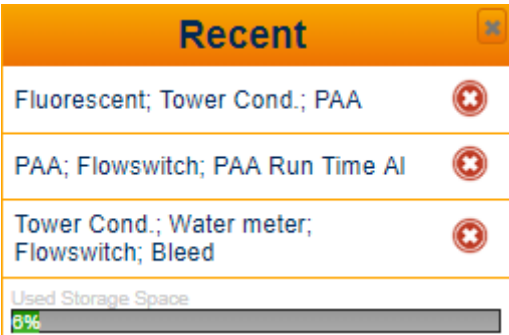
This picture depicts three previous graph configurations that have data in the graphing database. Click on one to create a graph, or remove them by selecting the X.

If you wish to keep the configuration but want to reduce the data, open the Manage Report Database window and make your selection. Press Delete.
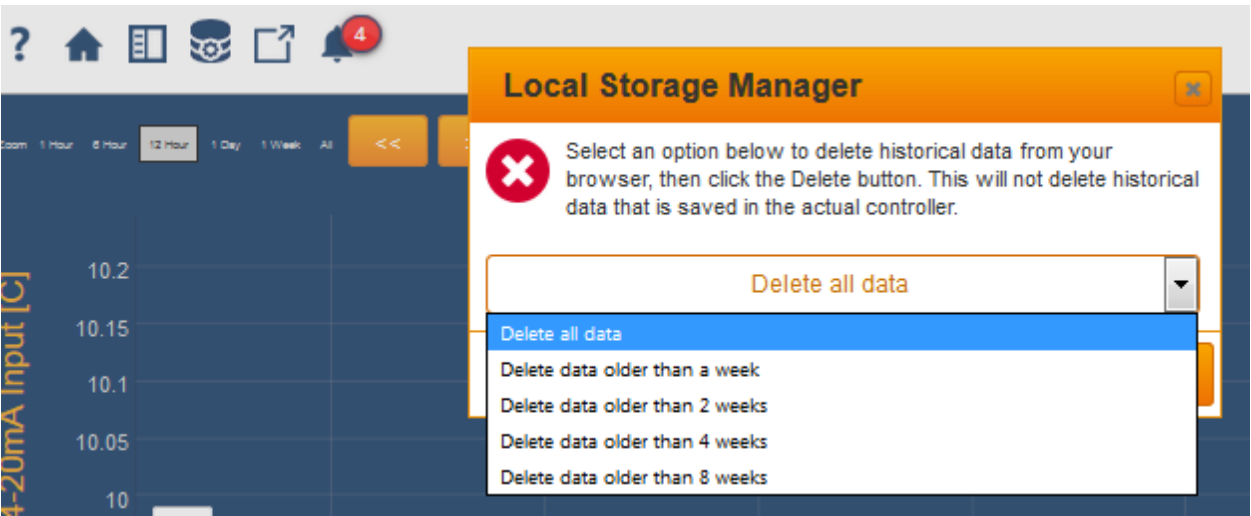
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1.5 View & Adjust Setpoints

Select the **1** to **9** icon on the home page. This example adjusts the Relay 1 setpoint

Select **Adjust Setpoint** from the pull-down

1:Tower276 Bleed

Adjust Setpoint

On: 1500 uS

Off: 1490 uS

Edit one or both setpoints & **Submit**

Bleed controls turn ON at the higher setpoint & then OFF @ the lower setpoint as the conductivity is lowered by the low conductivity make-up water

Refresh   Submit

In this example, we **Submit** a new setpoint, logging the activity

7:Acid Pump

Adjust Setpoint

Status	Setpoint change
100%:	7.50 pH
0%:	7.40 pH

Refresh   Submit

Frequency or 'Pulse' controls feed chemical proportionally between setpoints. In this example the pump would feed @ 50% of rated when the pH = 7.45

100% pulses the pump @ its maximum frequency

Sidebar:
Relays controlled by sensors power Pumps and Solenoids ON and OFF.
(Relays are outputs **1** to **5** & outputs **6** to **9** set to 'ON/OFF')
Frequency controlled Pumps feed chemicals at varying rates.
(Frequency controlled pumps are outputs **6** to **9** set to 'Pulse')

Tower Bleed solenoids use Setpoints 5uS to 20uS apart so that short bleeds are followed by short feeds. The resulting control has minimum variation in Inhibitor ppm and operates as close as possible to the target cycles of concentration.

ON-OFF Acid pumps use setpoints 0.05 pH apart so that the re-circulation delay between feeding acid and measuring its pH does not cause wide pH swings.

WARNING: Reversing setpoint order is blocked for ON/OFF controls but allowed for proportional Pulse controls. Reversing setpoints in this example would convert an Acid feed to a Caustic feed.

View & Adjust Setpoints continued

Setpoint values vary with the configuration of each control and the type of control output; ON/OFF or variable frequency (pulse).

5:Blr5 Treatment

Adjust Setpoint

Feeding on volume allows you to set the feedwater concentration. This example uses an ON/OFF pump

| Measure | 100 G |
| Feed | 10 seconds |

Refresh   Submit

8:Sulfite Feed

Adjust Setpoint

| Measure | 100 G |
| Feed | 10 ppm |

Refer to 3.1 for feed setup

Using a frequency controlled pump simplifies setting a feed concentration

In this example, a Pulse control has been configured to ON/OFF,
ON 18.5% of every 5 minutes

8:Sulfite Feed

Adjust Setpoint

| Percent Time | 18.5 % |

Refresh   Submit

9:Dispersant

Adjust Setpoint

| Base Feed | 12.5 mL/minute |

Submit

In this example, a Pulse control feeds continuously. Typically the feed would interlocked with a flowswitch or boiler run contact set from the site DCS.

Sidebar:
Controls may be configured to prevent one chemical feeding while another feeds (See 'Blocking') into a common injection header.

Inhibitor feeds may be delayed while the bleed solenoid in ON to prevent pumping inhibitor down the drain (See Section 3.)

Pumps or blowdown valve controls may be turned OFF when the tower or boiler is offline (See Interlocks)

Pay attention to the number **1** to **9** that precedes the pump, valve or solenoid name.
It's the physical location on the controller circuit board of the wiring that connects to the pump, valve or solenoid.

You may modify the name of the pump, valve or solenoid but you'll need to know which output is controlling so you can check that enclosure cover indicating light is ON when the pump, valve or solenoid is ON. (Relays 1-5 on the LHS & Pulse 6-9 on he RHS)

1.6 Priming-Testing Pumps & Solenoids

Select **Prime-Test** from the pull-down

Select the **1** to **9** icon on the home page. This example primes the Relay 3

3:Inhibitor Feed

Prime-Test

START	✔ Yes	No

Prime, Force ON	8.5 minutes

Refresh | Submit

Edit the Prime-Test Time & **Submit**

Time remaining until end of Prime-Test

3:Inhibitor Feed

Prime-Test

Remaining	00:08:24

End of Prime-Test	Yes	✔ No

Refresh | Submit

3:Inhibitor Feed

Prime-Test

Status	Interlocked

START	✔ Yes	No

Prime, Force ON	

Refresh | Submit

Select **End of Prime-Test** = **Yes** to end sooner & **Submit**

If the control is 'Blocked', 'Stopped', 'Interlocked' or 'Alarmed-OFF', Priming does not occur.

7:Acid Pump

Prime-Test

START	✔ Yes	No

Prime, Force ON	200.0 mL

Refresh | Submit

Pulse controls prime on volume, not time

7:Acid Pump

Prime-Test

Remaining	195 mL

End of Prime-Test	Yes	✔ No

Refresh | Submit

Refresh to update time or volume remaining

Sidebar:
Priming may also be used to slug feed on system start-up in addition to testing pumps, valves or solenoids. Feed limit alarms may stop priming.

2   Blowdown Controls: Towers, Boilers, Closed Loops

2.1   Conductivity Controlled Blowdown

Select the **1** to **9** icon on the home page.
This example sets up the Relay 1 as a Bleed Control

Select **Setup** from the pull-down

1:Tower276 Bleed

Setup

Each control has 3 possible **Control Types**: **Blowdown** controls conductivity in Towers & Boilers

Control Type	**Blowdown**

There are 3 possible **Blowdown** modes.
Select **Sensor Control** to use a Conductivity sensor to control the blowdown valve or bleed solenoid.

Set Blowdown Mode	**Sensor Control**

Control by:	**A:Tower Conduct.**

Select the sensor used to control the blowdown. This pulldown selects from installed conductivity & toroidal sensors, 4-20mA inputs & 'Phantoms' of 'Unassigned' type

Refresh   Submit

1:Tower276 Bleed

Configure

Select **Configure** from the pull-down

Rename the control for your site. Max. 16 characters.

Descriptor	Tower276 Bleed

Inherits the units from the controlling sensor. Rename if required-preferred. Max 3 characters.

Display Units(UOM)	uS

This relay cannot be disabled because it is in use to Prebleed Relay 2

Sets the number of digits after the decimal point used for setpoints. Inherits from controlling sensor. Unless a condensate control, fractional uS of little utility

Decimal digits	0

Used by I/O   2:Biofeed on 2

Control Action	**ON decreases sensor**

Towers & Boiler lower the conductivity when the bleed-blowdown opens & make-up-feedwater dilutes the circulating water. **Note 1.**

Special Control	**None**

'None' for typical tower controls. See 2.2 for Boiler blowdown & 2.5 for Varying Cycles.

Refresh   Submit

Sidebar:
Note 1: Closed loop conductivity controls usually use **Control Action** ON increases sensor
Select **Control by: More than one** to bleed on the ratio of tower to make-up conductivities.
See next page.

Conductivity Controlled Blowdown continued

If you have a conductivity sensor installed in the tower make-up line, you can control on the ration of the tower conductivity to the make-up conductivity.

CAUTION: If your tower has a long holding time or large circulating volume or you are running the chemistry close to the scaling limit, look closely at control effects. Auto-Increasing cycles of concentration (make-up conductivity falls) when the bulk of the tower water has not changed, may scale heat exchangers.

1:Tower276 Bleed ☒

	Setup	▾
Status	Reconfigured	
Control Type	**Blowdown** ▾	
Set Blowdown Mode	**Sensor Control**	
Control by:	A/E	

Refresh   Submit

To remove ratio controls, **Submit** a blank **Control By:** setting the control back to **'None'**

Selecting **Control by: More than one** on the **Configure** page allows you enter a ratio control equation.
In this example we are controlling in the ration of the sensor connect to input 'A' (Tower Conductivity) to the sensor connetced to input 'E' (Make-up Conductivity)

Ratio of conductivities sets the default units to **cyc**les & the default setpoints to 3.00 **Adjust Setpoint** for your application.

Set the cycles deadband (On-Off) narrow, for minimum change in chemistry as the bleed valve opens, the float adds make-up & the cycles fall.

1:Tower276 Bleed ☒

	Adjust Setpoint	▾
On:	3.00 cyc	
Off:	2.98 cyc	

Refresh   Submit

Sidebar:
If this is a new tower to you, take the time to watch a bleed cycle.
The bleed opens but the conductivity continues to increase until the float opens.
(If you have a meter on the make-up you'll see it increment volume @ a higher rate)
The conductivity then starts to fall & may continue to fall after the bleed has turned OFF, depending on the float dead band.
You can't control inside of the float dead band but you can see the parts of the blowdown control: sensor, solenoid, meter, float … all working.

AEGIS II Browser

2.2 Boiler Blowdown

Select the **1** to **9** icon on the home page.
This example sets up the Relay 4 as a Boiler Blowdown

Select **Configure** from the pull-down

4:Boiler_4_CS

Configure

The timing of Captured Sample blowdown controls varies with boiler usage, piping size & length from boiler to sensor, pressure, needle valve setting & feedwater quality.
Modify timing & **Submit.**

Descriptor	Boiler_4_CS
Display Units(UOM)	uS
Decimal digits	0
Disable	Yes ✓ No
Control Action	ON decreases sensor
Special Control	Captured Sample
Sample	30 seconds
Measure	60 seconds
Blowdown	120 seconds
ReSample	60 minutes
Fail-to-Sample	U:Thermal Switch

Refresh   Submit

Blowdown lowers boiler conductivity

Lower pressure commercial boilers use Captured Sample on the surface blowdown line for TDS control. **Note 1**.

Blowdown valve opens long enough to clear the surface blowdown line to the sensor, delivering a representative hot, un-flashed sample & goes to **Measure. Note 2.**

Valve closed. Sample cools a fixed & repatable amount. Conductivity is measured @ the end of the measure interval. **Note 3.**

If conductivity above the setpoint, valve opens & blows down for **Blowdown** period, then goes to **Measure**

If conductivity below the setpoint, waits for ReSample time & goes to Sample. Note 4.

Optional thermal switch @ sensor alarms if blowdown valve fails to open, piping valved OFF...

Sidebar:
Note 1. Higher pressure, utility-power generation boilers use a continuous blowdown & a sample cooler to measure conductivity.
Note 2: Sensor installed upstream of the blowdown valve-solenoid & throttling needle valve. Needle valve downstream of blowdown valve. Lower reliability, steam rated solenoids limited to very low pressure boilers.
Note 3: If you modify **Measure** time or needle valve setting. Recalibrate because you've changed the temperature at the measure point.
Note 4: Boilers which cycle up slowly can extend Resample time to minimize **Sample** energy, water & chemical losses. Process boilers may need to **Sample** more frequently.

AEGIS II Browser

2.3 Metered Blowdown

Select the **1** to **9** icon on the home page. This example sets up the Relay 1 as Meter controlled Bleed.

Select **Setup** from the pull-down

1:Tower276 Bleed

Setup

Status	Reconfigured
Control Type	Blowdown
Set Blowdown Mode	Water meter
Control by:	O:Tower Make-up

Refresh   Submit

Select **Set Blowdown Mode** = **Water meter** & select the controlling meter & **Submit**.

1:Tower276 Bleed

Adjust Setpoint

Measure	500 G
Feed	75 seconds

It would be unusual to control cycles using a single watermeter; however usable as a temporary fix on loss of a conductivity sensor.

1:Tower276 Bleed

Setup

Control Type	Blowdown
Set Blowdown Mode	Water meter
Control by:	O:P

Refresh   Submit

At sites where fouling or high silica prevents using contact conductivity sensors, two meter controls are **useable if make-up water chemistry constant**

Select **Control By** = **More than one** & edit to get a Makeup:Bleed sequential control. In the example 'O' is the make-up meter & 'P' the bleed .

1:Tower276 Bleed

Adjust Setpoint

Measure	300 G
Bleed	100 G

Refresh   Submit

Measure 300 Gallons or Make-up & then **Bleeds 100** Gallons. Cycles of concentration = 3.

Sidebar:
Toroidal (non-contact) conductivity sensors are also used in towers where fouling blocks contact type, conventional sensors.

AEGIS II Browser

2.4 Percentage Time Blowdown

Select the **1** to **9** icon on the home page. This example sets up the Relay 1 as a time controlled Bleed.

Select **Setup** from the pull-down

1:Tower276 Bleed

Setup

It would be unusual to control cycles using a **Percent Time** control; typically used as a temporary fix on loss of a conductivity sensor.

Status	Reconfigured
Control Type	**Blowdown**
Set Blowdown Mode	**Percent Time**

Refresh   Submit

Select **Set Blowdown Mode = Percent Time** & **Submit**.

1:Tower276 Bleed

Adjust Setpoint

Percent Time	25.0 %

Refresh   Submit

Setpoint is the % of every five mnutes. In this example 25% = 75 seconds in every 5 minutes

---

Sidebar:

Blowdown controls like other controls can be interlocked with flowswitch(es) or run contact sets & are subject to run time limits - alarms & blocking by other controls.

For example, if you use a **Percent Time** control to blowdown while you replace a sensor or meter, the bleed will turn OFF while the inhibitor feeds if you have configure the bleed to be 'Blocked by' the inhibitor pump.
However the bleed time owed in the current 5 minute cycle will be delivered when the inhibitor feed ends.

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2.5 Variable Cycles

1:Tower276 Bleed

Configure

Descriptor	Tower276 Bleed
Display Units(UOM)	cyc
Decimal digits	2
Used by I/O	2:Biofeed on 2
Control Action	ON decreases sensor
Special Control	Varying Cycles
uS Maximum	3000 uS
High Cycles	2.500
uS Hi Range	1000 uS
Med. Cycles	4.250
uS Med Range	650 uS
Low Cycles	6.100
uS Lo Range	350 uS

Refresh   Submit

If your make-up changes seasonally or periodically and you have a 2ⁿᵈ conductivity sensor installed in the tower make-up line you can control using **Varying Cycles**.

No not use **Varying Cycles** if:
1. The holding time or turnover time of the tower is 'long' then the bulk of the tower water has not changed when the make-up conductivity changes & you may scale if hardness limited. 'Long' is site specific and a function of temperature, water chemistry and treatment program.
2. The make-up conductivity does not track the component that limits the maximum cycles.
For example, hardness may increase with conductivity but silica may not & you may be silica limited.

