

DULCOMETER® Slimflex 5 Cooling Tower and Boiler Controller

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



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

This document can be downloaded from the ProMinent.US website and is supplied on an accompanying USB stick. The part number for the USB stick is: **1079218**

Slimflex 5 Browser

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

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1 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. Secondly, to give examples of how to program the outputs, calibrate sensors and/or view the process.

The Installation and Operation manual has detailed sensor information, keypad instruction and controller details and specification.

The following sections detail connecting your smart device or PC to the controller. WiFi has the advantage of not requiring a physical cable. LAN setup follows this chapter, then the Home screen is explained as it is common to either connection method.

1.1 The WiFi Connection

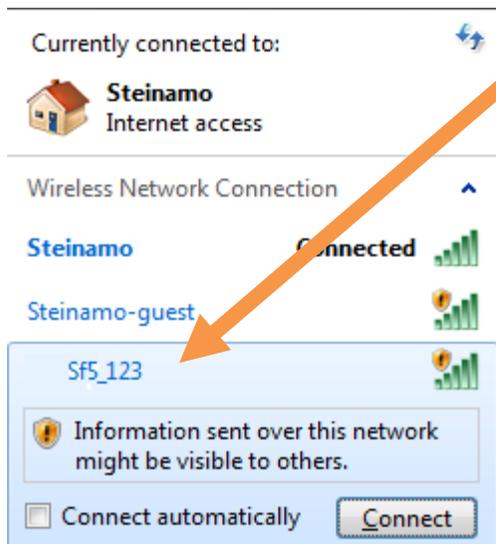
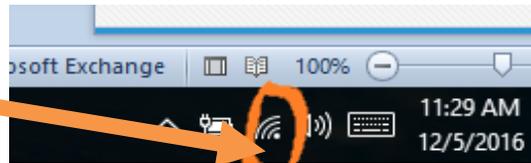
A **WiFi** connection eliminates cables and the need to change your IP address.

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

Step 1 is provided in two parts, [1.1.1 Using a PC or Tablet](#) and [1.1.2 Using a Smartphone](#)

1.1.1 Using a PC or Tablet:

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



Click on the Sf5_123 choice and press the Connect button.

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

Further differentiate your controller WiFi name. Edit the name in the System pages. See [9.3.1 LAN IP, Netmask, MAC, Gateway, WiFi IP](#)

You are now on the Aegis II **WiFi** network.

Continue with section [1.1.3 Opening the Browser page](#)

Sidebar:

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

See section [10.3 Communications](#) to make this change.

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1.1.2 Using a Smartphone

Navigate to your Smartphone setting page. Select the WiFi page. Select the _SF5_123 choice.

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

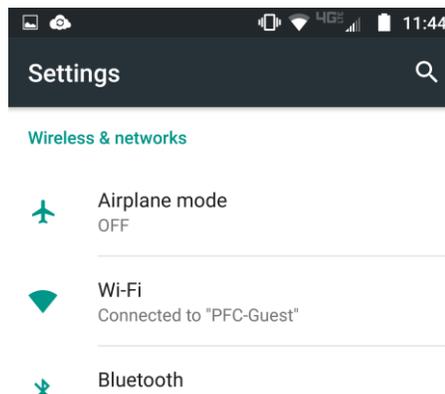
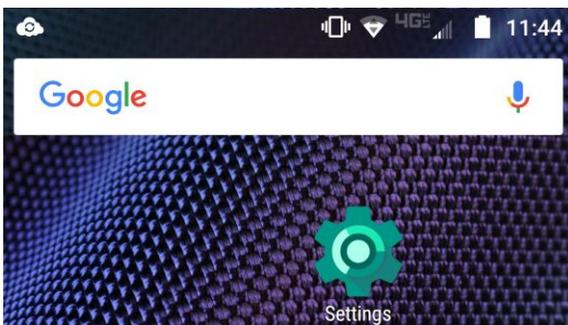
Sidebar:

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

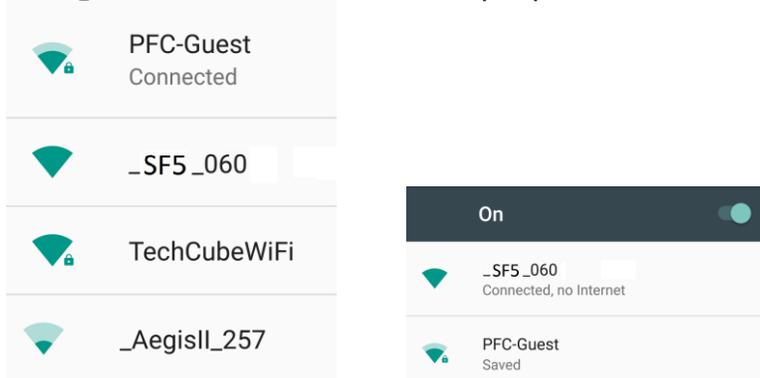
Here are examples using Android and iPhone;

1.1.2.1 Setting up WiFi using an Android phone

From your home page, press the settings button then choose Wi-Fi.



There may be more than one controller nearby. Choose your controller by comparing the serial numbers last 3 digits with the options on the phone. Select your controller. The status should change for that choice. See example picture below; SF5_060 is 'Connected, no Internet'.



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Continue with section [1.1.3 Opening the Browser page using WiFi](#)

1.1.2.2 Setting up WiFi using an iPhone

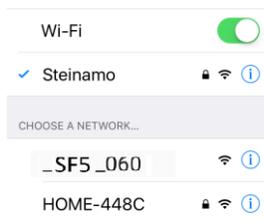
To connect your iPhone to an AegisII controller, make a **WiFi** connection; Select the Settings button from your desktop.



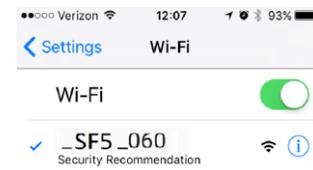
Select the **WiFi** button.



Choose your controller.



Note the connection status.



If you have more than one SF5 choice, the number on the screen represents the last 3 digits of the Slimflex controller serial number.

1.1.3 Opening the Browser page using WiFi

Once a WiFi connection is established, continue here with step 2.

To connect to the controller and see the screen, open a browser and enter the controller's **WiFi** IP address. (Not the LAN IP).

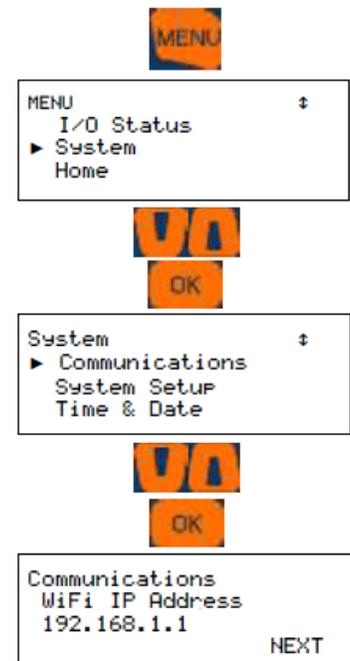
The default address is 192.168.1.1. If you do not see the connection status followed by the main page, it could be due to the WiFi address having been changed on the controller.

Find the controller **WiFi** IP address using the controller keypad.

- 1) Press the Menu key
- 2) Press the up arrow (scroll up) until you see System. Press OK
- 3) You should be at the Communications menu. Press OK.
- 4) You will see the LAN IP address. Press the down arrow twice to see the WiFi IP Address. This is the address you need to use in the browser URL box. No need to add the WWW or Http. Just enter as shown here. 192.168.1.1 and press your return key.



Connection status



Once connected, you can see values and status of many I/O point but you will not be able to edit or make programming changes without logging in. This is the **HOME** screen.

See section [1.3 The Home Screen](#)

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1.2 The LAN Connection

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

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

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

1.2.1.1 Determine the LAN IP address of the controller

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

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

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

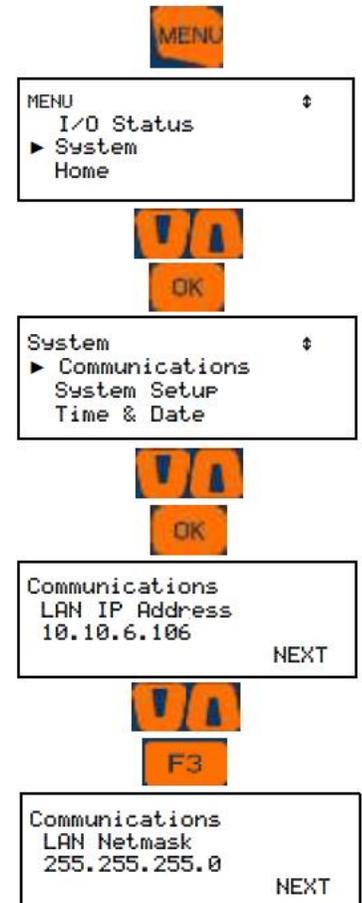
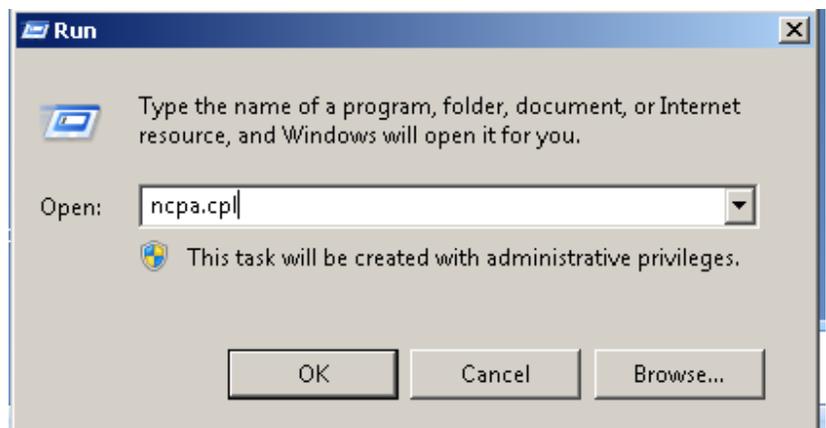
1.2.1.2 Setup the Local Area Connection on your PC

