DULCOMETER
DCM510® Aquatic Water Quality Controller

Use your Tablet or Smartphone. I'm WiFi ready!
The Table of Contents on page 2 consists of links to pages/sections

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

This document can be downloaded from the ProMinent.US website and is supplied on an accompanying USB stick.
The part number for the USB stick is: **1081672**

DCM510 Browser

Contents

Sidebars: Are used to relate helpful tips and default settings as well as explain typical uses for feed and control functions.

1 Day-to-Day Browsing

The purpose of this manual is the show the user how to connect to the DCM5 controller using an Ethernet connection, or wirelessly via WiFi from a PC, tablet or smart phone. Secondly, to give examples of how to program the outputs, calibrate sensors and/or view the process.
The Installation and Operation manual has detailed sensor information, keypad instruction and controller details and specification.
The following sections detail connecting your smart device or PC to the controller. WiFi has the advantage of not requiring a physical cable. LAN setup follows this chapter, then the Home screen is explained as it is common to either connection method.

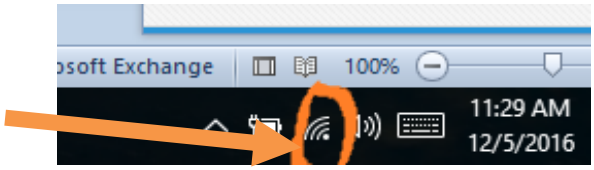
1.1 The WiFi Connection

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

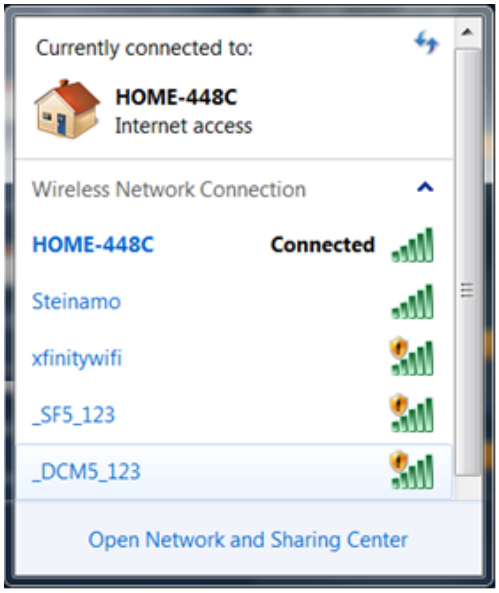
Step 1 is provided in three parts, **1.1.1 Using a PC**, **1.1.2 Using a Tablet** and **1.1.3 Using a Smartphone**

1.1.1 Using a PC:

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



Click on the _DCM5_123 choice and press the Connect button.
The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.
Further differentiate your controller WiFi name by changing it to a description of the process. See section **9.3 Communications**



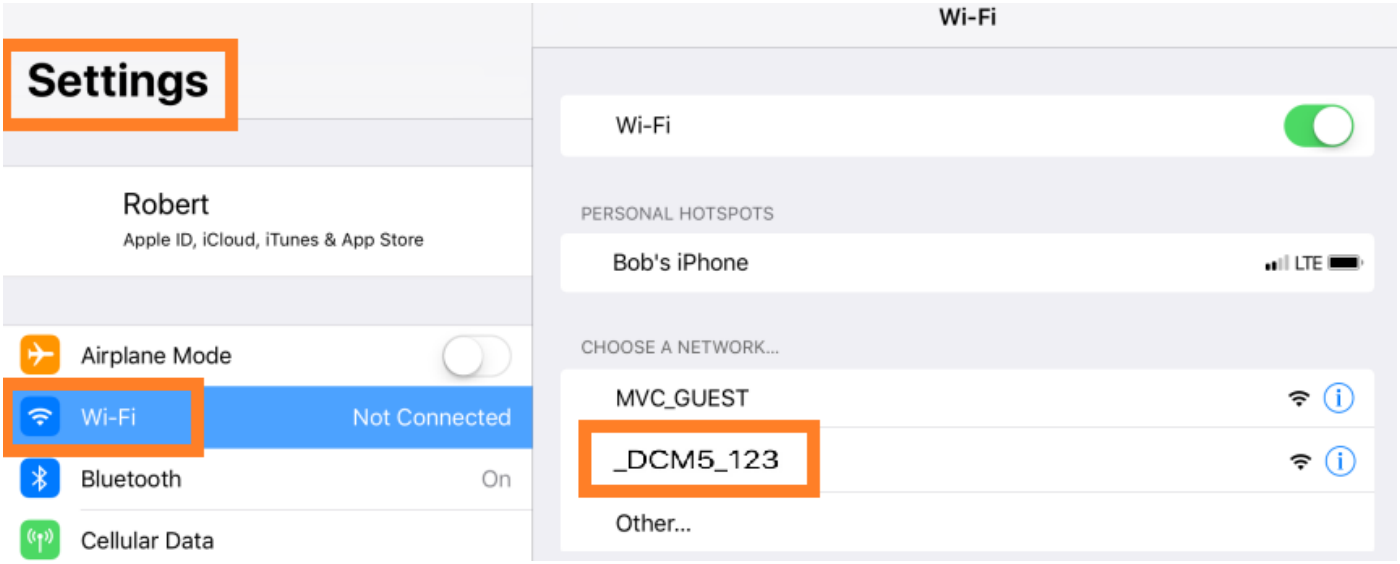
Your computer is now connected to the DCM5 **WiFi** network.
Continue with section **1.1.4 Opening the Browser page**

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

See section **9.3 Communications** to make this change.