Varying Cycles is not a **Special Control** option until **Control By:** is set to the ratio of the Tower-to-Makeup conductivities, **A/F** in this example

Set the maximum allowed tower water conductivity

When the Make-up conductivity ('F' in this example) is less than 1000uS, the tower bleed is controlled to 2.5 cycles of concentration

When the Make-up conductivity is less than 650 uS, the tower bleed is controlled to 4.25 cycles of concentration

When the Make-up conductivity is less than 350 uS, the tower bleed is controlled to 6.1 cycles of concentration

1:Tower276 Bleed

Setup

Control Type	Blowdown
Set Blowdown Mode	Sensor Control
Control by:	A/F

Refresh   Submit

Set **Blowdown Mode** = **Sensor Control** and **Control by:** to **More than one.** Then edit to the ratio of the [Tower]/[Make-up]. In this example the tower conductivity is measured @ input '**A**' & the make @ input '**F**' **Mathematical expressions require capitol letters! (A/F)**

AEGIS II Browser

2.6 Blowdown Limit Alarms

Select the **1** to **9** icon on the home page. This example uses the **Alarms page** for a blowdown control on Relay 1

Select **Alarms** from the pull-down

1:Tower276 Bleed

Alarms

Adjust for the number of minutes that would represent a failure to control cycles of concentration, 2 hours in this example

The number of minutes in any one bleed cycle

No = Alarm Logs & Displays but does not turn OFF the bleed

Yes = Turns ON the alarm relay when Relay 1 alarms

Status	Adjusted Alarm
Mins/Actuation	120.0 minutes
OFF on Alarm	Yes ✓ No
Alarm Relay	Yes ✓ No
Reset Alarm	Yes ✓ No
Limit:ON timer	14:51 2016-Jul-11

The default sets **OFF on Alarm** = **No**, some blowdown is usually better than none

If you are using another relay or DO with the **Special Control** = **Alarm Output**, then you can elect to have Relay1 alarm trip that relay or DO

Yes & Submit resets the alarm

Most recent alarm for Relay 1

Refresh Submit

Sidebar:
Obvious Alarm Causes:
Failed or blocked blowdown valve or solenoid, blowdown line inadvertently valved OFF after tower maintenance. If solenoid intermittent, check the static head required to operate.
Faulted or debris blocked blowdown meter for towers using sequential meter control.
Less Obvious Causes:
Undersized bleed as load increases &/or make-up chemistry changes.
Adding more gray water make-up @ higher than expected conductivity.
Failure to adjust bleed setpoints as seasonal changes in make-up chemistry occur.
Self-Inflicted Causes:
Recalibrating a low reading conductivity sensor rather than cleaning it or identifying the cause of the low reading. Sensor subsequently fails to track tower conductivity. This alarm may indicate higher levels of water & inhibitor usage.
Note:
No blowdown ON time may indicate a float stuck ON or partially ON

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2.7 Blowdown Interlocks-Flowswitches

Select the **1** to **9** icon on the home page. This example uses the **Interlocked** page for a boiler blowdown interlock on Relay 4

Select **Interlocked** from the pull-down

An **Interlock** stops a control from turning **ON** when the interlock is **OFF** .

If the control is **ON** when the Interlock turns **OFF**, the control turns **OFF**.

4:Boiler_1_CS ☒

Interlocked ▾

S:Flowswitch	unused ▾
T:Boiler 1 OnLine	Interlock ▾
U:Boiler 2 Online	unused ▾
W:Flowswitch_A	unused ▾
X:Contact set	unused ▾
Y:Contac...	

Refresh

All enabled contact set type inputs are shown on the **Interlocked** page. Select or deselect one or more **Interlock** & **Submit**

In this example, the contact set input @ T must be **ON** for The Boiler 1 blowdown control on Relay 4 to run

Cooling tower feed systems use a common flowswitch to interlock the bleed & all the chemical feeds. Boiler blowdowns typically use a separate interlock for each boiler.

A cooling tower flowswitch typically comes from a CTFS sensor but can be from any digital input device that represents flow

8:Sulfite Feed ☒

Interlocked ▾

Status	Interlock edit
S:Flowswitch	unused ▾
T:Boiler 1 OnLine	Interlock ▾
U:Boiler 2 Online	Interlock ▾
W:Flowswitch_A	unused ▾
X:Contact set	unused ▾
Y:Contact set	unused ▾
Contact set	'OR'ed ▾

Refresh   Submit

In this example pulse output **8** controls a sulfite pump typically feeding into the Deaerator sump.

If either Boiler 1 (**T**) or Boiler 2 (**U**) is online, we want the sulfite pump to be feeding so we select both to **Interlock** & '**OR**' them.

A flowswitch is part of a CTFS serial conductivity sensor. The temperature and flowswitch signals from this sensor must be assigned to phantom inputs. See section 5.6 Sensor Attributes for Phantoms

Selecting more than one Interlock requires you to select '**OR**'ed or '**AND**'ed
OR = Any selected Interlock **ON** turns **ON** the control
AND = All selected interlocks **ON** to turn **ON** the control

---

Sidebar:
Contact sets that are ON are usually CLOSED, but you may invert the ON state to be ON when the contact set is OPEN; Section 7.3

AEGIS II Browser

2.8 Blocking-Delaying a Blowdown

Select the **1** to **9** icon on the home page. This example uses the **Blocked by** page for a Tower bleed block on inhibitor feed

Select **Blocked By** from the pull-down

1:Tower276 Bleed

Blocked by

Blocking stops a control from turning **ON** when the blocking control is **ON** .

More than one block may be selected

Status	Blocking edit
2:Biofeed on 2	unused
3:Inhibitor Feed	Blocks
4:Boiler_1_CS	unused
5:Blr5 Treatment	unused
6:P6 unused	unused
7:Acid Pump	unused
8:Sulfite Feed	unused
9:Dispersant	unused

Refresh   Submit

In this example, the **Inhibitor Feed** pump controlled by Relay **3 Blocks** the bleed to prevent inhibitor from going direct to drain.

Select which controls you wish to Block the bleed & **Submit**

If feeding an oxidant into a common header with other reactive chemicals, you may elect to block the other chemicals from feeding when feeding oxidant

---

Sidebar:
Warning: A poorly conceived block may prevent a control from running or working correctly.
In this example, if the tower is bleed limited or the inhibitor pump undersized & therefore ON for an extended period, bleed control may fault.

You could elect to have the Bleed Control block the Inhibitor Pump & if you set the Bleed Setpoint inside of the float conductivity change, you'll have little effect on Inhibitor Levels.

Bleed then Feed Inhibitor feed controls block the Inhibitor Pump by feeding after the bleed ends.

Blocking inhibitor feed is seldom used on larger circulating volume towers where the feed point is usually remote in time & volume from the bleed point.

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2.9 Blowdown Diagnostics

Select the **1** to **9** icon on the home page. This example uses the Daignostic page for a Tower bleed block on Relay 1

1:Tower276 Bleed ✕

Select **Diagnostic** from the pull-down

Diagnostic ▾

Controlling sensor or control equation. In this example, the ratio of tower conductivity connected to '**A**' & make-up connected to '**F**'

Status	Operational, ON

Status: ON/OFF, blocked, interlocked, alarmed...

Blowdown by: A/F	17.95 cyc

ON time since midnight

Current value of the control sensor or control equation

48.4m ON today	48.4m ON, actuation

This blowdown control is running the **Varying Cycles** special control

ON time in the current bleed cycle. In this example the same as **ON today** time, may indicate a control problem

~~~~~~~~~~~~~~~~~~

Varying Cycles	ON uS Lo Range 350 uS

Refresh

Added special control information. In this example, that we are running in the lowest range of make-up conductivity.

4:Boiler_1_CS ✕

This example is a **Special Control = Captured Sample** boiler blowdown control by the sensor connected to input '**F**'.

Diagnostic ▾

Status	Special Control, OFF

Captured Sample controls only update the value of the controlling sensor @ the end of the **Measure** period

Blowdown by: F	100 uS

ON Setpoint	3000 uS

Why is the conductivity value so low?
Did the sampling valve-selnoid fail to open?
Did it fail to close & are we flashing @ the sensor?
Are we valved OFF upstream?
Did we just start-up & is the boiler cycling up?
Diagnostics provide the information, you supply the context

OFF Setpoint	2990 uS

Control Action	Lower TDS

The blowdown has only been ON 30 seconds today, likely a single Sample- Measure sequence