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

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

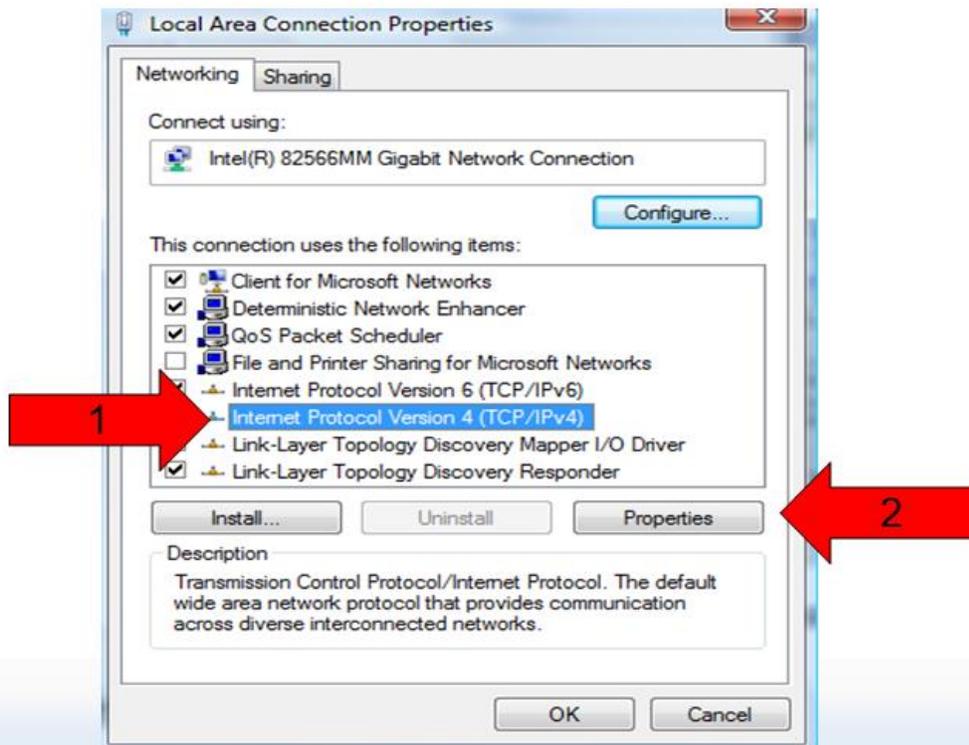
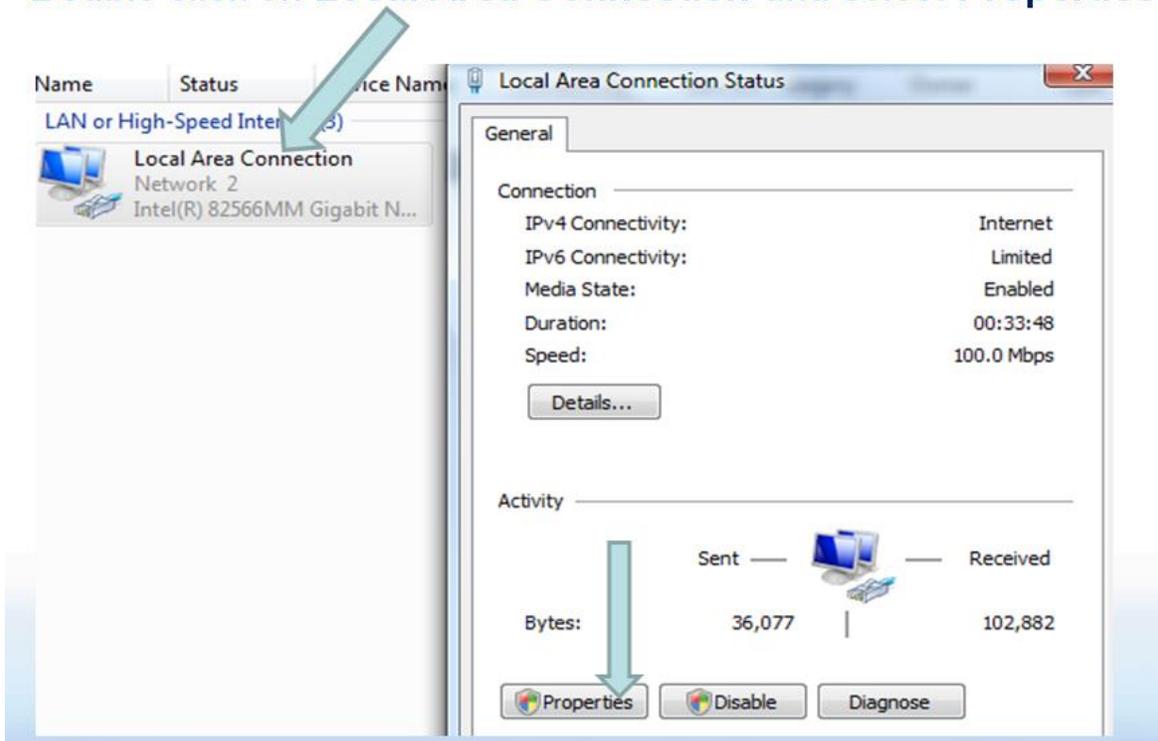
Hold down the Windows key  while you press the letter 'r'.

Enter 'ncpa.cpl' in the **Open** box.
Press **OK**.



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Double click on **Local Area Connection** and select **Properties**



- (1) Highlight Internet Protocol **Version 4** (TCP/IPv4)
- (2) Select Properties

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

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

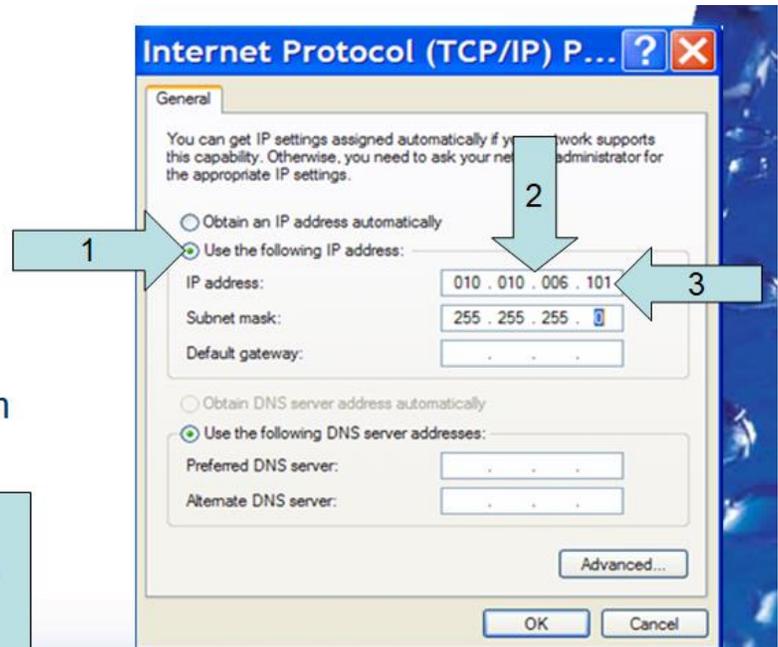
Example: 010.010.006.____

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

In this example, since the controller IP is 010.010.006.106, we used 010.010.006.101 (3)

Press the Tab key and enter the Subnet mask of 255.255.255.0

Select OK here and on the Local Area Connection window



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1.3 The Home Screen

Home Page System icons See section 1.2.3

DIGITAL IN: 6 On/Off or pulse inputs from flow switches, watermeters or other dry contact signals. (No sinusiodals)

User Logon and Status. See section 1.2.1

Name the Home page. See section 10.7 System Setup

ANALOG: Sensor inputs including conductivity, temperature, pH and ORP

OUTPUTS: ANALOG and DIGITAL – Analog 4-20mA output signals to pumps, PLCs, chart recorder, etc. Five digital relays power outputs including pumps, solenoids, MOV's.

Home Screen Data:

- System: Slimflex 5 South Tower
- User: Logout (admin)
- Date/Time: Mar-5-2018, 11:32:57 SF5
- Conductivity: 1626 μ S (Range: 1000-2500)
- pH Sensor: 6.73 pH (Range: 7.20-7.80)
- ORP Sensor: 0.0 mV (Range: 350.0-500.0)
- Flowswitch: ON: 8.4min
- Meters:
 - Make-up meter: 0010200 G
 - Bleed meter: 0003200 G
- mA Outputs:
 - pH to DCS: 11.69 mA (CAL: 48.07%)
 - ORP to DCS: 4.00 mA (CAL: 0.00%)
- Power Relays:
 - 1 Inhibitor AZ3: Owes 5.4min
 - 2 Bleed: Setpoint
 - 3 Acid: Setpoint
 - 4 Oxidant: ON: 13.9min
 - 5 Non-Ox: No Event

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



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1.4 Home Page Services

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

1.4.1 Log-In

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

Username with Default Passwords:

Operator1 = 1 Operator2 = 2 Operator3 = 3 Operator4 = 4.

Configure5 = 5 Configure6 = 6 Configure7 = 7 Administrator = AAAA

Login Page: Operators can view all controller pages. No access to most System pages.
Configure users can edit the program. No access to most System pages.

Modify Passwords:

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

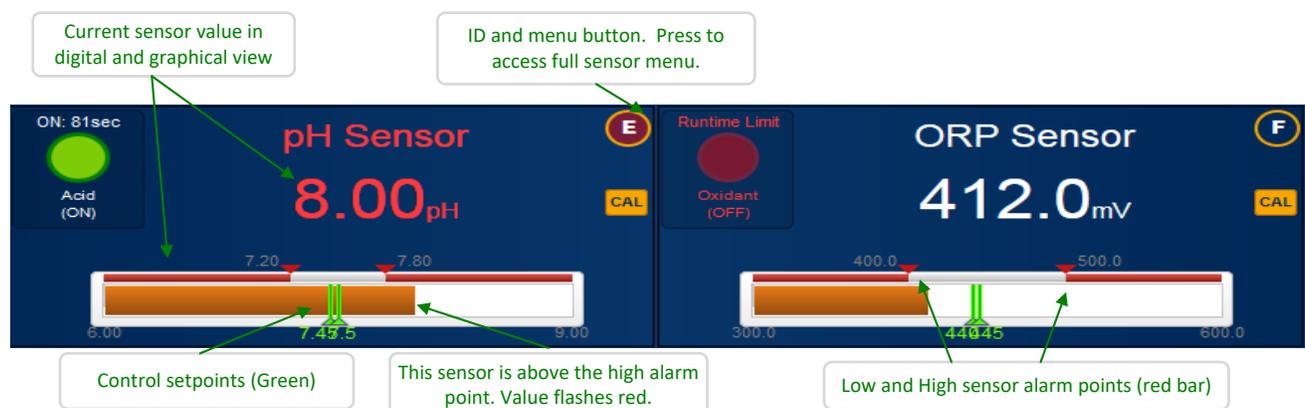
Two users cannot share the same password because only the password is used to identify keypad users. The controller displays **Password Fail** on a duplicate password.