1.1.2 Using a Tablet

Open the settings page on your Tablet. Select the Wi-Fi icon. Select the DCM network.



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

Further differentiate your controller WiFi name by changing the SSID name of the network. See **9.3 Communications**

Your computer is now connected to the DCM5 **WiFi** network.
Continue with section **1.1.4 Opening the Browser page**

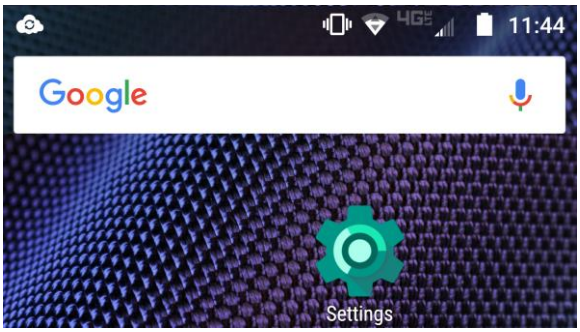
Sidebar:
Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits.
See section **9.3 Communications** to make this change.

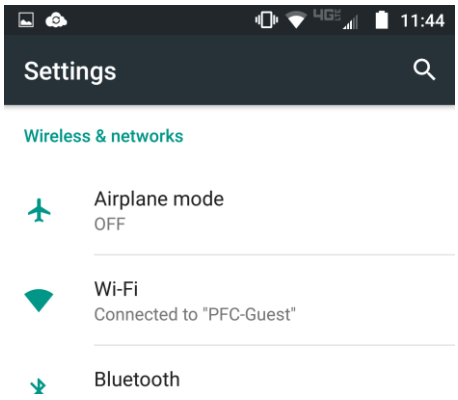
1.1.3 Using a Smartphone

Here are Smartphone examples using Android and IPhone;

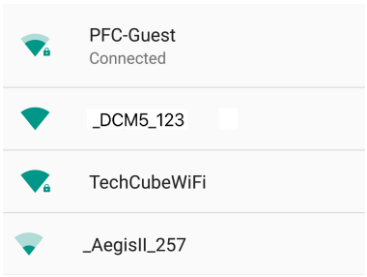
1.1.3.1 Setting up WiFi using an Android phone

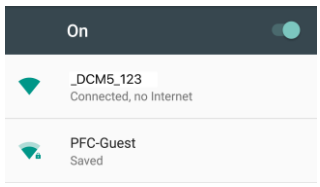
From your home page, press the settings button then choose Wi-Fi.





There may be more than one controller nearby. Choose your controller by comparing the serial numbers last 3 digits with the options on the phone. Select your controller. The status should change for that choice. See example picture below; DCM5_123 is 'Connected, no Internet'.





The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.
Further differentiate your controller WiFi name by changing the SSID name of the network. See **9.3 Communications**

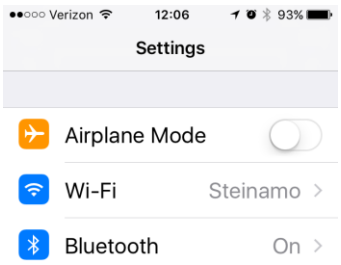
Your computer is now connected to the DCM5 **WiFi** network.
Continue with section **1.1.4 Opening the Browser page using WiFi**

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 **9.3 Communications** to make this change.

1.1.3.2 Setting up WiFi using an iPhone

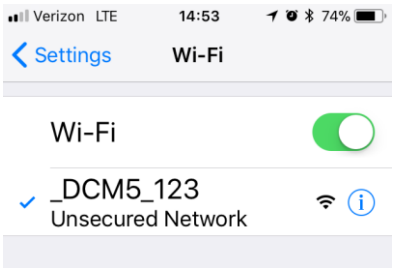
To connect your IPhone to an DCM5 controller, make a **WiFi** connection;
Select the Settings button from your desktop.

Select the **WiFi** button.



Choose your controller.

Note the connection status.



The number 123 in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.
Further differentiate your controller WiFi name by changing the SSID name of the network. See **9.3 Communications**

Your computer is now connected to the DCM5 **WiFi** network.
Continue with section **1.1.4 Opening the Browser page**

Sidebar:
Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits.
See section **9.3 Communications** to make this change.

1.1.4 Opening the Browser page using WiFi

Connection status

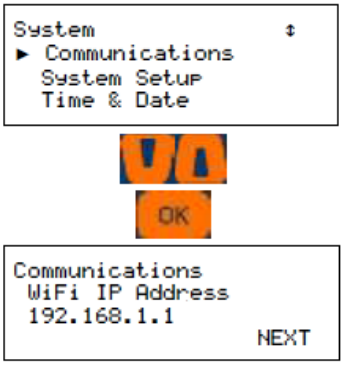
Once a WiFi connection is established, continue here with step 2.
To connect to the controller and see the screen, open a browser and enter the controller's **WiFi** IP address. (Not the LAN IP).
The default address is 192.168.1.1. This address cannot be changed.
. Find the controller **WiFi** IP address using the controller keypad.