~~~~~~~~~~~~~~~~~~

0.5m ON today	0.0m ON, actuation

~~~~~~~~~~~~~~~~~~

Captured Sample	ReSample OFF 11.3min

Refresh

Currently in the **ReSample** delay period.
In 11.3mutes, we'll open the blowdown valve-solenoid, **Sample**, close the Valve for the **Measure** period & update the value of '**F**' the controlling conductivity.
Then we'll either **Blowdown** or start another **ReSample** period.

AEGIS II Browser

3   Chemical Feed Controls: Inhibitor, Acid, Oxidant, Amine…

3.1   Water Meter Inhibitor Feed

Select the **1** to **9** icon on the home page. This example uses the **Setup** page for an Inhibitor feed controlled by Relay **3**

Select **Setup** from the pull-down

Feeding using a water meter on the make-up or bleed, is among the most ppm accurate, reliable & easiest to adjust methods for sites with relatively constant feedwater chemistry

3:Inhibitor Feed

Setup

Control Type	Feed
Set Feed Mode	Water meter
Control by:	O:Tower Make-up

Refresh   Submit

Select **Control Type** = **Feed**, select **Set Feed Mode** = **Water meter** & select the **Control by:** water meter, then **Submit**

After **Setup**, go to **Adjust Setpoint** & set for your target chemical ppm, pump setting, meter location…

Measure does not have to be a multiple of the meter setting, the control does the math

3:Inhibitor Feed

Adjust Setpoint

| Measure | 100 G |
| Feed | 12 seconds |

Refresh   Submit

Feed is the pump ON time. estimated based on pump size, stroke & frequency setting or adjusted based on a ppm test result

9:Dispersant

Adjust Setpoint

| Measure | 100 G |
| Feed | 10 ppm |

Refresh   Submit

If using a pulse or frequency controlled pump, each stroke delivers a fixed amount (of Dispersant in this example) so the **Feed** setpoint is in ppm

See Section 8.0 for ml/stroke defaults & adjustments.

Sidebar:
If using a water meter on the bleed & a pulse-controlled pump, the nominal inhibitor ppm in the tower is the Feed setpoint x% active/100; 100% if feeding neat.
See following page for make-up meter example.

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Water Meter Inhibitor Feed continued

It's common to feed inhibitor on the sum of potable-city & gray water make-ups.
If inhibiting for corrosion control, then you may wish to feed more on gray water make-up; increase the grey water meter scaling accordingly.
(A 100G/contact gray meter set to 200G/contact will double the feed).
If inhibiting for scale, then you may wish to feed less inhibitor on gray make-up; decrease the gray water meter scaling proportionately.
(A 100G/contact gray meter set to 50G/contact will halve the feed).
Changing the meter setup will also affect the totalized watermeter reading!

3:Inhibitor Feed ✕

Setup ▾

Control Type	**Feed** ▾
Set Feed Mode	**Water meter** ▾
Control by:	**More than one** ▾

Refresh   Submit

> To feed on the sum of 2 to 4 water meters select
> **Control by: More than one** & **Submit**

> Edit **Control by:** to be the sum of the target meters & **Submit**
> In this example, we're using a potable make @ input '**O**' & a gray water make-up @ input '**R**'

> Removing complex control equations:
> **Submit** a blank **Control by:**
> Sets **Control by:** to **None**

3:Inhibitor Feed ✕

Setup ▾

Status	Reconfigured
Control Type	**Feed** ▾
Set Feed Mode	**Water meter** ▾
Control by:	O+R

Refresh   Submit

Sidebar:
Simplified example: Yes, this begs for an app & likely you have access to one; if not:
An 8 GPD pump with the meter on the make-up & running 4 cycles of concentration feeding a 50% active product & requiring 20 ppm of inhibitor in the recirculating tower water:

100 gallons of make-up needs a 10 ppm (20ppm x 100%/50% / 4 cycles) feed.
An 8 GPD pump feeds   (8 G / (24hr. x 3600 sec/hr.) $92.6E^{-6}$ G/sec.
Every 100 Gallons of make-up we'll need to feed (100G x 10 ppm) $1E^{-3}$ gallons
which @ $92.6E^{-6}$ G/sec feed rate will take ($1E^{-3}$ / $92.6E^{-6}$) 10.8 seconds

There are error sources: How accurate is the % active?
Is 8GPD @ site temperature range & static head? How accurate is the cycle control?…..
This is a first guess; test ppm & adjust.
If this is a start-up, use pump Prime to get to an initial ppm.

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3.2 Sensor Controlled Feeds

Select the **1** to **9** icon on the home page. This example uses the **Setup** page for an Oxidant feed controlled by Relay 2

Setting up a sensor controlled feed has 3 steps: **Setup**, **Configure** & **Adjust Setpoint**

Select **Setup** from the pull-down

2:Oxidant_Control

Setup

Control Type	Feed
Set Feed Mode	Sensor Control
Control by:	D:ORP Sensor

Refresh   Submit

Select **Control Type** = **Feed**, **Set Feed Mode** = **Sensor** & then select the controlling sensor for **Control by:** from the pull-down & **Submit**

2:Oxidant_Control

Configure

Descriptor	Oxidant_Control
Display Units(UOM)	mV
Decimal digits	1
Disable	Yes ✔ No
Control Action	ON increases sensor
Special Control	None

Refresh   Submit

Edit for your site, up to 16 characters

Inherited from the controlling ORP sensor. Unints may be edited, up to 3 characters

Default is the correct Control Action for an oxidant where feeding increases the controlling ORP value. **ON decreases sensor** would be used for a bisulfite, de-chlor control

2:Oxidant_Control

Adjust Setpoint

Status	Setpoint change
On:	300.0 mV
Off:	325.0 mV

Refresh   Submit

Setpoints for an ORP control will vary with site water chemistry & target ppm. Biologicals drive the ORP down. When it's **300** mV the pump turns ON & stays ON until the ORP is **325** mV

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Sensor Controlled Feeds continued

7:Acid Pump

Setup

Control Type	Feed
Mode	Pulse Output
Set Feed Mode	Sensor Control
Control by:	C:pH Sensor

Refresh   Submit

Outputs **6** to **9** may be **Mode** configured as either **Pulse Output** or **ON/OFF Output**. Use Pulse for frequency controlled pumps & ON/OFF for Run/Stop controlled pumps.

In this example, we've configured output **7** for a frequency controlled pump

7:Acid Pump

Configure

Descriptor	Acid Pump
Display Units(UOM)	pH
Decimal digits	2
Disable	Yes ✓ No
Special Control	None
Pump Type	ProMinent 0704
mL/stroke	0.240

Refresh   Submit

If **Mode** = **Pulse Output**, the **Configure** page will show the installed **Pump Type** its nominal **mL/stroke** setting. Default **mL/stroke** assumes 100% stroke Refer to Section 8. for detail on pump selector & settings

7:Acid Pump

Adjust Setpoint

Status	Setpoint change
100%:	7.50 pH
0%:	7.45 pH

Refresh   Submit

Pump speed varies linearly between setpoints with maximum strokes/minute set by **Pump Type**

If **Mode** = **ON/OFF Output**, the **Adjust Setpoint** fields will be **On:** & **Off:**

Sidebar:

WARNING: Reversing setpoint order is blocked for ON/OFF controls but allowed for proportional Pulse controls. Reversing setpoints in this example would convert an Acid feed to a Caustic feed.

NOTE: Relays 6 through 9 set in pulse output mode can be used to drive 4-20mA outputs. This allows the 4-20mA output to use Special Control programs: PID, Time Modulation and Timed Cycling.

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3.3 Proportional Feed
3.3.1   Bleed Based Feed

Bleed & Feed and **Bleed then Feed** are used to feed inhibitor proportional to the tower bleed ON time. Commonly used on smaller towers without a make-up or bleed meter installed.

Bleed & Feed is usually only used when the tower is 'bleed limited', with the bleed undersized and ON for more than 50% of the time.

> Select the **1** to **9** icon on the home page. This example uses the **Setup** page for an Inhibitor feed controlled by Relay 3

> Select **Setup** from the pull-down

> Select **Set Feed Mode** = **Bleed then Feed** or **Bleed and Feed**

> Select **Bleed Control** = the control for the tower bleed, Relay 1 in this example & **Submit**

> The **Adjust Setpoint Bleed then Feed** value is the % of the bleed ON time. Bleed ON for 20 minutes, feeds for 5 minutes after the bleed turns OFF.

> The **Bleed and Feed** value is the % of every 5 minutes of bleed ON time. Bleed ON for 20 minutes, feeds for 1.25 minutes every 5 minutes.

Sidebar:
Bleed then Feed is used to feed cooling tower inhibitor when a make-up meter is not available and the bleed is ON typically for less than 50% of the time that the tower is on-line.

If the tower Bleeds for **X** Minutes, the Inhibitor is fed for a user set % of **X** minutes AFTER the bleed ends. It's a better way to feed inhibitor for small cooling towers than Bleed & Feed since less inhibitor is lost down the drain.

Inhibitor savings averaging more than 20% were measured on a mix of small towers in California simply by switching from **Bleed & Feed** to **Bleed then Feed**.
Reliability:
Bleed then Feed & **Bleed & Feed** controls are only as reliable as the tower bleed solenoid and conductivity sensor. So set bleed limit alarms to trap control faults.

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3.3 Proportional Feed
3.3.2 Time Modulation

Time Modulation allows an ON/OFF pump to operate like a frequency or 4-20mA controlled pump. ON-OFF pumps are typically set to maximum stroke and rate when **Time Modulation** is selected.

Select the **1** to **9** icon on the home page. This example uses the **Configure** page for an Oxidant feed controlled by Relay 2

Select **Configure** from the pull-down

2:Oxidant_Control

Configure

Status	Reconfigured
Descriptor	Oxidant_Control
Display Units(UOM)	mV
Decimal digits	1
Disable	Yes ✓ No
Control Action	ON increases sensor
Special Control	Time Modulate
Period	120 seconds

Refresh   Submit

Setup a sensor based control as shown in **Section 3.2 Sensor Controlled Feeds** then change **Special Control** from **None**

The selection of **Control Action** alters the ON & OFF time calculation in each **Period**

Select **Special Control** = **Time Modulate** And set the Modulation **Period** in seconds & **Submit**

In this example the setpoints are 50mV apart & the **Period** = **120** seconds.
If the current ORP = 320mV then the pump would be ON for 72 seconds
(**120** x (**350**-**320**)/(**350**-**300**)
and OFF for 48 seconds (**120** -72)

The pump would be ON for 120 seconds in every 120 seconds @ the **On:** ORP & OFF for 120 seconds in every 120 seconds @ the **Off:** ORP

2:Oxidant_Control

Adjust Setpoint

Status	Setpoint change
On:	300.0 mV
Off:	350.0 mV

Refresh   Submit

Sidebar:
Time Modulate Special Control is only selectable on Relays 1-5 and 6-9 only when they are set to **Mode** = **ON/OFF Output**.

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3.3 Proportional Feed
3.3.3 Timed Cycling

Timed Cycling allows time for the controlling sensor to measure the effect of chemical before feeding more chemical. **Timed Cycling** is used where a chemical is fed occasionally into a system with a large volume.

It may be several minutes before the chemical travels from the injection point through the piping and sump and then back to the controlling sensor location at the recirculating pump.

Based on the setpoint, the relay will be on for the ON time in each period and off for the remainder of the period. Once the setpoint is reached, the relay will not turn on again until the setpoint calls for chemical. It is either on for the ON Time each period, or off for the complete period.

Select the **1** to **9** icon on the home page. This example uses the **Configure** page for an Oxidant feed controlled by Relay 2

Select **Configure** from the pull-down

Setup a sensor based control as shown in **Section 3.2 Sensor Controlled Feeds** then change **Special Control** from **None**

In this example, if the oxidant value drops below the setpoint, relay #3 will turn on for 60 seconds and then remain off for (600-60) 540 seconds. This will repeat each Period until the ORP value rises above the setpoint. The controller only compares the value with the setpoint at the start of a cycle. Once a cycle starts, the relay will either be on for the On Time or not come on at all.

1. Select **Special Control** = **Timed Cycling**

2. Set **Period** = OFF + **ON Time**, maximum 1800 seconds, 30 minutes

3. Set **ON Time** = maximum feed time in any **Period** & **Submit**

Sidebar:
Often there is a long time delay between adding a chemical and measuring its effect at a sensor which causes setpoint overshoot and poor control.

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3.3 Proportional Feed
3.3.4   PID Controls (Relays 6 through 9 only)

Warning: An incorrectly configured PID control can be unstable or unresponsive when loaded or not. Wide swings in the sensor value can be the result of a poor configuration. If long delays (>5 minutes) exist in your control loop, or you are not experienced in PID control with long delays, we advise that you use a different proportional **Special Control**. **(See section 3.3.2 and 3.3.3)**

Select the 6 to **9** icon on the home page. This example uses the **Configure** page for an Oxidant feed controlled by Relay 7 in pulse mode

Select **Configure** from the pull-down

Setup a sensor based control as shown in **Section 3.2 Sensor Controlled Feeds** then change **Special Control** from **None to PID**

7:Chlor Pump pulse

Configure

Status	Reconfigured
Descriptor	Chlor Pump pulse
Display Units(UOM)	mV
Decimal digits	0
Disable	Yes ✓ No
Control Action	ON increases sensor
Special Control	PID Control
mL/stroke	0.100
Rated SPM	240
Xp Proportnl	20.000 mV
Integral Rate	30 seconds
Diffrnce Rate	15 seconds

7:Chlor Pump pulse

Adjust Setpoint

PID Control   740 mV

Refresh   Submit

PID Control only requires a single **Setpoint**

This example uses a pulse, variable frequency control. Selecting **PID Control** on a relay control adds a **Relay Period** field. The relay ON time is modulated by the PID control

Select **Special Control** = **PID Control**

Never change two or more parameters at the same time. This includes the pump output.

Proportional (band) is the range of control. 20mV (in this example) from the setpoint, the output will be at 100% on and proportionally diminish until at the setpoint, the output will be off.

The Integral rate effects how strongly the output responds to the error based on the amount of time the process and setpoint are different. A larger value will have less effect. Zero is off. Rule of thumb; set equal to 1.5x or 2x lag time.

Lag Time: Difference from the moment the chemical is added until the probe sees a change.

The difference rate is based on the rate of change in the process. Set for 0 (zero is off) and if the output has an oscillation that cannot be stopped using P and I, start to increase D slowly. 99% of customers will not need this parameter. Do not exceed 0.2x lag time.

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3.4 Base Feed

Base Feed is usually interlocked with a tower flowswitch or the boiler run contact set & feeds chemical continuously while the flowswitch is ON or boiler on-line.

Select the **1** to **9** icon on the home page. This example uses the **Setup** page for a Dispersant feed controlled by pulse output **9**

9:Dispersant

Setup

Select **Setup** from the pull-down

Control Type	Feed
Mode	Pulse Output
Set Feed Mode	Base Feed

1. Select **Control Type** = **Feed**
2. Select **Mode** = **Pulse Output**
3. Select **Set Feed Mode** = **Base Feed** & **Submit**

Refresh   Submit

9:Dispersant

Adjust Setpoint

| Base Feed | 10.0 mL/minute |

Refresh   Submit

Then **Adjust Setpoint** & **Submit** The pump type & ml/stroke are viewed - selected on the **Configure** page.

9:Dispersant

Setup

Control Type	Feed
Mode	ON/OFF Output
Set Feed Mode	Percent Time

Refresh   Submit

Relay 1-5 controlled base feeds are the same as Pulse 6-9 outputs configured **Mode** = **ON/OFF output** with **Set Feed Mode** = **Percent Time** & **Submit**

Then **Adjust Setpoint** & **Submit** For ON/OFF **Percent Time** controls, the Setpoint = ON time in every 5 minutes. In this example 25% = 75 seconds ON in every 300 seconds

9:Dispersant

Adjust Setpoint

| Percent Time | 25.0 % |

Refresh   Submit

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3.5 Control During Events

3:Oxidant_Feed

Select the **1** to **9** icon on the home page. This example uses the **Setup** page for an Oxidant feed controlled by Relay **3**

Setup

Select **Setup** from the pull-down

Control Type	Feed
Set Feed Mode	Sensor Control
Control by:	G:CBR Bromine

Events only exist on the pull down if **Control Type** = **Feed Set Feed Mode** = **Sensor Control** & the control is an oxidant, **Bromine** in this example

Refresh   Submit

Feed **Events** are set as detailed in the following Section 4.0

3:Oxidant_Feed

Events

Day 2   2 Events weekly

| Event Cycle | Weekly |
| Select Activity | Edit an Event |

Application flexibility:
1. **Event Control** = **No** works like normal biofeed feed event, feeding @ the current pump setting for the event duration.
2. Typically, the event setpoint would be higher than the non-event setpoints. But the control also works with event setpoints less than non-event setpoints

Select for Edit & Delete

Day 2 @ 11:45 for 5 minutes

Values for Add & Edit

3:Oxidant_Feed

Adjust Setpoint

| On: | 2.0 ppm |
| Off: | 2.1 ppm |

Refresh   Submit

Start Day	2 1-7
Start Time	11:45 HH:MM
ON Time	5 minutes

Adjust Setpoint controls the Relay 3 Oxidant Feed using these setpoints until an **Event** occurs.

| Event frequency | Once / Alternate Days / Daily |
| Event Control | ✓ Yes   No |

During an **Event**, if **Event Control = No,** the control is ON for the Event period with no setpoint controls

| ON Setpoint | 5.0 ppm |
| OFF Setpoint | 5.5 ppm |

During an **Event**, if **Event Control = Yes** these setpoints control

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3.6 Limiting Feed & Alarms

Feed Limits are used both to prevent sensor controlled overfeeds & to block the effect of errors in adjusting feed rates or setpoints.
Configure both the alarm & response to the type of chemical & how you are controlling the feed.