See section 9.8 Passwords to learn how to change passwords.

1.4.2 Home Page Detail

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

1.4.2.1 Analog Input Display



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Analog Input Display continued

Calibrate button, or use the sensor menu

Sensor menu button

All I/O are identified with letters (inputs) or numbers (relay outputs)

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

Relay Output	Status	ON Time
1 Inhibitor AZ3	Setpoint	
2 Bleed	No sensor	
3 Acid	ON: 13.2min	
4 Oxidant	ON: 3.03hrs	

1.4.2.2 Digital I/O Display

Contacts

- S Flowswitch ON :3.35hr

Meters

- Setpoint: Inhibitor AZ3 (OFF)
- Make-up meter: 0010200 G
- Bleed meter: 0003200 G

mA Outputs

- C pH to DCS: 11.68 mA, CAL: 48.00%
- D ORP to DCS: 4.00 mA, CAL: 0.00%

Power Relays

1	Inhibitor AZ3	Setpoint
2	Bleed	No sensor
3	Acid	Setpoint
4	Oxidant	ON: 3.44hrs
5	Non-Ox	No Event

Maximum of 6 digital inputs: Can be any combination of dry contact switches or digital watermeter signals from contact head or paddlewheel models.

See section 9 for 4-20mA output configuration

5 Digital output relays to power pumps, solenoids and MOV valves. See sections 2, 3 and 4

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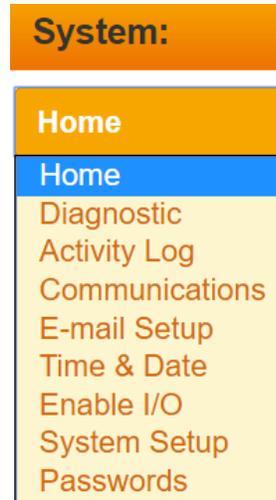
1.4.3 Home Page System Icons

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



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

The System Settings icon  has the following menus:  These menus are explained in section 9 System Settings.



The change display icon  allows users with dual systems to select how I/O points are displayed. See section 9.7 System Setup

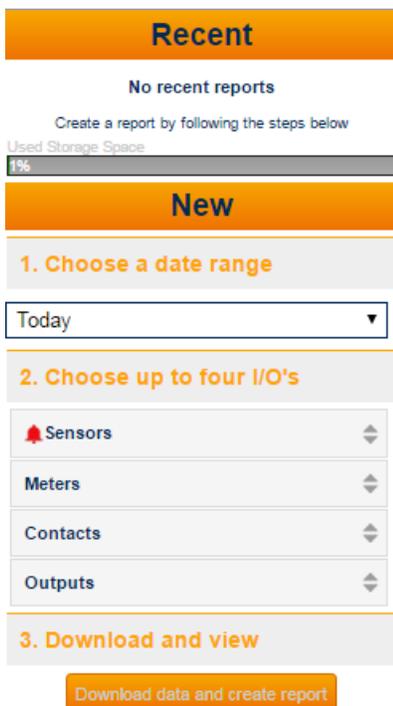
The report icon  opens the report page. See section 1.4.4 Create a Report

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

1.4.4 Create a Report



To create a report, select the report icon  from the main screen. Follow the three steps as shown.



The Icons:      

-  Access the controller manuals
-  Exit from the report menu back to the Live view
-  Show/hide the report menu
-  Manage the report database
-  Show/hide the controller header
-  Show/acknowledge current alarms

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Note the trend zoom tools.

Export as a picture



Manage the report database.

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1.5 View & Adjust Setpoints

Select the 1 to 5 icon on the home page. This example adjusts the Relay 1 setpoint

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

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

On: 1500 uS

Off: 1490 uS

Edit one or both setpoints & **Submit**

Refresh Submit

5: Blr5 Treatment

Adjust Setpoint

Measure 100 G

Feed 10 seconds

Submit

Feeding on volume allows you to set the feedwater concentration.

Sidebar:

Relays controlled by sensors power Pumps and Solenoids ON and OFF.

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.

Controls may be configured to prevent one chemical feeding while another feeds (See [3.7 Blocking, Delaying a Feed](#)) 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 3.3.1 Bleed Based Feed](#).)

Pumps or blowdown valve controls may be turned OFF when the tower or boiler is offline (See section [3.6 Interlocks](#))

Pay attention to the number **1** to **5** that precedes the pump, valve or solenoid name.

It's the physical location on the controller circuit board of the wiring that connects to the pump, valve or solenoid.

You may modify the name of the pump, valve or solenoid but you'll need to know which output is controlling so you can check that enclosure cover indicating light is ON when the pump, valve or solenoid is ON.

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1.6 Priming-Testing Pumps & Solenoids

Select the 1 to 5 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.

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.

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2 Blowdown Controls: Towers, Boilers, Closed Loops

2.1 Conductivity Controlled Blowdown

Select the 1 to 5 icon on the home page. This example sets up the Relay 2 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.

2:Tower276 Bleed	
Setup	
Control Type	Blowdown
Set Blowdown Mode	Sensor Control
Control by:	A:Tower Conduct.
Refresh Submit	

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.**

2:Tower 267	
Configure	
Descriptor	Tower 267
Display Units(UOM)	uS
Decimal digits	0
Used by I/O	5:Non-Ox
Control Action	ON decreases sensor
Refresh Submit	

Sidebar:

Note 1: Closed loop conductivity controls usually use **Control Action ON increases sensor**

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2.2 Boiler Blowdown

Select the 1 or 2 icon on the home page.
This example sets up the Relay 1 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 back to **Measure**

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

Status	Reconfigured
Descriptor	Blowdown 1
Display Units(UOM)	uS
Decimal digits	0
Disable	<input type="radio"/> Yes <input checked="" type="radio"/> No
Control Action	ON decreases sensor
Special Control	Captured Sample
Sample	30 seconds
Measure	60 seconds
Blowdown	120 seconds
ReSample	60 minutes

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.

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2.3 Metered Blowdown

Select the number 2 icon on the home page. This is the only relay that can control blowdown based on a Meter.

Select **Setup** from the pull-down

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

2: Tower276 Bleed	
Setup	
Status	Reconfigured
Control Type	Blowdown
Set Blowdown Mode	Water meter
Control by:	O: Tower Make-up
<input type="button" value="Refresh"/> <input type="button" value="Submit"/>	

2: Tower276 Bleed	
Adjust Setpoint	
Measure	500 G
Feed	75 seconds
<input type="button" value="Refresh"/> <input type="button" value="Submit"/>	

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2.4 Percentage Time Blowdown

Select the number **2** icon on the home page.

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

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 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.

Slimflex 5 Browser

2.5 Blowdown Limit Alarms

The screenshot shows the 'Alarms' configuration page for '2: Tower276 Bleed'. The interface includes a title bar, a pull-down menu for 'Alarms', and several configuration fields with radio button options. Annotations provide context for each field:

- Select the 1 or 2 icon on the home page. This example uses the Alarms page for a blowdown control on Relay 2** (points to the page title)
- Select Alarms from the pull-down** (points to the 'Alarms' pull-down menu)
- Adjust for the number of minutes that would represent a failure to control cycles of concentration, 2 hours in this example** (points to the 'Adjusted Alarm' field set to 120.0 minutes)
- The number of minutes in any one bleed cycle** (points to the 'Mins/Actuation' field)
- No = Alarm Logs & Displays but does not turn OFF the bleed** (points to the 'OFF on Alarm' field)
- Yes = Turns ON the alarm relay when Relay 2 alarms** (points to the 'Alarm Relay' field)
- The default sets OFF on Alarm = No, some blowdown is usually better than none** (points to the 'OFF on Alarm' field)
- If you are using another relay or DO with the Special Control = Alarm Output, then you can elect to have Relay2 alarm trip that relay or DO** (points to the 'Alarm Relay' field)
- Yes & Submit resets the alarm** (points to the 'Reset Alarm' field)
- Most recent alarm for Relay 1** (points to the 'Limit:ON timer' field showing 14:51 2016-Jul-11)

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

Slimflex 5 Browser

2.6 Blowdown Interlocks-Flowswitches

Select the number 2 icon on the home page. This example uses the **Interlocked** page for a boiler blowdown interlock on Relay 2

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**.

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 **S** must be **ON** for The Boiler 1 blowdown control on Relay 2 to run

3:Sulfite Feed

Interlocked

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

Refresh Submit

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

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

In this example pulse output 5 controls a sulfite pump typically feeding into the Deaerator sump.
If either Boiler 1 (T) or Boiler 2 (U) is online, we want the sulfite pump to be feeding so we select both to **Interlock & 'OR'** them.

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

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

Slimflex 5 Browser

2.7 Blocking-Delaying a Blowdown

Select the relay 2 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 **#2 Tower 276 Bleed** relay to prevent inhibitor from going direct to drain.

Select each control you wish to Block the bleed & **Submit**

Status	Blocking edit
1:Biofeed on 1	unused
3:Inhibitor Feed	Blocks
4:Boiler_1_CS	unused
5:Br5 Treatment	unused

Refresh Submit

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

Sidebar:

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

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

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

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

Slimflex 5 Browser

2.8 Blowdown Diagnostics

Select the number 2 icon on the home page. This example uses the Diagnostic page for a Tower bleed block on Relay 2

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...

ON time since midnight

Current value of the control sensor or control equation

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

1:Boiler_1_CS

Diagnostic

Status: Special Control,OFF

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

Blowdown by: F

100 uS

ON Setpoint

3000 uS

OFF Setpoint

2990 uS

Control Action

Lower TDS

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

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

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

3.1 Water Meter Inhibitor Feed

Select the relay 1 icon on the home page. This example uses the **Setup** page for an Inhibitor feed controlled by Relay 1. Relay 1 is dedicated to feeding an Inhibitor in Cooling mode.

Select **Setup** from the pull-down

Feeding chemical based on a make-up or bleed water meter 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**. You can feed based on multiple meters. See next page.

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

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 @ $(8 \text{ G} / (24\text{hr.} \times 3600 \text{ sec/hr})) = 92.6\text{E}^{-6} \text{ G/sec}$.
 Every 100 Gallons of make-up we'll need to feed $(100\text{G} \times 10 \text{ ppm}) = 1\text{E}^{-3}$ gallons which @ $92.6\text{E}^{-6} \text{ G/sec}$ 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.

Slimflex 5 Browser

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).

Changing the meter setup will also affect the totalized watermeter reading!

