AEGIS II Browser

CONTENTS Revised 12/6/16

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.

1.0 Day-to-Day Browsing

The purpose of this manual is the show the user how to connect to the Aegis II controller using an Ethernet connection, or wirelessly via WiFi from a PC, tablet or smart phone.

1.1 WiFi and LAN connect

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

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

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

1.1.1 Step 1 Using a PC or Tablet:

Click on the WiFi icon on your desktop.

Click on the AegisII_123 choice and press the Connect
button.
The number 123 will be different on each controller. These 3 digits will be the same as the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within WiFi range.

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

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

1.1.2 Step 1 Using a Smartphone

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

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

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

1.1.3 Step 2 Connecting to your device

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

Connection Status

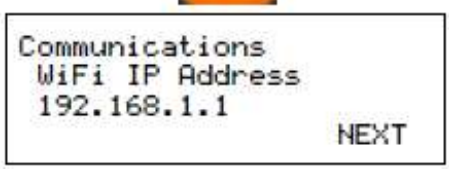
Find the controller WiFi IP address using the keypad.

1) Press the Menu key

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

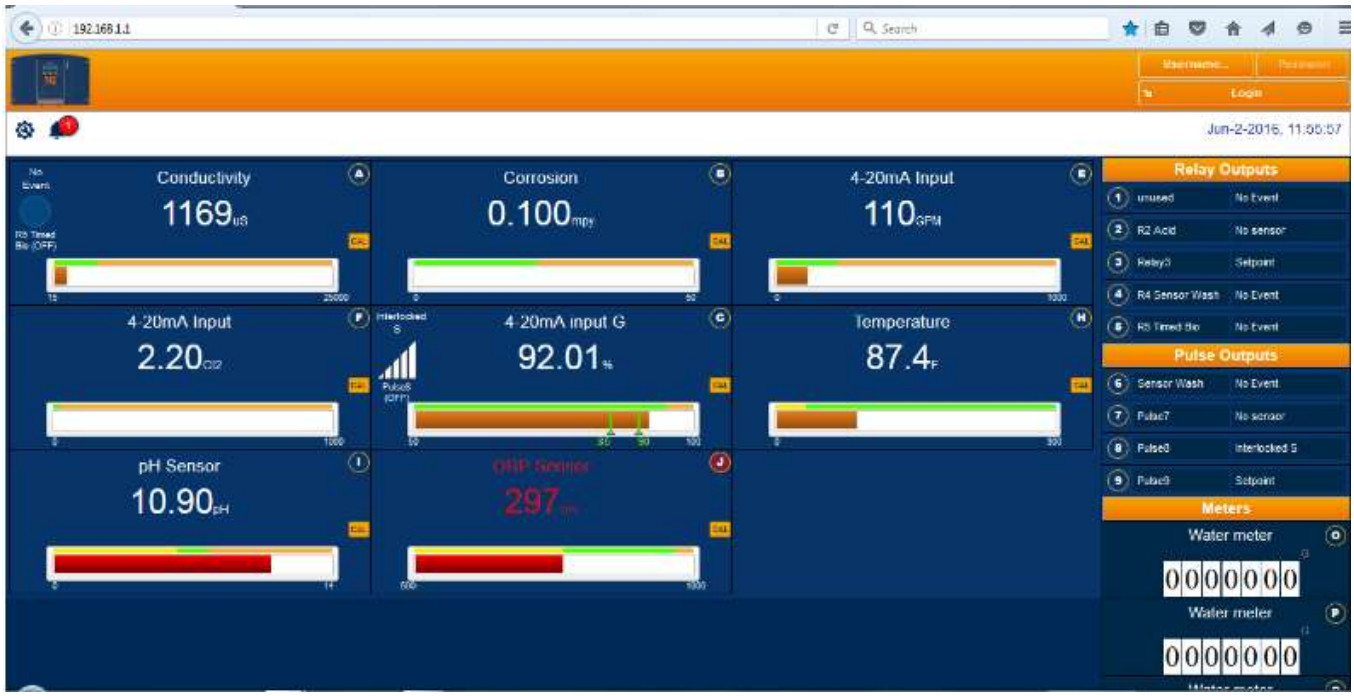
3) You should be at the Communications menu. Press OK.

4) You will see the LAN IP address. Press the down arrow twice to see the WiFi IP Address.
This is the address you need to use in the browser URL box. No need to add the WWW or Http. Just enter as shown here. 192.168.1.1 and press your return key.



AEGIS II Browser

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



View from PC or Tablet

View from Smartphone

AEGIS II Browser
1.2 Log-In

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

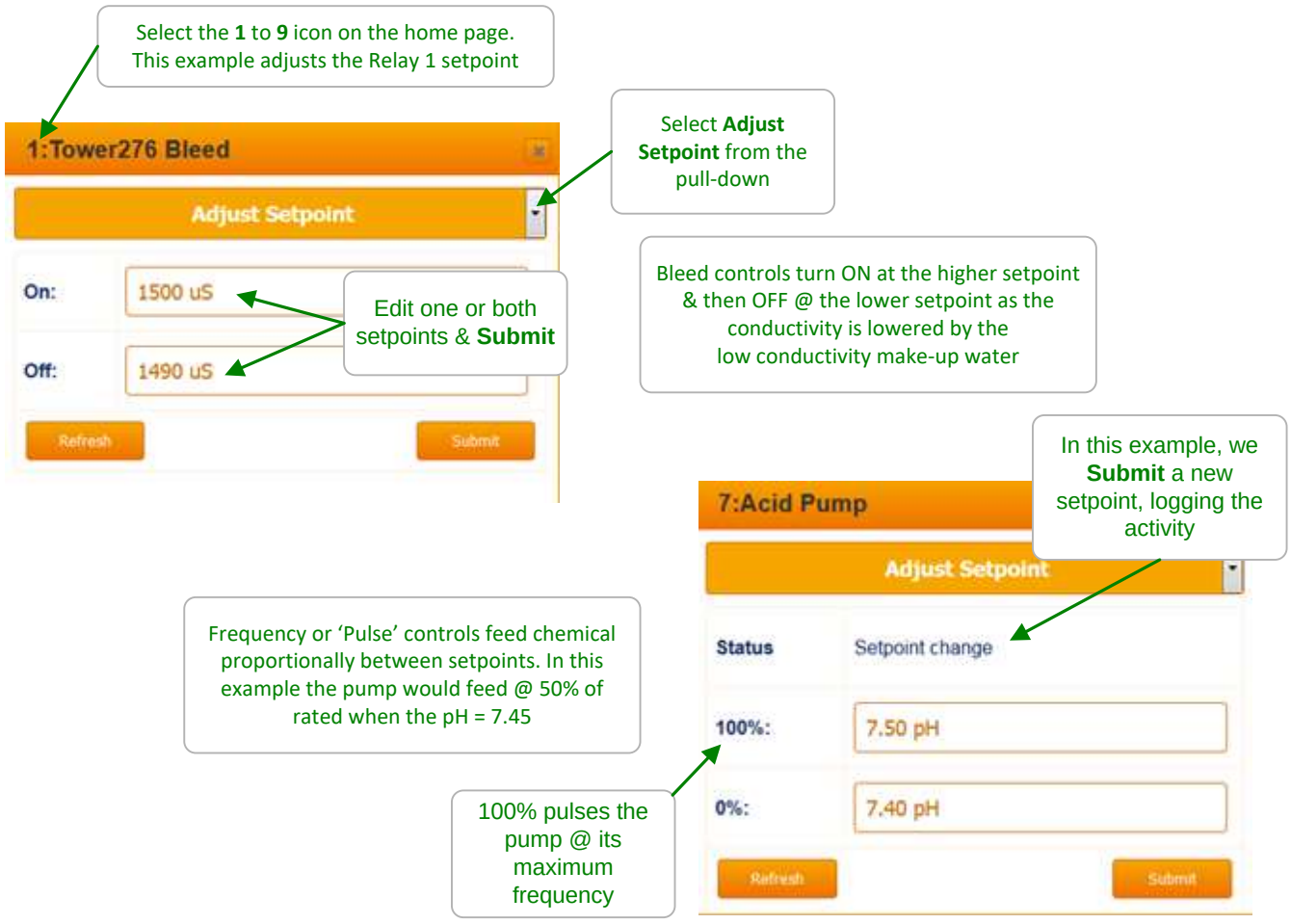
Default Passwords:
Operator1 = **1** Operator2 = **2** Operator3 = **3** Operator4 = **4**.
Configure5 = **5** Configure6 = **6** Configure7 = **7** Administrator = **AAAA**
Login Page: Operators can view all controller pages.

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

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

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

1.4 View & Adjust Setpoints



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

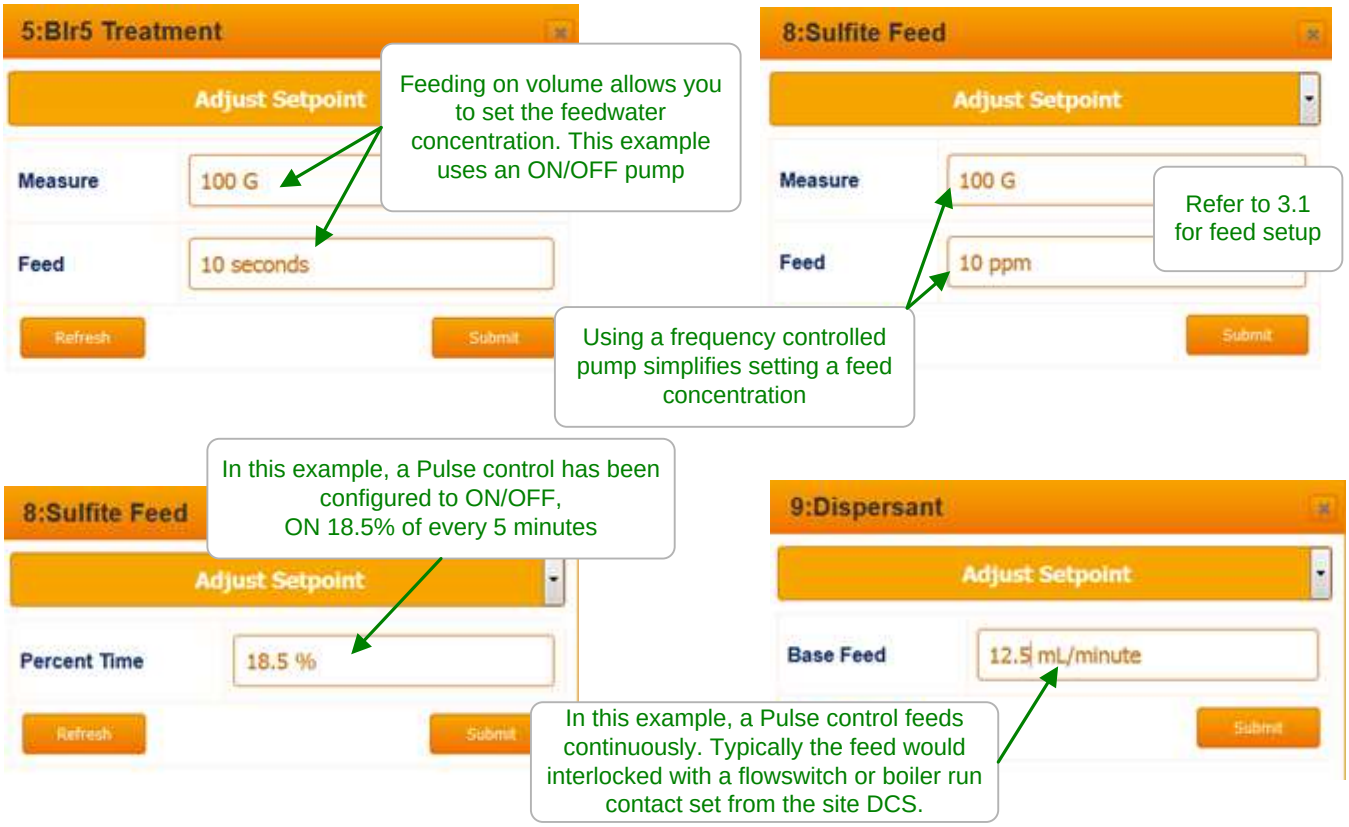
Tower Bleed solenoids use Setpoints 5uS to 20uS apart so that short bleeds are followed by short feeds. The resulting control has minimum variation in Inhibitor ppm and operates as close as possible to the target cycles of concentration.

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

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

1.4 View & Adjust Setpoints continued

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



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

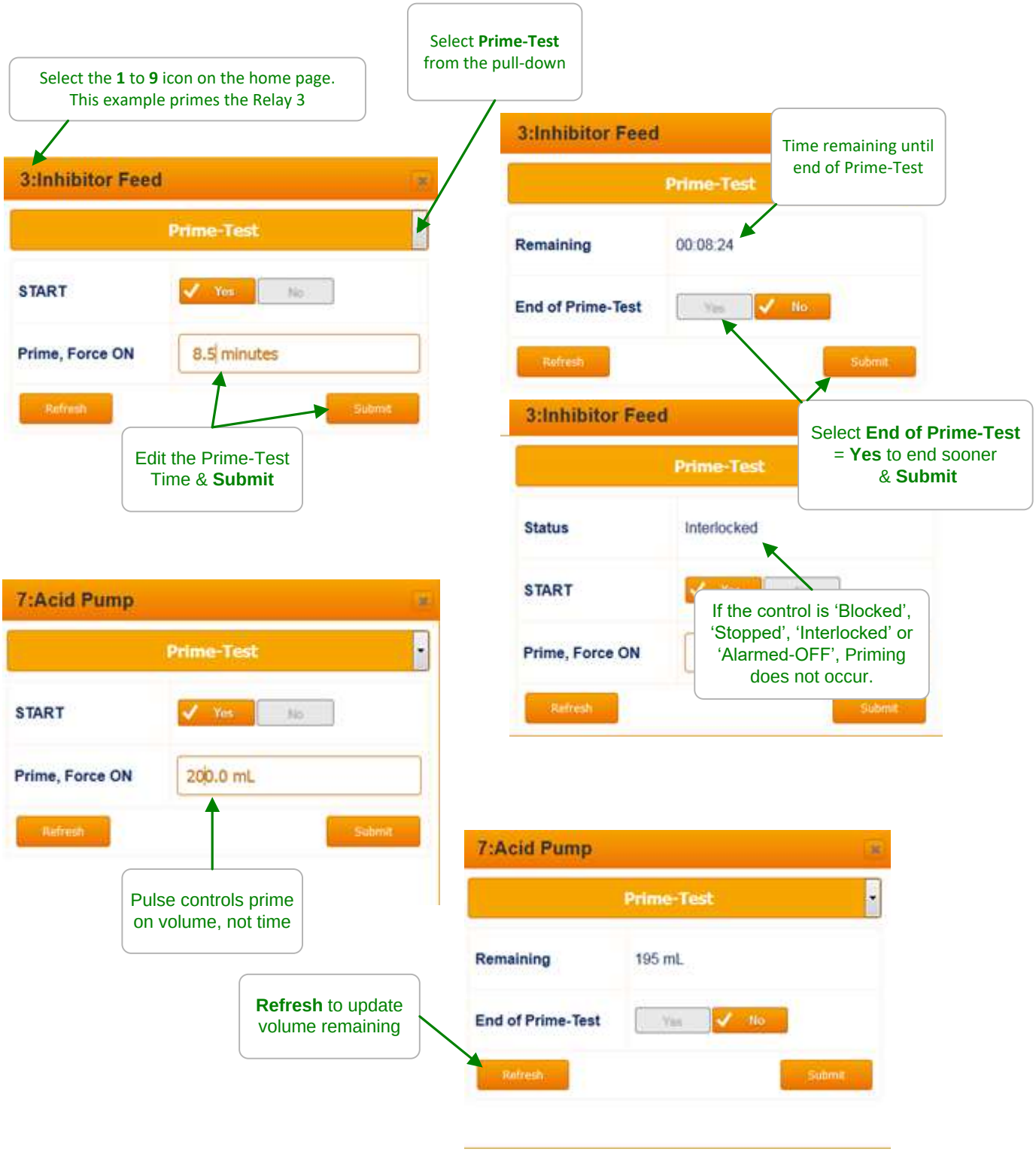
Inhibitor feeds may be delayed while the bleed solenoid in ON to prevent pumping inhibitor down the drain (See Section 3.)

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

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

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

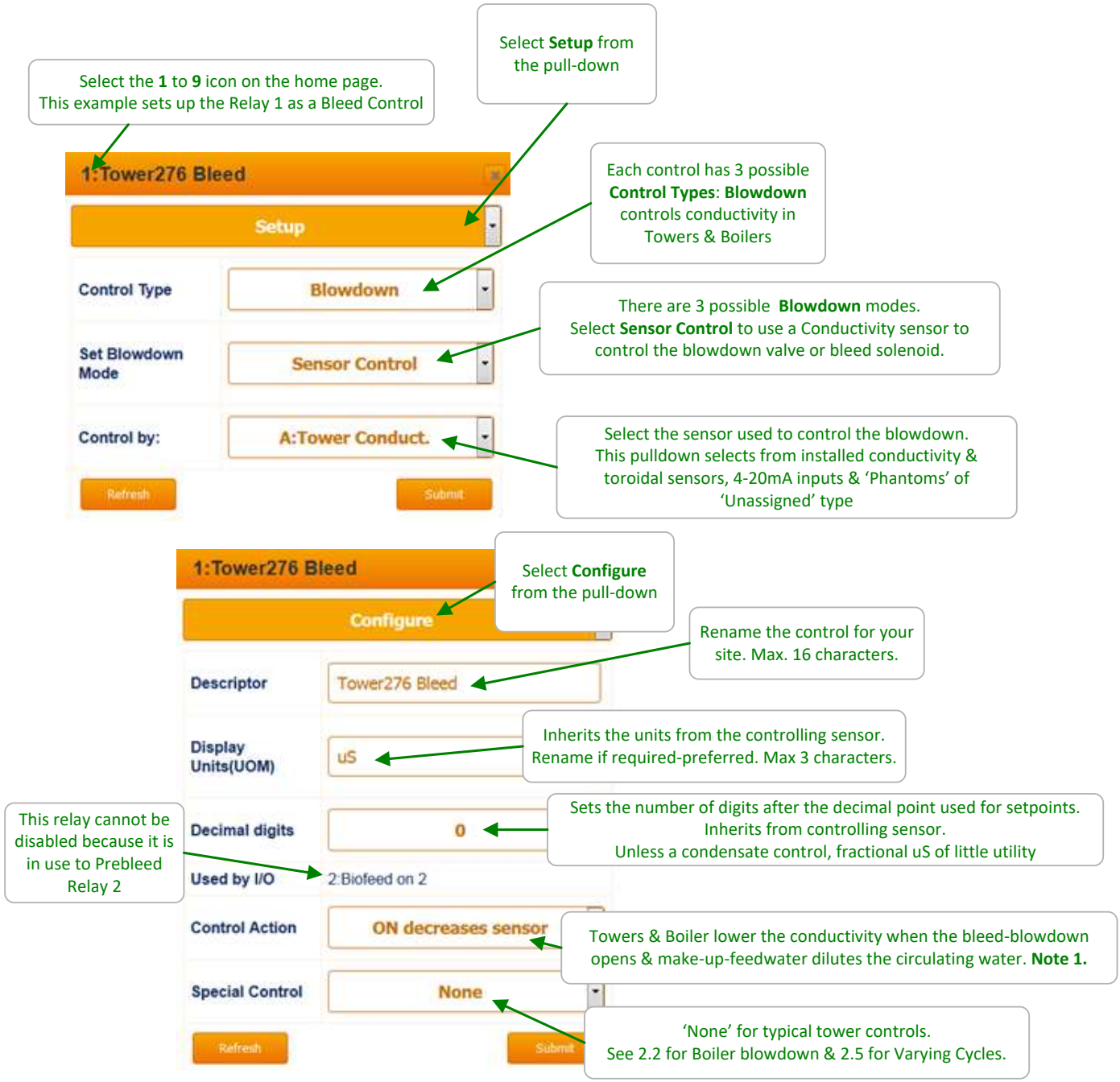
1.5 Priming-Testing Pumps & Solenoids



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

2.0 Blowdown Controls: Towers, Boilers, Closed Loops

2.1 Conductivity Controlled Blowdown

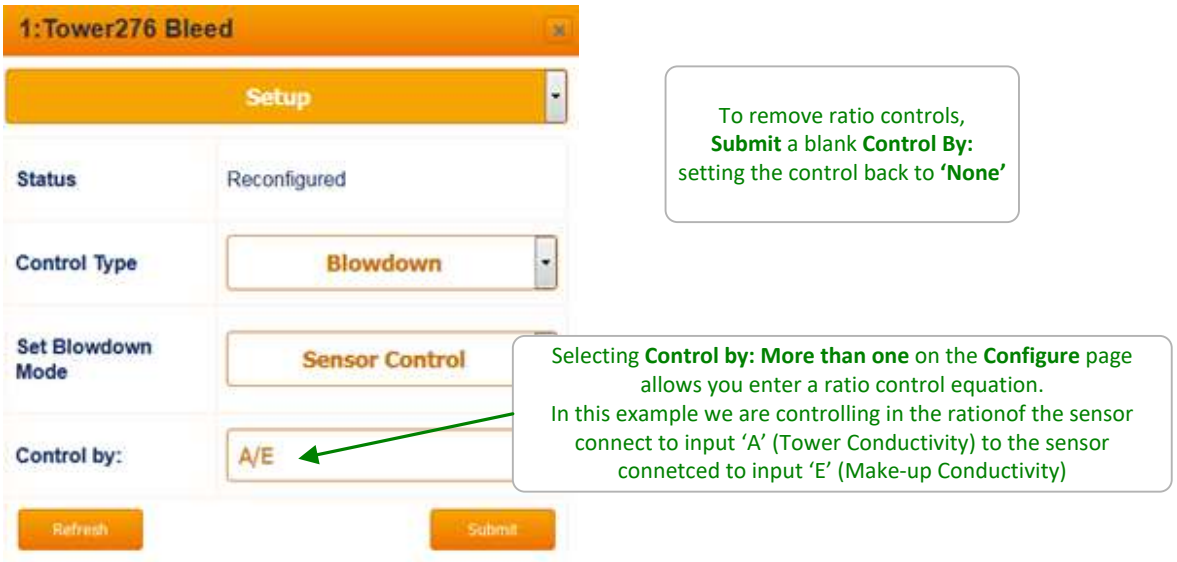


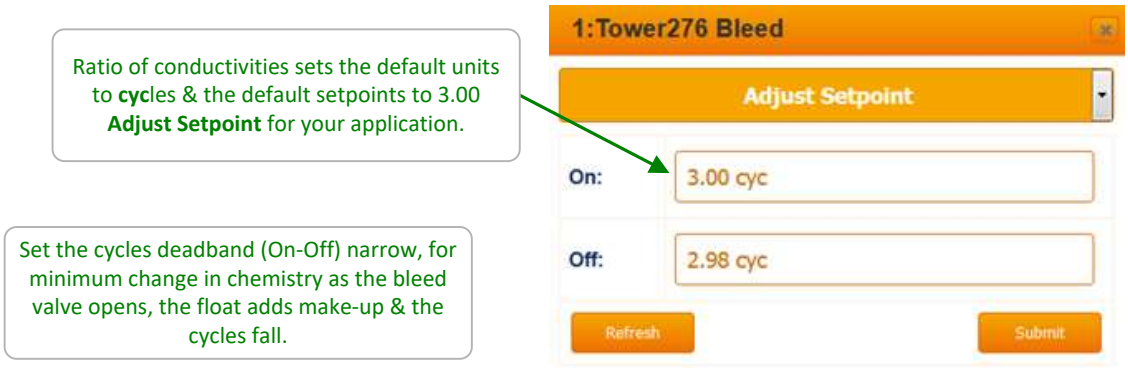
Sidebar:
Note 1: Closed loop conductivity controls usually use **Control Action ON increases sensor**
Select **Control by: More than one** to bleed on the ratio of tower to make-up conductivities.
See next page.

2.1 Conductivity Controlled Blowdown continued

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

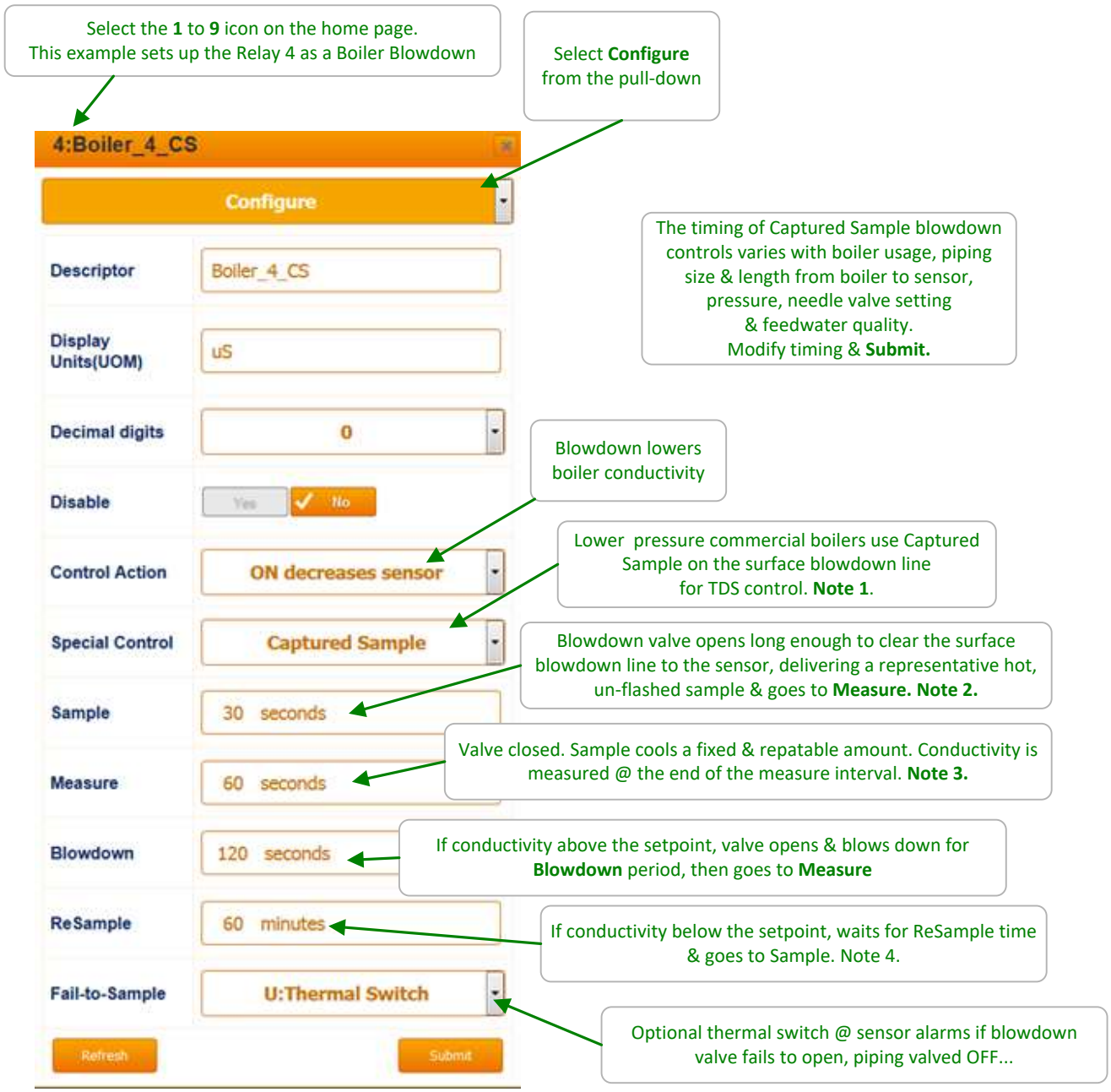
CAUTION: If your tower has a long holding time or large circulating volume or you are running the chemistry close to the scaling limit, look closely at control effects. Auto-Increasing cycles of concentration (make-up conductivity falls) when the bulk of the tower water has not changed, may scale heat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





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

2.2 Boiler Blowdown



Sidebar:

Note 1. Higher pressure, utility-power generation boilers use a continuous blowdown & a sample cooler to measure conductivity.

Note 2: Sensor installed upstream of the blowdown valve-solenoid & throttling needle valve. Needle valve downstream of blowdown valve. Lower reliability, steam rated solenoids limited to very low pressure boilers.

Note 3: If you modify **Measure** time or needle valve setting. Recalibrate because you've changed the temperature at the measure point.

Note 4: Boilers which cycle up slowly can extend Resample time to minimize **Sample** energy, water & chemical losses. Process boilers may need to **Sample** more frequently.