1) Press the Menu key

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

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

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



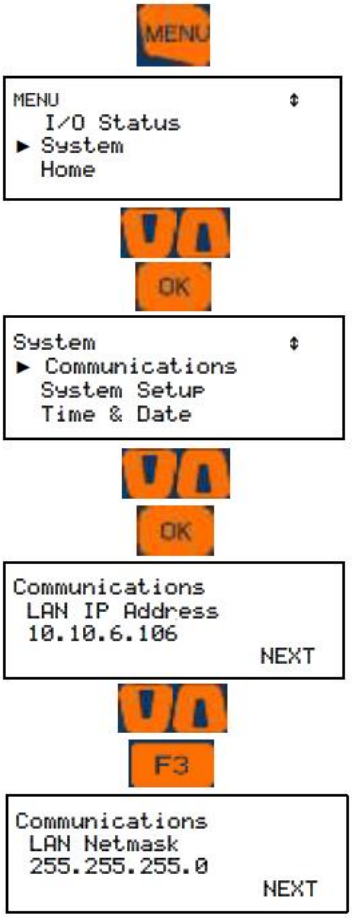
Once connected, you can see values and status of many I/O point but you will not be able to edit or make programming changes without logging in. This is the **HOME** screen.
See section **1.3 The Home Screen**

1.2 The LAN Connection to a Windows PC or Building Network

Set up the Local Area Network (LAN) connection to facilitate connecting a PC or to ready the controller for connection to the building network. This requires an Ethernet CAT5 cable.

1.2.1 Connecting to a PC

If connecting to your PC, you will need to set up your computer's Ethernet port to match the address of the controller.
The Ethernet cable no longer needs to be a 'crossover' type unless you are running a Windows version earlier than VISTA. WIN7 onward will determine which wires need to be transmit and receive and adjust to match the signals on the cable.
Attach the cable to the LAN port on your PC and to the LAN port inside the controller. (Lower left-hand corner). A green light should be seen on both ports. The amber light will blink with each packet that passes by in either direction.



1.2.1.1 Determine the LAN IP address of the controller

The controller's default LAN IP address is 10.10.6.106 and the LAN Netmask is 255.255.255.0.
Verify these numbers;

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

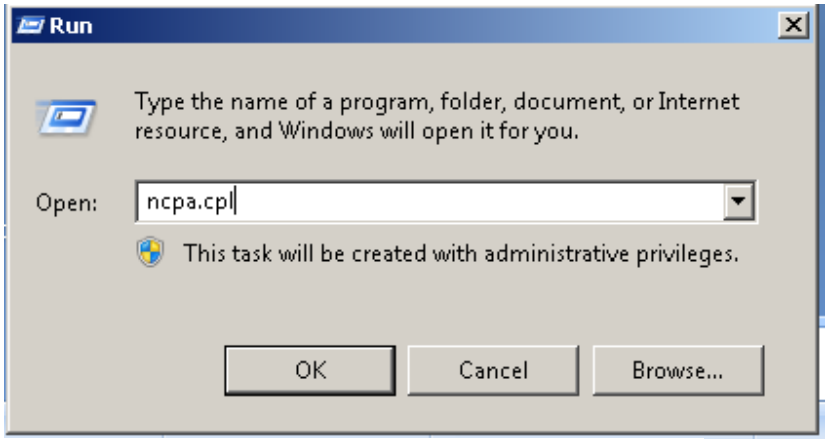
Once you have determined the IP address of the controller, you need to set a static IP address on your PC that is compatible with the controller address.

1.2.1.2 Setup the Local Area Connection on your PC

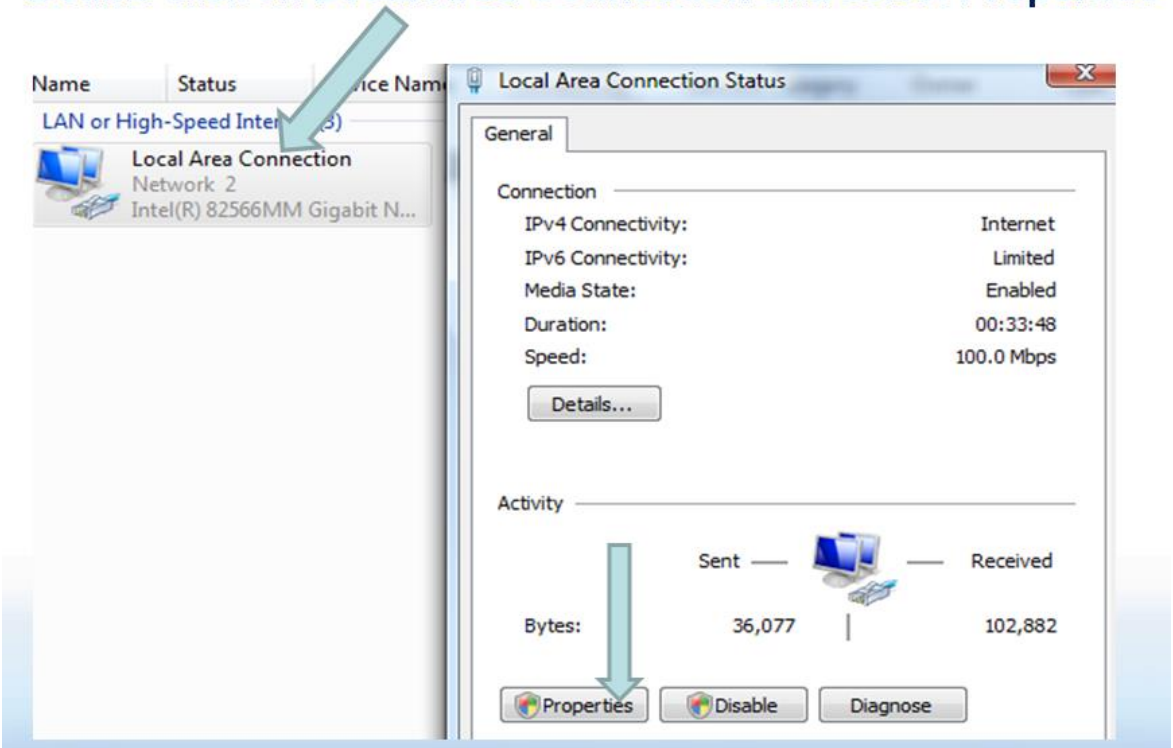
Depending on which version of Windows you are using, these instructions will vary. The idea is to set a compatible static IP address on your PC for the Ethernet port you will use to physically connect to the controller.
Use the following instructions for VISTA, WIN7, WIN8 and WIN10.