1: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**

1:Inhibitor Feed

Setup

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**

Slimflex 5 Browser

3.2 Sensor Controlled Feeds

Select the 3, 4 or 5 icon on the home page. This example uses the **Setup** page for an Oxidant feed controlled by Relay 4

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 440 mV the pump turns ON & stays ON until the ORP is 445 mV

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

Refresh Submit

Descriptor	Oxidant Pump
Display Units(UOM)	mV
Decimal digits	1
Disable	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Control Action	ON increases sensor
Special Control	None

Refresh Submit

Status	Setpoint change
On:	440.0 mV
Off:	445.0 mV

Refresh Submit

Slimflex 5 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 relay 1 icon on the home page. This example uses the Setup page for an Inhibitor feed controlled by Relay 1

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.

Slimflex 5 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 **3, 4 or 5** icon on the home page. This example uses the **Configure** page for an Oxidant feed controlled by Relay 4

Select **Configure** from the pull-down

Status	Reconfigured
Descriptor	Oxidant Pump
Display Units(UOM)	mV
Decimal digits	1
Disable	<input type="radio"/> Yes <input checked="" type="radio"/> No
Control Action	ON increases sensor
Special Control	Time Modulate
Period	120 seconds

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

Status	Setpoint change
On:	300.0 mV
Off:	350.0 mV

Sidebar:
Time Modulate Special Control is only selectable on Relays 3, 4 & 5

Slimflex 5 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.

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

Select the relay 3, 4 or 5 icon on the home page. This example uses the **Configure** page for an Oxidant feed controlled by Relay 4

Select **Configure** from the pull-down

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

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

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

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

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

4:Oxidant Pump	
Configure	
Status	Reconfigured
Descriptor	Oxidant Pump
Display Units(UOM)	mV
Decimal digits	1
Disable	<input type="radio"/> Yes <input checked="" type="radio"/> No
Control Action	ON increases sensor
Special Control	Timed Cycling
Period	600 seconds
ON Time	60 seconds
<input type="button" value="Refresh"/> <input type="button" value="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.

3.4 Control During Events

4:Oxidant Pump

Setup

Control Type: **Feed**

Set Feed Mode: **Sensor Control**

Control by: **F:ORP Sensor**

Refresh Submit

Select the relay 3, 4 or 5 icon on the home page. This example uses the **Setup** page for an Oxidant feed controlled by Relay 4

Select **Setup** from the pull-down

Events only exist on the pull down if **Control Type = Feed** or **Events-Other**. Set for **Feed**. Set Feed Mode = **Sensor Control** & the control is ORP

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

4:Oxidant Pump

Events

Day 4: 1 Events weekly

Event Cycle: **Weekly**

Select Activity: **Edit an Event**

Select for Edit & Delete

Day 1 @ 04:00 for 120 minutes

Values for Add & Edit

Start Day: 1 1-7

Start Time: 4:00 HH:MM

ON Time: 120 minutes

Event frequency: **Once**

Event Control: Yes No

ON Setpoint: 740.0 mV

OFF Setpoint: 745.0 mV

Reset Submit

Adjust Setpoint controls the Relay 4 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

Slimflex 5 Browser

3.5 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 5 icon on the home page. This example uses the **Alarms** page for an Inhibitor feed controlled by relay output 1

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

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.

Slimflex 5 Browser

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...

Slimflex 5 Browser

3.6 Interlocks

3.6.1 No feed on no flow

Select any relay 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 'T' **Boiler 2 Online** is **ON** then the relay 5 feed control runs.

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

Status	Interlock edit
S:Boiler 1 OnLine	unused
T:Boiler 2 Online	Interlock

In this example relay output 3 controls an acid pump.
If both **Flowswitch (S)** and **Low acid tank Level (R)** 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
R:Acid tank low	Interlock
S:Flowswitch	Interlock
T:Bleach tank low	unused
Contact set	'AND'ed

Slimflex 5 Browser

3.7 Blocking-Delaying a Feed

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

Select **Blocked** from the pull-down

Blocked by

Status	Blocking edit
2:Tower 2 Bleed	unused
3:Acid Pump	unused
4:Oxidant Pump	Blocks
5:Non-Oxidizer	unused

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 4 **Blocks** the **Inhibitor Feed** on Relay 1 to prevent degrading the inhibitor in the common feed header

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

Refresh Submit

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

Sidebar:

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

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

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

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

Slimflex 5 Browser

3.8 Feed Diagnostics

Select any relay icon on the home page. This example uses the **Diagnostic** page for an **Acid Pump** controlled by output 3

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

3:Acid Pump	Diagnostic
Status	Operational, ON
Feed by: E	7.98 pH
ON Setpoint	7.50 pH
OFF Setpoint	7.45 pH
Control Action	Feed Acid

0.3m ON today	0.3m ON, actuation
Refresh	

Control state

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

Current setpoints

Feed state

5:Br5 Treatment

Diagnostic

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
Refresh	

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**

Slimflex 5 Browser

Feed Diagnostics cont.

1:Inhibitor

Diagnostic

Status	Special Control,ON
0.5m ON today	0.5m ON, actuation
~~~~~	
Bleed then Feed	Bleed OFF Feed 4630 sec

Refresh

**5:Non-Oxidizer**

**Diagnostic**

Status	Special Control,ON
0.3m ON today	0.3m ON, actuation
~~~~~	
Percent Time,25%	Countdown: 55 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

Ref

**4:Oxidant Pump**

**Diagnostic**

Status	Blocked by 3 ,OFF
2.6m ON today	0.0m ON, actuation

Refresh

Control state: In this example, the **Bleed then Feed Special Control** is controlling Relay 1

The **Bleed** is now **OFF** & we owe 4630 seconds of pump run time. Is a 70 minute bleed cycle normal for this site or does it indicate a problem?

Control state: In this example, the **Percent Time** is controlling

We're in the ON state for another 55 seconds of the 5 minute cycle. 25% of 5 minutes = 75 seconds

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 4 is Blocked & OFF when Relay 3 turns ON

# Slimflex 5 Browser

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

### 4.1 Setting & Viewing Events

Select the relay 3, 4 or 5 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**. These events will repeat each week until changed or deleted.

## Slimflex 5 Browser

### 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 identical to those for **Chemical Feed Controls**. Refer to Sections [3.6](#) and [3.7](#) for setup & state pages.

Biocide feeds are always interlocked with the tower flowswitch.

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

# Slimflex 5 Browser

## 4.2 Prebleed – Lockout

The screenshot shows the configuration interface for '5:Biocide A'. The 'Configure' tab is active. The form includes the following fields and callouts:

- Status:** Reconfigured
- Descriptor:** Biocide A
- Disable:** Yes (disabled), No (selected)
- Special Control:** Prebleed Lockout (dropdown menu)
- Lockout:** 120 minutes
- Prebleed:** 30 minutes
- Prebleed Sensor:** A: Tower Conduct. (dropdown menu)
- Prebleed OFF:** 750 uS
- Blowdown Relay:** 2: Tower276 Bleed (dropdown menu)

Callout boxes provide the following explanations:

- Configure:** Select Configure on the Biocide Event control to setup **Prebleed Lockout**
- Special Control:** Select **Special Control = Prebleed Lockout & Submit.** Then set-adjust the following parameters
- Lockout:** **Lockout** is the time that the **Blowdown Relay** is blocked. Includes the Event time. Set = 0 for no **Lockout**.
- Prebleed:** **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:** **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:** **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 is cycles limited. **Lockout** has a lower cost but not applicable for many sites.

# Slimflex 5 Browser

## 4.3 Alarm Relay

Select the relay icon from the right side of the home page. Relays 3, 4 & 5 are available as alarms.

Select **Setup** from the pulldown

Verify **Control Type = Events-Other**

Then select **Configure** from the pulldown

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

5:Alarm_Relay	
Setup	
Control Type	Events-Other
Refresh	Submit

5:Alarm_Relay	
Configure	
Descriptor	Alarm_Relay
Disable	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Special Control	Alarm Output
Refresh	Submit

# Slimflex 5 Browser

## 5 Sensors Inputs: Conductivity, Temp., Fluorescent, pH & ORP

### 5.1 Sensor Calibration:

#### 5.1.1 Single Point – Grab Sample

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

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

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

Calibrating locks out the local keypad user so that both users are not calibrating @ the same time.

Press the **X** to close the window when finished

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

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**

**Factory Reset = Yes & Submit** restores the sensor to its default values. If the reset gives a new sensor value may indicate fouling or end-of-life state or allow you to recover from a faulted calibration procedure

A:Conductivity	
Calibrate	
Enter value	3009 uS
Factory Reset	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Submit Calibrate	

A:Conductivity	
Calibrate	
Status	Calibrated
Enter value	1700 uS
Factory Reset	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Submit Calibrate	

A:Conductivity	
Calibrate	
Status	Out of Range!
Sensor	1700 uS
Calib. Override	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Factory Reset	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Re-calibrate Submit	

# Slimflex 5 Browser

## 5.1 Sensor Calibration:

### 5.1.2 Boiler Conductivity

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

If using the **C to F** 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

Note the live value 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.

Enter the wet test value here. After the Measure time counts 0, press **Calibrate**

Successful **Calibration**.

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

# Slimflex 5 Browser

## 5.1. Sensor Calibration:

### 5.1.3 pH Dual Buffer Calibration 1 of 2

Select the **E** or **F** icon on the home page or the **CAL** icon below the **E**, **F** icons.  
This example calibrates the pH sensor connected to input **E**

**E:pH Sensor**

**Setup**

Status	Reconfigured
Descriptor	pH Sensor
Display Units(UOM)	pH
Decimal digits	2
Calibrate	2 Point
Used by I/O	3,

Reset Submit

If using the **E** or **F** 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**.

**Calibrate**

1st pH buffer: 7.00 pH

Factory Reset:  Yes  No

Submit Start

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

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

**E:pH Sensor**

**Calibrate**

Sensor Monitor	Elapsed
7.08 pH	00:37
7.0 Buffer	7.1 pH
Factory Reset	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Next

Monitor the live reading until the pH is stable & close to the buffer value. Then press **Next**.

# Slimflex 5 Browser

## 5.1 Sensor Calibration: pH Dual Buffer Calibration 2 of 2

E:pH Sensor

Calibrate

7.0 Buffer	7.08 pH
2nd pH buffer	<input type="text" value="10.00 pH"/>

Next

Results from 1st buffer

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

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

E:pH Sensor

Calibrate

Sensor Monitor	Elapsed
<input type="text" value="9.93 pH"/>	<input type="text" value="01:00"/>
7.0 Buffer	7.08 pH
10.0 Buffer	<input type="text" value="10 pH"/>
Factory Reset	<input type="button" value="Yes"/> <input checked="" type="button" value="No"/>

Calibrate

Successful calibration. Press the X to exit **Calibration**.

