CONTENTS

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

Aegis_Browser is included as Appendix 'C' in the **Aegis_user** manual when the controller includes the '**LB**', LAN Browser option.

Aegis_Browser & **Aegis_user** are available as a .pdf downloads from **www.Aquatrac.com**.

1.0 Day-to-Day Browsing

1.1 Connect

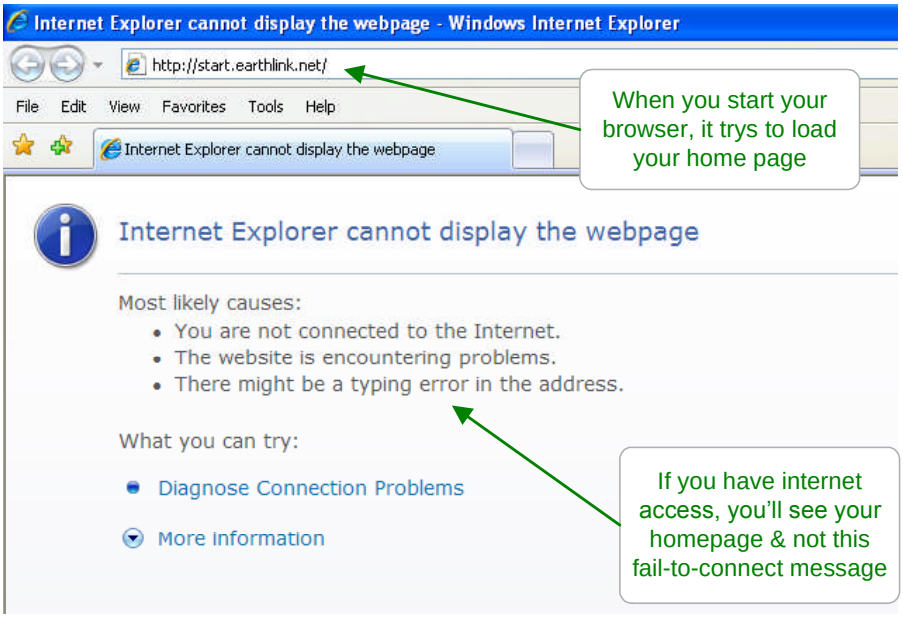
On-Site using a Notebook PC

A. You'll need an Ethernet cross-over cable available from office supply & electronics stores;
Example: **Staples Item 437225**, 12 ft. long, Belkin Model A3X126-14-YLW-M, $15.98.

B. You'll need to set up a new connection in your notebook. Refer to Section11 of this appendix.

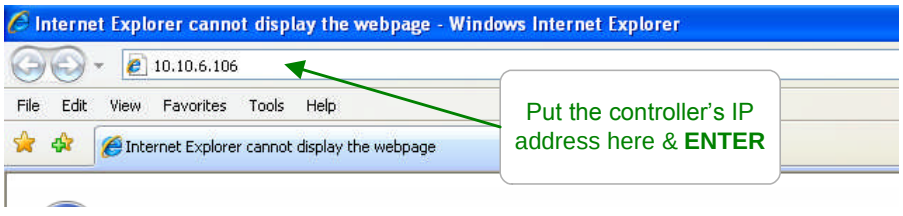
Open the controller enclosure door and jack into the controller Ethernet jack located on the center of the upper controller circuit board.

If you need command & control only, start **Internet Explorer 7** or **Mozilla's Firefox**.
If you also require reporting, start Aquatrac's **Trackster3** application.



Notebook PC & Over the Site LAN

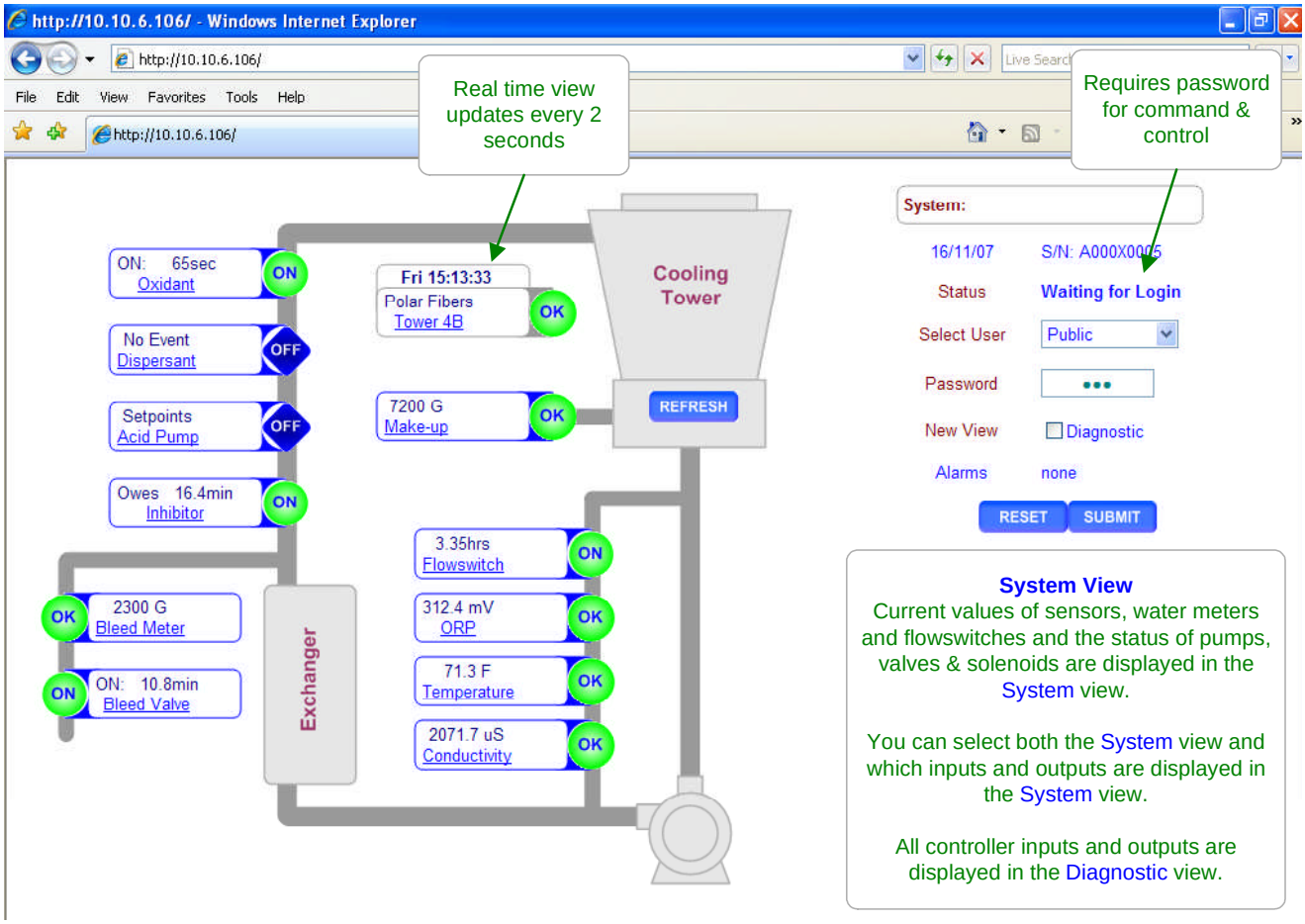
Key the controller IP address into the PC's browser address.
You can find the controller's IP address using the controller keypad.
Refer to Section 11.7 of the **AEGIS_user** manual.



1.1 Connect continued

Remotely using a VPN
If the site has provided you with VPN (Virtual Private Network) access to the site LAN, you'll need to start the VPN application on your PC to gain access to the site's LAN. Once connected to the site LAN, follow the previous, **'Over the Site LAN'** procedure.

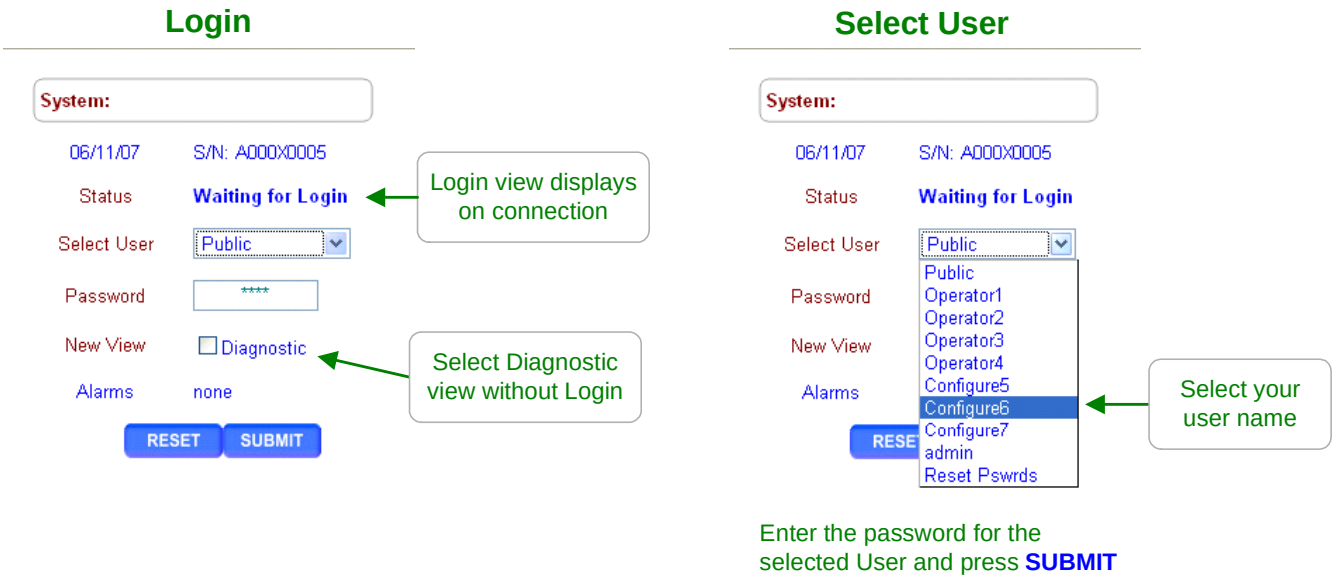
Remotely using a Modem
If your controller includes the **RM** option and you have a site telephone line, that can receive incoming calls, connected to the modem, you can browse the controller from any modem equipped PC.



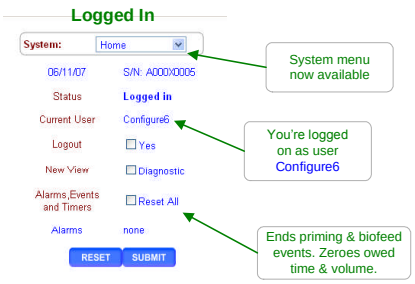
Note: System & Diagnostic views are optimized for notebook PCs at 1024 x 768 pixels.

1.2 Log-in

Pull down the **Select User** list and select a user id.
Key in the **Password** for the selected user ID & press **SUBMIT**.
Status updates you on an incorrect password.
Once you've logged in you can change your user ID & password.



Once you've logged in, the controller's home page changes to show your user ID, **Current User**.
Press the link at any sensor, meter, pump, solenoid or valve to view or modify.
If the controller parameter is not visible on the System view, select Diagnostic view & **SUBMIT.**

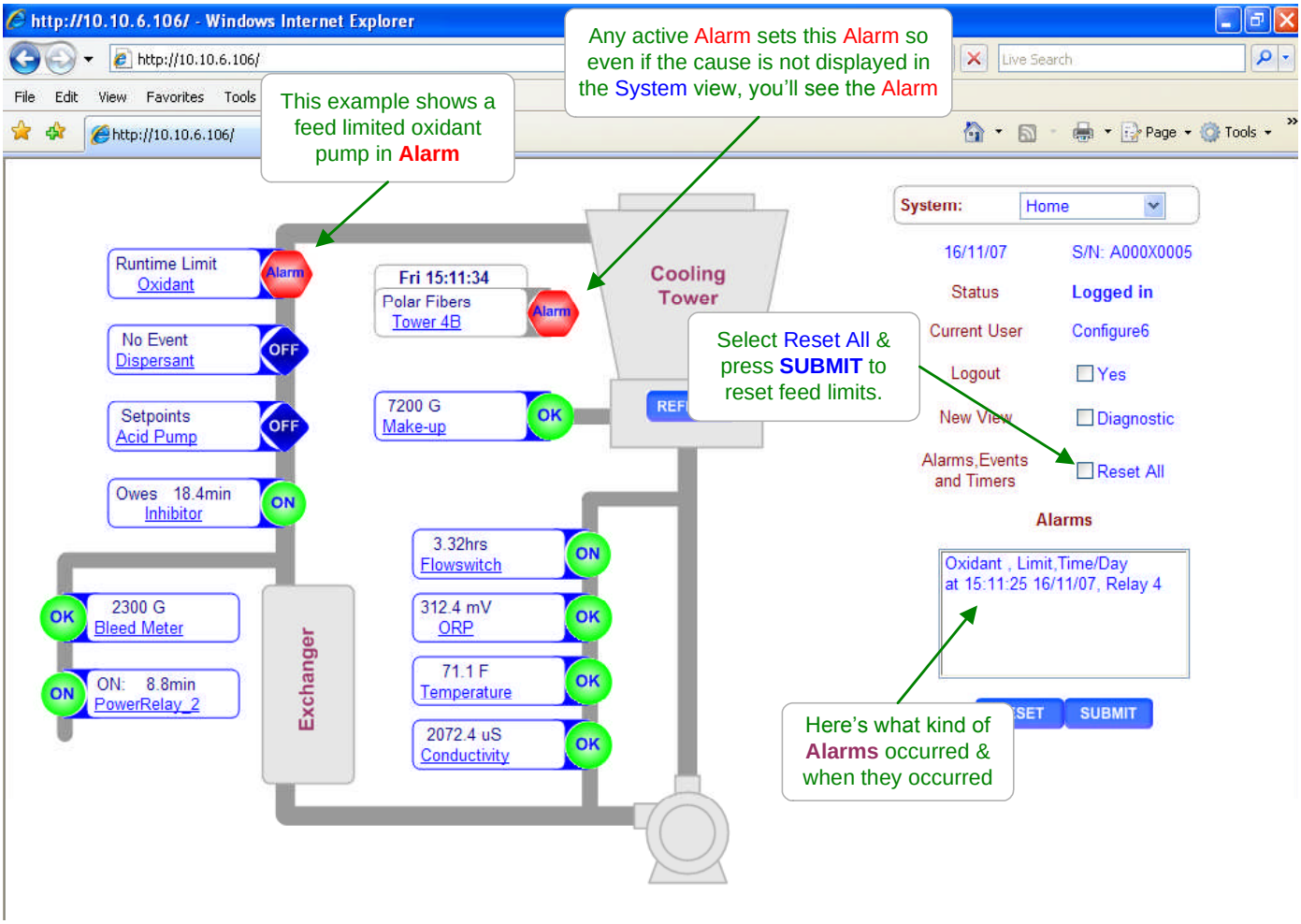


Default Passwords:
The factory default passwords are**:**
Operator1 = **1** Operator2 = **2** Operator3 = **3** Operator4 = **4**.
Configure5 = **5** Configure6 = **6** Configure7 = **7** Administrator = **AAAA**
There are 3 password levels, Operator, Configure and Administrator.
The User IDs are used in the controller's keypress log.

5 incorrect passwords, block logon until 7:00AM or unitil a power OFF/ON.

1.3 Checking & Clearing Alarms

Alarms display as **RED Alarm** hexagons.
Any alarm also sets the System alarm which displays on both the System & Diagnostic views beside the Day-Time display. If an alarm occurs on an input-output that is not displayed in the view, the System alarm alerts you that the alarm has occurred.



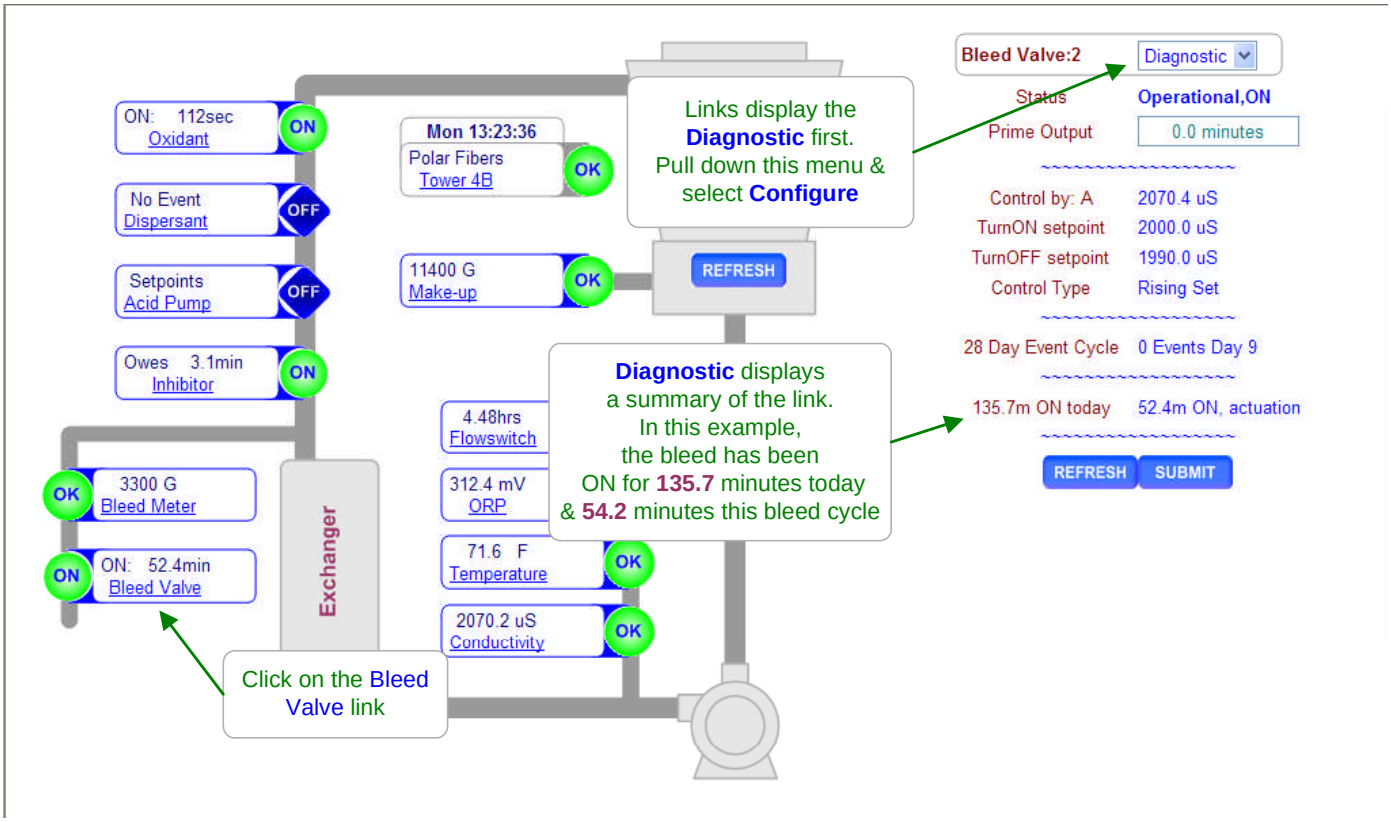
Sidebar:
Feed limit and water meter alarms will immediately re-trip unless you adjust the alarm limits. Sensor alarms will re-trip after the user set 'Delay' unless the fault is corrected.

Individual input-output alarms may be cleared by selecting the input or output link and then selecting **Alarms** from the pull down menu at the top of the left side of the screen.

Internet Explorer users can e-mail this or any page by selecting **File /Send/ Page by E-mail** on the IE7 tool bar. If you are not on-site, show on-site staff how to e-mail you on alarm.

1.4 View & Adjust Setpoints

Setpoint values vary with the use of the pump, valve or solenoid.
The following, typical example changes the tower bleed setpoints.



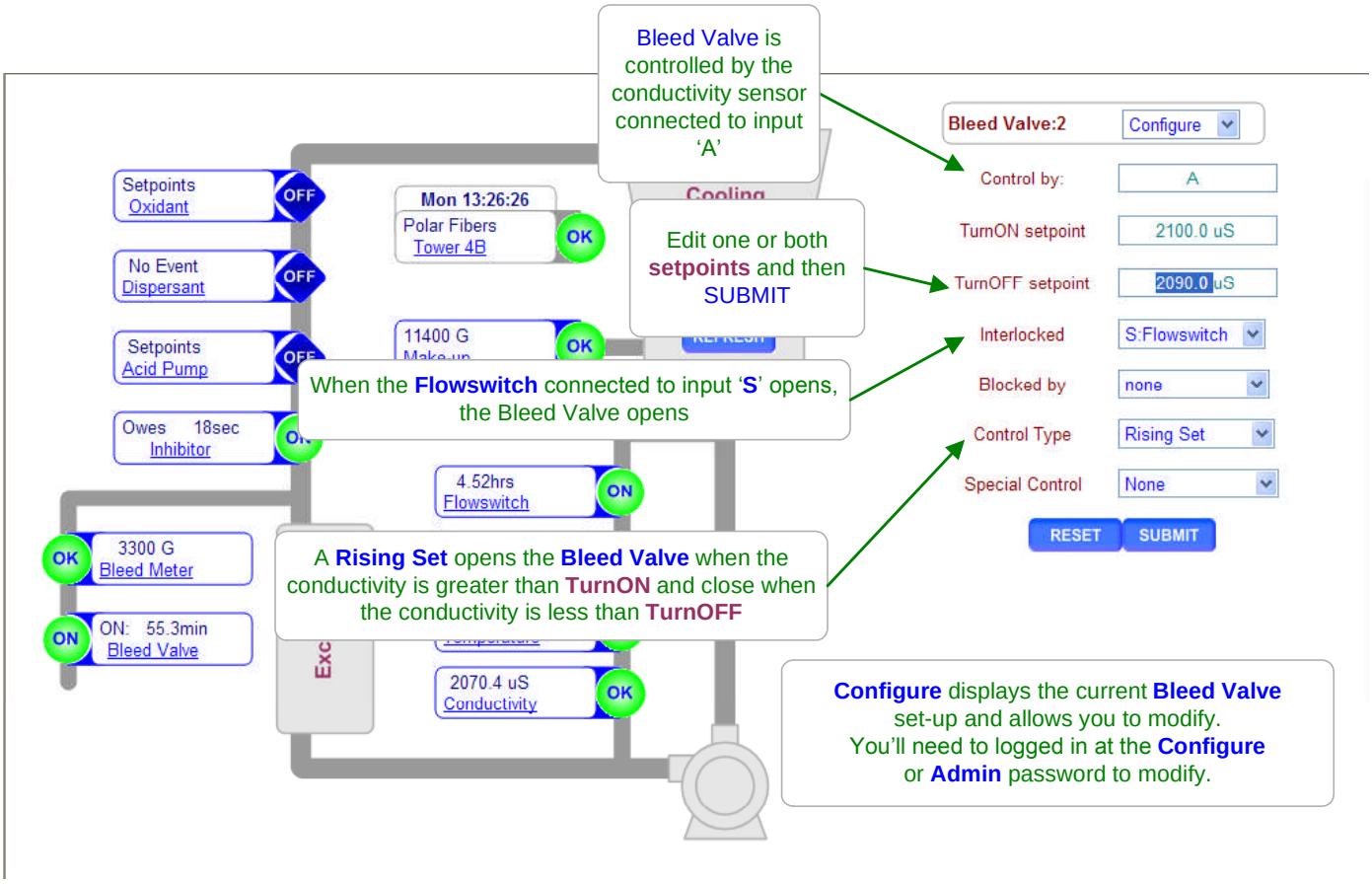
Sidebar:
Relays controlled by sensors power Pumps and Solenoids ON and OFF.
(Relays are outputs **1** to **5**)
Frequency controlled Pumps feed chemicals at varying rates.
(Frequency controlled pumps are outputs **6** to **9**)

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 delay between feeding acid and measuring it's pH does not cause wide pH swings.

1.4 View & Adjust Setpoints continued

'Interlocked', 'Blocked by', 'Control Type' and 'Special Control' are all detailed in the following sections of this Appendix and in the AEGIS_User manual.

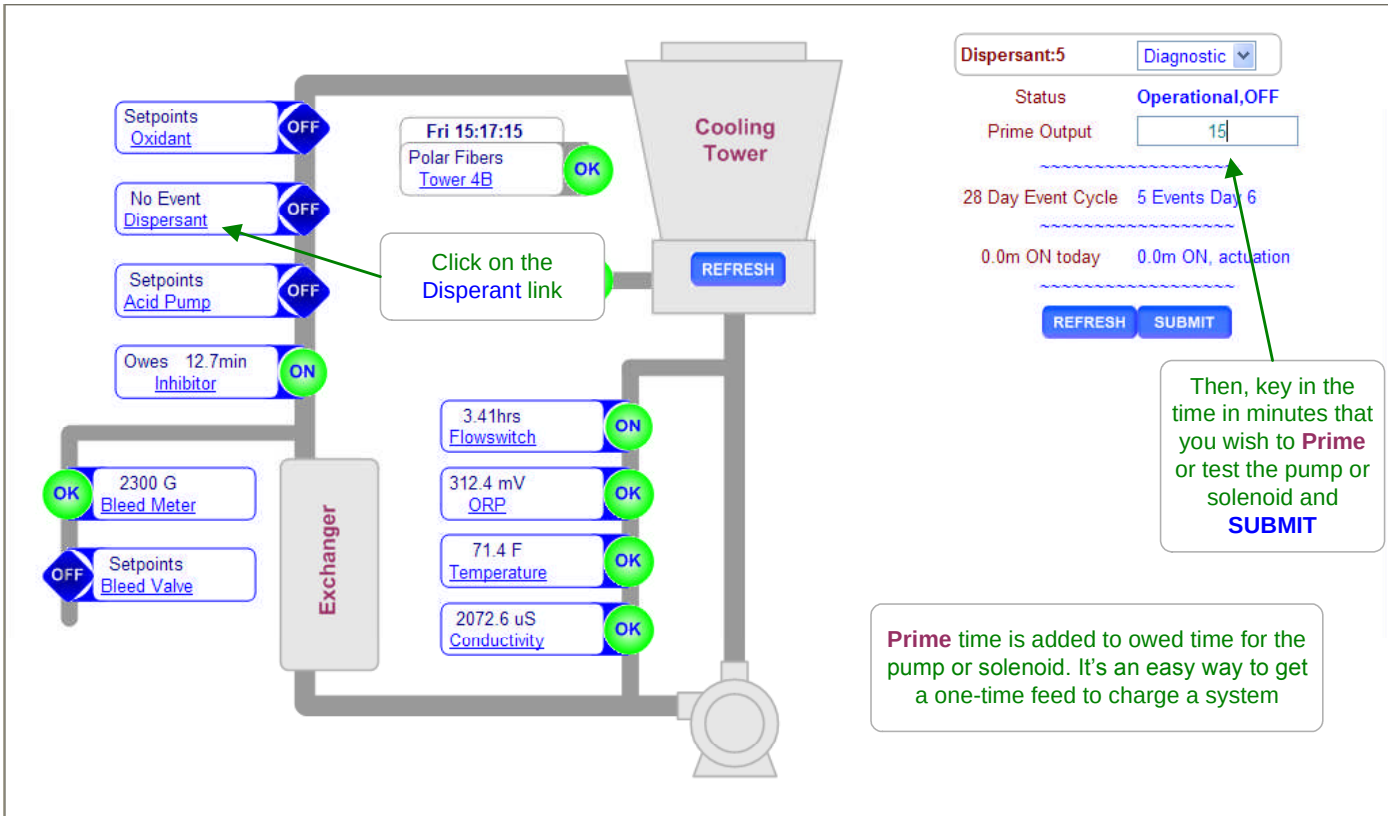


Sidebar:
Pay attention to the number **:1** to **:9** that follows the pump, valve or solenoid name.
It's the physical location on the lower controller circuit board that connects to the pump, valve or solenoid.

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 the **1** to **9** **GREEN** indicating light is ON when the pump, valve or solenoid is ON.

1.5 Priming-Testing Pumps & Solenoids

ON-OFF pumps, valves & solenoids controlled by relays 1 to 5, are primed in minutes.
Frequency controlled pumps 6 to 9 are primed in mL of volume.
Use Clear Alarms to end priming.
The following example primes the Dispersant pump connected to Relay 5.



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

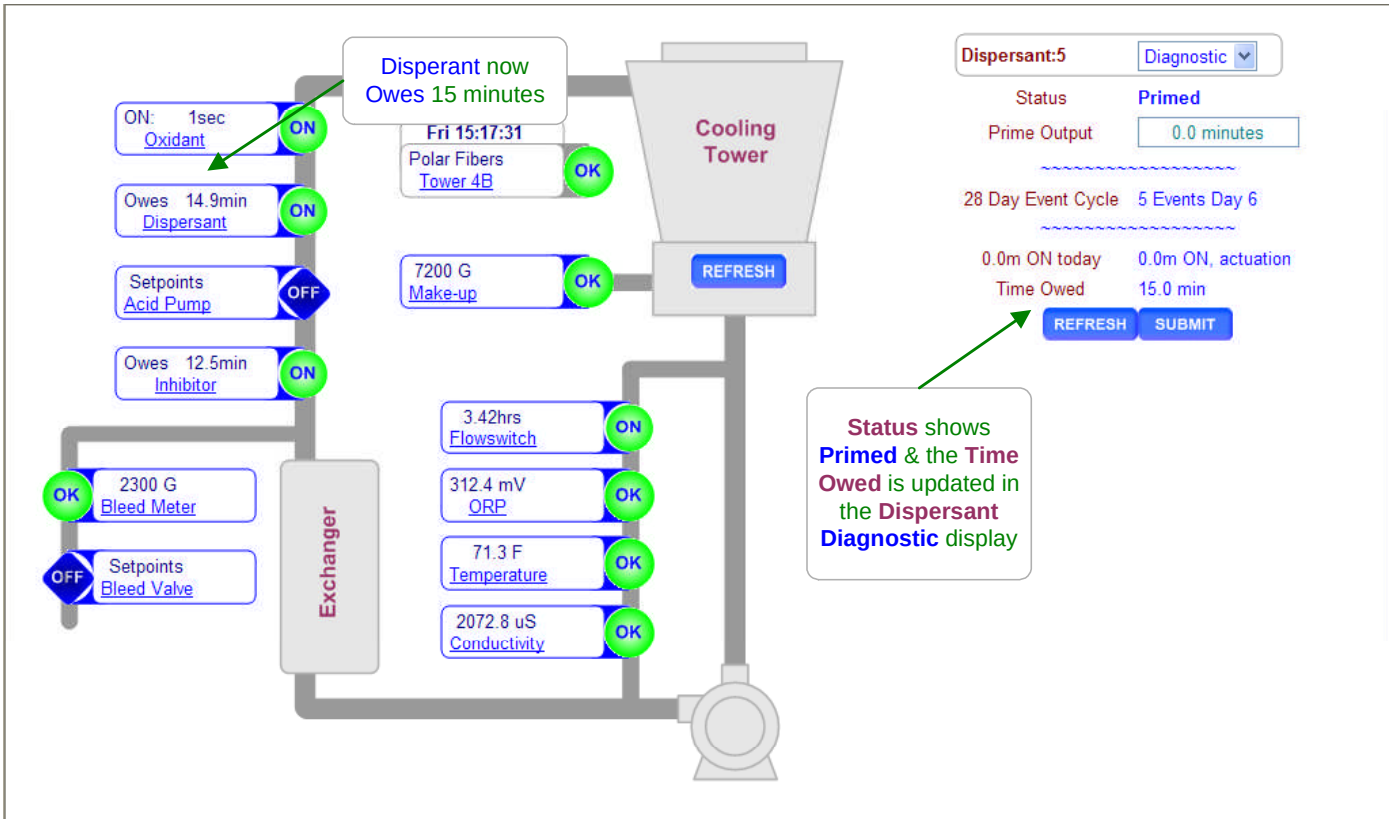
Ending Prime-Test:
Clear Alarms, Section 1.2 ends all owed time & volume for all pumps and solenoids.