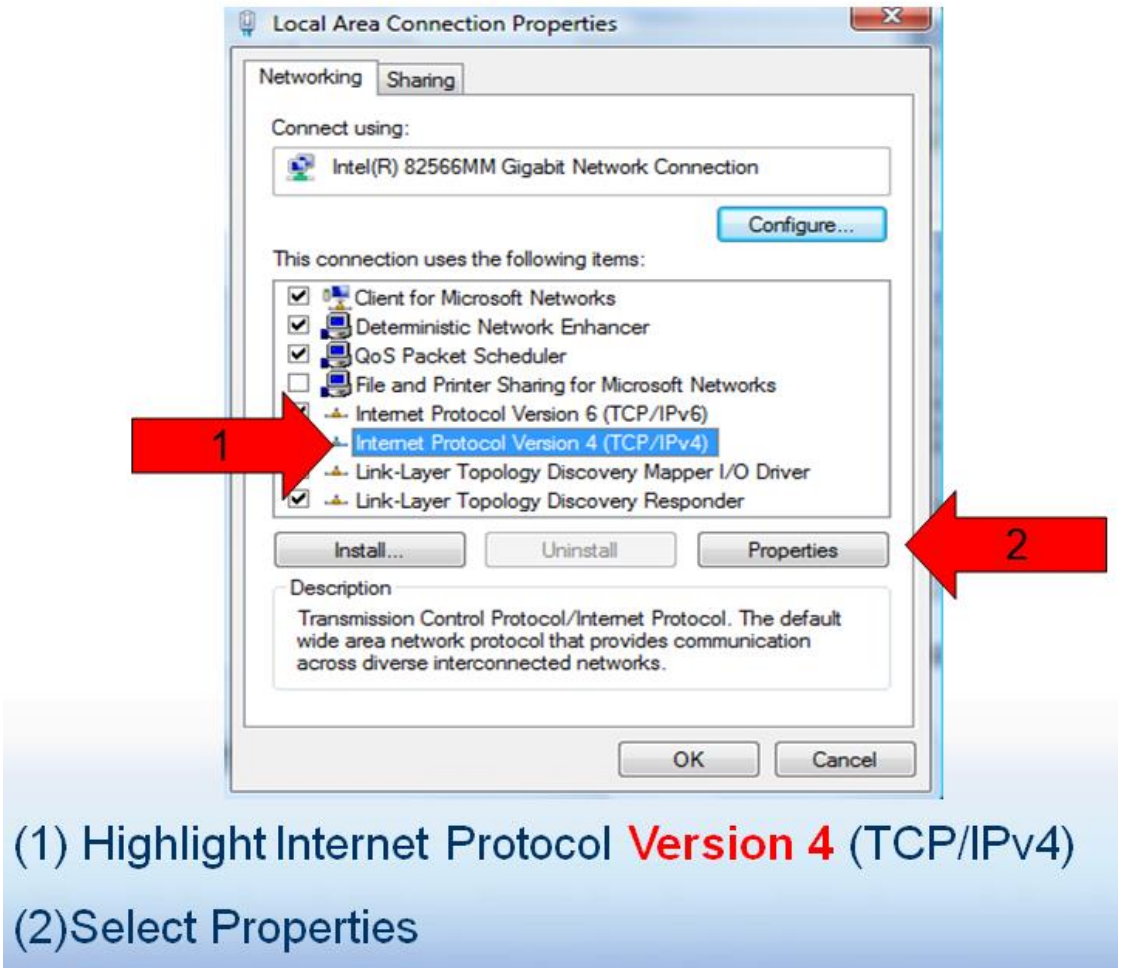
Hold down the Windows key  while you press the letter ‘r ’.

Enter ‘ncpa.cpl’ in the **Open** box.
Press **OK**.



