

CONTENTS Revised 12/6/16

1. Day-to-Day Browsing

- 1.1 Wi-Fi & LAN Connect
- 1.2 Log-in
- 1.3 Home Page Services
- 1.3 Viewing & Clearing Alarms
- 1.4 View & Adjust Setpoints /ed
- 1.5 Priming-Testing Pumps & Solenoids /ed
- 1.6 Reporting & Control Loop Tools

2. Blowdown Controls: Towers, Boilers, Closed Loops

- 2.1 Conductivity Controlled Blowdown
- 2.2 Boiler Blowdown
- 2.3 Metered Blowdown
- 2.4 Percentage Time Blowdown
- 2.5 Variable Cycles
- 2.6 Blowdown Limit Alarms
- 2.7 Blowdown Interlocks-Flowswitches
- 2.8 Blocking-Delaying a Blowdown
- 2.9 Blowdown Diagnostics

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

- 3.1 Water Meter Inhibitor Feed
- 3.2 Sensor Controlled Feeds
- 3.3 Proportional Feed
- 3.4 Base Feed
- 3.5 Control During Events
- 3.6 Limiting Feed & Alarms
- 3.7 No Feed on No Flow
- 3.8 Blocking-Delaying a Feed
- 3.9 Feed Diagnostics

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

- 4.1 Setting & Viewing Events
- 4.2 Prebleed – Lockout
- 4.3 Alarm Relay
- 4.5 Sensor Wash

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

- 5.1 Sensor Calibration
- 5.2 Sensor Alarms
- 5.3 Sensor Setup
- 5.4 Sensor Compensation
- 5.5 Sensor Diagnostics
- 5.6 Using Sensor Attributes for Phantoms
- 5.7 Inventory: Using Feed Meters & Pumped volumes

AEGIS II Browser

6. Measuring Volume: Water Meters, Inventory, Verify Feed

- 6.1 Configuring a New Meter
- 6.2 Copying, Flow Rate Alarms & Rate to Volume
- 6.3 Meter Diagnostics
- 6.4 Meter Alarms

7. Flowswitches, Interlocks & Contact Sets

- 7.1 Switching Meters & Contact Sets
- 7.2 Contact Set Alarms
- 7.3 Logically Inverting Contact Sets
- 7.4 Fail-to-Feed
- 7.5 Mirroring a Control ON/OFF

8. Frequency Controlled Pumps

- 8.1 Selecting a Pump, Adjusting mL/stroke & SPM Rating

9. 4-20mA Outputs

- 9.1 Configure: Manual-Auto Switch
- 9.2 Calibrate
- 9.2 Diagnostic & Mirroring

10. System Settings

- 10.1 Diagnostic
- 10.2 Activity Log
- 10.3 Communications
- 10.4 Time & Date
- 10.5 Enable I/O
- 10.6 System Setup
- 10.7 Passwords

11. E-mail

- 11.1 E-Mail Setup – Test

Appendices:

- A. IO NameSpace: Letters & Numbers
- B. Input Attributes & Phantoms
- C. 4-20mA Input Selectable Types
- D. Enabling-Disabling I/O & Adding-Removing Driver Cards

Sidebar: Are used to explain typical uses for feed and control functions.
Sidebars are at the bottom of the page detailing the function.
New users & users new to water treatment will find these explanations helpful.

AEGIS II Browser

1.0 Day-to-Day Browsing

The purpose of this manual is to 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.

1.1 WiFi and LAN connect

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 Step 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** 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.



You are now on the Aegis II WiFi network. Continue with section **1.1.3 Step 2; Connecting to your device.**

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.

AEGIS II Browser

1.1.2 Step 1 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:

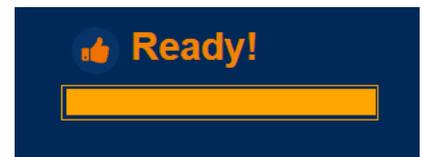
Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits.

See section **10.3 Communications** to make this change.

1.1.3 Step 2 Connecting to your device

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.



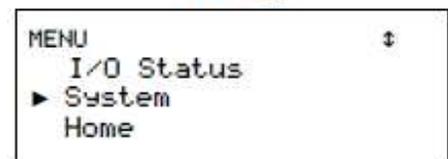
Connection Status

Find the controller WiFi IP address using the keypad.

1) Press the Menu key



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

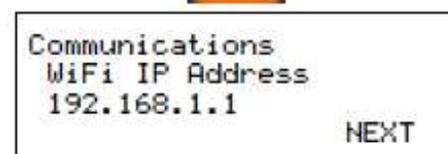


3) You should be at the Communications menu. Press OK.