Fail to Prime:
A pump or solenoid that is Interlocked, Blocked or OFF on alarm will not Prime.
The time or volume owed will be fed when the reason for no feed is removed.
The **Diagnostic** display for the target pump or solenoid will display the reason for fail to prime

If the green LED on the lower controller circuit board is ON, the pump or valve connected to that output **1** to **9** should also be ON

1.5 Priming-Testing Pumps & Solenoids continued

ON-OFF pumps, vlaves & soloroinbd controlled by relay 1 to 5, are primed in minutes. Frequency controller pumps 6 to 9 are p[rimed in volume. Use Clear Alarms to end priming.
The following example changes the tower bleed setpoints.

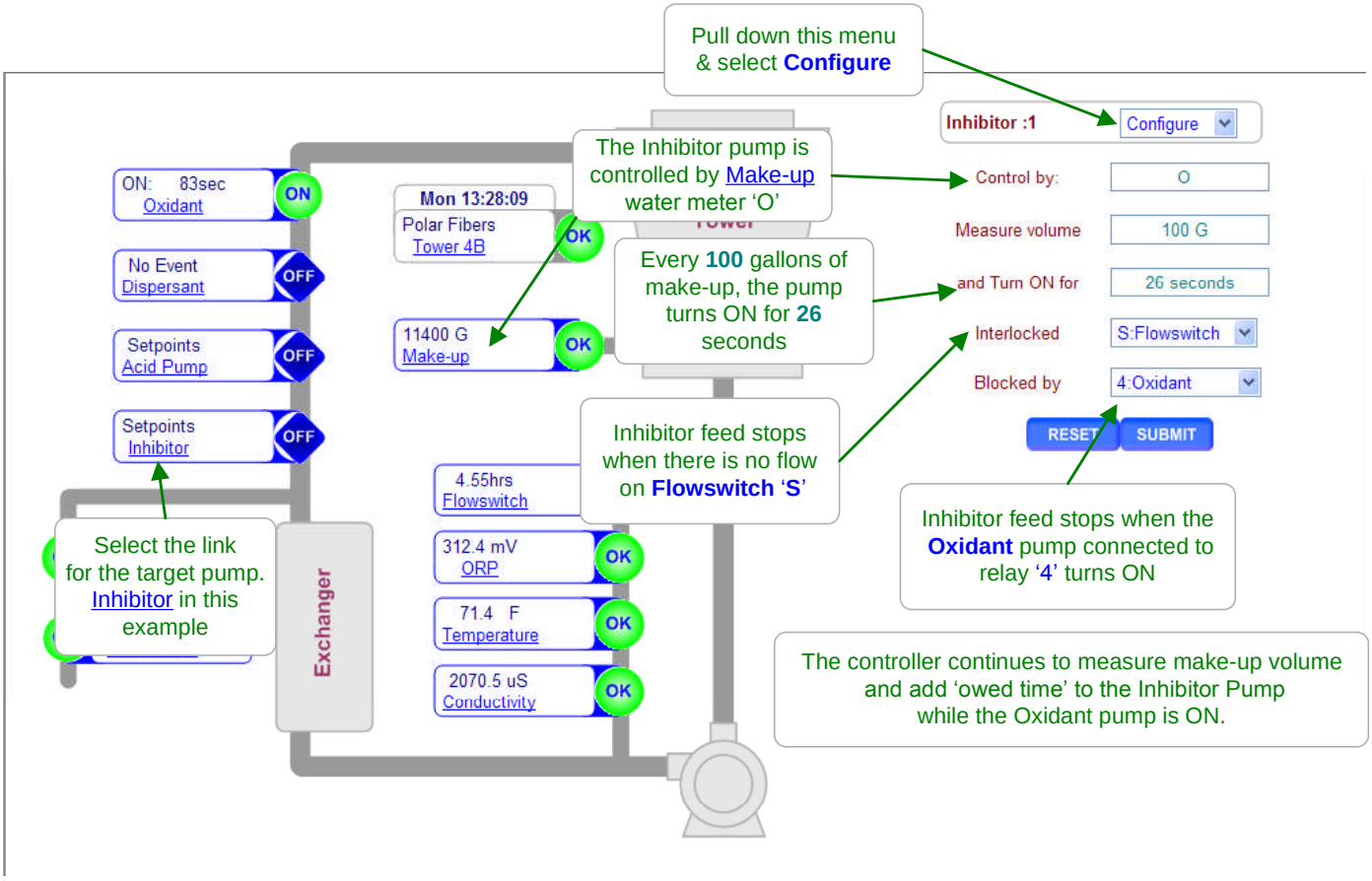


Sidebar:
Priming may also be used to slug feed on system start-up in addition to testing pumps, valves or solenoids.

Verify that the slug feed time does not exceed either of the **Minutes/Day** or **Mins/Actuation** Alarm times for the pump or solenoid. Frequency controlled pumps use **Volume/Day** and **volume at MAX spm** as feed limit Alarms.

2. Chemical Feed Controls: Inhibitor, Acid, Bleach, Amine…

2.1 Water Meter Feed



Sidebar:
Water meter and Feedwater Meter based controls feed proportional to load to maintain a target ppm of the fed chemical. Inhibitors, Boiler Treatment and Amines are usually fed to achieve a target ppm and therefore frequently meter controlled.

Meter based feeds are among the most reliable, accurate and simplest ways to feed.
The cost of installing a water meter is offset by the resulting reliability.

Summing Meters:
Up to 4 meters may be summed to control a pump. Use when towers have more than 1 make-up.
Sequencing Meters:
Refer to **Aegis_User** manual **5.3 Feed Verification** & **5.4 Cycle Controls**.

Oxidizing chemicals like bleach are almost never fed using a water meter since the demand is not proportional to the make-up volume.
pH correction, feeding acid based on make-up volume, only works if make-up water chemistry is constant. Even then, a monitoring pH sensor is required.

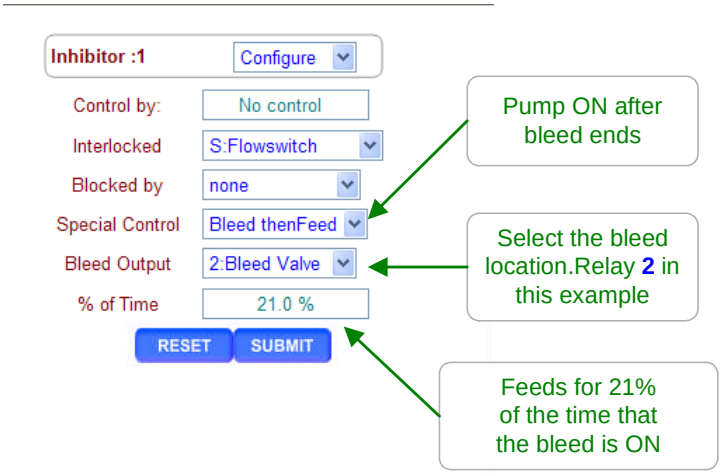
2.2 Bleed Based Feed

Select the link on the target inhibitor feed pump and pull down the top, right menu, selecting **Configure.**

When **Control by** = **'No control'**, both **Bleed then Feed** and **Bleed & Feed Special Special Control** may be selected.

Select a bleed valve or solenoid relay and set the target % of bleed ON time.

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.



Sidebar:
Bleed then Feed is used to feed cooling tower inhibitor when a make-up meter is not available and the bleed is ON 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 are only as reliable as the tower bleed solenoid and conductivity sensor. Refer to **Aegis_user 2.5 Limiting Feed & Alarms** for guidelines on preventing overfeed and recovering from bleed fault.

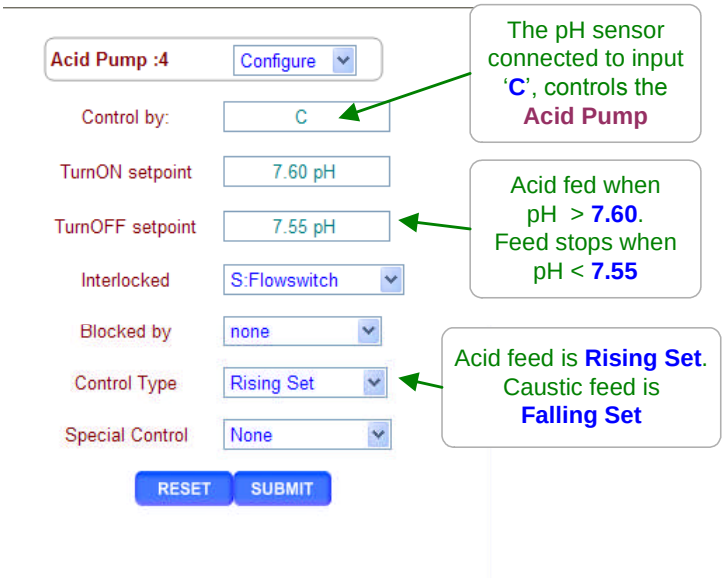
2.3 Sensor Controlled ON/OFF Feeds

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure.**

Set **Control by** to the sensor input 'A' to 'N'.

Setpoints display the units of the controlling sensor.

ON-OFF Pumps controlled by sensors may also use **Timed Cycling** or **Holding Time Special Control**. Refer to the Section 2.4 of **Aegis_User** manual for configuration and operational detail.



Sidebar:
Pumps powered by the controller Relays 1 to 5 are switched ON and OFF based on the value of the controlling sensor or sensors.

Control Type
Each sensor uses a control type based on the water treatment system's effect on the sensor. For example, a cooling tower conductivity and pH **rise** as the tower operates & both these sensor use a **Rising Setpoint**. The ORP of a tower **falls** as the tower operate & ORP uses a **Falling Setpoint**. Refer to the following page.

Sensor Math
Most feeds are controlled by a single sensor. If the control combines more than one sensor with different units the control setpoints must reflect the result. Example: If the sum of temperature and make-up rate in GPM control a pump, the ON/OFF setpoints are in degrees + rate.

Interlocking & Blocking:
Interlocking prevents a chemical from feeding when the tower or boiler is off line.
Refer to **Section 2.7. No Feed on No Flow.**
Blocking prevents one chemical from feeding while another is feeding.
Refer to **Section 2.8**. **Blocking a Feed.**

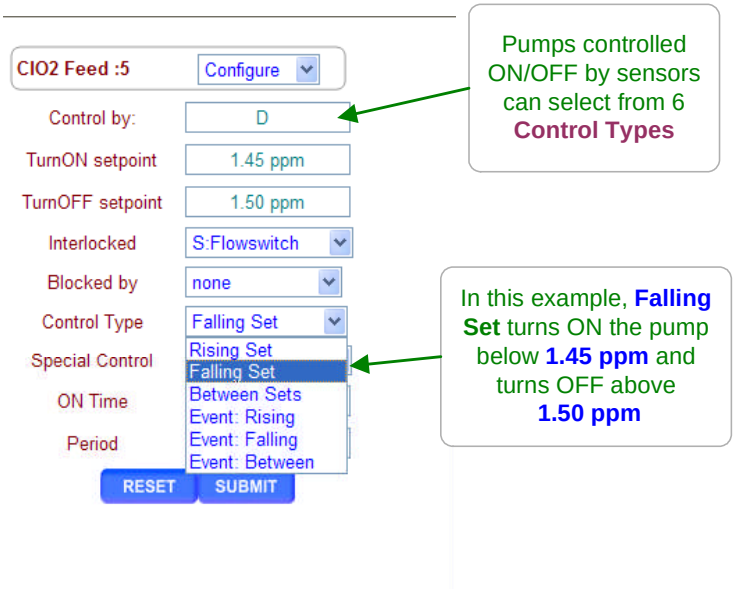
Reliability
Setpoints may be set incorrectly. Sensors eventually fail. Solenoids & Pumps fault.
Refer to **Section 2.6 Limiting Feed & Alarms** to control a fault response.

2.3 Sensor Controlled ON/OFF Feeds continued

Control type:
Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure.**

Each sensor pump control uses a **Control type** based on the water treatment system's effect on the sensor.

For example:
A cooling tower's conductivity and pH **rise** as the tower operates & both these sensors use a **Rising Set**. The ORP of a tower **falls** as the tower operates & ORP uses a **Falling Set.**



Sidebar:
Control Type is not applicable or displayed for water meter based feeds.
Control Type for frequency controlled pumps **6** to **9** are **Always** & **During Events**

Between Sets turns ON a pump or solenoid whenever the controlling sensor value is between the TurnON &TurnOFF setpoints. This type finds use in blocking and sequential PLC types controls.

The **Event: Control Type** controls the chemical pump only during a timed event.
During the timed event interval the control works normally, turning the pump ON & OFF as the controlling sensor value changes. When the timed event ends, the pump turns OFF.

Example:
Event: Falling Control Type is used to slug bleach during a biocide feed event to hold a target ORP during the event period.

Setpoint Order:
The controller will automatically switch the setpoints to fit the selected **Control Type**, inserting a **Setpoints Switched** message into the **Status** line of the left hand side of the page.

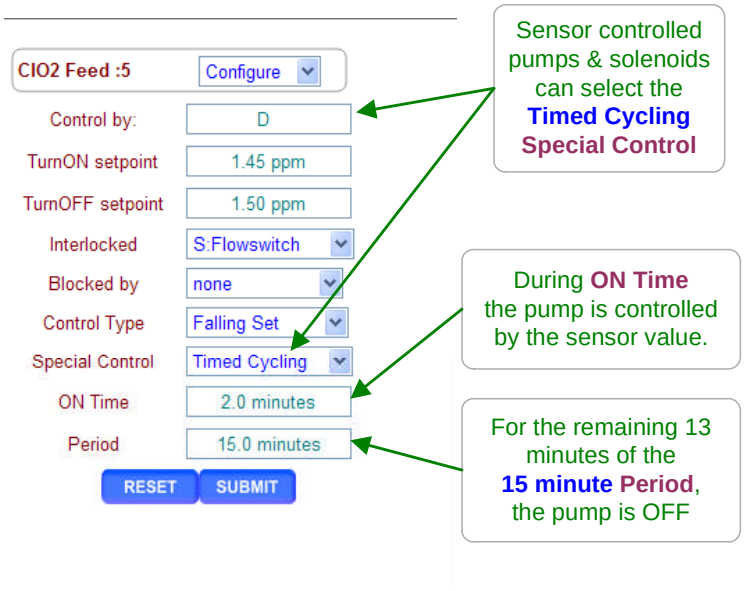
2.3 Sensor Controlled ON/OFF Feeds continued

Special Control: Timed Cycling
Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure.**

Timed Cycling allows time for the controlling sensor to measure the effect of chemical before feeding more chemical.

This **Special Control** 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.



Sidebar:
Often there is a long time delay between adding a chemical and measuring it's effect at a sensor which causes setpoint overshoot and poor control.
Examples: Pumping citric acid into a large swimming pool or adding bleach to a cooling system with a large sump volume.

The **Timed Cycling Special Control** feeds for a user defined **ON Time** than waits for a user defined time before feeding again allowing the system to respond to the fed chemical. During the **ON Time** ON-OFF pumps and frequency controlled pumps feed on setpoint control.

The '**ClO2 Feed Diagnostic** display counts down the time in the **ON Time** and **OFF Period.**

Selecting a **Special Control** automatically sets typical default times or sensor values.
Adjust the default values for your site's application.

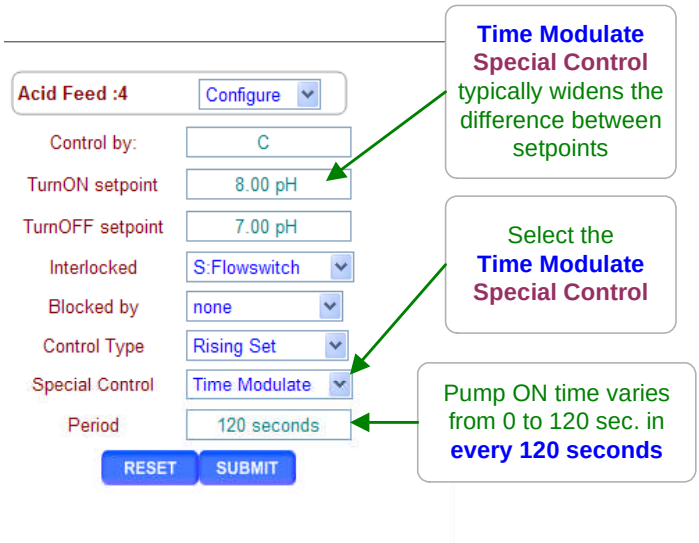
2.4 Proportional Feed

Special Control: Time Modulate for ON-OFF Pumps
Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure.**

Time Modulate allows an ON/OFF pump to operate like a frequency or 4-20mA controlled pump.

This **Special Control** is used feed proportionally to a sensor value.

ON-OFF pumps are typically set to maximum stroke and rate when **Time Modulate** is selected.



Sidebar:
Frequency controlled pumps connected to controller outputs '**6**' to '**9**' are proportionally controlled as the controlling sensor varies the pump frequency.

Often there is a need to proportionally control an ON/OFF pump connected to one of the controller power relays '**1**' to '**5**'.
Examples: The pump may be oversized for the application or turning down the pump stroke or frequency may cause loss of prime or feed line blocking.

The **Time Modulate Special Control:**
Turns OFF below the **TurnOFF** setpoint and is always ON above the **Turn ON** setpoint.
Between setpoints, linearly increases the ON time from zero @ the **TurnOFF** to always ON at the **Turn ON** setpoint.

Example: Period=120 seconds, pH **Turn ON** = 7, pH **TurnOFF** = 8, current pH = 7.4.
ON time = 48 seconds in every 120 seconds, OFF time = 72 seconds in every 120 seconds.

Time Modulate Special Control works for both rising & falling setpoints.

2.4 Proportional Feed

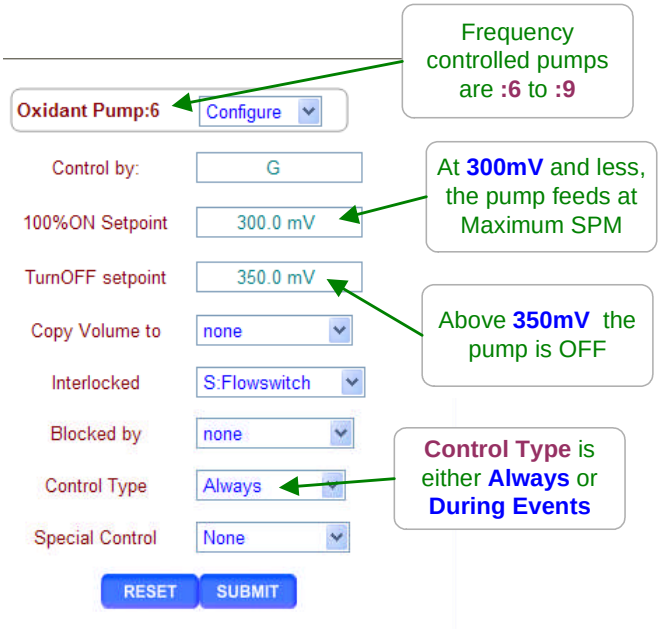
Frequency Controlled Pumps

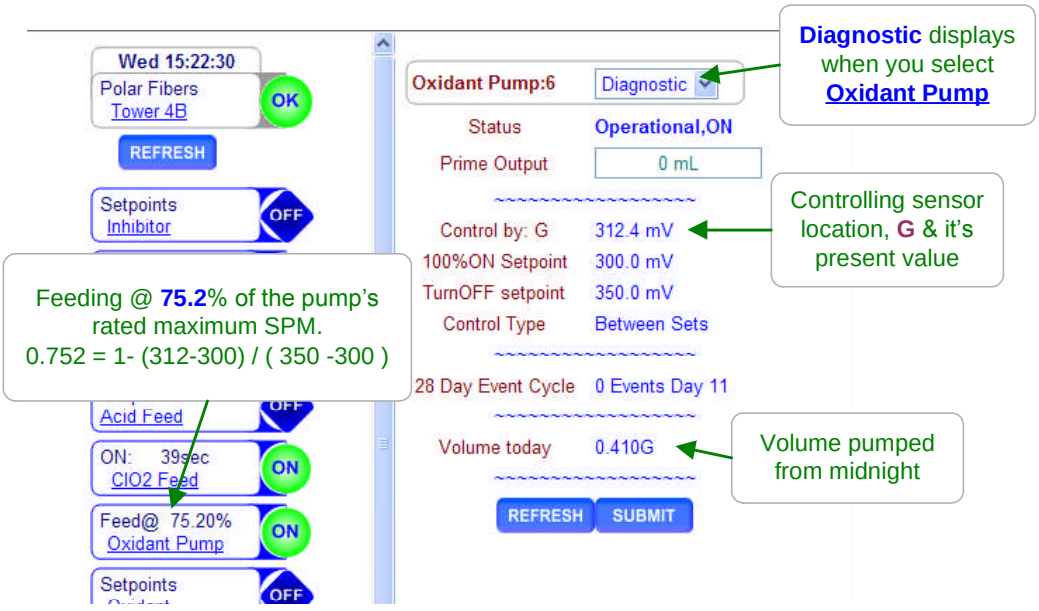
Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure.**

Frequency controlled pumps modify the feed rate as the value of the controlling sensor changes.

In this example, the pump frequency increases as the ORP falls towards 300mV.
At 300mV the bleach is fed at the maximum rate, decreasing as the ORP increases.

If this example was an anti-chlor pump, the **100%ON Setpoint** would be greater than the **TurnOFF setpoint**. As anti-chlor feeds, the ORP decreases.

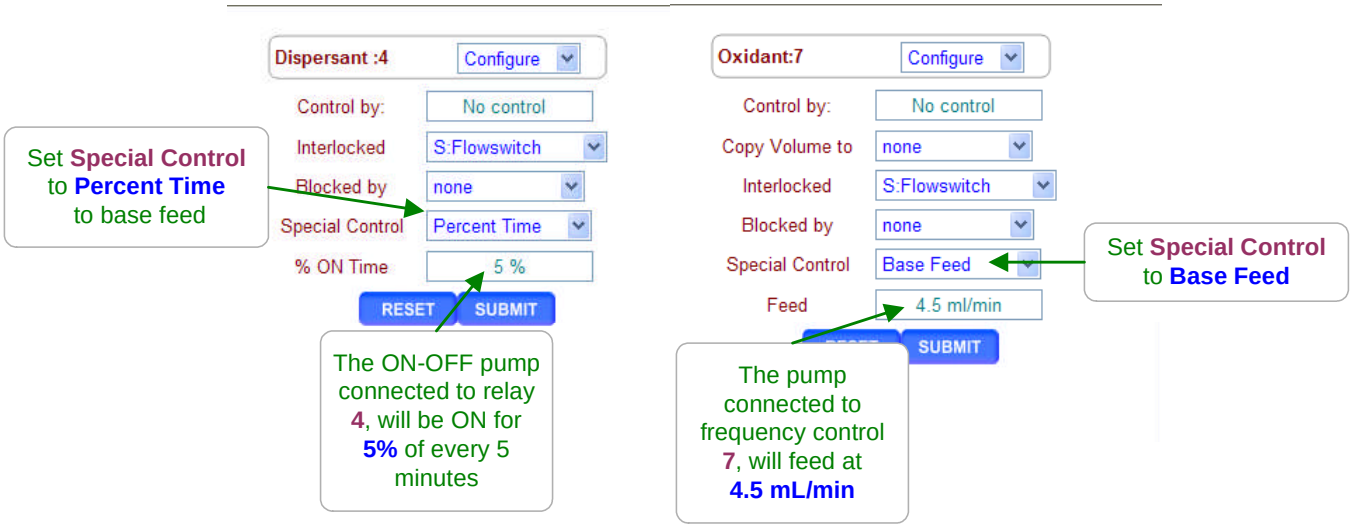




Sidebar:
In this example the pump is rated @ 180 SPM, Strokes per Minute, and pumps 0.1mL stroke so we're pumping (180 x 0.1 x 0.752) 13.54 ml/minute or 0.215 Gallons/hour

2.5 Base Feed

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure.**



ON-OFF Pumps: Setting the **% ON Time** greater than 100%, sets the % to 100.
5% ON time is 15 seconds ON in every 5 minutes (0.05 x 300 seconds).

Frequency Controlled Pumps: If you set a **Feed** rate greater than the pump rating, the controller will set the feed rate to pump maximum SPM. If the pump is rated 180 strokes/minute & 0.1mL stroke, the rate will be set to **18mL/min**.

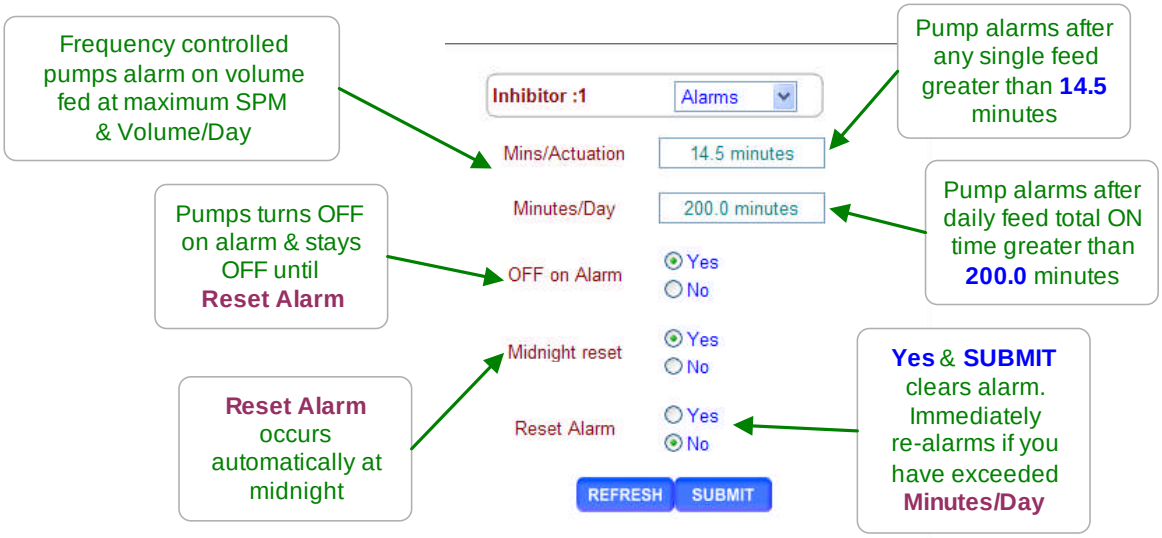
Sidebar:
Base Feeds are used to continuously feed a chemical.
In some cases, as a temporary measure while a sensor is replaced or a water meter repaired or to pre-treat a system on start-up

Boiler chemicals are frequently base fed as long as the boiler's on-line contact set is closed.

Concentration is modified by changing the frequency controlled pump (**6** to **9**) feed rate or relay (**1** to **5**)**% ON Time**.

2.6 Limiting Feed & Alarms

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Alarms.**



Sidebar:
Feed Limits are times for pumps & solenoids controlled by relays **1** to **5** and volumes for frequency controlled outputs **6** to **9**.

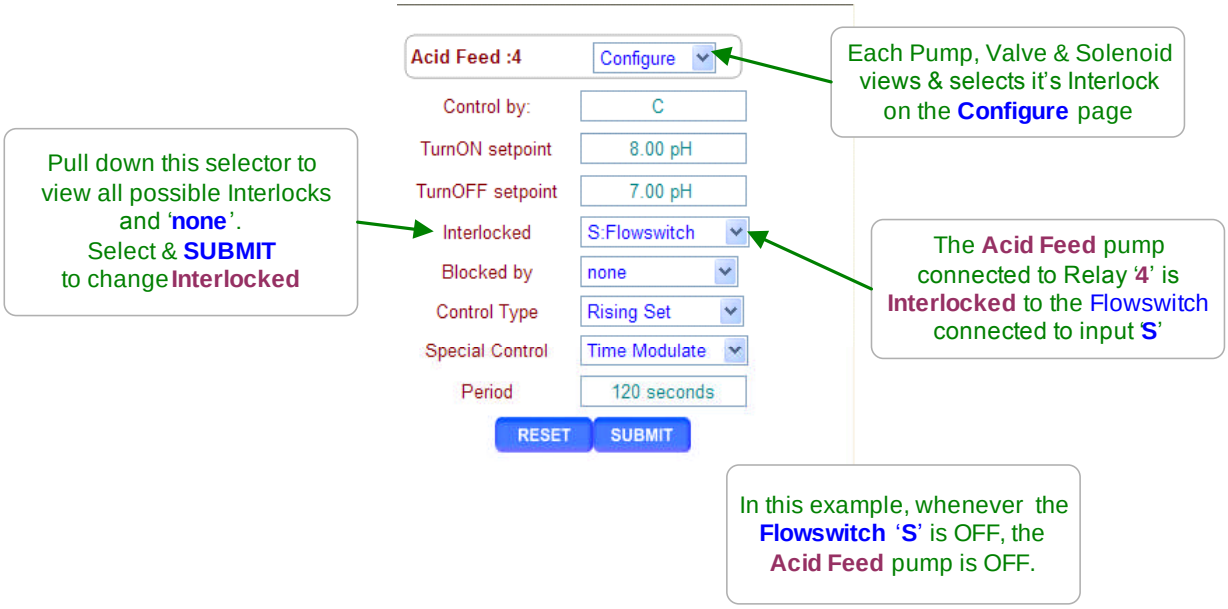
Set the limits so that worst case operation on the hottest day or highest boiler load will not trip the limit, avoiding nuisance alarms. In more critical applications, run the limit close to actual operating volume or time & use the limit alarms to flag atypical system operation.

Chemical feeds are usually all set to **OFF on alarm** since an overfeed indicates an operating problem which requires correction and continuing to feed may case damage or incur product cost. Bleeds & Blowdowns are not set to **OFF on Alarm.**

Typically you are only concerned with either the **Actuation** or **Day** limit.
Examples:
Inhibitors usually use the **Day** limit for both cost & ppm objectives, setting the **Actuation** limit so it never trips.
Oxidant feeds usually use the **Actuation** limit to prevent overfeeds & to detect loss of feed, setting the **Day** limit so it never trips.
Acid feeds would use both **Actuation** and **Day** limits since different fault types trip each limit alarm.

2.7 No Feed on No Flow

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure.**



Sidebar:
Interlocks are contact sets that must be closed for a Pump to feed, a Solenoid to open or a boiler Blowdown Valve to operate.

Cooling towers use a flowswitch installed in the sensor piping to detect that the cooling tower is operating & it's OK to feed chemicals & bleed the tower.
Boilers use dry contact sets from the boiler firing control or site automation to tell the controller that the boiler or boilers are on-line & it's OK to blowdown.