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




Local Area Connection Properties
Networking
Sharing
Connect using:
Intel(R) 82566MM Gigabit Network Connection
Configure...
This connection uses the following items:
Client for Microsoft Networks
Deterministic Network Enhancer
QoS Packet Scheduler
File and Printer Sharing for Microsoft Networks
Internet Protocol Version 6 (TCP/IPv6)
Internet Protocol Version 4 (TCP/IPv4)
Link-Layer Topology Discovery Mapper I/O Driver
Link-Layer Topology Discovery Responder
Install...
Uninstall
Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
OK
Cancel
1
2
(1) Highlight Internet Protocol Version 4 (TCP/IPv4)
(2)Select Properties

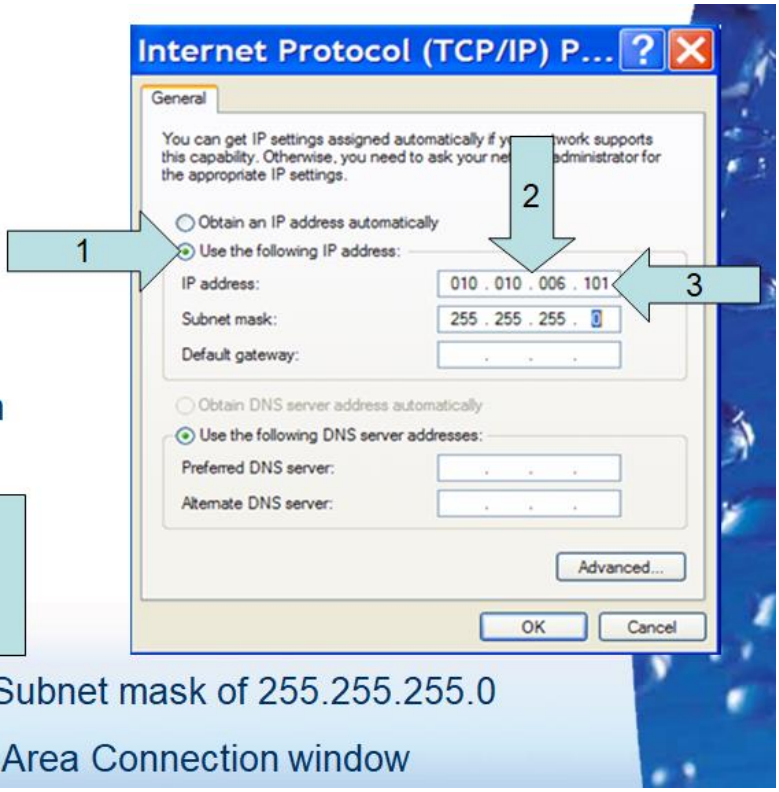
Select the 'Use the following IP address': circle (1)

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

Example: 010.010.006.___

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

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



Press the Tab key and enter the Subnet mask of 255.255.255.0

Select OK here and on the Local Area Connection window

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

10.10.6.106:100

The WiFi default address is now:

192.168.1.1:100

1.2.2 Connecting to the building network

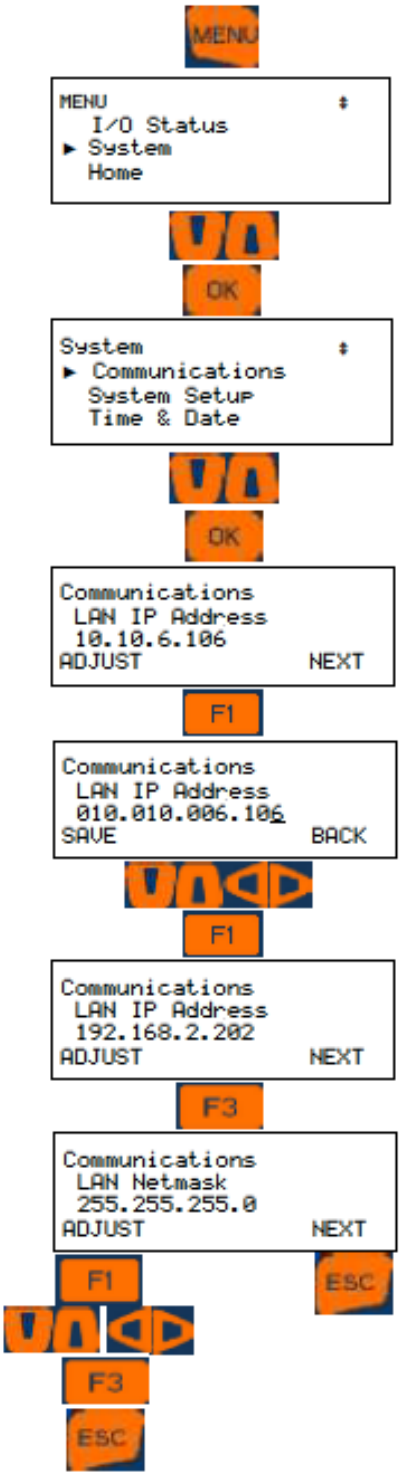
Using the Local Area Network (LAN) port to connect to the building network, you will need to acquire an IP address from the customer which will allow the controller to be compatible with this network. The address you receive must be unique on this network.