E:pH Sensor

Calibrate

Status	Calibrated
1st pH buffer	<input type="text" value="7.00 pH"/>
Factory Reset	<input type="button" value="Yes"/> <input checked="" type="button" value="No"/>

Submit Start

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

**Note:** Two buffer pH calibration seldom results in better pH control than single point, grab sample calibration, but may be required by site practice. It is a good test for a sluggish probe.

Clean the sensor and re-calibrate. If error continues, try a new sensor.

E:pH Sensor

Calibrate

Status	Out of Range!
7.0 Buffer	6.91 pH
Sensor	10.00 pH
Calib. Override	<input type="button" value="Yes"/> <input checked="" type="button" value="No"/>
Factory Reset	<input type="button" value="Yes"/> <input checked="" type="button" value="No"/>

Re-calibrate Submit

# Slimflex 5 Browser

## 5.1 Sensor Calibration:

### 5.1.4 Fluorescent Calibration 1 of 2

The SlimFlex5 program will only allow the Little Dipper and Pyxis fluorescent sensors as inputs to the 4-20mA input driver. The 4-20mA input card is preset from the factory for a fluorescent sensor.

A 2-point calibration requires buffers from the manufacturer or samples with two known fluorescent values.

**E:Fluorescent**

Select the C to F icon on the home page or the **CAL** icon below the C to F icons. This example calibrates the fluorescent sensor connected to input E

Select **Setup** from the pulldown

Edit the description, display units and decimal digits as desired

Choose 1 or 2 point calibration. This example details a 1-point calibration. A 2-point calibration requires buffers

The range is set from the factory

Press Submit to save any changes

Select **Calibrate** from the pulldown menu

Test the fluorescence of the sample and enter the value here. Press **Calibrate**

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

If the value entered is not within the expected range of the current input value, an Out of Range! message is displayed. Select Calib. Override to keep the newly entered value or press Re-calibrate. This is typically a result of a fouled sensor or open loop. Clean or replace the sensor. Check for loose connections.

<b>Status</b>	Out of Range!
<b>Sensor</b>	30.0 ppb
<b>Calib. Override</b>	<input type="radio"/> Yes <input checked="" type="radio"/> No

Re-calibrate Submit

# Slimflex 5 Browser

## 5.1 Sensor Calibration: Fluorescent Calibration 2 of 2

Decimal digits	1
Calibrate	2 Point

If you chose 2-point calibration on the Setup page, use this example

**E:Fluorescent** ✕

**Calibrate** ▼

Enter 1st value	30.0 ppb
-----------------	----------

From the **Calibrate** menu, enter the first buffer value and press **Start**

Enter the second buffer value and press **Calibrate**

**E:Fluorescent** ✕

**Calibrate** ▼

<b>Status</b>	Out of Range!
<b>First value</b>	30.0 ppb
<b>Sensor</b>	130.0 ppb
<b>Calib. Override</b>	<input type="button" value="Yes"/> <input checked="" type="button" value="No"/>

**Status = Calibrated** & displays most recent value or Out of Range  
 If Out of Range, clean sensor and try again. Use the **Calib. Override** button to keep your entry as is, **Re-calibrate** to start over or **Submit** to cancel.

# Slimflex 5 Browser

## 5.1 Sensor Calibration:

### 5.1.5 Manual Inputs

**N:Manual Entry** [Close]

Configure

Compensation: **Manual Entry**

Reset Submit

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

**N:Drop_test** [Close]

Setup

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

Reset Submit

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

**N:Drop_test** [Close]

Calibrate

Enter value: 8.0 drp

Factory Reset: Yes No

Submit

Close the window to exit & to unlock keypad calibrate access

Edit Enter Value & Submit

# Slimflex 5 Browser

## 5.1.6 CTFS Flowswitch Calibration

**A:Conductivity**

**Configure**

Compensation: **None**

Override flowswitch:  Yes  No

Flowswitches:

Select Configure from the Conductivity sensor pulldown

Select Override Flowswitch 'Yes' and press Submit.

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

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

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

**A: Tower Cond.**

**Diagnostic**

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

# Slimflex 5 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 pull-down

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'

<b>A: Tower Conduct.</b>	
<b>Alarms</b>	
HiAlarm	2000 uS
LoAlarm	1000 uS
Alarm Relay	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Delay on Alarm	5.0 minutes
Disable Alarms	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Slider Max.	4000 uS
Slider Min.	500 uS
<input type="button" value="Reset"/> <input type="button" value="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.

# Slimflex 5 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 pulldown

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.

**F:Boiler Cond.**

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**

**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. See section 9.6

# Slimflex 5 Browser

## 5.4 Sensor Compensation

**A: Tower Conduct.**

Configure

Compensation	Thermal Comp.
Thermal Sensor	K:Temperature
Compensation	0.970 %/F
Override flowswitch	<input type="radio"/> Yes <input checked="" type="radio"/> 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

**C: pH Sensor**

Configure

Compensation	Thermal Comp.
Thermal Sensor	K:Temperature

Reset Submit

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

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

### Sidebar:

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

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

# Slimflex 5 Browser

## 5.5 Sensor Diagnostics 1 of 2

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

Sensor input '**A**' is used for conductivity 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**

A: Tower Conduct.	
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
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)

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	

### Sidebar:

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

# Slimflex 5 Browser

## 5.5 Sensor Diagnostics 2 of 2

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

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

**C:pH Sensor**

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

Refresh

**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

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

## Slimflex 5 Browser

### 5.6 Using Sensor Attributes for Phantoms

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

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

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

Select **Configure** from the pulldown

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

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

Appendix '**B**' lists available attributes by sensor type.

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 physical wiring locations.

## 6 Measuring Volume: Water Meters

### 6.1 Configuring a New Meter

Select the **O** to **T** 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 Switching Meters and Contact Sets](#)

Select **Setup** from the pulldown

Descriptor: Grey Water add ← Edit **Descriptor** to set site name, 16 characters max. & **Submit**

Display Units(UOM): G ← Edit **Units** (defaults to system units) , 3 characters max. & **Submit**

Decimal digits: 2 ← Select # **digits** after decimal & **Submit**

Disable: Yes  No  ← **Disable & Sensor Type** options only display if meter not in use by another I/O

Sensor Type: Turbine meter

Reset Submit

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

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

R:Grey Water add

Configure

'K' Factor: 2.000

Compensation: None

Reset Submit

O: Tower Make-up

Configure

Vol/contact: 100 G

Compensation: None

Reset Submit

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

O: Tower Make-up

Setup

Descriptor: Tower Make-up

Display Units(UOM): G

Decimal digits: 0

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

Reset Submit

# Slimflex 5 Browser

## 6.2 Copying Meters,

Use Copy Meter to sum make-up or blowdown volumes from multiple meters.

**Z:Water meter** configuration:

- Compensation: None
- Sensor Type: Water meter
- Select source: none

**R:Water meter** configuration:

- Vol/contact: 100 G
- Compensation: Copy meter
- Target Meter: Z:Water meter

**Q: Tower blowdown** configuration:

- R Factor: 10.000
- Compensation: Copy meter
- Target Meter: Z:Water meter

**Meters** display:

- Feedwater 1: 0001900 G
- Backup Feed: 0000007 G
- Sum of O and P: 0001907 G

Annotations:

- Enable an digital phantom **O** through **Z**
- Use the **Configure** menu and select type **Water meter**
- This example sums the meter volumes @ 'R' and 'Q' to the phantom meter at 'Z' using **Copy Meter**. Copy either type of meter, contact head or Turbine
- Select **Compensation = Copy Meter**
- Select **Target Meter = phantom Meter** in the 'W' to 'Z' space & **Submit**
- The Sum of O and P are displayed on meter Z

# Slimflex 5 Browser

## 6.3 Flow Rate Conversion

Water meters display the number of gallons measured. Use an analog phantom I through N to display the flow rate of a Turbine style meter.

Convert a paddlewheel meter to a flow rate in GPM. Cannot convert contact head meters.

Enable an analog phantom I through N

N:Flow rate

Configure

Compensation	Not applicable
Select source	P1:Rate

Reset Submit

The Flow Rate is displayed on the Home screen. Units are set based on the system choice of Metric or not.

Flow rate  
Boiler 1 | Boiler 2  
125.1 gpm  
CAL

Use the **Configure** menu to choose the **Rate** attribute from the meter. Press **Submit**.

Detailed description: The image illustrates the configuration and display of flow rate. On the left, a configuration interface for 'N:Flow rate' is shown. It includes a 'Configure' dropdown menu, a 'Compensation' field set to 'Not applicable', and a 'Select source' dropdown menu set to 'P1:Rate'. 'Reset' and 'Submit' buttons are at the bottom. Callout boxes provide instructions: 'Convert a paddlewheel meter to a flow rate in GPM. Cannot convert contact head meters.' points to the 'N:Flow rate' header; 'Enable an analog phantom I through N' points to the 'N' icon; and 'Use the Configure menu to choose the Rate attribute from the meter. Press Submit.' points to the 'P1:Rate' selection. On the right, a screenshot of the 'Flow rate' home screen displays '125.1 gpm' with a progress bar below it. A callout box states: 'The Flow Rate is displayed on the Home screen. Units are set based on the system choice of Metric or not.'

# Slimflex 5 Browser

## 6.4 Meter Diagnostics

Select the **O** to **T** 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 pulldown

<b>Sensor Type</b>	Water meter
<b>Vol. this year</b>	6711 G
<b>1 Days Online</b>	Vol/Day,6711 G
<b>Volume Total</b>	6711 G
<b>Vol. last year</b>	0 G
<b>Input Firmware Driver</b>	built-in
<b>Configure: 0000</b>	Status: 0000
<b>Device: 000C4E31</b>	Product: 0E12519A
<b>Rev.#: 00000001</b>	S/N:: 15082008
<b>A.ID#: 31032004</b>	A.Part#: -1
<b>A.rev#: 0</b>	Firmware:01.01.02.00

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

Total since meter installed

Refresh

**Q: Tower Blowdown**

**Diagnostic**

<b>Sensor Type</b>	Water meter
<b>Vol. this year</b>	377 G
<b>1 Days Online</b>	Vol/Day,377 G
<b>Volume Total</b>	377 G
<b>Vol. last year</b>	0 G
<b>Input Firmware Driver</b>	built-in
<b>Configure: 0000</b>	Status: 0000
<b>Device: 000C4E31</b>	Product: 0E12519A
<b>Rev.#: 00000001</b>	S/N:: 15082008
<b>A.ID#: 31032004</b>	A.Part#: -1
<b>A.rev#: 0</b>	Firmware:01.01.02.00

DI (Digital Input) driver detail Shared by all inputs 'O' thru 'T'

Refresh

# Slimflex 5 Browser

## 6.5 Meter Alarms

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

or select **Alarms** from the pulldown

R:Water meter	
Alarms	
Status	Alarmed
HiAlarm	5000 G
LoAlarm	0 G
Alarm Relay	<input type="radio"/> Yes <input checked="" type="radio"/> No
Clear Alarms	<input type="radio"/> Yes
Alarmed High	15:00 2018-Mar-08
Disable Alarms	<input type="radio"/> Yes <input checked="" type="radio"/> No
<input type="button" value="Reset"/> <input type="button" value="Submit"/>	

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.