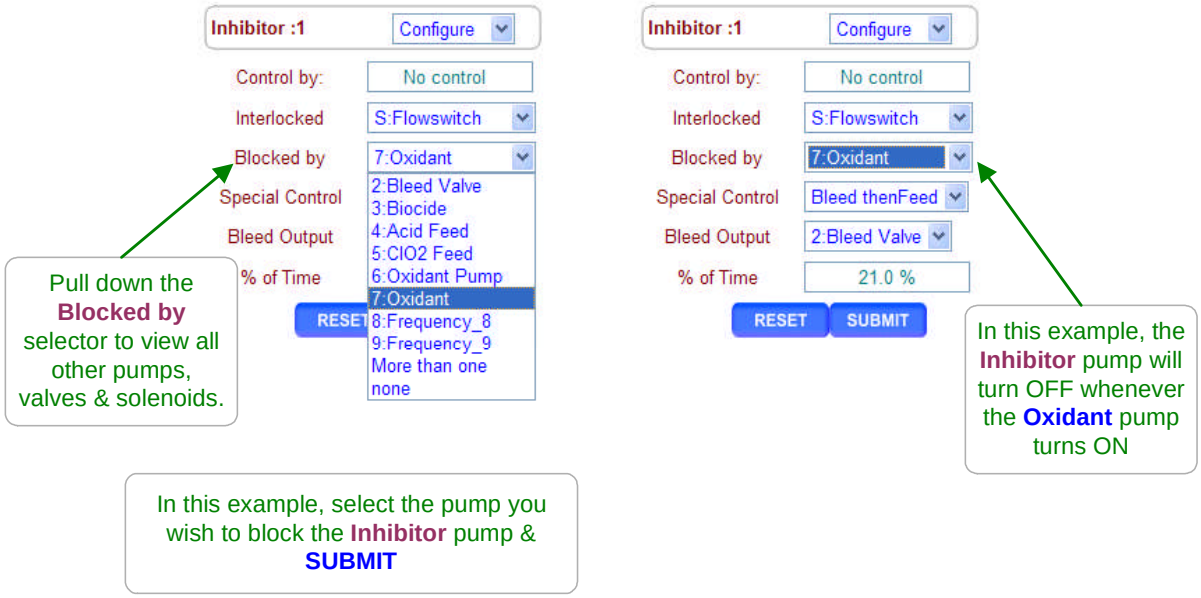
One or more closed contact sets may be required to **Interlock** a pump.
Examples:
If any of three boilers is on-line, feed sulfite. Each boiler has it's own on-line contact set connected to controller inputs '**T**', '**U**' & '**V**'. The sulfite pump **Interlocked** = **T/U/V**

If there is flow in the feed line(Input '**S**') and the tank level switch (Input '**T**') shows chemical available, feed chemical. The chemical pump **Interlocked** = **S+T**

Notice that Interlocks may be **OR**ed using the '**/**' symbol or **AND**ed using the'**+**' symbol.
The controller prevents a mix of **OR**s and **AND**s in any one **Interlock**.

2.8 Blocking a Feed

Select the link on the chemical feed pump that you wish to block and pull down the top, right menu, selecting **Configure.**



Sidebar:
Blocking prevents one or more chemicals from feeding at the same time. If you are owed time or volume on the blocked pump, the controller remembers and feeds when the block clears.

A pump may be **Blocked** by one or more other pumps, solenoids or valves.

Examples:
1. Some products jell or react in the feed line when fed at the same time.
Block ChemicalA pump connected to Relay '**4**' with the ChemicalB connected to Frequency '**7**'.
ChemicalA **Blocked by = '7'.**

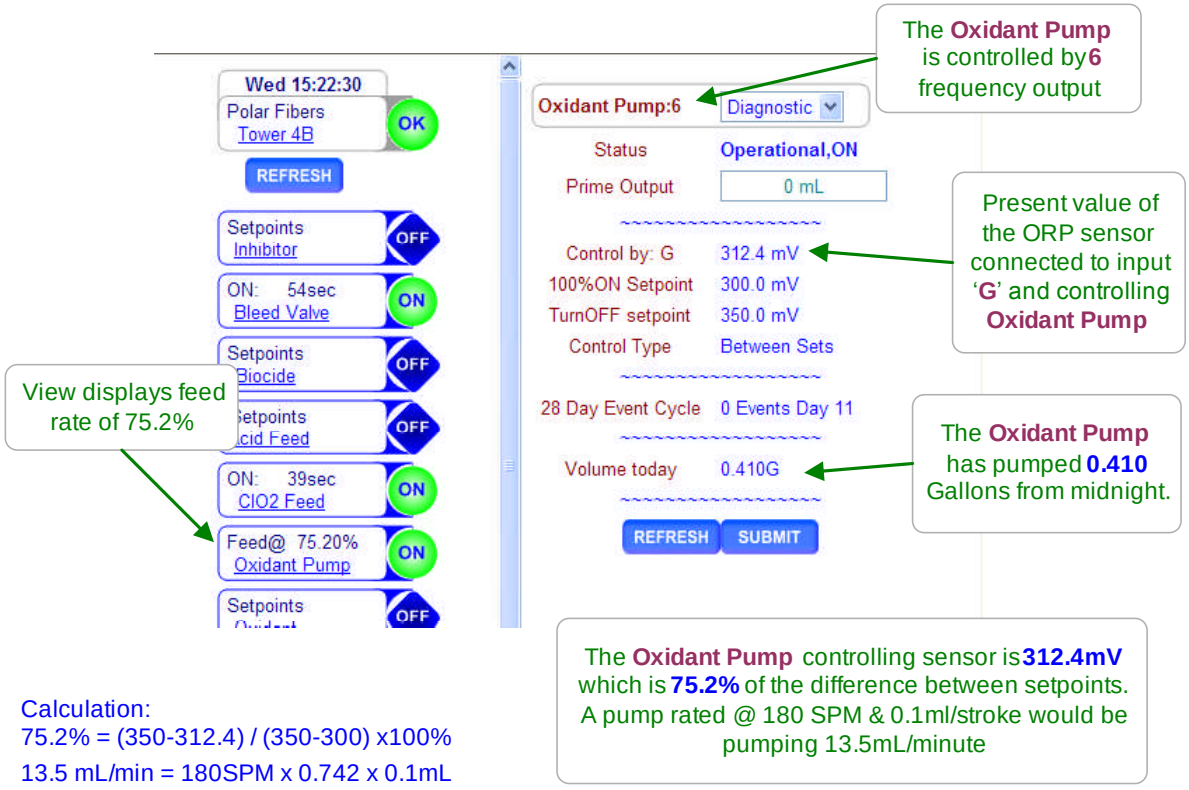
2. Some inhibitors are degraded by high levels of oxidant. The Inhibitor pump is connected to Relay '**1**' & the Oxidant pump connected to frequency control '**7**'. Inhibitor **Blocked by = '7'**

3. Three chemical pumps connected to Frequencies '**6**','**7**' & '**8**' share a common feed line. Only one can be fed at a time. Frequency**6 Blocked by = 'none'**, Frequency**7 Blocked by = '6+8'** and Frequency**8 Blocked by = '6+7'**.
'**6**' can always feed, '**7**' feeds if '**6**' & '**8**' are OFF, '**8**' feeds if '**6**' & '**7**' are OFF

Caution: Be careful **Blocking** with frequency outputs '**6**' to '**9**' that are controlled by a sensor to ensure that they occasionally turn OFF to allow the blocked pump to feed.

2.9 Feed Diagnostics

Select the link on the target chemical feed pump. The pump **Diagnostic** displays on the right.



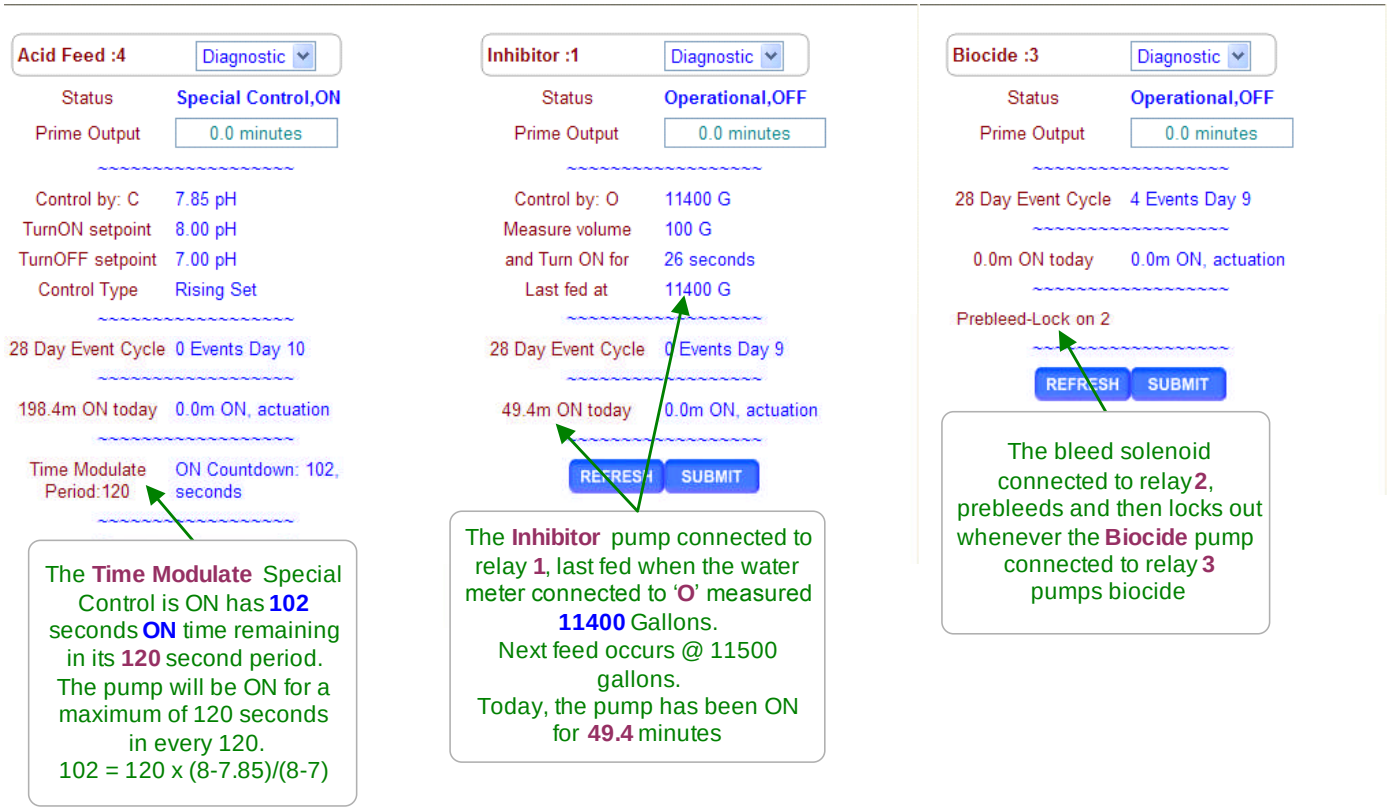
Calculation:
75.2% = (350-312.4) / (350-300) x100%
13.5 mL/min = 180SPM x 0.742 x 0.1mL

Sidebar:
Diagnostics vary with the output type and control.
Relays '**1**' to '**5**' use ON time instead of the volumes of Frequency controls '**6**' to '**9**'.

The main menu displays **Blocked** & the blocking output OR **Lockout** & the **Interlock** input OR **Alarmed** if a pump cannot feed.

2.9 Feed Diagnostics

Select the link on the target chemical feed pump. The pump **Diagnostic** displays on the right.



The **Time Modulate** Special Control is ON has **102** seconds **ON** time remaining in its **120** second period. The pump will be ON for a maximum of 120 seconds in every 120.
102 = 120 x (8-7.85)/(8-7)

The **Inhibitor** pump connected to relay **1**, last fed when the water meter connected to '**O**' measured **11400** Gallons.
Next feed occurs @ 11500 gallons.
Today, the pump has been ON for **49.4** minutes

The bleed solenoid connected to relay **2**, prebleeds and then locks out whenever the **Biocide** pump connected to relay **3** pumps biocide

Sidebar:
AEGIS controllers are **Diagnostic** intensive.
Each sensor, water meter , contact set, relay-frequency output and the controller itself has a **Diagnostic** display sequence.

Diagnostic tells you a lot about the operation of the treatment system and is invaluable if you have a configuration problem or feed fault.

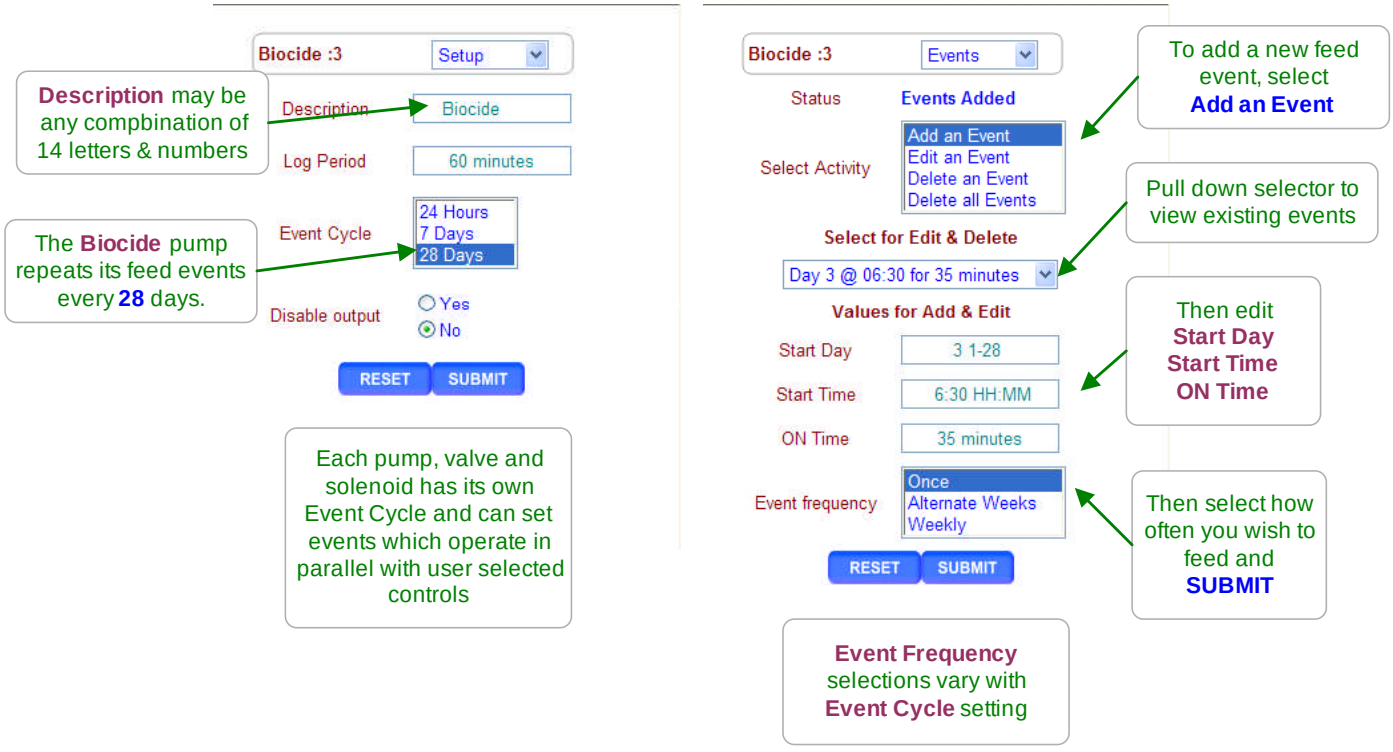
Even if you have **Passwords** turned ON, any user can still view the **Diagnostics**.
An uniformed user reading you the **Diagnostic** screen sequence may save you a site trip.

Browser access available locally or remotely via a VPN or modem connection displays all controller Diagnostics.

3.0 Biocides: Feeding by Time & Date

3.1 Setting & Viewing Events

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Setup** for the left page or **Events** for the right page.



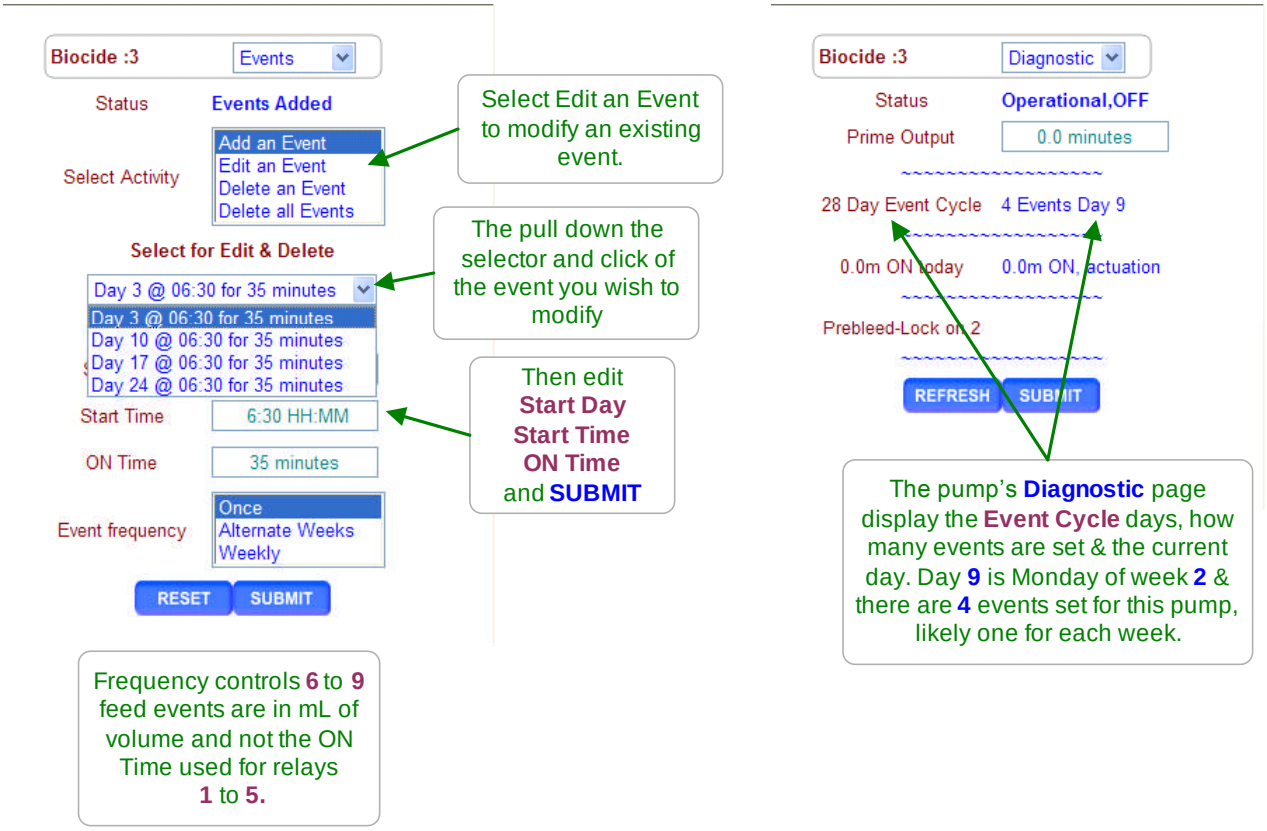
Sidebar:
Event Day can be set from **1** to **28** for Pumps set on a 28 day **Event Cycle** and from **1** to **7** for controllers set on a 7 day **Event Cycle** or always 1 on a 1 day **Event Cycle.**
Events repeat every **1**,**7** or **28** days.
Relays '**1**' to '**5**' feed time in minutes. Frequency controlled outputs '**6**' to '**9**' feed volume in mL.

If you set a **Start Day**, **Start Time** or **ON Time** out of range, the controller will correct, set to a default value or to the maximum allowed & display the result. You can then either modify the revised event, **Edit an Event** or delete it, **Delete an Event**.

If you are feeding two organic biocides, alternating every week,
you should use the default **28 Day Event Cycle**.
If you are feeding bleach or another oxidant, you are likely dosing 2 to 3 times week & never on Saturday or Sunday. You should use the **7 Day Event Cycle**
If you are using the Biofeed timer for a process type task like automating sensor cleaning or backwashing a filter, the **24 Hour Event Cycle** may fit your application.

3.1 Setting & Viewing Events

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Events**.



Sidebar:
Events with zero minutes ON time or zero volume are deleted.

Each Relay '**1**' to '**5**' and Frequency control '**6**' to '**9**' may have up to 28 Events.
Each Relay and Frequency control may have its own **Event Cycle** of 1,7 or 28 days.

Selecting **BioVolume Feed** & **Delete Events**, removes ALL events.
Selecting **BioFeed Event** & **Delete Events**, removes ALL events.

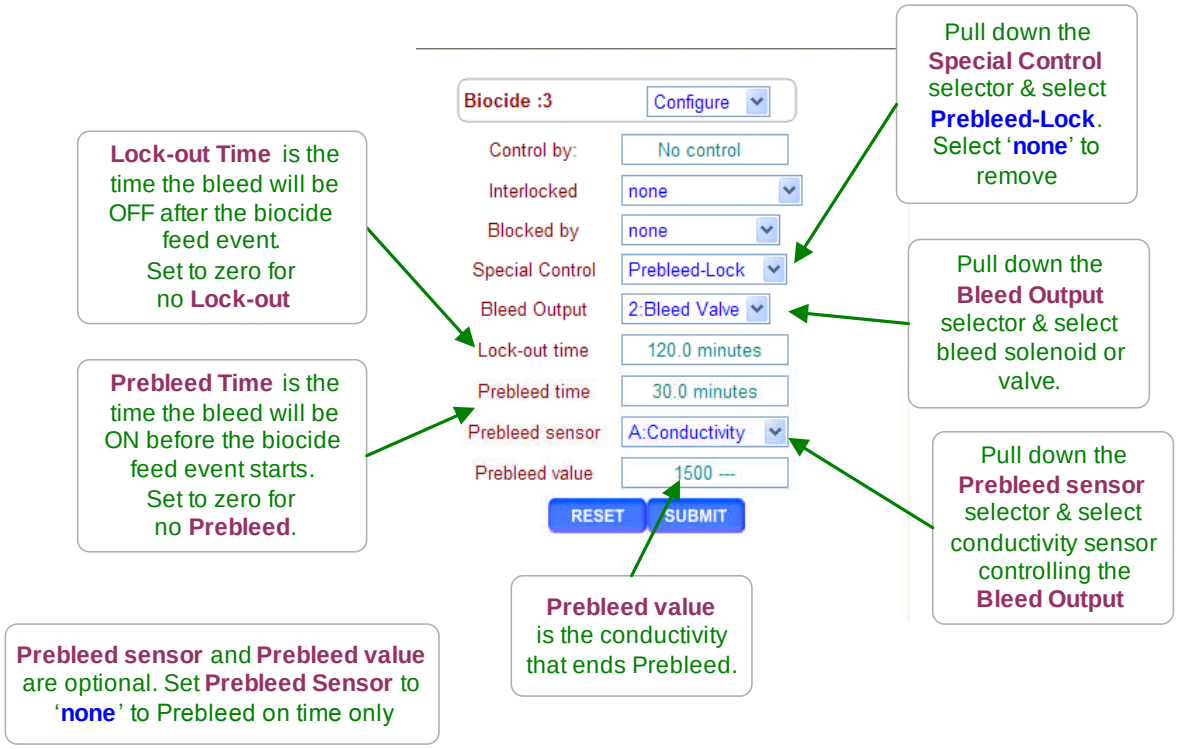
BioVolume: Maximum volume per event is 25000mL, 25L

BioFeed: Maximum feed per event is 1440 minutes, 24 hours.

PotFeeders : Oxidizing biocides for smaller towers frequently use bleach tablets or pucks in pot feeders. A solenoid connected to Relay '**1**' to '**5**' is turned ON directing flow through the feeder. Verify that both isolation valves are open after filling the feeder.

3.2 Prebleed-Lockout

Select the link on the target chemical feed pump and pull down the top, right menu, selecting **Configure**.



Sidebar:
Prebleed lowers tower conductivity before feeding biocide so make-up does not dilute the biocide. Biocides are preferably fed when tower thermal load is low & make-up is therefore limited.

Lock-out prevents tower bleed during the time required for a biocide to act. It may not be necessary to **Lock-Out** lightly loaded towers. Do not **Lock-out** heavily thermally loaded towers for extended periods.

Lock-out time starts when **Prebleed time** ends and the feed event starts.
If you require 90 minutes of residence time for a biocide to be effective then
Lock-out time = Feed time + 90 minutes.

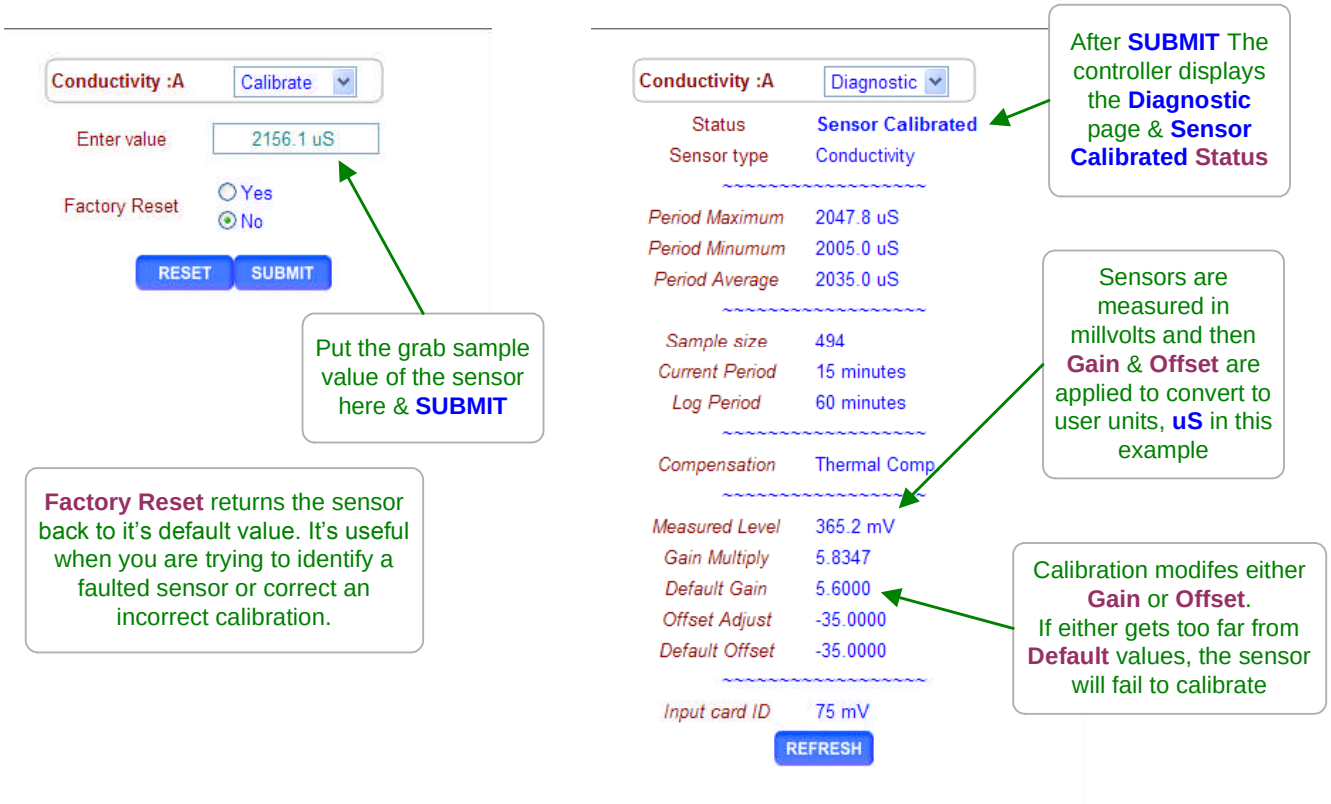
Biocide Pumps powered by Relay '**1**' to '**5**' should be set to MAX stroke & frequency to slug feed.

Bioicide Feed on frequency controls '**6**' to '**9**' will feed at MAX frequency.
In either case, the feed objective is to get to the target kill concentration quickly.

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

4.1 Sensor Calibration

Select the link on the target sensor and pull down the top, right menu, selecting **Calibrate**.



Sidebar:
Single Point Calibration: All sensors but some 4-20mA inputs can be single point calibrated. Aquatrac recommends that you measure a sample from the sensor installation line and calibrate the sensor based on the grab sample. It's the simplest, most repeatable method.

Corrosion rate sensors are not calibrated.

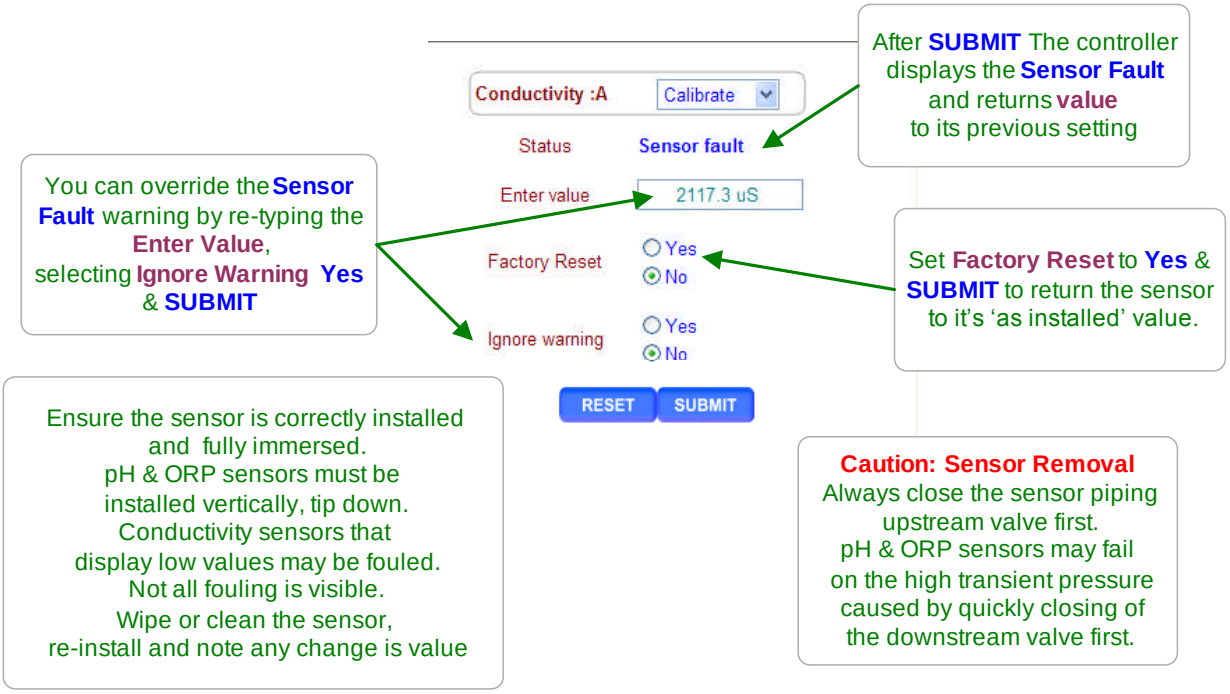
Water treatment systems setpoint control so that the conductivity, pH or ORP is controlled within a narrow range allowing simple single point calibration.

Process control and monitoring only sites which may operate over a wide sensor range benefit from 2 point calibration. For these users, the controller supports direct set of sensor OFFSET & GAIN.

Calibration Faults: Refer to the next page for options on fault.
Inventory and Manual Input sensors
Use **Calibrate** when you fill a tank to correct the **Inventory** level.
Use **Calibrate** after you measure a drop count to update a **Manual Input**.