Use the keypad to change the address; (See flowchart on next page)

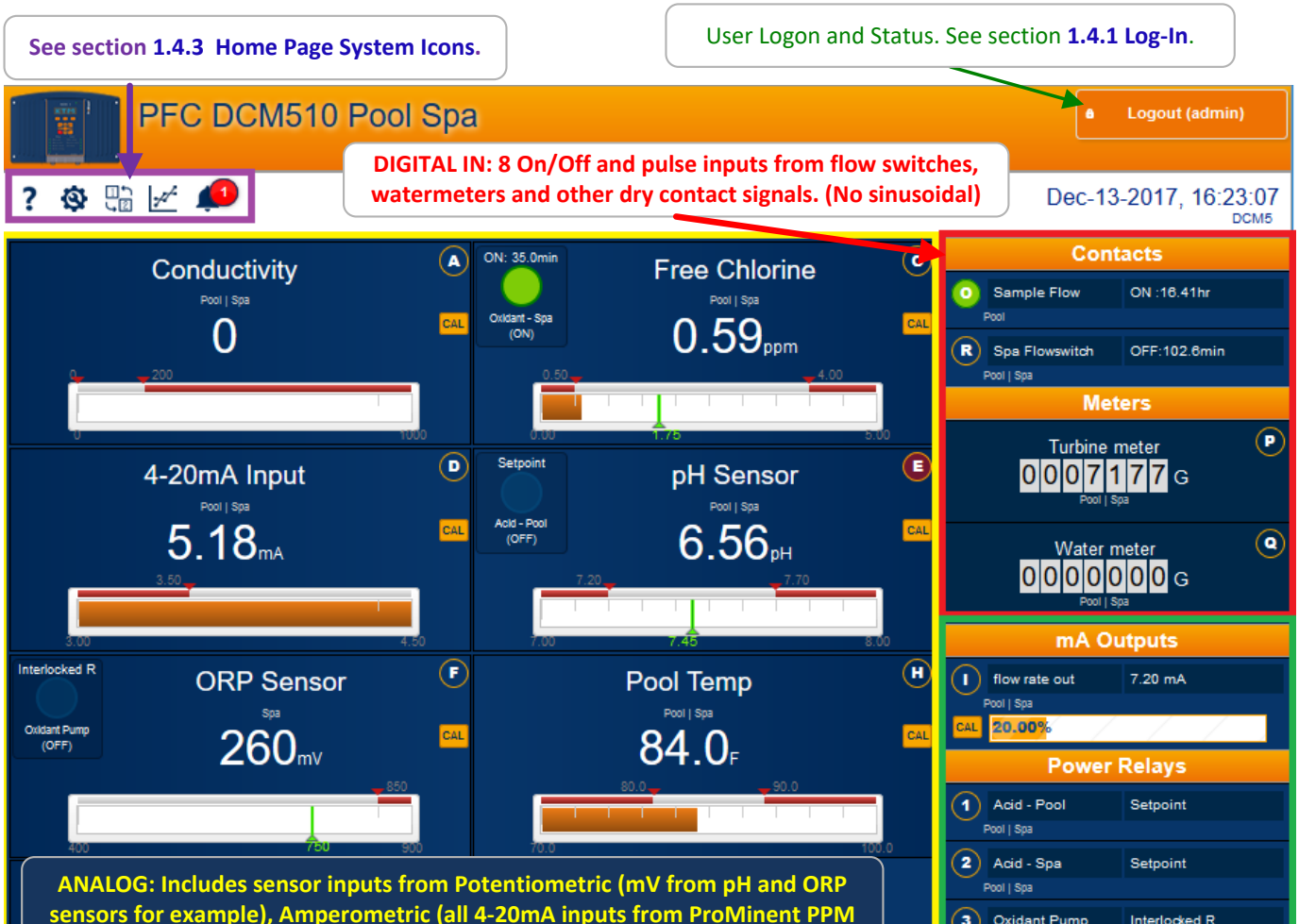
1 Press Menu

DCM510 Browser

2 Scroll up to System. Press OK
3 Scroll down to Communications. Press OK
4 Scroll down to LAN IP Address. Press F1 Adjust
5 Use the up/down and left/right arrows to change the numbers until they show the new address. Press F1 Save.
6 If the LAN Netmask is different from the building network, change that as well, then Save.