2.3 Metered Blowdown

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

Select **Setup** from the pull-down

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

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

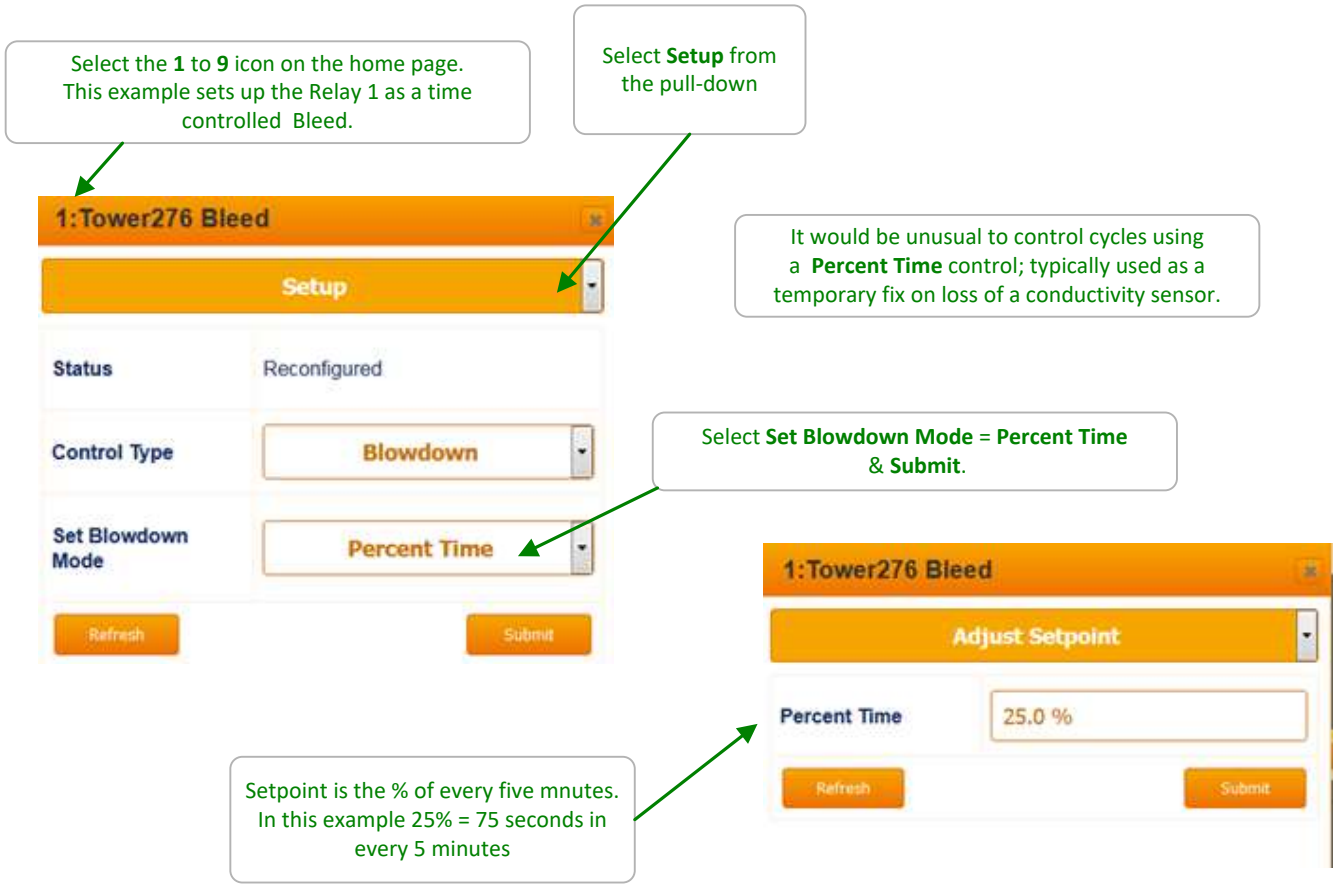
At sites where fouling or high silica prevents using contact conductivity sensors, two meter controls are **useable if make-up water chemistry constant**

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

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

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

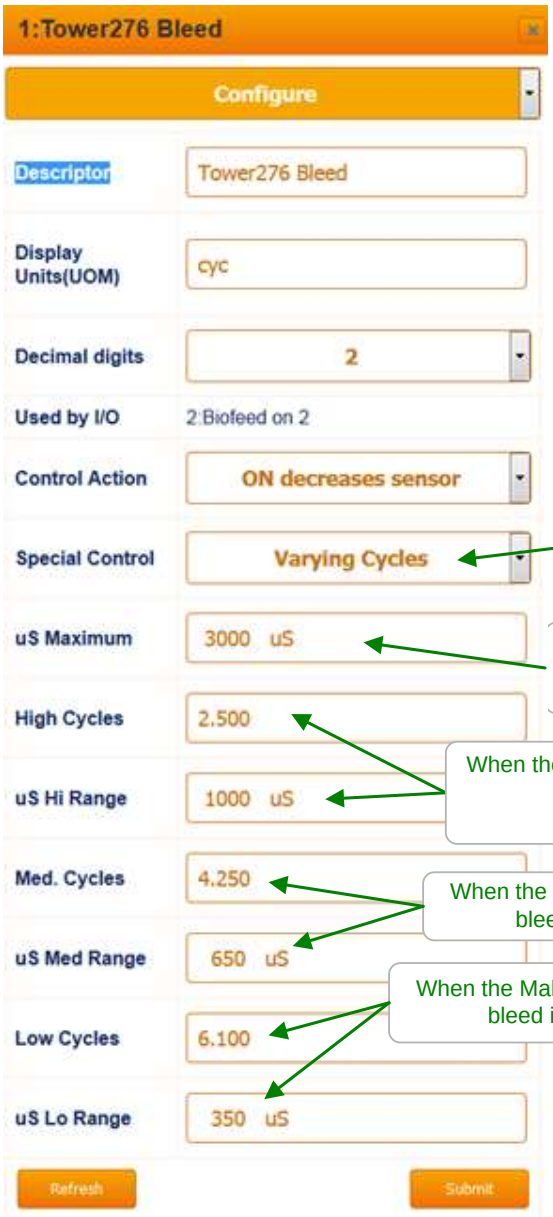
2.4 Percentage Time Blowdown



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

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

2.5 Variable Cycles



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

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

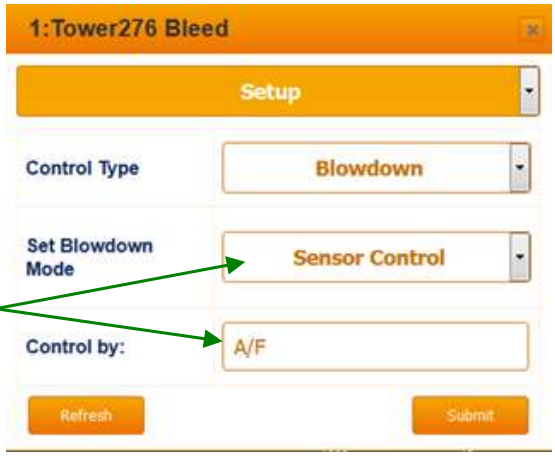
Varying Cycles is not a **Special Control** option until **Control By:** is set to the ratio of the Tower-to-Makeup conductivities, **A/F** in this example

Set the maximum allowed tower water conductivity

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

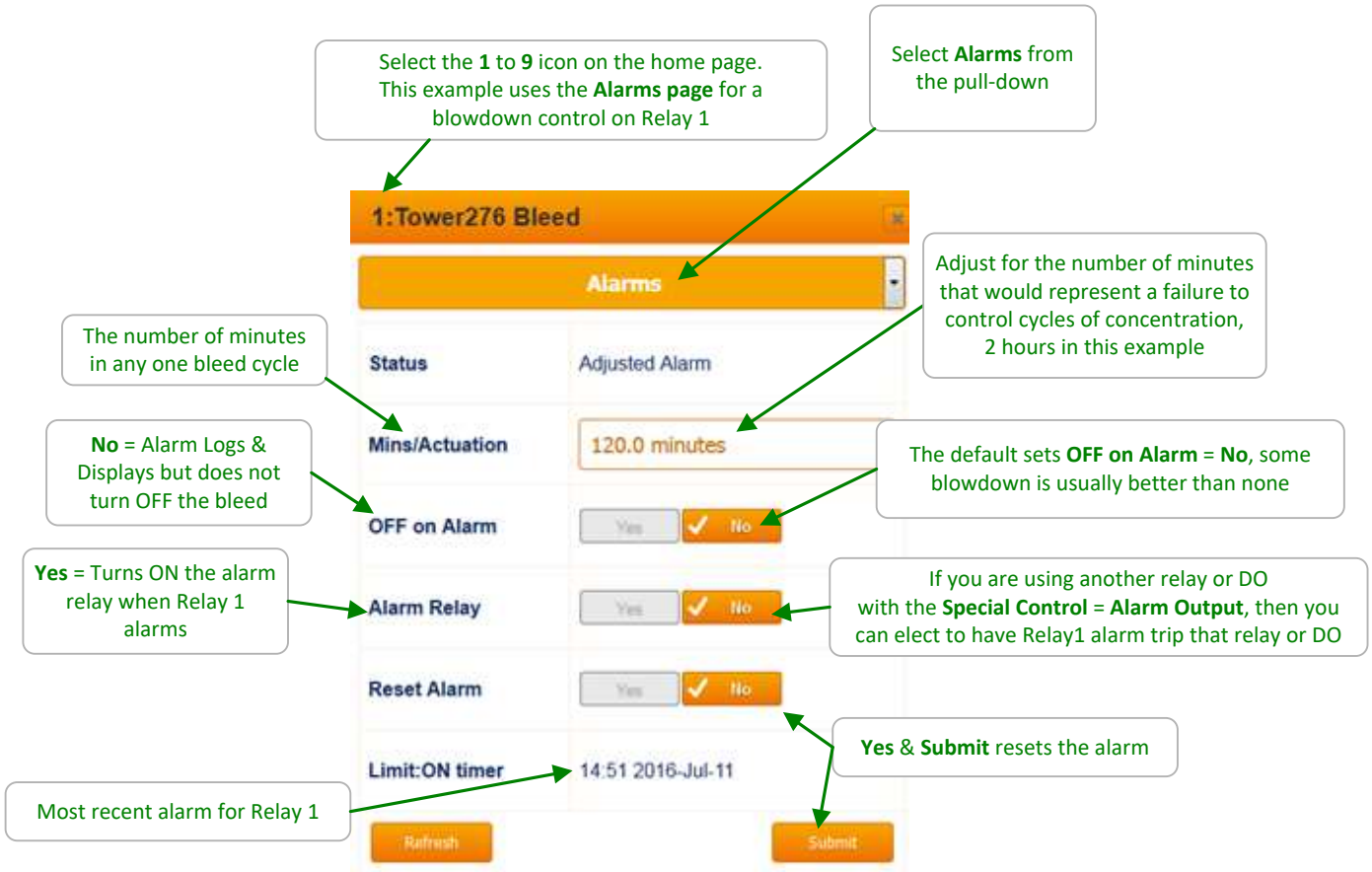
When the Make-up conductivity is less than 650 uS, the tower bleed is controlled to 4.25 cycles of concentration

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



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

2.6 Blowdown Limit Alarms



Sidebar:

Obvious Alarm Causes:

Failed or blocked blowdown valve or solenoid, blowdown line inadvertently valved OFF after tower maintenance. If solenoid intermittent, check the static head required to operate.

Faulted or debris blocked blowdown meter for towers using sequential meter control.

Less Obvious Causes:

Undersized bleed as load increases &/or make-up chemistry changes.

Adding more gray water make-up @ higher than expected conductivity.

Failure to adjust bleed setpoints as seasonal changes in make-up chemistry occur.

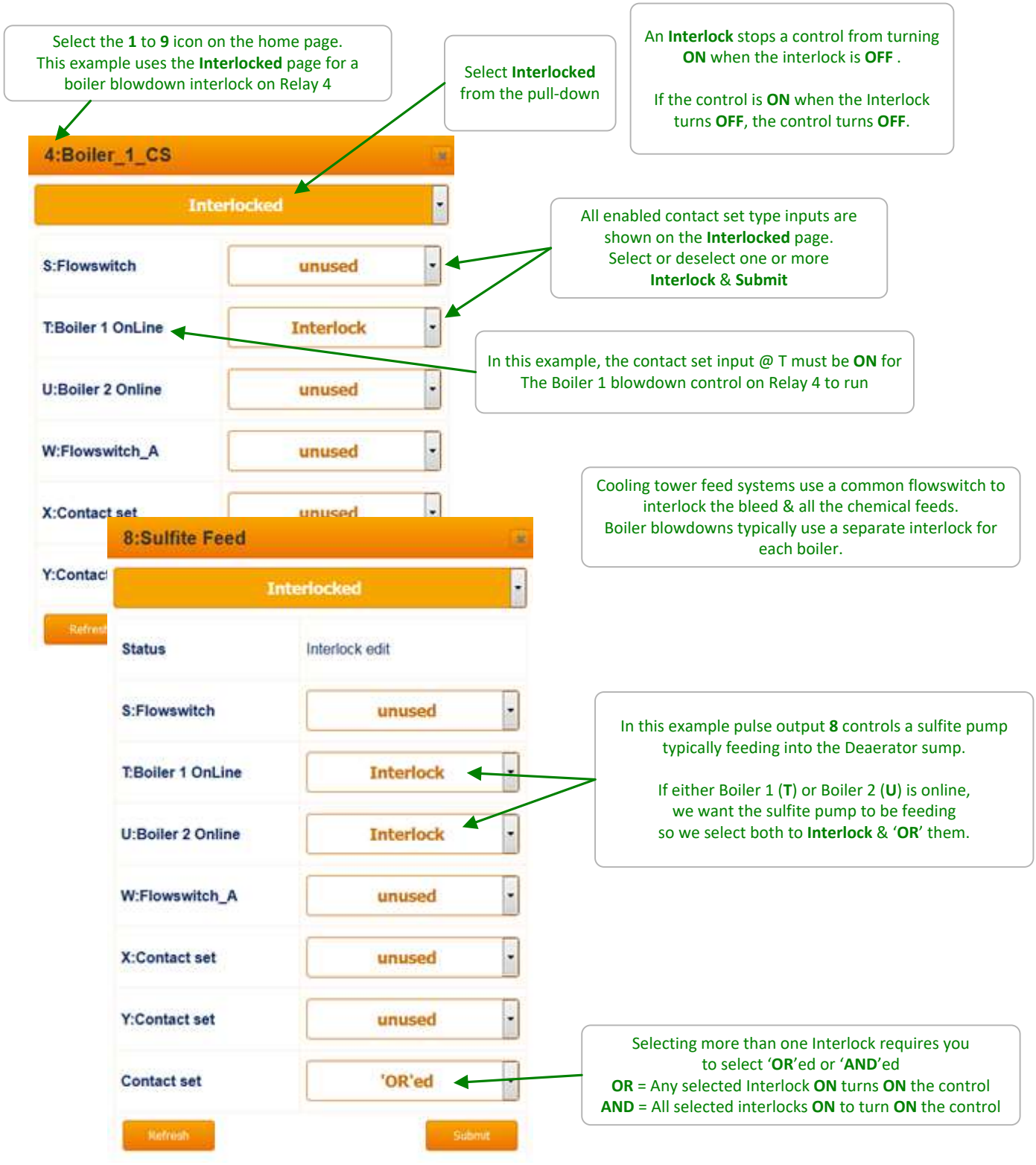
Self Inflicted Causes:

Recalibrating a low reading conductivity sensor rather than cleaning it or identifying the cause of the low reading. Sensor subsequently fails to track tower conductivity. This alarm may indicate higher levels of water & inhibitor usage.

Note:

No blowdown ON time may indicate a float stuck ON or partially ON

2.7 Blowdown Interlocks-Flowswitches



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

2.8 Blocking-Delaying a Blowdown

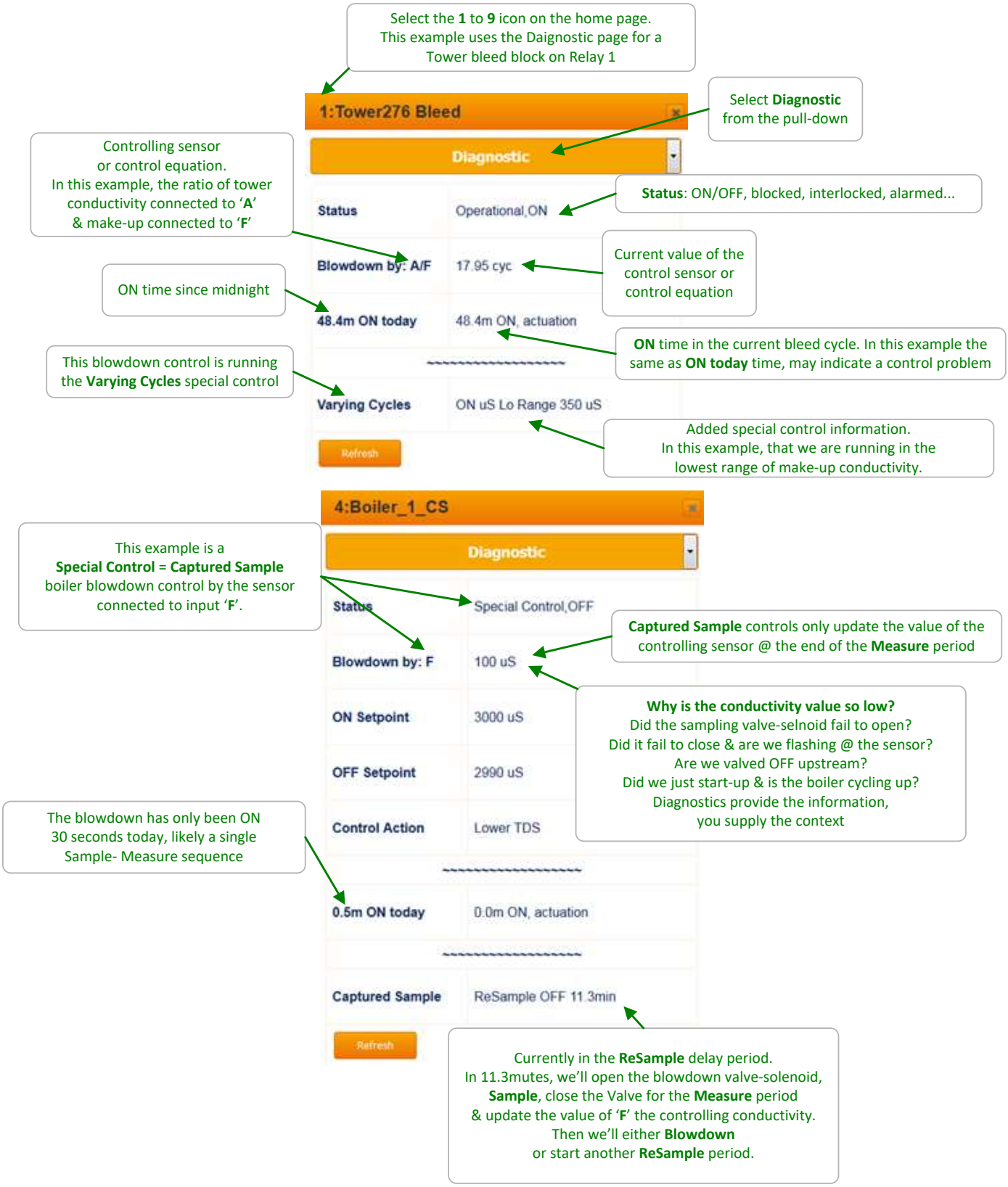
Sidebar:
Warning: A poorly conceived block may prevent a control from running or working correctly.
In this example, if the tower is bleed limited or the inhibitor pump undersized & therefore ON for an extended period, bleed control may fault.

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

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

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

2.9 Blowdown Diagnostics



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

3.1 Water Meter Inhibitor Feed

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

Select **Setup** from the pull-down

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

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

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

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

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

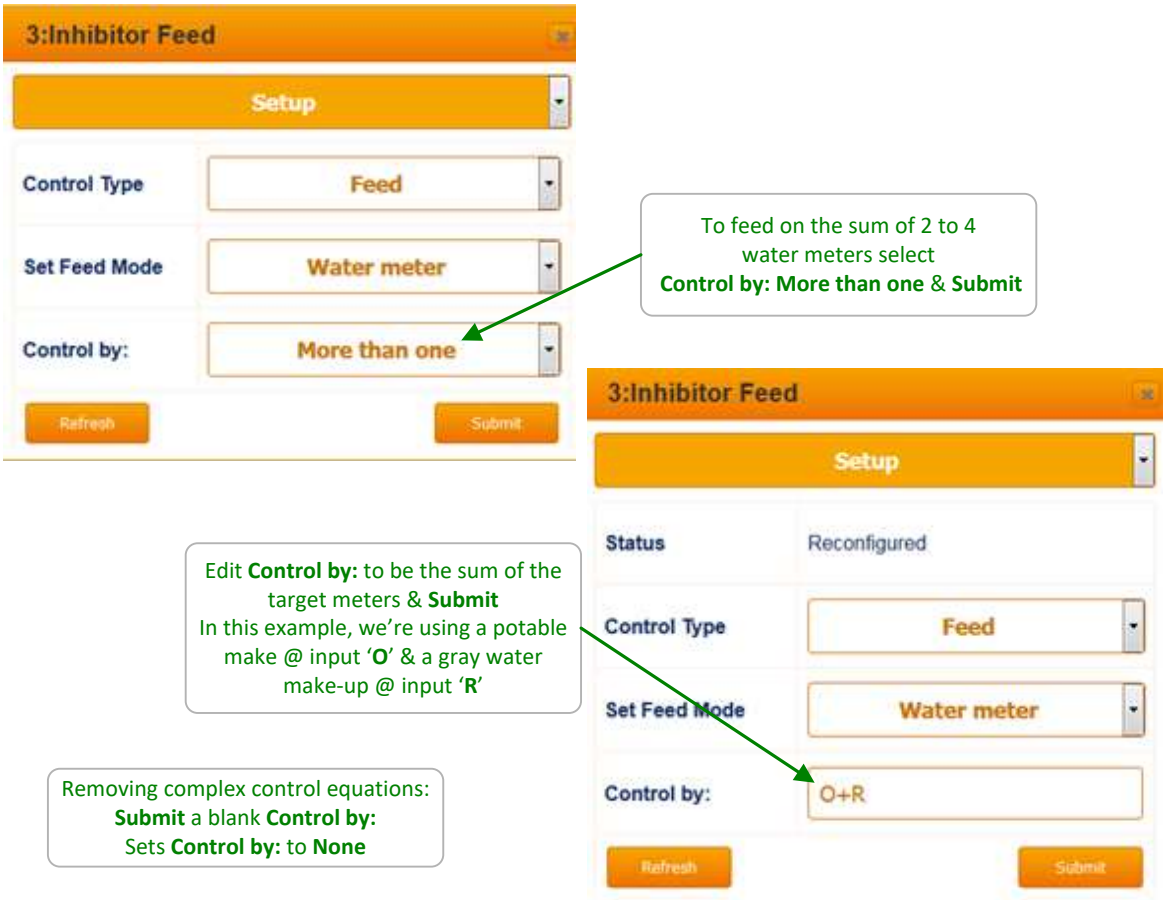
If using a pulse or frequency controlled pump, each stroke delivers a fixed amount (of Dispersant in this example) so the **Feed** setpoint is in ppm

See Section 8.0 for ml/stroke defaults & adjustments.

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

3.1 Water Meter Inhibitor Feed cont.

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



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

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

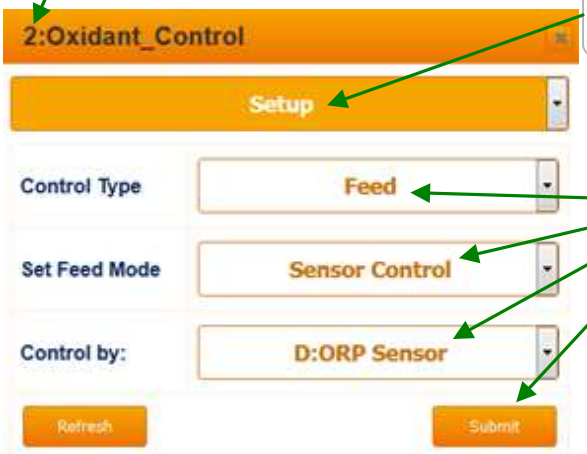
There are error sources: How accurate is the % active?
Is 8GPD @ site temperature range & static head? How accurate is the cycle control…..
This is a first guess; test ppm & adjust.
If this is a start-up use pump Prime to get to an initial ppm.

3.2 Sensor Controlled Feeds

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

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

Select **Setup** from the pull-down



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

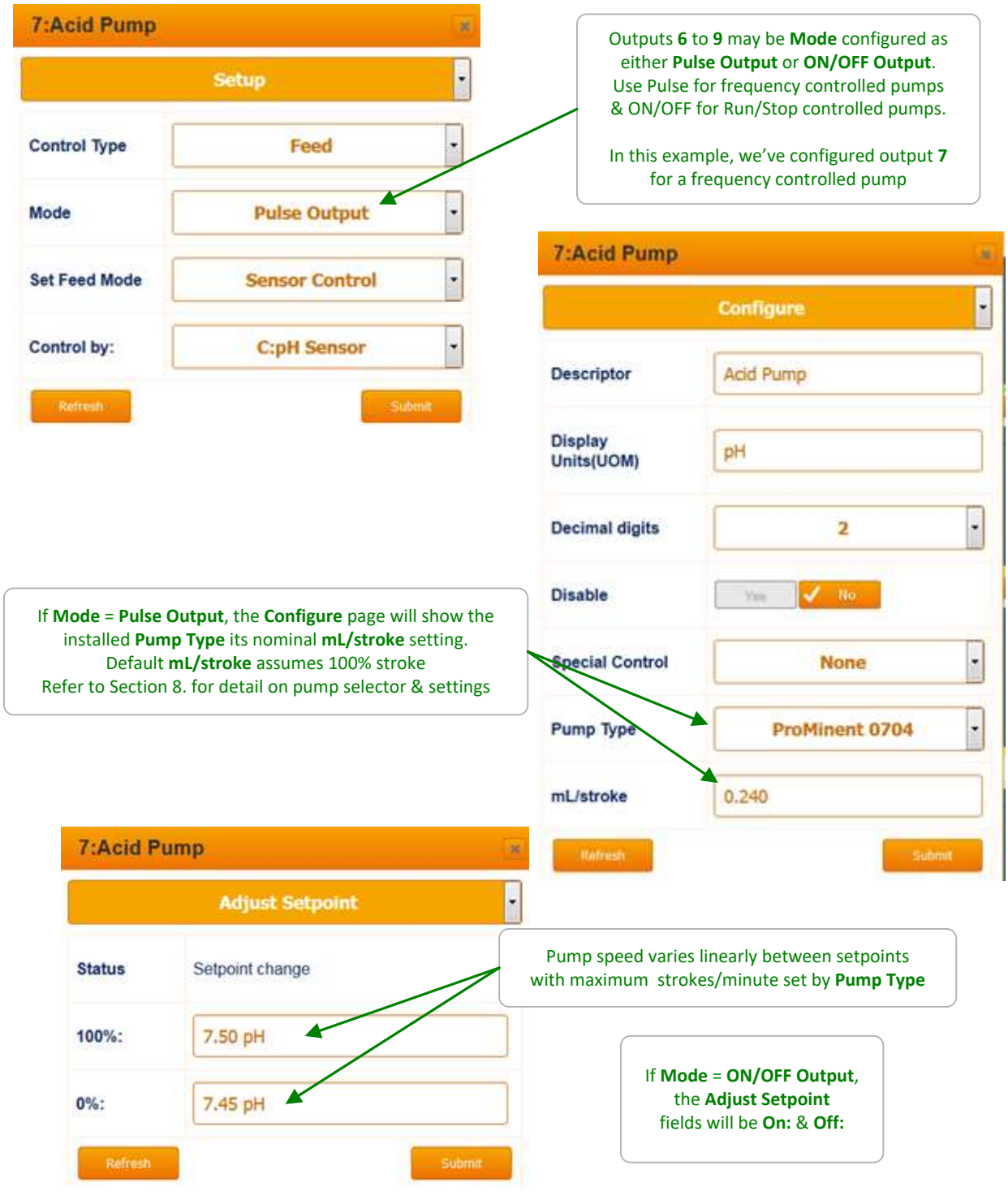
Edit for your site, up to 16 characters

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

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

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

3.2 Sensor Controlled Feeds cont.

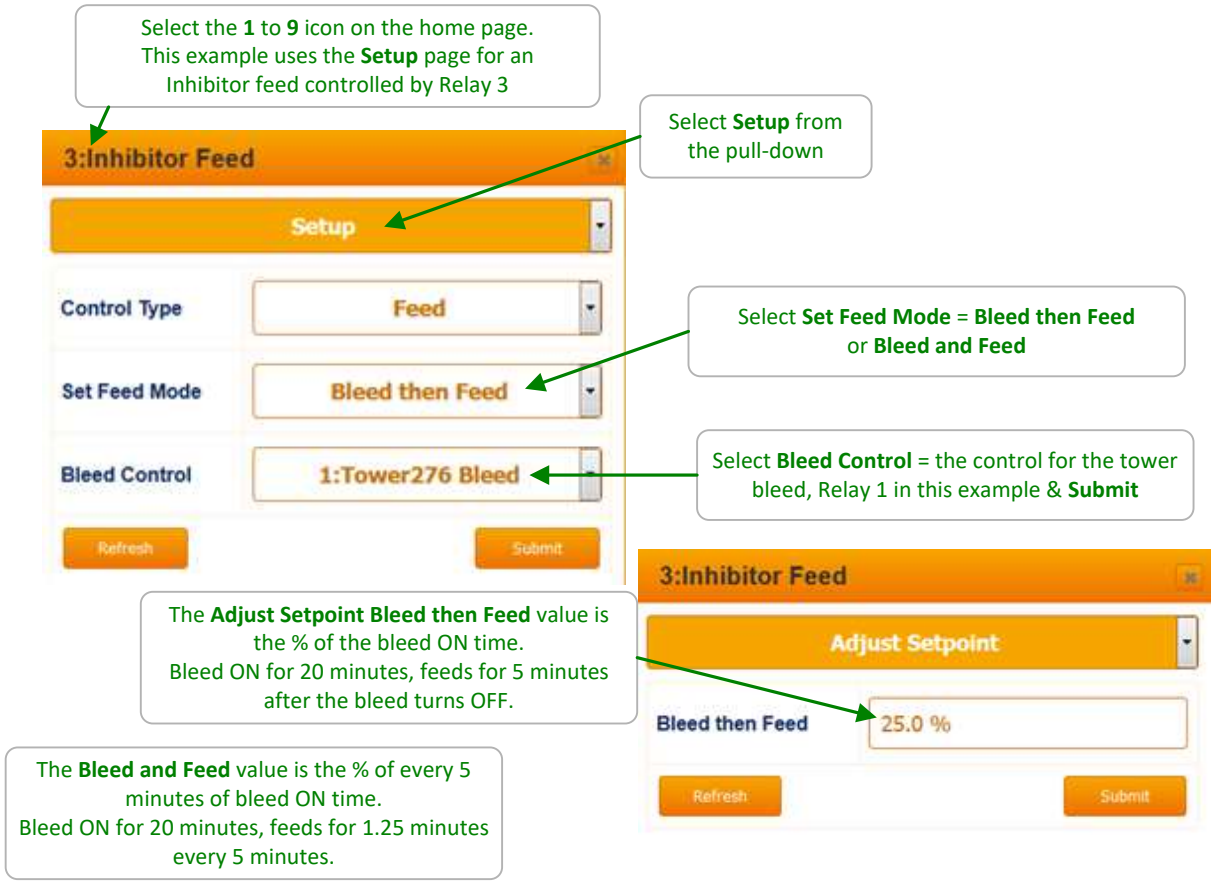


Sidebar:
WARNING: Reversing setpoint order is blocked for ON/OFF controls but allowed for proportional Pulse controls. Reversing setpoints in this example would convert an Acid feed to a Caustic feed.

3.3 Proportional Feed 3.3.1 Bleed Based Feed

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

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



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

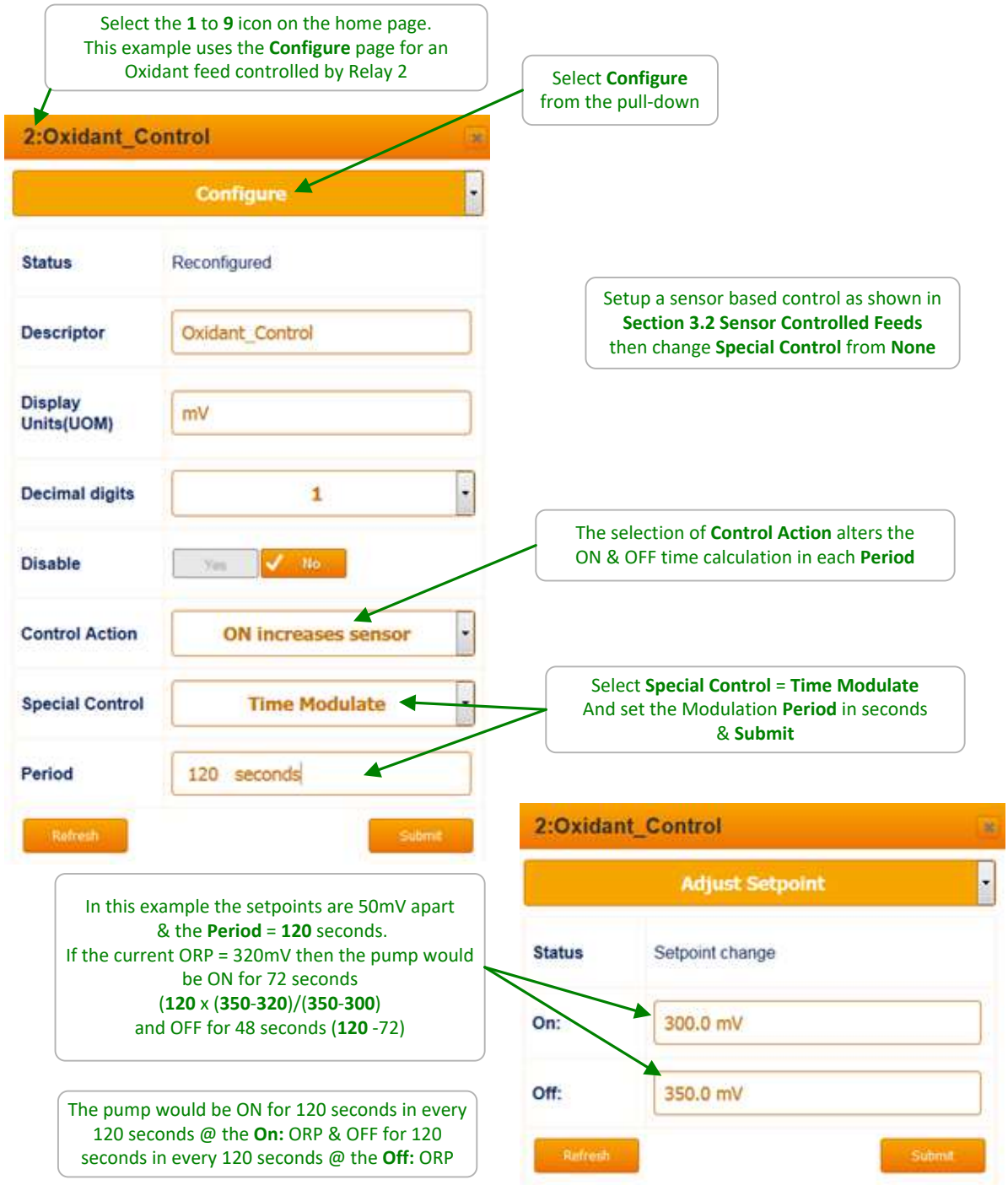
If the tower Bleeds for **X** Minutes, the Inhibitor is fed for a user set % of **X** minutes AFTER the bleed ends. It's a better way to feed inhibitor for small cooling towers than Bleed & Feed since less inhibitor is lost down the drain.

Inhibitor savings averaging more than 20% were measured on a mix of small towers in California simply by switching from **Bleed & Feed** to **Bleed then Feed**.

Reliability:
Bleed then Feed & **Bleed & Feed** controls are only as reliable as the tower bleed solenoid and conductivity sensor. So set bleed limit alarms to trap control faults.