4.1 Sensor Calibration

This page displays on a failure to calibrate. Although, you may elect to ignore and bypass this warning it's usually telling you there's a problem. You may have forced to sensor to read a value, but it may not track changes in conductivity, pH, ORP, temperature, GPM…



Sidebar:
Sensor Fault: The controller verifies that sensor OFFSET or GAIN required to make the sensor read it's new value are within the range of typical sensor operation.
If out of range, **Sensor Fault** displays.

Fault Cause varies with sensor type**.**
Conductivity: Fouling lowers the measured value. Remove and inspect. Whitish deposits indicate overcycling & may require HCl cleaning to remove. If no visible fouling clean, with alcohol or solvent then **Factory Reset**. Refer to Section 7. for boiler sensors.

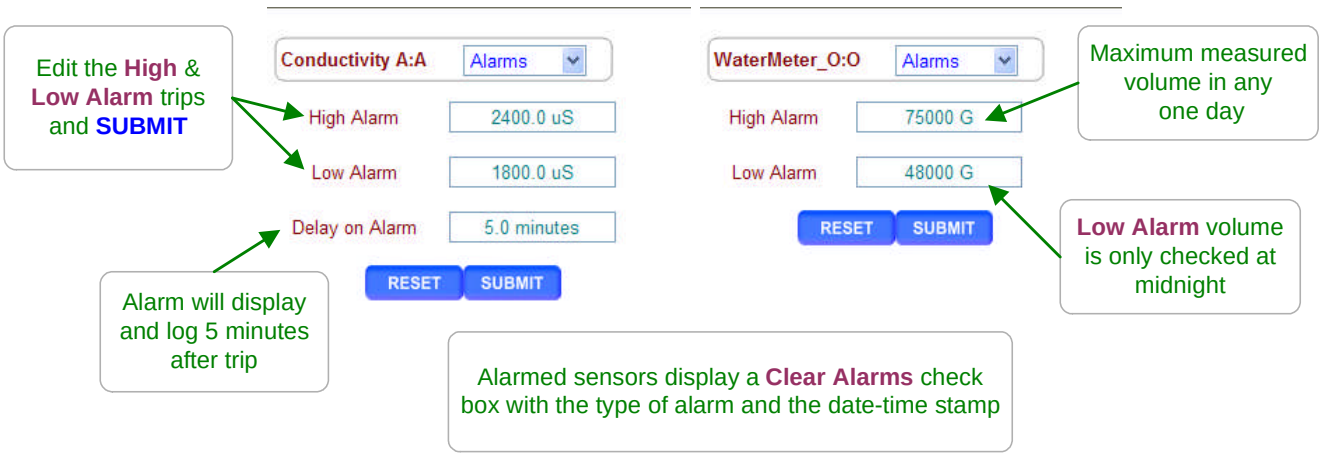
ORP: Verify sensor cable not shortened & firmly connected. Verify not visibly fouled. If stream contains organics, clean with alcohol or solvent. If stream high in iron or copper restore platinum surface with Aqua Regia or equal.

pH: Verify solution ground connected & excess sensor cable coiled at sensor, not in enclosure. Verify sensor cable not shortened & firmly connected. Then replace if no recovery after **Factory Reset**. pH sensor life decreases with handling and temperature extremes.

Temperature: Verify color coding correct and sensor wires firmly connected. Inspect sensor for damage or leaking.

4.2 Sensor Alarms

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.



Sidebar:
Sensor Alarms: Nuisance alarms tend to be ignored.
Select alarm limits that represent control fault or sensor failure.

Example:
If the tower make-up is 450uS and you are controlling at 2.5 cycles or 1125uS…

Set the **Low Alarm** at 900uS because if you ever get to 900uS you have a leak or water loss causing undercycling. If your biocide feed **Prebleed** lowers the conductivity below 900uS, then set the **Low Alarm** lower.

Set the **High Alarm** at 1300uS because if you ever get to 1300uS, bleed control has failed. The bleed solenoid has faulted. The bleed line is blocked or valved off. The controller relay fuse has opened. You're being punished for a misspent youth. If your biocide feed **Lockout** period results in a higher conductivity, increase the **High Alarm**. If your treatment program scales at a conductivity higher than 1250uS without scaling, reduce the **High Alarm**.

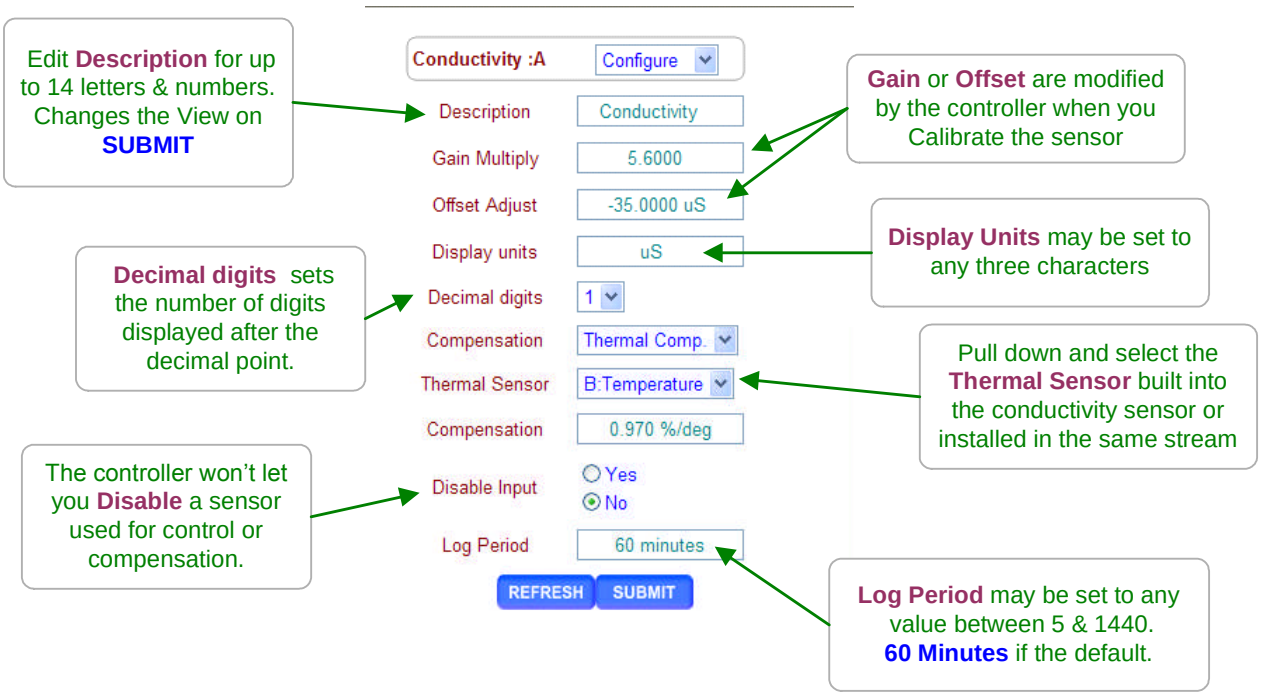
If the feed program has a tight temperature limit set the Temperature alarm to alert you.

Clear Alarms: Resets the **Delay on Alarm** time
If the **Delay on Alarm** is set to zero minutes and the sensor is above the **High Alarm** or below the **Low Alarm**, the sensor alarm will immediately re-trip.

Alarms when Tower OFF Line:
If the sensor installation piping drains or siphons when the tower turns OFF and a sensor alarm results, install a check valve on the sensor line.
A check valve will prevent alarms but more importantly will prevent wet-dry cycles from depositing on sensing surfaces, causing calibration problems and shortening sensor life.

4.3 Sensor Configure

Select the link on the target sensor and pull down the top, right menu, selecting **Configure**.



Sidebar:
Description: Text is rejected if it contains HTML delimiters like < >.
Avoid assigning duplicate or similar names for sensors, requiring the user to identify using only the identifying letter '**A**' to '**N**'.
Each sensor has only one name. It's the same for both Keypad-LCD and Browser users and is included in the controller data logs.

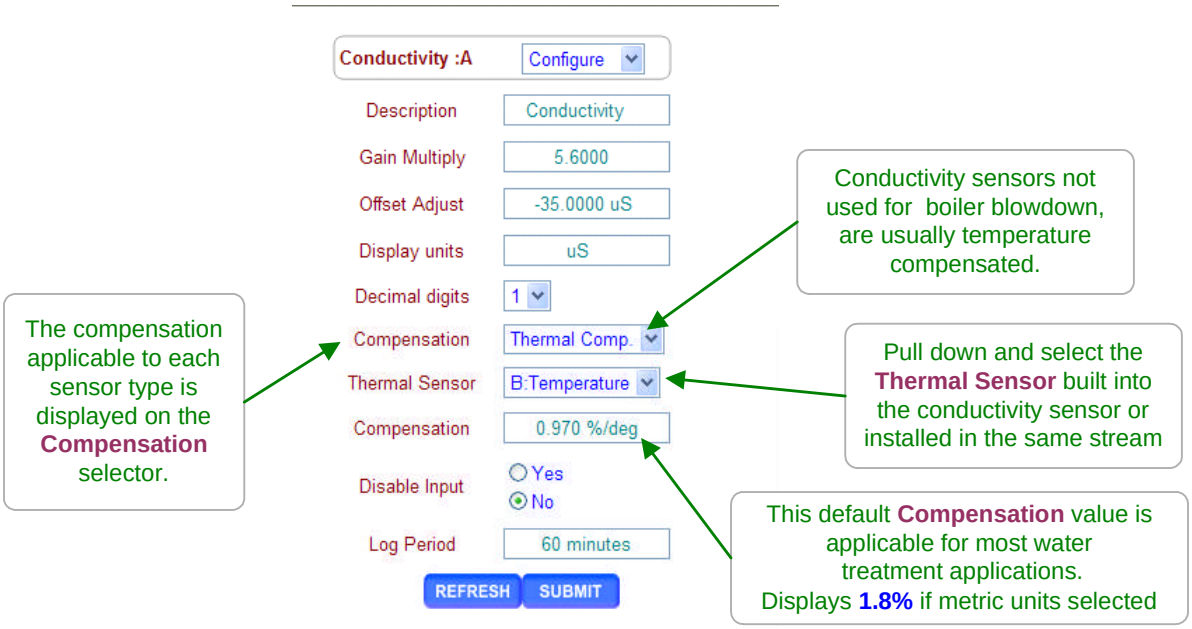
Resolution: When you select the number of digits displayed after the decimal:
1. Keep the number to a minimum to unclutter the display, making sensor values easier to read & remember.
2. Conductivity is usually not measured with more than 1uS resolution & is never controlled within 1uS so it's not necessary to display fractional uS.
3. Small changes in calculated ppm may indicate a large change in chemical usage so three digits after the decimal is useful.

The displayed resolution of a sensor does not alter the data log resolution or the resolution used for control or the accuracy of sensor calculations.

Disabling a sensor removes if from the display and all selection menus used for control and compensation. Data logging stops for disabled sensors.
Refer to **11.4 Enabling Inputs & Outputs** if you need to re-enable a disabled sensor.
Use **Disable Input** to unclutter the LCD & browser display, reducing scrolling key presses.

4.3 Sensor Compensation

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.



Sidebar:

Conductivity Temperature Compensation:

Cooling tower applications use conductivity as a measure of total dissolved solids (TDS).
If we didn't temperature compensate then we'd have an error of roughly 1%/F in the TDS.
A typical cooling tower 15 degree F temperature rise would cause about a 15% error in TDS because water is more conductive as temperature increases even though the TDS hasn't significantly changed.
We temperature compensate conductivity so it tracks TDS, the variable we want to control.

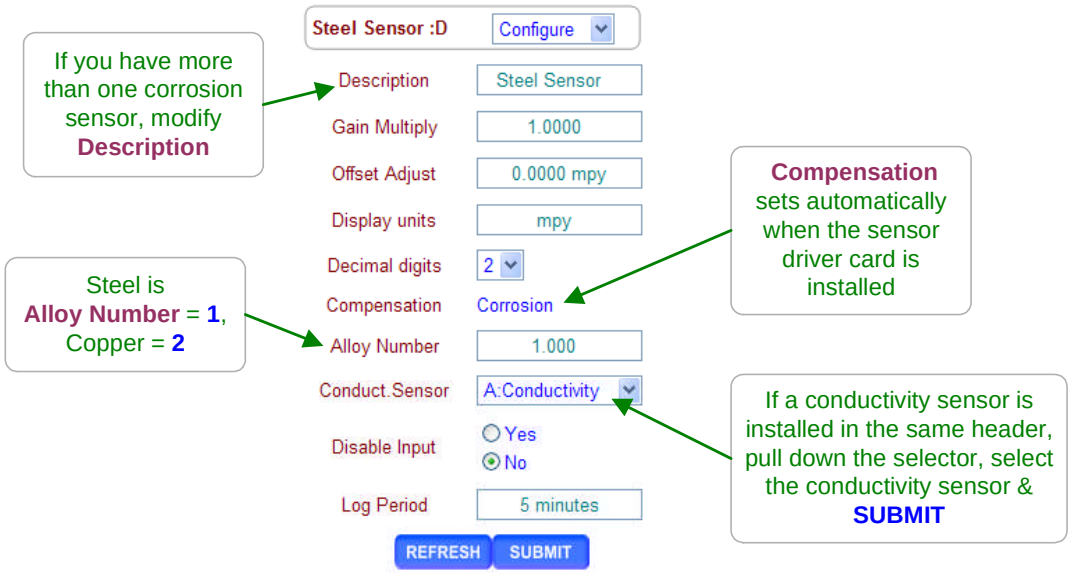
pH Temperature Compensation:

If your site switches to free cooling and water temperature spans 40-60F in a day then temperature compensating pH is worth the slight decrease in overall reliability.
Otherwise you won't see any measurable benefit in temperature compensating pH.

4.3 Sensor Compensation

Select the link on the target corrosion rate sensor and pull down the top, right menu, selecting **Configure**.

Corrosion rate sensors installed as an on-site upgrade auto-configure for carbon steel.
If you order the controller with a Cupro-Nickel, Copper, Admiralty or Zinc (Galvanizing) corrosion rate included, it will ship correctly configured.



Sidebar:
Corrosion Rate Measurements:
Weight loss coupons are commonly used to measure average corrosion rate over the coupon immersion period. The AEGIS' corrosion rate measurement uses **LPR** (Linear Polarization Resistance) for a corrosion rate that's updated every 2 minutes.

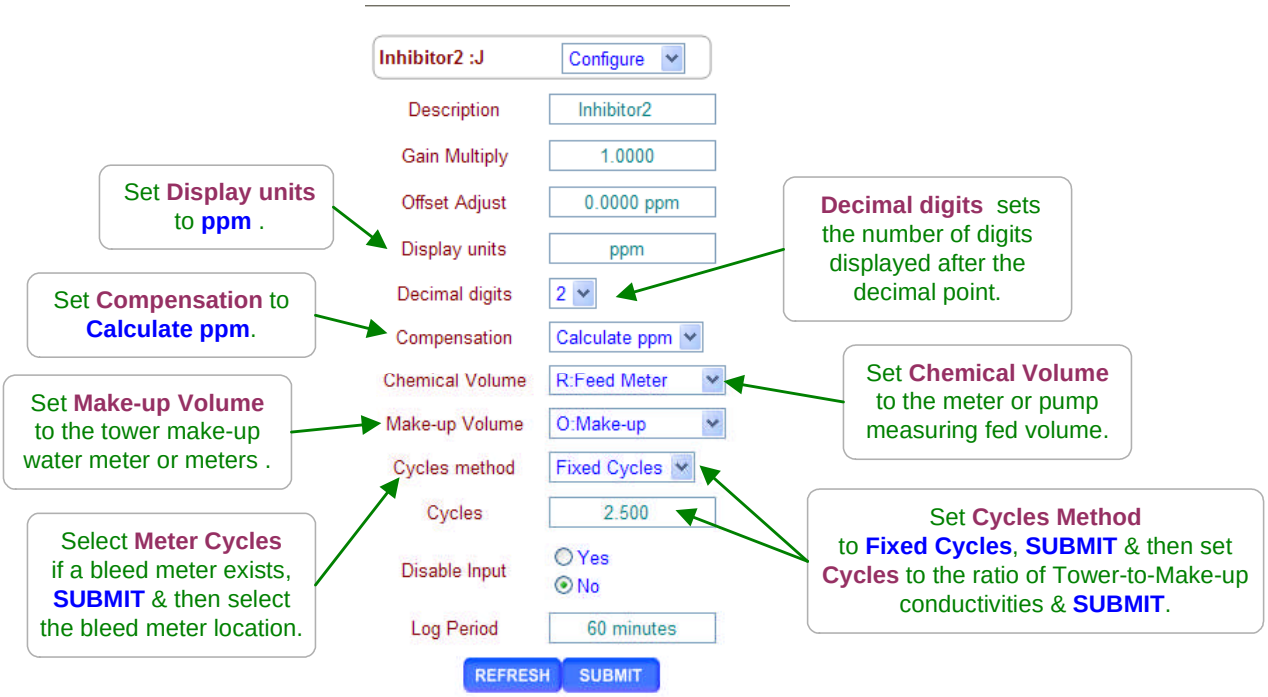
Although LPR is not as accurate as weight loss, LPR responds immediately to changes in corrosivity & is sensitive enough to detect when you are feeding oxidant, which marginally increases corrosion rate. Sensor life in treated cooling waters is many years.

Corrosion rates are measured in mils/year, MPY where 1mil = 0.001".

LPR is a proven technique for real time measurement of general corrosion rates for all of the metals and alloys in typical cooling water systems. It is not useable for aluminum or stainless steels, which pit rather than corrode uniformly.

4.3 Sensor Compensation

Select the link on the input 'H' to 'N', used for ppm calculation and pull down the top, right menu, selecting **Configure**.



Sidebar:

Calculate ppm:

If the controller knows the volume of chemical fed, the make-up volume and cycles of concentration, then the ppm of the fed chemical can be calculated.

The 1mL/pulse Tacmina positive displacement feed meters installed on the pump outlet or the inlet of fractional HP boiler feed pumps are an accurate way to measure volume fed.
In this example, the feed meter is connected to controller input '**R**'.

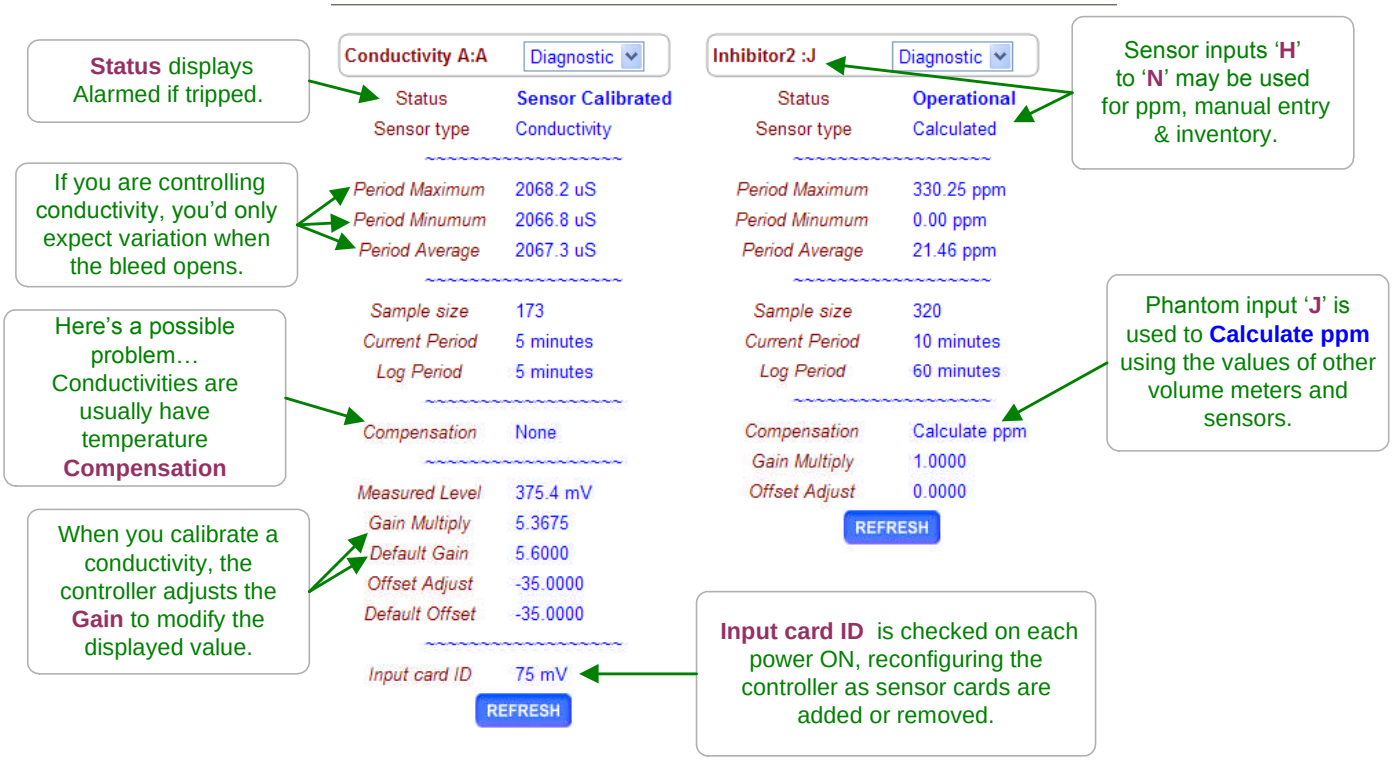
Phantom Inputs 'H' to 'N'

In this example we've enabled phantom input '**J**' for use as a ppm sensor.
'**H**' to '**N**' may also be used as **Inventory** or **Manual Input** sensors.

Phantom inputs are logged, used for controls and alarming just like inputs '**A**' to '**G**' which do physically exist and have connection terminal blocks.

4.4 Sensor Diagnostics

Select the link on any sensor to view the **Diagnostic** page for the sensor.

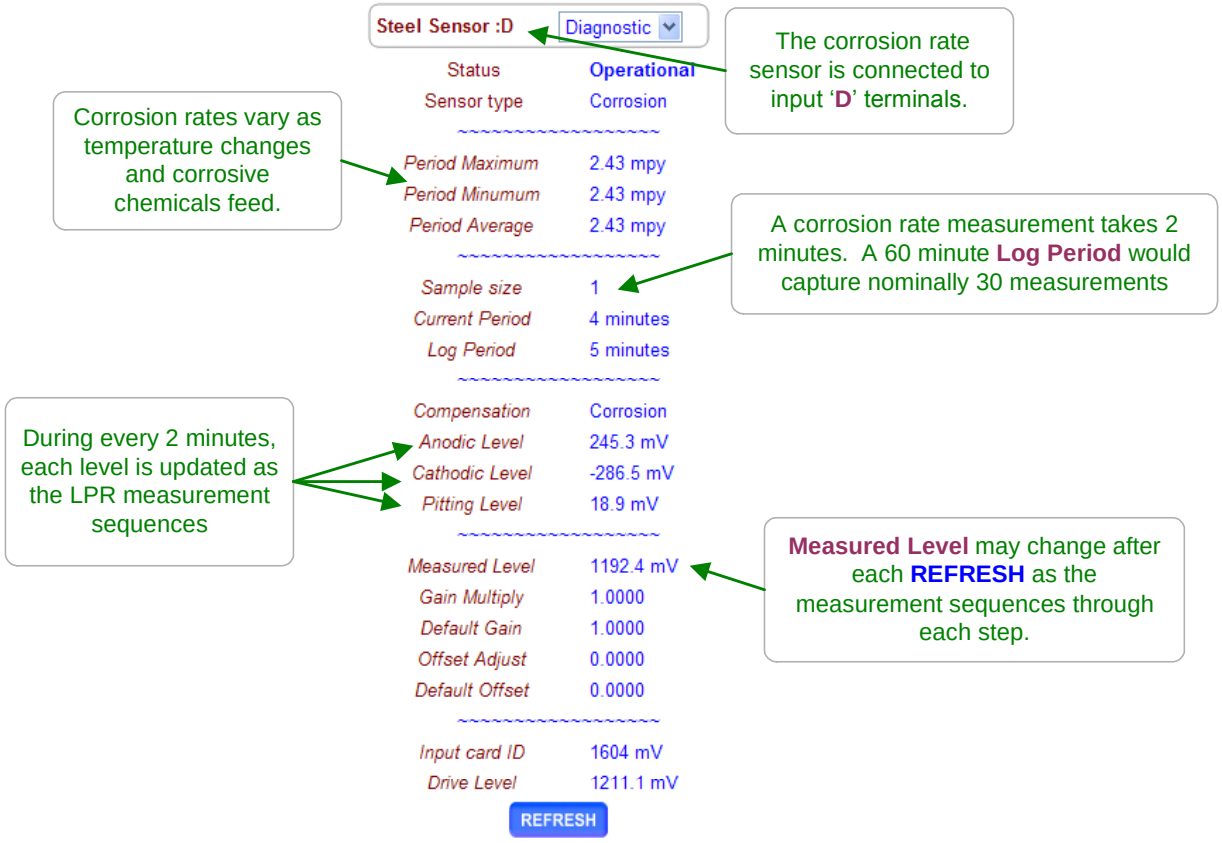


Sidebar:
Diagnostic displays how the sensor is configured, compensated and calibrated.

Gain & Default Gain
When you calibrate a conductivity, the controller adjusts the GAIN to make your measured value match the displayed value.
Offset & Default Offset
When you calibrate a pH, ORP, temperature or corrosion rate, the controller adjusts the OFFSET to make your measured value match the displayed value.
When you two point calibrate a 4-20mA input, the controller adjusts both OFFSET and GAIN.
Inventory, ppm and Manual Sensors:
These sensor types use only the OFFSET to set the displayed value.
The controller ignores GAIN for these sensor types.
For example when you fill a tank and **Calibrate** an Inventory sensor to display 48.5 Gallons, **Offset Adjust** will display 48.5.
Measured Level:
pH sensors have a well defined mV to pH relationship.
Example pH7 = 0mV, pH10=176 mV and pH4 = -176 mV.
Displayed sensor value = (**GAIN** x **Measured Level**) + **OFFSET**.
Using this simple equation, you can directly modify the OFFSET & GAIN to get a desired display.
This is seldom done, but it's convenient for some unusual sensor types.

4.4 Sensor Diagnostics

Select the link on any sensor to view the **Diagnostic** page for the sensor.



Sidebar:
Corrosion Rate has a unique set of diagnostics.
Anodic and **Cathodic** levels should be opposite is sign and nominally the same magnitude
If not, the sensor tips may be fouled, debris blocked or pitting.

Pitting Level
Linear Polarization corrosion rates sensors work correctly unless pitted.
Pitting usually only occurs under deposits in cooling water systems since water treatment prevents pitting on exposed surfaces.

Alarms:
If the magnitude of **Pitting Level** exceeds the **Anodic** or **Cathodic** level, the controller sets the '*Sensor Pitted*' alarm at corrosion rates > 2 mpy.

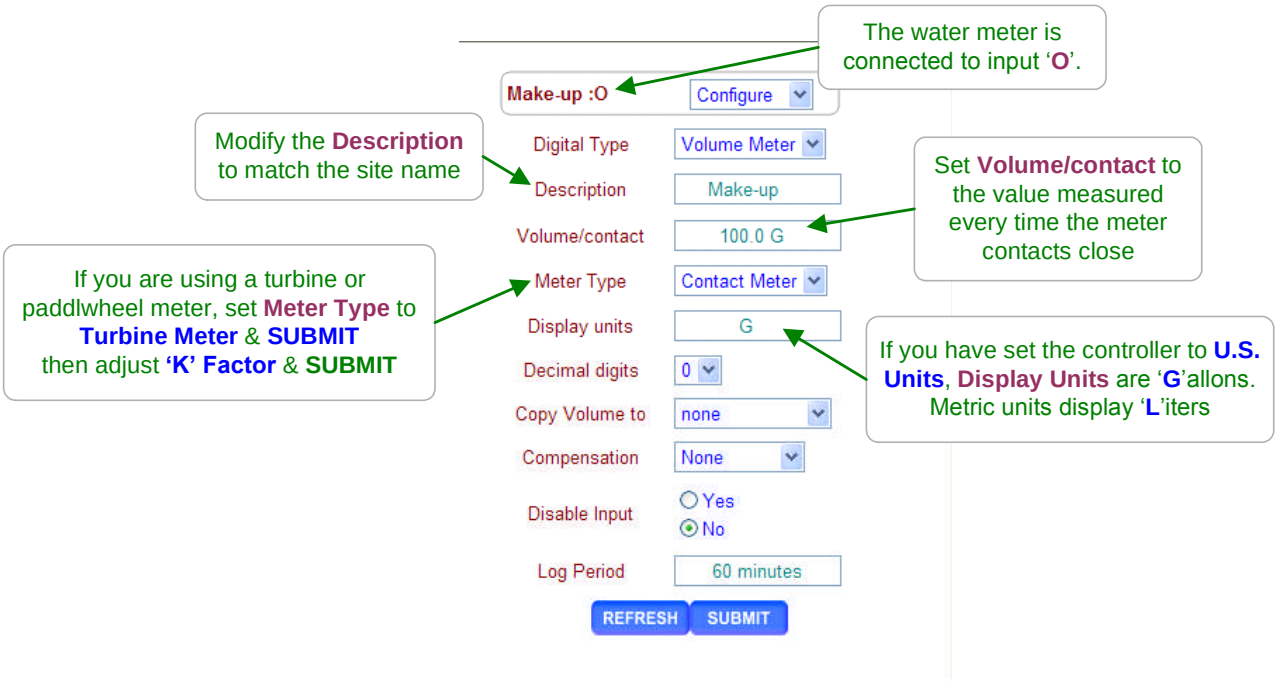
If a conductivity sensor is selected and more than 50% of the measurement voltage is used to overcome the water resistance, the controller sets the 'Low Conductivity' alarm.

These alarms alert you to error in the displayed corrosion rate.

5.0 Measuring Volume: WaterMeters, Inventory, Verify Feed

5.1Configuring a New Meter

Select the link on the meter and pull down the top, right menu, selecting **Configure**.



Sidebar:

Contact Head Meters

Meters may often be user configured for many Gallon/Contact or Liter/Contact settings. Make sure you get the volume/contact correct or feed concentration errors will occur.