1.3 The Home Screen 1 of 2



The Home Screen 2 of 2

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

1.4 Home Page Services

DCM510 Browser

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

1.4.1 Log-In

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

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

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

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

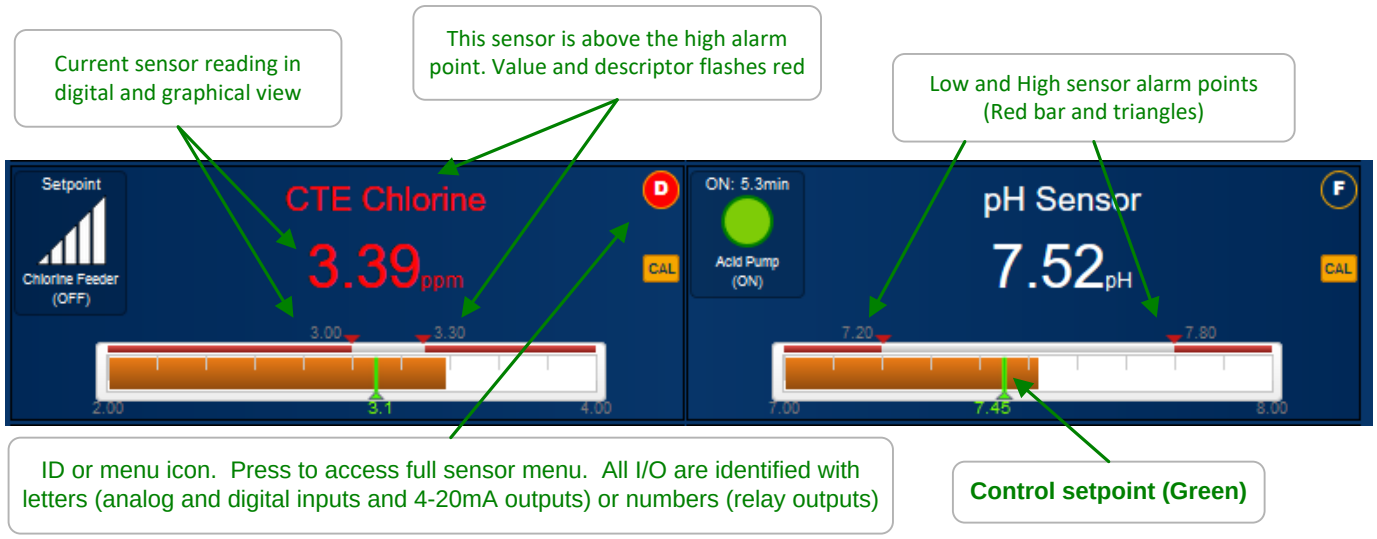
See section **9.8 User Setup** to learn how to change passwords.

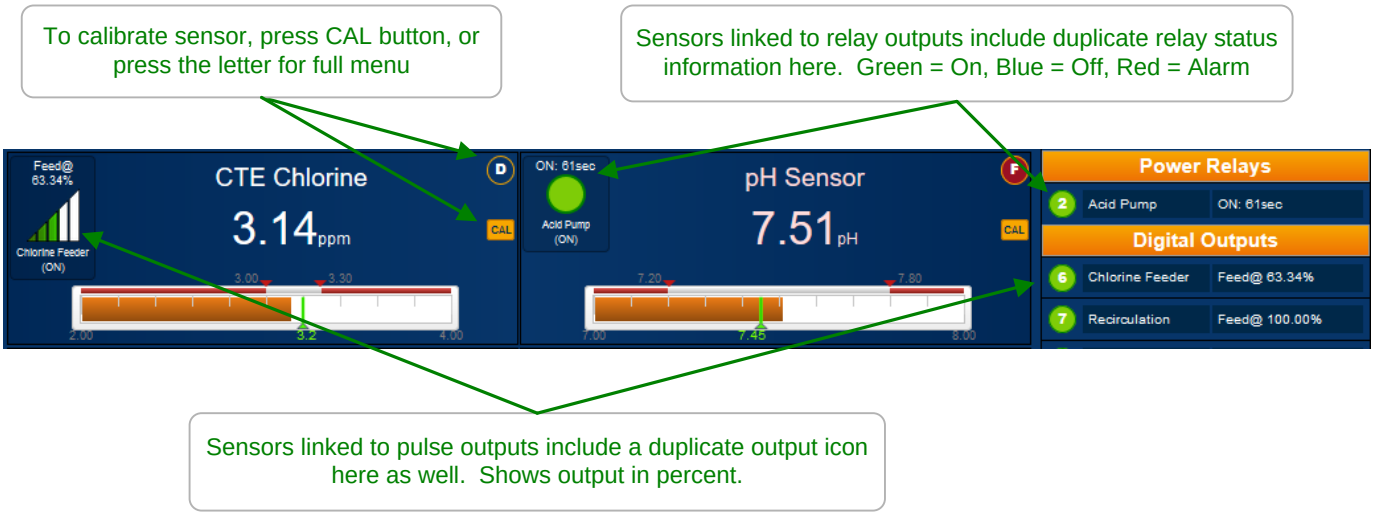
1.4.2 Home Page Detail

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

1.4.2.1 Analog Input Display

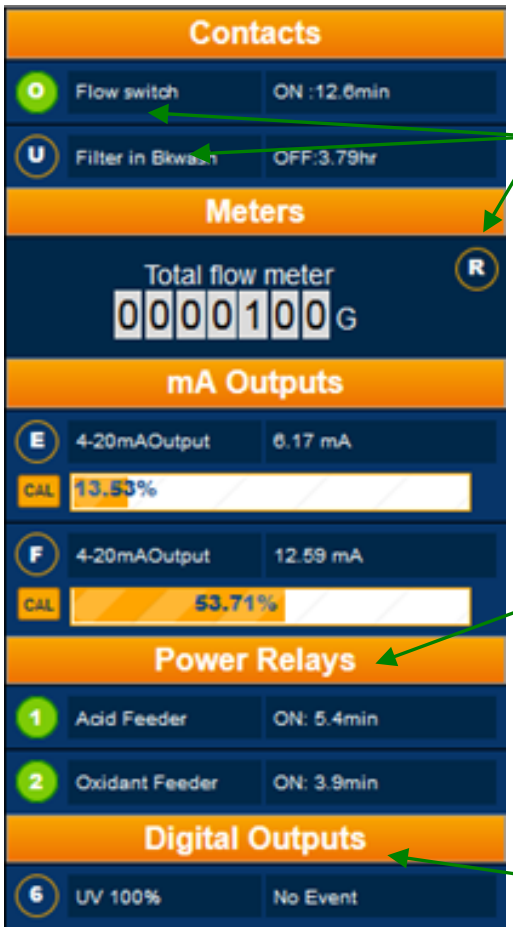
DCM510 Browser





1.4.2.2 Digital I/O Display

DCM510 Browser



Maximum of 8 Digital inputs, O through V. Can be any combination of dry contact switches or digital flowmeter signals from contact head or paddle wheel models. One is dedicated as a flowswitch per pool.