3.3 Proportional Feed 3.3.2 Time Modulation

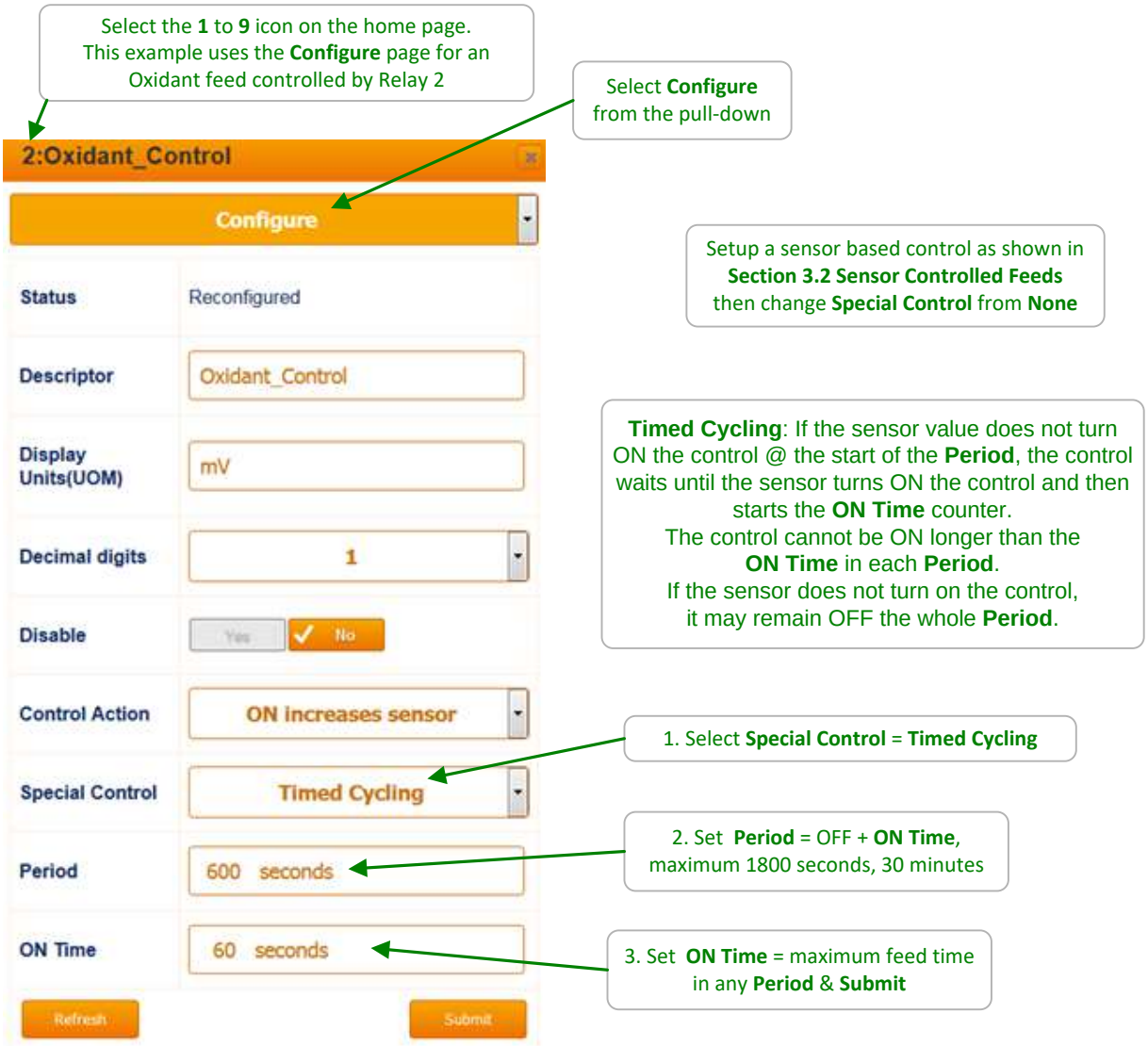
Time Modulation allows an ON/OFF pump to operate like a frequency or 4-20mA controlled pump. ON-OFF pumps are typically set to maximum stroke and rate when **Time Modulation** is selected.



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

3.3 Proportional Feed 3.3.3 Timed Cycling

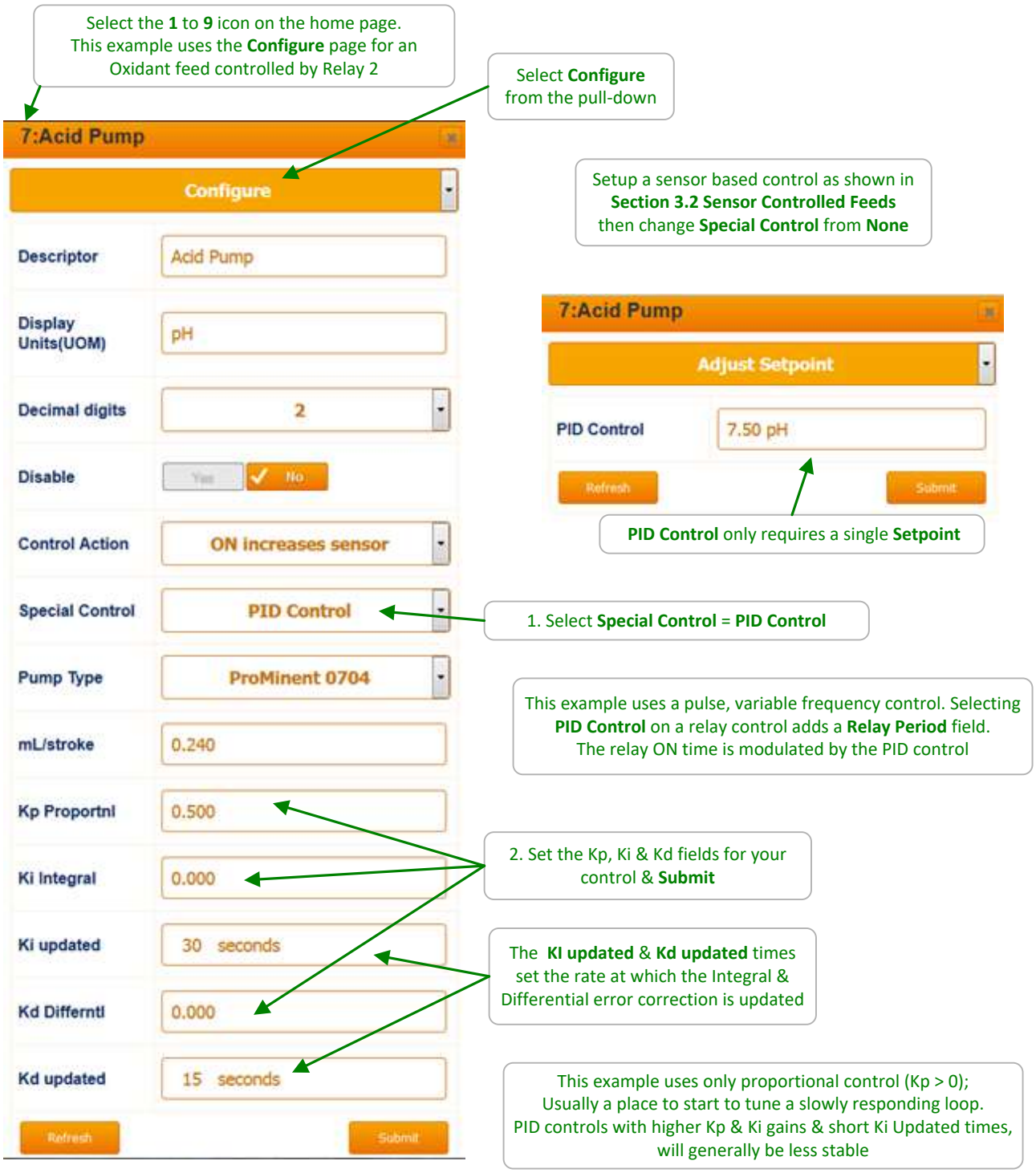
Timed Cycling allows time for the controlling sensor to measure the effect of chemical before feeding more chemical. **Timed Cycling** is used where a chemical is fed occasionally into a system with a large volume.
It may be several minutes before the chemical travels from the injection point through the piping and sump and then back to the controlling sensor location at the recirculating pump.



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

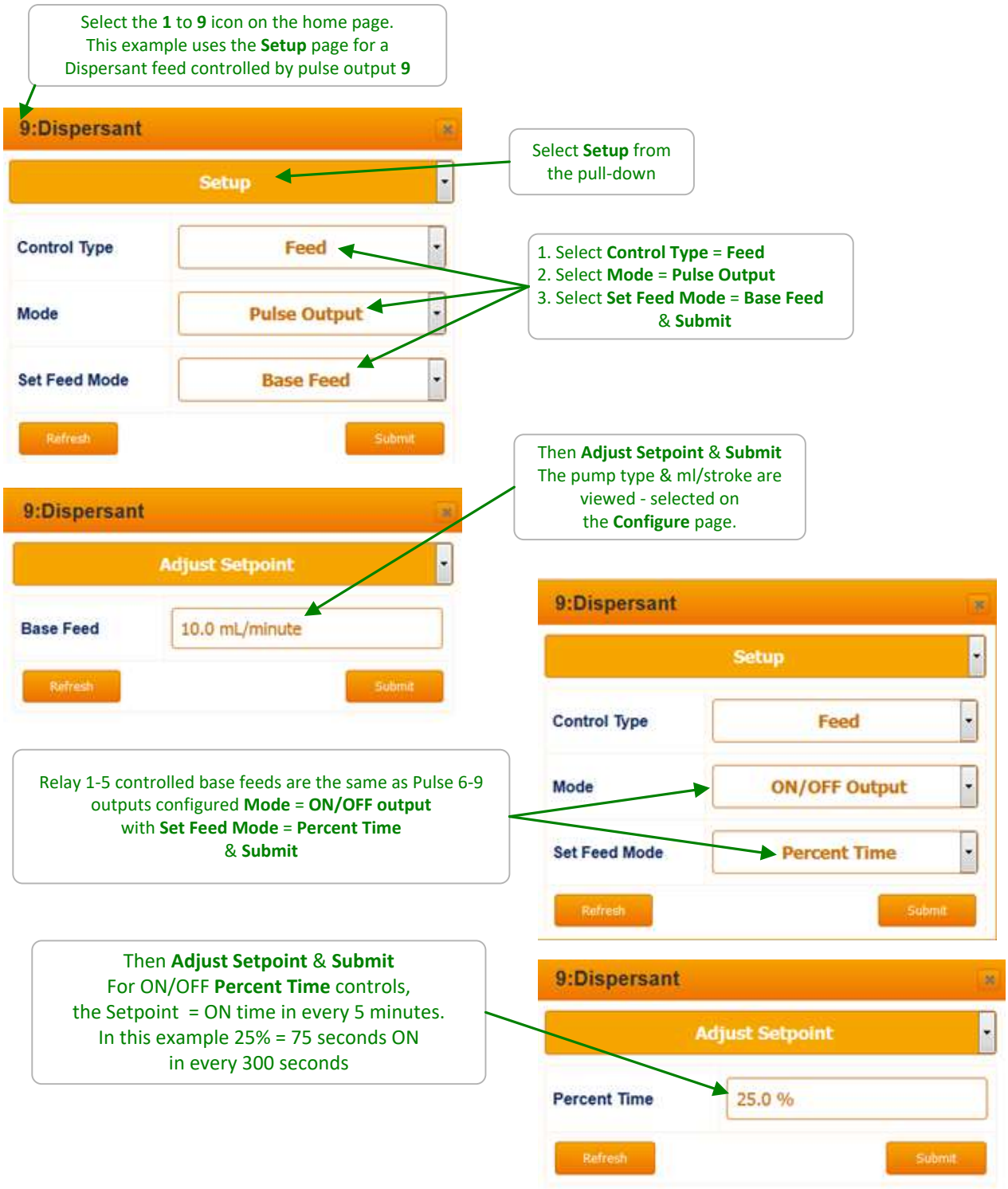
3.3 Proportional Feed 3.3.4 PID Controls

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

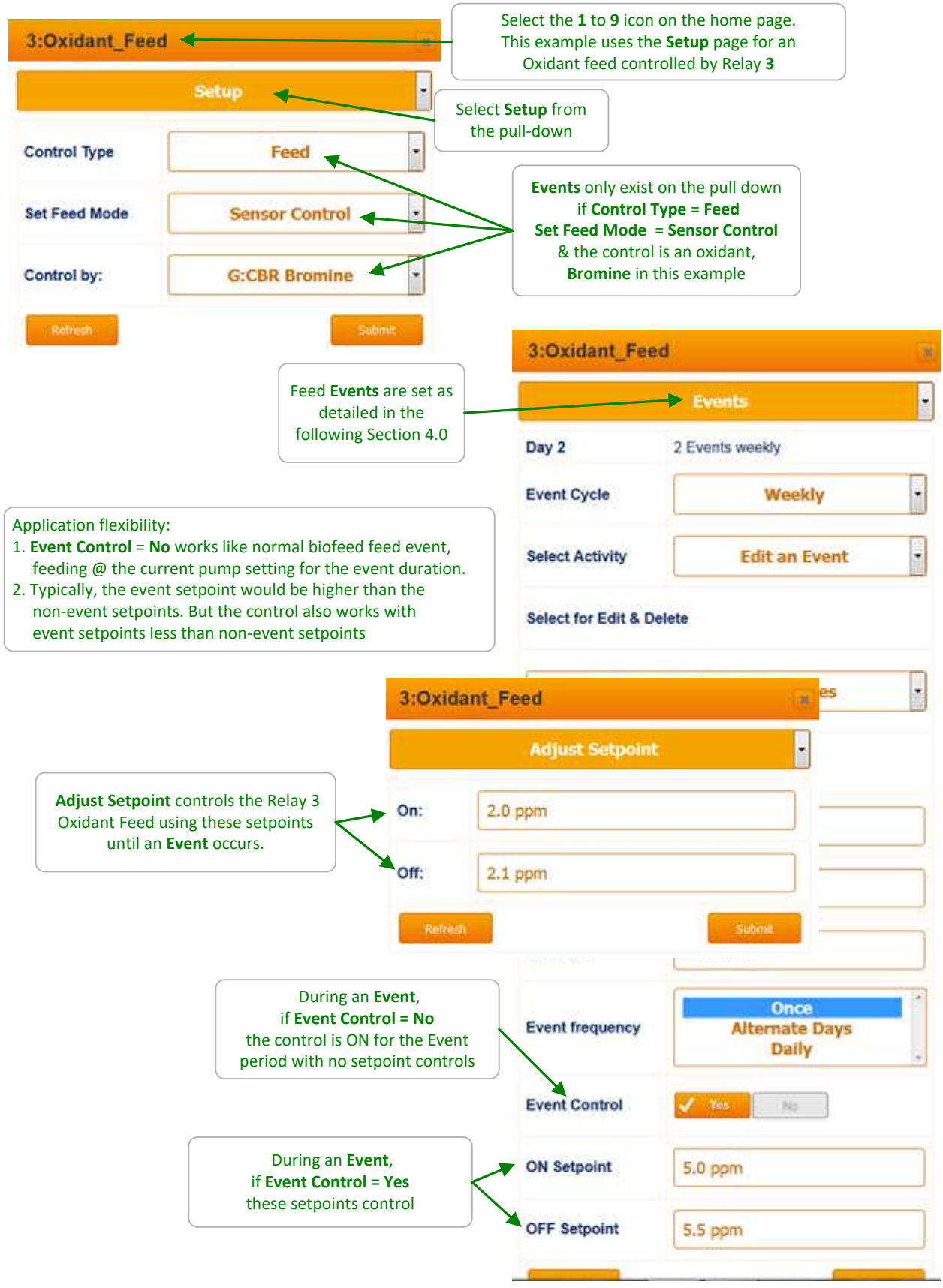


3.4 Base Feed

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

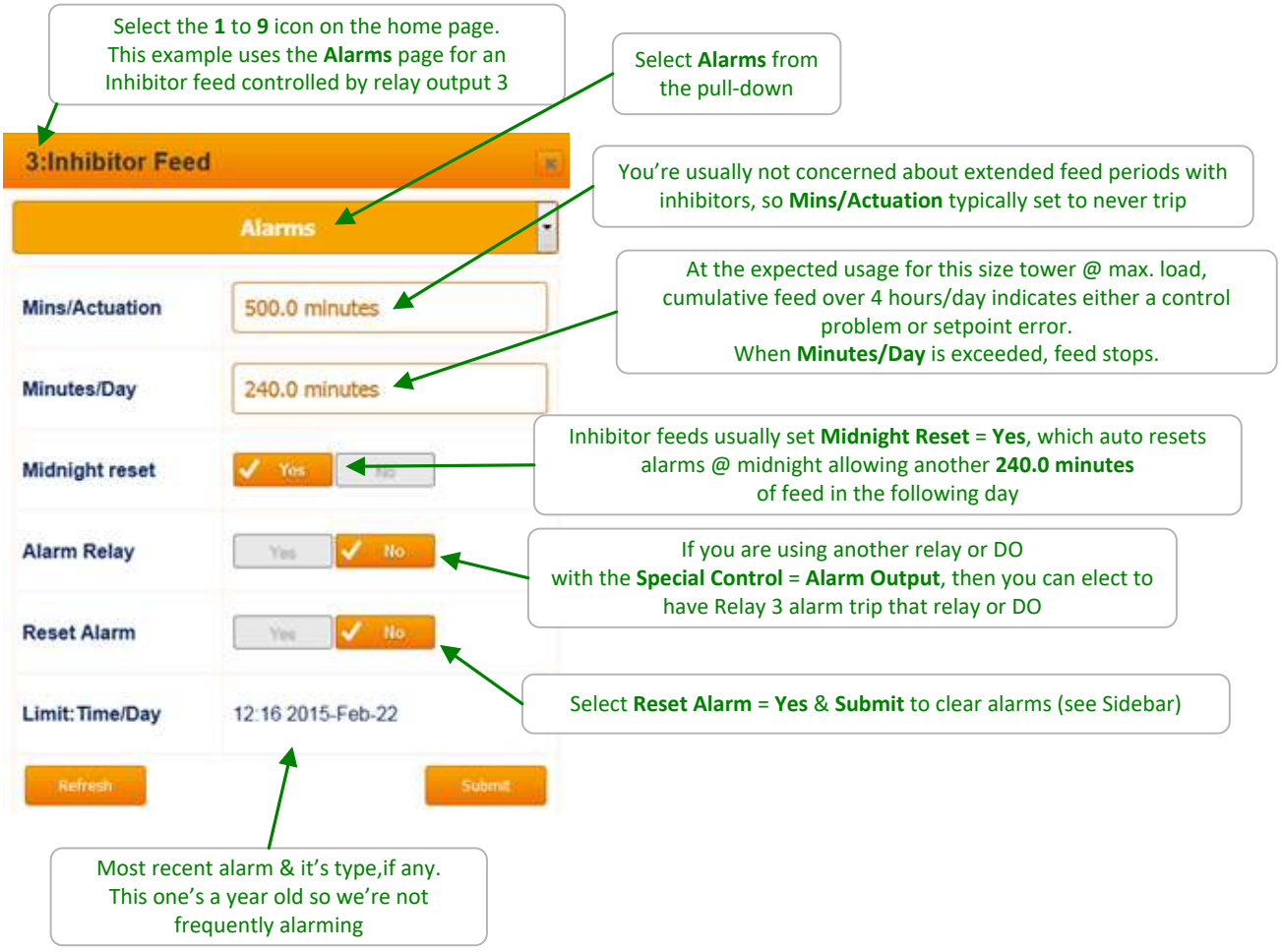


3.5 Control During Events



3.6 Limiting Feed & Alarms

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



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

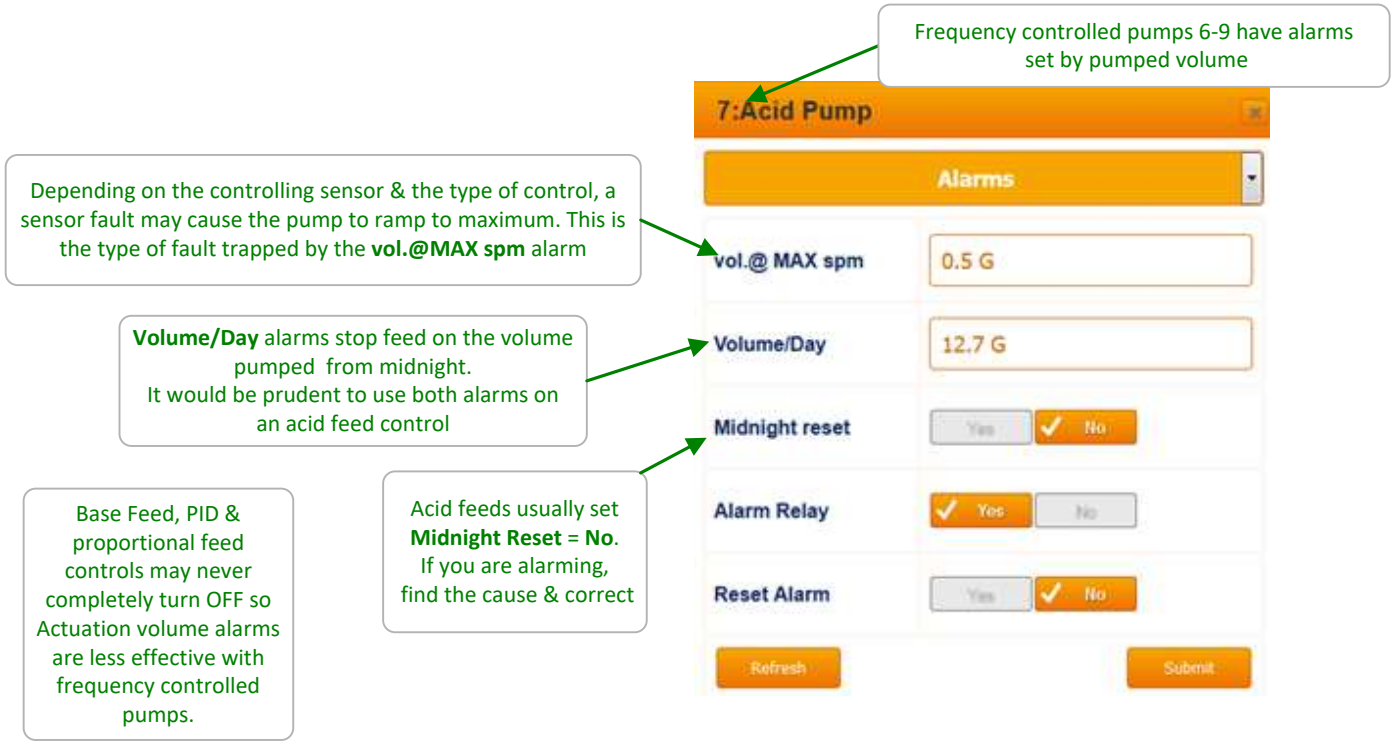
If alarmed on **Minutes/Day**, **Reset Alarm** does not restart the feed because we've still exceeded the **Minutes/Day** limit. If you need to continue to feed, increase the **Minutes/Day** limit.

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

3.6 Limiting Feed & Alarms cont.

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

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



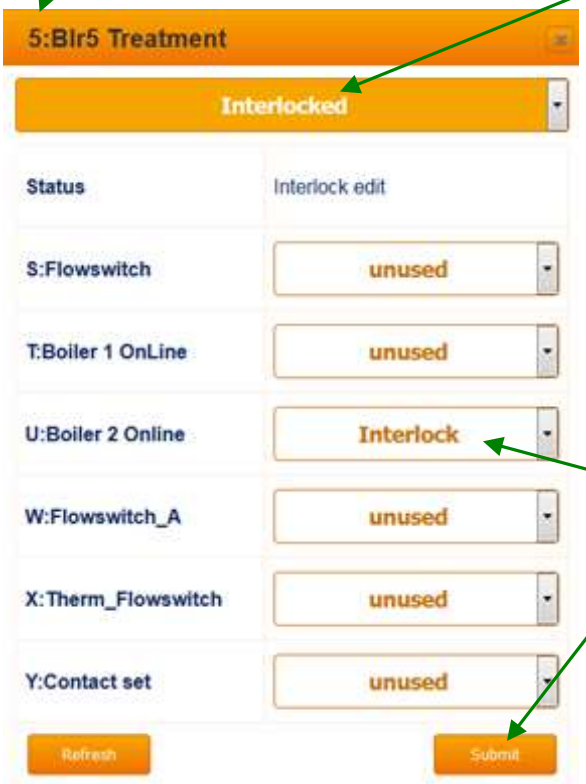
Sidebar:
Feed controls stop feeding when alarmed.
If alarmed on **vol.@MAXspm**, the alarm ends feed cycle,
so **Reset Alarm** = **Yes** & **Submit** re-starts the feed.

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

3.7 No Feed on No Flow

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

Select **Interlocked** from the pull-down



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

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

In this example relay output 3 controls an inhibitor pump.

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

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

3.8 Blocking-Delaying a Feed

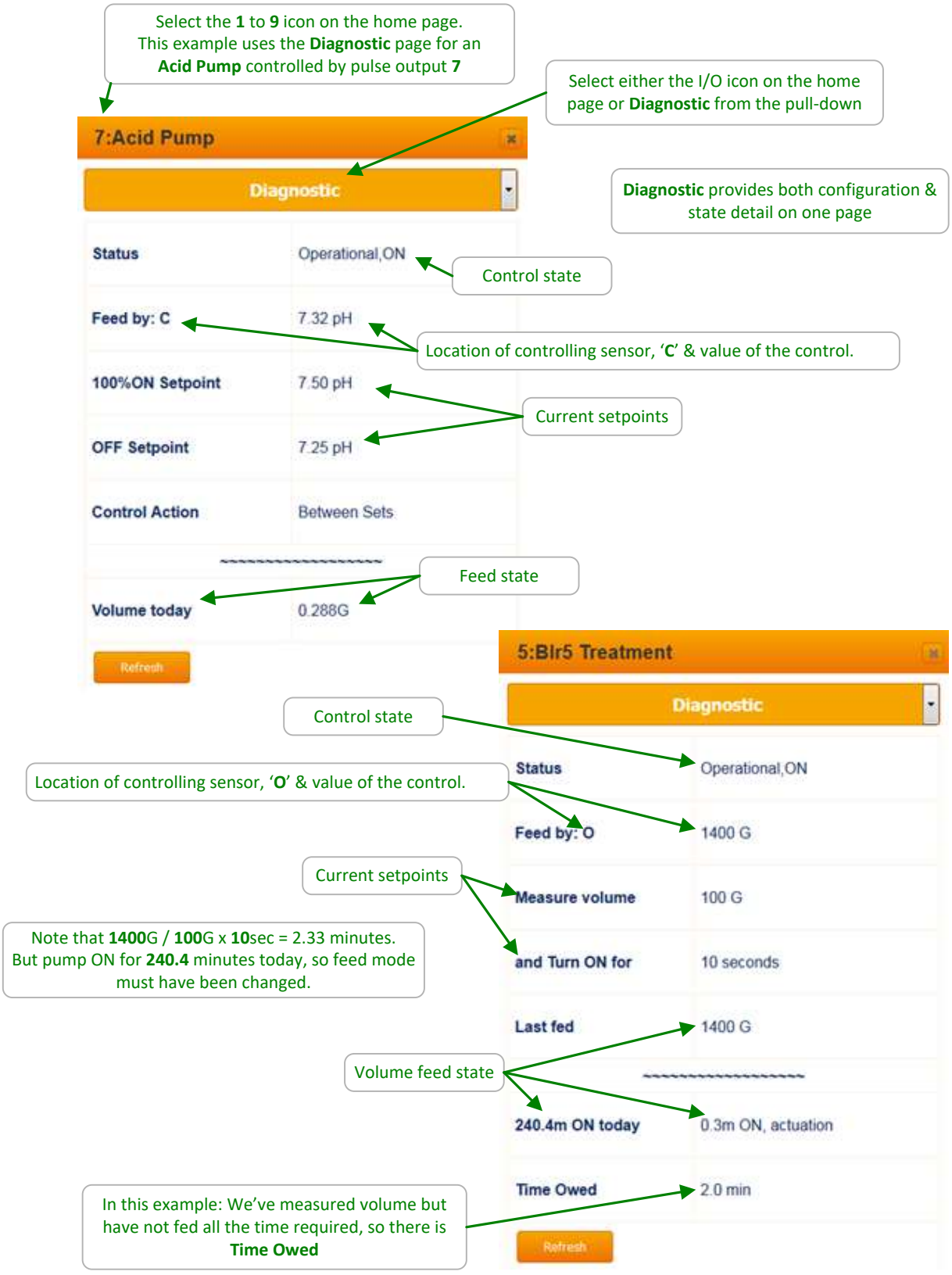
Sidebar:
Warning: A poorly conceived block may prevent a control from running or working correctly.