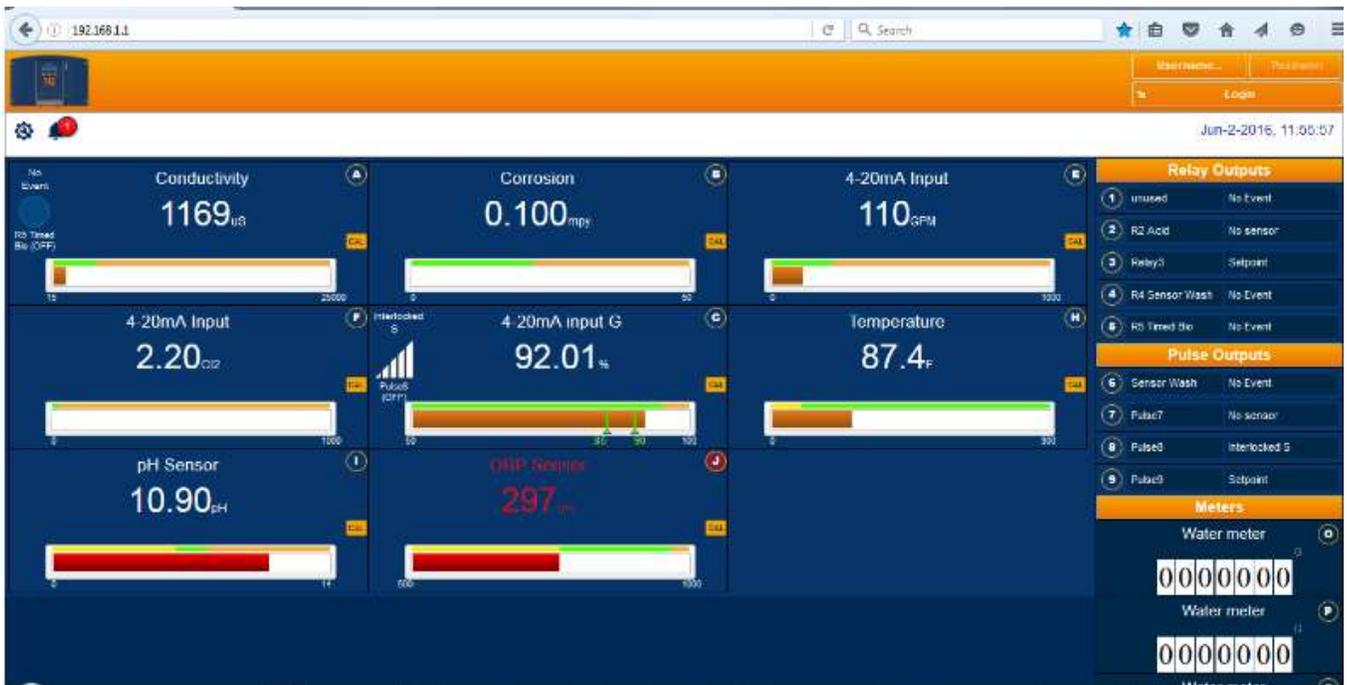
4) You will see the LAN IP address. Press the down arrow twice to see the WiFi IP Address.

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.



AEGIS II Browser

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.



View from PC or Tablet



View from Smartphone

AEGIS II Browser

1.2 Log-In

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

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 **10.7 Passwords** to learn how to change passwords.

AEGIS II Browser

1.4 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

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

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

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

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

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.

AEGIS II Browser

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.

1.4 View & Adjust Setpoints continued

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

The image displays four screenshots of the AEGIS II Browser interface, each showing a different control panel with callouts explaining their configurations:

- 5:Blr5 Treatment:** Shows the 'Adjust Setpoint' panel with 'Measure' set to 100 G and 'Feed' set to 10 seconds. A callout states: "Feeding on volume allows you to set the feedwater concentration. This example uses an ON/OFF pump".
- 8:Sulfite Feed:** Shows the 'Adjust Setpoint' panel with 'Measure' set to 100 G and 'Feed' set to 10 ppm. A callout states: "Using a frequency controlled pump simplifies setting a feed concentration". Another callout points to the 'Feed' field: "Refer to 3.1 for feed setup".
- 8:Sulfite Feed:** Shows the 'Adjust Setpoint' panel with 'Percent Time' set to 18.5%. A callout states: "In this example, a Pulse control has been configured to ON/OFF, ON 18.5% of every 5 minutes".
- 9:Dispersant:** Shows the 'Adjust Setpoint' panel with 'Base Feed' set to 12.5 mL/minute. A callout states: "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 is 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.

AEGIS II Browser

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 the RHS)

AEGIS II Browser

1.5 Priming-Testing Pumps & Solenoids

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

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

Time remaining until end of Prime-Test

Remaining 00:08:24

End of Prime-Test Yes No

Refresh Submit

3:Inhibitor Feed

Prime-Test

START Yes No

Prime, Force ON 8.5 minutes

Refresh Submit

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

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

Status Interlocked

START Yes No

Prime, Force ON

Refresh 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

Refresh to update volume remaining

7:Acid Pump

Prime-Test

Remaining 195 mL

End of Prime-Test Yes No

Refresh Submit

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.