Select the **1** to **9** icon on the home page. This example uses the **Alarms** page for an Inhibitor feed controlled by relay output 3

Select **Alarms** from the pull-down

3:Inhibitor Feed

Alarms

You're usually not concerned about extended feed periods with inhibitors, so **Mins/Actuation** typically set to never trip

At the expected usage for this size tower @ max. load, cumulative feed over 4 hours/day indicates either a control problem or setpoint error.
When **Minutes/Day** is exceeded, feed stops.

Mins/Actuation — 500.0 minutes

Minutes/Day — 240.0 minutes

Midnight reset — ✓ Yes / No

Inhibitor feeds usually set **Midnight Reset** = **Yes**, which auto resets alarms @ midnight allowing another **240.0 minutes** of feed in the following day

Alarm Relay — Yes / ✓ No

If you are using another relay or DO with the **Special Control** = **Alarm Output**, then you can elect to have Relay 3 alarm trip that relay or DO

Reset Alarm — Yes / ✓ No

Select **Reset Alarm** = **Yes** & **Submit** to clear alarms (see Sidebar)

Limit: Time/Day — 12:16 2015-Feb-22

Refresh   Submit

Most recent alarm & it's type, if any. This one's a year old so we're not frequently alarming

---

Sidebar:
Unlike Blowdown controls, Feed controls stop feeding when alarmed.
If alarmed on **Mins/Actuation**, the alarm ends the **Actuation** period,
so **Reset Alarm** = **Yes** & **Submit** re-starts the feed.

If alarmed on **Minutes/Day**, **Reset Alarm** does not restart the feed because we've still exceeded the **Minutes/Day** limit. If you need to continue to feed, increase the **Minutes/Day** limit.

In either case. The alarms are either set too tight, operating conditions may have changed or there is a control-pump-feed-sensor problem.

Limiting Feed & Alarms continued

Alarms on feeds for acid, caustic or oxidants that are not tripping because they are set too tight to the normal operating or seasonal variation, usually indicate a maintenance response is required.

Make-up water chemistry may have changed. Towers may have added a gray water make-up or boilers may have deaerator problems or contaminated condensate return.
Sensors age, foul & drift. Meter wiring may be sharing conduit with power wiring…

Frequency controlled pumps 6-9 have alarms set by pumped volume

7:Acid Pump

Alarms

Depending on the controlling sensor & the type of control, a sensor fault may cause the pump to ramp to maximum. This is the type of fault trapped by the **vol.@MAX spm** alarm

vol.@ MAX spm — 0.5 G

Volume/Day alarms stop feed on the volume pumped from midnight.
It would be prudent to use both alarms on an acid feed control

Volume/Day — 12.7 G

Midnight reset — Yes / **No**

Base Feed, PID & proportional feed controls may never completely turn OFF so Actuation volume alarms are less effective with frequency controlled pumps.

Acid feeds usually set **Midnight Reset = No**.
If you are alarming, find the cause & correct

Alarm Relay — **Yes** / No

Reset Alarm — Yes / **No**

Refresh   Submit

Sidebar:
Feed controls stop feeding when alarmed.
If alarmed on **vol.@MAXspm**, the alarm ends feed cycle,
so **Reset Alarm = Yes** & **Submit** re-starts the feed.

If alarmed on **Volume/Day**, **Reset Alarm** does not restart the feed because we've still exceeded the **Volume/Day** limit. If you need to continue to feed, increase the **Volume/Day** limit.

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3.7 No Feed on No Flow

Select the **1** to **9** icon on the home page.
This example uses the **Interlocked** page for a
Boiler treatment feed controlled by relay output 5

Select **Interlocked**
from the pull-down

5:Blr5 Treatment

Interlocked

In this example, when the contact set @ input '**U**'
Boiler 2 Online is **ON** then the relay **5**
feed control runs.

Status	Interlock edit
S:Flowswitch	unused
T:Boiler 1 OnLine	unused
U:Boiler 2 Online	Interlock
W:Flowswitch_A	unused
X:Therm_Flowswitch	unused
Y:Contact set	unused

Refresh   Submit

Select **Interlock** @ the target input & Submit

In this example relay output 3 controls an inhibitor pump.

If both **Flowswitch** (**S**) and **Low_Level** (**U**) are **ON**,
we want the inhibitor to be feeding
so we select both to **Interlock** & '**AND**' them.
(Avoiding both a loss of prime & pumping dry.)

3:Inhibitor Feed

Interlocked

Status	Interlock edit
S:Flowswitch	Interlock
T:Boiler 1 OnLine	unused
U:Low_Level	Interlock
W:Flowswitch_A	unused
X:Therm_Flowswitch	unused
Y:Contact set	unused
Contact set	'AND'ed

Refresh   Submit

Selecting more than one Interlock requires you
to select '**OR**'ed or '**AND**'ed
OR = Any selected Interlock **ON** turns **ON** the control
AND = All selected interlocks **ON** to turn **ON** the control

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3.8 Blocking-Delaying a Feed

Select the **1** to **9** icon on the home page. This example uses the **Blocked by** page for an Inhibitor feed controlled by relay output 3

Select **Blocked** from the pull-down

3:Inhibitor Feed

Blocked by

Status	Blocking edit
1:Tower276 Bleed	unused
2:Oxidant_Control	Blocks
4:Boiler_1_CS	unused
5:Blr5 Treatment	unused
6:P6 unused	unused
7:Acid Pump	unused
8:Sulfite Feed	unused
9:Dispersant	unused

Refresh   Submit

Blocking stops a feed control from turning **ON** when the blocking control is **ON** .

More than one block may be selected

In this example, the **Oxidant_Control** pump controlled by Relay 2 **Blocks** the **Inhibitor Feed** on Relay 3 to prevent degrading the inhibitor in the common feed header

Select which controls you wish to Block the **Inhibitor Feed** & **Submit**

If feeding inhibitor controlled by a make-up meter or Bleed_then_Feed…. & the **Oxidant_Control** blocks, owed inhibitor feed occurs when the **Oxidant Control** turns OFF

Sidebar:
Warning: A poorly conceived block may prevent a control from running or working correctly.

In this example, if the **Oxidant_Control** runs long because the chlorine demand is not met or the control setpoints are set too far apart, inhibitor levels in the recirculating water may fault.

Generally (dependent on tower size, injection point & siting), once you've met the initial chlorine demand, setting ORP setpoints 5-10mV apart should result in short oxidant feed periods.

If you have a large inhibitor pump &/or short inhibitor feeds, you could get the same result by blocking the **Oxidant_Control** with the inhibitor pump.

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3.9 Feed Diagnostics

Select the **1** to **9** icon on the home page. This example uses the **Diagnostic** page for an **Acid Pump** controlled by pulse output **7**

Select either the I/O icon on the home page or **Diagnostic** from the pull-down

7:Acid Pump

Diagnostic

Diagnostic provides both configuration & state detail on one page

Status	Operational,ON
Feed by: C	7.32 pH
100%ON Setpoint	7.50 pH
OFF Setpoint	7.25 pH
Control Action	Between Sets
~~	
Volume today	0.288G

Control state

Location of controlling sensor, '**C**' & value of the control.

Current setpoints

Feed state

Refresh

5:Blr5 Treatment

Diagnostic

Control state

Location of controlling sensor, '**O**' & value of the control.

Current setpoints

Note that **1400**G / **100**G x **10**sec = 2.33 minutes. But pump ON for **240.4** minutes today, so feed mode must have been changed.

Status	Operational,ON
Feed by: O	1400 G
Measure volume	100 G
and Turn ON for	10 seconds
Last fed	1400 G
~~	
240.4m ON today	0.3m ON, actuation
Time Owed	2.0 min

Volume feed state

In this example: We've measured volume but have not fed all the time required, so there is **Time Owed**

Refresh

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Feed Diagnostics continued

3:Inhibitor Feed ✕

Diagnostic

Status	Special Control,ON
5.7m ON today	5.7m ON, actuation
~~	
Bleed then Feed	Bleed OFF Feed 7475 sec

Refresh

Control state: In this example, the **Bleed then Feed Special Control** is controlling Relay **3**

The **Bleed** is now **OFF** & we owe **7475** seconds of pump run time. Is a 2 hour bleed cycle normal for this site or does it indicate a problem?

Control state: In this example, the **Percent Time Special Control** is controlling **9** configured as an ON/OFF output

9:Dispersant ✕

Diagnostic

Status	Special Control,ON
130.7m ON today	0.7m ON, actuation
~~	
Percent Time,25%	Countdown: 33 seconds

Refresh

We're in the ON state for another 33 seconds of the 5 minute cycle. **25%** of 5 minutes = 75 seconds

3:Inhibitor Feed ✕

Diagnostic

Status	Interlocked S,OFF
Feed by: O	2100 G
Measure volume	100 G
and Turn ON for	10 seconds
Last fed	2100 G
~~	
130.8m ON today	0.0m ON, actuation

Refresh

Control state: In this example, the Inhibitor feed on relay **3** is controlled by the meter @ input 'O' is **OFF** because the Flowswitch @ input 'S' is **OFF** (**S Interlocks 3**)

If 'O' measures volume while interlocked, the feed for the measured volume will occur when 'S' turns ON

2:Oxidant_Control ✕

Diagnostic

Status	Blocked by 3 ,OFF
2.5m ON today	0.0m ON, actuation

Refresh

Control state: In this example, the **Oxidant Control** by relay **2** is Blocked & OFF when Relay **3** turns ON

AEGIS II Browser

4 Biocide Events & Other Controls: Feeding by Time & Date

4.1 Setting & Viewing Events

Select the **1** to **9** icon on the home page.
This example uses **Bioicide A**
controlled by relay **5**

Select **Setup** from the pull-down
& after **Submit**, select **Events**

5:Biocide A

Setup

Control Type   **Events-Other**

Select **Control Type** = **Events-Other**
& **Submit**

Refresh   Submit

Daily, **Weekly** & **28 Day** programs can be mixed
in one controller.
Oxidants typically fed weekly with two organic biocides more
commonly fed on alternating weeks using a 28 day program
Dispersants may be fed daily

Day# in the current 28 day cycle.
Monday, **Day 2** in this example
May be reset to the current Sunday,
See Section 10.7

A new biocide control will
have **0 Events** set

5:Biocide A

Events

Day 2	0 Events weekly
Event Cycle	**Weekly**
Select Activity	**Add an Event**
Start Day	2
Start Time	7:00 HH:MM
ON Time	20 minutes
Event frequency	Once / **Alternate Days** / Daily

Reset   Submit

Events repeat
Daily, **Weekly** or every **28 Days**
Select the required **Event Cycle**.

Select Activity = **Add an Event**

In this example, the first event
occurs on Monday, day **2**
starting @ **7:00** AM
& feeding for **20** minutes

In this example, we're also adding feed events on
Wednesday, Friday & Sunday by selecting
Alternate Days & **Submit**

Sidebar:
Relay 1-5 and ON-OFF 6-9 controls have timed events = **ON Time**.
Pulse-frequency controls 6-9 have volume feed events = **Volume**.

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Setting & Viewing Events continued

5:Biocide A ✕

Events

Day 2	4 Events weekly
Event Cycle	Weekly
Select Activity	Edit an Event

Select for Edit & Delete

Day 1 @ 07:00 for 20 minutes

Values for Add & Edit

Start Day	1 1-7
Start Time	7:00 HH:MM
ON Time	20 minutes
Event frequency	Once / Alternate Days / Daily

Reset   Submit

In the previous page's example, 4 feed events on Monday, Wednesday, Friday & Sunday were added on **Submit**

Select Activity to
Edit an Event
Delete an Event
Delete All Events
Or
Add an Event (see previous page)

Pull down this selector to view all of the events for this control
&
to select an event for Editing or Deleting

If **Select Activity** = **Edit an Event** or **Add an Event** the values in these fields are set on **Submit**.

Sidebar:
Limit Alarms, Interlocking & Blocking also are used with Biocide Events.
They are set identically to those for **Chemical Feed Controls**.
Refer to Sections 3.5 to 3.7 for setup & state pages.

Biocide feeds are always interlocked with the tower flowswitch.

Timed & Volume events can also be used to wash sensors, flush sumps,
block other controls for event times….

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4.2 Prebleed – Lockout

5:Biocide A [x]

Configure

Status	Reconfigured
Descriptor	Biocide A
Disable	Yes ✓ No
Special Control	Prebleed Lockout
Lockout	120 minutes
Prebleed	30 minutes
Prebleed Sensor	A:Tower Conduct.
Prebleed OFF	750 uS
Blowdown Relay	1:Tower276 Bleed

Refresh   Submit

Select Configure on the Biocide Event control to setup **Prebleed Lockout**

Select **Special Control** = **Prebleed Lockout** & **Submit**.
Then set-adjust the following parameters

Lockout is the time that the **Blowdown Relay** is blocked. Includes the Event time. Set = 0 for no **Lockout**.

Prebleed is the time that the **Blowdown Relay** is forced ON to lower the recirculating water conductivity before the Event runs. Set = 0 for no **Prebleed**.

Prebleed Sensor is the selected conductivity sensor which is used to limit the **Prebleed** time to **Prebleed OFF**. It's optional, however its use prevents wasting treated recirculating water

Blowdown Relay is the location of the tower bleed for this biocide control.

Sidebar:

Prebleed-Lockout is used to prevent to tower from making up during & diluting the biocide concentration. Use is determined by biocide type & required concentration-residence time

Prebleed is typically used for cycles limited towers with **Lockout** more common on towers inhibited for corrosion control. Few sites need to use both.

Prebleed costs both water & its inhibitor, but there may be no choice if hardness cycles limited. **Lockout** has a lower cost but not applicable for many sites.

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4.3 Alarm Relay

Select the control# icon from the right side of the home page

5:Alarm_Relay ☒

Setup

Select **Setup** from the pulldown

Control Type   Events-Other ▾

Verify **Control Type** = **Events-Other**

Refresh   Submit

Then select **Configure** from the pulldown

5:Alarm_Relay ☒

Configure ▾

Descriptor	Alarm_Relay
Disable	Yes ✓ No
Special Control	Alarm Output ▾

Set **Special Control** = **Alarm Output** & **Submit**

Refresh   Submit

Sidebar:
If **Special Control = Alarm Output** is set for a pulse-frequency control (6 to 9), the control is converted to an ON/OFF control on **Submit**.

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4.4 Sensor Wash

Sensor Wash is useable for systems-sites where all of the sensors are installed in a common header.

Sensor Wash locks all of the sensor values prior to starting the wash event, blocking alarms & unexpected sensor values on the HMIs.
If concerned about other controls running during a wash, block (Section 3.7) the controls.

Select the control# icon from the right side of the home page

5:Sensor_Wash

Configure

Select **Configure** from the pulldown

Status	Reconfigured
Descriptor	Sensor_Wash
Disable	Yes ✓ No
Special Control	**Sensor Wash**
Wash END delay	300 seconds

Sensor_wash is only available on controls
Control Type = **Events-Other**

Select **Special Control = Sensor Wash** & **Submit**

Then edit **Wash END delay** & **Submit**

Refresh   Submit

Wash END delay is the time after the washing event has ended that sensor vlaues remain locked to allow recovery from washing

5:Sensor_Wash

Events

Status	No Events set
Day 1	0 Events daily
Event Cycle	**Daily**
Select Activity	**Add an Event**
Start Time	7:00 HH:MM
ON Time	20 minutes
Event frequency	**Once** / **Alternate Hours** / **Hourly**

Reset   Submit

Sensor Wash events are set like all other feed events on either time
(Relay controls 1 to 5 & ON/OFF Pulse controls)
or pumped volume
(Pulse controls 6 -9).

5   Sensors: Conductivity, pH, ORP, Corrosion, 4-20mA…

5.1   Sensor Calibration:
5.1.1   Single Point – Grab Sample

Select the A to N icon on the home page or the CAL icon below the A-N icons.
This example calibrates conductivity sensor connected to input 'A'

A:Tower Conduct.   ✕

Calibrate

If using the A to N icon, select
Calibrate from the pulldown

Enter value   1650 uS

Grab sample from the sensor header & enter
measured conductivity & select Calibrate

Factory Reset   Yes   ✓ No

Calibrating locks out the local keypad user so that
both users are not calibrating @ the same time.
Cancel to remove the lock & exit calibration

Calibrate   Cancel

A:Tower Conduct.   ✕

Calibrate

Status   Calibrated

In this example we edited the current
1650 uS to measure 1700 uS

Enter value   1700 uS

Factory Reset   Yes   ✓ No

Exit by selecting Cancel @ the end of Calbration
or you'll lock out keypad calibration for this sensor for 15 minutes.

Calibrate   Cancel

A:Tower Conduct.   ✕

Calibrate

Single point, grab sample calibration is typically used
for controlling sensors which need to be accurate at
the single point used for control

Status   Out of Range!

Sensor   3000 uS

Each sensor type has calibration limits which usually indicate a sensor
or installation problem, but not always.
If you get an error message you can ignore it by
Calib. Override = Yes & Submit

Calib. Override   Yes   ✓ No

Factory Reset   Yes   ✓ No

Factory Reset = Yes & Submit restores the sensor to its default values.
Useful for pH, ORP & Conductivity sensors.
New sensor value may indicate fouling or end-of-life state
or allow you to recover from a faulted calibration procedure

Cancel   Re-Calibrate   Submit

Cancel leaves the sensor vlaue unchanged,
Removes the lock out on keypad calibration &
exits.

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5.1 Sensor Calibration:
5.1.2 DPD: Oxidant Sensors

Select the **A** to **N** icon on the home page or the **CAL** icon below the A-N icons. This example calibrates chlorine sensor connected to 4-20mA input C

C:CLE3 Chlorine

Calibrate

If using the **A** to **N** icon, select **Calibrate** from the pulldown

DPD Sample & START

Grab sample from the sensor installation header & press **Start**

Factory Reset Yes ✓ No

Start saves the current value of the sensor for use when you complete the DPD test.

Start   Cancel   Submit

This page locks out the keypad sue from claibratiin he sensor @ '**C**'. **Cancel** to exit the page & unlock.

C:CLE3 Chlorine

Calibrate

When you have the result of the DPD test, edit the displayed value & **Calibrate**

CLE3 Chlorine 2.35 ppm 14sec

Calibrate   Refresh   Cancel

Use **Cancel** to exit the DPD calibration