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

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

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

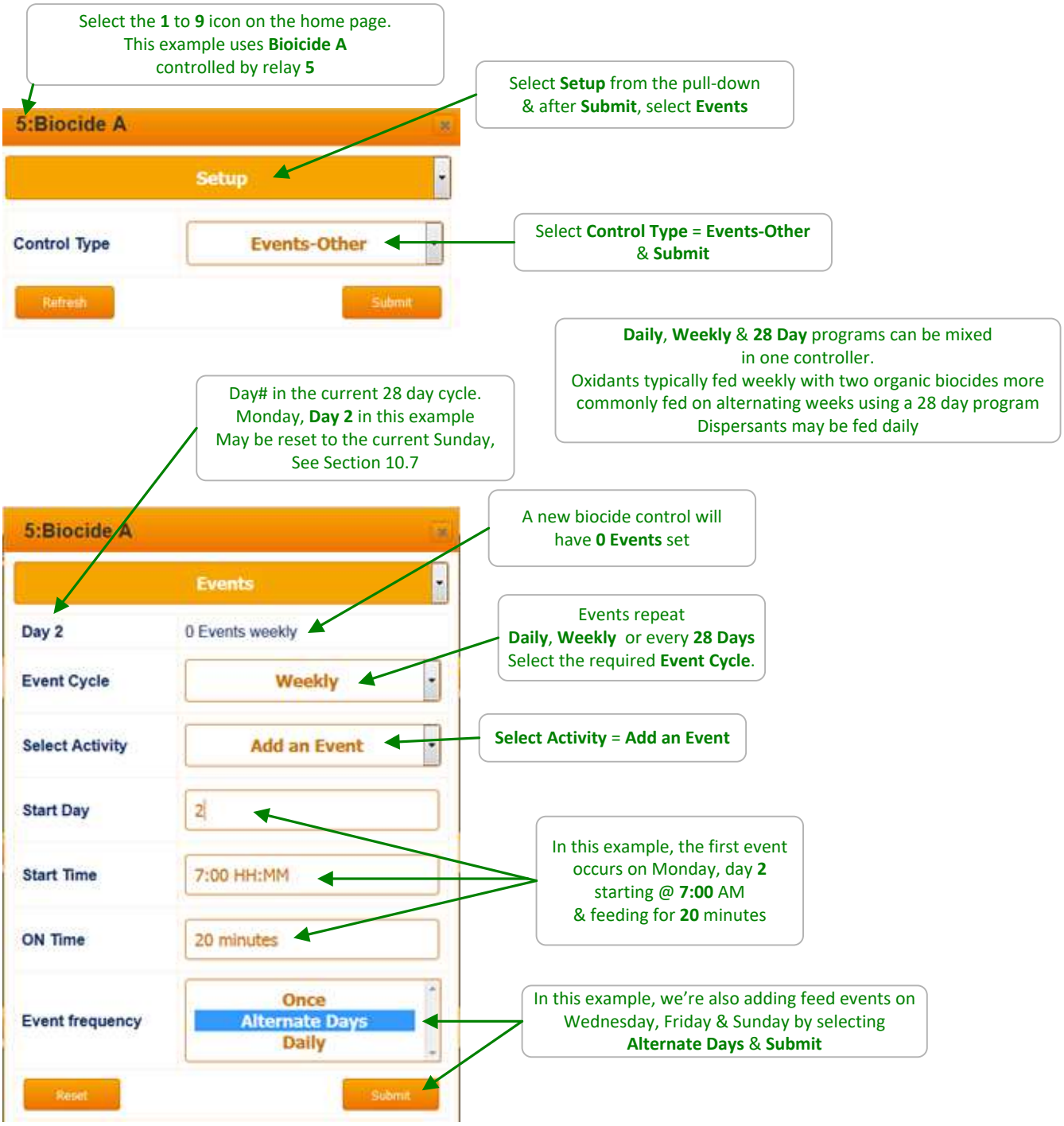
3.9 Feed Diagnostics



3.9 Feed Diagnostics cont.

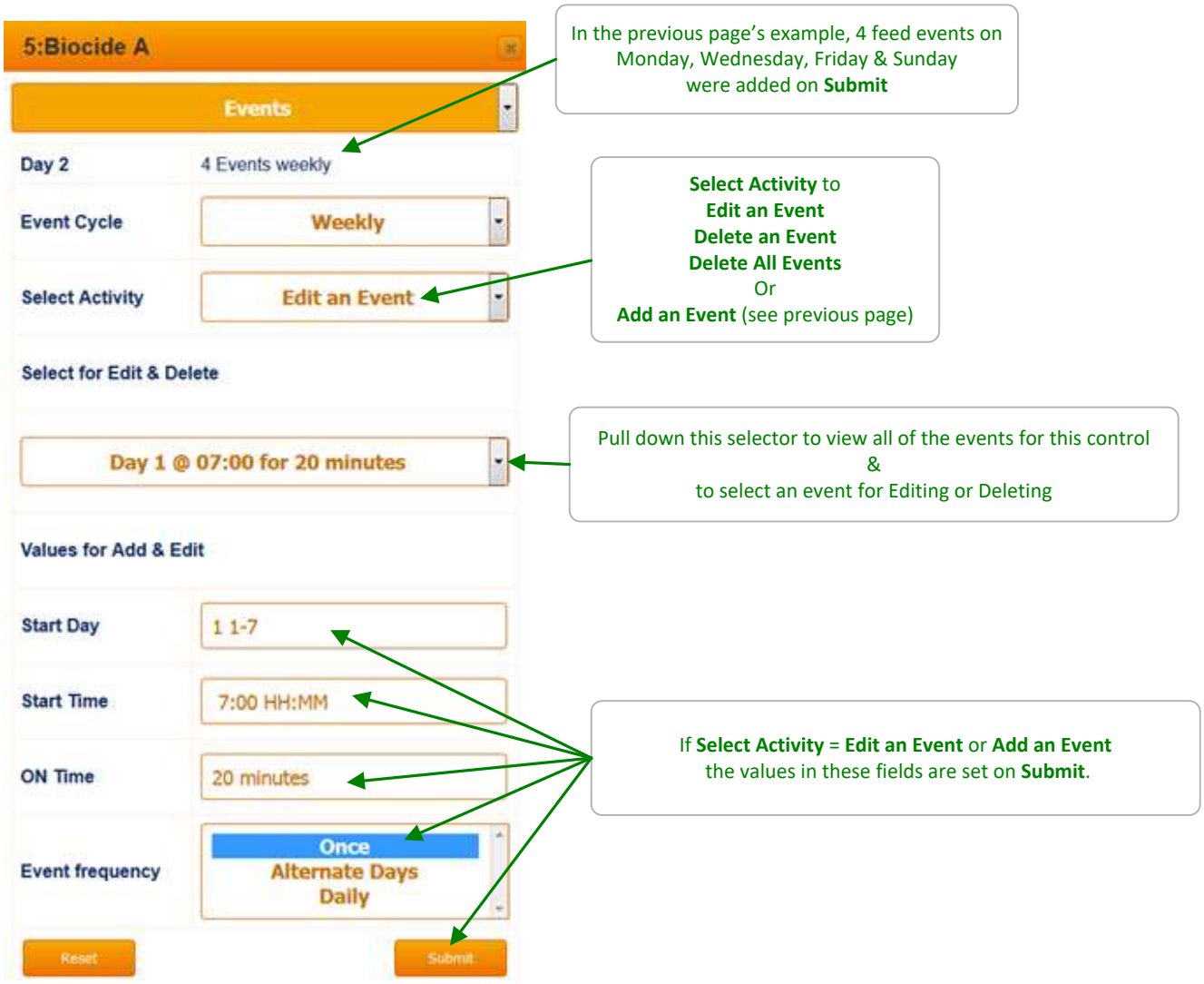
4. Biocide Events & Other Controls: Feeding by Time & Date

4.1 Setting & Viewing Events



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

4.1 Setting & Viewing Events cont.

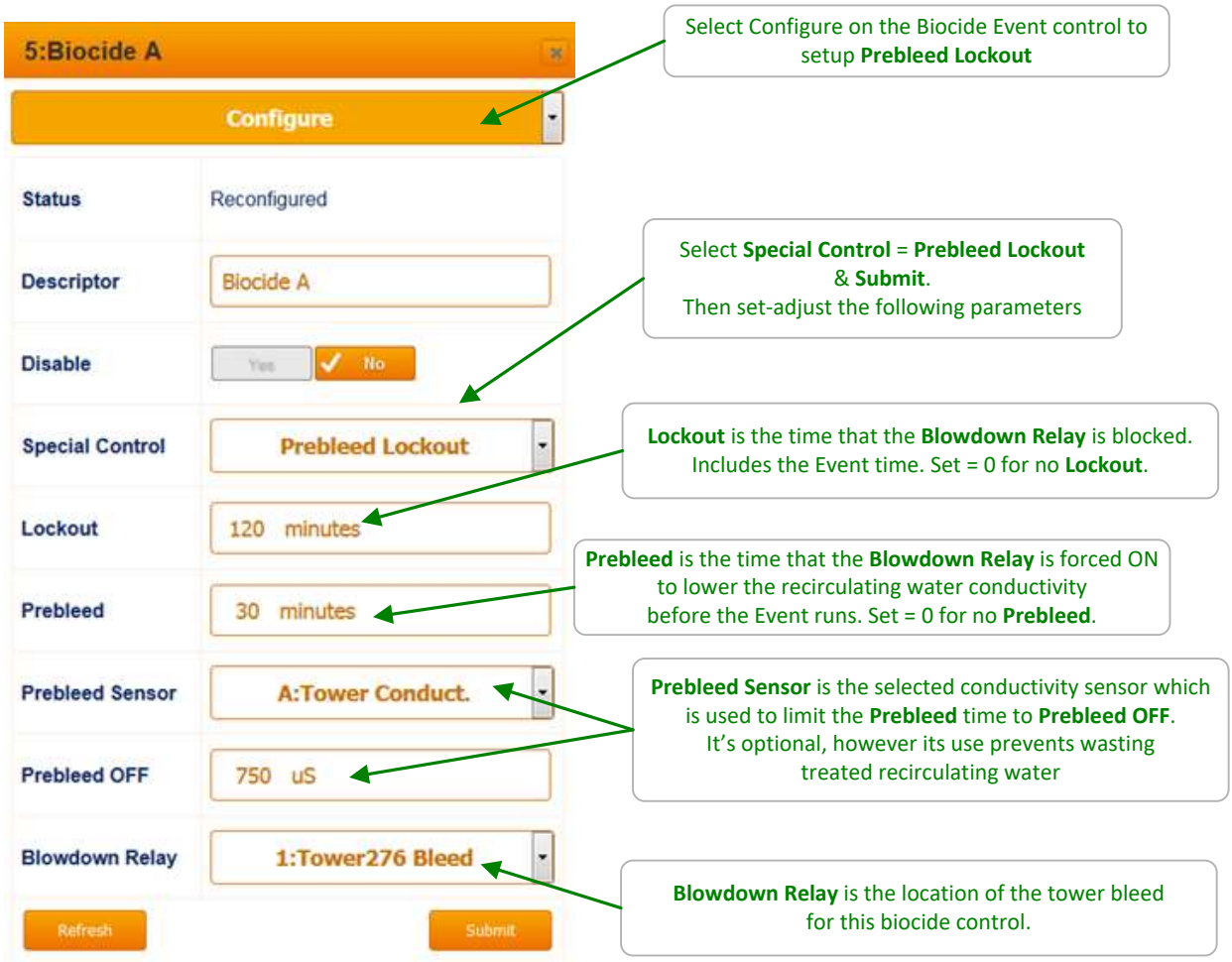


Sidebar:
Limit Alarms, Interlocking & Blocking also are used with Biocide Events.
They are set identically to those for **Chemical Feed Controls**.
Refer to Sections 3.5 to 3.7 for setup & state pages.

Biocide feeds are always interlocked with the tower flowswitch.

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

4.2 Prebleed – Lockout



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

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

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

4.3 Alarm Relay

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

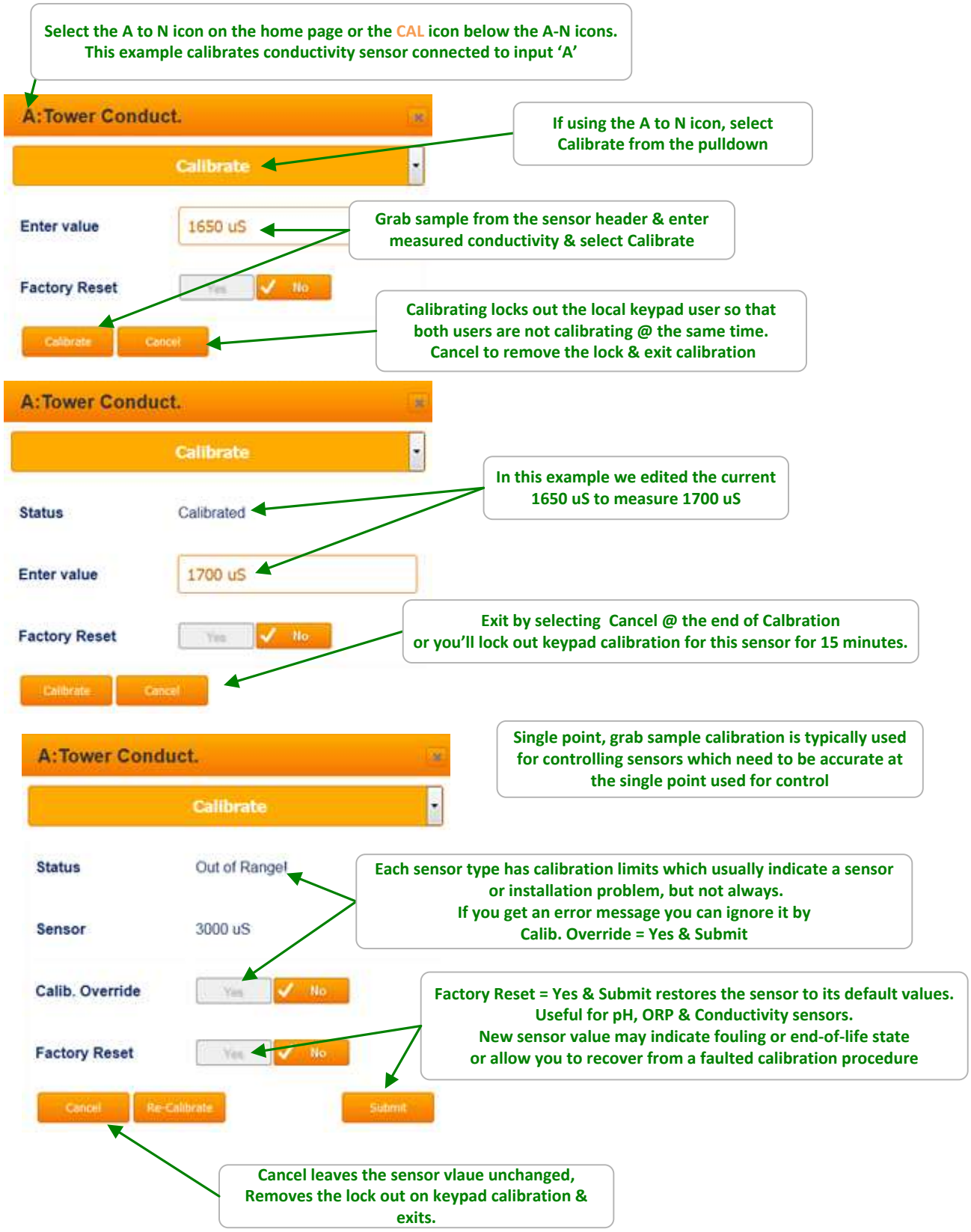
4.5 Sensor Wash

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

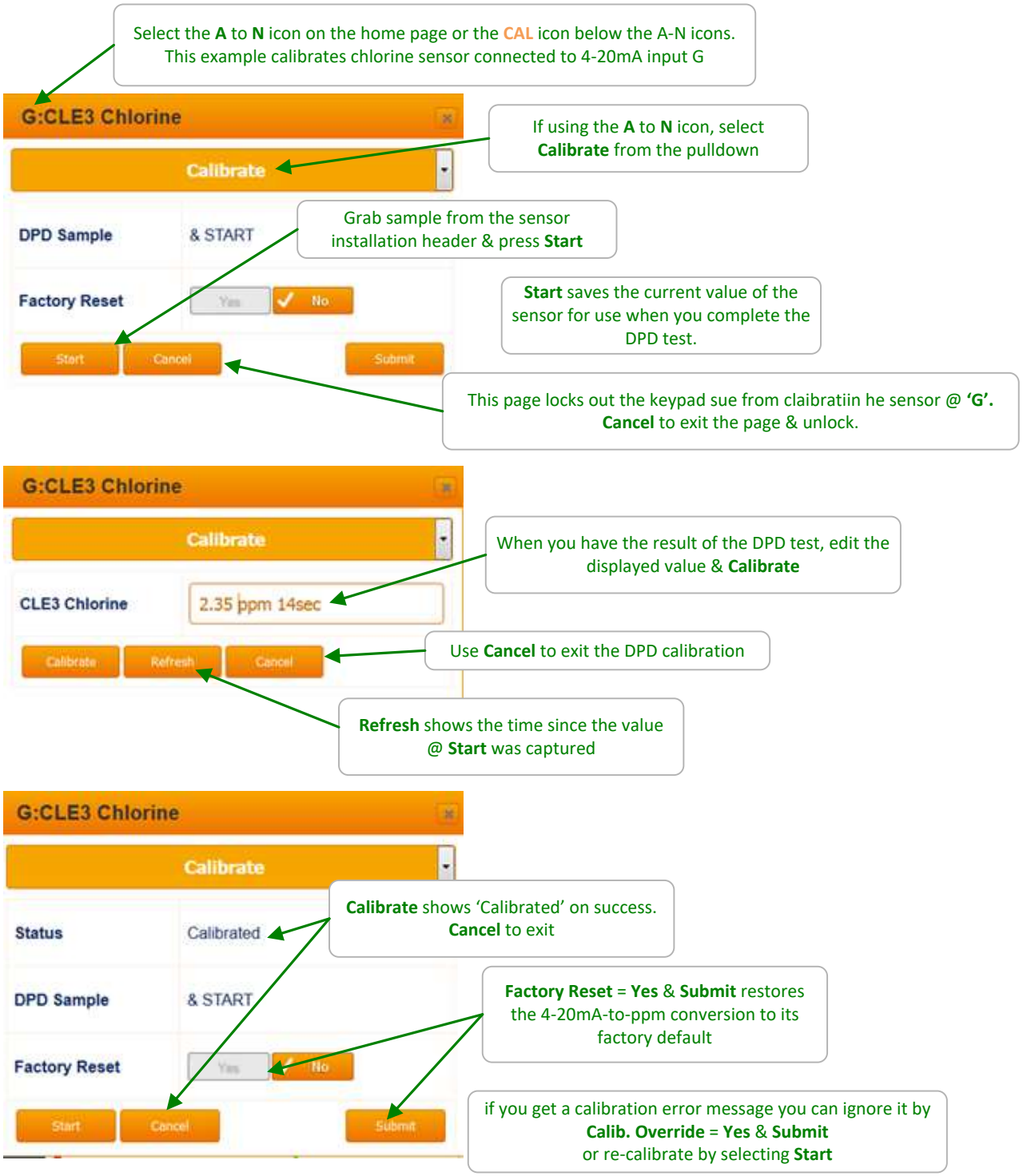
Sensor Wash locks all of the sensor values prior to starting the wash event, blocking alarms & unexpected sensor values on the HMIs.
If concerned about other controls running during a wash, block (Section 3.7) the controls.

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

5.1 Sensor Calibration: 5.1.1 Single Point – Grab Sample

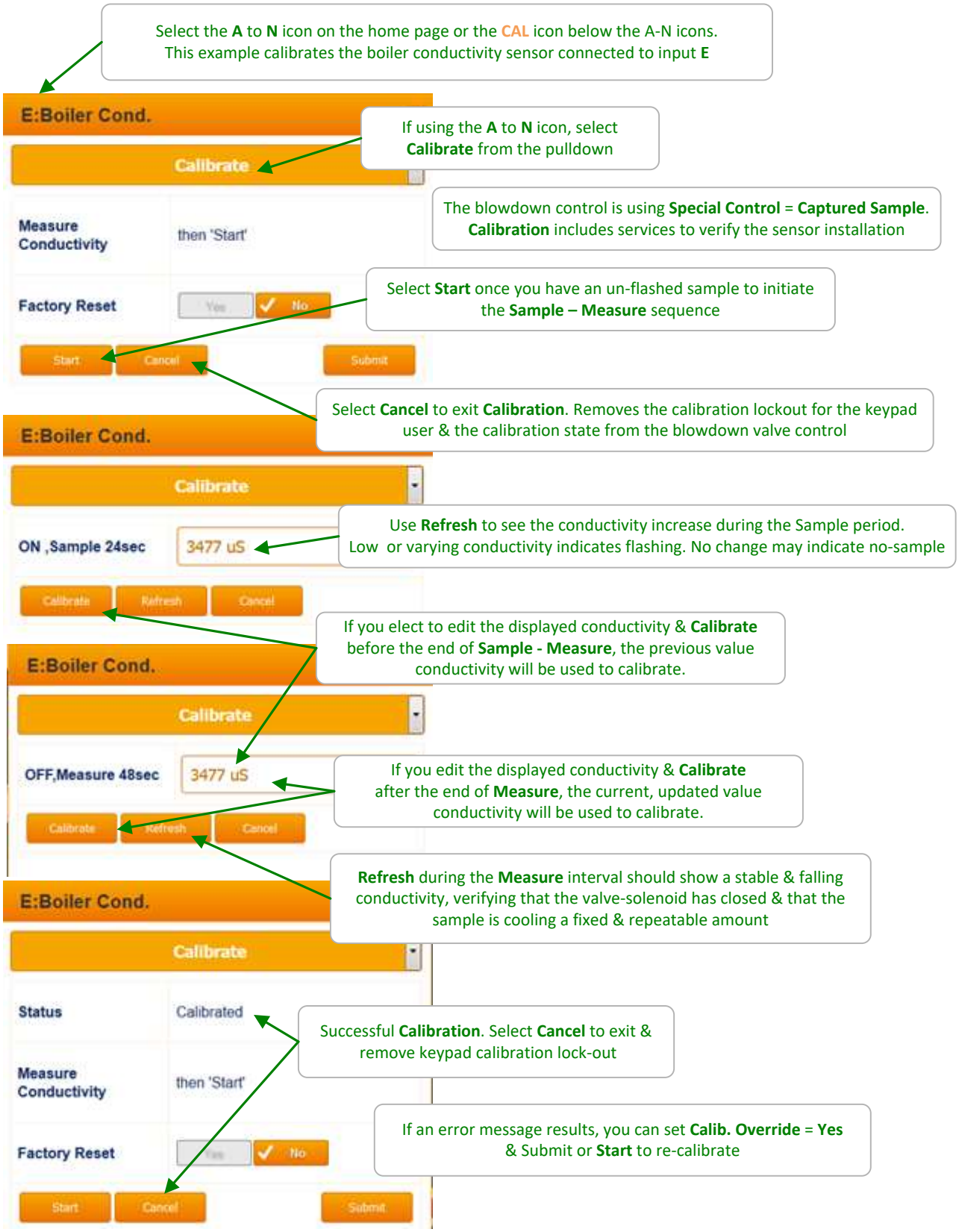


5.1 Sensor Calibration: 5.1.2 DPD: Oxidant Sensors

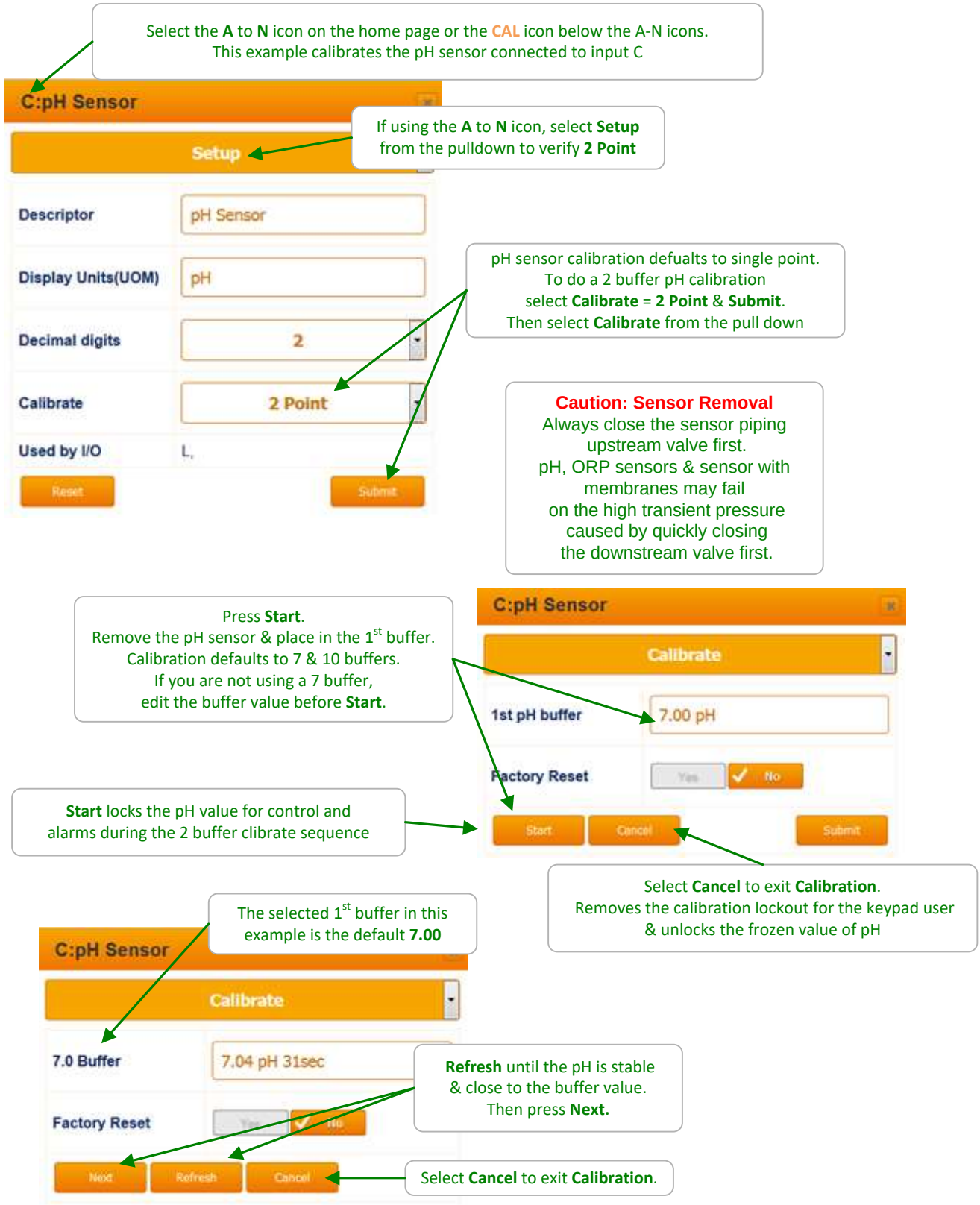


Sidebar:
The DPD calibration applies to CLB,CTE & CLE3 Chlorine, CGE, CBR Bromine & PAA Peracetic sensors. All of these sensors connect to 4-20mA inputs.
Calibrates the sensor value & not the underlying 4-20mA input.

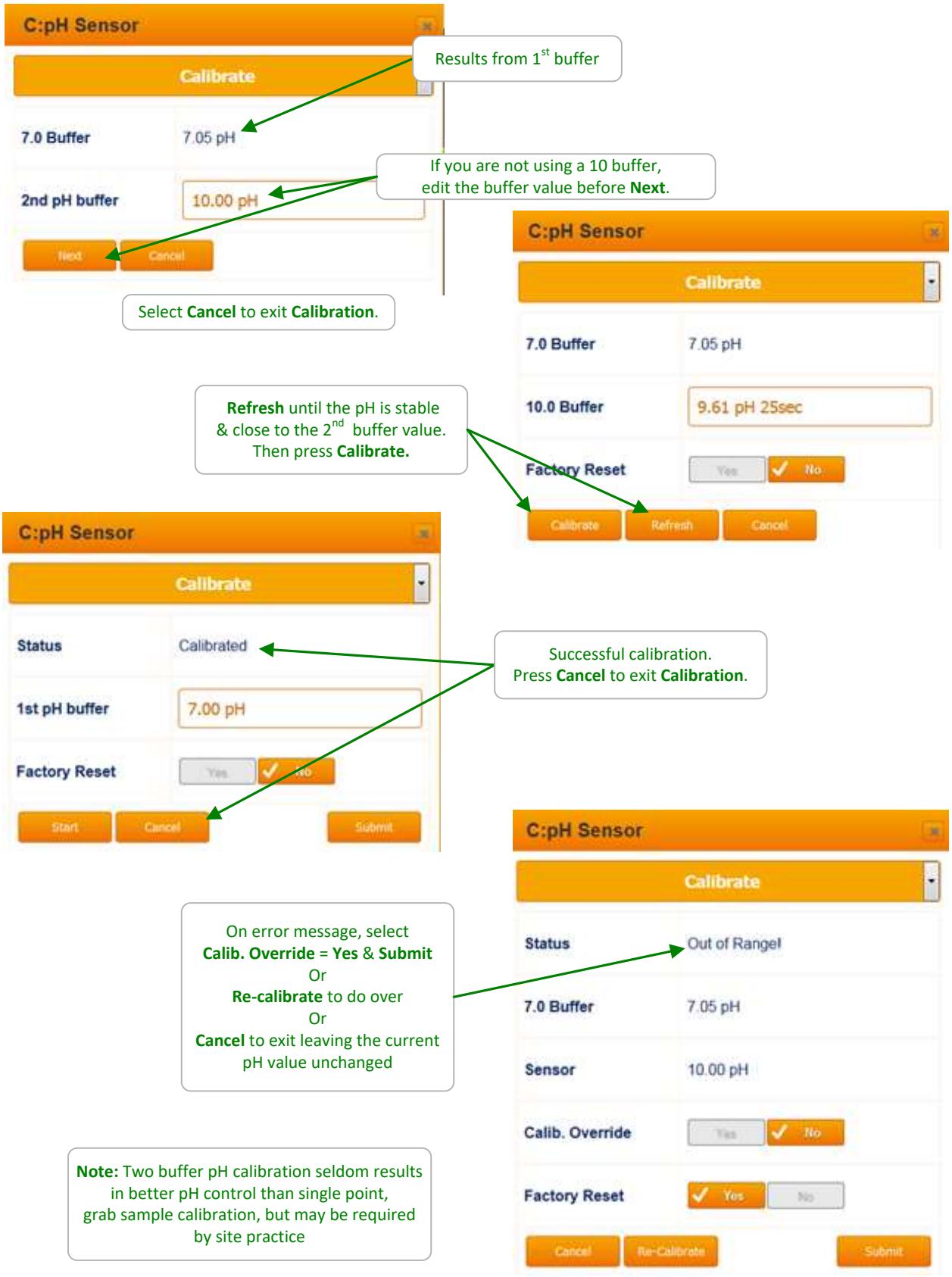
5.1 Sensor Calibration: 5.1.3 Boiler Conductivity



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

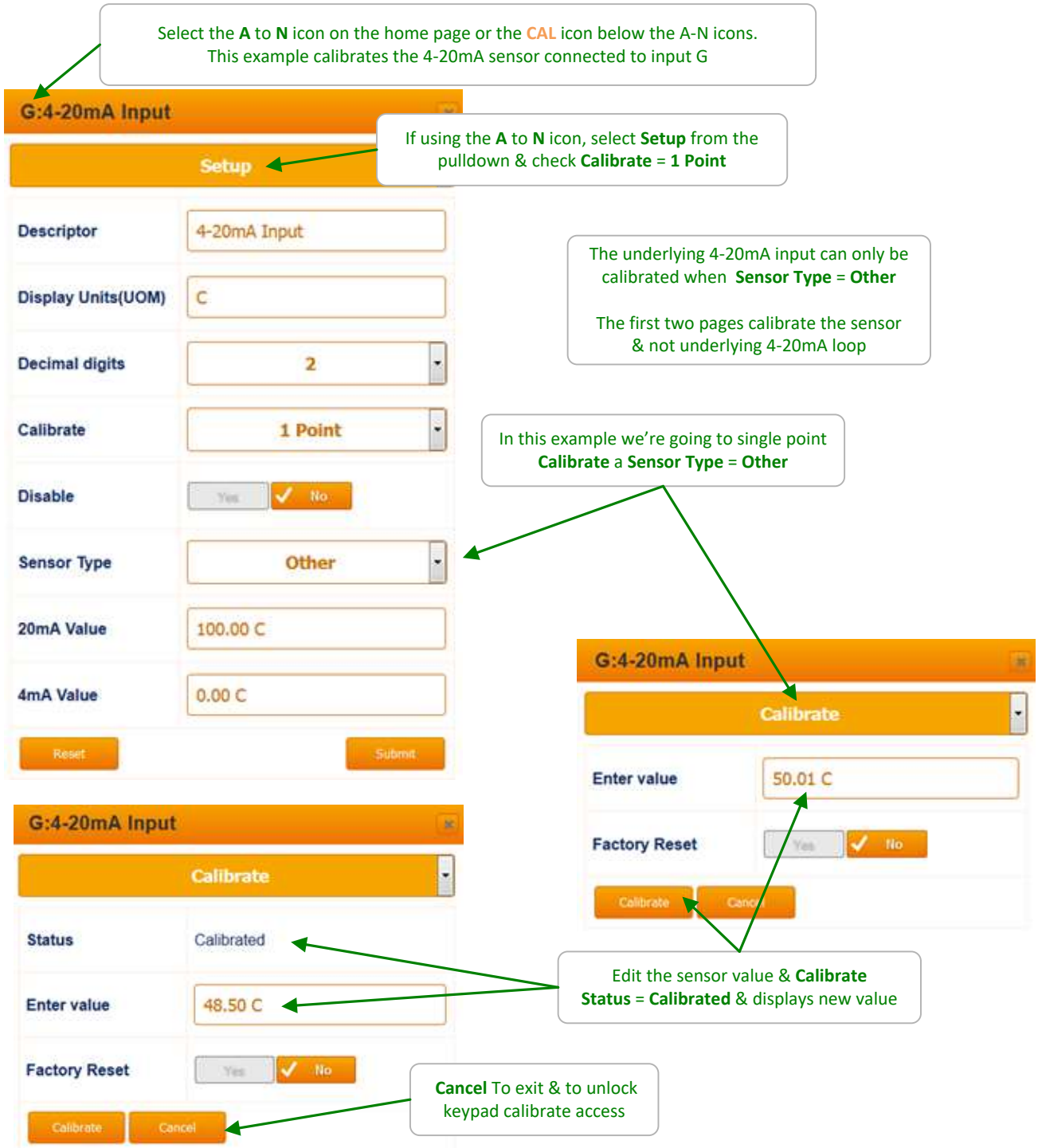


5.1 Sensor Calibration: 5.1.4 pH Dual Buffer Calibration 2 of 2



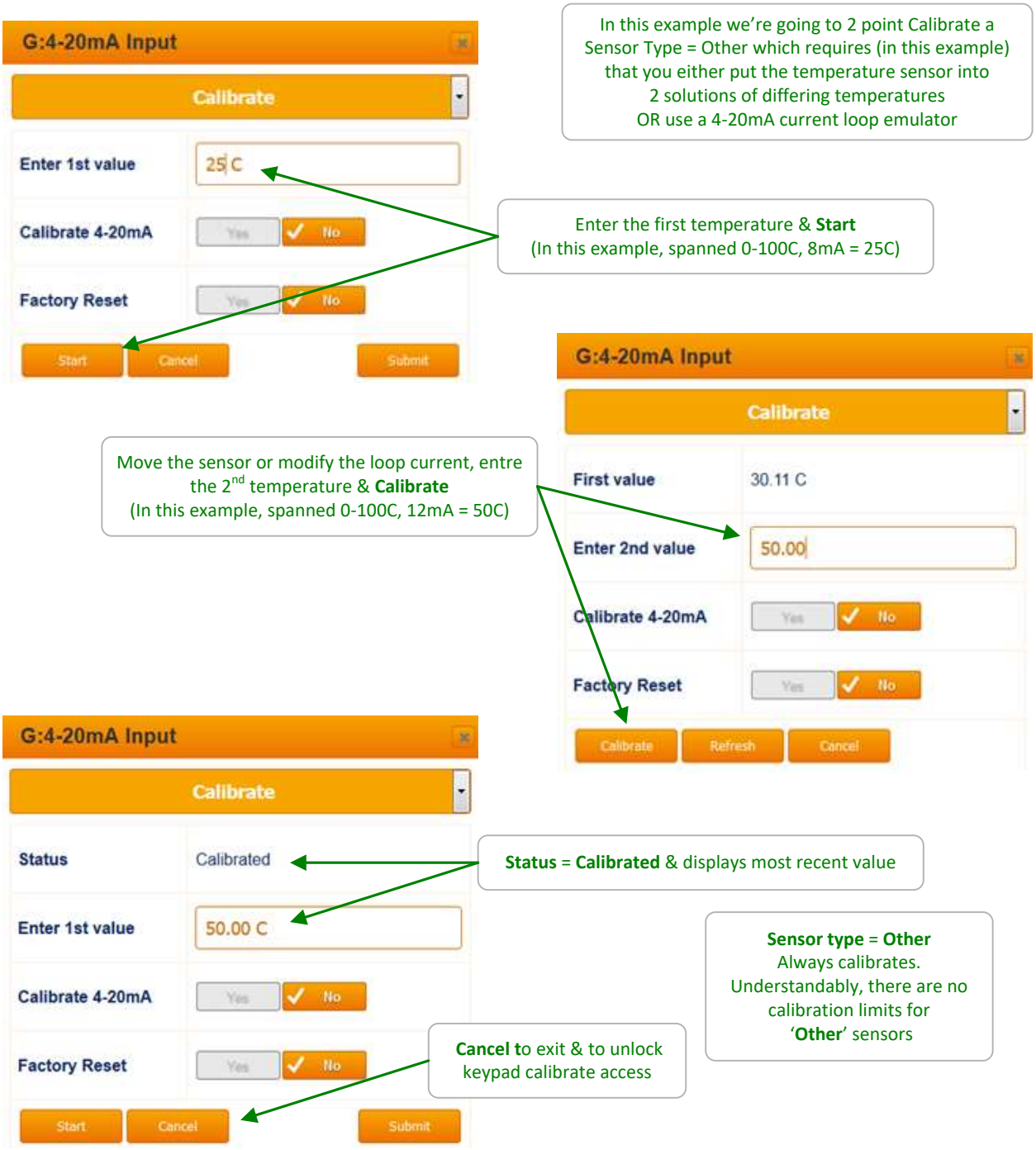
5.1 Sensor Calibration: 5.1.5 4-20mA Input Loop Calibration 1 of 3