AEGIS II Browser

2.0 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

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

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

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

Select **Configure** from the pull-down

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

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

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

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

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

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

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.

AEGIS II Browser

2.1 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 rationof the sensor connect to input 'A' (Tower Conductivity) to the sensor conncted to input 'E' (Make-up Conductivity)

Ratio of conductivities sets the default units to **cycles** & 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

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**.

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 & repeatable 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...

| | |
|--------------------|---|
| Descriptor | Boiler_4_CS |
| Display Units(UOM) | uS |
| Decimal digits | 0 |
| Disable | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| 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

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

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

1: Tower276 Bleed

Setup

Status: Reconfigured

Control Type: Blowdown

Set Blowdown Mode: Water meter

Control by: O: Tower Make-up

Refresh 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

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

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

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

1: Tower276 Bleed

Status: Reconfigured

Control Type: Blowdown

Set Blowdown Mode: Percent Time

Refresh Submit

1: Tower276 Bleed

Adjust Setpoint

Percent Time: 25.0 %

Refresh Submit

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 configured 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.

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

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'

1: Tower276 Bleed

Setup

Control Type: Blowdown

Set Blowdown Mode: Sensor Control

Control by: A/F

Refresh Submit

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

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

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

| Status | Adjusted Alarm |
|----------------|---|
| Mins/Actuation | 120.0 minutes |
| OFF on Alarm | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Alarm Relay | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Reset Alarm | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Limit:ON timer | 14:51 2016-Jul-11 |

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

AEGIS II Browser

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**.

| Input | Value |
|-------------------|-----------|
| S:Flowswitch | unused |
| T:Boiler 1 OnLine | Interlock |
| U:Boiler 2 Online | unused |
| W:Flowswitch_A | unused |
| X>Contact set | unused |

| Input | Value |
|-------------------|-----------|
| 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 |

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.

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.

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

Blocking stops a control from turning **ON** when the blocking control is **ON** .
More than one block may be selected

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

| Status | Blocking edit |
|-------------------|---------------|
| 1: Tower276 Bleed | Blocked by |
| 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

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.

2.9 Blowdown Diagnostics

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

Select **Diagnostic** from the pull-down

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

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

Operational, ON

Blowdown by: A/F 17.95 cyc

Current value of the control sensor or control equation

ON time since midnight 48.4m ON today 48.4m ON, actuation

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

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

Varying Cycles ON uS Lo Range 350 uS

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

Refresh

4:Boiler_1_CS

Special Control = Captured Sample boiler blowdown control by the sensor connected to input 'F'.

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

Why is the conductivity value so low?
 Did the sampling valve-solenoid 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

ON Setpoint 3000 uS

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

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.

Refresh

AEGIS II Browser

3.0 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

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

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

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.

AEGIS II Browser

3.1 Water Meter Inhibitor Feed cont.

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).

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**

3:Inhibitor Feed

Status: Reconfigured

Control Type: Feed

Set Feed Mode: Water meter

Control by: O+R

Refresh 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**

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 ($20\text{ppm} \times 100\%/50\% / 4 \text{ cycles}$) feed.

An 8 GPD pump feeds @ $(8 \text{ G} / (24\text{hr.} \times 3600 \text{ sec/hr})) 92.6\text{E-6 G/sec}$.

Every 100 Gallons of make-up we'll need to feed ($100\text{G} \times 10 \text{ ppm}$) 1E-3 gallons which @ 92.6E-6 G/sec feed rate will take $(1\text{E-3} / 92.6\text{E-6}) 10.8$ 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.

AEGIS II Browser

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

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

Edit for your site, up to 16 characters

Inherited from the controlling ORP sensor. Units 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

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**

2:Oxidant_Control

Setup

Control Type: **Feed**

Set Feed Mode: **Sensor Control**

Control by: **D:ORP Sensor**

Refresh 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

2:Oxidant_Control

Adjust Setpoint

Status: **Setpoint change**

On: **300.0 mV**

Off: **325.0 mV**

Refresh Submit

AEGIS II Browser

3.2 Sensor Controlled Feeds cont.

The 'Setup' page for '7:Acid Pump' contains the following fields:

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

Buttons: 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

The 'Configure' page for '7:Acid Pump' contains the following fields:

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

Buttons: 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

The 'Adjust Setpoint' page for '7:Acid Pump' contains the following fields:

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

Buttons: 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.

AEGIS II Browser

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.

AEGIS II Browser

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

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
 $(120 \times (350-320)/(350-300))$
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**.

AEGIS II Browser

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.

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**

Timed Cycling: If the sensor value does not turn ON the control @ the start of the **Period**, the control waits until the sensor turns ON the control and then starts the **ON Time** counter. The control cannot be ON longer than the **ON Time** in each **Period**. If the sensor does not turn on the control, it may remain OFF the whole **Period**.

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**

| | |
|--------------------|---|
| Status | Reconfigured |
| Descriptor | Oxidant_Control |
| Display Units(UOM) | mV |
| Decimal digits | 1 |
| Disable | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Control Action | ON increases sensor |
| Special Control | Timed Cycling |
| Period | 600 seconds |
| ON Time | 60 seconds |

Refresh 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.