Refresh shows the time since the value @ **Start** was captured

C:CLE3 Chlorine

Calibrate

Status Calibrated

Calibrate shows 'Calibrated' on success. **Cancel** to exit

DPD Sample & START

Factory Reset Yes ✓ No

Factory Reset = **Yes** & **Submit** restores the 4-20mA-to-ppm conversion to its factory default

Start   Cancel   Submit

if you get a calibration error message you can ignore it by **Calib. Override** = **Yes** & **Submit** or re-calibrate by selecting **Start**

Sidebar:
The DPD calibration applies to CLB, CTE & CLE3 Chlorine, CGE, CBR Bromine & PAA Peracetic sensors. All of these sensors connect to 4-20mA input driver cards. The G input does not have the necessary voltage to power a loop for the ProMinent amperometric sensors.
ProMinent does not recommend ORP sensor calibration. If the sensor is not tracking, clean with a mild acid. The Offset may be adjusted +/- 40mV if necessary. Rather, consider changing the setpoint. There are many non-oxidants that affect ORP sensors falsely.

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5.1 Sensor Calibration:
5.1.3 Boiler Conductivity

Select the **A** to **N** icon on the home page or the **CAL** icon below the A-N icons. This example calibrates the boiler conductivity sensor connected to input **E**

E:Boiler Cond.

Calibrate

If using the **A** to **N** icon, select **Calibrate** from the pulldown

Measure Conductivity	then 'Start'

The blowdown control is using **Special Control** = **Captured Sample**. **Calibration** includes services to verify the sensor installation

Factory Reset	Yes ✓ No

Select **Start** once you have an un-flashed sample to initiate the **Sample – Measure** sequence

Start   Cancel   Submit

Select **Cancel** to exit **Calibration**. Removes the calibration lockout for the keypad user & the calibration state from the blowdown valve control

E:Boiler Cond.

Calibrate

ON ,Sample 24sec	3477 uS

Use **Refresh** to see the conductivity increase during the Sample period. Low or varying conductivity indicates flashing. No change may indicate no-sample

Calibrate   Refresh   Cancel

If you elect to edit the displayed conductivity & **Calibrate** before the end of **Sample - Measure**, the previous value conductivity will be used to calibrate.

E:Boiler Cond.

Calibrate

OFF,Measure 48sec	3477 uS

Calibrate   Refresh   Cancel

If you edit the displayed conductivity & **Calibrate** after the end of **Measure**, the current, updated value conductivity will be used to calibrate.

Refresh during the **Measure** interval should show a stable & falling conductivity, verifying that the valve-solenoid has closed & that the sample is cooling a fixed & repeatable amount

E:Boiler Cond.

Calibrate

Status	Calibrated

Successful **Calibration**. Select **Cancel** to exit & remove keypad calibration lock-out

Measure Conductivity	then 'Start'

If an error message results, you can set **Calib. Override** = **Yes** & Submit or **Start** to re-calibrate

Factory Reset	Yes ✓ No

Start   Cancel   Submit

AEGIS II Browser

5.1. Sensor Calibration:
5.1.4   pH Dual Buffer Calibration   1 of 2

Select the **A** to **N** icon on the home page or the **CAL** icon below the A-N icons.
This example calibrates the pH sensor connected to input C

C:pH Sensor

Setup

If using the **A** to **N** icon, select **Setup**
from the pulldown to verify **2 Point**

Descriptor	pH Sensor
Display Units(UOM)	pH
Decimal digits	2
Calibrate	2 Point
Used by I/O	L,

Reset   Submit

pH sensor calibration defualts to single point.
To do a 2 buffer pH calibration
select **Calibrate** = **2 Point** & **Submit**.
Then select **Calibrate** from the pull down

Caution: Sensor Removal
Always close the sensor piping
upstream valve first.
pH, ORP sensors & sensor with
membranes may fail
on the high transient pressure
caused by quickly closing
the downstream valve first.

Press **Start**.
Remove the pH sensor & place in the 1st buffer.
Calibration defaults to 7 & 10 buffers.
If you are not using a 7 buffer,
edit the buffer value before **Start**.

C:pH Sensor

Calibrate

1st pH buffer	7.00 pH
Factory Reset	Yes ✓ No

Start   Cancel   Submit

Start locks the pH value for control and
alarms during the 2 buffer clibrate sequence

Select **Cancel** to exit **Calibration**.
Removes the calibration lockout for the keypad user
& unlocks the frozen value of pH

The selected 1st buffer in this
example is the default **7.00**

C:pH Sensor

Calibrate

7.0 Buffer	7.04 pH 31sec
Factory Reset	Yes ✓ No

Next   Refresh   Cancel

Refresh until the pH is stable
& close to the buffer value.
Then press **Next.**

Select **Cancel** to exit **Calibration**.

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5.1 Sensor Calibration:
pH Dual Buffer Calibration 2 of 2

C:pH Sensor

Calibrate

7.0 Buffer	7.05 pH
2nd pH buffer	10.00 pH

Next   Cancel

Results from 1st buffer

If you are not using a 10 buffer,
edit the buffer value before **Next**.

Select **Cancel** to exit **Calibration**.

C:pH Sensor

Calibrate

7.0 Buffer	7.05 pH
10.0 Buffer	9.61 pH 25sec
Factory Reset	Yes ✔ No

Calibrate   Refresh   Cancel

Refresh until the pH is stable
& close to the 2nd buffer value.
Then press **Calibrate.**

C:pH Sensor

Calibrate

Status	Calibrated
1st pH buffer	7.00 pH
Factory Reset	Yes ✔ No

Start   Cancel   Submit

Successful calibration.
Press **Cancel** to exit **Calibration**.

On error message, select
Calib. Override = **Yes** & **Submit**
Or
Re-calibrate to do over
Or
Cancel to exit leaving the current
pH value unchanged

C:pH Sensor

Calibrate

Status	Out of Range!
7.0 Buffer	7.05 pH
Sensor	10.00 pH
Calib. Override	Yes ✔ No
Factory Reset	✔ Yes No

Cancel   Re-Calibrate   Submit

Note: Two buffer pH calibration seldom results
in better pH control than single point,
grab sample calibration, but may be required
by site practice

AEGIS II Browser

5.1 Sensor Calibration:
5.1.5 4-20mA Input Loop Calibration 1 of 3

4-20mA inputs may be single or two point calibrated if they do not require a DPD test.
Both options calibrate the sensor represented by the 4-20mA input & not the underlying 4-20mA current loop.
For example: If calibrating a 4-20mA Temperature sensor, you are correcting the sensor to read the current measured Temperature test.

Select the **A** to **N** icon on the home page or the **CAL** icon below the A-N icons. This example calibrates the 4-20mA sensor connected to input G

G:4-20mA Input

Setup

If using the **A** to **N** icon, select **Setup** from the pulldown & check **Calibrate = 1 Point**

Descriptor	4-20mA Input
Display Units(UOM)	C
Decimal digits	2
Calibrate	1 Point
Disable	Yes ✓ No
Sensor Type	Other
20mA Value	100.00 C
4mA Value	0.00 C

Reset   Submit

Once a sensor has been selected for control by a relay, the Setup menu changes. 'Sensor Type' will not be seen. In its place is a Used by note depicting the relay being controlled.

See section 3.2 Sensor Controlled Feeds. Choose a different sensor to release this sensor setup page. **Remember to return the sensor selection when done.**

1:Acid Pump

Setup

Control Type	Feed
Set Feed Mode	Sensor Control
Control by:	E:pH Sensor

C:Free Chlorine
D:CTE Chlorine
E:pH Sensor
F:ORP Sensor

Minimum ON time

Used by I/O   2,

In this example we're going to single point **Calibrate** a **Sensor Type = Other**

G:4-20mA Input

Calibrate

Status	Calibrated
Enter value	48.50 C
Factory Reset	Yes ✓ No

Calibrate   Cancel

G:4-20mA Input

Calibrate

Enter value	50.01 C
Factory Reset	Yes ✓ No

Calibrate   Cancel

Edit the sensor value & **Calibrate**
Status = Calibrated & displays new value

Cancel To exit & to unlock keypad calibrate access

AEGIS II Browser

5.1   Sensor Calibration:
4-20mA Input Loop Calibration 2 of 3

On this page we are 2 point calibrating a 4-20mA Temperature sensor.
Verify the **Setup** page **Calibrate** = **2 Point** & select **Calibrate** from the pull down.

In this example we're going to 2 point Calibrate a
Sensor Type = Other which requires (in this example)
that you either put the temperature sensor into
2 solutions of differing temperatures
OR use a 4-20mA current loop emulator

G:4-20mA Input

Calibrate

Enter 1st value	25 C
Calibrate 4-20mA	Yes ✓ No
Factory Reset	Yes ✓ No

Start   Cancel   Submit

Enter the first temperature & **Start**
(In this example, spanned 0-100C, 8mA = 25C)

G:4-20mA Input

Calibrate

First value	30.11 C
Enter 2nd value	50.00
Calibrate 4-20mA	Yes ✓ No
Factory Reset	Yes ✓ No

Calibrate   Refresh   Cancel

Move the sensor or modify the loop current, entre
the 2nd temperature & **Calibrate**
(In this example, spanned 0-100C, 12mA = 50C)

G:4-20mA Input

Calibrate

Status	Calibrated
Enter 1st value	50.00 C
Calibrate 4-20mA	Yes ✓ No
Factory Reset	Yes ✓ No

Start   Cancel   Submit

Status = **Calibrated** & displays most recent value

Sensor type = **Other**
Always calibrates.
Understandably, there are no
calibration limits for
'**Other**' sensors

Cancel to exit & to unlock
keypad calibrate access

AEGIS II Browser

5.1 Sensor Calibration:

You'll rarely need to calibrate the underlying 4-20mA current loop.
However, if **Setup** page **Sensor type** = **Other** and **Calibrate** = **2 Point** you can calibrate the underlying 4mA & 20mA levels as follows:

You'll need either a current loop emulator
Connected to input '**G**' (in this example)
or the means to switch the current loop
to 4mA & then to 20mA

G:4-20mA Input

Calibrate

Enter 1st value	50.04 C
Calibrate 4-20mA	✓ Yes No
Factory Reset	Yes ✓ No

Start   Cancel   Submit

Set **Calibrate 4-20mA** = **Yes** & Submit

G:4-20mA Input

Calibrate

| Connect 4mA test | & Start |
| Factory Reset | Yes   ✓ No |

Start   Cancel   Submit

Set the current loop @ '**G**'
to 4mA & **Start**

G:4-20mA Input

Calibrate

Connect 4mA test	4.00 mA measured
Connect 20mA test	& Next
Factory Reset	Yes ✓ No

Next   Refresh   Cancel

Set the current loop @ '**G**'
to 20mA & **Next**

G:4-20mA Input

Calibrate

Connect 4mA test	4.00 mA measured
Connect 20mA test	20.00 mA measured
Factory Reset	Yes ✓ No

Calibrate   Refresh   Cancel

Select **Calibrate** to complete

The measured 4 & 20 levels are the actual
currents at input 'G'.
If they are not nominally
4 & 20mA, then that may indicate why you
are calibrating input 'G' or you may have an
emulator problem

Status = **Calibrated** on success
or error message

G:4-20mA Input

Calibrate

Status	Calibrated
Enter 1st value	100.40 C
Calibrate 4-20mA	Yes ✓ No
Factory Reset	Yes ✓ No

Start   Cancel   Submit

Cancel to exit & to unlock
keypad calibrate access

AEGIS II Browser

5.1 Sensor Calibration:
5.1.6 Inventory

K:Inhibitor_Tank

Setup

Status	Reconfigured
Descriptor	Inhibitor_Tank
Display Units(UOM)	G
Decimal digits	2
Disable	Yes ✓ No

Reset Submit

Phantom inputs do not physically exist; you can't wire to them. They are of two types: Analog values in the 'K' to 'N' space & volumes-contact sets in the 'W' to 'Z' space. This example, uses 'K' as a tank level

Input 'K' has **Compensation** set to **Inventory**

K:Inventory

Configure

Compensation	Inventory
O:Tower Make-up	unused
P:Feedwater	unused
Q:Tower blowdown	unused
R:Grey Water add	unused
V:Water meter	unused
Z:Water meter	unused
6:Inhibitor Pump	Target Output
8:ORP pid	unused

Reset Submit

Inventory subtracts the volume pumped by pulse controls and/or the volume measured by displacement metering on the pump head from the user set volume

In this example, the volume pumped by pulse control '**6**' lowers the tank level

Phantoms are logged, alarmed & can be used for controls. In this example, likely only a low tank level alarm is used

K:Inventory

Calibrate

Enter value	99.99 G

Calibrate Cancel

When the tank is refilled, edit **Enter Value** & **Calibrate** to set the current tank level

Cancel to exit & to unlock keypad calibrate access

AEGIS II Browser

5.1 Sensor Calibration:
5.1.7 LSI & Manual Inputs   1 of 2

L:LSI

Calibrate

Alkalinity	95 ppm
Factory Reset	Yes ✓ No

Calibrate   Cancel

> LSI (Langelier Saturation Index) **Compensation** was selected for phantom sensor input 'L'
> **Calibrate** prompts for those values not measured by the controller

> In this example both the pH & conductivity are measured by controller sensors, so only 2 parameters are required to calculate the LSI. (Temperature always measured by the controller)

> Measure **Alkalinity**, edit & **Calibrate**

L:LSI

Calibrate

CaCO3 Hardness	75 ppm
Factory Reset	Yes ✓ No

Calibrate   Refresh   Cancel

> Measure **Hardness**, edit & **Calibrate**

L:LSI

Calibrate

Status	Calibrated
Alkalinity	95 ppm
Factory Reset	Yes ✓ No

Calibrate   Cancel

> Calibration completes.
> LSI recalculated.
>
> **Cancel** to exit & to unlock keypad calibrate access

Sidebar:
Ryznar Stability Index or 'Ryznar' is a generalized measure of scaling-corrosivity
& calculated concurrently from the same parameters & sensors as LSI.
The Ryznar value is displayed on the LSI **Diagnostics** page
& Ryznar alarms are set on the LSI **Alarms** page

Manual LSI values are clamped to block measure-entry errors;
Alkalinity: 30 to 140 ppm   Hardness: 50 to 400 ppm
Conductivity: 100 to 10,000 uS   pH: 6 -10
If you enter a value outside of the range, the value is set to the closest range limit.

AEGIS II Browser

LSI & Manual Inputs   2 of 2

N:Manual Entry

Configure

Compensation	Manual Entry

Reset   Submit

Phantom inputs do not physically exist; you can't wire to them.
They are of two types: Analog values in the 'K' to 'N' space
& volumes-contact sets in the 'W' to 'Z' space.
This example, uses 'N' to log the rsults of a drop test

Input 'N' has **Compensation** set to **Manual Entry**

Phantoms are logged, alarmed & can be used for controls.
In this example, the drop test results may be logged
so that they can be aligned in time with feed rates
& other sensor values

N:Drop_test

Setup

Descriptor	Drop_test
Display Units(UOM)	drp
Decimal digits	1
Used by I/O	K,

Reset   Submit

Once **Compensation** has been set
to **Manual Entry**,
rename the **Descriptor**, **Units**
& **digits** (after the decimal) to fit
your usage

N:Drop_test

Calibrate

Enter value	8 drp
Factory Reset	Yes No

Calibrate   Cancel

Edit **Enter Value**
& **Calibrate**

Cancel to exit & to unlock
keypad calibrate access

AEGIS II Browser

5.1.8 CTFS Flowswitch Calibration

A:Conductivity ☒

Configure

Select Configure from the Conductivity sensor pulldown

Select Override Flowswitch 'Yes' and press Submit.

Compensation	None
Override flowswitch	✓ Yes No
Flowswitches	892

Reset   Submit

A CTFS flowswitch can be adjusted by editing the "Flowswitches" value box in the conductivity Configure menu. Lowsering the value will cause the switch to turn on for a smaller amount of flow but may not turn off the at no flow. Edit this value to be halfway between the on and off value shown on the Diagnostic page.

A:Tower Cond. ☒

Diagnostic ▼

Sensor Type	Conductivity
Variance this hour	1449 to 1451 uS
Raw sensor	829
Gain Multiply	1.7494
Offset Adjust	0.0000uS
Alarmed High	18:16:53 2019-Jun-21
Sensor OK	Connected
79.7F Flow ON	Flow:1047 ON @ 892

Refresh

The "Flow" value shown on the conductivity Diagnostic page shows the current value of the flowswitch. Turn the water on and off to see the high and low values for flow. Edit the Configur/Flowswitches box above to be in the center of these two values.
Press the Refresh button to see the current Flow value.

Example: If the flow on value is 1047 with the water running, and 847 when the water is off, the halfway point is 947. Edit the Flowswitches value based on this calculation.

5.1.9 Corrosion Rate Calibration

B:Corrosion ☒

Configure

Select **Configure** from the pulldown

Sensor Alloy	Carbon Steel
	Carbon Steel
	Copper
	Cupro-Nickel
	Admiralty
	Zinc
	Other

Reset

A corrosion rate sensor should never be calibrated. Open the Configuration menu and select the Alloy you are using. Press Submit.

AEGIS II Browser

5.2 Sensor Alarms

Select the **A** to **N** icon on the home page .
This example is a conductivity sensor connected to input **A**

A:Tower Conduct.

Select **Alarms** from the pulldown

Alarms

HiAlarm	2000 uS
LoAlarm	1000 uS
Alarm Relay	✔ Yes / No
Delay on Alarm	5.0 minutes
Disable Alarms	Yes / ✔ No
Slider Max.	4000 uS
Slider Min.	500 uS

Reset   Submit

If using for control, set the **HiAlarm** to trap a fault.
In this example a failure to bleed-blowdown on an
1800uS setpoint

If using for control, set the **LoAlarm** to trap a fault.
In this example a stuck float would lower the condcuuvity towards
the make-up conductivity.
(1800uS & 3 cycles would be a make-up of 600uS)

Set **Alarm Relay** = **Yes** to trip the output with
Special Control = **Alarm Relay** on an 'A' alarm

Use **Delay on Alarm** to block nuisance alarms &
those that occur on transient operating states

Disable Alarms = **Yes** turns OFF 'A' alarms

Slider Max & **Slider Min** are used solely to
format the browser home page for input 'A'

Sidebar:
Every sensor, water meter, flowswitch & each control has alarms.
Typically, alarms are used to trap changes in operating conditions (make-up water, temperature...)
mechanical faults (stuck floats, valved off or faulted blowdown-valves), feed issues (loss of prime,
low tank level, tubing faults) & sensor faults (failure to track, fouling...)

Setting alarms too tight so that they trip frequently under normal operating variances,
may result in a critical alarm getting a slow or no response.

Understandably alarms are set to reflect site practice, chemistry & plumbing & time of year.
Review each control loop, its sensor-meter, interlock, pump or actuator & setpoints.
It's typical that sensor & feed limit alarms in concert can trip on the most likely faults.

AEGIS II Browser

5.2 Sensor Alarms

LSI alarms differ from other sensor alarms which are limited to high & low alarms referenced to the current value of the sensor.

Sensor high & low alarms & LSI alarms latch. Meaning they persist until **Clear Alarms**.
All unacknowledged alarms flash the red led at the top, right of the controller enclosure cover & appear on the home page on the browser HMI.

Select the **A** to **N** icon on the home page .