Turbine-Paddlewheel Meters

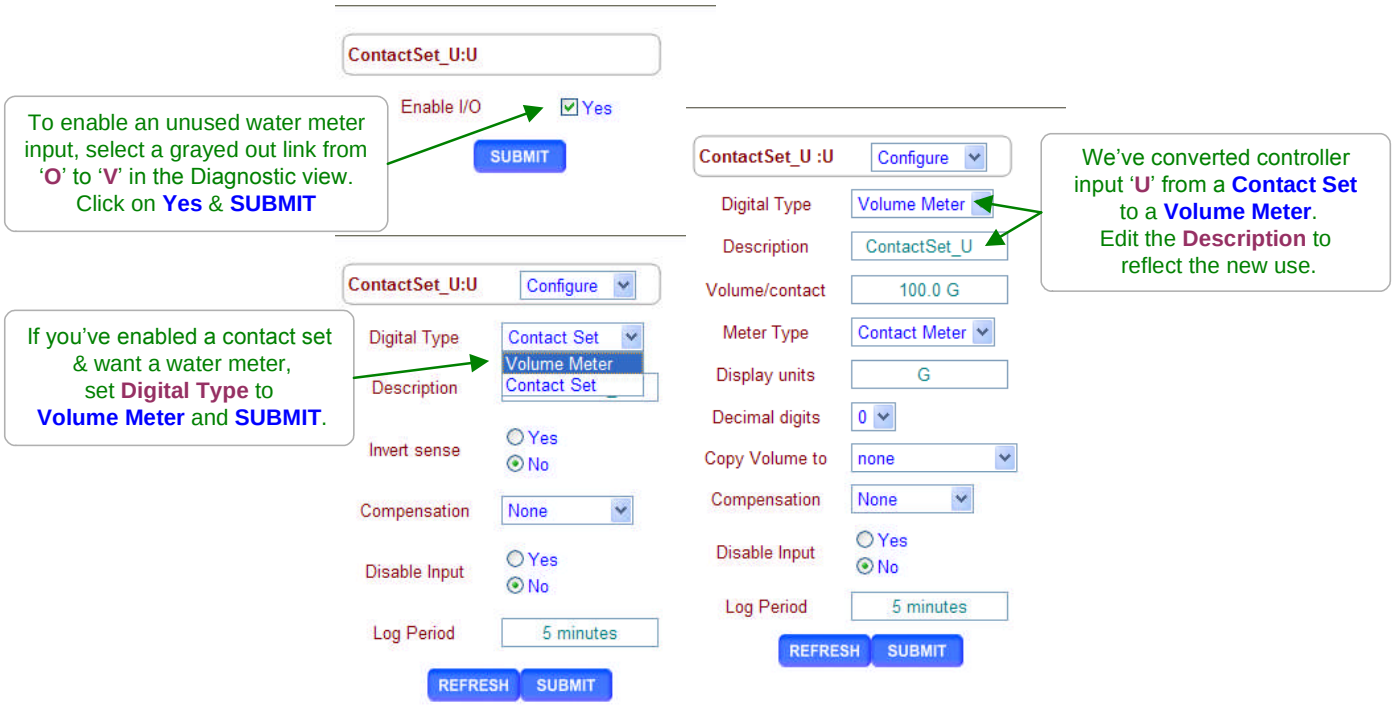
Nominal **'K' Factors** or Pulses-per-Gallon are listed for each pipe size on the manufacturer's web site or on the installation manual supplied with the meter.
When meter are supplied with entry fittings, the actual 'K' factor is frequently labeled on the body of the meter.

Common Meter Wiring Errors:

1. Switching wire colors when extending 3 wire meter cables.
2. Routing meter wiring in the same conduit as AC power.
   Meter cables are low voltage. If site practice allows, tie wrap meter cabling to the outside of conduit rather than share a conduit with AC power.

5.1Configuring a New Meter

Unused controller digital inputs can be enabled and used for either contact set-flowswitch inputs or to measure volume as water meters or chemical feed meters.
Select the **Diagnostic** page from the **System Home** page.



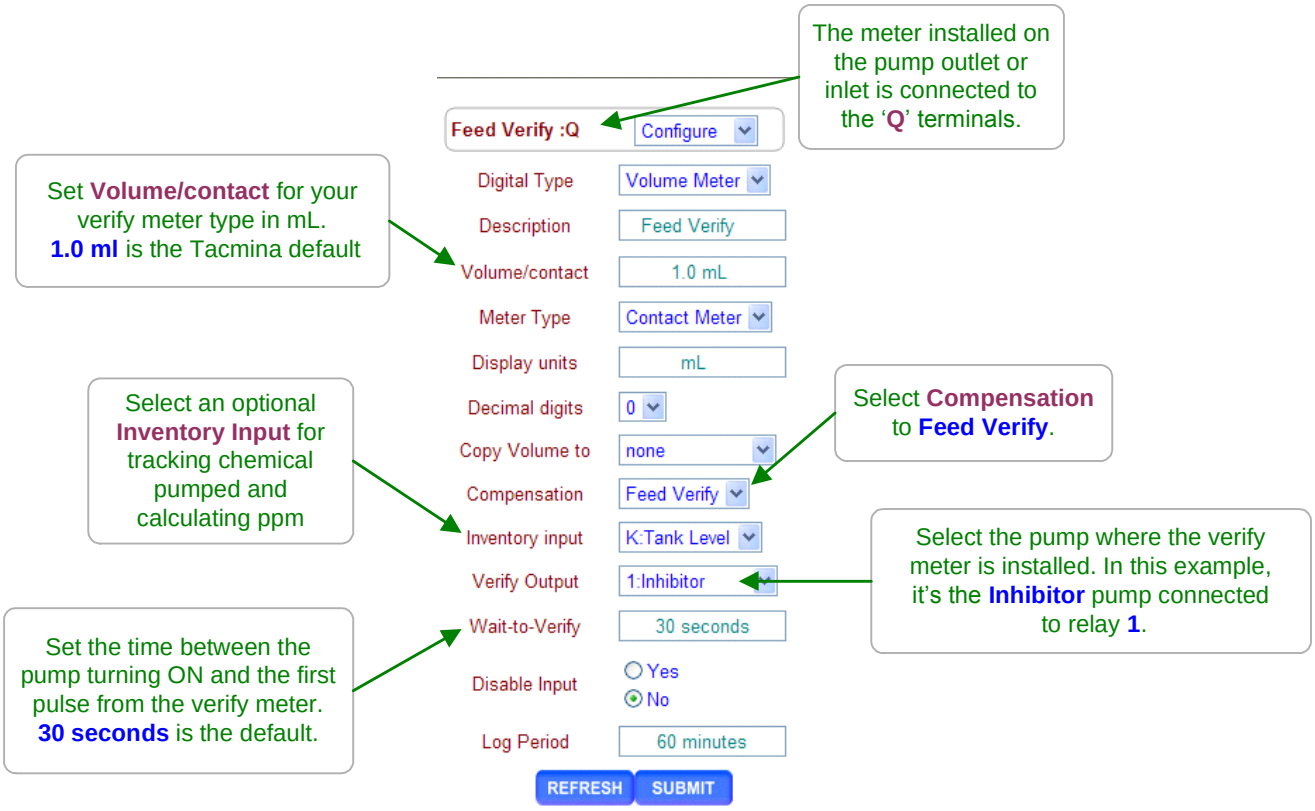
Sidebar:
Digital Type
The eight controller inputs '**O**' to '**V**' may be configured to any combination of meter and contact set inputs. Meter inputs measure volume and contact sets measure state, ON or OFF.

Contact Set Debouncing:
Mechanical water meter contact sets bounce when closing or opening. The controller software debounces so that you don't measure extra counts when you select **Contact Meter**.

Maximum Turbine Pulse Rate:
Turbine pulse streams are not debounced and will measure up to 400 pulses/sec. or Hertz. 400 Hz. is faster than the pulse stream from the Seametrics type meter at maximum **'K' Factor**.

5.2 Feed Verification & Inventory

Select the link on the target sensor and pull down the top, right menu, selecting **Configure**.



Sidebar:
Feed Verify uses a feed meter on the pump to ensure chemical is pumped when the pump is turns **ON**. Any water meter input '**O**' to '**Z**' can be used for a **Verify Meter**.
Feed Verify can be used to check any control or feed with a downstream water meter.
Relays '**1**' to '**5**' and frequency controlled Pumps '**6**' to '**9**' can be alarmed on fail to feed with the **Feed Verify Compensation**.

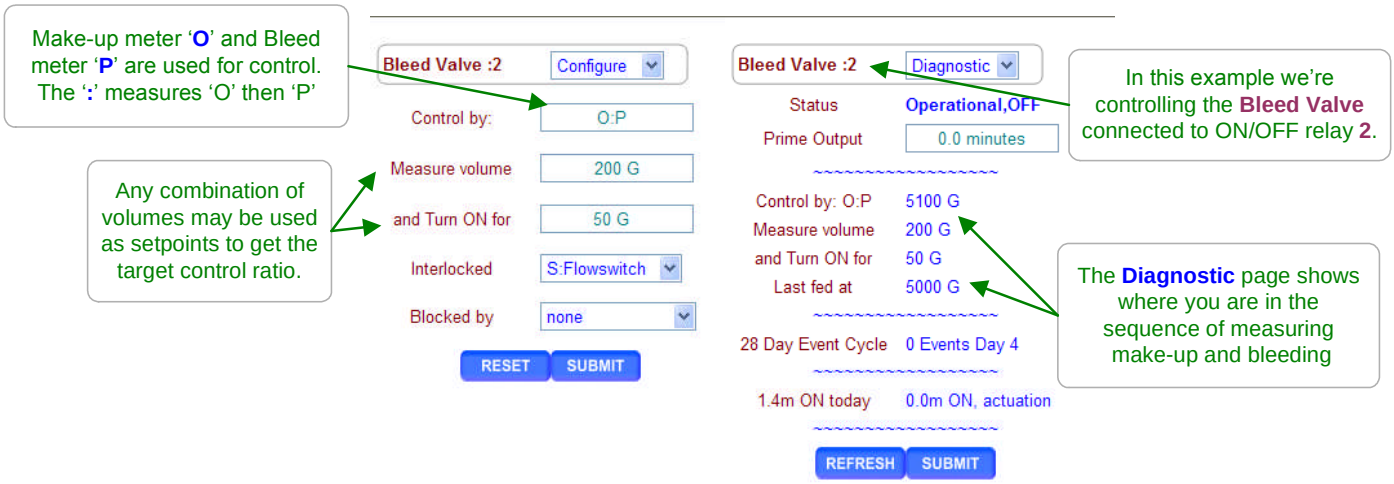
Once you've set up the **Verify Meter**, you'll need to tell it which Pump to verify and if you wish keep track of the chemical pumped, which input to use for **Inventory**.
More than one **Verify Meter** can use the same **Inventory input** since more than one pump may use the same tank or tote.

Feed meters may be built into the pump, installed on the pump feed tubing or on the pump suction tubing for fractional HP boiler feed pumps.
Many pumps can be purchased with a low cost option that provides a contact closure whenever the pump feeds, typically every stroke.

These contact sets can **Feed Verify** that the pump has not lost prime, become unplugged or run out of chemical in applications where the accuracy of a higher cost 1mL/pulse meter is not required.

5.3 Cycle Controls

Select the link on the target bleed control and pull down the top, right menu, selecting **Configure**. The **Diagnostic** page is displayed when you select the target bleed control.



Sidebar:
Cycles of concentration are usually set by the conductivity control that operates the bleed solenoid. If the make-up conductivity & chemistry is constant, two water meters can be used for cycles of concentration control.

For every 200 Gallons of Make-up, the controller opens the bleed solenoid until it measures 50 Gallons. The result is 4 cycles of concentration.
In this example, the conductivity sensor is used only to monitor the tower and not to operate the bleed solenoid. Volume setpoints can be adjusted for any Cycles target.

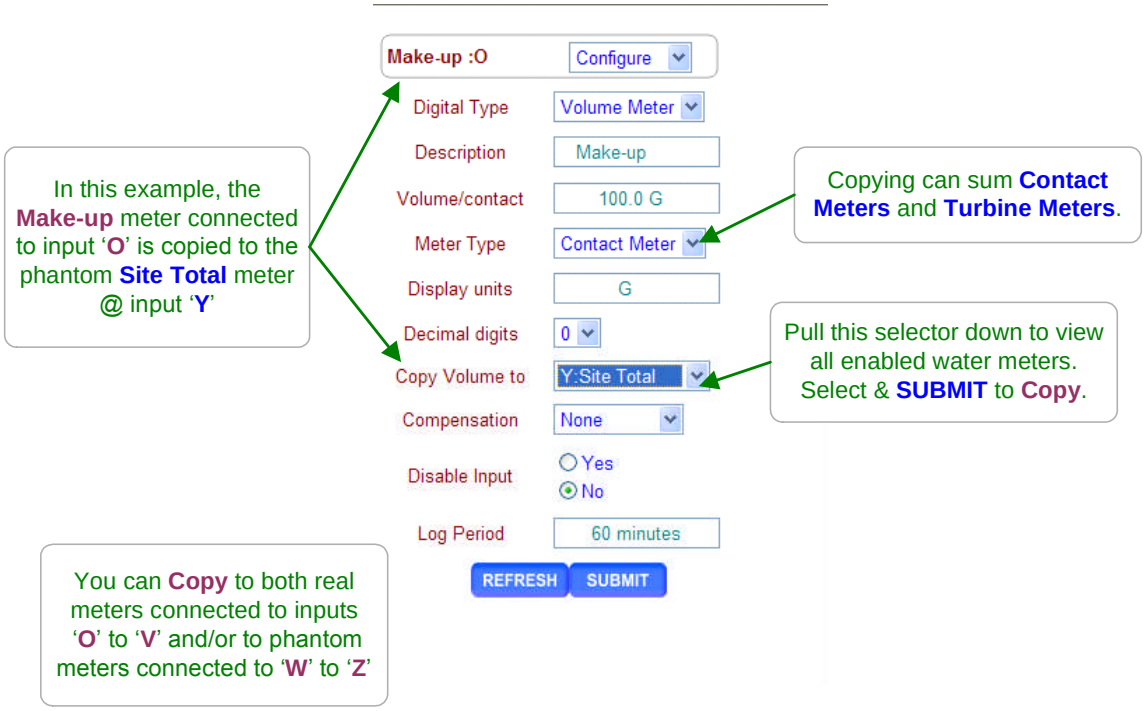
Don't worry about the math and each meter's volume/contact rating or 'K' factor. The controller takes care of these details.

Applications:
Any two volume meter inputs can be used to feed a ratio of chemicals.
You could use the make-up meter and a 1mL/pulse feed volume meter to feed at a fixed ppm.

Example:
You Rate-to-Volume compensate a 4-20mA input which represents process line speed to volume meter input '**R**' and measure cleaner feed volume on meter input '**Q**'.
The Cleaner pump controlled using 'Control by' = **R:Q** to feed cleaner proportional to process line speed.

5.4 Copying Meters

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.



Sidebar:
The volume measured by one water meter can be copied to another water meter.
There are several uses for copying meters:
1. More than one meter can be summed for each meter in an O:P type Cycle Control.
2. Several tower's make-ups or boiler's feedwater volumes may be summed to a single meter for logging or alarming purposes. If you enabled a phantom input, '**W**' to '**Z**' you don't need to give up a physical controller input to sum volumes.

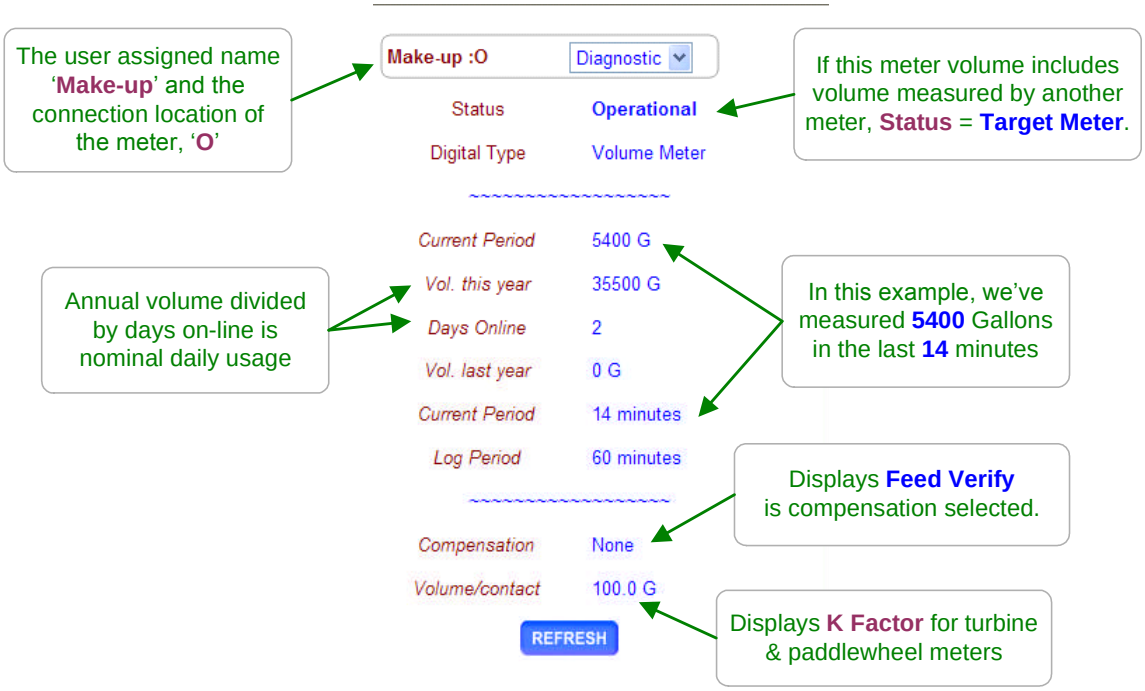
Meter Control Equations:
Up to 4 Meters can be summed or differenced to control a pump without using **Copy Volume to.**
Copy Volume to adds flexibility to configuring volume feed controls

Operation:
Only the incremental volume measured is copied, not the meter daily total.
Copying starts when you set **Copy Volume to.**

Constraint:
The target meter of a **Copy Volume to** cannot be copied to prevent a run-away circular copy. In this example if you copied meter '**O**' to Meter '**Q**' and then copied '**Q**' to '**O**', you'd quickly get an infinite volume. The controller blocks this type of circular reference.

5.5 Meter Diagnostics

Select the link on the target volume meter to display the **Diagnostic** page.



Sidebar:
If **Days Online** = 286 and **Vol. this year** = 1642900 & the tower or boiler operates 24/7 then we're averaging 5750 Gallons/day
Is this the expected volume for the target cycles of concentration and thermal load?
If we've been averaging 5750 and today at noon we've measured
Volume today = 9860 Gallons, why the increase?

Meter Alarms: Low Alarm
The **Low Alarm** for water meters only trips at midnight if the meter has not exceeded to **Low Alarm** volume. Set **Low Alarms** = 0 to prevent alarms @ midnight.

Use **Low Alarm** to flag towers or boilers that have not made-up,
towers that have had no blowdown or chemicals that have not fed.
Meter Alarms: High Alarm
The **High Alarm** for water meters trips when the meter exceeds the **High Alarm** volume.

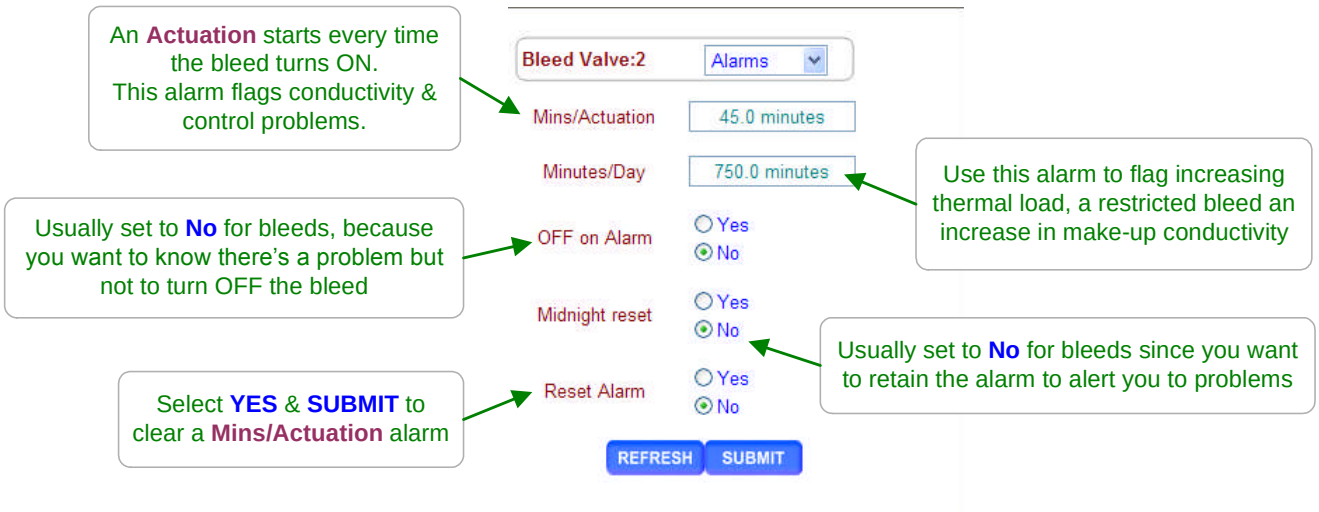
Set **High Alarms** higher than the volume expected @ highest thermal load
to prevent nuisance alarms OR close to actual usage to flag you on increased load..

Set **High Alarms** on feed verify meters to flag you on increased usage.
Note; clearing a water meter **High Alarm** without adjusting the **High Alarm** level
will immediately trip another alarm on the meter.

6.0 Cooling Tower Bleed

6.1 Bleed Alarms

Select the link on the target bleed valve or solenoid and pull down the top, right menu, selecting **Alarms**.



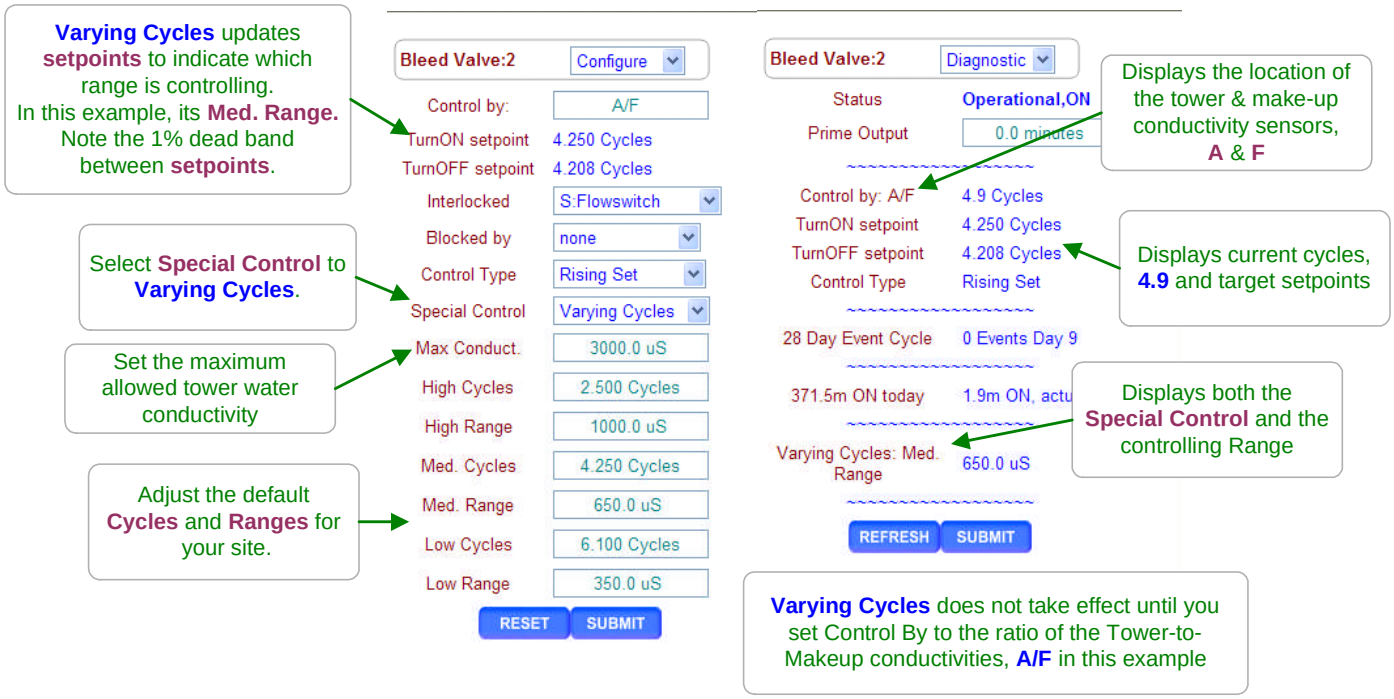
Sidebar:
Alarms: Because bleed ON time alarms are usually not set to turn OFF the bleed, they are typically set tighter to actual operating times for a tower under maximum thermal load.

These alarms can be used to flag you on maintenance problems with the bleed or changes in the thermal loading of the tower. An increase in make-up conductivity or an error in adjusting bleed setpoints could also increase bleed time & trip the alarm.

The **Minutes/Actuation** alarm starts timing when the bleed turns ON and returns to zero when the bleed turns OFF. This alarm does not reset it's timing at midnight since an actuation period or bleed cycle may bridge two days.

6.2 Variable Cycles

Select the link on the target bleed valve or solenoid and pull down the top, right menu, selecting **Conifgure**.



Sidebar:

Varying Cycles: Controls tower bleed on the ratio of the Tower-to-Make-up conductivity. The user selects the cycles of concentration for three ranges of make-up conductivity and a maximum tower sump conductivity.
The controller measures the make-up conductivity and controls bleed @ one of the three cycles of concentration. If the tower sump exceeds the maximum conductivity, the tower conductivity is used to control the bleed & to reduce the sump conductivity.

Where Used:

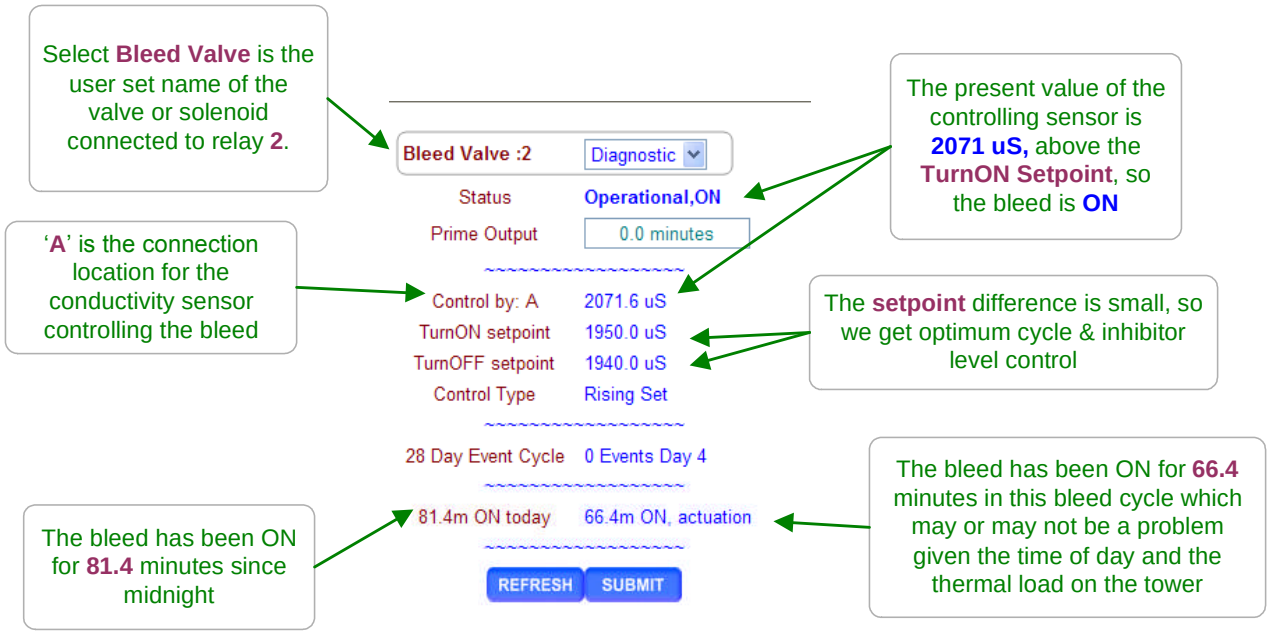
If your make-up changes seasonally or periodically and you have a 2nd conductivity sensor installed in the tower make-up line you can control using Varying Cycles.

Where Not Used:

1. If the holding time or turnover time of the tower is 'long' then the bulk of the tower water has not changed when the make-up conductivity changes & you may scale if hardness limited.
'Long' is site specific and a function of temperature, water chemistry and treatment program.
2. If the make-up conductivity does not track the component that limits the maximum cycles.
For example, hardness may increase with conductivity but silica may not & you may be silica limited.

6.3 Diagnostics

Select the link on the target bleed valve or solenoid and the **Diagnostic** page will display.



Sidebar:

ON Today: If the tower has been operating for 10 hours today, then its bleeding for about 36% of the time; typical for a tower under load.

If the tower has been operating for 4 hours today, then its bleeding for about 90% of the time indicating that the bleed may be undersized or partially blocked or bleed setpoints may be set incorrectly,
or that make-up conductivity has changed..
An increase in tower thermal load could cause the conductivity to rise beyond the **Turn ON** setpoint because the bleed can't keep up.

Special Control: Varying Cycles

Displays '**Offline**' if not controlled by a ratio of conductivities. Correct **Control by:**

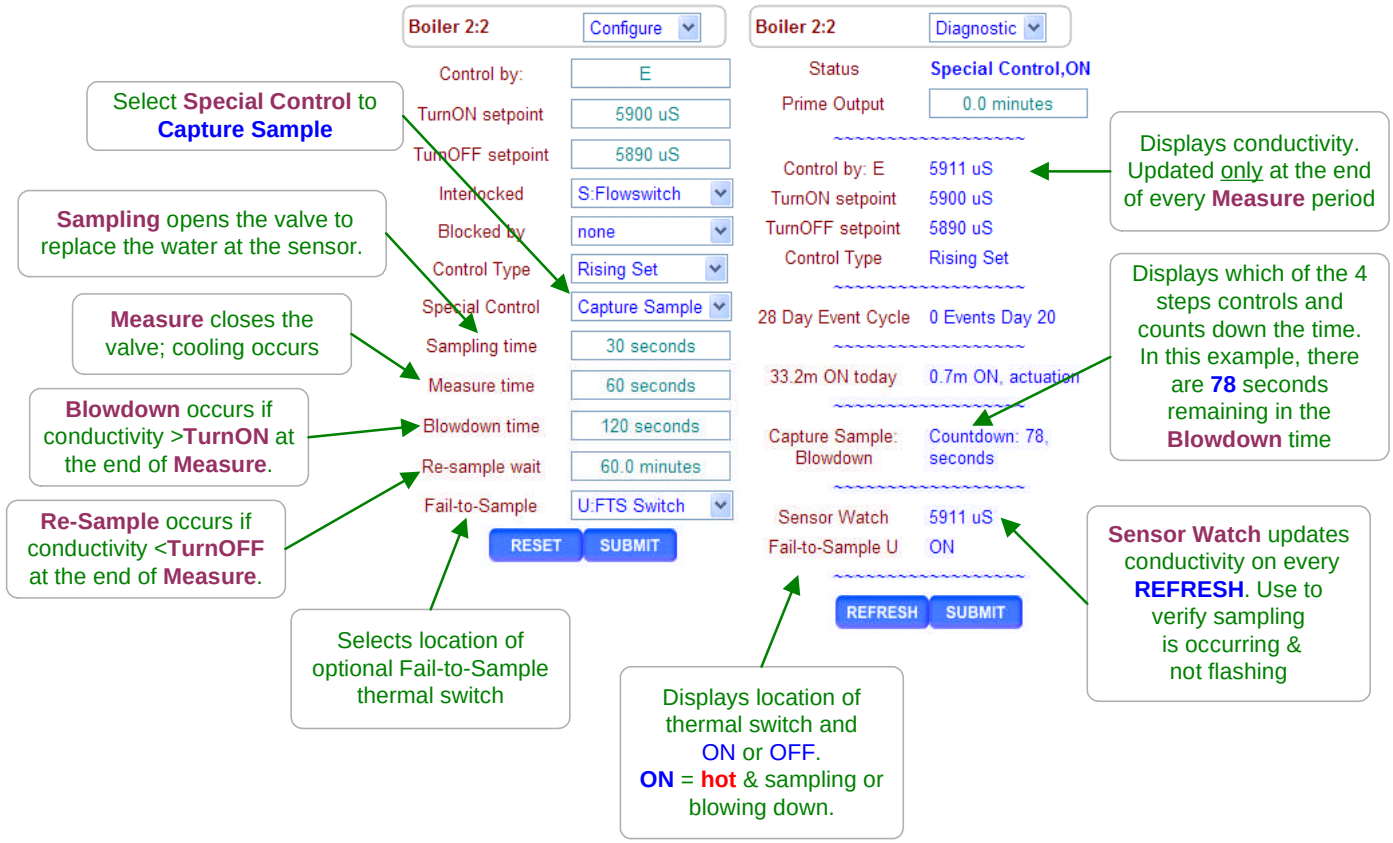
Displays '**Low Range**', '**Med. Range**' or '**High Range**' depending on the make-up conductivity and controls the bleed to maintain the cycles of concentration setpoint for the displayed range.