AEGIS II Browser

3.3 Proportional Feed 3.3.4 PID Controls

Warning: An incorrectly configured PID control can be unstable both when load or sensor values change or in steady state. Wide swings in the controlling sensor value can be the result of an unstable control. If you are not familiar with using PID control with long delays between chemical fed & sensor response, use another proportional **Special Control**.

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**

7:Acid Pump

Configure

Descriptor: Acid Pump

Display Units(UOM): pH

Decimal digits: 2

Disable: Yes No (No selected)

Control Action: ON increases sensor

Special Control: PID Control

Pump Type: ProMinent 0704

mL/stroke: 0.240

Kp Proportnl: 0.500

Ki Integral: 0.000

Ki updated: 30 seconds

Kd Differntl: 0.000

Kd updated: 15 seconds

Refresh Submit

7:Acid Pump

Adjust Setpoint

PID Control: 7.50 pH

Refresh Submit

PID Control only requires a single **Setpoint**

1. Select **Special Control = PID Control**

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

2. Set the Kp, Ki & Kd fields for your control & **Submit**

The **KI updated** & **Kd updated** times set the rate at which the Integral & Differential error correction is updated

This example uses only proportional control ($K_p > 0$); Usually a place to start to tune a slowly responding loop. PID controls with higher K_p & K_i gains & short K_i Updated times, will generally be less stable

AEGIS II Browser

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



Select **Setup** from the pull-down

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

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



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



AEGIS II Browser

3.5 Control During Events

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

Select **Setup** from the pull-down

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

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

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

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

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

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

AEGIS II Browser

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

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.

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

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

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

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

| | |
|--|---|
| 3:Inhibitor Feed | |
| Alarms | |
| Mins/Actuation | 500.0 minutes |
| Minutes/Day | 240.0 minutes |
| Midnight reset | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Alarm Relay | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Reset Alarm | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Limit: Time/Day | 12:16 2015-Feb-22 |
| <input type="button" value="Refresh"/> | <input type="button" value="Submit"/> |

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.

AEGIS II Browser

3.6 Limiting Feed & Alarms cont.

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...

The screenshot shows the '7: Acid Pump' configuration page in the AEGIS II Browser. The page has an orange header with the pump name and a dropdown menu for 'Alarms'. Below this, there are several rows of configuration options, each with a label and a control element (text input, radio buttons, or checkboxes). At the bottom, there are 'Refresh' and 'Submit' buttons.

Callouts provide additional context:

- Top right:** Frequency controlled pumps 6-9 have alarms set by pumped volume
- Left side (top):** 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
- Left side (middle):** **Volume/Day** alarms stop feed on the volume pumped from midnight. It would be prudent to use both alarms on an acid feed control
- Left side (bottom left):** Base Feed, PID & proportional feed controls may never completely turn OFF so Actuation volume alarms are less effective with frequency controlled pumps.
- Left side (bottom right):** Acid feeds usually set **Midnight Reset = No**. If you are alarming, find the cause & correct

| Parameter | Value/Setting |
|----------------|---|
| vol.@ MAX spm | 0.5 G |
| Volume/Day | 12.7 G |
| Midnight reset | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Alarm Relay | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Reset Alarm | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

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.

AEGIS II Browser

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

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

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.)

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

| 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 |

| 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 |

AEGIS II Browser

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

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

| 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 |

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.

AEGIS II Browser

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

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

5: Bir5 Treatment

| | |
|------------------------|--------------------|
| 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 |

Control state

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

Current setpoints

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

Volume feed state

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

AEGIS II Browser

3.9 Feed Diagnostics cont.

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

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

9:Dispersant

Diagnostic

Status: Special Control, ON

130.7m ON today: 0.7m ON, actuation

Percent Time, 25%: Countdown: 33 seconds

Refresh

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

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

2:Oxidant_Control

Diagnostic

Status: Blocked by 3 ,OFF

2.5m ON today: 0.0m ON, actuation

Refresh

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 **Biocide A** controlled by relay 5

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

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

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

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

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

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**.

AEGIS II Browser

4.1 Setting & Viewing Events cont.

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....

AEGIS II Browser

4.2 Prebleed – Lockout

The screenshot shows the configuration interface for '5:Biocide A'. The 'Configure' tab is active. The status is 'Reconfigured'. The descriptor is 'Biocide A'. The 'Disable' option is set to 'No'. The 'Special Control' is set to 'Prebleed Lockout'. The 'Lockout' is set to '120 minutes'. The 'Prebleed' is set to '30 minutes'. The 'Prebleed Sensor' is set to 'A: Tower Conduct.'. The 'Prebleed OFF' is set to '750 uS'. The 'Blowdown Relay' is set to '1: Tower276 Bleed'. There are 'Refresh' and 'Submit' buttons at the bottom.