This example is LSI on phantom input '**L**'

L:LSI

Select **Alarms** from the pulldown

Alarms

Practice varies, but typically any LSI > 0 indicates scaling

Status	Alarmed
LSI Scaling	0.50
RYZ Corrode	8.50
RYZ Scaling	4.50
Alarm Relay	✓ Yes No
Delay on Alarm	5.0 minutes
Clear Alarms	Yes
Scale Alarm	10:28 2016-Aug-29
Disable Alarms	Yes ✓ No
Slider Max.	10.00
Slider Min.	-10.00

Reset   Submit

Again, opinions vary, but typically Ryznar > 8.0 indicates a corrosive stream

And typically a Ryznar < 6.0 indicates scaling

The LSI & Ryznar levels for alarms vary widely. In the absence of guidelines for your water chemistry, metallurgy, exchanger tube type & treatment program, it's you & Wikipedia

Clear Alarms = **Yes** & **Submit** resets the alarm on '**L**' only

If a sensor has previously alarmed, the most recent alarm type & when it occurred are here. LSI dispalys either **Scale Alarm** or **Corrode Alarm**

LSI & Ryznar duplicate a response on scaling. Not surprising since both indexes are derived from the same parameter set.

AEGIS II Browser

5.3 Sensor Setup

Select the **A** to **N** icon on the home page .
This example is an ORP sensor connected to input '**D**'

D:ORP Sensor

Select **Setup** from the pulldown

Setup

Edit **Descriptor** to site name for browser & local HMIs.
Maximum 16 characters

Descriptor	ORP Sensor

Edit Units, defaults to typical for sensor type
Maximum 3 characters

Display Units(UOM)	mV

#of digits after decimal. Defaults to typical for sensor type
pH = **2**, conductivity = **0**

Decimal digits	1

1 Point or 2 Point calibration.
Defaults to 1 Point, typical for controlling sensors

Calibrate	1 Point

Used by I/O	7,8,

Reset   Submit

Submit to modify

Used by I/O blocks the **Disable** option & indicates where the sensor is used.
Controls **7** & **8** in this example

Select **Configure** from the pulldown to set the **Sensor Alloy** for corrosion rate sensors. Defaults to **Carbon Steel**

B:Steel Corrosion

Configure

Sensor Alloy	Carbon Steel

Reset   Submit

B:Steel Corrosion

Configure

Sensor Alloy	Other
Alloy#	1.000

Reset   Submit

If the **Sensor Alloy** pull down does not have the electrode metallurgy you're using, select **Other** & **Submit**
(Commonly used metals for cooling towers are in the pull down)

Alloy# is the ratio of **Other** electrodes to Carbon Steel (= 1.000) weight loss for LPR type sensors.

Sidebar:
Disabled sensors do not appear on either the local or browser HMIs or any option pull down.
Sensors cannot be disabled while in use for control or compensation.
Disabled sensors are re-enabled on the **System** / **Enable I/O** page.

AEGIS II Browser

5.3   Sensor Setup

F:Boiler Cond.

Setup

Select **Setup** from the pulldown to set the type of conductivity sensor connected to a dual conductivity driver card

Descriptor	Boiler Cond.
Display Units(UOM)	uS
Decimal digits	0
Disable	Yes ✔ No
Sensor Type	Boiler Cond.

Reset   Submit

Boiler Cond. are 2 wire, non-temperature compensated.
Conductivity are 4 wire, non-metallic temperature compensated.
Condensate are 4 wire, ¾" NPT, temperature compensated.

Select **Sensor Type** & **Submit**

G:CLE3 Chlorine

Setup

Descriptor	CLE3 Chlorine
Display Units(UOM)	ppm
Decimal digits	2
Disable	Yes ✔ No
Sensor Type	CLE3 Chlorine
Sensor Range	CLE3 0-10ppm

Reset   Submit

G:4-20mA Input

Setup

Descriptor	4-20mA Input
Display Units(UOM)	C
Decimal digits	2
Calibrate	2 Point
Disable	Yes ✔ No
Sensor Type	Other
20mA Value	100.00 C
4mA Value	0.00 C

Reset   Submit

Defined **Sensor Type**s may have more than one available **Sensor Range**.
Select **Sensor Type** & **Submit**
Then Select **Sensor Range** & **Submit**

4-20mA inputs @ '**G**' and on dual 4-20mA input driver cards can select **Sensor Type** = **Other** to install sensor type not shown in the **Sensor Type** pull down

Sensor Type = **Other** may set a user defined loop span for the sensor & **Submit**

Sidebar:
Selecting a **Sensor Type** installs the correct 4-20 mA to sensor value conversion & sets calibration limits.

AEGIS II Browser

5.4 Sensor Compensation

A:Tower Conduct.

Configure

Compensation	Thermal Comp.
Thermal Sensor	K:Temperature
Compensation	0.970 %/F
Override flowswitch	Yes · ✔ No

Reset · Submit

Select **Configure** from the pulldown to select-view **Compensation**. Not all sensor types have **Compensation**

Tower conductivity is always thermally compensated. Select **Compensation = Thermal Comp.** & **Submit**. Then select **Thermal Sensor** = target sensor & **Submit**

This **Compensation** value works for cooling towers, your app may differ

Serial conductivity sensors include a temperature sensor (assigned to '**K**' in the example) & a thermal flowswitch with the option to **Override** the switch flow/no flow trip point

G:CLE3 Chlorine

Configure

| Compensation | pH Corrected |
| pH Sensor | C:pH Sensor |

Reset · Submit

Some amperometric oxidant sensors may be pH corrected. Seldom useful for cooling towers where cycle control fixes the pH. More useful for process apps where pH varies

Select **Compensation** = **pH Corrected** & **Submit**. Then select **pH Sensor** = target sensor & **Submit**.

pH Sensor may be selected = **Manual** & **Submit t**o get a **Manual pH** entry value

C:pH Sensor

Configure

| Compensation | Thermal Comp. |
| Thermal Sensor | K:Temperature |

Reset · Submit

pH temperature compensation is seldom used in Cooling Tower apps which operate close to pH 7 where temperature has little effect on pH

Select **Compensation** = **Thermal Comp.** & **Submit**. Then select **Thermal Sensor** = target sensor & **Submit**.

Sidebar:
Controllers are typically pre-configured for the target app.
So cooling tower controllers will include a temperature compensated conductivity.

If you are re-purposing a controller or adding additional sensors & controls then you may be changing-modifying the default compensation.

AEGIS II Browser

5.5 Sensor Diagnostics

Select the **A** to **N** icon on the home page & the **Diagnostic** page will display

Sensor inputs '**A**' & '**B**' are used for serial sensors

Or select **Diagnostic** from the pulldown

A:Tower Conduct.

Diagnostic

If sensor used for control then **Variance** shows the range of values as the control operates. Reset on the hour.

Sensor Type	Conductivity
Variance this hour	2542 to 2564 uS
Raw sensor	332
Gain Multiply	8.5000
Offset Adjust	0.0000uS
Alarmed High	14:52:34 2016-Aug-30
Sensor OK	Connected
78.1F Flow OFF	Flow:2514 ON @3600

Refresh

The sensor value = **Raw sensor** x **Gain** + **Offset**
Modified in this case by **Thermal Compen**sation
After calibration, **Gain** or **Offset** or both will be adjusted

Most recent alarm type & time-date

Serial conductivity sensors include temperature (**78.1F**) & a thermal flowswitch.
Flow 2514 is less than **ON @ 3600** so **Flow OFF**

Serial sensors auto-install on power ON.
If you switch types & the previous type was used for control, the control is disabled

Wiring-connection problems flagged here

Attributes which may be assigned to phantoms '**K**' to '**N**' (See Section 5.6) are displayed @ the source sensor I/O location. The 'Pitting' or imbalance value in this example

B:Steel Corrosion

Diagnostic

Sensor Type	Corrosion
Variance this hour	11.5 to 11.5 mpy
Raw sensor	11.5
Gain Multiply	1.0000
Offset Adjust	0.0000mpy
Alarmed High	12:08:23 2016-Jul-26
Sensor OK	Connected
Pitting 0.12mpy	Carbon Steel

Refresh

Some fields are specific to the sensor type.
In this case the corrosion rate sensor is using Carbon Steel electrodes

---

Sidebar:
Diagnostic is a summary of the sensor state.
Contents vary widely with sensor type.

AEGIS II Browser

5.5   Sensor Diagnostics

Select the **A** to **N** icon on the home page & the **Diagnostic** page will display

Sensor inputs '**C-D**', '**E-F**' and '**I-J**' are used for driver cards so the installed sensor will vary with the type of installed card: pH-ORP, conductivity, 4-20mA input, serial sensor or pH-Temperature

C:pH Sensor

Diagnostic	
Sensor Type	pH Sensor
Variance this hour	8.82 to 8.89 pH
Raw sensor	883.00
Gain Multiply	0.0100
Offset Adjust	0.0000pH
Alarmed High	14:52:34 2016-Aug-30
Sensor driver type	Dual pH or ORP
Configure: 103C	Status: 1007
Device: 000C3A88	Product: 0E125180
Rev.#: 00000001	S/N:: 15082008
A.ID#: 31032004	A.Part#: -1
A.rev#: 0	Firmware:01.00.02.01

Refresh

In this example, there is a pH-ORP card installed in the **C-D** slot & '**C**' is a pH sensor

This pH sensor not used for control or the **Variance** would reflect the control loop delay dependant of feed point, sensor location & re-circ water volume

The sensor value = **Raw sensor** x **Gain** + **Offset**

Most recent alarm type & time-date

Parameters for the **Dual pH or ORP** card installed in the C-D slot

E:Boiler Cond.

Diagnostic	
Sensor Type	Boiler Cond.
Variance this hour	467 to 467 uS
Raw sensor	4227
Gain Multiply	0.1000
Offset Adjust	0.0000uS
Alarmed Low	14:52:34 2016-Aug-30
Sensor driver type	Dual conductivity
Configure: 000C	Status: FFFFDE5E
Device: 000C3B55	Product: 0E127777
Rev.#: 00000001	S/N:: 15082008
A.ID#: 31032004	A.Part#: -1
A.rev#: 0	Firmware:01.00.00.02

Refresh

The sensor value = **Raw sensor** x **Gain** + **Offset**
Single point calibration modifies the **Gain** or **Offset** (varies with sensor type)
Two point calibration modifies both the **Gain** & **Offset**

Parameters for the **Dual conductivity** card installed in the E-F slot

AEGIS II Browser

5.5 Sensor Diagnostics

Select the **A** to **N** icon on the home page & the **Diagnostic** page will display

G:CLE3 Chlorine

Diagnostic

Sensor Type	CLE3 Chlorine
Variance this hour	5.80 to 5.84 ppm
Sensor Range	0.00 to 10.00 ppm
Raw sensor	10.99mA 58.3%
Gain Multiply	0.8330
Offset Adjust	-3.3330ppm
Alarmed High	14:52:34 2016-Aug-30
Input Firmware Driver	built-in
Configure: 003C	Status: 0003
Device: 000C3B40	Product: 0E120712
Rev.#: 00000001	S/N:: 15082008
A.ID#: 31032004	A.Part#: -1
A.rev#: 0	Firmware:00.00.00.14

Refresh

Sensor inputs '**G**' (4-20mA input) & '**H**' (10mV/C thermal sensor input) are fixed in controller hardware unlike the sensor driver slots @ **C-D**, **E-F** & **I-J**

In this example, a 4-20mA **CLE3 Chlorine** sensor is connect to input '**G**'

The user selected **0.00 to 10.00 ppm** CLE3 sensor type converts the 4-20mA signal (**10.99mA** or **58.3%** of span) from the sensor to a ppm value.

In this example **10.99**mA x **0.833** -**3.333** = **5.82**ppm (ppm = **mA** x **Gain** + **Offset**)

Phantom inputs configured to calculate LSI show Ryznar & the values of the LSI-Ryznar calculation parameters on the Diagnostic page.

L:LSI

Diagnostic

Sensor Type	Calculated
Scale Alarm	14:52:34 2016-Aug-30
Ryznar	6.4
Alkalinity	95ppm
CaCO3 Hardness	75ppm
Temperature	89.9F
pH Sensor	8.88
Conductivity	2564uS
No source selected	

Refresh

K:Temperature

Diagnostic

Sensor Type	Temperature
Variance this hour	77.3 to 173.5 F
Raw sensor	78.0
Gain Multiply	1.0000
Offset Adjust	0.0000F
No alarm logged	
from A, attribute 1	Temperature

Refresh

Phantom inputs derived from sensor attributes may be independently calibrated modifying the **Gain** or **Offset** value applied to **Raw Sensor**

In this example the **Temperature** is derived from the sensor connected to input '**A**', **attribute 1** (this serial conductivity sensor has 3 attributes)

AEGIS II Browser

5.6 Using Sensor Attributes for Phantoms

Phantom sensors are input 'K' through 'N' and can be enabled from the **System Enable I/O** page.

Once enabled they will automatically appear on the home page for the controller and can be assigned attributes from sensors or used for manual entries and inventory & LSI calculations.

Select the **K** to **N** icon on the home page
To assign another sensor's attribute to a phantom sensor

M:Salt_Concen

Configure

Select **Configure** from the pulldown

Compensation — None

Select source — A0:Tower Conduct.

Reset — Submit

In this example 'M' uses attribute '0' from sensor 'A'
Attribute '0' is the raw value of the sensor, conductivity in this example, calibrated to measure salt ppm

Select Source = target attribute & **Submit**.
Pull down has all of the installed sensors & their sensor attributes.

Appendix 'B' lists available attributes by sensor type.

Volume measuring meters have a **Rate** attribute which can be assigned to a sensor.
In this example the turbine meter @ input 'Q's rate is assigned to the phantom @ 'N'

N:Flow rate

Configure

Compensation — Not applicable

Select source — Q1:Rate

Reset — Submit

K:Temperature

Configure

Used by I/O — A,C,

Reset — Submit

Select Source is not available for phantoms which are used by other sensors.
In this example the Temperature @ 'K' is used to temperature compensate the sensors @ 'A' & 'C'

Sidebar:
Phantom Sensors 'K' to 'N' and phantom meters-contact sets 'W' to 'Z' are logged, alarmed & can be used for compensation & controls.
They are phantom in the sense that they do not have wiring locations.

AEGIS II Browser

5.7 Inventory: Using feed meters & pumped volumes

Select the **K** to **N** icon on the home page
To make a phantom input track tank volume

K:Inventory

Configure

Select **Configure** from the pulldown

| Compensation | **Inventory** |
| Select **Compensation** = **Inventory** & **Submit** |

O:Tower Make-up	unused
P:Feedwater	unused
Q:Tower blowdown	unused

Inventory displays all of the volume
measuring inputs & pulse controlled pumps.

R:Grey Water add	unused
V:Water meter	unused
Z:Water meter	unused

If using a Tacmina or equivalent displacement meter on
an ON/OFF pump, they are typically set to 1mL/pulse.
If U.S. units, meter scaling = 3785 pulses/G
If metric units scaling = 1000 pulses / L

| 6:Inhibitor Pump | **Target Output** |
| 8:ORP pid | unused |

Select all of the meters & pumps that use the
target tank & **Submit.**
In this example only the Inhibitor Pump uses
the target tank

Reset **Submit**

K:Inventory

Calibrate

Initial tank level & tank level on refill
is set using **Calibrate**.
Measured & pumped volumes are subtracted
from the **Calibrate** value.

Enter value 99.99 G

Calibrate **Cancel**

Sidebar:
Metric or U.S. units are set on the **System** / **System Setup** page.
The controller converts the pumped mL/stroke setting to either Liters or Gallons depending on the **System Setup metric units** = **Yes** - **No** setting.

Volume meters are assumed to measure either Gallons (U.S. units) or Liters (Metric) when calculating **Inventory** - tank levels or ppm concentrations.
Scale all of the volume meters according to the System units setting.

AEGIS II Browser

6 Measuring Volume: Water Meters, Inventory, Verify Feed

6.1 Configuring a New Meter

Select the **O** to **V** icon from the right side of the home page to configure-setup a new meter or modify an existing meter

Enable new meters @ the **System**, **Enable I/O** page. Enabled as a contact set & appears on right side of home page. See Section 7.1 to switch to meter.

R:Grey Water add   ×

Setup

Select **Setup** from the pulldown

Descriptor	Grey Water add

Edit **Descriptor** to set site name, 16 characters max. & **Submit**

Display Units(UOM)	G

Edit **Units** (defaults to system units) , 3 characters max. & **Submit**

Decimal digits	2

Select # **digits** after decimal & **Submit**

Disable	Yes ✓ No

Disable & **Sensor Type** options only display if meter not in use by another I/O

Sensor Type	Turbine meter

Reset   Submit

Select Sensor Type = **Turbine Meter** (3 wire meters) or **Water Meter** (contact head, 2 wire) & **Submit** to set meter type

R:Grey Water add   ×

Configure

'K' Factor	2.000
Compensation	None

Reset   Submit

Turbine Meters are scaled by **'K'Factor** (pulses/gallon)
Contact head, **Water Meter**s are scaled in **Vol/contact** closure.

O:Tower Make-up   ×

Configure

Vol/contact	100 G
Compensation	None

Reset   Submit

O:Tower Make-up   ×

Setup

Descriptor	Tower Make-up
Display Units(UOM)	G
Decimal digits	0
Used by I/O	3,

Reset   Submit

Select Sensor Type = **Turbine Meter** or **Water Meter** controls the type of debouncing used Internally to measure pulse streams or contact clousres

In this example, the meter @ '**O**' is used by the control relay '**3**' so **Disable** & **Sensor Type** are not available

AEGIS II Browser

6.2 Copying, Flow Rate Alarms & Rate-to-Volume

V:Water meter ✕

Configure

Vol/contact	100.0 G
Compensation	**Copy meter**
Target Meter	**Z:Water meter**

Reset   Submit

Use **Copy Meter** to sum make-up or blowdown volumes from multiple towers or boilers

Select **Compensation** = **Copy Meter**

Select **Target Meter** = phantom Meter in the '**W**' to '**Z**' space & **Submit**

This example sums the meter volumes @ '**V**' and '**Q**' to the phantom meter at '**Z**' using **Copy Meter**

Q:Tower blowdown ✕

Configure

'K' Factor	10.000
Compensation	**Copy meter**
Target Meter	**Z:Water meter**

Reset   Submit

FlowRate Alarm is used to alarm on high or low flow rate. Disabled when offline on if **Flowswitch** not 'None'

Select **Compensation**= **FlowRate Alarm** & **Submit**

Q:Tower blowdown ✕

Configure

'K' Factor	10.000
Compensation	**FlowRate Alarm**
High Alarm	100.0 gpm
Low Alarm	50.0 gpm
Flowswitch	**W:Flowswitch_A**

Reset   Submit

Then set **High** & **Low** alarms & **Submit**.
Set **Low Alarm** < 0 if you don't want a low flow alarm or if flow is not continuous.

Alarms do not occur when **Flowswitch** = **OFF**
Optional: Select a **Flowswitch** & **Submit**

V:Water meter ✕

Configure

Vol/contact	100.0 G
Compensation	**Rate to Vol.**
Flowrate sensor	**G:4-20mA Input**

Reset   Submit

Select **Compensation**= **Rate to Vol** & **Submit**
Then select a **Flowrate sensor** & **Submit**

Use **Rate to Vol** to convert a 4-20mA input on **Flowrate** to a volume on a meter input.

AEGIS II Browser

6.3 Meter Diagnostics

Select the **O** to **V** icon from the right side of the home page to view the Diagnostic page

Meters display the volume measured from midnight on the home page.

O:Tower Make-up   ✕

Diagnostic ◄—— or select **Diagnostic** from the pulldown

Sensor Type	Water meter
Vol. this year	12600 G