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.

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

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.

Notice: Since the R meter is not in alarm, the Clear Alarms button is not available

R:Grey Water add	
Alarms	
Status	Adjusted Alarm
HiAlarm	10.00 G
LoAlarm	-100.00 G
Alarm Relay	<input checked="" type="radio"/> Yes <input type="radio"/> No
Disable Alarms	<input type="radio"/> Yes <input checked="" type="radio"/> No
<input type="button" value="Reset"/> <input type="button" value="Submit"/>	

# Slimflex 5 Browser

## 7 Flowswitches, Interlocks & Contact Sets

### 7.1 Switching Meters & Contact Sets

Volume meters and contact set inputs are connected in the 'O' to 'T' 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 **T** 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**

<b>U:Low_Level</b>	
Setup	
Descriptor	Low_Level
Disable	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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)

<b>S:Flowswitch</b>	
Setup	
Descriptor	Flowswitch
Used by I/O	1,3,
Reset Submit	

# Slimflex 5 Browser

## 7.2 Contact Set Alarms

Select the **O** to **T** 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.

S:Flowswitch	
Alarms	
ON Time Alarm	600.0 minutes
No Flow Alarm	1500.0 minutes
Alarm Relay	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Disable Alarms	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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 <input type="checkbox"/> No <input checked="" type="checkbox"/>
Disable Alarms	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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.

## Slimflex 5 Browser

### 7.3 Logically Inverting Contact Sets

Select the **O** to **T** 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 Mirroring a Control ON/OFF

A phantom contact set may be configured to mirror any relay. 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

Relay 4 feeds the bleed line chemical, configured to base feed @ 5mL/minute

Phantom Contact Set 'X' mirrors Relay 1 & Interlocks Relay 4

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**

# Slimflex 5 Browser

## 8 4-20mA Outputs

### 8.1 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 on console keyboard is pressed

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

Select **Control by** and **Submit**

Select output range and **Submit**

The range does not have to be the full range of the sensor

In this example, a pH of 7.5 would set the 4-20mA output to 10mA  

$$(16\text{mA} \times (7.5 - 6.0) / (10.0 - 6.0)) + 4\text{mA}$$

#### Sidebar: Manual Mode

Use **Manual mode** to verify the pump is 100% ON=20mA, completely OFF=4mA, or to verify the loop span on the monitoring DCS that is using the current loop value to represent a controller conductivity, pH, ORP or temperature.

# Slimflex 5 Browser

## 8.2 Calibrate

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

Select **Calibrate** from the pull-down

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

Edit **Output @ 4mA** level. Use the mA current value displayed on the pump, measured by the DCS or volt meter. Press **Calibrate**

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

Calibration ends. Close the window.

C:4-20mAOutput	
Calibrate	
4-20mA = 4mA	<input checked="" type="checkbox"/> START
Factory Reset	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<input type="button" value="Submit"/> <input type="button" value="Start"/>	

C:4-20mAOutput	
Calibrate	
Output @ 4mA	4.0 mA measured
<input type="button" value="Calibrate"/>	

C:4-20mAOutput	
Calibrate	
Output @ 20mA	19.97
<input type="button" value="Calibrate"/>	

C:4-20mAOutput	
Calibrate	
Status	Calibrated
4-20mA = 4mA	<input checked="" type="checkbox"/> START
Factory Reset	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<input type="button" value="Submit"/> <input type="button" value="Start"/>	

# Slimflex 5 Browser

## 8.3 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	1.0019
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

Controlling sensor name

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

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'

Sensor Type	4-20mAOutput
Manual Setpoint	5.60mA 10.0%
Gain Multiply	1.0019
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

# Slimflex 5 Browser

## 9 System Settings

### 9.1 Home & Diagnostic pages

#### 9.1.1 S/N, Versions, Fuse & Fan state, Biofeed Week#

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

System: Home

Language: English

2017-Apr-10 S/N: 123

Status: Logged in

Current User: Operator1

Logout: Yes

Keep session active: Yes  No

Buttons: Reset, Submit

Callouts:

- Duplicates login state from top, right of home page
- Logout here or on the home page. Logs out automatically if no activity for 30 minutes
- Disables the 30 minute timer

System: Diagnostic

Diagnostic

Serial number	123
Firmware	17.12.07.00
HMI Firmware	17.03.23.00
Web Browser HMI Version	05.00.00.00
Relay Fuse	OK
Watchdog Resets	0
Admin Password	Default
O-T wiring	OK
Fan speed	3720 RPM
Biotiming, Events	Thu, WEEK 1

Buttons: Refresh

Callouts:

- Select Diagnostic from the pull down
- The last three digits of the serial number. Used to ID E-mail, tags the log & activity files
- Controller services & controls
- Line power fuse for relays 1 & 2. May be used to power loads switched by relays 3-5.
- Accumulates CPU crashes. Should read O. Check incoming power.
- Default = AAAA, otherwise known only to the Admin
- Status of the power for 3 wire turbine meters connected to inputs 'O' thru 'T'.
- Cooling fan fault shuts down all sensor driver cards & controls. Displays only fault message on local HMI display
- Events are entered as daily, weekly or monthly (28 days). In daily, every day is day = 1. In weekly, every Sunday is Sunday = 1. This page shows the 28 day cycle. This is day 9 of 28.

# Slimflex 5 Browser

## 9.2 Activity Log:

### 9.2.1 User ID, time stamp

**System: Activity Log**

**Activity Log**

67 Events, 1-10

Mar

8

IO	Activity	User ID	Time
K:	Activity ,Enabled	admin	10:09:43
L:	Activity ,Enabled	admin	10:09:48
K:	Configure ,Type changed	admin	10:09:59
L:	Activity ,Changed	admin	10:10:10
Q:	Activity ,Changed	admin	10:10:52
Q:	Activity ,Changed	admin	10:10:52
Q:	Activity ,Changed	admin	10:10:52
Q:	Activity ,Changed	admin	10:11:06
Q:	Activity ,Changed	admin	10:11:14
R:	Activity ,Changed	admin	10:11:37

Next Submit

**System: Activity Log**

**Activity Log**

0 Events, 1-0

May

1

No activity file

Submit

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

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

View another day: Select Month & Day & **Submit** (ast six months selectable)

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** selection not shown @ end of day's activities  
In this example, we are viewing events 1-10 of 67 total activities

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

## Slimflex 5 Browser

### 9.3 Communications:

#### 9.3.1 LAN IP, Netmask, MAC, Gateway, Wifi IP

You'll need to be logged in as the admin user to modify **Communications**.

The top of the page will prompt you with the required login if you are not allowed to modify the current page.

The controller does not include a **DHCP client** which means when you connect to the site LAN you'll need to assign a static IP valid for the LAN.

The screenshot shows the 'System: Communications' configuration page. The 'System' dropdown is set to 'Communications'. The form contains the following fields and callouts:

LAN IP Address	10.10.6.118	Static IP LAN address of the controller If you edit & <b>Submit</b> to modify, you'll lose the current browser connection on the current IP
LAN Netmask	255.255.255.0	Set LAN Netmask to desired netmask & <b>Submit</b>
LAN MAC Address	54:10:ec:58:ee:7c	
LAN Gateway	10.10.6.19	If you are using the E-mail functionality (alarms & auto-reporting), then the LAN Gateway should match other devices on this LAN
LAN Primary DNS	10.10.6.1	
LAN Secondary DNS	0.0.0.0	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
WiFi IP Address	192.168.1.1	
WiFi Netmask	255.255.255.0	
WiFi SSID	_SF5_123	The WiFi SSID defaults to <b>_SF5_xxx</b> where <b>xxx</b> = last 3 numbers of the controller serial number. Edit to modify & <b>Submit</b>

Buttons: Reset, 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 through the settings.

LAN (Local Area Network) refers to the Ethernet port connection. WiFi refers to the wireless connection. See section **1 Day to Day Browsing** for connection information.

# Slimflex 5 Browser

## 9.4 Time & Date:

### 9.4.1 Sync to Device

**System: Time & Date**

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

**Time & Date**

Date DD/MM/YY 08/03/18

Time HH:MM:SS 16:46:55

Weekday Thu

[Set fields to match my computer](#)

Reset Submit

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

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

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

# Slimflex 5 Browser

## 9.5 E-Mail Setup – Test

**System: E-mail Setup**

**E-mail Setup**

**E-mail Enabled**  Yes  No

**E Service Reports**  Yes  No

**E-mail day's summary**  Yes  No

**E-mail on Alarm**  Yes  No

**Mail To:** datastream@prominent.us

**cc E-mail to** stein.peter@prominent.com

**cc E-mail to** Unassigned

**cc E-mail to** Unassigned

**cc E-mail to** Unassigned

**SMTP IP Address** 43.228.184.6

**SMTP Port** 2525

**SMTP Username** sf5@prominent.us

**SMTP Password** ●●●●

**SMTP reset**  Yes  No

**Test E-mail**  Yes  No

**Next mail** 58.0min

**Reset** **Submit**

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 Service Reports requires a paid subscription to H2Tronics.

Choose to receive a file or email

**E-mail day's summary = Yes** sends a midnight E-mail. Includes sensor values, run times, volumes... Targeted @ 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 four optional **cc E-mail to**  
Edit zero length to remove & **Submit**

Set the SMTP back to the factory default parameters

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

# Slimflex 5 Browser

## 9.6 Enable I/O:

### 9.6.1 Enable IO, Assign to System#

#### Sidebar:

All I/O points can be enabled and used in the program. Enabled points are displayed on the main screen. If a point is disabled, it is removed from the main screen and has no programmable function.

If you select two systems (Section 9.7 System Setup), you will see the menu on the left. A single system user will see the menu in the lower right corner of this page.

This is the display you will see if you have chosen 2 systems on the System setup page. You can place any I/O point into either system or both. This will affect how the information is displayed in any reports

To enable an I/O, use the box at the bottom of the page.