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.

AEGIS II Browser

4.3 Alarm Relay

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

Select **Setup** from the pulldown

Verify **Control Type = Events-Other**

Then select **Configure** from the pulldown

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

AEGIS II Browser

4.5 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

Select **Configure** from the pulldown

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

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

Then edit **Wash END delay & Submit**

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

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:Sensor_Wash

Configure

| | |
|-----------------|--|
| Status | Reconfigured |
| Descriptor | Sensor_Wash |
| Disable | <input type="button" value="Yes"/> <input checked="" type="checkbox"/> <input type="button" value="No"/> |
| Special Control | Sensor Wash |
| Wash END delay | 300 seconds |

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 |

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'

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

Enter value: 1650 uS

Factory Reset: Yes No (No is selected)

Buttons: Calibrate Cancel

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

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

Status: Calibrated

Enter value: 1700 uS

Factory Reset: Yes No (No is selected)

Buttons: Calibrate Cancel

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

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

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

Status: Out of Range

Sensor: 3000 uS

Calib. Override: Yes No (No is selected)

Factory Reset: Yes No (No is selected)

Buttons: Cancel Re-Calibrate Submit

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

AEGIS II Browser

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 G

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

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

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

This page locks out the keypad due from calibration the sensor @ **'G'**. **Cancel** to exit the page & unlock.

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

Use **Cancel** to exit the DPD calibration

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

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

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

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 inputs. Calibrates the sensor value & not the underlying 4-20mA input.

AEGIS II Browser

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**

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

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

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

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

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

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

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

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

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

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

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

pH sensor calibration defaults 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**.

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

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

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

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

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

AEGIS II Browser

5.1 Sensor Calibration: 5.1.4 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 Rangel

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

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

The underlying 4-20mA input can only be calibrated when **Sensor Type = Other**

The first two pages calibrate the sensor & not underlying 4-20mA loop

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

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

Cancel To exit & to unlock keypad calibrate access

G:4-20mA Input

Setup

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

G:4-20mA Input

Calibrate

Enter value: 50.01 C

Factory Reset: Yes No

Calibrate Cancel

G:4-20mA Input

Calibrated

Status: Calibrated

Enter value: 48.50 C

Factory Reset: Yes No

Calibrate Cancel

AEGIS II Browser

5.1 Sensor Calibration: 5.1.5 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.

G:4-20mA Input

Calibrate

Enter 1st value: 25 C

Calibrate 4-20mA: Yes No

Factory Reset: Yes No

Start Cancel Submit

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

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, enter 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: 5.1.5 4-20mA Input Loop Calibration 3 of 3

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

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

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

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

Select **Calibrate** to complete

Status = Calibrated on success or error message

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

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 (checked)

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

The screenshot shows the 'L:LSI' calibration screen. At the top, there is a 'Calibrate' dropdown menu. Below it, the 'Alkalinity' field is set to '95 ppm'. There is a 'Factory Reset' section with 'Yes' and 'No' radio buttons, where 'No' is selected. At the bottom, there are 'Calibrate' and 'Cancel' buttons.

LSI (Langelier Saturation Index) **Compensation** was selected for phantom sensor input 'L' **Calbrate** 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**

The screenshot shows the 'L:LSI' calibration screen. The 'CaCO3 Hardness' field is set to '75 ppm'. The 'Factory Reset' section has 'Yes' and 'No' radio buttons, with 'No' selected. At the bottom, there are 'Calibrate', 'Refresh', and 'Cancel' buttons.

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

The screenshot shows the 'L:LSI' calibration screen after completion. The 'Status' is 'Calibrated'. The 'Alkalinity' field is still '95 ppm'. The 'Factory Reset' section has 'Yes' and 'No' radio buttons, with 'No' selected. At the bottom, there are 'Calibrate' and 'Cancel' buttons.

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

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

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 results 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

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

Edit Enter Value & Calibrate

Cancel to exit & to unlock keypad calibrate access

The image contains three screenshots of the AEGIS II Browser interface, each with a title bar and a dropdown menu. The first screenshot is titled 'N:Manual Entry' and shows a 'Configure' dropdown menu, a 'Compensation' field set to 'Manual Entry', and 'Reset' and 'Submit' buttons. The second screenshot is titled 'N:Drop_test' and shows a 'Setup' dropdown menu, a 'Descriptor' field with 'Drop_test', a 'Display Units(UOM)' field with 'drp', a 'Decimal digits' dropdown menu set to '1', and a 'Used by I/O' field with 'K,'. The third screenshot is titled 'N:Drop_test' and shows a 'Calibrate' dropdown menu, an 'Enter value' field with '8| drp', a 'Factory Reset' section with 'Yes' and 'No' buttons, and 'Calibrate' and 'Cancel' buttons.