20 Days Online	Vol/Day,630 G
Volume Total	107500 G
Vol. last year	0 G
Rate	52.8gpm
No alarm logged	
Input Firmware Driver	built-in
Configure: 0000	Status: 0000
Device: 000C4E31	Product: 0E12519A
Rev.#: 00000001	S/N:: 15082008
A.ID#: 31032004	A.Part#: -1
A.rev#: 0	Firmware:01.01.00.05

Refresh

Useful if the towers run 7 days/week otherwise discount for typical ON/OFF day ratio

Total since meter installed

Contact head meters calculate **Rate** using the interval since the last volume increase event.
Therefore not representative on first count of an new cooling day or first count on a new bleed cycle

Volume resolution (digits after the decimal) is set by **Decimal Digits** on the **Setup** page

Q:Tower blowdown   ✕

Diagnostic

Sensor Type	Turbine meter
Vol. this year	76927.01 G
20 Days Online	Vol/Day,3846.35 G
Volume Total	798929.50 G
Vol. last year	0.00 G
Rate	19.7gpm
No alarm logged	
Input Firmware Driver	built-in
Configure: 0001	Status: 0000
Device: 000C4E31	Product: 0E12519A
Rev.#: 00000001	S/N:: 15082008
A.ID#: 31032004	A.Part#: -1
A.rev#: 0	Firmware:01.01.00.05

Refresh

Turbine type meters calculate **Rate** every second as meter pulse counts are measured.
Therefore **Rate** is more representative than contact head meter rates because counting occurs more frequently.

DI (Digital Input) driver detail
Shared by all inputs 'O' thru 'V'

AEGIS II Browser

6.4 Meter Alarms

Select the **O** to **V** icon from the right side of the home page to view the Diagnostic page

P:Feedwater ✕

or select **Diagnostic** from the pulldown

Alarms ▾

HiAlarm is the volume measured from midnight. Edit & **Submit**

HiAlarm | 50000 G

LoAlarm is set on the daily volume.
It's checked only once @ midnight. Edit & **Submit**

LoAlarm | 100 G

Alarm Relay | Yes ✓ No

Alarm Relay = **Yes** & **Submit** will turn ON the alarm relay if one has been configured.

Disable Alarms | Yes ✓ No

Disable Alarms = **Yes** stops new alarms on meter input '**P**' in this example.

Reset | Submit

If alarmed, a **Clear alarms** option will be included on this page.

If you clear a **HiAlarm** & the day has not changed, it will re-alarm because todays volume is more than **HiAlarm**.

R:Grey Water add ✕

Alarms ▾

Status | Adjusted Alarm

In this example, we want an alarm on any **Grey Water** make-up
But don't want an alarm if there is no **Grey Water** make-up
(so **LoAlarm** is less than zero)

HiAlarm | 10.00 G

LoAlarm | -100.00 G

In this example, we're also using one of the relays or pulse outputs as a dedicated alarm relay, perhaps to the site DCS.

Alarm Relay | ✓ Yes No

Disable Alarms | Yes ✓ No

Reset | Submit

7 Flowswitches, Interlocks & Contact Sets

7.1 Switching Meters & Contact Sets

Volume meters and contact set inputs are connected in the 'O' to 'V' namespace.
They are also in the 'W' to 'Z' phantom space.
If the meter or contact set input is not being used for control, it can be re-purposed, making a contact set a meter or the reverse.

When an input in the 'O' to 'Z' namespace is enabled, it's initially configured as a contact set.

Contact sets are ON when the contact set is closed. The logical sense of the input may be inverted so that ON = contact set open (Refer to Section 7.3).

Select the **O** to **V** icon from the right side of the home page

U:Low_Level

Select **Setup** from the pulldown

Setup

Descriptor	Low_Level
Disable	Yes ✓ No
Sensor Type	Contact set

Reset   Submit

Select **Sensor Type** from the pulldown
Water meter = 2 wire contact head meter
Turbine meter = 3 wire pulse meter
& **Submit**

Changing the DI (digital input) type using **Sensor Type** is not available if the DI is in use by a control, interlock, fail-to-feed...

S:Flowswitch

Setup

| Descriptor | Flowswitch |
| Used by I/O | 1,3, |

Reset   Submit

In this example, **Used by I/O** indicates that **S:Flowswitch** is used by the control for relays **1** & **3**. (likely as an interlock flowswitch)

AEGIS II Browser

7.2 Contact Set Alarms

Select the **O** to **V** icon from the right side of the home page

S:Flowswitch

Alarms

Select Alarms from the pulldown

ON Time Alarm	600.0 minutes
No Flow Alarm	1500.0 minutes
Alarm Relay	Yes ✓ No
Disable Alarms	Yes ✓ No

Reset   Submit

In this example, if the flowswitch is ON for more than 10 hours it will alarm.
Edit & **Submit** to modify

The **No Flow Alarm** is set to > 1440
(the number of minutes in a day)
so it will never alarm.

Alarms use the time ON or OFF today
which is reset to 0.0 @ midnight.

If you are not using the alarms, set
Disable Alarm = **Yes** & **Submit**

In this example, we're using the alarm to alert us if the cooling tower is offline for more than an hour.
Edit & **Submit** to modify

S:Flowswitch

Alarms

ON Time Alarm	1500.0 minutes
No Flow Alarm	60.0 minutes
Alarm Relay	Yes ✓ No
Disable Alarms	Yes ✓ No

Reset   Submit

Sidebar:
Contact set alarms are frequently used to flag unusual operating conditions or outages.

If you are alarming on an event that bridges midnight, bear in mind that the ON or OFF time that trips the alarm is reset @ midnight.

AEGIS II Browser

7.3 Logically Inverting Contact Sets

Select the **O** to **V** icon from the right side of the home page

T:Boiler 1 OnLine

Configure

Select **Configure** from the pulldown

Compensation	None

If you are interlocking using a contact set that is OPEN in the interlocked state, **Invert sense** & input 'T' will be ON when the contact set is open

Invert sense	Yes ✓ No
Used by I/O	4,

Set **Invert sense** = **Yes** & **Submit**

Reset   Submit

7.4 Fail-to-Feed

Fail-to-Feed alarms on the contact set input that monitors the pump head feed meter if measured feed events do not occur every **Delay on Alarm** period while the pump is ON.

In this example **U:Monitor Feed** would display a '**Fail to Feed**' alarm if a feed contact closure did not occur every 30 seconds or less while Relay 3 is ON, unless 'U' alarms were disabled.

If you wire the feed verify meter in parallel to a volume meter input, you can measure the actual volume fed.

Select the **O** to **V** icon from the right side of the home page

U:Monitor_feed

Configure

Select **Configure** from the pulldown

Compensation	Fail to Feed

Set **Compensation** = **Fail to Feed** & **Submit**

Target Output	3:Inhibitor Feed

Then select **Target Output** = target control and **Delay on Alarm** = time between measured feed volume pulses & **Submit**

Delay on Alarm	30 seconds
Invert sense	Yes ✓ No

Fail-to-feed uses a meter on the output of the pump like those made by Tacmina, which measure volumes in the mL range. Depending on the pump size, there will be a delay between turning ON the pump & measuring the first & subsequent feed pulses.

Reset   Submit

AEGIS II Browser

7.5 Mirroring a Control ON/OFF

A phantom contact set may be configured to mirror a relay (1-5) or a pulse output (6-9) configured as an ON/OFF control. When the control is ON, the phantom contact set is ON.

This compensation is available to link controls when simply wiring them in parallel wouldn't work.

For example:
Site doesn't have a bleed meter installed but needs to feed into the bleed line whenever the bleed is ON (perhaps a de-chlor or a sequestrant for a component that's concentrated when the tower cycles up).
Relay 1 controls the bleed on conductivity
Pulse 8 feeds the bleed line chemical, configured to base feed @ 5mL/minute
Phantom Contact Set 'X' mirrors Relay 1 & Interlocks Pulse 8

When done with **Mirror output** (instead of simply using conductivity to control Pulse 8) any blocking or Prebleed-Lockout that stops Relay 1, stops feeding into the bleed line.

AEGIS II Browser

8 Frequency Controlled Pumps

8.1 Selecting a Pump, Adjust mL/stoke & SPM

Select the '**6**' to '**9**' icon from the right side of the home page

6:Inhibitor Pump

Configure

Select **Configure** from the pulldown

Pump Type sets limits on mL/minute setpoints

Status	Reconfigured
Descriptor	Inhibitor Pump
Disable	Yes ✓ No
Pump Type	ProMinent 1602
mL/stroke	0.130

Refresh   Submit

Set **Pump Type** = one of the 6 built-in pumps & **Submit**
Setting both the maximum SPM &
typical 40 psi head feed rate

Use the default **ml/stroke** unless:
1. You require the accuracy the you would get from calibrating with a graduated cylinder.
2. The pump is not @ 100% stroke.

9:Dispersant

Configure

Descriptor	Dispersant
Disable	Yes ✓ No
Special Control	None
Pump Type	Other
mL/stroke	5.000
Other Pump	400 Rated SPM

Refresh   Submit

Be aware that the output of most pumps will vary when backpressure changes. Using a back pressure valve will hold that pressure steady.

Select **Pump Type** = **Other** for larger pulse-frequency controlled pumps & **Submit**

Edit **ml/stroke** & **Rated SPM** for the installed pump & **Submit**
'**Other**' type pumps are limited to 25 **mL/stroke**.
Listed pumps are limited to 2.0 **mL stroke**.
All have no minimum limit.

Exercise care not to exceed the Rated SPM for the pump, response to high pulse rates is indeterminate and maximum feed rates will be incorrect.

Built-in Pump types

Pump Type	ml/stroke	Liters/hr	Gallons/hr
1601	0.13	1.404	0.371
1602	0.24	2.592	0.685
1001	0.10	1.080	0.285
1002	0.24	2.592	0.685
0704	0.42	4.536	1.198
0705	0.50	5.400	1.427

9   4-20mA Outputs

9.1   Configure: Manual-Auto Switch

Select the letter icon from the bottom right side of the home page

I:4-20mAOutput

A newly installed 4-20mA out card initializes to Manual mode & 0% (4mA) output current

Configure

Select **Configure** from the pulldown

Control by: None

Select **Control by:** and the target control sensor from the pull down & **Submit**

Manual mode   ✓ Yes   No

Edit **Manual mode** level & **Submit** to modify the current. 0.0% = 4 mA 100% = 20 mA

Manual mode   47.6 %

Interlocked   none

(Optional) When the Interlocked contact set input is OFF, the current is set to 4mA
Set **Interlocked** = target contact set & **Submit**

Open Loop alarm   ✓ Yes   No

J:4-20mAOutput

Controls a Pump   Yes   ✓ No

Controls a Pump = Yes goes to 4mA when **STOP** key pressed

Configure

Reset   Submit

Control by: pH Sensor

J:4-20mAOutput

Exit Manual to Auto mode by **Manual mode = No** & **Submit**

Manual mode   ✓ Yes   No

Configure

Manual mode   25.0 %

Control by: pH Sensor

Manual mode   Yes   ✓ No

Interlocked   S:Flowswitch

20mA Value   10.00 pH

Open Loop alarm   ✓ Yes   No

4mA Value   6.00 pH

In Auto mode, edit both **20mA Value** & **4mA Value** & **Submit**

Reset   Submit

Interlocked   S:Flowswitch

In this example, a pH of 7.5 would set the 4-20mA output to 10mA
(16mA x (7.5 - 6.0) /(10.0 – 6.0)) +4mA

Open Loop alarm   ✓ Yes   No

Reset   Submit

Sidebar: Manual Mode
Use **Manual mode** to verify the pump is 100% ON=20mA, completely OFF=4mA.
and to verify the loop span on the monitoring DCS that is using the current loop value
to represent a controller conductivity, pH, ORP, corrosion rate sensor or ppm calculation.

AEGIS II Browser

9.2 Adding Special Control to 4-20mA Outputs

6:Acid Control

Select a frequency pump 6 through 9. If not available, enable one. Only Relays 6 through 9 will work

Setup

Control Type	Feed
Mode	Pulse Output
Set Feed Mode	Sensor Control
Control by:	E:pH Sensor

Set up the relay Control Type as Feed and based on the sensor of choice

Must use the Pulse Output choice

Set up the Configure, alarm and setpoint menus as needed.
Close the relay menu window when done

Refresh   Submit

Open the 4-20mA output menu. Use the Setup menu to edit the output name/desctiption.

I:Acid pump speed

Configure

Use the Configure menu to set the Control by. The pulse output relay will be identified by the relay name. My relay 6 is named Acid Control so I chose it here.

Control by:	Acid Control
Manual mode	Yes ✔ No
20mA Value	Rated SPM
4mA Value	OFF
Interlocked	S:Flow switch
Open Loop alarm	Yes ✔ No
Controls a Pump	✔ Yes No

Switch to Manual mode to test the output

The 4 and 20mA output values are driven by the relay and cannot be adjusted here.
Set the Interlock here or in the relay.

The Open Loop alarm choice will alarm this output if the 4-20mA wires are not connected correctly.
With Controls a Pump set to YES, the output will drop to 0% if the STOP button is pressed on the controller panel or if the Control By is set to a relay.

Reset   Submit

AEGIS II Browser

9.3 Calibrate a 4-20mA Output

Select the letter icon from the bottom right side of the home page

J:4-20mAOutput

Calibrate

Select **Calibrate** from the pulldown

Calibrate overrides the Manual setting or sensor control to set the output to 4mA & then 20mA

4-20mA = 4mA   ✓ START

Select **Start** to start the two point calibration process

Factory Reset   ✓

Start   Cancel   Submit

J:4-20mAOutput

Calibrate

Edit **Output @ 4mA** level & select **Calibrate**

Output @ 4mA   3.95

Use the mA current value displayed on the pump, measured by the DCS or meter

Calibrate   Refresh   Cancel

J:4-20mAOutput

Calibrate

Output @ 20mA   19.86

Edit **Output @ 20mA** level & select **Calibrate**

Calibrate   Refresh   Cancel

Factory Reset = **Yes** & **Submit**
Returns the 4-20mA outputs to default

J:4-20mAOutput

Calibrate

Status   Calibrated

4-20mA = 4mA   ✓ START

Factory Reset   Yes   ✓ No

Calibration ends.
Select **Cancel** to return the current loop to Manual or sensor control & exit callbration

Start   Cancel   Submit

AEGIS II Browser

9.4 Diagnostic & Mirroring

Select the letter icon from the bottom right side of the home page to display **Diagnostic** page

J:4-20mAOutput [×]

Diagnostic

Or select **Diagnostic** from the pulldown

Sensor Type	4-20mAOutput
Control by:	pH Sensor
Gain Multiply	1.0057
Offset Adjust	0.0031mA
Sensor driver type	Dual 4-20mA Output
Configure: 003C	Status: 0000
Device: 000C3A55	Product: 0E125188
Rev.#: 00000001	S/N:: 15082008
A.ID#: 31032004	A.Part#: -1
A.rev#: 0	Firmware:00.00.00.01

Refresh

Controlling sensor name

Gain & Offset are modified when a 4-20mA output is calibrated.
Factory Reset: **Gain** = 1.0 & **Offset** = 0.0

Mirroring a Pulse Controlled Pump
If you select a pump to control the 4-20mA output from the **Control by:** pull down
The 4-20mA output is automatically spanned
4mA = 0 SPM to 20mA = 100% SPM.

Mirroring provides a way to implement more complex controls on a 4-20mA output or to monitor pump speed on a DCS

I:4-20mAOutput [×]

Diagnostic

Sensor Type	4-20mAOutput
Manual Setpoint	12.96mA 56.0%
Gain Multiply	1.0000
Offset Adjust	0.0000mA
Sensor driver type	Dual 4-20mA Output
Configure: 033C	Status: 0000
Device: 000C3A55	Product: 0E125188
Rev.#: 00000001	S/N:: 15082008
A.ID#: 31032004	A.Part#: -1
A.rev#: 0	Firmware:00.00.00.01

Refresh

4-20mA in **Manual mode**
Shows both loop current & % of span
(for loops controlling pumps)

4-20mA Output driver detail
Shared by inputs 'I' & 'J'

AEGIS II Browser

10 System Settings
10.1 Home & Diagnostic pages

Select the controller icon at the top of the home page to access the **System** menu.

System:

Home

2019-Jun-13	S/N:2017057141
Status	Logged in
Current User	admin
Logout	Yes

Reset | Submit

Date and controller serial number

Current Log on state and user

Logout here or on the home page.
Logs out automatically if no activity for "Browser Logsout" minutes. See System Setup for minutes selection.

Select Diagnostic from the pulldown

System: Diagnostic

Diagnostic

Serial number	2017057141
Firmware	19.05.29.00
HMI Firmware	16.07.11.00
Web Browser HMI Version	11.00.00.00
Relay Fuse	OK
Watchdog Resets	4
Admin Password	Default
O-T wiring	OK
U-V wiring	OK
Fan speed	4020 RPM
Biotiming, Events	Thu, WEEK 1

Refresh

Controller serial number

Firmware versions

Relay fuse status

Accumulates CPU crashes. Should read O. Check incoming power.

Default = AAAA, otherwise known only to the Admin

Power status for 3 wire inputs 'O' thru 'T'.

Power status for 3 wire inputs 'U' and 'V'. U and V have a separate power supply from O – T.

Cooling fan fault shuts down all sensor driver cards & controls. Displays only fault message on local HMI display

Events are entered as daily, weekly or monthly (28 days). In daily, every day is day = 1. In weekly, every Sunday is Sunday = 1. This page shows the 28 day cycle.

AEGIS II Browser

10.2 Activity Log:
10.2.1 User ID, time stamp

System: Activity Log

Activity Log

Select **Activity Log** from the **System** pulldown

82 Events, 41-50

Initially displays the current day's activities in blocks of 10

Sep

1

View another day: Select Month & Day then press **Submit**
(Last six months selectable)

IO	Activity	User ID	Time
A:	Alarms Alarmed High	System	12:38:01
C:	Alarms Alarmed High	System	12:38:01
E:	Alarms Alarmed Low	System	12:38:01
F:	Alarms Alarmed Low	System	12:38:01
L:	Alarms Scale Alarm	System	12:38:01
M:	Alarms Alarmed High	System	12:38:01
S:	Activity Adjusted Alarm	admin	12:38:52
U:	Activity Changed	admin	13:40:30
U:	Activity Changed	admin	13:40:41
U:	Configure Compen. modify	admin	13:41:04

Next   Back   Submit

The list shows the I/O point effected, a description of the activity, the User that made the change and the time

List activities both by **User ID** & those that occur Automatically (**System**).

In these examples, the System logs input M is Alarmed & the admin user adjusted the Alarms on Input 'S'

Next button is removed when at end of list.
In this example, we are viewing events **41-50** of **82** total activities

If you select a day when the controller was powered OFF or prior to it's installation, you'll get this response

System: Activity Log

Activity Log

0 Events, 1-0

May

1

No activity file

Submit

AEGIS II Browser

10.3 Communications:
10.3.1 LAN IP, Netmask, MAC, Gateway, Wifi IP

You'll need to be logged in as the admin user to modify **Communications**.
The top of the page will prompt you with the required login if you are not allowed to modify the current page.

The controller includes a **DHCP client** which means when you connect to the site LAN you can assign a static IP valid for the LAN or select DHCP and let the network assign a compatible IP address to the controller.

System: Communications	☒

Communications ▾

LAN IP Address	10.10.6.140
DHCP	Yes ✓ No
LAN Netmask	255.255.255.0