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



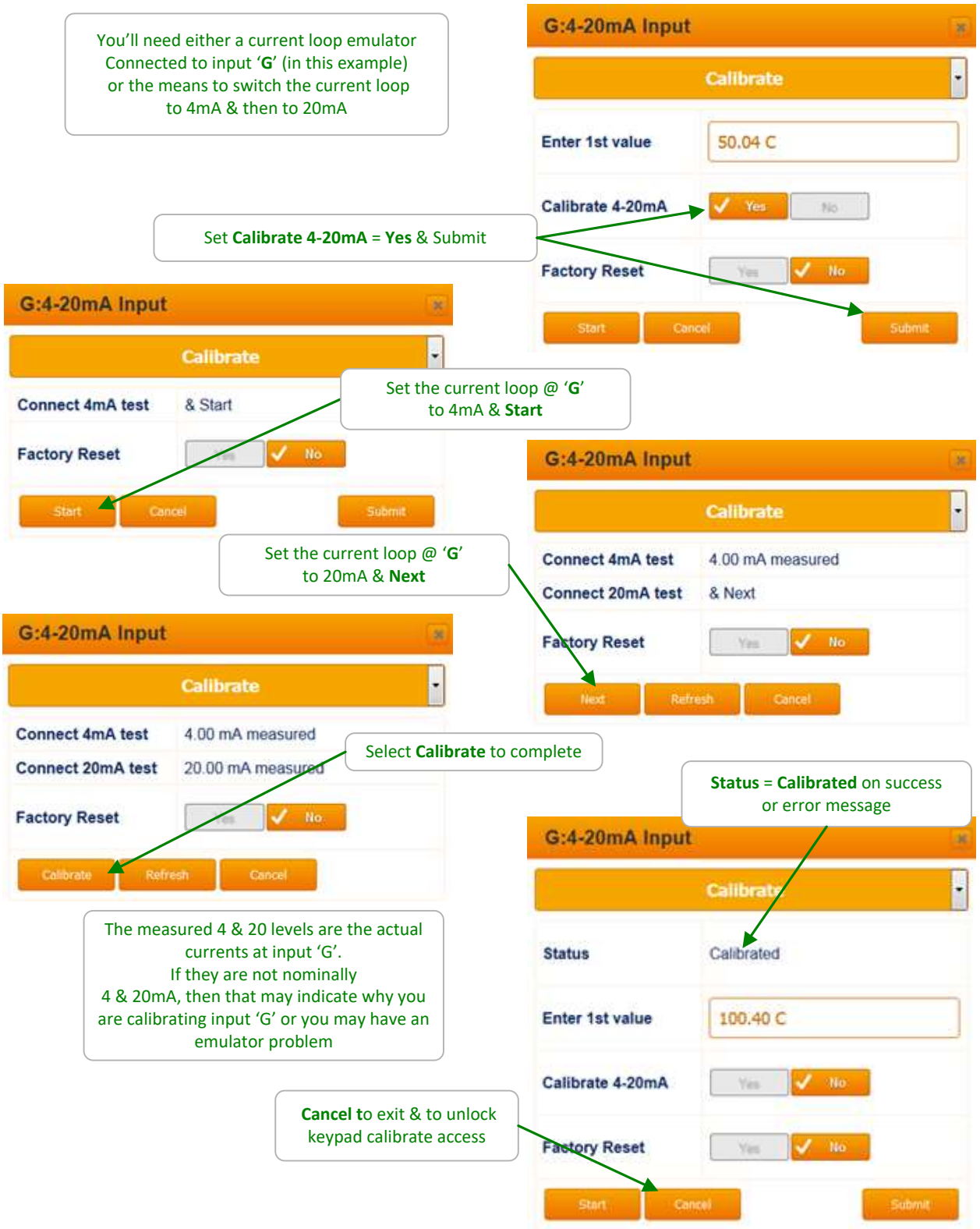
5.1 Sensor Calibration: 5.1.5 4-20mA Input Loop Calibration 2 of 3

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

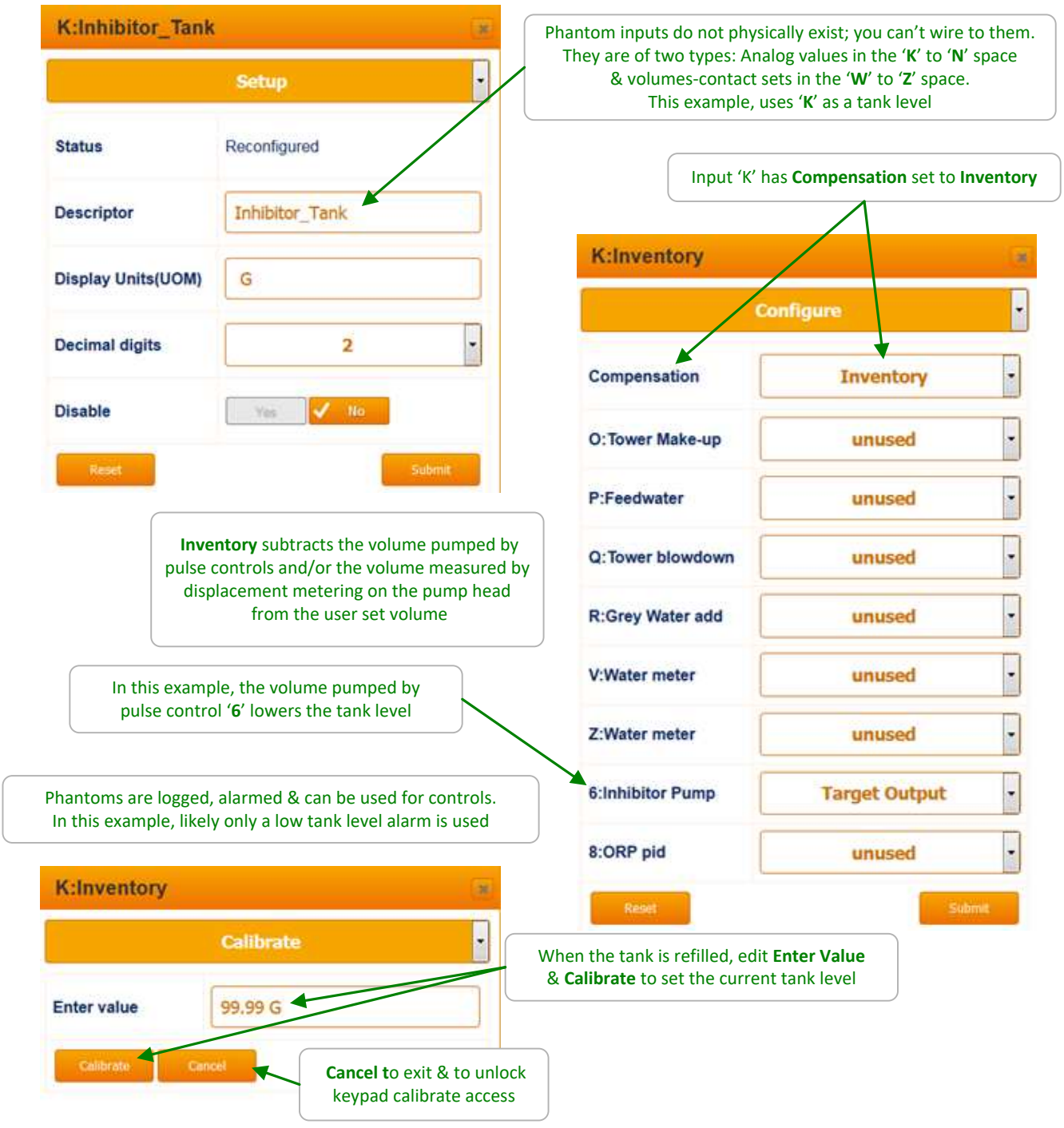


5.1 Sensor Calibration: 5.1.5 4-20mA Input Loop Calibration 3 of 3

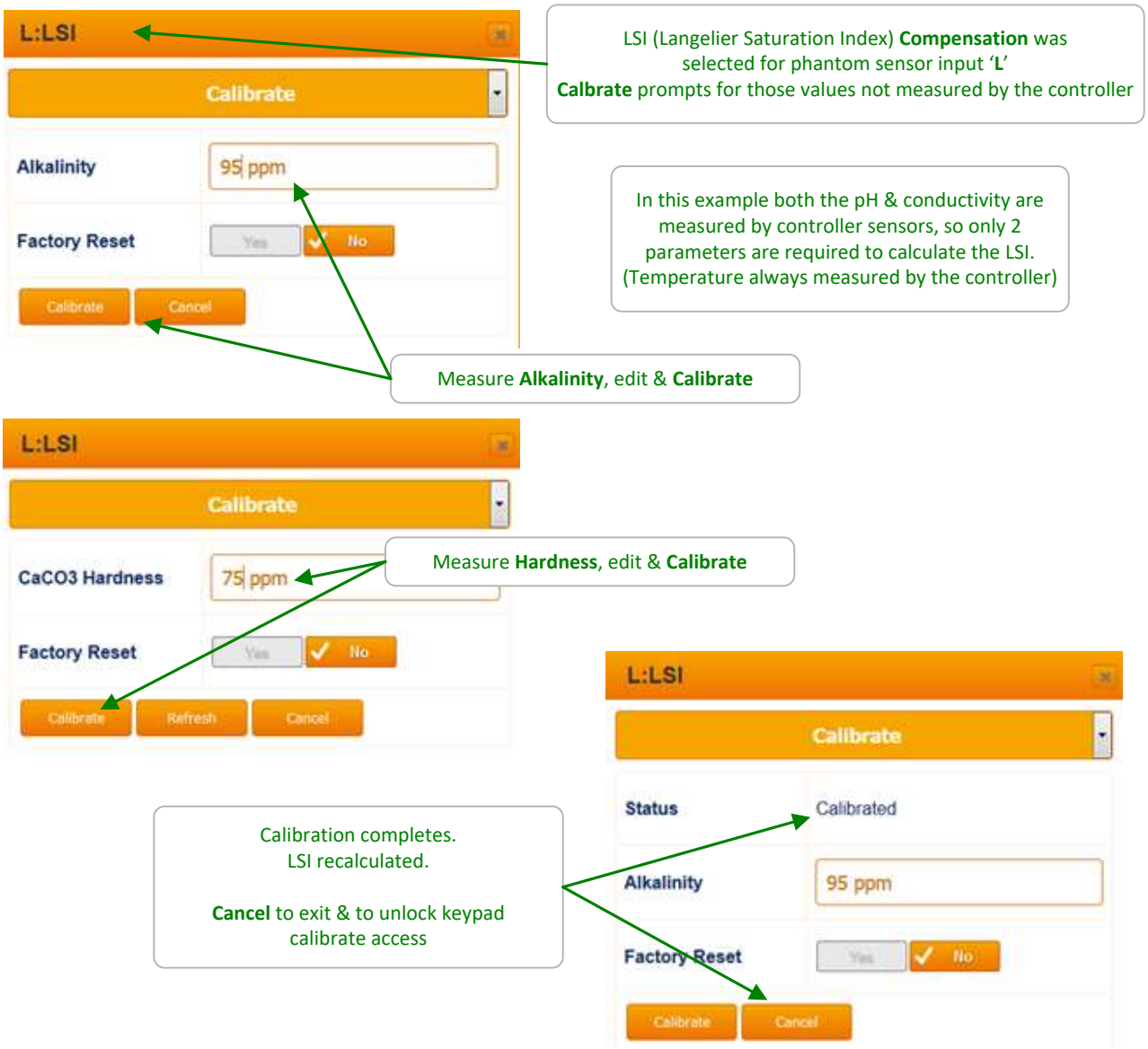
You'll rarely need to calibrate the underlying 4-20mA current loop.
However if **Setup** page **Sensor type** = **Other** and **Calibrate** = **2 Point** you can calibrate the underlying 4mA & 20mA levels as follows:.



5.1 Sensor Calibration: 5.1.6 Inventory



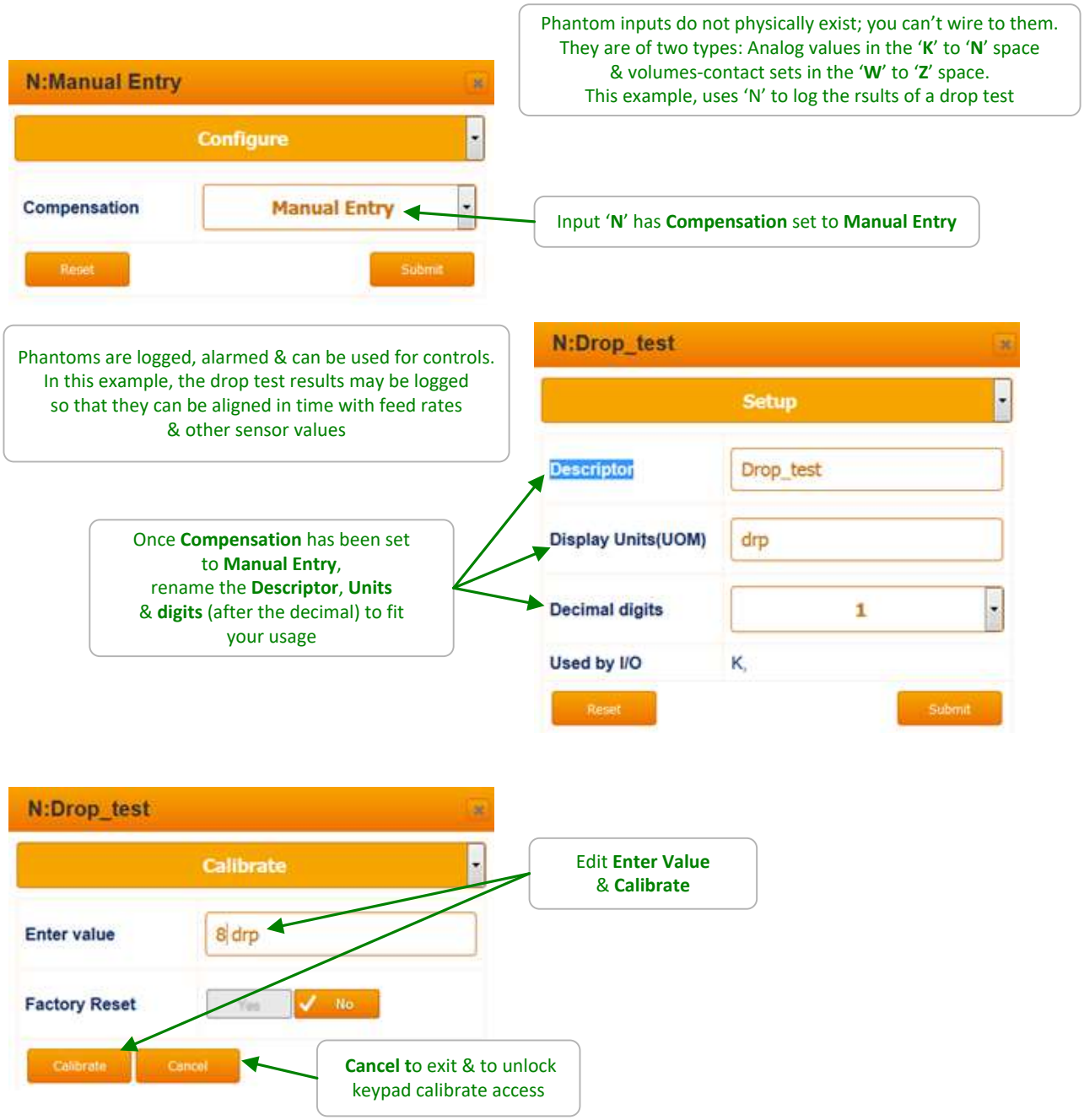
5.1 Sensor Calibration: 5.1.7 LSI & Manual Inputs 1 of 2



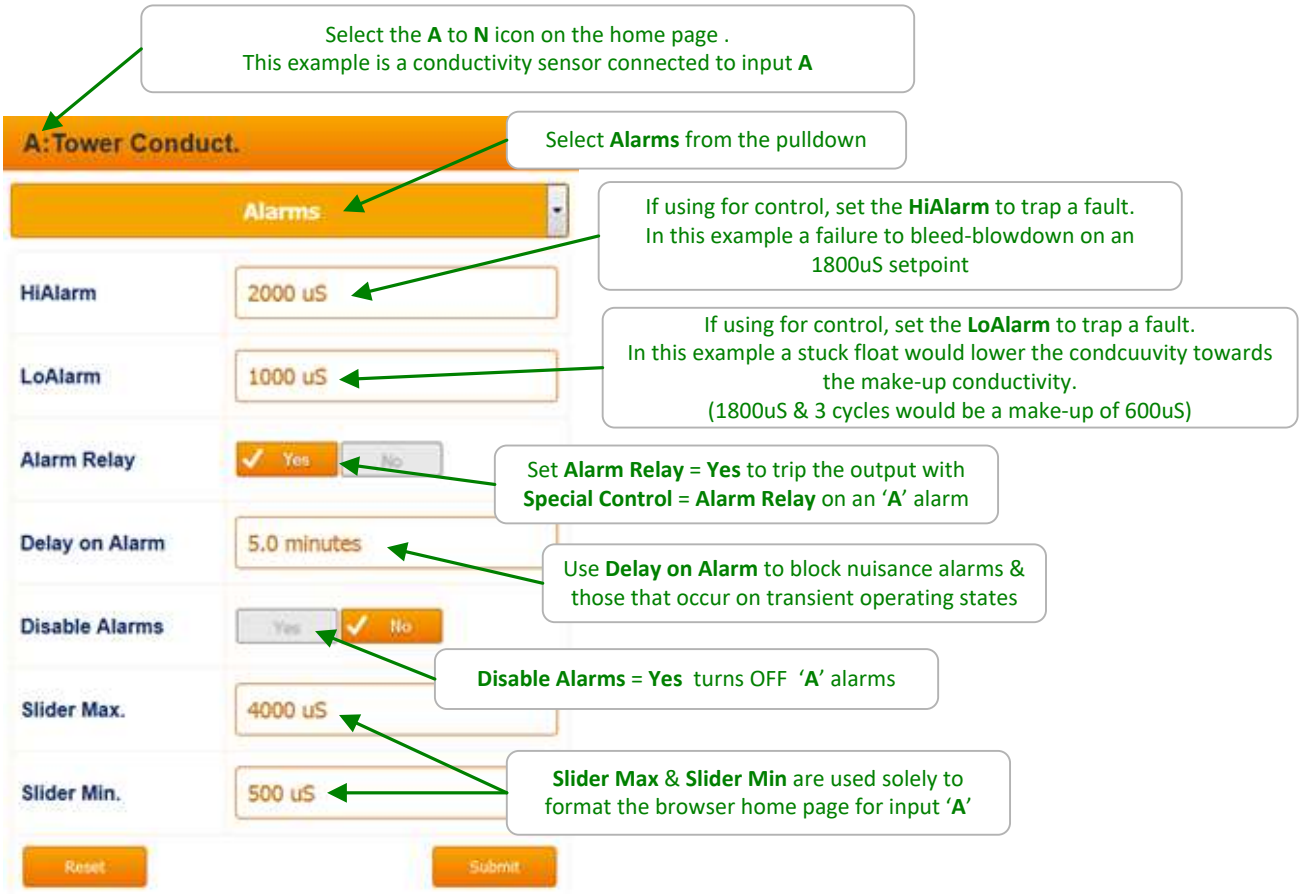
Sidebar:
Ryznar Stability Index or 'Ryznar' is a generalized measure of scaling-corrosivity & calculated concurrently from the same parameters & sensors as LSI.
The Ryznar value is displayed on the LSI **Diagnostics** page & Ryznar alarms are set on the LSI **Alarms** page

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

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



5.2 Sensor Alarms 1 of 2



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

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

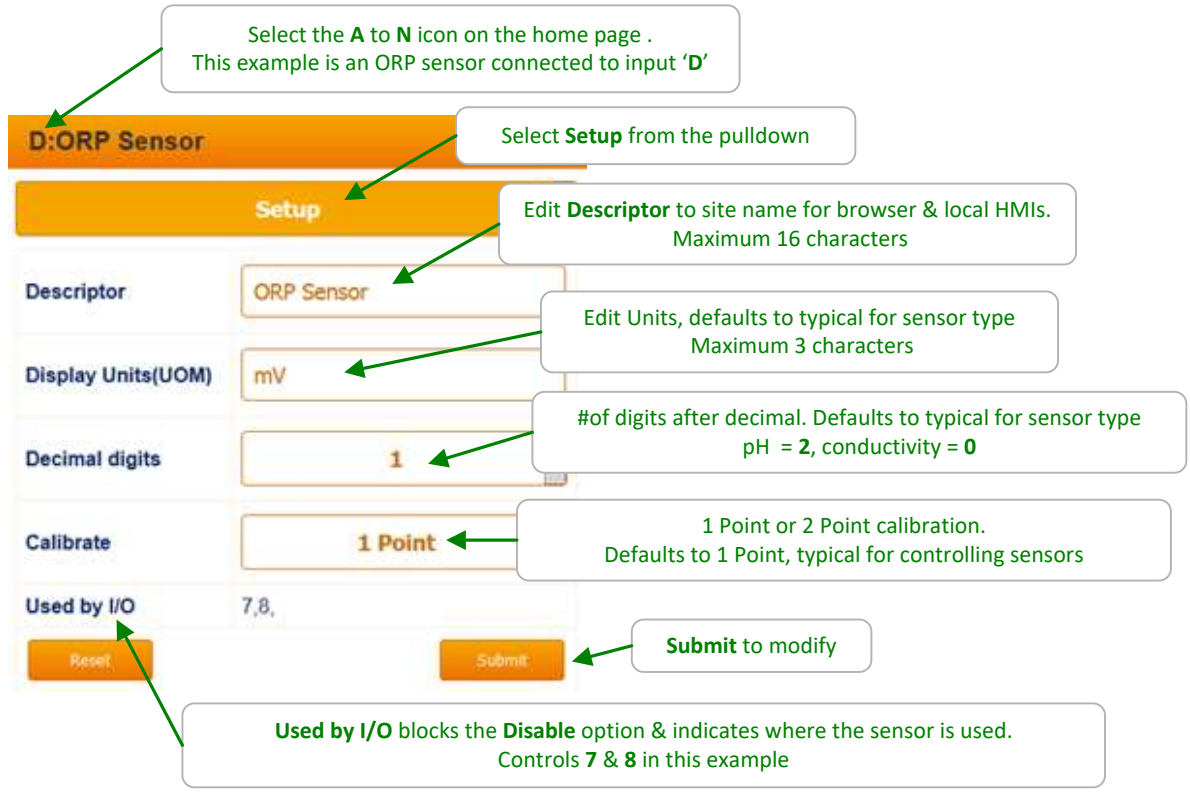
Understandably alarms are set to reflect site practice, chemistry & plumbing & time of year.
Review each control loop, its sensor-meter, interlock, pump or actuator & setpoints.
It's typical that sensor & feed limit alarms in concert can trip on the most likely faults.

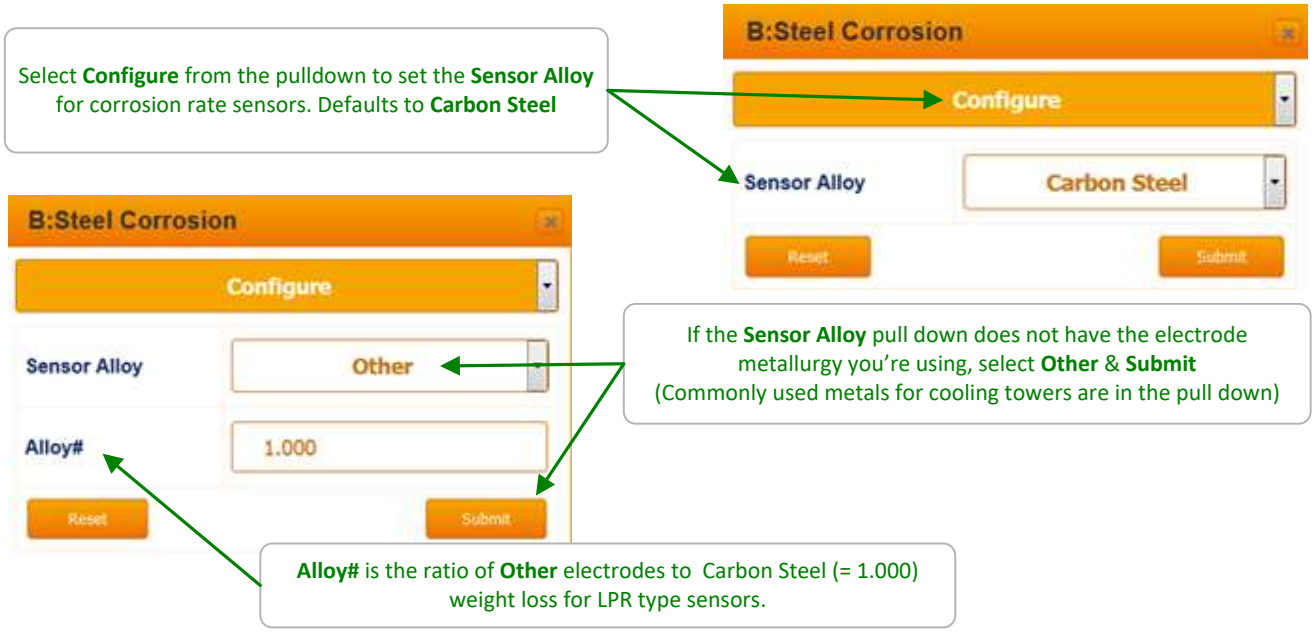
5.2 Sensor Alarms 2 of 2

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

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

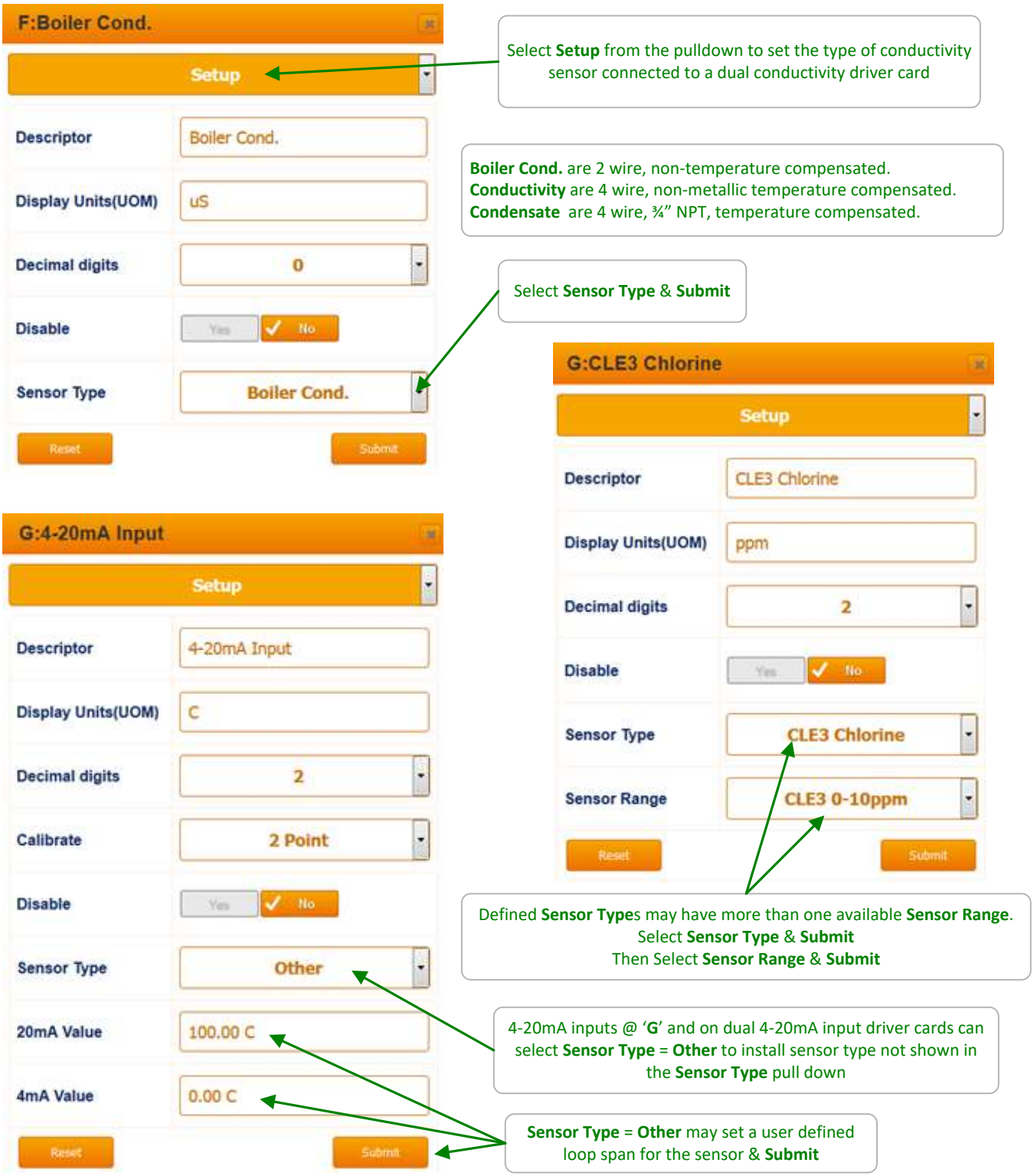
5.3 Sensor Setup 1 of 2





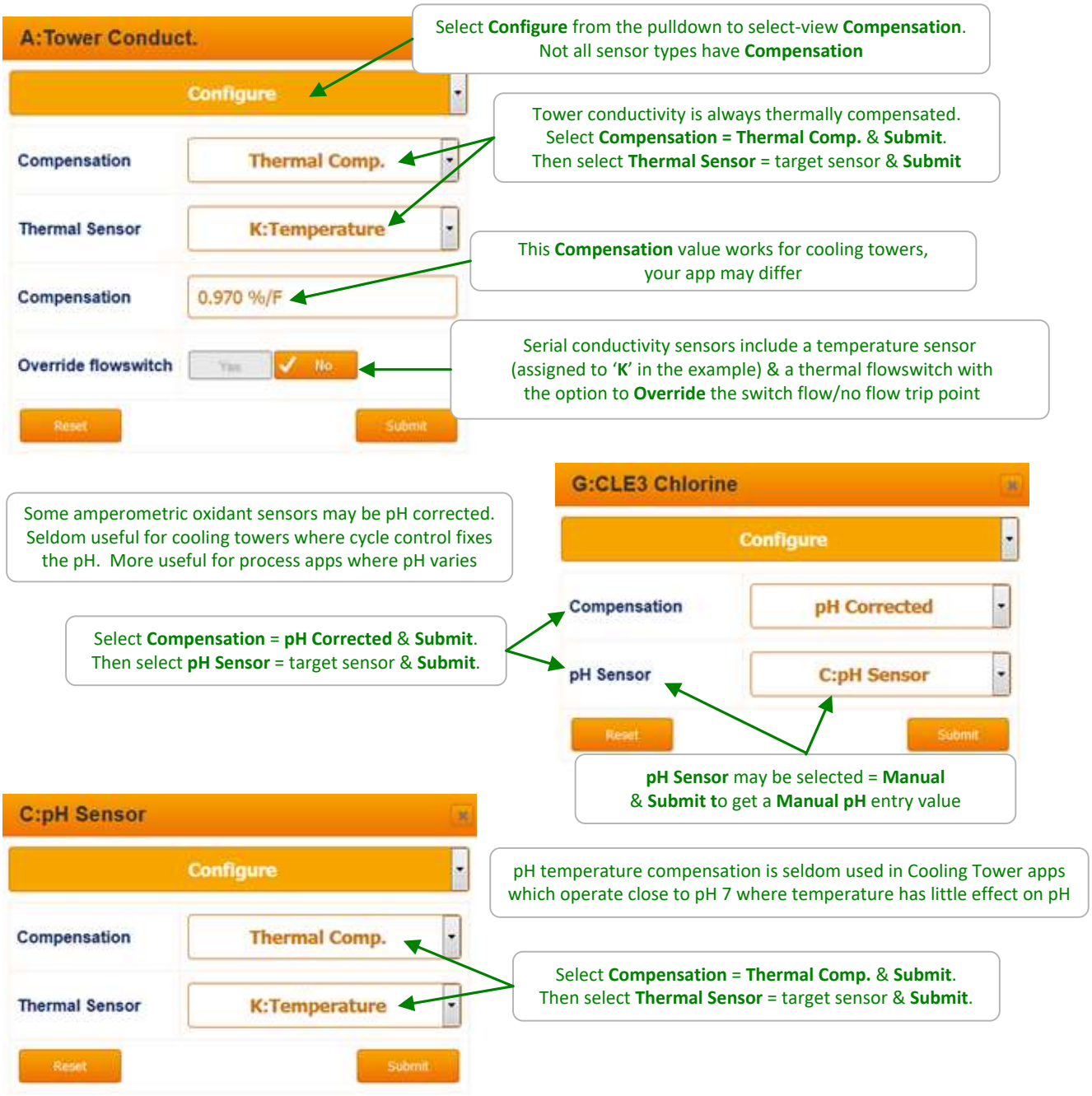
Sidebar:
Disabled sensors do not appear on either the local or browser HMIs or any option pull down.
Sensors cannot be disabled while in use for control, compensation…..
Disabled sensors are re-enabled on the **System** / **Enable I/O** page.