The image shows two screenshots of the 'Enable I/O' interface. The top screenshot shows a multi-system view with a table of I/O points and their assigned systems. The bottom screenshot shows a single-system view with a simplified interface.

Configure	System
C:Boiler 1 Cond.	Boiler 1
D:Boiler 2 Cond.	Boiler 2
E:B1 Cond Output	Boiler 1
F:B2 Cond Output	Boiler 2
Enable I/O	none

**Annotations:**

- Select **Enable I/O** from the **System** pulldown
- All I/O are divided into 3 pages. This is the **Sensor** page. Choose a system for each point and **Submit**. Use the pulldown to see **Control** and **Meter/Contact set** choices
- System Setup page field # of Systems = One Is limited to **Enable IO**
- Select I/O you wish to enable or **None** & **Submit**

# Slimflex 5 Browser

## 9.7 System Setup:

### 9.7.1 Naming, Sunday=Day1 ,Metric Units, Restart Options

You'll need to be logged in as the admin user to modify **System Setup**.

The top of the page will prompt you with the required login if you are not allowed to modify the current page.

The screenshot shows the 'System Setup' web interface. The page title is 'System Setup' and the status is 'Reconfigured'. The form contains the following fields and options:

- Site name:** Prminent
- System-Name:** Tower #1
- 2nd System-Name:** Tower # 2
- Keypad Password:** Yes (checked) / No
- Metric Units:** Yes (checked) / No
- Sunday=Day 1:** Yes (checked) / No
- # of Systems:** Two
- Alarm on STOPS:** Yes (checked) / No
- System restart:** Yes / No (checked)
- Factory Reset:** Yes / No (checked)
- Enable Alarm Chime:** Yes / No (checked)

Callout boxes provide the following instructions:

- Select System Setup from the System pulldown**
- Site Name & System-Names will tag your reports & E-mail alarms to differentiate controllers. Sixteen characters maximum. Edit & Submit**
- Select Keypad Password = Yes & Submit**  
Shares passwords & access level with the controller keypad users, see Section 9.7 Passwords for more information.
- Metric Units = Yes & Submit** displays temperatures in 'C' & measures volumes in Liters.  
**Metric Units = No & Submit** displays temperatures in 'F' & measures volumes in Gallons
- Select 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.
- Select # of Systems = One or Two & Submit**  
**Two** turns on selectors in **Enable I/O** page
- Select Alarm on STOPS = Yes & Submit**  
To alarm when user presses STOP on local HMI keypad.
- Select System restart = Yes & Submit**  
Same effect as cycling the power OFF-ON; restarts controls & actuation times
- Select Factory Reset = Yes & Submit**  
Removes user settings, controls, naming, calibration... Load a default or previously saved configuration after **Factory Reset** to avoid reconfiguring each I/O.
- Select Enable Alarm Chime = Yes & Submit**  
for audible tone on alarm

# Slimflex 5 Browser

## 9.8 Passwords:

### 9.8.1 View-Set Access Level

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

**System: Passwords**

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

**New Password** AAAA

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

**Select User** O:Operator1

**Access Level** Operate

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**

Reset Submit

**System: Passwords**

**System: Passwords**

**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

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

Reset Submit

**Access Level** is used to prevent casual users from inadvertently modifying controls

#### Default Passwords:

Operator1 = 1 Operator2 = 2 Operator3 = 3 Operator4 = 4.

Configure5 = 5 Configure6 = 6 Configure7 = 7 Administrator = AAAA

**Login Page:** Operators can view all controller pages. No access to most System pages.  
Configure users can edit the program. No access to most System pages.

#### Modify Passwords:

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

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

# Slimflex 5 Browser

## 10 Using the USB Port

### 10.1 Capturing Data 1 of 2

The SlimFlex5 controller logs all enabled sensors, flow switches, meter values, relay ON times, fed volumes and status. This data is easily captured from the USB port located behind the communication light cover. The USB flash drive must be FAT32, a 4GB storage limit.

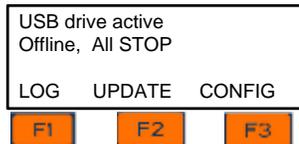


Phillips head screw  
Hinges (2)

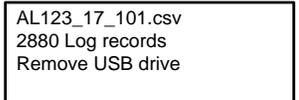
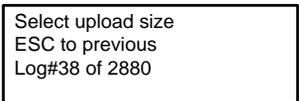


Figure 67 USB Access Door Closed [Top] and Open [Bottom]

- 1- Insert a USB flash drive into the USB port shown. The OLED screen will acknowledge the drive.



- 2- Choose F1, LOG to set up the download.
- 3- Choose the amount of history, DAY [F1], WEEK [F2], or MONTH [F3]. When you choose the period, the download starts.
- 4- *During the download, the keypad and browser connection are locked. The controller outputs are turned off!*
- 5- The controller display will show the progress of the download
- 6- Once complete, the display will show the file name uploaded to the USB flash drive (ending in "csv"), the size of the file in number of records or time stamps, and instructs you to remove the drive to return the controller to normal operation.
- 7- The filename includes the last three digits of the controller serial number, the year and day of the year. In this example, 123, 17 and 101 respectively in this example.
- 8- Don't forget to close and re-secure the access door to assure the interior of the controller is not subjected to moisture or corrosive fumes from the environment.



### CSV File Name Format

The name of a CSV Log saved on your USB drive is created based on the following format:  
AL123_17_101.csv: AL = CSV Log file, 17 is the year 2017, 101 is the day of the year.

## Slimflex 5 Browser

No special conversion program or Excel add-in is needed to import the CSV formatted data into Microsoft Excel® or similar spreadsheet programs. Refer to your spreadsheet or graphing software product to learn how to import CSV data. (CSV = Comma Separated Value). See example on next page.

Datalog example opened in Excel:

	A	B	C	D	E	F	G	H	I	J
1	SF5									
2	Serial number	Site name	Controller name							
3	20173425123	Office demo	Stein							
4	Log records									
5	I/O	Location	A	C	D	O	S	1	2	3
6	I/O	Units	uS	pH	mV	Gal	sec	sec	sec	sec
7	Date	Time	Conductivity	pH Sensor	ORP Sensor	Recirc Flow	Delta Alar	Inhibitor	Bleed	Acid
8	10/9/2018	16:31:30	1440	7	330	0	30	0	0	30
9	10/9/2018	16:31:00	1440	7.01	333	0	30	0	0	30
10	10/9/2018	16:30:30	1441	7	333	0	30	0	0	30
11	10/9/2018	16:30:00	1439	7.01	338	0	30	0	30	30
12	10/9/2018	16:29:30	1440	7	337	0	30	0	30	30
13	10/9/2018	16:29:00	1439	7.01	337	0	30	0	30	30
14	10/9/2018	16:28:30	1440	7.01	335	0	30	0	30	0
15	10/9/2018	16:28:00	1440	7	338	0	30	0	30	0

Table 20 Partial example of captured data

Box A1 = Controller Type

Inputs are denoted by letters and relays by numbers. (Line 5)

Values shown are as taken, not averaged over the period.

Relays show ON-time in seconds when in on/off mode.

Only I/O that are currently enabled are included in report.

Above report was taken from a controller set for gathering data every 30 seconds. (note 'Time' in column B). Early versions of the SF5 firmware were locked at 5 minutes per sample. The latest version allows for 30 second, 1, 2, 5, 30 or 60 minute sample rate selection. See the System Setup menu.

## 10.2 Save or Load the Program Configuration

**Perform this step prior to a Firmware Upgrade. See section 13.3 Firmware Upgrade using USB.**

A program configuration is a list of instructions that the user can edit. Set-points, calibrations, names of I/O are all saved in the program configuration. You can save the configuration via a USB drive for backup purposes or to clone another controller. (Save from one controller and Load the configuration onto another.)

To see how to access the USB port, see section 13.1 Capturing Data.



### Configuration File Name Format

The name of a configuration saved on your USB drive is created based on the following format:  
AC123_18_292.cfg: AC = Configuration file, 18 is the year 2018, 292 is the day of the year.

# Slimflex 5 Browser

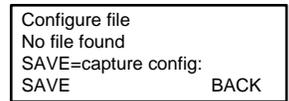
## 10.2.1 Saving to the USB

1- To save a copy of your current program onto a USB drive, insert a USB into the USB port located behind the Communication panel.

2- Press F3 Config



3- If you have not previously saved a program on this USB you can only F1 SAVE a copy to the USB.



4- If you have a previously saved program, you have the choice of saving F1 or loading F3.



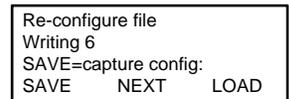
In either case, press **F1 SAVE** to copy the current configuration to the USB drive. When the save is complete, the display will notify you to remove the USB drive.



## 10.2.2 Loading from the USB

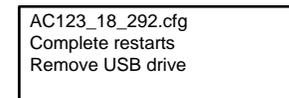
1- To load a previously saved program from the USB to your controller, insert the USB drive with the saved configuration into the USB port as explained in step 1 above.

2- Press F3 Config



3- Press F3 Load.

4- The controller loads the program from your USB and notifies you to remove it.



Sometimes referred to as “Cloning”, a saved program file can be loaded onto a different SlimFlex5 controller. They will then have the same configuration.

## 10.2.3 Saving to/from flash using the controller keypad

A copy of the configuration can be saved to the controller flash memory for immediate recall at a later time.

Press Menu, scroll up to System and press OK. Scroll up to Configuration and press OK. Save or load a configuration.

## 10.3 Firmware Upgrade using USB

If necessary, your controller can have the firmware upgraded. Firmware is a set of instructions which tell the controller CPU how to operate. Firmware is not your ‘program configuration’ which determines which relay operates when and how. The program configuration can be saved and if needed, re-loaded, or copied to another controller. See section, [13.2 Save or Load the Program Configuration](#)

# Slimflex 5 Browser

## 1 File Please

To avoid accidents and confusion with this important process, please remove all files from the USB drive prior to adding the .hex file. The controller will only allow you to view one file. Be sure you copy the correct file to the USB. If you have more than one, you may load the wrong file.

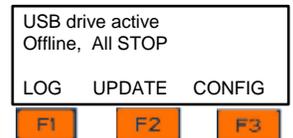
## Firmware File Name Format

The name of a Firmware hex type file has the following format:  
 APS17091200.hex: APS = SlimFlex5 Firmware, 170912 is the date: YYMMDD, 00 is for USB.