LAN MAC Address	00:1e:c0:ef:42:ab
LAN Gateway	10.10.6.19
LAN Primary DNS	10.10.6.19
LAN Secondary DNS	0.0.0.0
WiFi Controls	WiFi while used ▾
WiFi IP Address	192.168.1.1
WiFi Netmask	255.255.255.0
WiFi SSID	_AegisII_141
HTTP Port	80

Reset   Submit

Select **Communications** from the **System** pulldown

Current IP **LAN** address of the controller
If you edit & **Submit** to modify, you'll lose the current browser connection. Re-connect using the new IP address

Select DHCP if you wish the system to choose the IP address. This ensures the controller is visible from and compliant with the customers network

Set **LAN Netmask** to desired netmask & **Submit**

If you are using the E-mail functionality (alarms & auto-reporting), then the **LAN Gateway** should match other devices on this LAN

Set the WiFi for always on, off or for 5 minute timeout after using. Some customers do not want the WiFi signal.

Controller WiFi is limited to HTTP browser services for mobile devices & notebook WiFi & therefore uses a fixed IP address. With the SSID set on the System Setup page

The WiFi SSID defaults to **_AegisII_xxx** where **xxx** = last 3 numbers of the controller serial number. If multiple controllers in close proximity, edit to create descriptive ID like "Boilers" etc. & **Submit**

The HTTP port is defaulted to 80, the standard browser port

Sidebar:
If you modify the IP or Netmask & can no longer connect, the current IP & Netmask can be viewed on the local HMI (keypad & display).

Key **Menu** / **Up** / **System** / **OK** / **Communication / OK** & Up - Down to scroll through the settings.

LAN (Local Area Network) refers to the Ethernet port connection. WiFi refers to the wireless connection. See section 1.1 for connection information.

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Communications: 2 of 2
10.3.2 Com card setup

The communication card adds the option of communicating with a wide range of standard equipment protocol. This card includes a serial slave port for connection with a plant serial MODBUS, or a variety of Gateways for access to MODBUS TCPIP, serial or IP BACnet or most any protocol with the proper Gateway.
The communication card includes two 4-20mA outputs while allowing a dual 4-20mA input card to be piggy-backed on the com card.
The Pyxis fluorometer is compatible with the MODBUS Master serial port while a serial Master can attach to the serial Slave port. The second slave port can be used to pass along the Master communication.
Consult the Addendum: Aegis II Communication Driver manual for complete instructions.

Note: The below picture is the lower part of the System: Communications menu from the previous page.

Pyxis connected	No
Modbus Slave	RTU Serial Connection
RTU address	10
RTU Baud rate	19200
RTU parity	EVEN
RTU stop bits	ONE

Reset   Submit

Pyxis Fluorometer status

Slave port status

Serial MODBUS setup.
Port number must be unique to the network
The baud rate, parity and stop bit settings must match the Master port

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10.4 E-Mail Setup – Test

System: E-mail Setup

E-mail Setup

Select **E-mail Setup** from the **System** pulldown

Status	Mail error: 503

E-mail Enabled = **Yes** sends a daily E-mail @ noon so you know the controller is up. Sensor values confirm control.
E-mail services enable.

E-mail Enabled — ✓ Yes / No

E Service Reports requires a paid subscription to H2Tronics.

H2Tronics eService Report — Yes / ✓ No

E-mail Daily Data Log = **Yes** sends a midnight E-mail.
Includes sensor values, run times, volumes….
Targeted @ apps that parse E-mail body for content

E-mail Data Log — at Midnight ▼

E-mail on Alarm = **Yes** sends an E-mail on alarm.
Includes sensor values & volumes so you get operating context

E-mail on Alarm — ✓ Yes / No

E-mail Status — at Midnight and 12:00PM ▼

Choose E-mail status: Disable, Midnight, Noon and Midnight & Noon
Includes sensor values & volumes so you get operating context.

Mail To: Unassigned

cc E-mail to Unassigned

Edit **Mail To** = your email & **Submit**

cc E-mail to Unassigned

Edit to add 3 optional **cc E-mail to**
& **Submit**

cc E-mail to Unassigned

cc E-mail to Unassigned

Continued on next page

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SMTP IP Address	43.228.184.6
SMTP Port	2525
SMTP Username	aegis@prominent.us
SMTP Password	••••
SMTP reset	Yes ✓ No
Test E-mail	Yes ✓ No
Next mail	2.15hrs

Reset   Submit

Shown are the default SMTP settings that point to the Prominent SMTP server. This is a free service.
If you cannot use the service, enter your service information ands press Submit.

Reset the SMTP setting to those shown on this page

Send a status report to all email addresses listed above

Next report is expected to send …

AEGIS II Browser

10.5 Time & Date:
10.5.1 Sync to Device

System: Time & Date

Time & Date

Select **Time & Date** from the **System** pulldown

Date DD/MM/YY	02/09/16
Time HH:MM:SS	11:13:55
Weekday	Fri

Set fields to match my computer

Reset   Submit

Edit the **Date**, **Time** & **Weekday** fields & **Submit**
Follow the formatting for the **Date** (DD/MM/YY)
and **Time** (**HH:MM:SS**) fields
or you'll get an error message
or use the Set fields… link

Adjusting the time & date affects biocide feed events,
controls that use time, data logging, alarming…..

This is usually the easiest way to synch the controller to
your device, click on the link & **Submit**.

AEGIS II Browser

10.6 Enable I/O:
10.6.1 Enable IO, Assign to System#

Sidebar:
If you select **two systems** (System Setup menu), you will see the menu on the left. A **single system** user will see the menu in the lower right corner of this page.

All I/O points can be enabled and used in the program. Enabled points are displayed on the main screen. If a point is disabled, it is removed from the main screen and has no programmable function.

Select **Enable I/O** from the **System** pulldown

The Configure box allows you to see all Sensors, Meter/Contacts or Control relays. This example shows all Control relays. Edit this choice to see Sensors or the Meter Contact lists.

Enable I/O	
Configure	Control
1: Tower276 Bleed	Shared
2: Oxidant_Control	Shared
3: Inhibitor Feed	Shared
4: Boiler_1_CS	Shared
5: Sensor_Wash	Shared
6: Inhibitor Pump	Boiler_System
7: ORP_ONOFF	Tower_System
8: ORP pid	Shared
9: Dispersant	Shared
Enable I/O	Y: Contact set

Reset   Submit

If the **System Setup** page field **# of Systems = Two**, this page allows you to select to which system the I/O pertains.

System Setup page field # of Systems = One Is limited to Enable IO as there are not systems to designate.

Enable I/O	
Enable I/O	
One System	No View-Config
Enable I/O	Y: Contact set

Reset   Submit

Select I/O you wish to enable or **None** & **Submit**

AEGIS II Browser

10.7 System Setup:
10.7.1 Naming, Sunday=Day1 ,Metric Units, Restart Options

You'll need to be logged in as the admin user to modify **System Setup**.
The top of the page will prompt you with the required login if you are not allowed to modify the current page.

System Setup

System Setup

Status	Reconfigured
Site name	ProMinent
System-Name	CT1
2nd System-Name	CT2
Keypad Password	Yes / ✓ No
Metric Units	Yes / ✓ No
# of Systems	Two
Logging rate	5 Minutes
Browser logsout	60 Minutes
Alarm on STOPs	✓ Yes / No
System restart	Yes / ✓ No
Factory Reset	Yes / ✓ No
Enable Alarm Chime	Yes / ✓ No

Reset   Submit

Select **System Setup** from the **System** pulldown

Site Name & **System-Names will** tag your reports & E-mail alarms to differentiate controllers. Sixteen characters maximum. Edit & **Submit**

Select **Keypad Password** = **Yes** & **Submit**
Shares passwords & access level with browser users, see Section 10.7

Metric Units = **Yes** & **Submit** displays temperatures in 'C' & measures volumes in Liters.
Metric Units = **No** & **Submit** displays temperatures in 'F' & measures volumes in Gallons

Select **# of Systems** = **One** or **Two** & **Submit**
Two turns on selectors in **Enable I/O** page

Logging rate set the frequency of data points stored in the database

Browser logsout will end the browser session after x minutes of inactivity

Select **Alarm on STOPs** = **Yes** & **Submit**
To alarm when user presses STOP on local HMI keypad.

Select **System restart** = **Yes** & **Submit**
Same effect as cycling the power OFF-ON; restarts controls & actuation times

Select **Factory Reset** = **Yes** & **Submit**
Removes user settings, controls, naming, calibration...
Load a default or previously saved configuration after **Factory Reset** to avoid reconfiguring each I/O.

Select **Enable Alarm Chime** = **Yes** & **Submit**
for audible tone on alarm

AEGIS II Browser

10.8 Passwords: 1 of 2
10.8.1 View-Set Access Level - Admin

The System Passwords screen allows users to change their passwords.
The Passwords screen seen by the Admin user is different from the other users. This page describes the Admin version. The next page explains the Users version.

Changes made on these pages are logged in the Activity Log.

System: Passwords

Passwords

Select **Passwords** from the **System** pulldown

Status	Login @ Admin

Shows the user or lets you know you need to be logged in as Admin if a user attempts to perform a function that is not allowed at their access level

New Password	AAAA
Confirm Password	AAAA

In this section, any user can change their password. Edit the passwords in both boxes & press **Submit**
In this example, the default **Admin** password is shown.

admin	View-Set Access
Select User	O:Operator1
Access Level	Operate

This section is only available to the Admin user:
Select a user, choose an Access Level and press Submit.

The 'Operate' **Access Level** is used to prevent casual users from inadvertently modifying controls.

Reset user password	Yes ✓ No

Reset   Submit

This function can only be performed by the Admin user. Although, each user can always change his/her own password, the Admin user can also reset other user passwords to their default. Select a user, press **Reset user password** and then press **Submit**. This button does not affect the Admin password.

Default Passwords:
Operator1 = **1**   Operator2 = **2**   Operator3 = **3**   Operator4 = **4**.
Configure5 = **5**   Configure6 = **6** Configure7 = **7**   Administrator = **AAAA**
Login Page: Operators can view all controller pages. No access to most System pages.
            Configure users can edit the program. No access to most System pages.

Modify Passwords:
If the controller is accessible on the site LAN, you should modify all 8 passwords.

Two users cannot share the same password because only the password is used to identify keypad users. The controller displays **Password Fail** on a duplicate password.

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Passwords: 2 of 2
10.8.2 View-Set Access Level - Users 1 - 7

System: Passwords ⊠

Passwords ▾

Status	Login @ operate
User ID	Operator1
New Password	••
Confirm Password	••

Reset   Submit

Select **Passwords** from the **System** pulldown

Shows Access Level

The 'Operate' **Access Level** is used to prevent casual users from inadvertently modifying controls.

Displays User name. Edit and press **Submit**.

Use these boxes to change your current password. Enter the same word into both boxes and press **Submit**.

11 Appendices:

a. IO Namespace: Letters & Numbers

The controller uses the letters 'A' to 'Z' to refer to sensors, meters, contact sets & 4-20mA outputs and the numbers '1' to '9' to refer to controls

Users can assign site specific names to all of the I/O, A-Z & 1-9. The I/O letters & numbers are a convenient, compact way to describe both the physical location of the I/O within the controller enclosure & the capabilities of each I/O.

Some letters are 'phantom', meaning they don't have physical wiring location within the enclosure. 'Phantoms' are used to represent calculated & derived values that are logged, alarmed & may be used for control.

I/O	Type	Notes
A-B	Serial sensors	3 wire Conductivity-Flowswitch-Temperature or Corrosion Rate or Differential pressure sensors
C-D **E-F** **I-J**	Dual sensor driver cards 6 types in any combination	pH-ORP: configurable as dual pH or dual ORP or pH-ORP 4-20mA input 4-20mA output Conductivity pH & 4-20mA input Dual serial sensor
G	Built-in 4-20mA input	
H	Built-in 10mV/C temperature sensor input	
K-N	Phantom sensors	Calculated (Inventory, Manual) or derived from other sensors & meters
O-V	Volume meter & contact set inputs	Each of 6 inputs configurable as Turbine, Contact Head meter or Contact Set
W-Z	Phantom volume meter & contact set inputs	Calculated (Fail-to-Feed, Fail-to-Sample) or derived from other sensors & meters
1-2	Line powered control relays	Form C, powers pumps, solenoids & motorized valves
3-5	Dry or line powered control relays	Form C, may be used dry or powered.
6-9	Pulse or ON/OFF controls	Dry contact sets used to pulse or enable pumps, alarm… 24V 250mA max.

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b. Input Attributes & Phantoms

Many of the sensors connected to the controller have attributes other than the default value.

For example, the serial conductivity sensor measures conductivity, temperature & includes a flowswitch. The conductivity is the default value of the sensor connect to input 'A' (attribute A0) & the Temperature (attribute A1) & the flowswitch (attribute A2).
Notice that the A1 attribute is of the same type as the A0 attribute, both are sensor values but the A2 attribute is a contact set attribute (ON/OFF).

Attributes can be assigned to phantom inputs where they are logged, alarmed & used for control.
A phantom input cannot be assigned to another phantom. (prevents circular references).

Phantoms in the **K-N** space are sensors. Those in the **W-Z** space are volumes & contact sets.

I/O	Type	Attribute x = I/O	Phantom
A-B	Serial Conductivity	x0 Conductivity	**K-N**
		x1 Temperature	**K-N**
		x2 Flowswitch	**W-Z**
	Serial Corrosion Rate	x0 Corrosion Rate	**K-N**
		x1 Pitting Rate (Imbalance)	**K-N**
	Serial Differential Pressure	x0 Differential Pressure	**K-N**
		x1 Inlet Pressure	**K-N**
		x2 Outlet Pressure	**K-N**
C-D **E-F** **I-J**	pH-ORP driver card	x0 ORP or pH	**K-N**
		x1 Temperature if pH	**K-N**
	Conductivity card	x0 Conductivity	**K-N**
		x1 Temperature if 'Conductivity'	**K-N**
		or 'Condensate'	**K-N**
	pH- 4-20mA input card	x0 pH	**K-N**
		x1 Temperature-pH side	**K-N**
	Serial Sensor card	Identical sensors & attributes To **A-B**	
H	Temperature	x0 Temperature	**K-N**
		x1 Rate	**K-N**
O-V	Volume meters	x0 Volume Today	**W-Z**
		x1 Rate	**K-N**
		x2 Volume this Year	**W-Z**
		x3 Volume total	**W-Z**

Use the x0 attribute if you wish to have one sensor display two values.
For example, using a conductivity sensor to measure conductivity & salt concentration

c. 4-20mA Input Selectable Types

Knowing the sensor type connected to a 4-20mA input allows the controller to:

A. Scale the input correctly for the selected sensor type

B. Provide calibration & calibration limits appropriate to selected type

C. Clamp the measured sensor values so that an open loop doesn't measure a negative ppm or conductivity

Select **Sensor Type** = Other if A,B or C not applicable

Sensor Type	Span Options & units	mA Span	G=Gain, O=Offset Span not user modifiable
Other	Generic 0-100	4-20	**User modifiable span** G= 6.25, O=-25
CBR Bromine	CBR 0-2ppm	4-16	G=0.167, O=-0.667
	CBR 0-10ppm	4-16	G=0.833, O=-3.333
CGE Chlorine	CGE 0-2 ppm	4-16	G=0.167, O=-0.667
	CGE 0-10ppm	4-16	G=0.833, O=-3.333
CLE3 Chlorine	CGE 0-2ppm	4-16	G=0.167, O=-0.667
	CGE 0-10ppm	4-16	G=0.833, O=-3.333
	CGE 0-100ppm	4-16	G=8.33, O=-33.33
CLO Chlorine	CLO 0-2ppm	4-16	G=0.167, O=-0.667
	CLO 0-10ppm	4-16	G=0.833, O=-3.333
CTE Chlorine	CTE 0-2ppm	4-16	G=0.167, O=-0.667
	CTE 0-10ppm	4-16	G=0.833, O=-3.333
Diff.Pressure	DeltaP 0-100psi	4-20	G= 6.25, O=-25
Fluorescent	Fluor 0-200ppm	4-20	G= 12.5, O=-50
PAA 0-200ppm	PAA 0-200ppm	4-16	G=16.67, O=-66.67
	PAA 0-2000ppm	4-16	G=166.67, O=-666.67
pH-transducer	pH 0 to 14	4-20	4mA=-1.45pH 20mA=15.45pH pH outside of 0-14 blocked G=1.056, O=-5.674 5.373mA=0pH, 18.6mA=14pH
ORP-transducer	ORP 0-1000mV	4-20	G= 62.5, O=-250
Temperature	Temp. 0-100C	4-20	G= 6.25, O=-25
Toroidal	Tor. 0-10000uS	4-20	G= 625, O=-2500
	Tor. 0-100000uS	4-20	G= 6250, O=-25000

Notes:
1. Gain & Offset return to the table values @ Calibrate = Factory Reset
2. The preceding table applies to the ChemFeed version of the Aegis II

d. Enabling-Disabling I/O & Adding-Removing Driver Cards

Inputs A-Z cannot be disabled if in use.

The disable option in both the HTTP & local HMIs is replaced with a message telling you where the target sensor is used, so you can remove the dependency.

Note that the sensor can be used for control, compensation of other sensors & in the case of sensors with more than one attribute; as a source for phantom sensors.

When you disable a sensor, the compensation is removed so that if for example:

You disable a thermally compensated conductivity sensor and the thermal sensor is subsequently removed or disabled, there is no conflict when the conductivity sensor is re-enabled, but it's no longer thermally compensated.

When a **C-D**, **E-F** or **I-J** driver card is removed, all of the dependencies are removed on the next power ON. Outputs that use the removed driver sensor(s) for control have the control equation removed. Other sensors which use the removed driver sensors are modified.

When you install a new driver, the sensor inputs default. For example, adding a pH-ORP driver, configures for one pH & one ORP sensor on power ON.

Auto-Removing Phantoms:

Phantoms are auto-removed if they are derived from inputs >= 'C'

If the Phantom is in use as an interlock a latching alarm is set.

Example: User removes a serial sensor card with a CTFS sensor OR connects a corrosion rate sensor to a CTFS sensor input on a serial sensor card.

Phantoms derived from inputs 'A' & 'B' are not auto-removed unless the sensor type is changed.

This is done to prevent wholesale auto-reconfiguration & safety related interlock removals on 'A' & 'B' CTFs conductivity sensors.