Displays '**Max Conduct**.' if sump conductivity exceeds maximum setpoint.
The controller sets the **TurnOFF** setpoint 1% below the '**Max. Conduct**' setpoint.
For example, if **Max. Conduct** = 3000 uS, **TurnOFF** would be 2970 uS.

7.0 Boiler Blowdown

7.1 Adjusting Boiler Blowdown Timing

Select the link on the blowdown valve and pull down the top, right menu, selecting **Configure**.



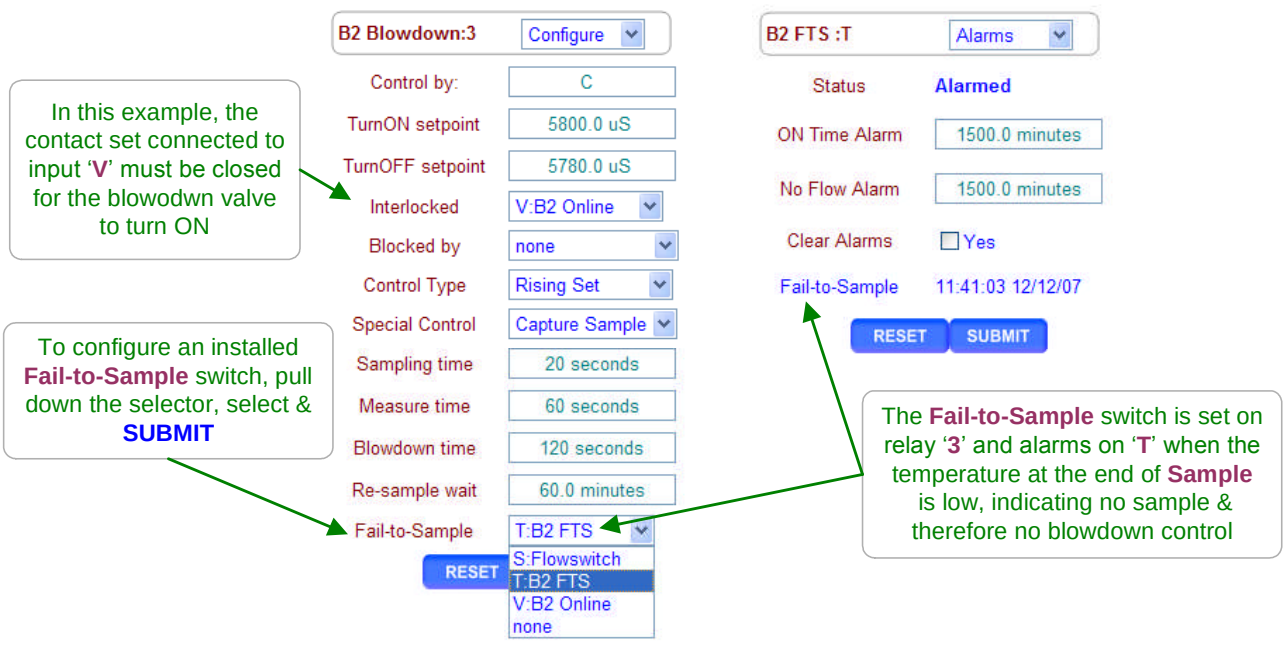
Sidebar:
Re-sample Time: Varies with boiler load type. Process boilers check conductivity frequently. Lightly loaded or constant load boilers check every few hours

Measure Time, **Blowdown Time** and **Re-sample wait** are viewed and modified in the same way as **Sample Time**.
Whenever you modify **Captured Sample** timing a new **Sample** time starts immediately.

Setting a Re-sample Wait Time:
Energy, softened make-up and treatment chemicals are lost during each **Sample** so its appealing to set a long **Re-sample Wait** time.
Set the **Re-sample Wait** time to reflect the time it takes the boiler to increase conductivity under the worst case, heaviest load and lowest percentage of condensate return.
A high percentage of condensate return usually means that it takes longer to increase boiler water conductivity.

7.2 Fail-to-Sample

Select the link on the blowdown valve and pull down the top, right menu, selecting **Configure**.



Sidebar:

Fail-to-Sample: At the end of a **Sample** period when the piping at and upstream of the conductivity sensor is hottest, the controller checks the **Fail-to-Sample** switch.
If the switch is hotter than 190F to 200F (88C to 93C), its contact set is closed.
An open contact set indicates a **Fail-to-Sample** and the controller sets an alarm.

If the surface blowdown line is accidentally valved OFF upstream or downstream of the **Fail-to-Sample** switch or the blowdown valve does not open, the piping never heats, the switch contacts never close & the controller alarms.
Surface blowdown piping cools to ambient during the **Re-sample Wait** time and the **Fail-to-Sample** contact set opens.

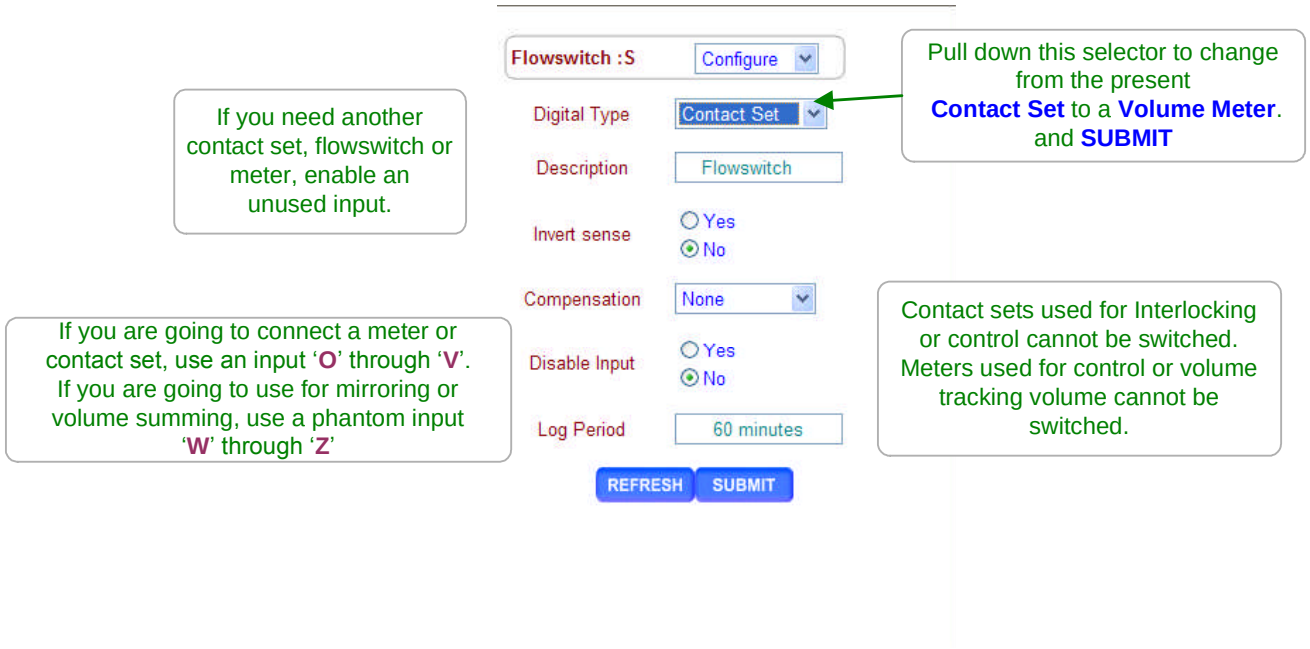
Flashing: Flashing at the conductivity sensor causes poor control because the sensor is measuring a varying mix of water and steam. Frequently flashing deposits solids on the sensor, fouling it and causing a low conductivity measurement.
In some cases you can limit flashing by reducing the flow at the throttling or needle valve.

Effective Blowdown Control:
Accurate, non-drifting blowdown control requires a non-flashed sample at the conductivity sensor, fixed **Measure** time and fixed throttling valve setting.
Any change in timing or plumbing which effects the temperature at the start or end of the **Measure** time requires a conductivity sensor calibration.

8.0 Flowswitches & Contact Sets

8.1 Switching Meters & Contact Sets

Select the link on the target water meter or contact and pull down the top, right menu, selecting **Configure**.



Sidebar:

Volume & Contact Set Inputs:

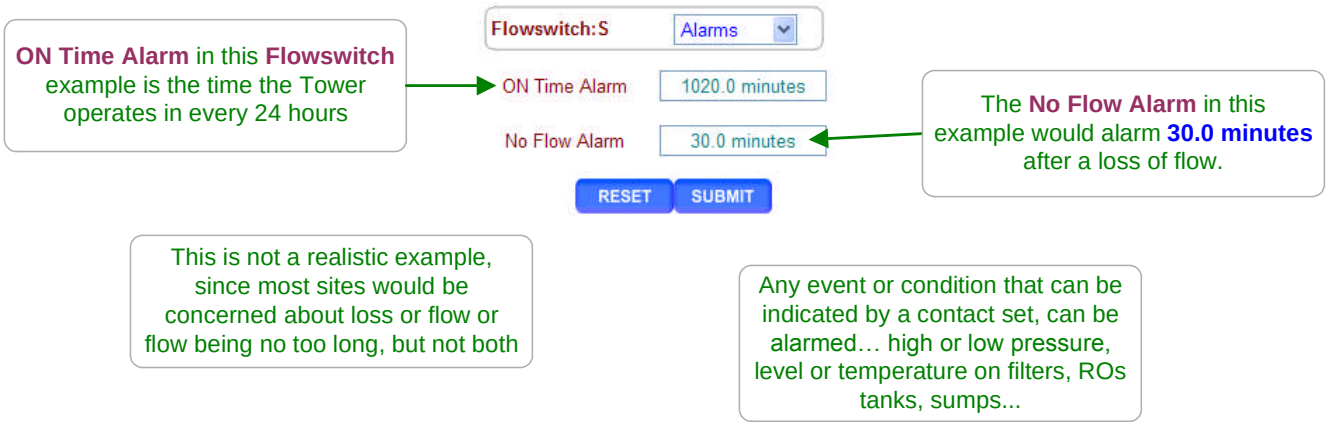
Controller inputs '**O**' through '**V**' may be set individually to be a water meter or a contact set. The controller is defaulted to meters at inputs '**O**' to '**R**' and contact sets at inputs '**S**' to '**V**'.

Phantom Inputs:

Controller inputs '**W**' through '**Z**' do not have physical terminals but may be enabled individually as either water-volume meters or contact sets. Phantom meters are used as '**Rate-to-volume'** or '**Copy Volume to'** targets. Phantom contact sets are used to '**Mirror'** controller outputs and then to sequence or block other controller outputs

8.2 Contact Set Alarms

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.



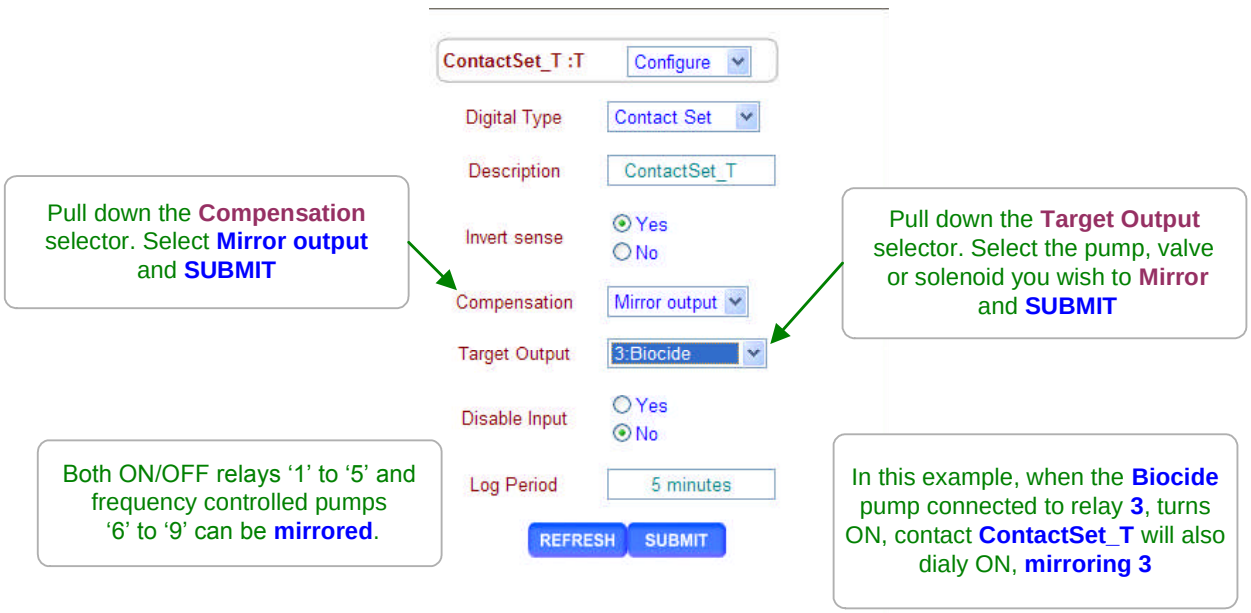
Sidebar:
Default alarm times are set so that contact sets won't alarm unless user configured.
It's unlikely that you would set both alarms on any one contact set but the ability to alarm both ON & OFF states gives you a lot of application flexibility.

ON Time Alarm:
If the pressure switch on your RO or sidestream filter shows high pressure for more than 30 minutes, you'd like to log an alarm.
If the flowswitch on a comfort cooling tower which typically is ON between 6:00AM & 6:00PM Is ON for more than 13 hours, either the flowswitch has faulted OR tower operation has changed.

No Flow Alarm:
If you had a treatment system that runs 24/7 you'd want to alarm on a flowswitch that has no flow since it indicates that the sensor or injection line is blocked or inadvertently valved OFF.
If you expected a bottom blow thermal switch to trip daily when the bottom blow valve is manually opened, you want an alarm if this bottom blowdown did not occur.

8.3 Mirroring Outputs

Select the link on the contact set that you wish to use for mirroring and pull down the top, right menu, selecting **Configure**.



Sidebar:
Mirroring, **Inverting** & **Contact Set Controls** support varied and complex PLC type applications.

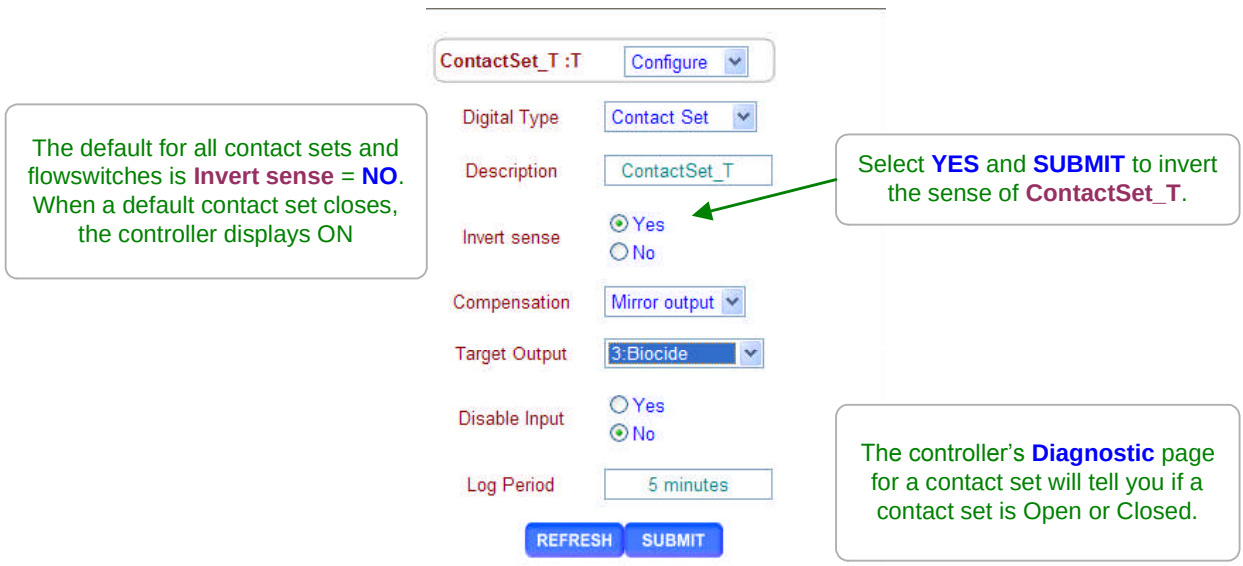
Many sites won't use these extra contact set functions, however for those sites which have applications these controls, they are built into each controller.

Example:
Every time I feed oxidizing biocide using the **Biocide** pump powered by relay 3, I want to feed extra corrosion inhibitor after the bioicde feed ends.
I'll configure **ContactSet_T** to mirror the **Biocide** & then use **ContactSet_T** to control the Inhibitor Pump to turn ON for 15 seconds.

To make this work, I'll need to invert **ContactSet_T** and then configure a contact set control. These methods are detailed in the foll0wing two sections of this appendix.

8.4 Inverting Contact Sets

Select the link on the contact set you wish to invert and pull down the top, right menu, selecting **Configure**.



Sidebar:

Inverting Sense:

Contact sets interlock and control when they are **ON**.
For non-inverted contact sets, **ON** is when the contact set is closed.

If you wish to Interlock or control when the contact set is open, set Invert sense to YES.

If your contact sets are open when they are measuring the state you wish to alarm, control using or log, set Invert sense to YES.

RUN/STOP an 'Invert sense' Example:

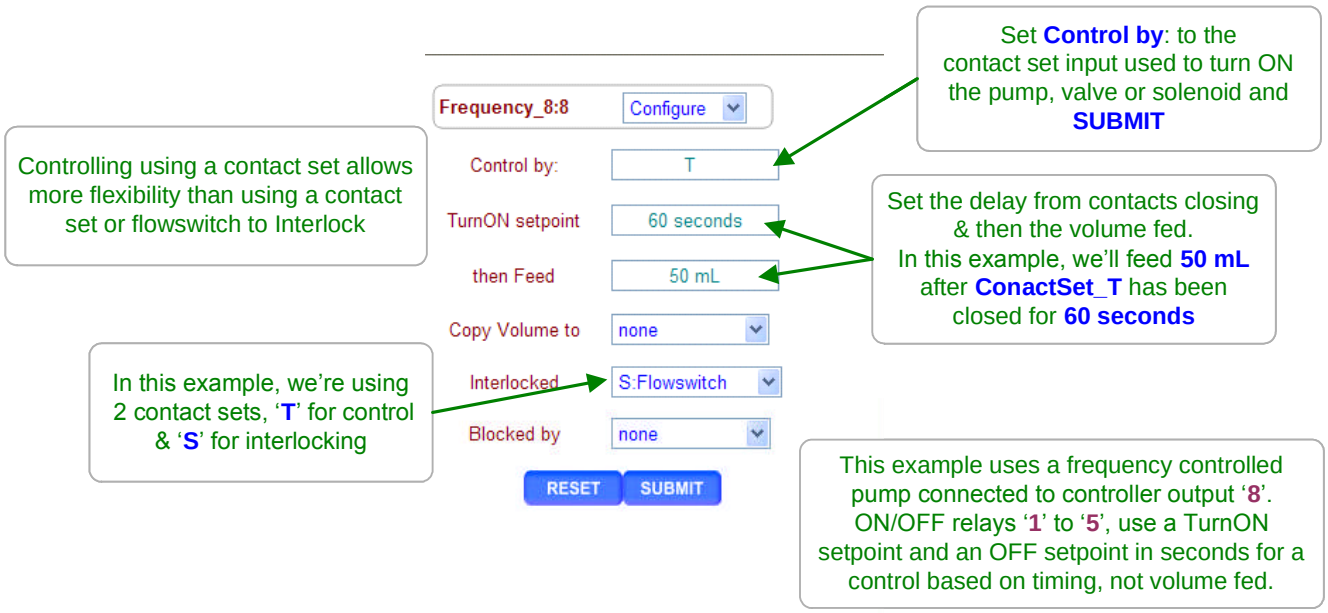
Contact set '**U**' is used for a RUN/STOP switch.
The switch contacts are OPEN when the switch is set to RUN.
Invert sense is set for '**U**' so that RUN displays on the controller as **ON** and so that '**U**' can be used as a flowswitch for pumps and solenoids.

1 Contact Set, 2 Jobs Example:

I want to control a solenoid when the contact set is open & control a pump when the contact set is closed.
Wire the contact set to input '**U**' and jumper the **U+** terminal to the **V+** terminal.
Use input '**U**' for the pump. Invert the '**V**' input & use it for the solenoid.

8.5 Contact Set Controls

Select the pump, valve or solenoid you wish to control using a contact set or flowswitch and pull down the top, right menu, selecting **Configure**.



Sidebar:
Contact Set Control Example:
A pressure switch connected to controller input '**V**' turns **ON** when the pressure drop across a sidestream filter indicates a need for a backwash sequence.
The **TurnON Setpoint** is set to 30 seconds to prevent transient states from triggering a backwash.
The **OFF Setpoint** is set to 900 seconds, 15 minutes, the time required to backwash the filter.

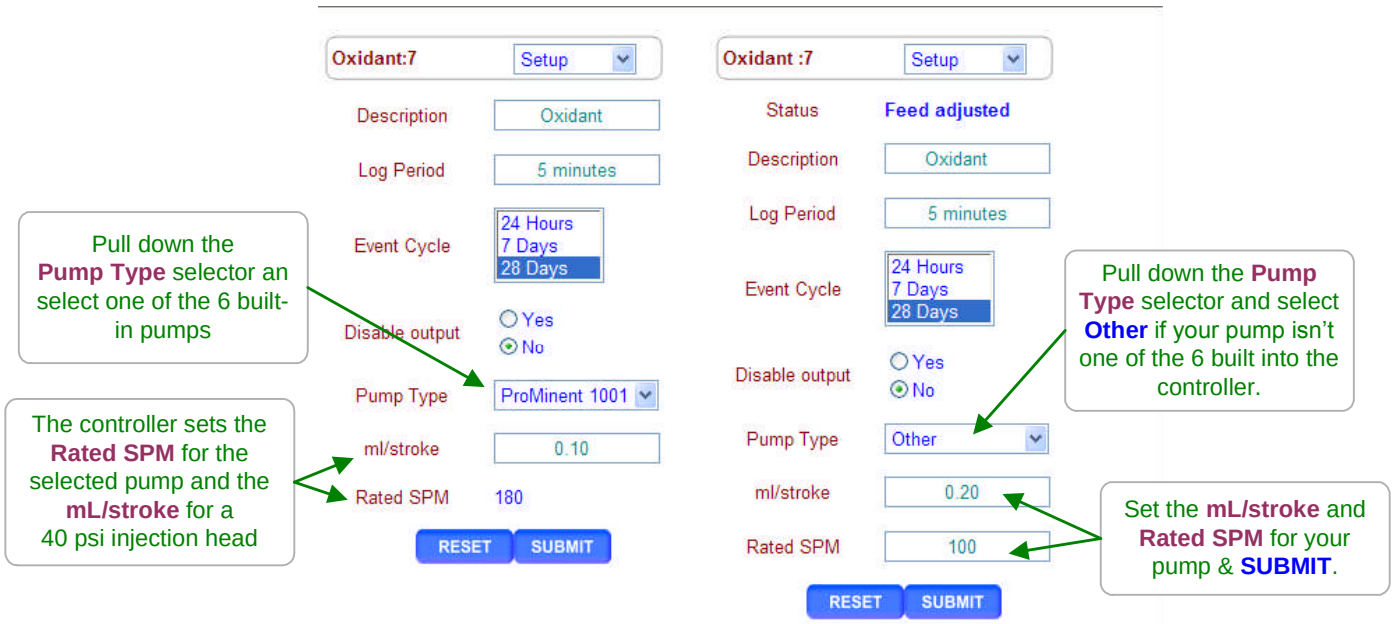
Set the **ON Time alarm** on **Pressure** '**V**' to 20 minutes, because if '**V**' hasn't turned **OFF** in 20 minutes, then backwashing failed and filter pressure is still high.

Owed Time or Volume:
Contact set controls work by adding time or volume to the controlled output.
Reset alarms zeroes time (Relays **1** to **6**) or volume (Pumps **6** to **9**) owed.
Time or volume owed adds to any existing owed so every time a controlling contact set turns **OFF** and then **ON** for more than **TurnON Setpoint**, the owed time or volume increases.
Contact set controls work in parallel with **Prime-Test** and **Biofeed** event time or volume owed.

9.0 Frequency Controlled Pumps

9.1 Selecting a Pump

Select the link on the target pump and pull down the top, right menu, selecting **Setup**.



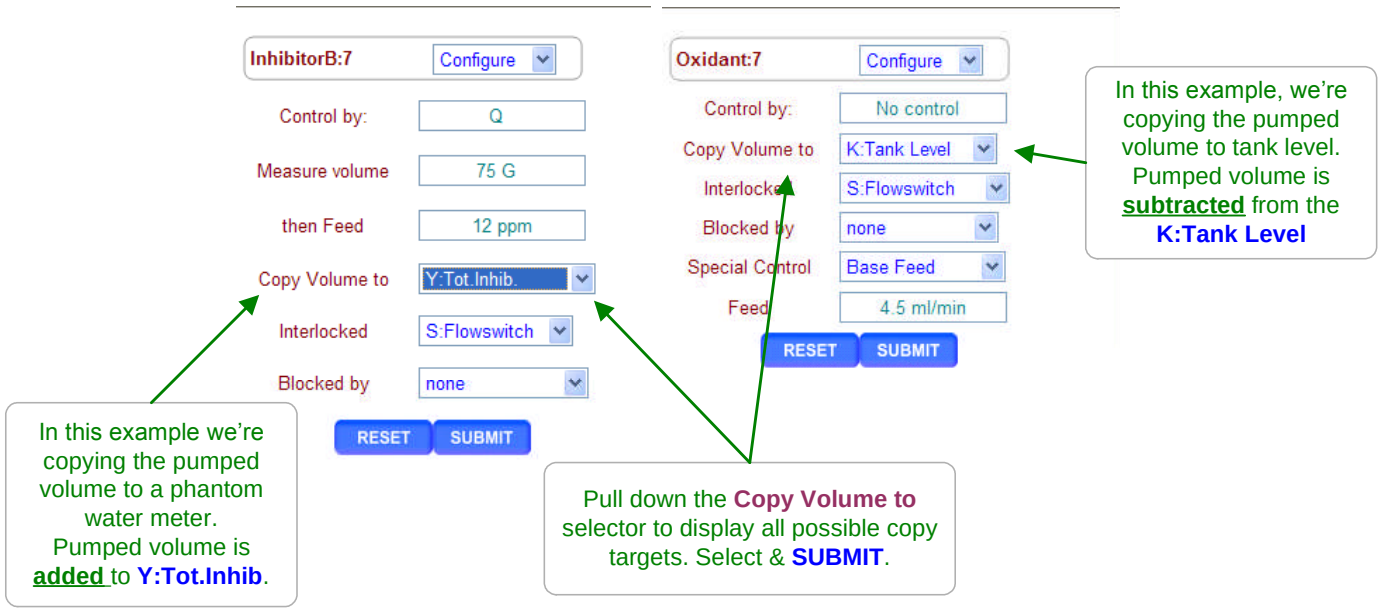
Built-in Pump types

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

Sidebar:
Pump Type:
If you select one of the 6 built-in ProMinent pumps, the feed volume mL/stroke and maximum frequency are set correctly and automatically assuming a nominal 40 psi feed line pressure.
If you select '**Other**' as a pump type, you'll need to provide both the nominal mL/stroke and maximum stroke rate. Pumps with maximum stroke rates from 50 SPM to 400 SPM are supported by the controller.
Relay Controls:
Frequency controlled pumps may be switched ON/OFF by one of the controller's relays '**1**' to '**5**'. Disconnect and remove the frequency control cable and plug the pump power cord into the controller.
This is not the best use for a frequency controlled pump but if you need more than the controller's four frequency controls, its an option.

9.2 Copying a Pump Volume

Select the link on the target sensor and pull down the top, right menu, selecting **Alarms**.



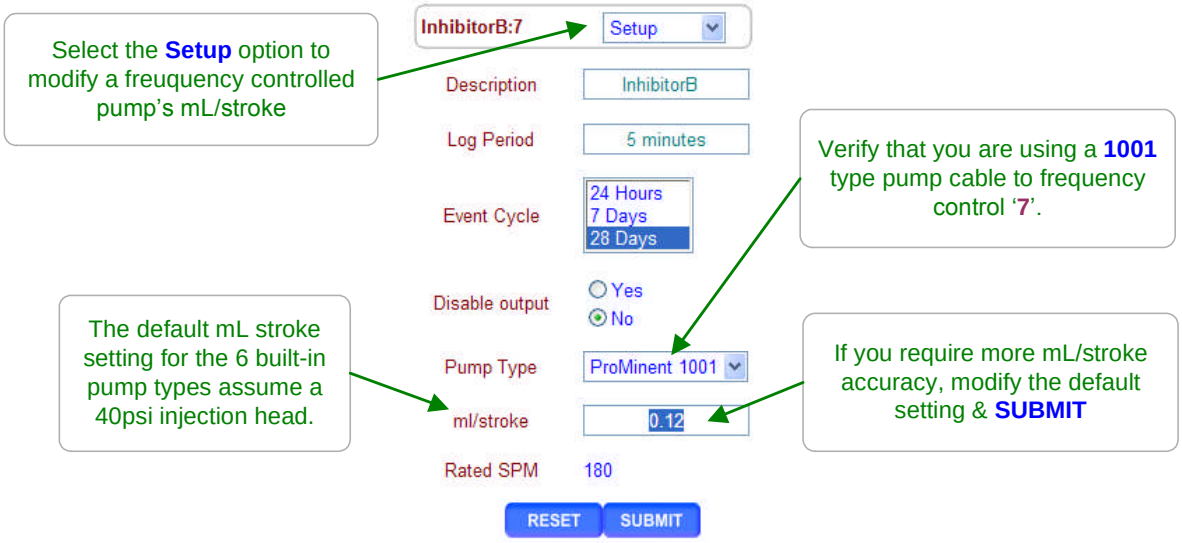
Sidebar:
Copying Volumes:
Pumped volumes are summed to volume meter inputs '**O**' to '**Z**'
and subtracted from sensor inventory inputs '**H**' to '**N**'.

Inventory Applications: Summing to Sensor
If more than one frequency controlled pump is feeding from the same tank, both pumps can be set to Copy Volume to the same tank to display and alarm on a calculated tank volume. A Feed Verify meter can also share the same calculated volume.

Proportional Feed Application: Summing to Meter
If you wish to feed 100mL of dispersant after every 1000mL of inhibitor, copy the inhibitor pump volume to a water meter.
Then use the water meter to feed 100ml of dispersant every time it measures 1000mL.
The meter doesn't need to physically exist, so you could enable and use one of the phantom inputs '**W**' to '**Z**' to avoid using one of the meter-contact set inputs '**O**' to '**V**' which have physical terminal blocks.

9.3 Adjusting mL/stroke

Select the link on the target frequency controlled pump and pull down the top, right menu, selecting **Setup**.