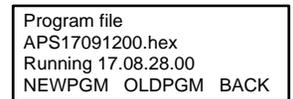
Obtain the hex file from the ProMinent.com web site (see instructions in section [13.4 Remote HMI \(Browser\) Firmware Update](#))

Insert the thumb drive with the new file into the USB port located behind the Communication panel. See section [13.1 Capturing Data](#) above to find the USB port.

Press F2, UPDATE

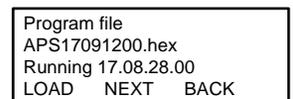


The display now shows the one file from the USB drive; APS17091200.hex and the current hex file in use; Running : 17.08.28.00. Note: These numbers are date codes, year, month and day. '00' Indicates that this is a USB type file.

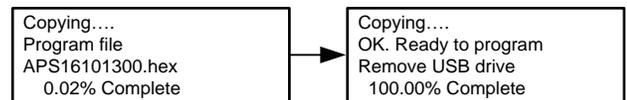


**Your dates will differ from this example!**

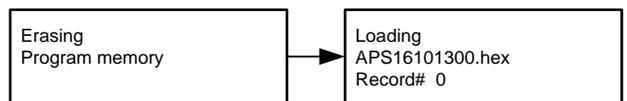
If the file on line 2 is the new firmware file, press F1 NEWPGM to select the new hex file. Press F1 Load to install the new hex file.



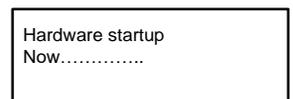
The firmware is copied to the controller. When complete SlimFlex5 will notify you to remove the USB drive.



After you remove the drive, the controller will erase the existing firmware and install the new one.



Once the new firmware is installed, the controller will restart.



Verify the new firmware is loaded: On the keypad, press Menu, up arrow to System, press OK, up arrow to Diagnostic, press OK, then up arrow to see the version.

## Slimflex 5 Browser

### 10.4 Remote HMI (Browser) Firmware Update

This firmware should be updated if a browser connection does not display correctly or if recommended by a ProMinent factory technician. This program is related to how your PC, tablet or Smartphone displays the controller information on your screen.

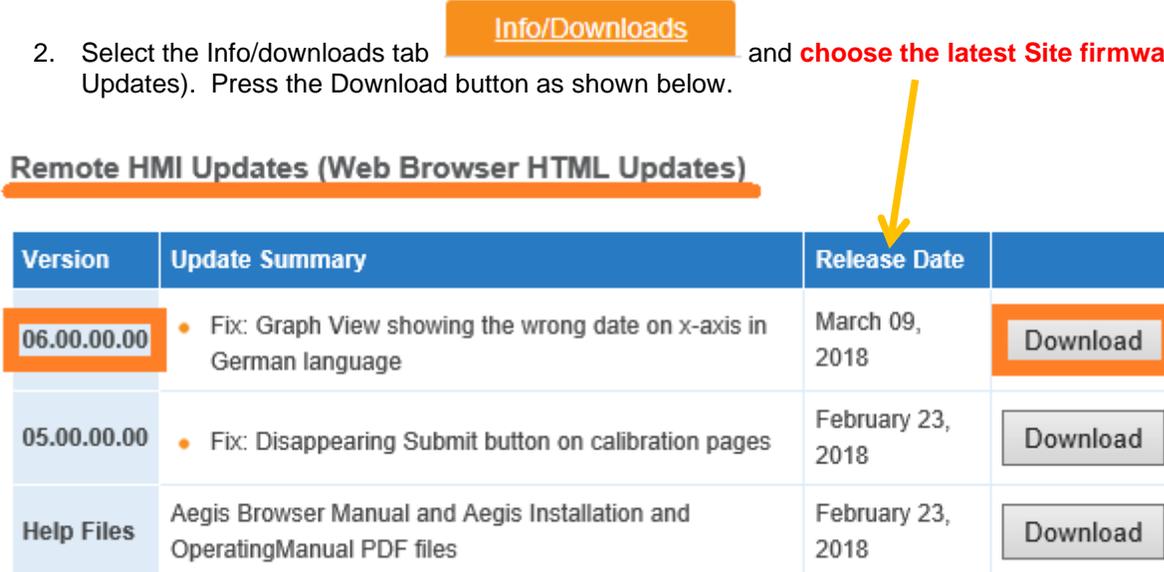
This firmware is used across multiple controller platforms. It is located in one place on our website...

1. Download and the latest version of the Remote HMI file from our web site. Click on the link:

[http://prominent.us/products/Controllers_Monitors/Cooling_Tower_Boiler_Controllers/AEGIS_II](http://prominent.us/products/Controllers_Monitors/Cooling_Tower_Boiler_Controllers/AEGIS_II)

2. Select the Info/downloads tab  and **choose the latest Site firmware** (Remote HMI Updates). Press the Download button as shown below.

#### Remote HMI Updates (Web Browser HTML Updates)



Version	Update Summary	Release Date	
06.00.00.00	<ul style="list-style-type: none"><li>Fix: Graph View showing the wrong date on x-axis in German language</li></ul>	March 09, 2018	Download
05.00.00.00	<ul style="list-style-type: none"><li>Fix: Disappearing Submit button on calibration pages</li></ul>	February 23, 2018	Download
Help Files	Aegis Browser Manual and Aegis Installation and OperatingManual PDF files	February 23, 2018	Download

Figure 68 Remote HMI Updates

3. Find the Zip file in your Downloads directory. Unzip the files from this folder and save them in the folder of your choice.
4. Copy the "site" folder from step 3
5. Insert a USB thumb-drive into your computer
6. Paste the "site" folder to the root of the USB thumb-drive
7. **Eject your USB drive before you remove it from your computer**, then insert it into the controller's USB port. (See [figure 66](#) in section [13.1 Capturing Data](#))
8. The controller OLED display should show the message: "**USB DRIVE ACTIVE**". If the controller does not display this message, then remove the USB drive and try again. The USB drive should be configured as FAT32.
9. Press F2 (UPDATE)
9. Press F2 (SITE)
10. Wait until the controller tells you to remove the USB drive
11. Open a web browser then go to <http://10.10.6.106> (or whatever the IP Address of your controller is)

For more information on using a browser, consult the SlimFlex5 Browser manual.

## Slimflex 5 Browser

### 10.5 E-mail Reports and Alarms

The E-mail function is explained in the SlimFlex5 Browser manual. You cannot access this feature through the keypad. The following explanation is for informational purposes only.

The E-mail tool can send four types of information; Alarms, Status, Data log data and eService reports. Setup is via a PC or smart phone browser.

During controller power up or reset, E-mail initializes as disabled.

#### 10.5.1 E-mail Types:

##### 10.5.1.1 ALARM:

**Sent once when an alarm first occurs.**

Lists all active alarms.  
Includes enabled sensor, meter & contact values for alarm context  
User Enabled/Disabled.

##### 10.5.1.2 STATUS:

**Sent @ noon, midnight or both every day (12:00/24:00).**

Verifies that the controller is running & on the LAN.  
Includes enabled sensor, meter & contact values.  
Allows for commercial systems to experience some run time and some of the day is left to respond to operating issues.

##### 10.5.1.3 DATA LOG:

**Sent @ midnight (23:59) or hourly.**

Verifies that the controller is running & on the LAN.  
Includes enabled output run times or volumes and sensor, meter & contact values. User Enabled/Disabled.

Each of the above E-mail types send Comma Separated Values (CSV); one line per I/O or Alarm so that both the subject & body can be easily parsed into a logging app, a typical use for the DAILY type.

Will make text-to-speech entertaining (bit encoded value-states are therefore intentionally excluded).

##### 10.5.1.4 H2Tronics eService Report:

**Third party software is needed for this option.**

Contact Technical Support or H2Tronics for more information.

## Slimflex 5 Browser

### 11 Appendices:

#### a. IO Namespace: Letters & Numbers

The controller uses the letters 'A' to 'Z' to refer to sensors, meters, contact sets, phantoms & 4-20mA outputs and the numbers '1' to '5' to refer to controls.

Users can assign site specific names to all of the I/O. 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 'phantoms', 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.

<b>I/O</b>	<b>Type</b>	<b>Notes</b>
<b>A</b>	Serial sensors	3 wire Conductivity-Flowswitch-Temperature
<b>C-D</b> <b>E-F</b>	Dual sensor driver cards  3 types in any combination	pH-ORP: configurable as dual pH or dual ORP or pH-ORP 4-20mA output Conductivity (boiler and cooling)
<b>G</b>	No used	
<b>H</b>	Not used	
<b>K-N</b>	Phantom sensors	Calculated, (Manual) or derived from other sensors & meters
<b>O-T</b>	Volume meter & contact set inputs	Each of 6 inputs configurable as Turbine, Contact Head meter or Contact Set
<b>W-Z</b>	Phantom volume meter & contact set inputs	Calculated (Fail-to-Feed, Fail-to-Sample) or derived from other sensors & meters
<b>1-2</b>	Line powered control relays	Form C, powers pumps, solenoids & motorized valves
<b>3-5</b>	Dry or line powered control relays	Form C, may be used dry or powered.
<b>6-9</b>	Not used	

## Slimflex 5 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.

<b>I/O</b>	<b>Type</b>	<b>Attribute x = I/O</b>	<b>Phantom</b>
<b>A</b>	Serial Conductivity	x0 Conductivity x1 Temperature x2 Flowswitch	<b>K-N</b> <b>K-N</b> <b>W-Z</b>
	Serial Corrosion Rate	Not used	<b>K-N</b> <b>K-N</b>
	Serial Differential Pressure	Not used	<b>K-N</b> <b>K-N</b> <b>K-N</b>
<b>C-D</b> <b>E-F</b> <b>I-J</b>	pH-ORP driver card	x0 ORP or pH x1 Temperature if pH	<b>K-N</b> <b>K-N</b>
	Conductivity card	x0 Conductivity x1 Temperature if 'Conductivity' or 'Condensate'	<b>K-N</b> <b>K-N</b> <b>K-N</b>
	pH- 4-20mA input card	x0 Inhibitor input only	<b>K-N</b> <b>K-N</b>
	Serial Sensor card	Not used	
<b>H</b>	Temperature	Not used	<b>K-N</b> <b>K-N</b>
<b>O-T</b>	Volume meters	x0 Volume Today x1 Rate x2 Volume this Year x3 Volume total	<b>W-Z</b> <b>K-N</b> <b>W-Z</b> <b>W-Z</b>

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

## Slimflex 5 Browser

### c. 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**, or **E-F** 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.

Phantoms derived from input 'A' is not auto-removed unless the sensor type is changed.

This is done to prevent wholesale auto-reconfiguration & safety related interlock removals on 'A' CTFs conductivity sensors.