5.3 Sensor Setup 2 of 2



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

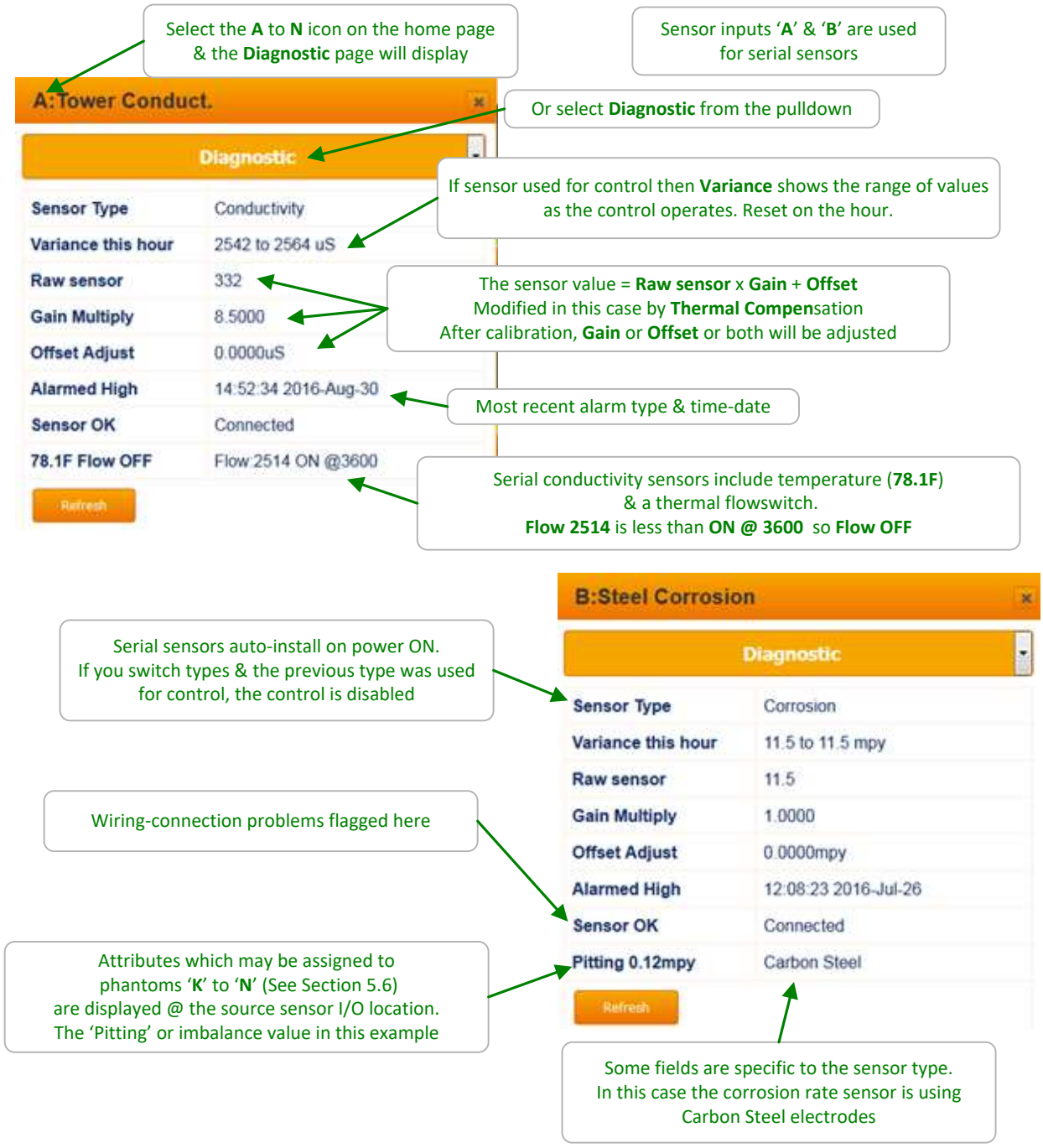
5.4 Sensor Compensation



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

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

5.5 Sensor Diagnostics 1 of 3

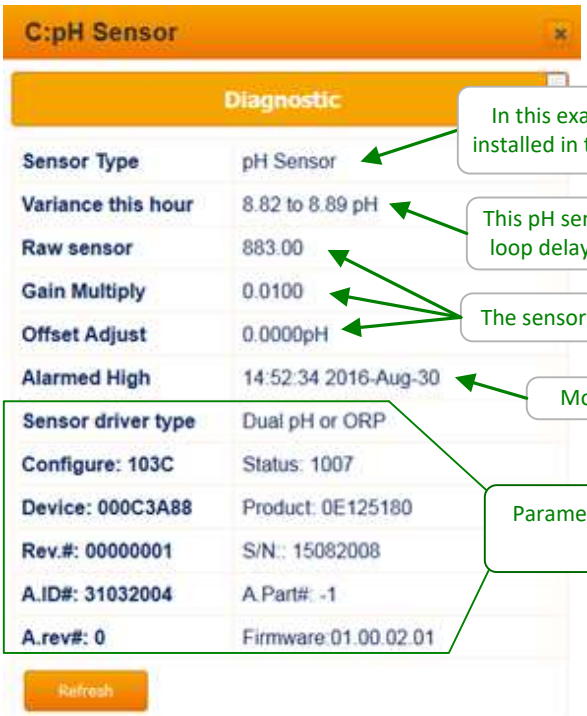


Sidebar:
Diagnostic is a summary of the sensor state.
Contents vary widely with sensor type.

5.5 Sensor Diagnostics 2 of 3

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

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



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

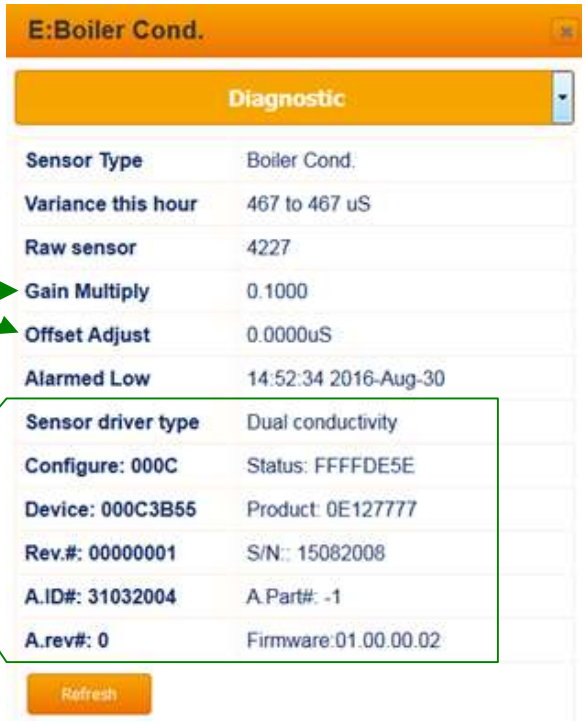
This pH sensor not used for control or the **Variance** would reflect the control loop delay dependant of feed point, sensor location & re-circ water volume

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

Most recent alarm type & time-date

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

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

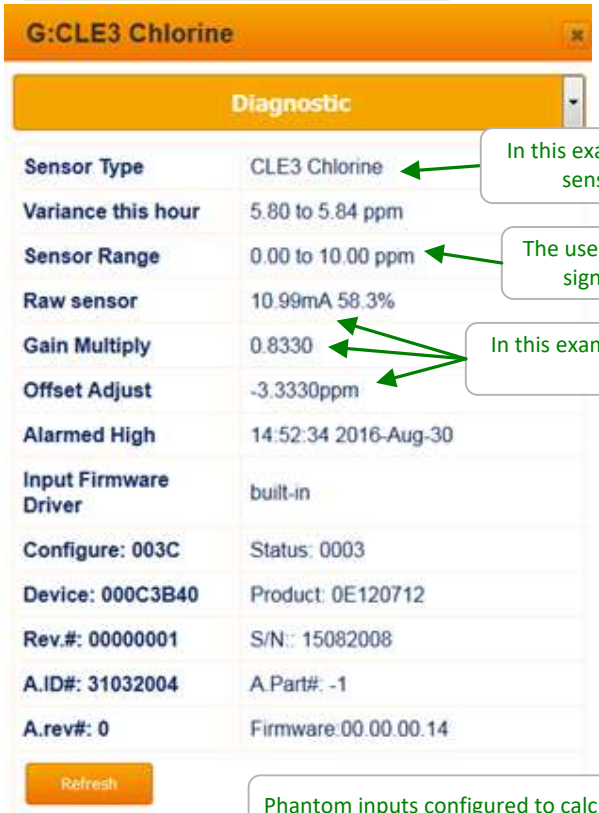


Parameters for the **Dual conductivity** card installed in the E-F slot

5.5 Sensor Diagnostics 3 of 3

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

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

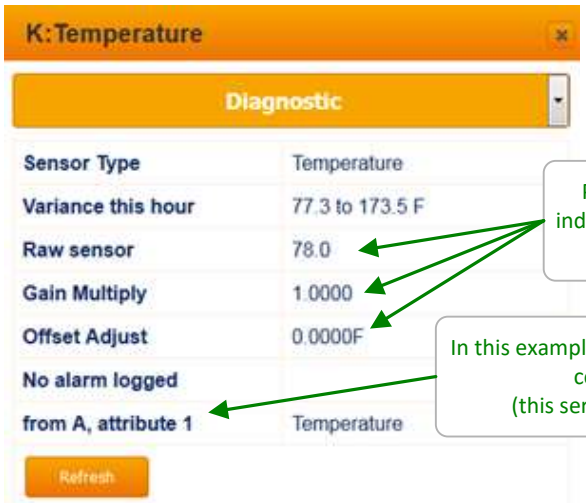


In this example, a 4-20mA **CLE3 Chlorine** sensor is connect to input '**G**'

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

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

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

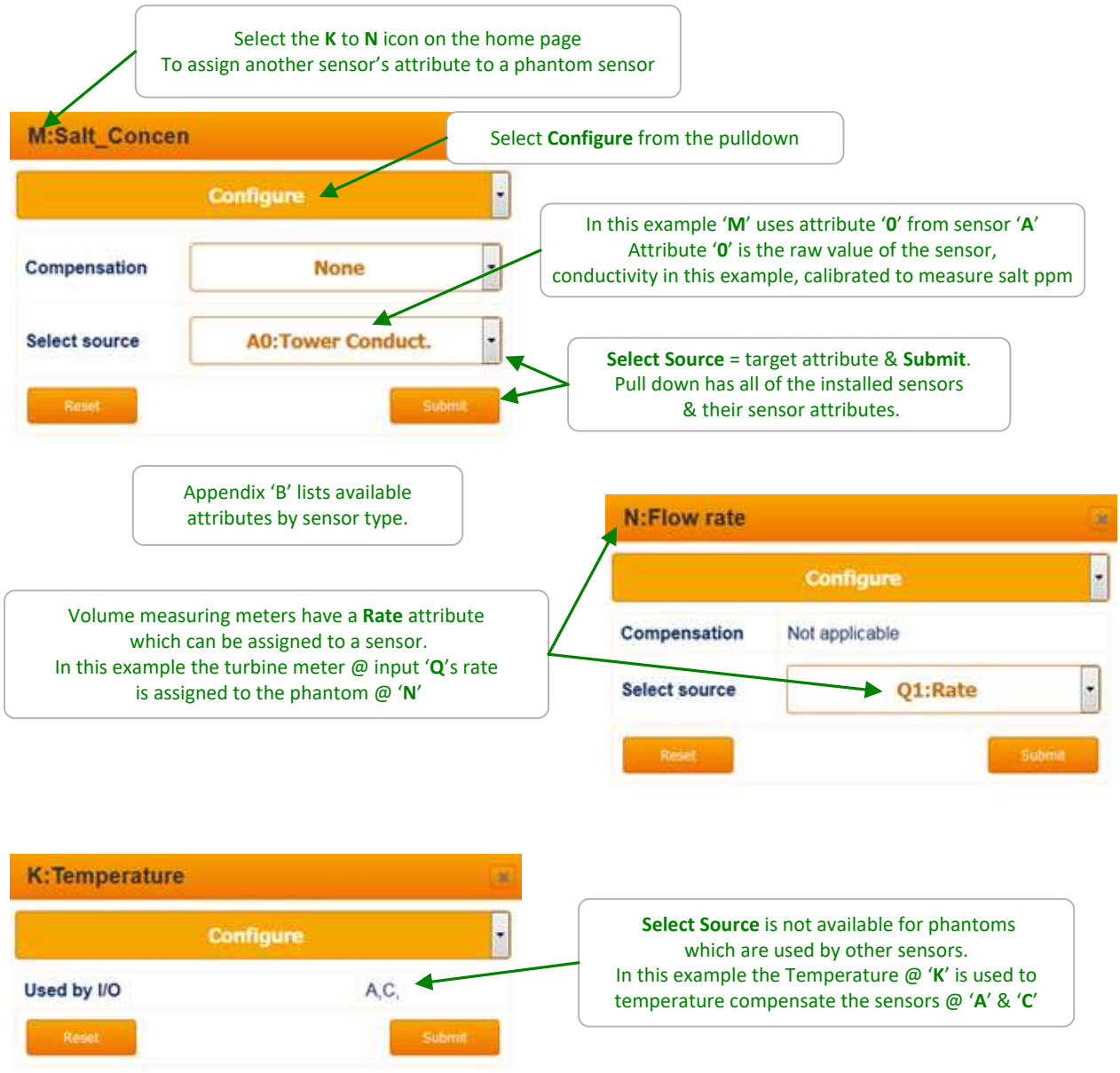


Phantom inputs derived from sensor attributes may be independently calibrated modifying the **Gain** or **Offset** value applied to **Raw Sensor**

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

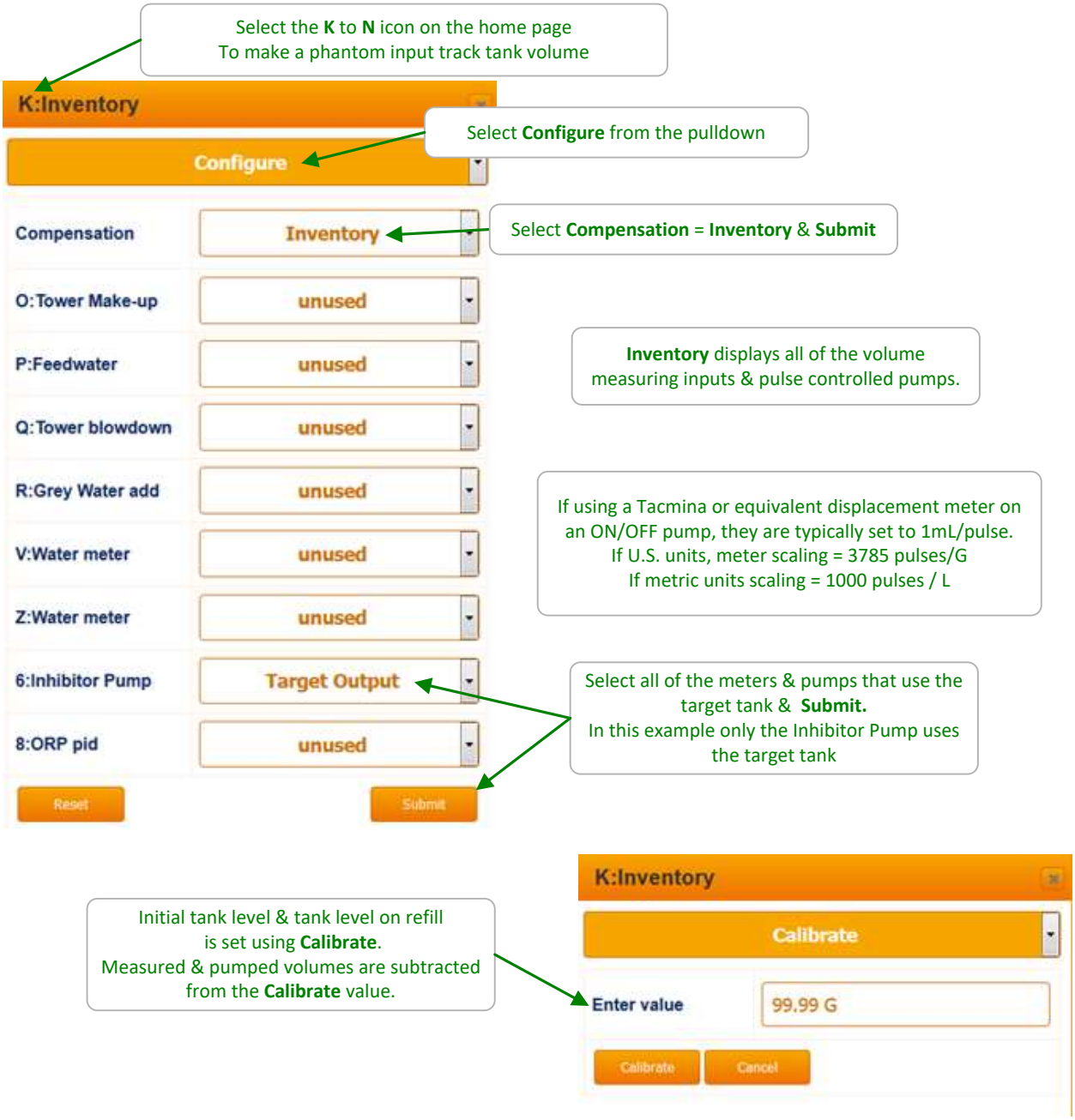
5.6 Using Sensor Attributes for Phantoms

Phantom sensors are input '**K**' through '**N**' and can be enabled from the **Enable I/O** page of **System**.
Once enabled they will automatically appear on the home page for the controller and can be assigned attributes from sensors or used for manual entries and inventory & LSI calculations.



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

5.7 Inventory: Using feed meters & pumped volumes

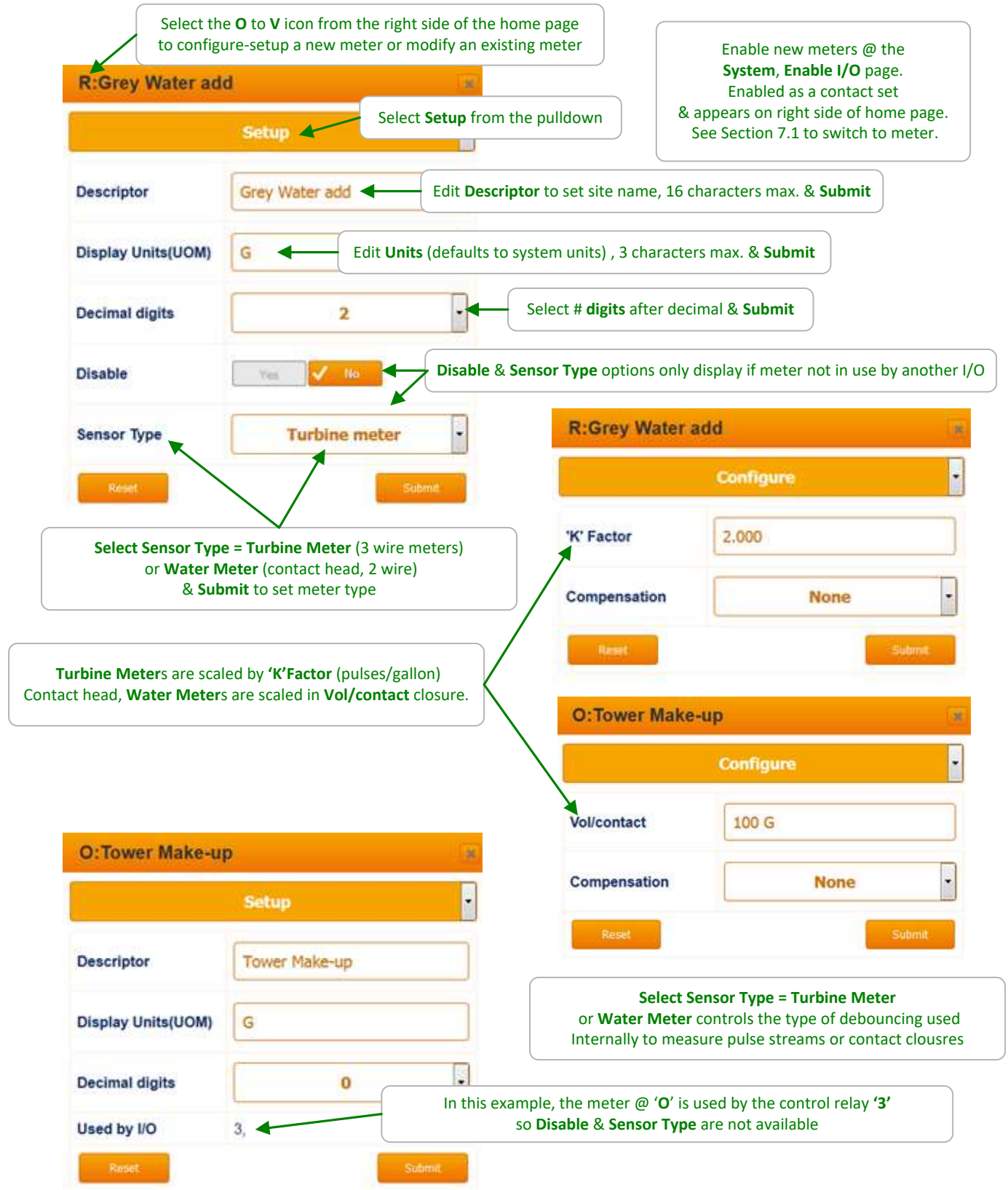


Sidebar:
Metric or U.S. units are set on the **System** / **System Setup** page.
The controller converts the pumped mL/stroke setting to either Liters or Gallons depending on the **System Setup metric units** = **Yes** - **No** setting.

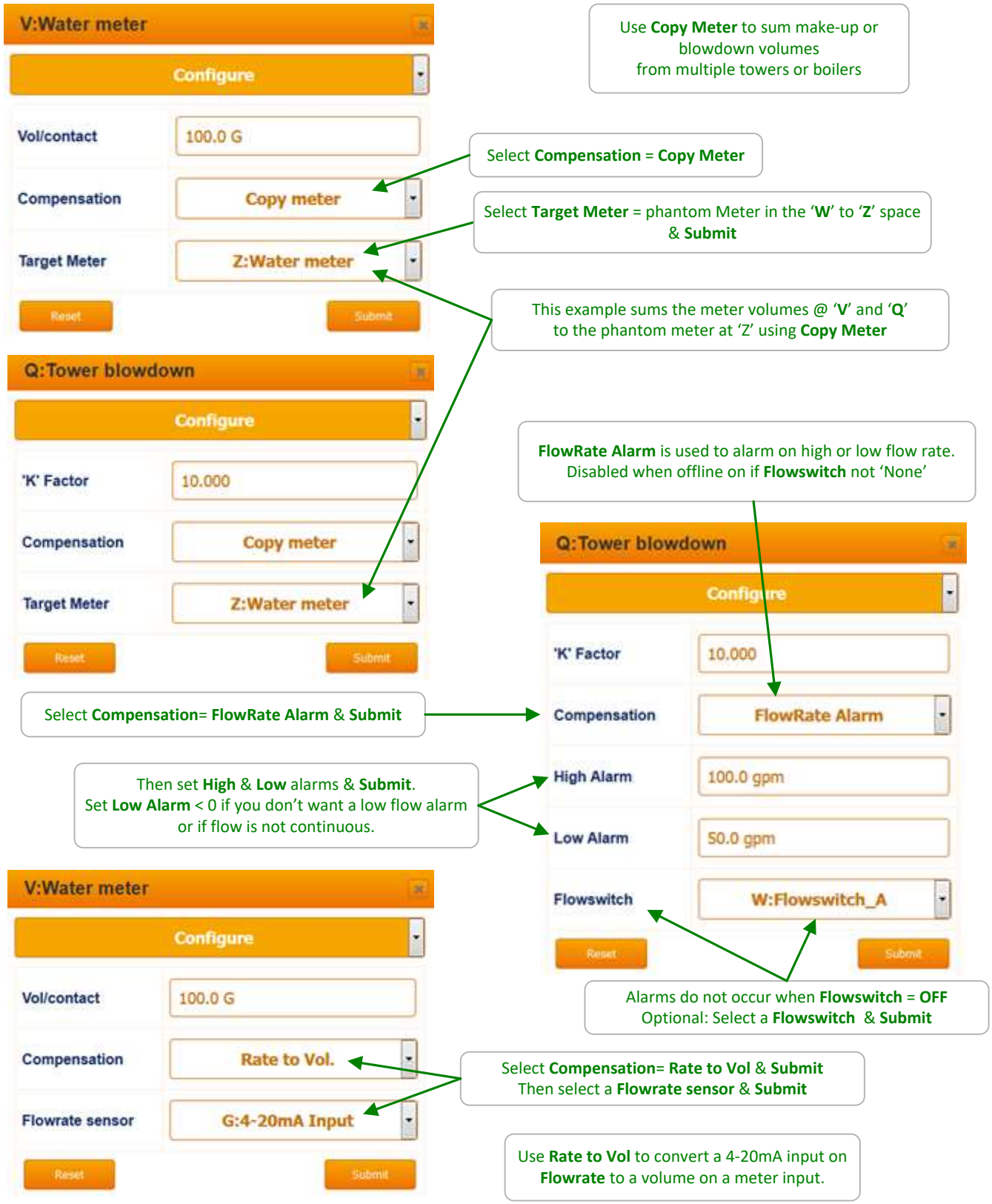
Volume meters are assumed to measure either Gallons (U.S. units) or Liters (Metric) when calculating **Inventory** - tank levels or ppm concentrations.
Scale all of the volume meters according to the System units setting.