Sidebar:

Product Concentration Error Sources

ppm level errors can be caused by: Product formulation inaccuracy, loss of active product due to extended storage, settling-separation or temperature, reaction of the product with other fed chemicals, errors in the ppm test method or its reagent, inaccuracy or incorrect scaling of the make-up or feedwater meter **and** errors in the mL/stroke setting of the feed pump.

Calibrating Stroke Volume:

When your chemical ppm tests don't match the feed ppm setpoints or the calculated inventory doesn't match the actual tank volume, then consider calibrating the pump ml/stroke.
If you find you're correcting the mL/stroke value frequently, then its very likely that the error source is not the mL/stroke setting since the feed head hasn't changed.

Calculated Adjust:

If you test 5% higher than the ppm feed setpoint, then adjust the mL/stroke x 1.05.
This method is minimum effort but it may mask other contributors to concentration error.

Pump from a Graduated Cylinder:

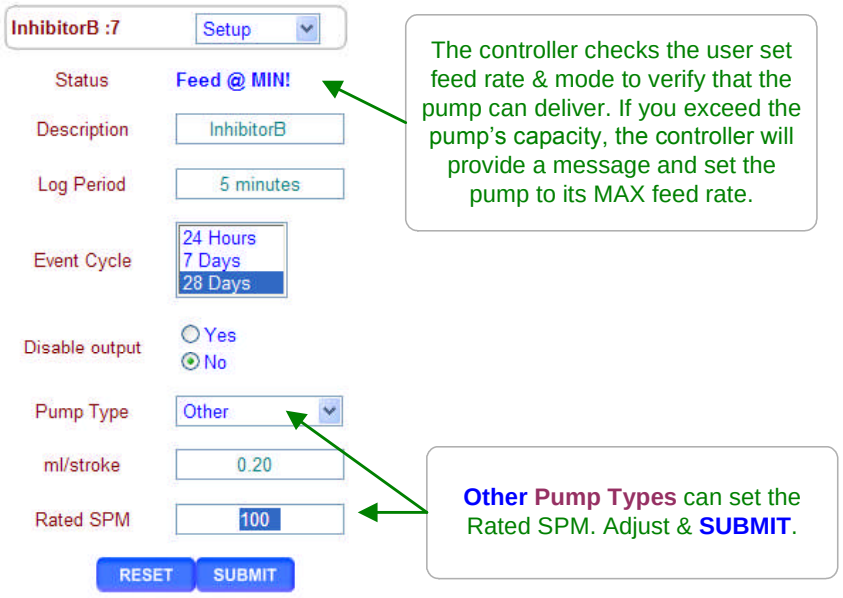
Pump 100 to 250mL from a graduated cylinder and note the change in inventory or fed volume. Correct the mL/stroke accordingly.

Calibration Limits:

The controller limits the range of **mL/stroke** calibration for the built-in ProMinent pumps.

9.4 Setting the SPM Rating

Select the link on the target frequency controlled pump and pull down the top, right menu, selecting **Setup**.



Sidebar:
Strokes per Minute:
Only **Other** type pumps can adjust the Rated SPM from 50 to 400 strokes per minute.
The built-in ProMinent pumps have preset SPM ratings.

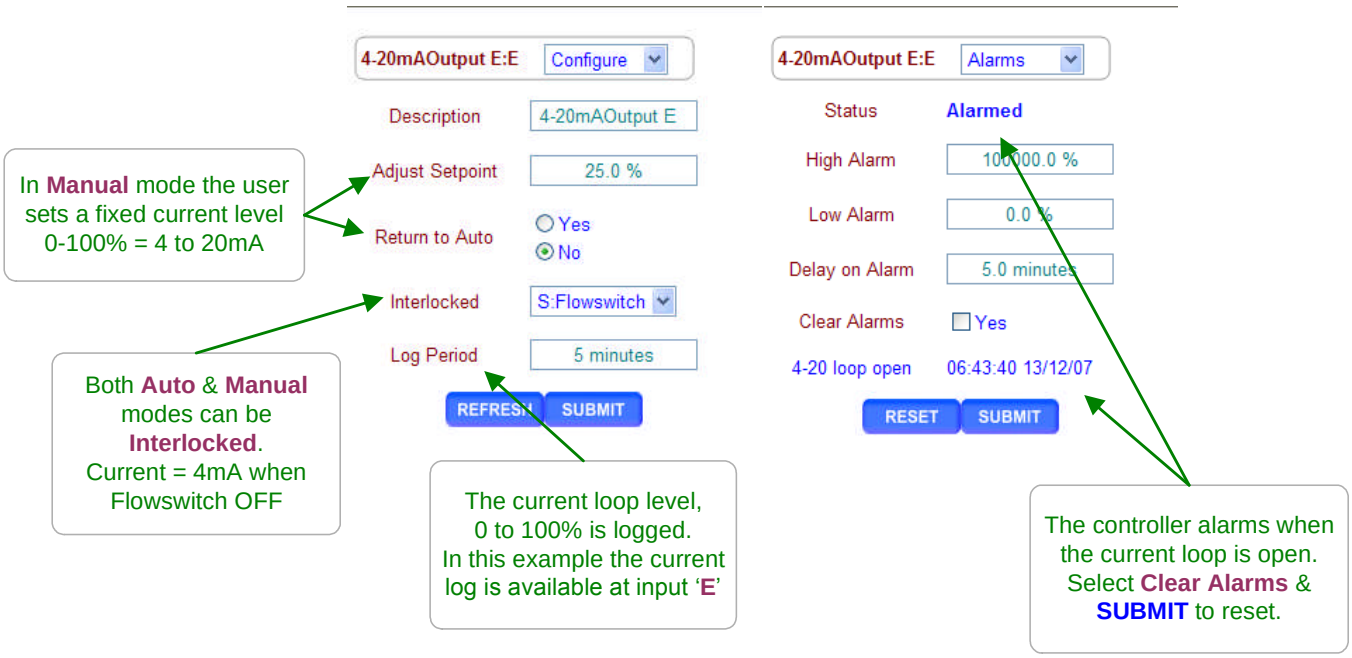
The controller uses the **Rated SPM** and **mL/stroke** to verify that feed **mL/minute** setpoints can be delivered.

Warning:
Don't set the **Rated SPM** for the pump higher than its nameplate rating since the action of the pump on overspeed may not be defined and in the worst case the pump may stall. This potential operating fault is not an issue for the built-in ProMinent pumps.

10.0 4-20mA Outputs

10.1 4-20mA Output Setpoints

Select the link on the 4-20mA output and pull down the top, right menu, selecting **Configure**.



Sidebar:
Manual Mode:
Use **Manual mode** to verify the 100% ON=20mA, OFF=4mA & that modulated operation of the proportional pump or valve is operating correctly.
Use **Manual mode** to verify the monitoring input that is using the current loop value to represent a controller conductivity, pH, ORP or corrosion rate sensor or ppm calculation.

Load Powered 4-20mA Loop:
4-20mA current outputs are powered by the loop load or by the controller 15VDC power supply. Building automation system typically supply 24VDC to power current loops. Current loop controlled pumps and valves usually use the controller 15VDC supply to power the loop.
Open Loop Alarm:
The DC isolated 4-20mA output alarms on an open loop or a loss of loop power.

10.1 4-20mA Output Setpoints

Select the link on the 4-20mA output and pull down the top, right menu, selecting **Configure**.

Sidebar:

Setpoints: Setpoints may be positive or negative numbers.
The 4mA Setpoint may be greater or less than the 20mA setpoint so that the loop current may either increase or decrease as the controlling sensor increases.
A pH sensor can control an acid pump on one 4-20mA output and a caustic pump on another 4-20mA output.

Calculating Loop Current:

4-20mA Output current (mA) = **4 + 16 x** ((**Sensor Value –4mA Setpoint**) / (**20mA Setpoint – 4mA Setpoint**))

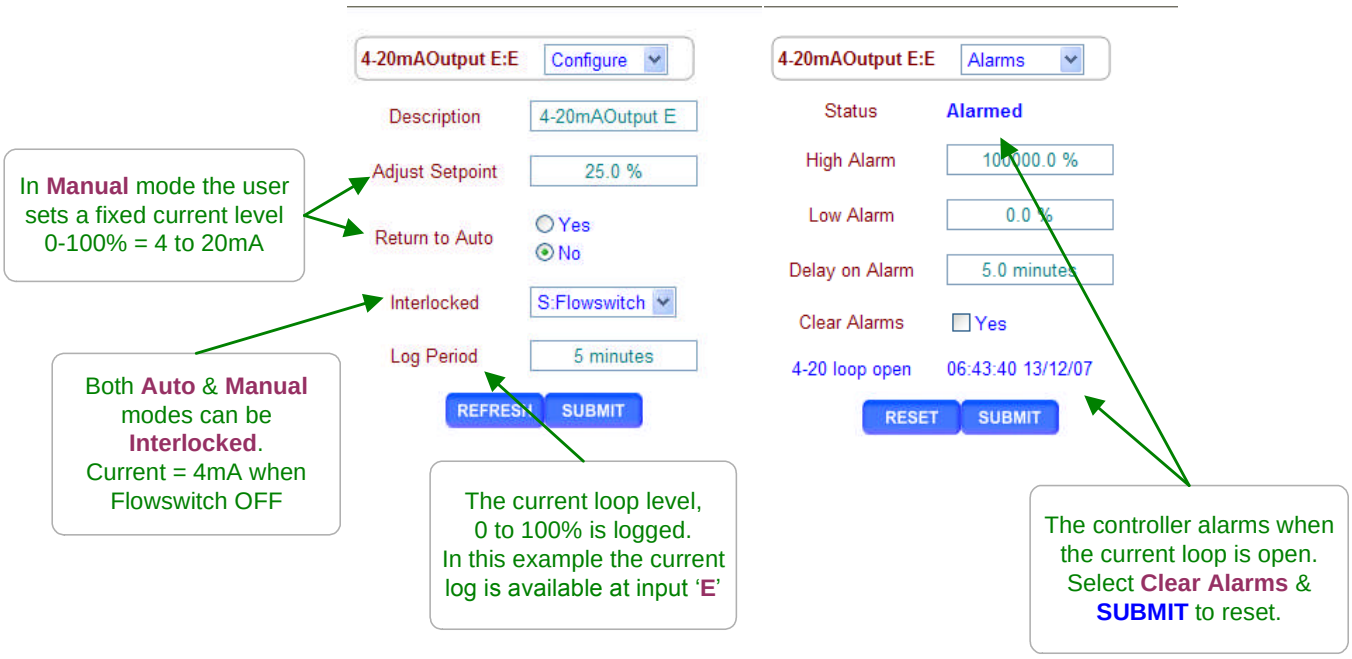
Use the absolute value of the setpoint difference for **20mA Setpoint** < **4mA Setpoint**.
For this page's example, if the conductivity connected to input 'A' is 1500uS:
8.0mA = **4 + 16** x ((**1500uS –1000uS**) / (**3000uS** - **1000uS**))

Manual-Auto Switching:

Setpoints are retained when you switch between Auto & Manual.
You can use one mode to verify the other if you are checking the level at a monitoring DCS or the operation of a proportional pump or valve.

10.2 4-20mA Configuration

Select the link on the 4-20mA output and pull down the top, right menu, selecting **Configure**.



Sidebar:
Control by: Any enabled sensor of any type, '**A**' to '**N**' may be used to control the 4-20mA loop current.
Once you've selected a controlling sensor, adjust the **4mA Setpoint** and **20mA Setpoint** to reflect the range for either control of a pump or valve or for a remote DCS monitoring input.

Example: You are controlling the 4-20mA output current using a pH sensor.

If the 4-20mA current is controlling a pump feeding acid you could set 4mA= 7.0pH and 20mA = 8.0pH.
The pump would be OFF at 7.0pH and at 100% at 8.0pH.

If the 4-20mA current is monitored by a building automation system or distributed control system, you could set 4mA= 6.0pH and 20mA = 10.0pH. since this span represents the likely range of measured pH.

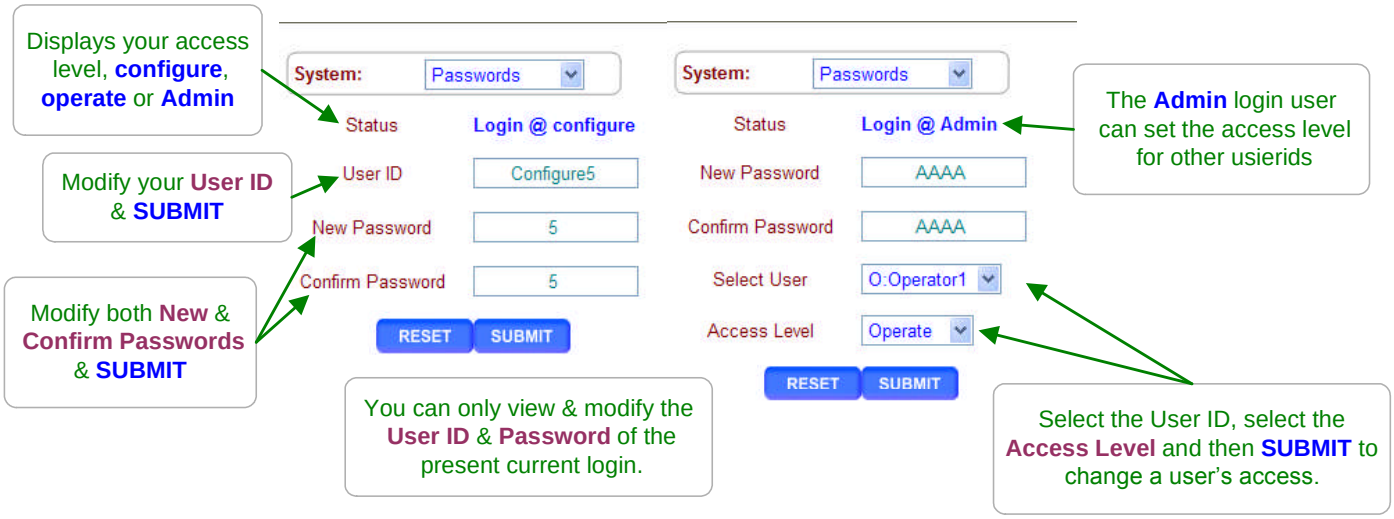
Auto Mode: The **Control Sensor** option only appears in **Auto** mode.

Open Loop Alarms: Both disconnected wiring and loss of loop power cause an open loop alarm. In either case, the current loop cannot control a pump or valve.

11.0 System Settings

11.1 Passwords

Select the system or home link. Pull down the top, right menu, selecting **Passwords**.



Default Passwords:
Operator1 = **1** Operator2 = **2** Operator3 = **3** Operator4 = **4**.
Configure5 = **5** Configure6 = **6** Configure7 = **7** Administrator = **AAAA**
There are 3 password access levels, Operate, Configure and Administrator.

The eight User IDs are used in the controller's keypress log.

Login Page: Operators can view all controller pages.
When you modify a page & **SUBMIT** the Status message will display **Login @ configure** OR **Login @ Admin** is a higher access level is required.
Go to the home page or select the system link and **Logout** & **SUBMIT**,
then login at the required access level.

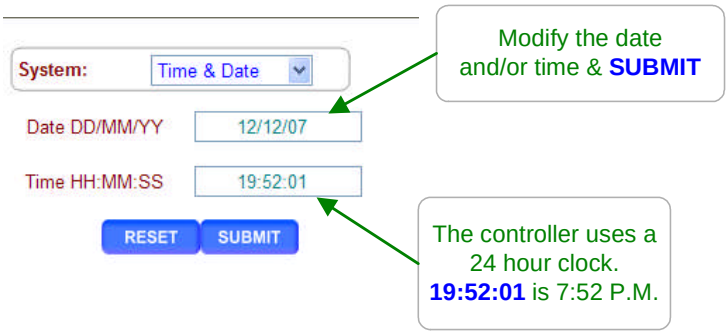
Modify Passwords:
If the controller is accessible on the site LAN, you should modify all 8 passwords.
Passwords are limited to 8 letters and numbers. Keypad passwords are capitals only.
Any space in a password ends the password on both editing and **Login** password entry

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.

Reset Passwords: If you forget your password, a **Reset Password**, available from Aquatrac & specific to your controller's serial number, setting all passwords to default.

11.2 Time & Date

Select the system or home link. Pull down the top, right menu, selecting **Time & Date**.



Sidebar:
Time & Date:
The controller uses a 24 hour clock where 14:30 is 2:30 PM.
When you set the Date, the controller automatically sets the correct day of the week.

Controller Response to a new Time&Date:
When you change the time & date, the controller:
1. Turns all outputs OFF, resets all control timing and restarts the logging period on each I/O

2. Ends prebleeds, lock-outs and zeroes time and volume owed which ends all BioFeed events.

3. Does a midnight reset which will may set volume-meter Low Alarms and will reset any output alarms set to reset @ midnight.

4. Sets the biocide Day 1 to the most recent Sunday.

Example: If you are at Day 19, Thursday of week 3, on a 28 day biocide cycle.
After a **Time&Date** change you are now at, Day 5,Thursday of week 1

11.3 Keypress-Alarm Log

Select the system or home link. Pull down the top, right menu, selecting **Activity Log**.

Sidebar:
Keypress-Alarm Log:
The log contains the last 25 activities that effect the operation of the controller.
Most recent activities first. Both keypad and browser user activities are logged.

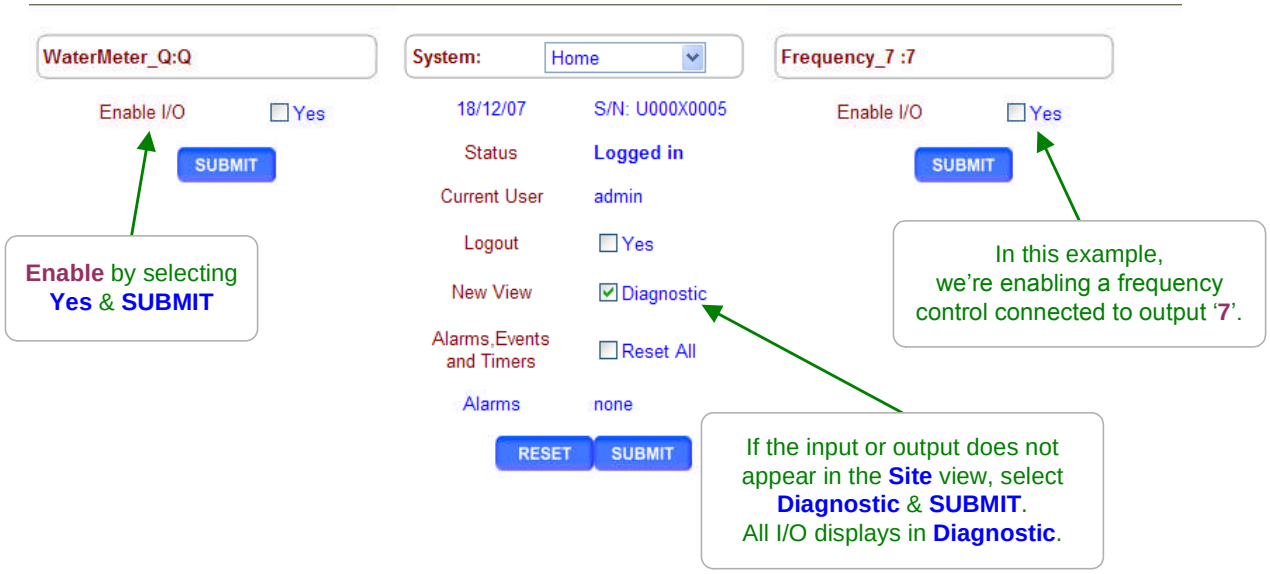
User IDs:
Keypad Password ON: Logs the User IDs listed in **Section 11.1 Default Passwords**.
Keypad Password OFF: Logs all User IDs as **Keypad**.

Browser user IDs are always logged because login is required to browse.

Actions taken by the controller, like configuring a new driver card on power ON, use the **System** user ID.

11.4 Enabling Inputs & Outputs

Select the link on the target **'unused'** input or output in either the **Diagnostic** or **Site** views.



Disabling I/O:
Select Input link and then the **Configure** top menu option, then **Disable** & **SUBMIT**.
Select Output link then the **Setup** top menu option, then **Disable** & **SUBMIT**.
I/O in use by the controller for control or sensor compensation cannot be disabled.
Disabled I/O is grayed out, displaying the 'unused' gray disc icon.
Disabled I/O is not logged and does not appear in the selections used to compensate and configure other enabled I/O

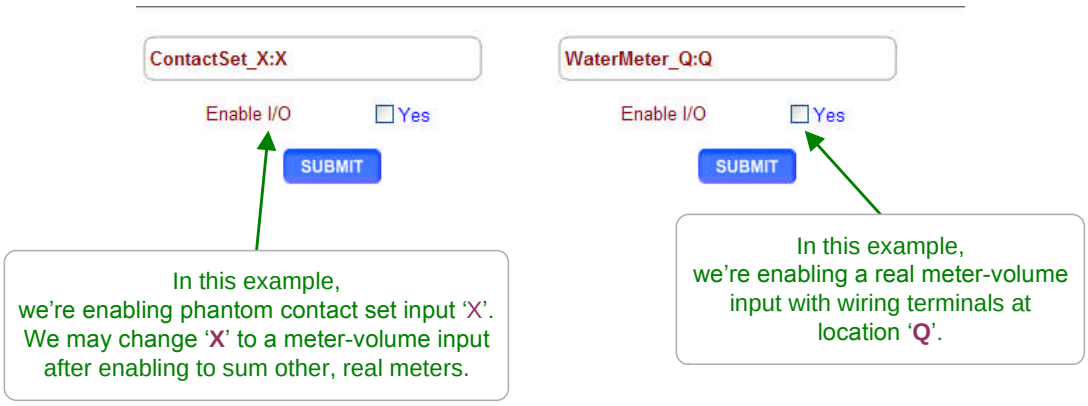
Enabling Inputs:
Sensor inputs **A**:Conductivity, **B**:Temperature and **G**:4-20mA Input are fixed.
A,**B** & **G** may be enabled or disabled but their function is fixed.
The function of Sensor inputs **C-D** and **E-F** is set by the installed sensor-driver card to be another conductivity or a pH, ORP, corrosion rate…
Phantom Sensor inputs '**H**' to '**N**' are enabled as needed to for tank inventory and ppm calculations and to log manually entered drop counts.

Meter-Volume and Contact Set Inputs '**O**' to '**V**' are enabled and configured for either water-volume meters OR flowswitches, boiler ON line contact sets, level-pressure switches …
Phantom Meter-Volume or Contact Set inputs '**W**' to '**Z**' are enabled as needed as **'Rate-to-Volume'** and **'Copy Volume to'** target or as **'Mirror Output'** targets.

Enabling Outputs:
Outputs **1** to **5** are AC power switching relays that are enabled to power pumps, solenoids or motorized valves.
Outputs **6** to **9** are frequency controlled outputs that are enable to proportionally control pumps.

11.4 Enabling Inputs & Outputs

Select the link on the target **'unused'** input or output in either the **Diagnostic** or **Site** views.



Sidebar:
Enabling Inputs:
In each controller there are 26 inputs; 14 Sensors '**A**' to '**N**'
and 12 Meter-Volume or Contact Sets '**O**' to '**Z**'.

Of the 14 sensors, 7, **A-G**, have terminal blocks where you can connect actual sensors and 7, **H-N**, are 'Phantom' and are used for manual and calculated values.

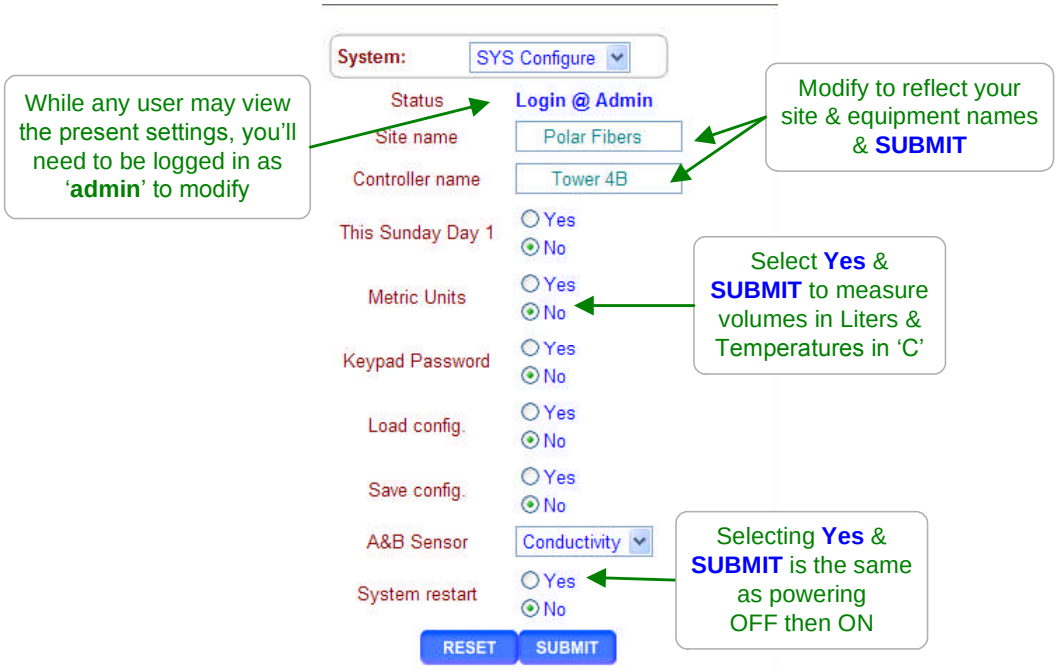
Of the 12 Meter-Volume or Contact Sets, 8, **O-V** have terminal blocks where you can connect actual meters or contact sets and 4, **W-Z** are 'Phantom' and are used for copy targets and mirroring.

Enabling Outputs:
Outputs are enabled in the same way as inputs. Each controller has 9 outputs.

Outputs **1-5** are relays which switch controller AC power to turn ON and OFF pumps, valves and solenoids.
Outputs **6-9** are frequency controls which are connected to frequency controlled pumps by a 2 wire control cable. The pumps are plugged into the AC power and the controller modifies the feed rate by changing the pump stroke frequency.

11.5 Metric & U.S. Units

Select the system or home link. Pull down the top, right menu, selecting **SYS Configure**.



Sidebar:
Commissioning:
Select U.S. or Metric Units when you commission or install the controller.
Data logging uses the Units setting for the units on logged volumes and temperatures.
Changing units does not change data already logged.

Metric Inputs:
Non 4-20mA temperature inputs are converted to Centigrade using the default offset and gain for each of the thermal input type.
If you switch back to U.S. units, temperatures are converted to Fahrenheit using the default offset & gain, removing the effect of any user calibration.
Inventory volumes are calculated in Liters but units are not changed.
ppm calculations now assume metered volumes in Liters and not gallons.
Metric Outputs:
Pumped volumes are reported in mL & Liters.
Biofeed event volumes are in Liters and not Gallons.
The controller uses the units of the controlling sensor for setpoints.
If a water meter was set to measure Gallons prior to switching the **Metric Units**, it will still display Gallons on the meter and wherever it's used for control.

11.6 Configurations

Select the system or home link. Pull down the top, right menu, selecting **SYS Configure** or select **View-Config**. **View-Config** selection is only available when the Diagnostic View displays.

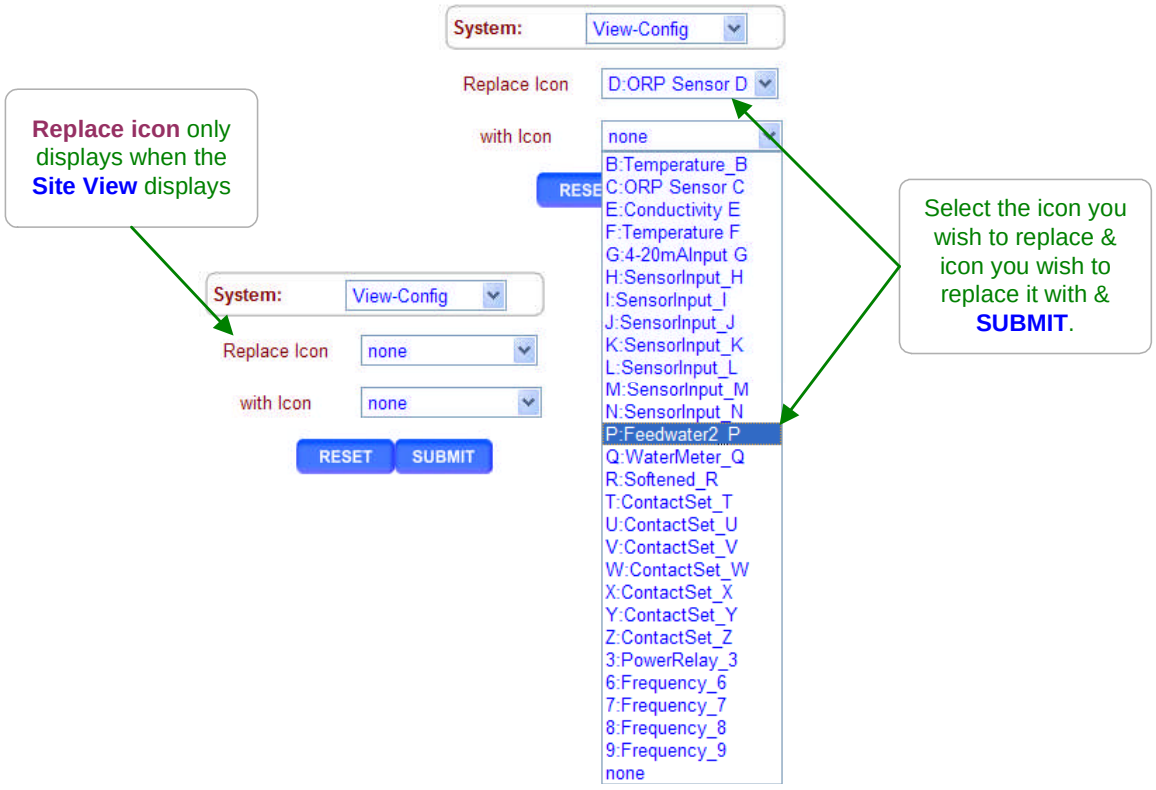
System: View-Config

Up to 15 configurations may be included with the controller.
The configurations shipped with the controller may make it easy to add a 2nd boiler blowdown, a make-up conductivity or an ORP controlled bleach feed.
They may also include complete preset feed programs complete with setpoints, pump type selection and biofeed timing.

The views associated with the configurations may display boilers or towers or specialized process equipment and maintenance-service pages.

11.6 Configurations

Display the **Site View** then select the system or home link.
Pull down the top, right menu, selecting **View-Config**.



Sidebar:

Replace icon allows you to modify the **Site View** to match your installed sensor-meter-pump-solenoid set.

Any icon can be replaced with any other icon.
A water meter can be replaced with a frequency-controlled pump.
A biocide pump can be replaced with a pH sensor or a calculated tank level.