AEGIS II Browser

5.2 Sensor Alarms 1 of 2

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

Select **Alarms** from the pulldown

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 conductivity 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'

Reset **Submit**

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 2 of 2

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'

Select **Alarms** from the pulldown

Status: Alarmed

Practice varies, but typically any LSI > 0 indicates scaling

LSI Scaling: 0.50

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

RYZ Corrode: 8.50

And typically a Ryznar < 6.0 indicates scaling

RYZ Scaling: 4.50

Alarm Relay: Yes No

Delay on Alarm: 5.0 minutes

Clear Alarms: Yes No

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

Scale Alarm: 10/28/2016-Aug-29

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

Disable Alarms: Yes No

Slider Max.: 10.00

Slider Min.: -10.00

Reset Submit

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

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 1 of 2

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

Select **Setup** from the pull down

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

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

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

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

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 pull down to set the **Sensor Alloy** for corrosion rate sensors. Defaults to **Carbon Steel**

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, compensation..... Disabled sensors are re-enabled on the **System / Enable I/O** page.

AEGIS II Browser

5.3 Sensor Setup 2 of 2

F:Boiler Cond.

Setup

Descriptor: Boiler Cond.

Display Units(UOM): uS

Decimal digits: 0

Disable: Yes No

Sensor Type: Boiler Cond.

Reset Submit

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

Boiler Cond. are 2 wire, non-temperature compensated.
Conductivity are 4 wire, non-metallic temperature compensated.
Condensate are 4 wire, 3/4" 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

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

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

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**.

G:CLE3 Chlorine

Configure

Compensation pH Corrected

pH Sensor C:pH Sensor

Reset Submit

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

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

C:pH Sensor

Configure

Compensation Thermal Comp.

Thermal Sensor K:Temperature

Reset Submit

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 1 of 3

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

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

The sensor value = **Raw sensor** x **Gain** + **Offset**
Modified in this case by **Thermal Compensation**
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**

| Diagnostic | |
|--------------------|----------------------|
| 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 |

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

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

| 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 |

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

AEGIS II Browser

5.5 Sensor Diagnostics 2 of 3

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

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

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

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

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

AEGIS II Browser

5.5 Sensor Diagnostics 3 of 3

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

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**

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

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 $10.99\text{mA} \times 0.833 - 3.333 = 5.82\text{ppm}$
(ppm = mA x Gain + Offset)

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

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

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 **Enable I/O** page of **System**.

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

Select **Configure** from the pull-down

In this example '**M**' uses attribute '**O**' from sensor '**A**'
Attribute '**O**' 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**'

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

Select **Configure** from the pulldown

| | | |
|-------------------|----------------------|---|
| Compensation | Inventory | Select Compensation = Inventory & Submit |
| 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 | Select all of the meters & pumps that use the target tank & Submit . In this example only the Inhibitor Pump uses the target tank |
| 8: ORP pid | unused | |

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

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

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

Buttons: Reset, Submit, 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.

6. Measuring Volume: WaterMeters, 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.

Select **Setup** from the pulldown

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

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

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

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

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

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

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

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

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 or if **Flowswitch** not 'None'

Select **Compensation= FlowRate Alarm** & **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.

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

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.

or select **Diagnostic** from the pull-down

| | |
|------------------------------|----------------------|
| 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 |

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 a 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 Make-up

Diagnostic

Refresh

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 |

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'

Refresh

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

or select **Diagnostic** from the pulldown

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

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

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

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



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 today's volume is more than **HiAlarm**.

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)

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



AEGIS II Browser

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

Select **Setup** from the pulldown

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

U:Low_Level

Setup

Descriptor Low_Level

Disable Yes No

Sensor Type Contact set

Reset 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...

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)

S:Flowswitch

Setup

Descriptor Flowswitch

Used by I/O 1,3

Reset Submit

AEGIS II Browser

7.2 Contact Set Alarms

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

Select Alarms from the pulldown

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.

Reset Submit

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

Select **Configure** from the pull-down

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

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

Select **Configure** from the pull-down

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

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

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.

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.

Select the **W to Z** icon from the right side of the home page

Select **Configure** from the pull-down

Select **Compensation = Mirror output** & Submit

Then select **Compensation = Target Output** & Submit

| X:Contact set | |
|--|---|
| Configure | |
| Compensation | Mirror output |
| Target Output | 1: Tower276 Bleed |
| Invert sense | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Sensor Type | Contact set |
| <input type="button" value="Reset"/> <input type="button" value="Submit"/> | |

8. Frequency Controlled Pumps

8.1 Selecting a Pump, Adjust mL/stroke & SPM

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

Select **Configure** from the pulldown

Pump Type sets limits on mL/minute setpoints

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.