6. Measuring Volume: WaterMeters, Inventory, Verify Feed

6.1 Configuring a New Meter

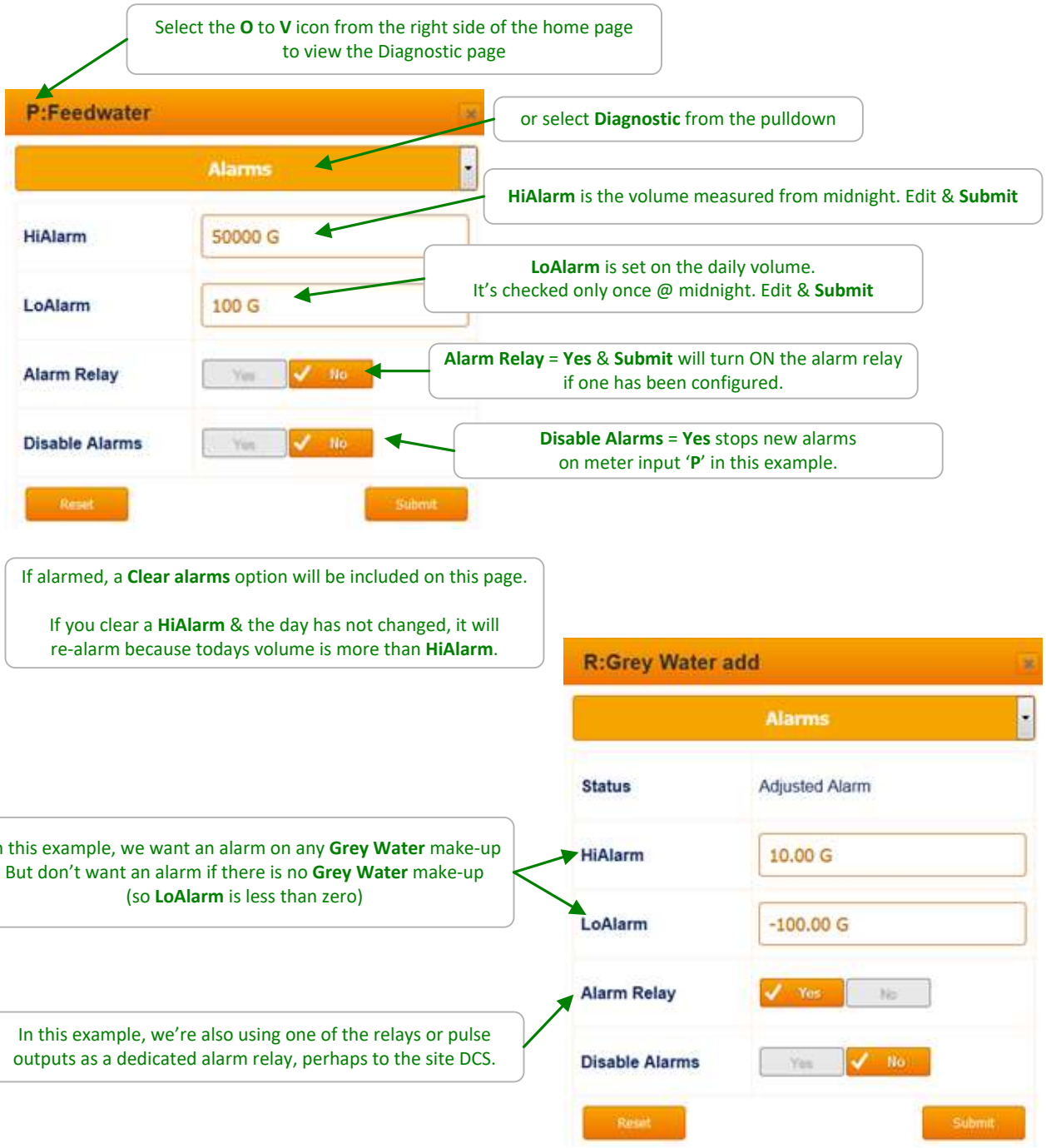


6.2 Copying, Flow Rate Alarms & Rate-to-Volume



6.3 Meter Diagnostics

6.4 Meter Alarms



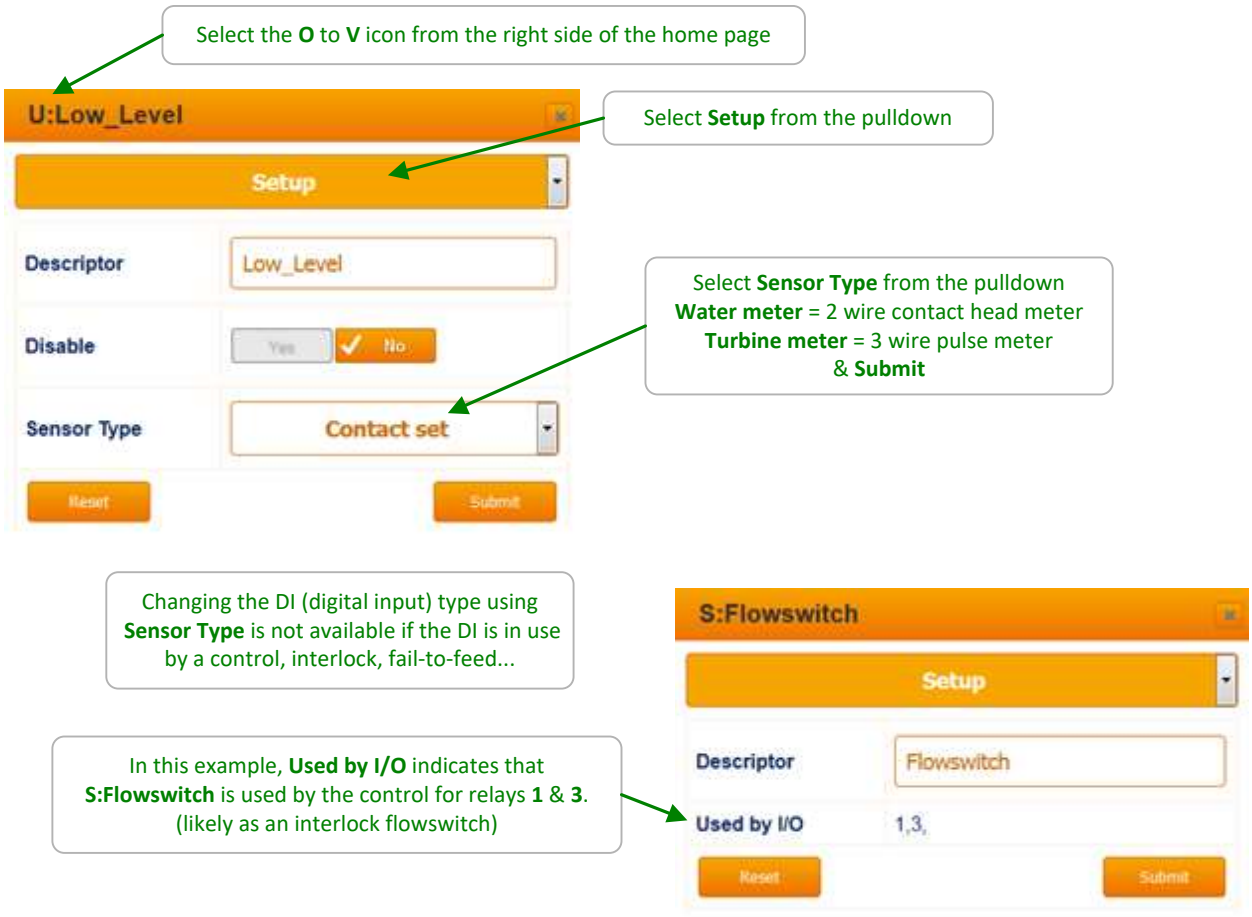
7. Flowswitches, Interlocks & Contact Sets

7.1 Switching Meters & Contact Sets

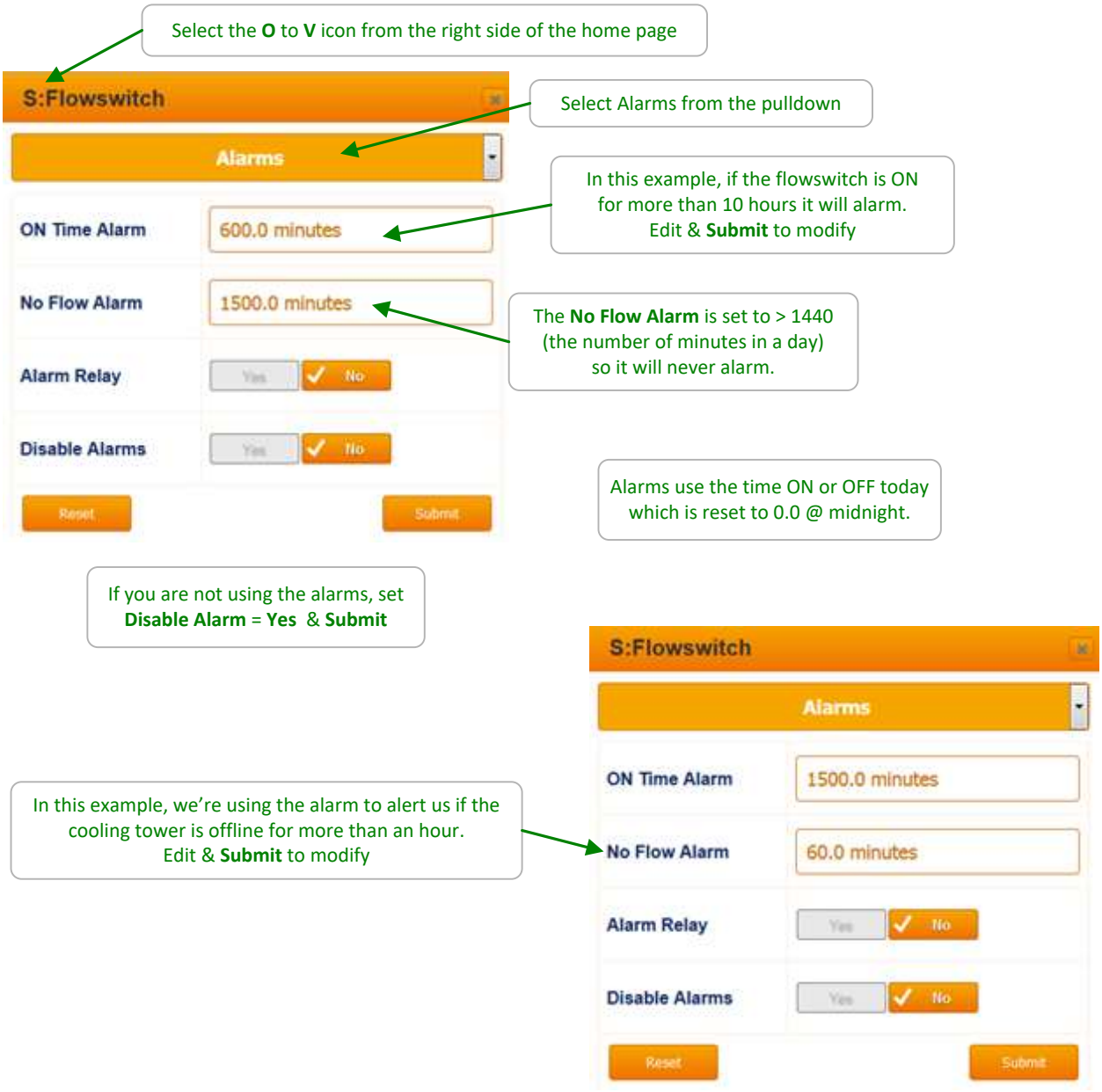
Volume meters and contact set inputs are connected in the '**O**' to '**V**' namespace.
They are also in the '**W**' to '**Z**' phantom space.
If the meter or contact set input is not being used for control, it can be re-purposed, making a contact set a meter or the reverse.

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

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



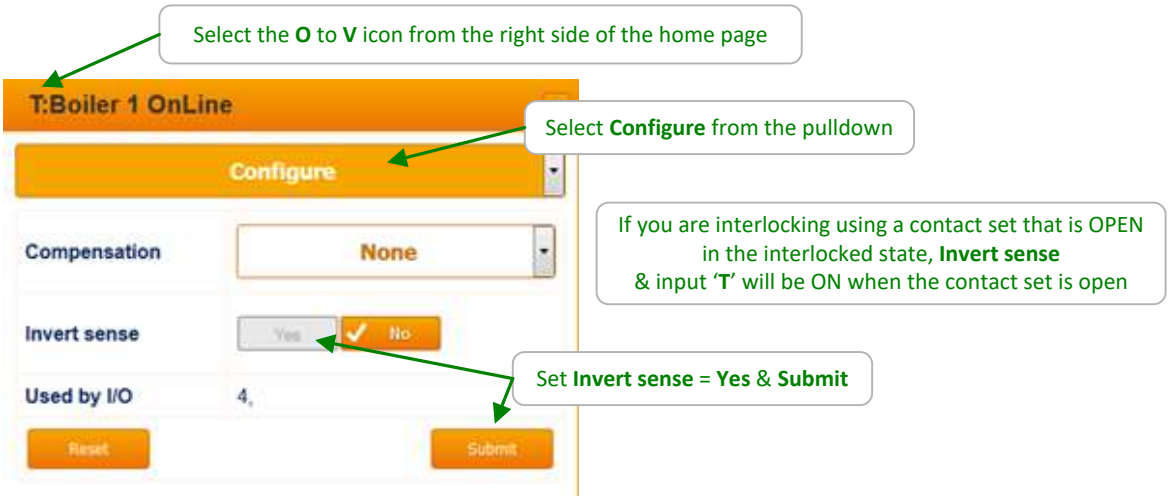
7.2 Contact Set Alarms



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

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

7.3 Logically Inverting Contact Sets

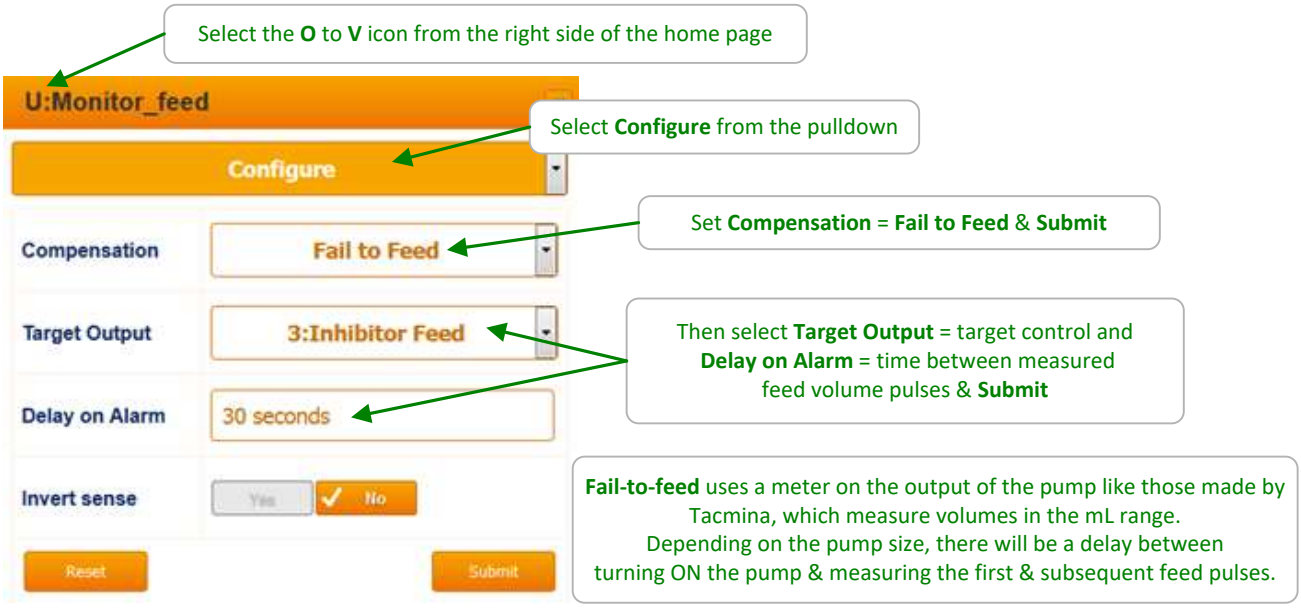


7.4 Fail-to-Feed

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

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

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



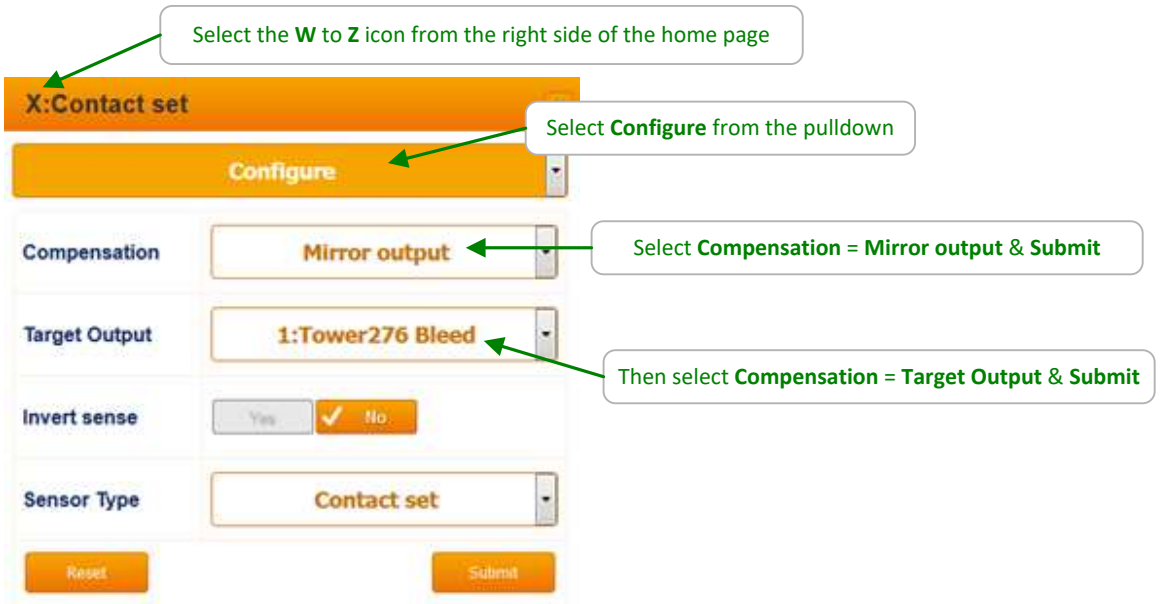
7.5 Mirroring a Control ON/OFF

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

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

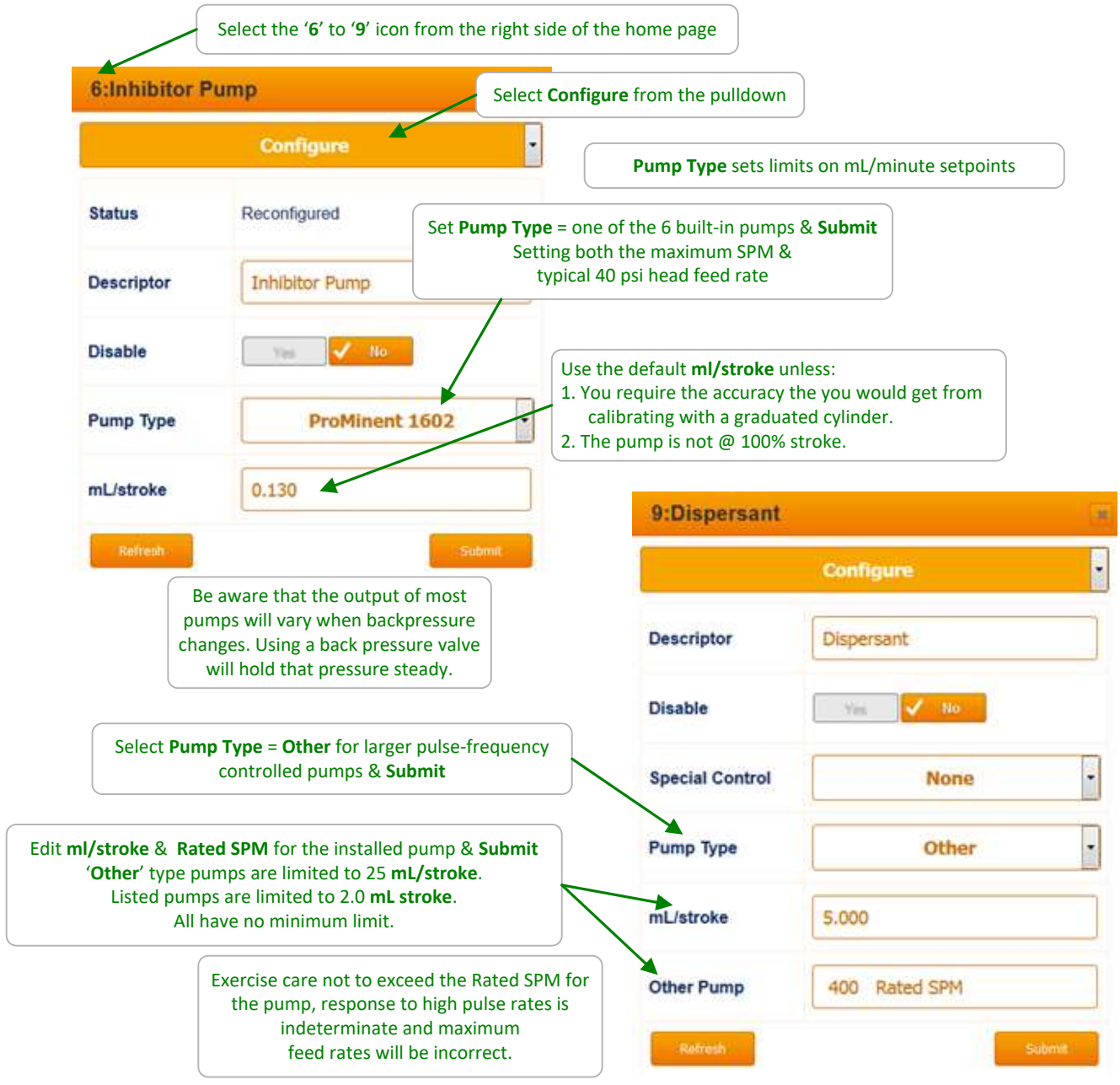
For example:
Site doesn't have a bleed meter installed but needs to feed into the bleed line whenever the bleed is ON (perhaps a de-chlor or a sequestrant for a component that's concentrated when the tower cycles up).
Relay 1 controls the bleed on conductivity
Pulse 8 feeds the bleed line chemical, configured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