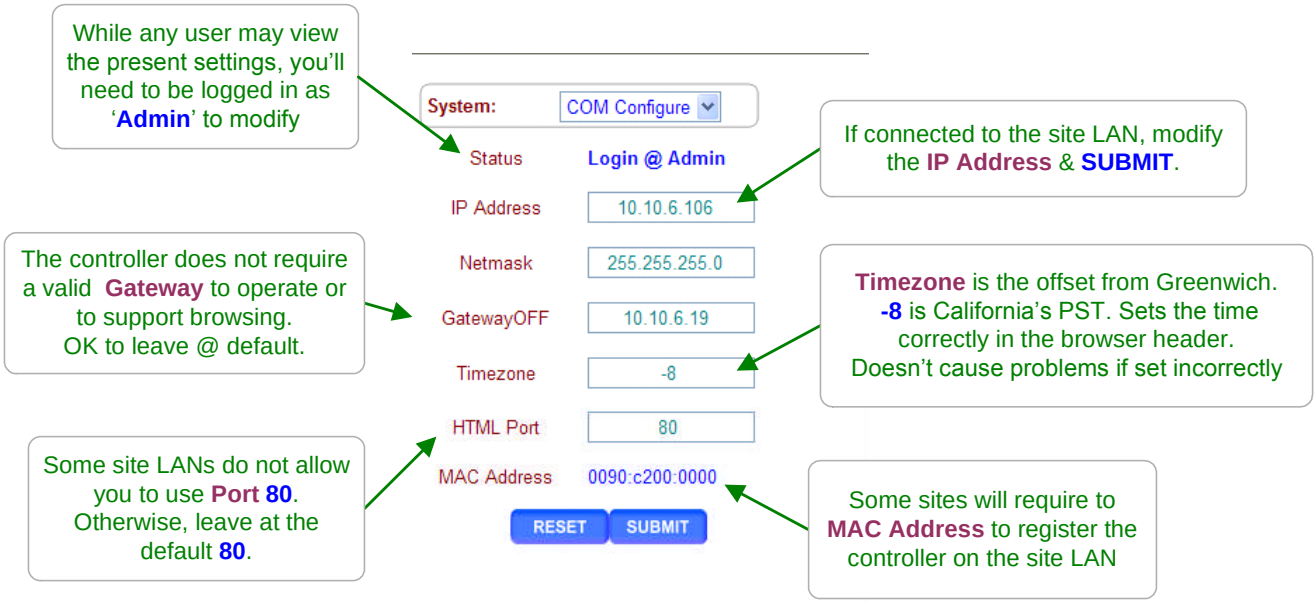
All enabled and disabled inputs display in both icon selectors

Note: Replacing & switching icons has no effect on the operation of any controls, alarms or data logging. It's a visual change only.

When you remove an icon from the **Site View**, you can still see and access the icon in the **Diagnostic** view.

11.7 Communications

Select the system or home link. Pull down the top, right menu, selecting **COM Configure**.



Sidebar:
Warning: Do not connect the controller Ethernet connection into a site LAN until the site IT staff have assigned a valid IP Address.

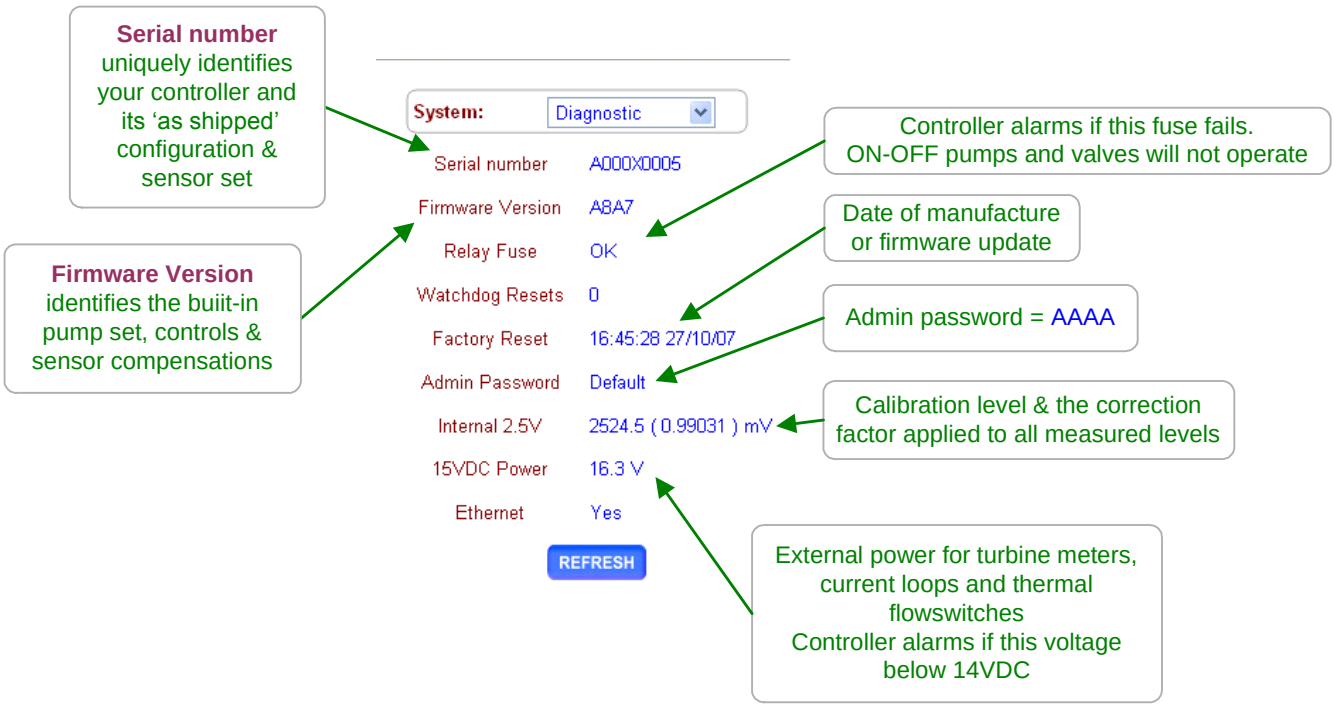
Not Connected to the Site LAN:
Leave the IP Address at 10.10.6.106.
Connect a crossover cable from your notebook PC to the controller and browse 10.10.6.106.

Browser passwords are the same as the default keypad passwords listed in the manual & Appendix Section **11.1 Passwords**.

You'll need to configure your notebook to connect.
Refer to Section 12 of this Appendix for XP & Vista Ethernet TCP-IP setup.

11.8 System Diagnostic

Select the link below the view Day & Date to get to the log in page then select **Diagnostic** at the top on the right side page.



Sidebar:
If the **System Diagnostic** Admin Password is not Default, then you will not be able to use the default 'AAAA' administrator password to log onto the controller.

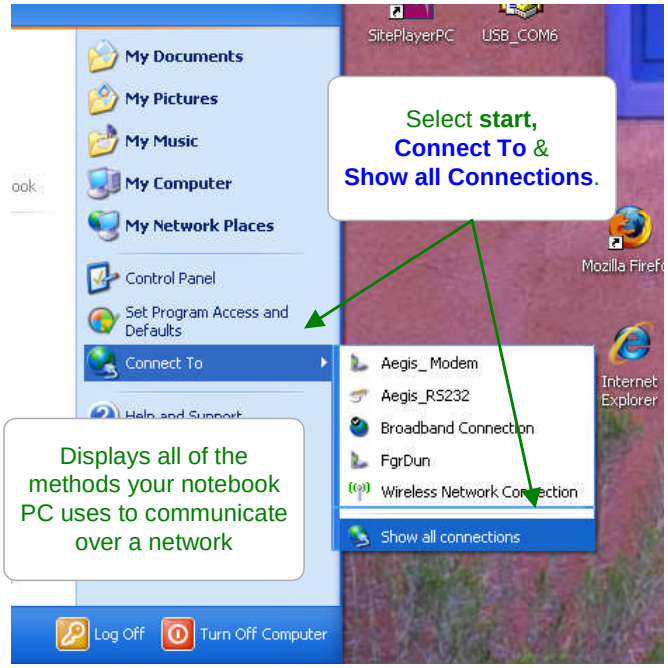
Watchdog Resets should always be zero.
If you have discharged static onto one of the controller circuit boards or one of the meter, sensor or contact set cables is in the same conduit as AC power switching transients, you may see the Watchdog Resets count up as the controller tries to recover.

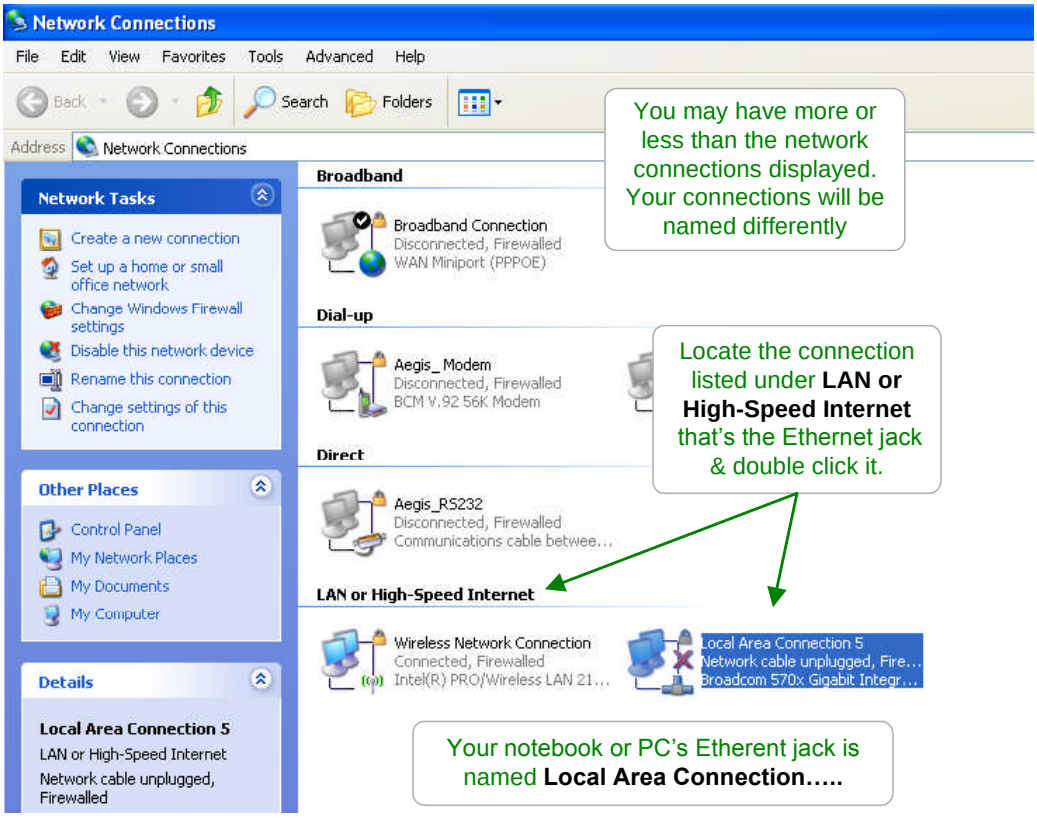
Touch the grounded controller internal aluminum frame before handling controller sensor cards or re-wiring controller terminals. Static discharge is not typically a problem on-site since few controllers are installed in carpeted areas.

Correct wiring to remove instrument cabling from AC power conduits.

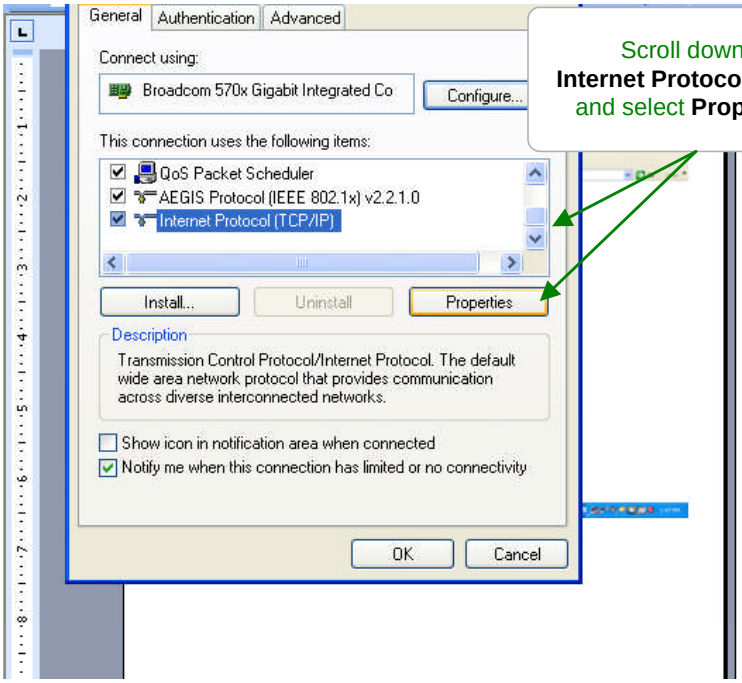
12.0 Notebook & PC Ethernet Set-up

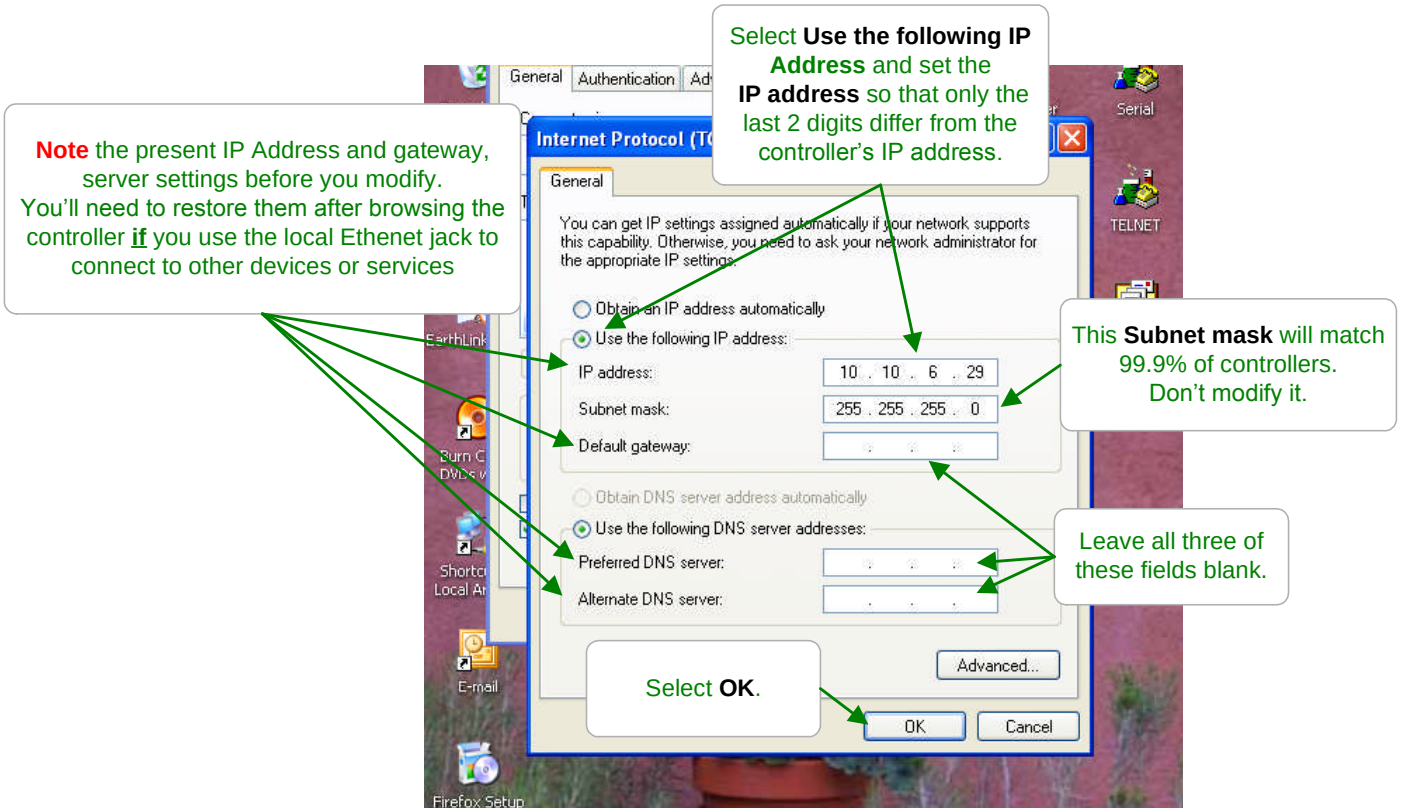
12.1 Windows XP Browser Set-up



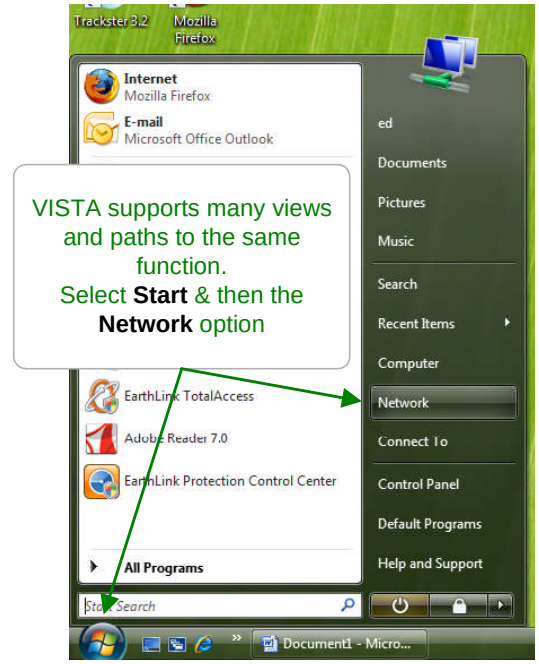


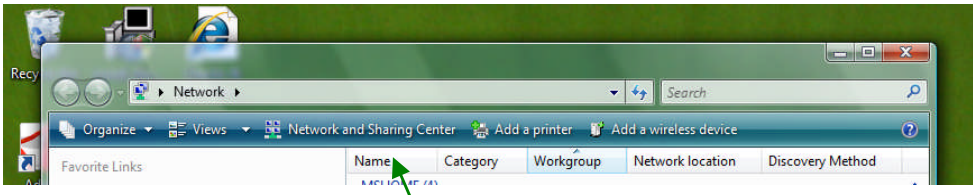
12.1 Windows XP Browser Set-up cont.

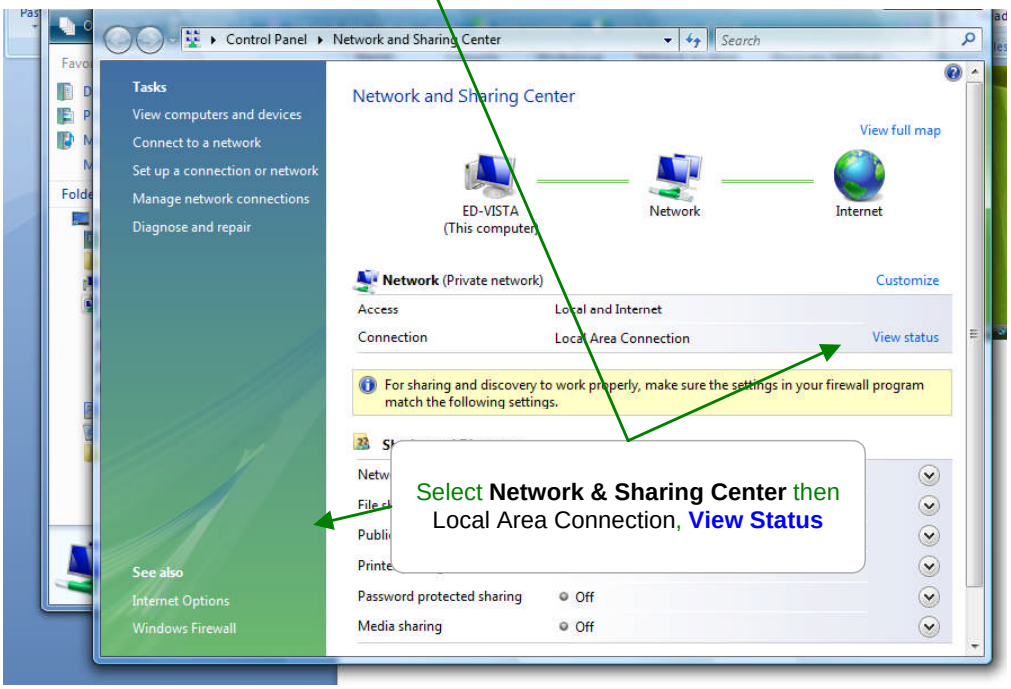




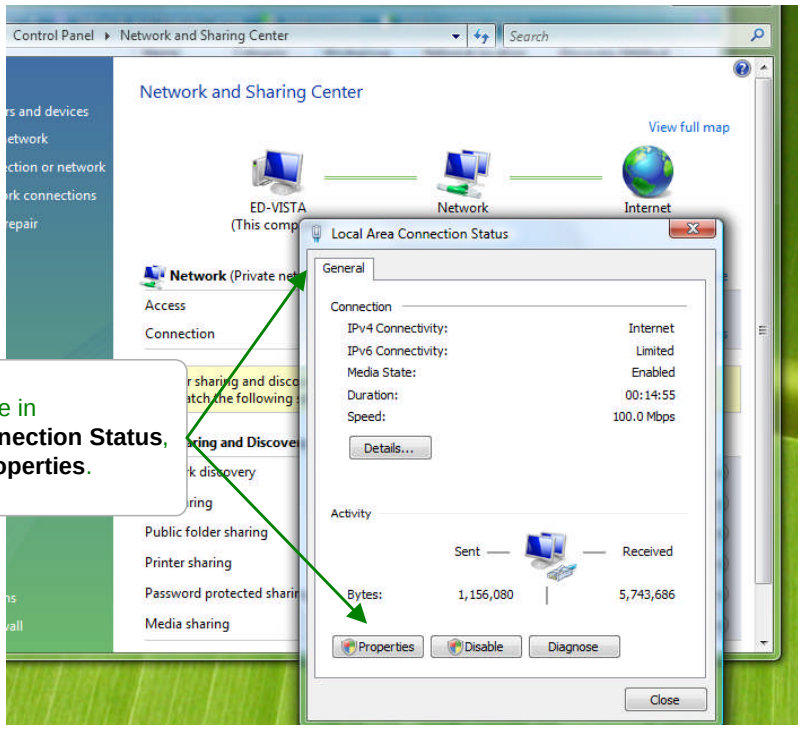
12.2 Windows VISTA Browser Set-up



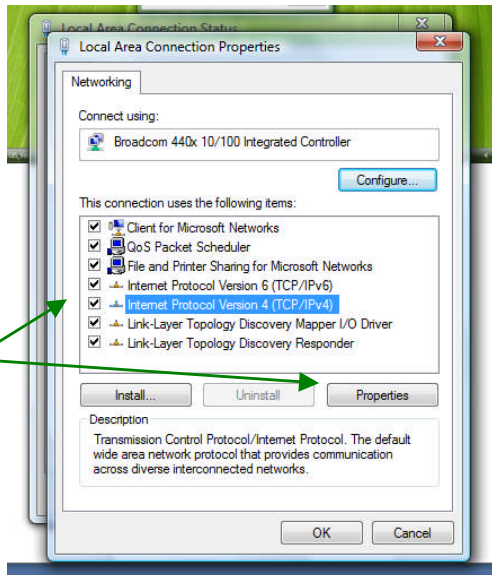




12.2 Windows VISTA Browser Set-up cont.

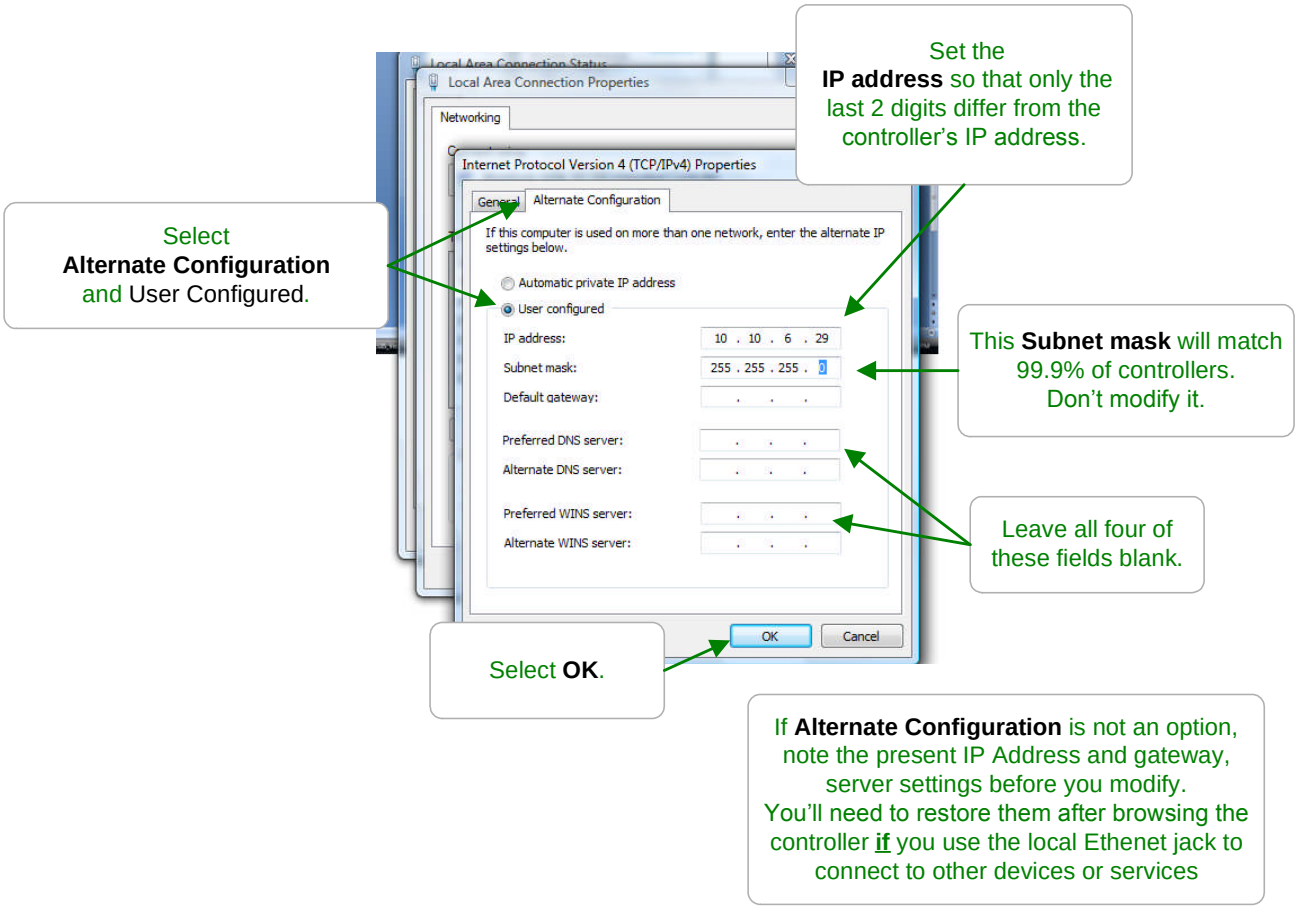


Once in
Local Area Connection Status,
select **Properties**.

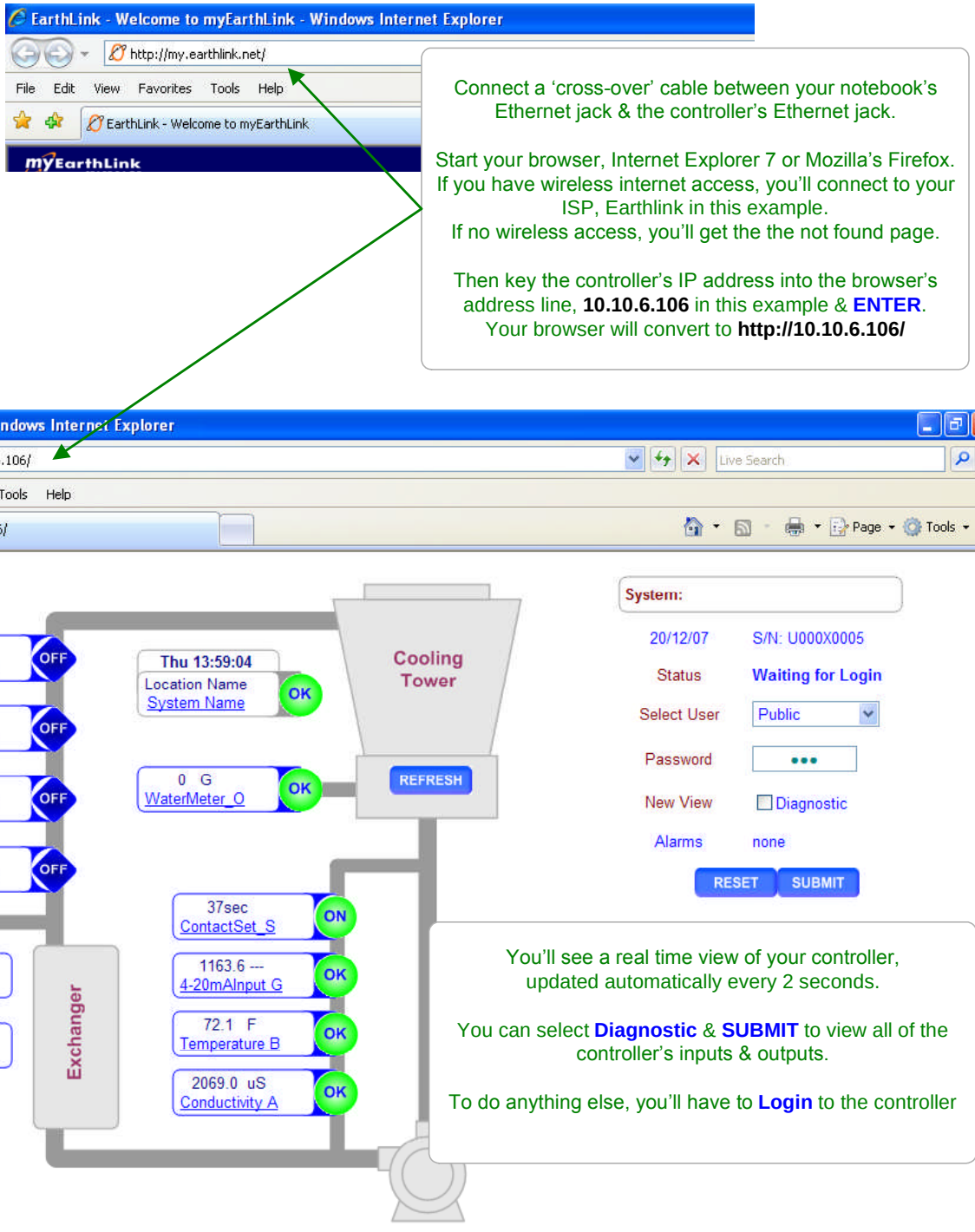


Select
Internet Protocol Version 4,
and then select **Properties**.

12.2 Windows VISTA Browser Set-up cont.



12.2 Windows Browser Connect



12.2 Find the Controller's IP Address

The following is copied from Section 11.7 of the Aegis_User manual.

To view or adjust the controller Ethernet setting press **ENTER** and **DOWN** to **Communicate** at the power up or day-time display.

Key **ENTER** @ **Communicate**

Displays the current LAN **IP address**. In this example, it's the factory default. If you are connecting into the site LAN, **IP address** is assigned by the site IT staff. Key **ENTER** to modify.

Netmask is usually this value for most sites. Key **ENTER** to modify.

This is the default **HTML Port** for browsing. It can be modified only via the browser.

The site IT staff may require the controller **MAC Address** to register-allow the controller on the site network. The **MAC address** is six 2 digit hexadecimal numbers, separated by colons into 3 groups of 4 to fit the LCD screen. In this example, the **MAC address** is **00 90 C2 00 00 00**