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 |

AEGIS II Browser

9. 4-20mA Outputs

9.1 Configure: Manual-Auto Switch

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

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

Select **Configure** from the pulldown

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

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

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

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

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

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

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

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 Calibrate

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

Select **Calibrate** from the pulldown

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

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

4-20mA = 4mA START

Factory Reset Yes No

Start Cancel Submit

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

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

Output @ 4mA 3.95

Calibrate Refresh Cancel

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

Output @ 20mA 19.86

Calibrate Refresh Cancel

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

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 calibration

Start Cancel Submit

AEGIS II Browser

9.2 Diagnostic & Mirroring

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

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 |

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

- 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'

| | |
|-----------------------|----------------------|
| 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

AEGIS II Browser

10. System Settings

10.1 Diagnostic: S/N, Versions, Fuse & Fan state, Biofeed Week#

Select the controller icon at the top of the home page to get to the **System** pull down

select **Diagnostic** from the pull down

Duplicates login state from top, right of home page

Logout here or on the home page. Logs out automatically if no activity for 15 minutes

| | |
|--------------|------------------------------------|
| 2016-Sep-02 | S/N:123 |
| Status | Logged in |
| Current User | admin |
| Logout | <input type="button" value="Yes"/> |

Reset Submit

Select **Diagnostic** from the pull down

ID's E-mails, tags log & activity files

Controller services & controls

Line power fuse for relays 1 & 2. May be used to power loads switched by relays 3-5.

Default = AAAA, otherwise known only to the Admin

Power for 3 wire turbine meters connected to inputs 'O' thru 'V'

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

| | |
|-------------------------|-------------|
| Serial number | 123 |
| Firmware | 16.09.01.00 |
| HMI Firmware | 16.04.06.00 |
| Web Browser HMI Version | 01.05.03.00 |
| Relay Fuse | OK |
| Watchdog Resets | 8 |
| Admin Password | Default |
| O-V wiring | OK |
| Fan speed | 3570 RPM |
| Biotiming, Events | Fri, WEEK 3 |

Refresh

Biotiming, Events = day# in current 28 day biofeed cycle
Day 20 in this example. Day 1= Sunday, Week 1

AEGIS II Browser

10.2 Activity Log: User ID, time stamp

System: Activity Log

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

Activity Log

82 Events, 41-50

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

Sep

1

View another day: Select Month & Day & **Submit**
(ast 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 |

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

In these Activities, the System logs Alarmed activities & the admin user adjusts the Alarms on Input 'S'

Next Back Submit

Next selection not shown @ end of day's activities
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: 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 server** but not a **DHCP client** which means:

- A: When you connect to the site LAN you'll need to assign a static IP valid for the LAN & the controller will always be at this IP (**DHCP client OFF**).
- B: When you temporarily connect to a notebook PC or device, the **DHCP sever** puts your device on the same network as the controller.

The screenshot shows the 'System: Communications' configuration page. The page title is 'System: Communications'. Below the title is a 'Communications' section. The status is 'Reconfigured'. The fields and their values are:

| | |
|-------------------|-------------------|
| Status | Reconfigured |
| LAN IP Address | 192.168.2.90 |
| LAN Netmask | 255.255.255.0 |
| LAN MAC Address | 00:1e:c0:ef:65:83 |
| LAN Gateway | 192.168.2.1 |
| LAN Primary DNS | 8.8.8.8 |
| LAN Secondary DNS | 8.8.4.4 |
| WiFi IP Address | 192.168.1.1 |
| WiFi Netmask | 255.255.255.0 |
| WiFi SSID | AegisII_Tower5 |

Callouts and annotations:

- Select **Communications** from the **System** pulldown
- Static IP **LAN** address of the controller
If you edit & **Submit** to modify, you'll lose the current browser connection on the current IP
- 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
- 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.
Edit to modify & **Submit**

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 thru settings.

AEGIS II Browser

10.4 Time & Date: Synch to Device

The screenshot shows the 'System: Time & Date' configuration interface. At the top, a dropdown menu is set to 'Time & Date'. Below this are three input fields: 'Date DD/MM/YY' with the value '02/09/16', 'Time HH:MM:SS' with the value '11:13:55', and 'Weekday' with the value 'Fri'. A link labeled 'Set fields to match my computer' is positioned above 'Reset' and 'Submit' buttons. Three callout boxes provide instructions: one points to the dropdown menu, another points to the Date, Time, and Weekday fields, and a third points to the 'Set fields to match my computer' link.

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

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, alarmin.....

This is usually the easiest way to synch the controller to your device, click on the link & **Submit**.

AEGIS II Browser

10.5 Enable I/O: Enable IO, Assign to System#

Enable I/O

Select **Enable I/O** from the **System** pulldown

To select a System# for **Sensor** or **Control** or **Meter-Contact Set** , select **Configure** to I/O type & **Submit**

| | |
|--------------------|---------------|
| 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 |

If the **System Setup** page field **# of Systems = Two** Enable I/O shows selectors for each I/O type

System Setup page field **# of Systems = One** Is limited to **Enable IO**

Select I/O you wish to enable or **None** & **Submit**

Enable I/O

One System No View-Config

Enable I/O Y:Contact set

Reset Submit

AEGIS II Browser

10.6 System Setup: 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.

The screenshot shows the 'System Setup' page with the following settings and callouts:

- System Setup** (dropdown menu): Select **System Setup** from the **System** pulldown
- Site name**: Aegis II Site. **Site Name & System-Name** tags reports & E-mail alarms to differentiate controllers. Sixteen characters maximum. Edit & Submit
- System-Name**: Tower_System
- 2nd System-Name**: Boiler_System
- Keypad Password**: Yes No (No is selected). Select **Keypad Password = Yes & Submit**. Shares passwords & access level with browser users, see Section 10.7
- Metric Units**: Yes No (No is selected). **Metric Units = Yes & Submit** displays temperatures in 'C' & measures volumes in Liters. **Metric Units = No & Submit** displays temperatures in 'F' & measures volumes in Gallons
- # of Systems**: Two. Select **# of Systems = One or Two & Submit**. **Two** turns on selectors in **Enable I/O** page
- Alarm on STOPS**: Yes No (Yes is selected). Select **Alarm on STOPS = Yes & Submit**. To alarm when user presses STOP on local HMI keypad.
- System restart**: Yes No (No is selected). Select **System restart = Yes & Submit**. Same effect as cycling the power OFF-ON; restarts controls & actuation times
- Factory Reset**: Yes No (No is selected). Select **Factory Reset = Yes & Submit**. Removes user settings, controls, naming, calibration... Load a default or saved configuration after **Factory Reset** to avoid reconfiguring each I/O.
- Enable Alarm Chime**: Yes No (Yes is selected). Select **Enable Alarm Chime = Yes & Submit** for audible tone on alarm
- Reset** and **Submit** buttons are at the bottom.
- Sunday=Day 1**: (Not visible in the screenshot, but mentioned in the callout). Select **Sunday=Day 1 = Yes & Submit**. Resets 28 day biocide clock to the current week. For example if today is Wednesday, sets today to day #4. **Note:** This option only displays if not already week #1. Appears after **Metric Units**

AEGIS II Browser

10.7 Passwords: View-Set Access Level

System: Passwords Select **Passwords** from the **System** pulldown

Status Login @ Admin Only the **Admin** user can change the Access Level for other users

New Password AAAA Edit passwords & **Submit**
In this example, the **Admin** password is @ default

Confirm Password AAAA

Select User O:Operator1 O: = **Operate** level access & C: = **Configure** level access
Set **Select User** = one of seven users
& select **Access Level** = **Operate** or **Configure**
& **Submit** to modify **Access Level**

Access Level Operate

Reset Submit

System: Passwords Access Level is used to prevent casual users from inadvertently modifying controls

Status Login @ configure Each user can see their current **Access Level**

User ID Configure5 Only the user can modify the **User ID** that appears in the Activity Log & the Login selector.
Edit & **Submit**

New Password 5 Edit passwords & **Submit**
In this example, the **Configure5** password is @ default

Confirm Password 5

Reset Submit

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.

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.

11. E-mail

11.1 E-Mail Setup – Test

System: E-mail Setup

E-mail Setup

E-mail Enabled Yes No

E-mail day's summary Yes No

E-mail on Alarm Yes No

Mail To: your_email@home.com

cc E-mail to Unassigned

cc E-mail to Unassigned

cc E-mail to mom@home.com

cc E-mail to Unassigned

cc E-mail to Unassigned

cc E-mail to maint@service.net

Test E-mail Yes No

Next mail 21:55hrs

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

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 day's summary = Yes sends a midnight E-mail. Includes sensor values, run times, volumes.... Targetted @ apps that parse E-mail body for content

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

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

Edit to add up to six optional **cc E-mail to**
Edit zero length to remove & **Submit**

Set **Test E-Mail To = Yes & Submit**
Whenever you modify E-mail parameters.

Select **Refresh** every few seconds.
Status line on this page will show if you are getting stuck getting to the SMTP server

System: E-mail Setup

E-mail Setup

Status Mail sent

E-mail Enabled Yes No

AEGIS II Browser

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. |

AEGIS II Browser

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 x1 Temperature x2 Flowswitch | K-N K-N W-Z |
| | Serial Corrosion Rate | x0 Corrosion Rate x1 Pitting Rate (Imbalance) | K-N K-N |
| | Serial Differential Pressure | x0 Differential Pressure x1 Inlet Pressure x2 Outlet Pressure | K-N K-N K-N |
| C-D E-F I-J | pH-ORP driver card | x0 ORP or pH x1 Temperature if pH | K-N K-N |
| | Conductivity card | x0 Conductivity x1 Temperature if 'Conductivity' or 'Condensate' | K-N K-N K-N |
| | pH- 4-20mA input card | x0 pH x1 Temperature-pH side | K-N K-N |
| | Serial Sensor card | Identical sensors & attributes To A-B | |
| H | Temperature | x0 Temperature x1 Rate | K-N K-N |
| O-V | Volume meters | x0 Volume Today x1 Rate x2 Volume this Year x3 Volume total | W-Z K-N W-Z 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

AEGIS II Browser

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

AEGIS II Browser

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 \geq '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.