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



8. Frequency Controlled Pumps

8.1 Selecting a Pump, Adjust mL/stoke & SPM

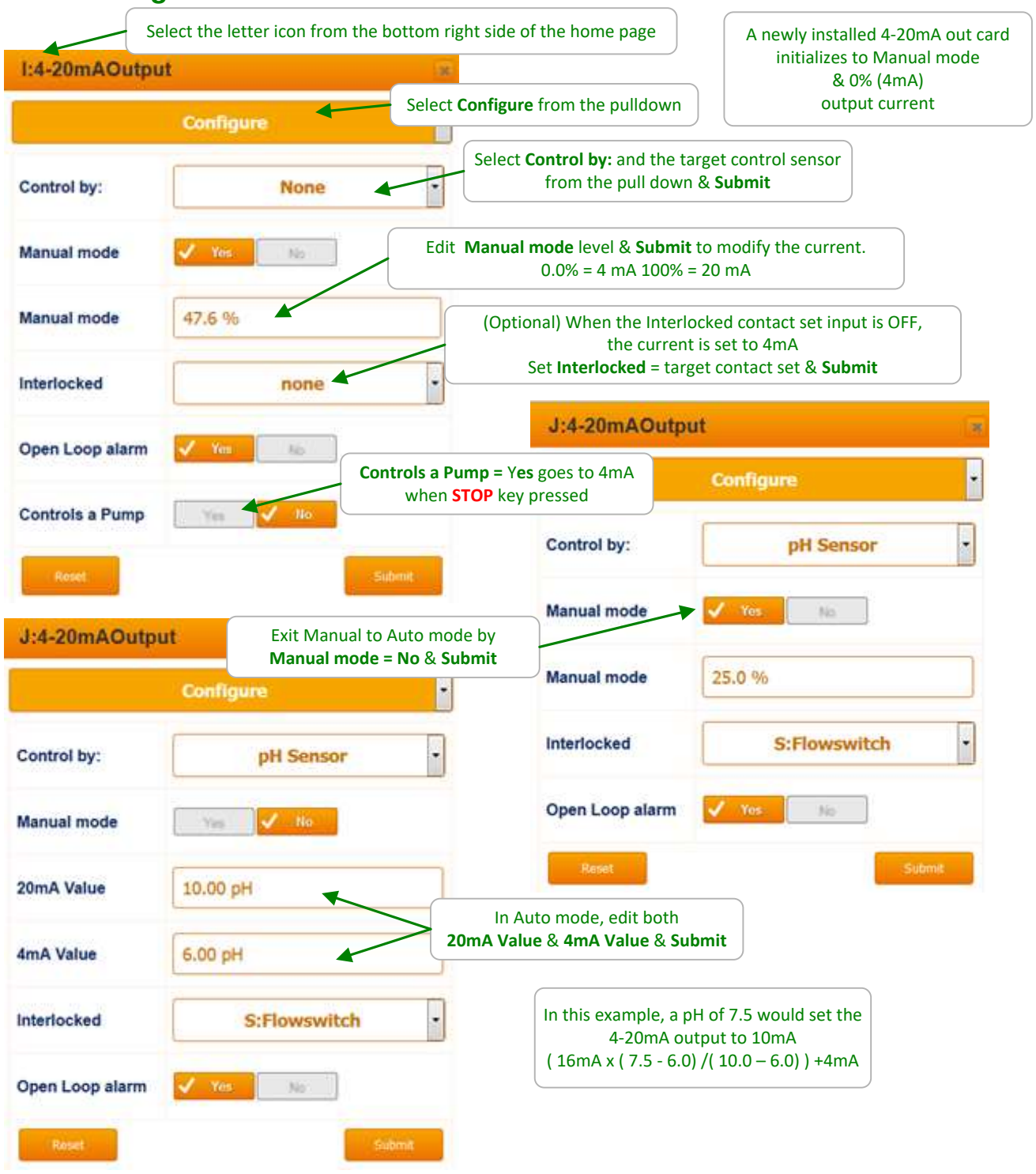


Built-in Pump types

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

9. 4-20mA Outputs

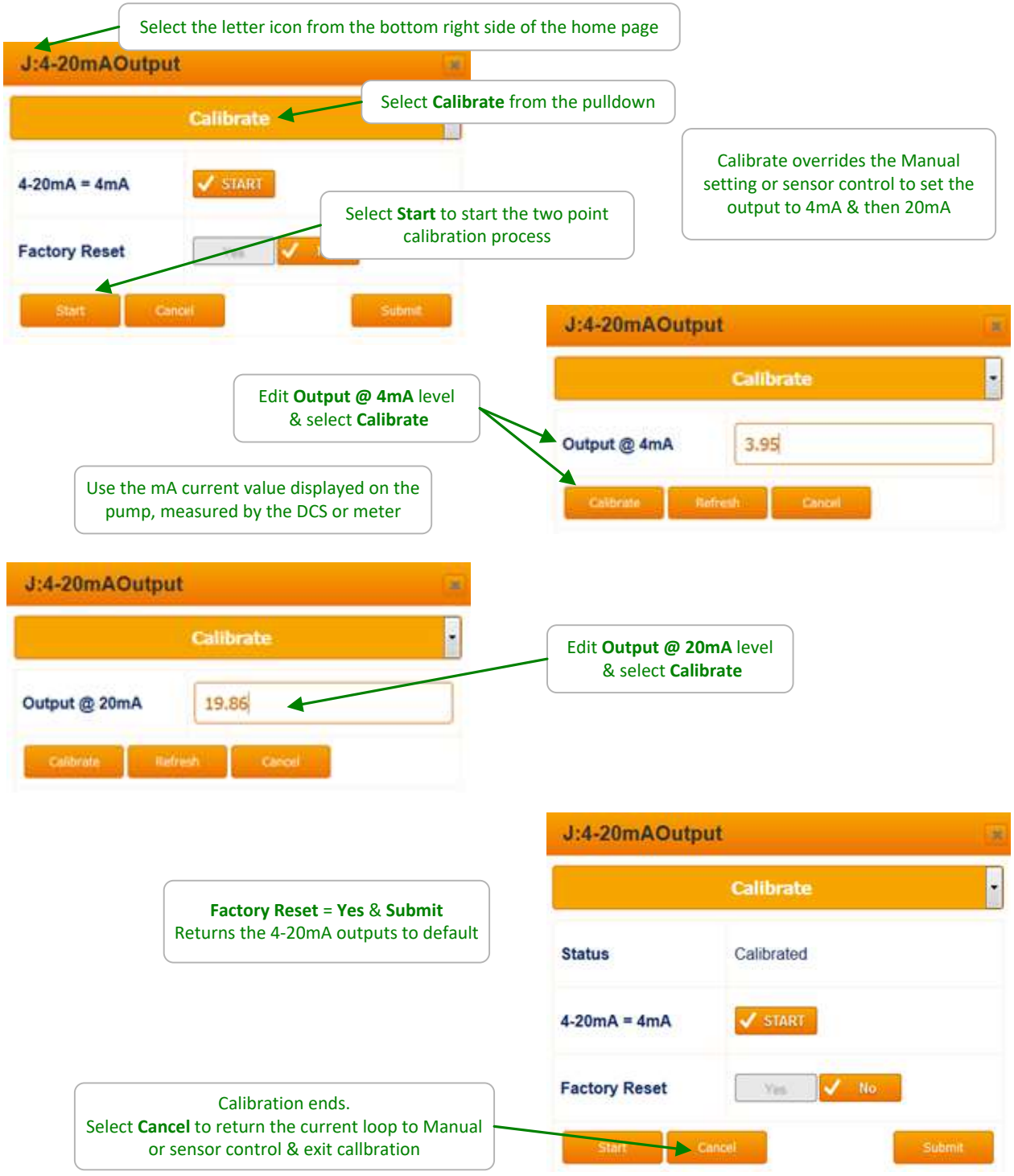
9.1 Configure: Manual-Auto Switch



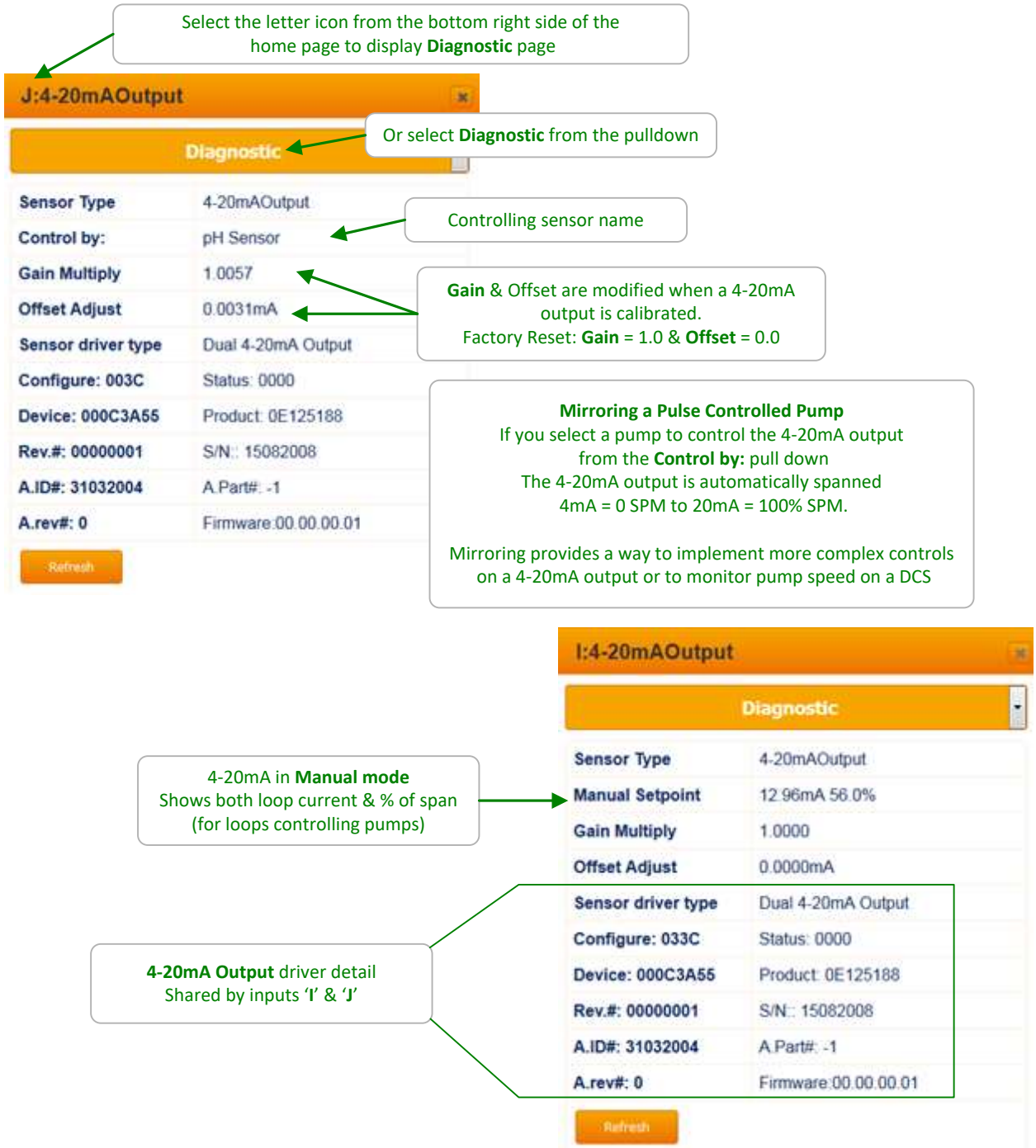
Sidebar: Manual Mode

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

9.2 Calibrate

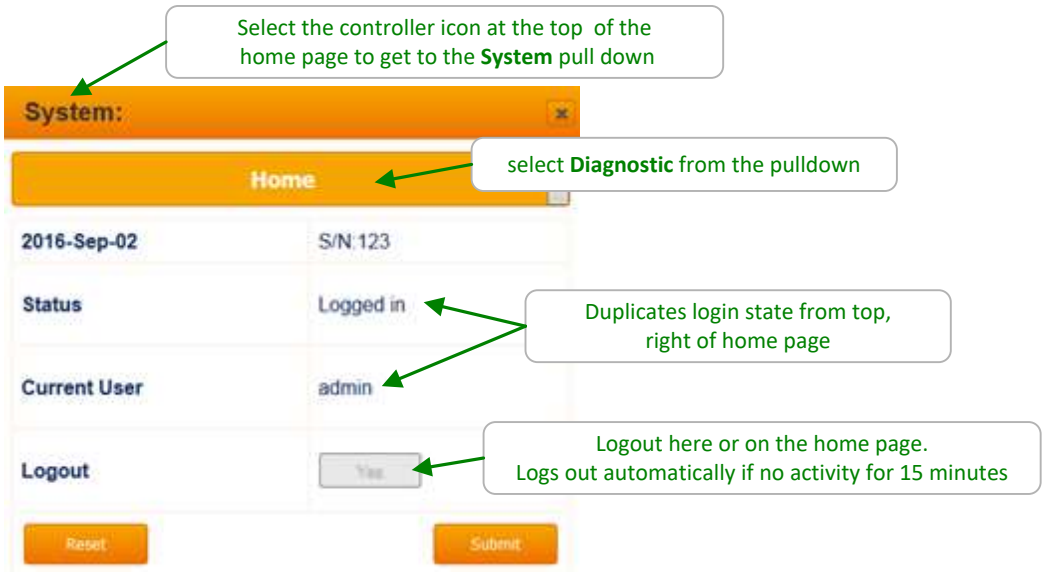


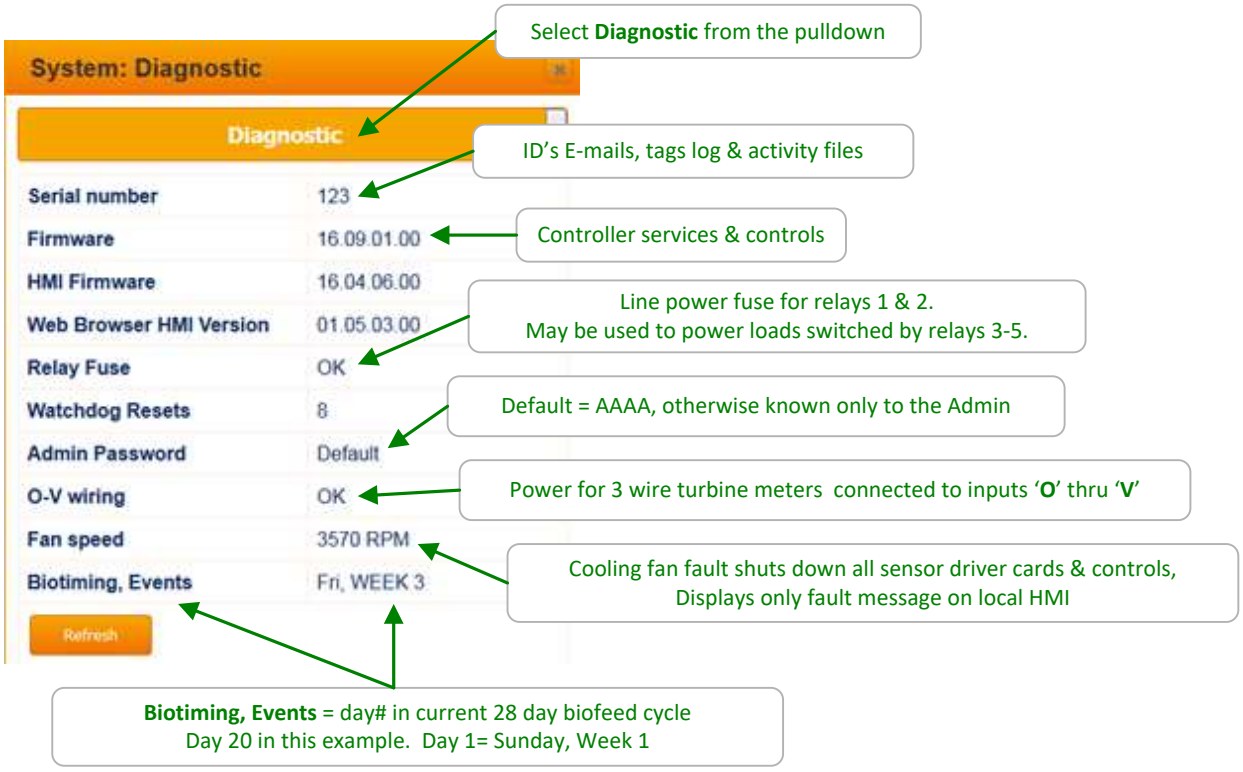
9.2 Diagnostic & Mirroring



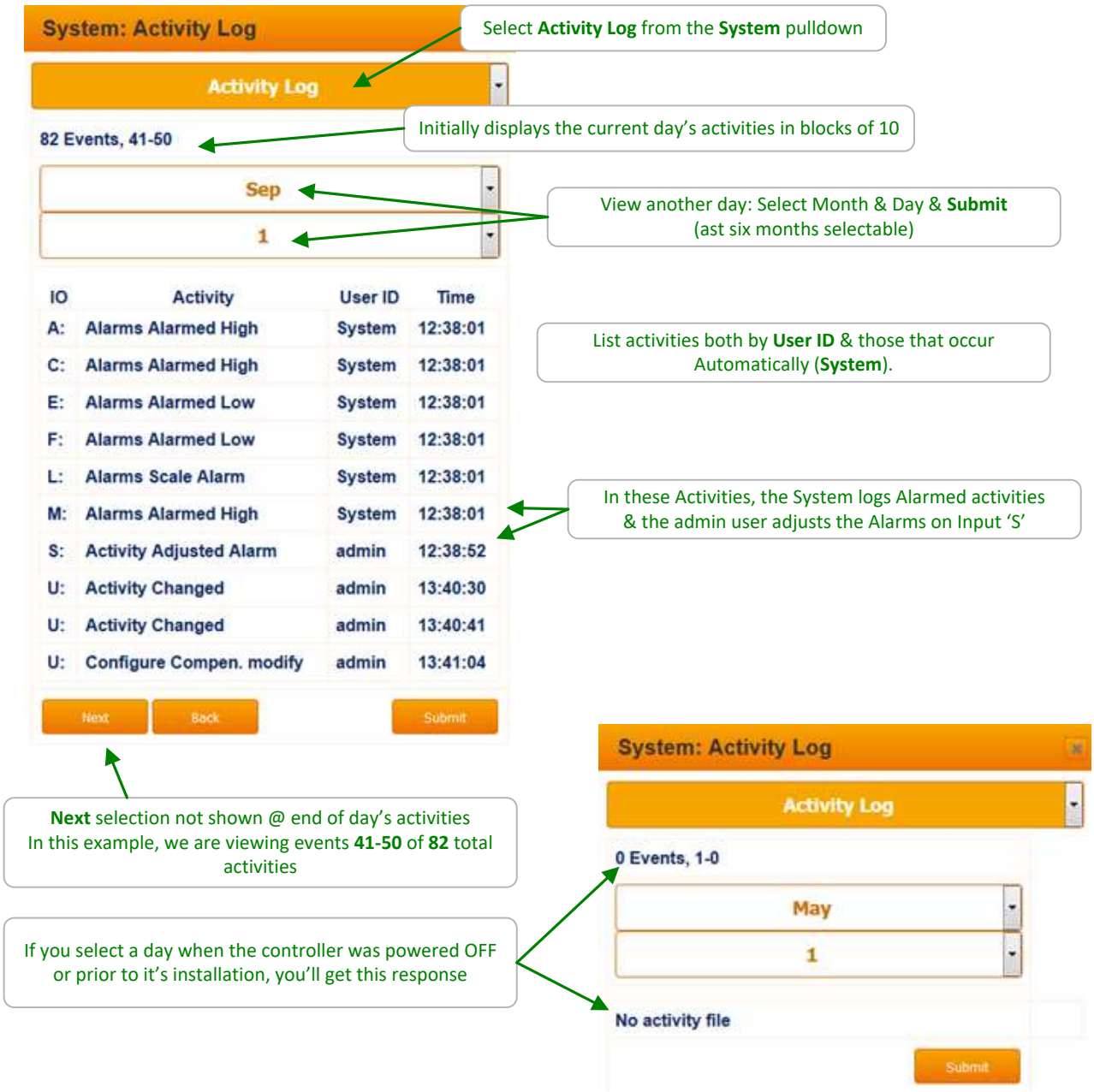
10. System Settings

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





10.2 Activity Log: User ID, time stamp



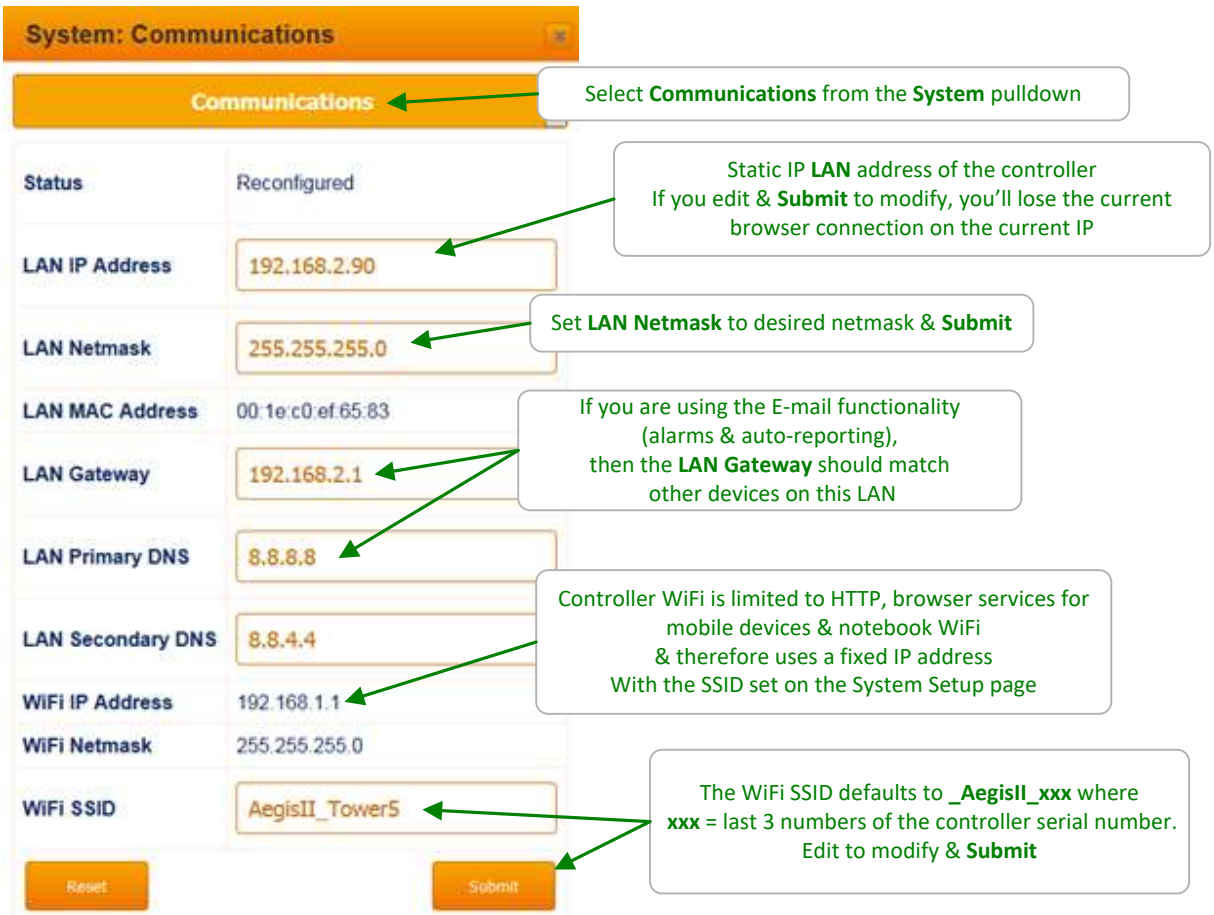
10.3 Communications: IP, Netmask,MAC,Gateway,Wifi IP

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

The controller includes a **DHCP server** but not a **DHCP client** which means:

A: When you connect to the site LAN you'll need to assign a static IP valid for the LAN & the controller will always be at this IP (**DHCP client** OFF).

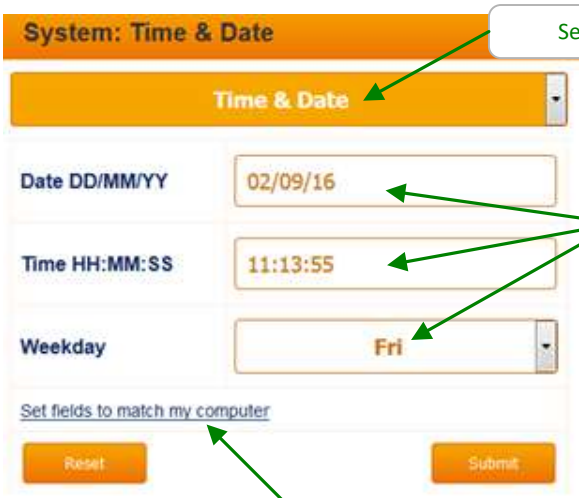
B: When you temporarily connect to a notebook PC or device, the **DHCP sever** puts your device on the same network as the controller.



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

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

10.4 Time & Date: Synch to Device



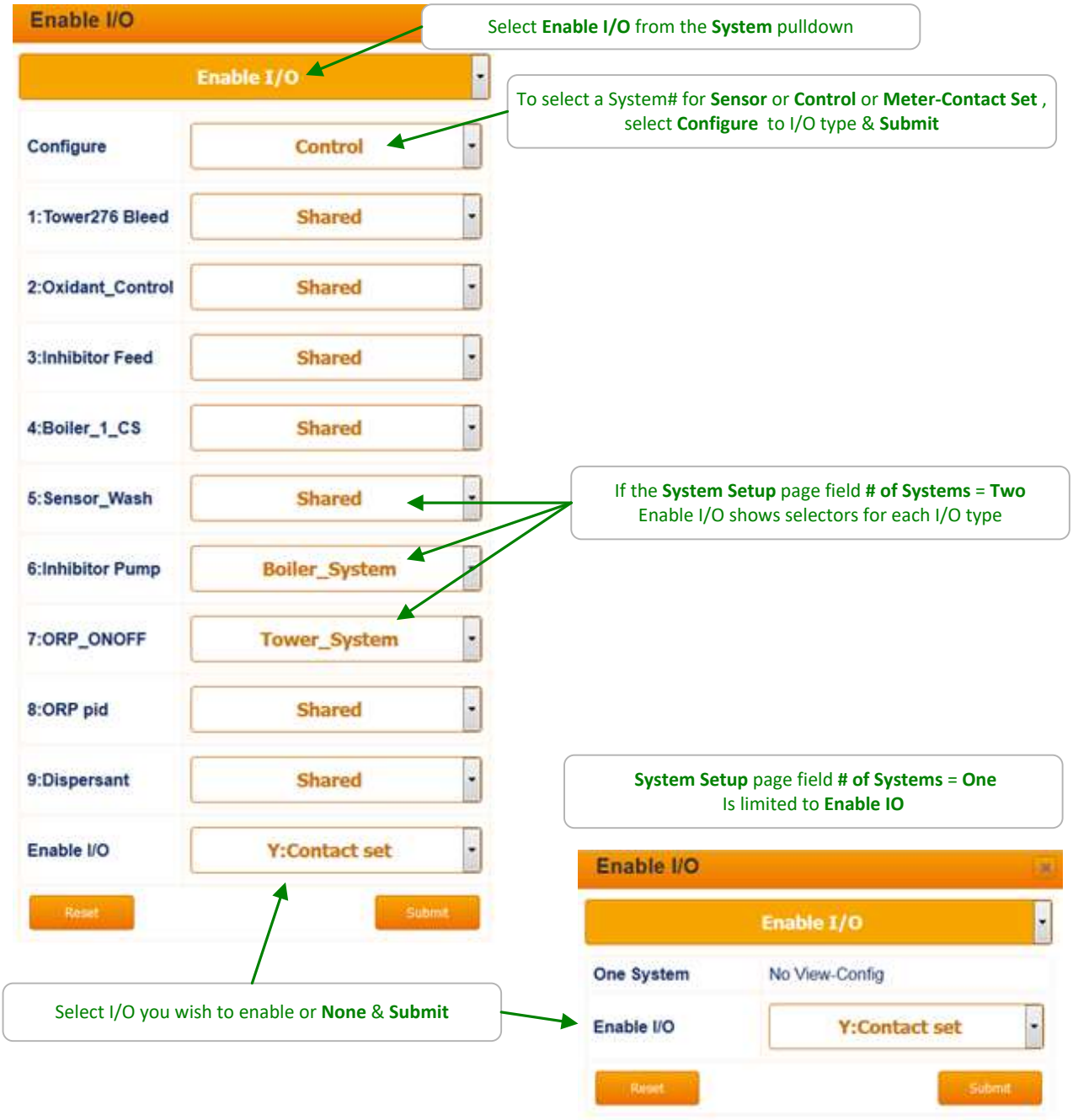
Select **Time & Date** from the **System** pulldown

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

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

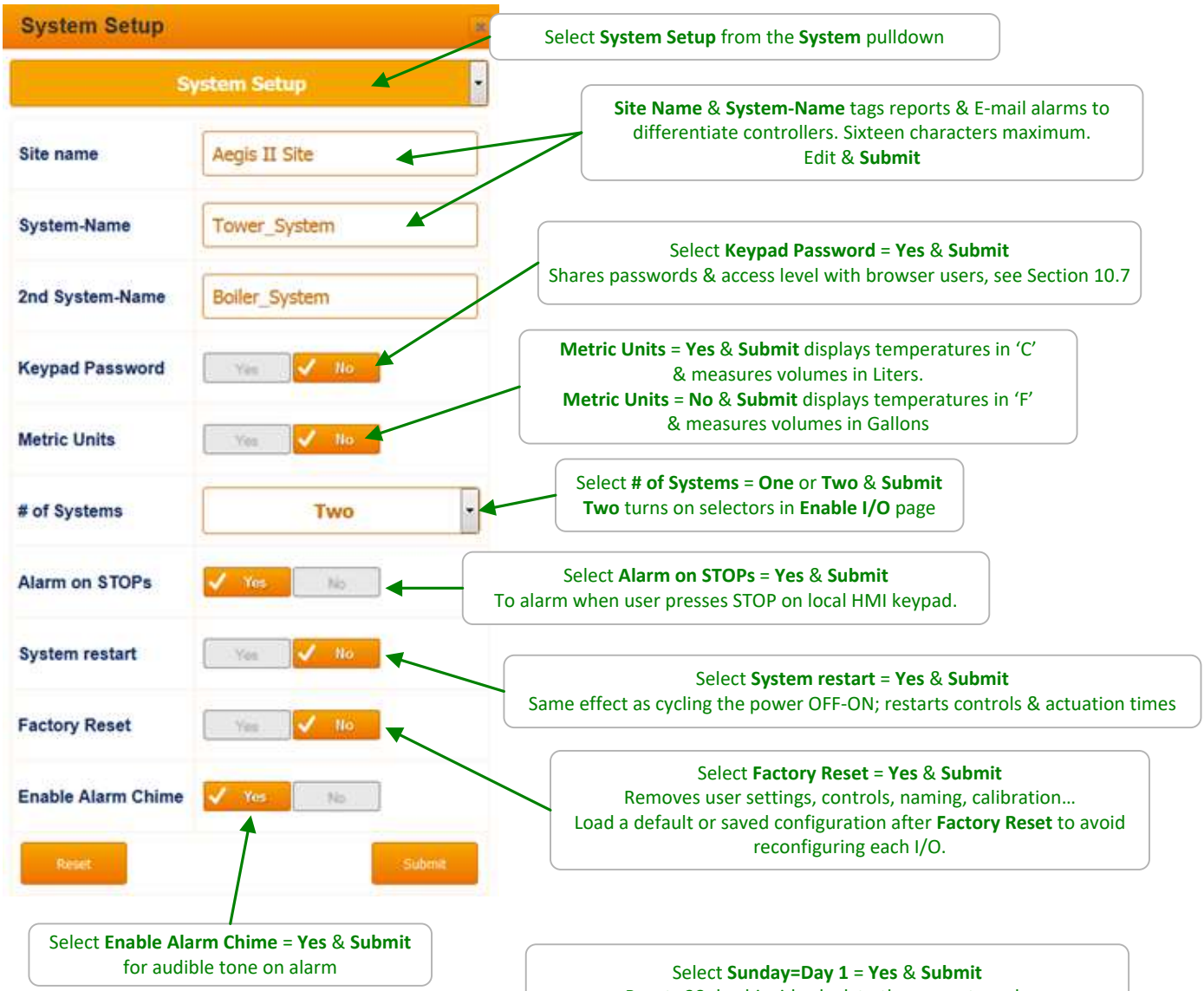
This is usually the easiest way to synch the controller to your device, click on the link & **Submit**.

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

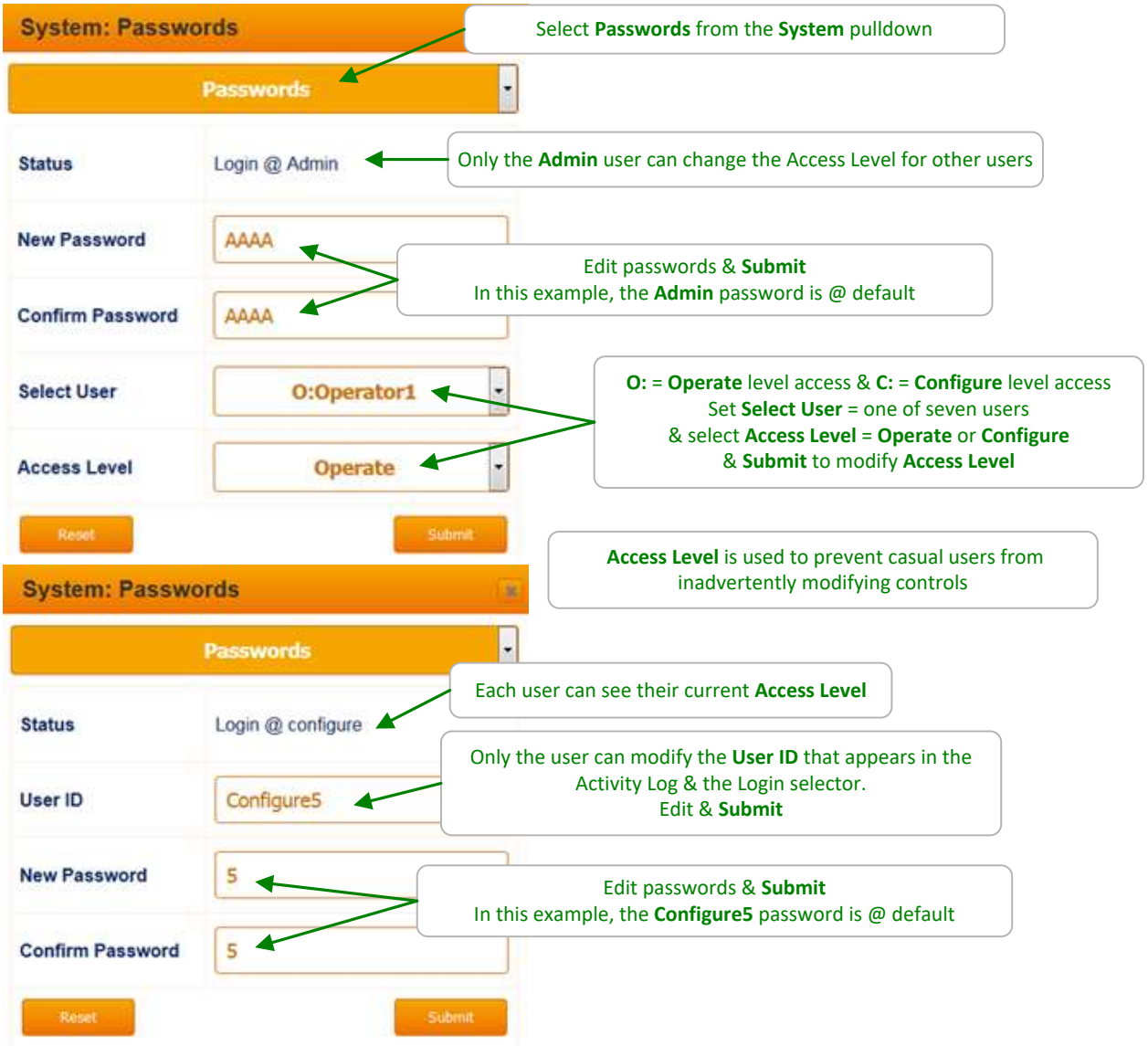


10.6 System Setup: Naming, Sunday=Day1 ,Metric Units, Restart Options

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



10.7 Passwords: View-Set Access Level



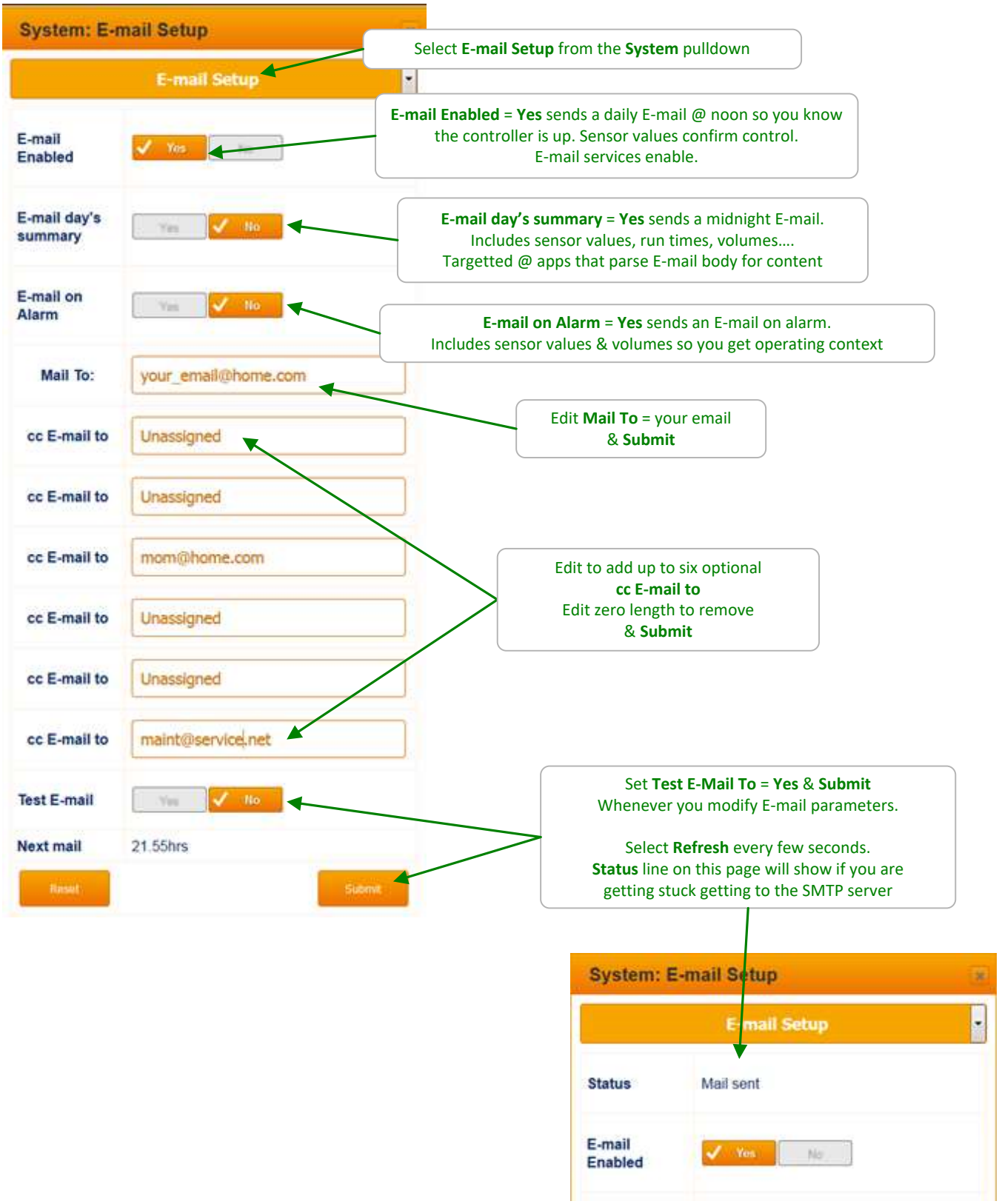
Default Passwords:
Operator1 = **1** Operator2 = **2** Operator3 = **3** Operator4 = **4**.
Configure5 = **5** Configure6 = **6** Configure7 = **7** Administrator = **AAAA**
Login Page: Operators can view all controller pages.

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

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

11. E-mail

11.1 E-Mail Setup – Test



Appendices:

A. IO NameSpace: Letters & Numbers

The controller uses the letters ‘A’ to ‘Z’ to refer to sensors, meters, contact sets & 4-20mA outputs and the numbers ‘1’ to 9’ to refer to controls

Users can assign site specific names to all of the I/O, A-Z & 1-9. The I/O letters & numbers are a convenient, compact way to describe both the physical location of the I/O within the controller enclosure & the capabilities of each I/O.

Some letters are ‘phantom’, meaning they don’t have physical wiring location within the enclosure. ‘Phantoms’ are used to represent calculated & derived values that are logged, alarmed & may be used for control.

I/O	Type	Notes
A-B	Serial sensors	3 wire Conductivity-Flowswitch-Temperature or Corrosion Rate or Differential pressure sensors
C-D **E-F** **I-J**	Dual sensor driver cards 6 types in any combination	pH-ORP: configurable as dual pH or dual ORP or pH-ORP 4-20mA input 4-20mA output Conductivity pH & 4-20mA input Dual serial sensor
G	Built-in 4-20mA input	
H	Built-in 10mV/C temperature sensor input	
K-N	Phantom sensors	Calculated (Inventory, Manual) or derived from other sensors & meters
O-V	Volume meter & contact set inputs	Each of 6 inputs configurable as Turbine, Contact Head meter or Contact Set
W-Z	Phantom volume meter & contact set inputs	Calculated (Fail-to-Feed, Fail-to-Sample) or derived from other sensors & meters
1-2	Line powered control relays	Form C, powers pumps, solenoids & motorized valves
3-5	Dry or line powered control relays	Form C, may be used dry or powered.
6-9	Pulse or ON/OFF controls	Dry contact sets used to pulse or enable pumps, alarm… 24V 250mA max.

B. Input Attributes & Phantoms

Many of the sensors connected to the controller have attributes other than the default value.

For example, the serial conductivity sensor measures conductivity, temperature & includes a flowswitch. The conductivity is the default value of the sensor connect to input 'A' (attribute A0) & the Temperature (attribute A1) & the flowswitch (attribute A2).
Notice that the A1 attribute is of the same type as the A0 attribute, both are sensor values but the A2 attribute is a contact set attribute (ON/OFF).

Attributes can be assigned to phantom inputs where they are logged, alarmed & used for control. A phantom input cannot be assigned to another phantom. (prevents circular references).

Phantoms in the **K-N** space are sensors. Those in the **W-Z** space are volumes & contact sets.

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

Use the x0 attribute if you wish to have one sensor display two values.
For example, using a conductivity sensor to measure conductivity & salt concentration

C. 4-20mA Input Selectable Types

Knowing the sensor type connected to a 4-20mA input allows the controller to:
A. Scale the input correctly for the selected sensor type
B. Provide calibration & calibration limits appropriate to selected type
C. Clamp the measured sensor values so that an open loop doesn't measure a negative ppm or conductivity
Select **Sensor Type** = Other if A,B or C not applicable

Sensor Type	Span Options & units	mA Span	G=Gain, O=Offset Span not user modifiable
Other	Generic 0-100	4-20	**User modifiable span** G= 6.25, O=-25
CBR Bromine	CBR 0-2ppm	4-16	G=0.167, O=-0.667
	CBR 0-10ppm	4-16	G=0.833, O=-3.333
CGE Chlorine	CGE 0-2 ppm	4-16	G=0.167, O=-0.667
	CGE 0-10ppm	4-16	G=0.833, O=-3.333
CLE3 Chlorine	CGE 0-2ppm	4-16	G=0.167, O=-0.667
	CGE 0-10ppm	4-16	G=0.833, O=-3.333
	CGE 0-100ppm	4-16	G=8.33, O=-33.33
CLO Chlorine	CLO 0-2ppm	4-16	G=0.167, O=-0.667
	CLO 0-10ppm	4-16	G=0.833, O=-3.333
CTE Chlorine	CTE 0-2ppm	4-16	G=0.167, O=-0.667
	CTE 0-10ppm	4-16	G=0.833, O=-3.333
Diff.Pressure	DeltaP 0-100psi	4-20	G= 6.25, O=-25
Fluorescent	Fluor 0-200ppm	4-20	G= 12.5, O=-50
PAA 0-200ppm	PAA 0-200ppm	4-16	G=16.67, O=-66.67
	PAA 0-2000ppm	4-16	G=166.67, O=-666.67
pH-transducer	pH 0 to 14	4-20	4mA=-1.45pH 20mA=15.45pH pH outside of 0-14 blocked G=1.056, O=-5.674 5.373mA=0pH, 18.6mA=14pH
ORP-transducer	ORP 0-1000mV	4-20	G= 62.5, O=-250
Temperature	Temp. 0-100C	4-20	G= 6.25, O=-25
Toroidal	Tor. 0-10000uS	4-20	G= 625, O=-2500
	Tor. 0-100000uS	4-20	G= 6250, O=-25000

Notes:
1. Gain & Offset return to the table values @ Calibrate = Factory Reset
2. The preceding table applies to the ChemFeed version of the Aegis II

D. Enabling-Disabling I/O & Adding-Removing Driver Cards

Inputs A-Z cannot be disabled if in use.

The disable option in both the HTTP & local HMIs is replaced with a message telling you where the target sensor is used, so you can remove the dependency.

Note that the sensor can be used for control, compensation of other sensors & in the case of sensors with more than one attribute; as a source for phantom sensors.

When you disable a sensor, the compensation is removed so that if for example:

You disable a thermally compensated conductivity sensor and the thermal sensor is subsequently removed or disabled, there is no conflict when the conductivity sensor is re-enabled, but it's no longer thermally compensated.

When a **C-D**, **E-F** or **I-J** driver card is removed, all of the dependencies are removed on the next power ON. Outputs that use the removed driver sensor(s) for control have the control equation removed. Other sensors which use the removed driver sensors are modified.

When you install a new driver, the sensor inputs default. For example adding a pH-ORP driver, configures for one pH & one ORP sensor on power ON.

Auto-Removing Phantoms:

Phantoms are auto-removed if they are derived from inputs >= 'C'

If the Phantom is in use as an interlock a latching alarm is set.

Example: User removes a serial sensor card with a CTFS sensor OR connects a corrosion rate sensor to a CTFS sensor input on a serial sensor card.

Phantoms derived from inputs 'A' & 'B' are not auto-removed unless the sensor type is changed.

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