See section **8 4-20mA Outputs** for configuration

Max of 5 Digital (AC Line) Output Relays to power pumps, solenoids and MOV valves.

Digital output configuration covered in sections **2 and 3**.

Max of 4 Pulse frequency or On/Off relays. Rated for 24VDC

1.4.3 Home Page System Icons

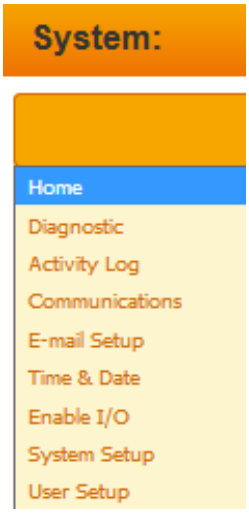
The home page has a variety of services unrelated to the program. These services are accessed via the icons in the upper left corner of the page. 

The User Manuals icon  gives you access to the two DCM510 manuals; Operating and Browser (this manual). The Operating manual explains the keypad usage, wiring and specifications. The

DCM510 Browser

Browser manual shows you how to connect to and program a DCM510 controller using a PC, tablet or Smartphone.

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



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

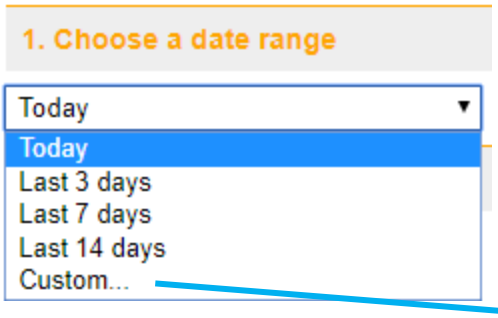
The report icon opens the report page for trending recent controller history. See section **1.4.4 Create a Report**

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

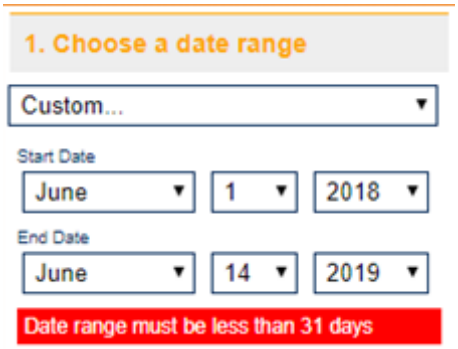
1.4.4 Create a Report 1 of 3

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

Follow the three steps as shown.



1. Choose a date range.



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

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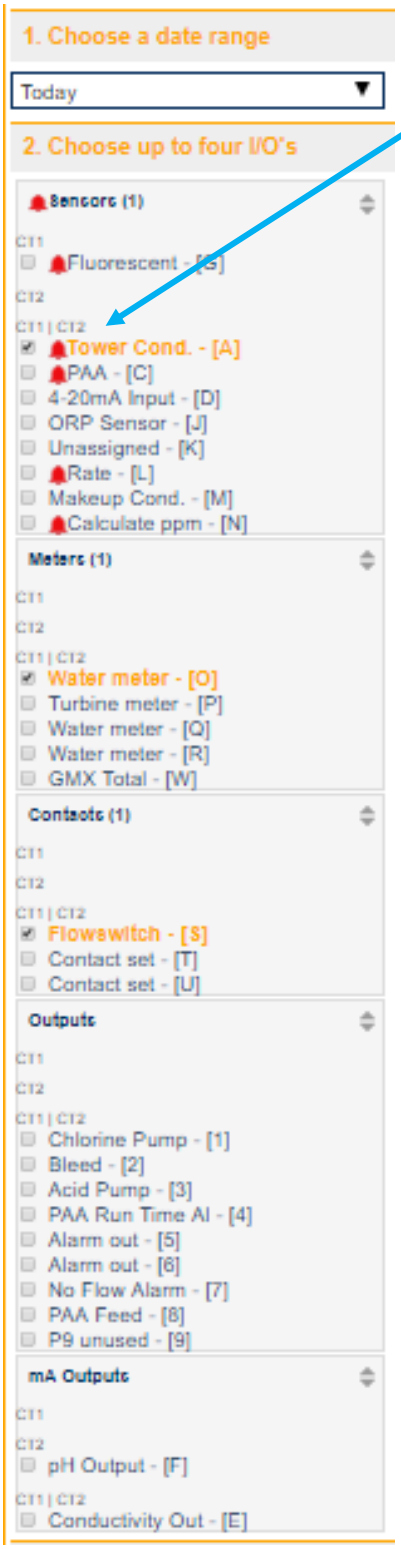
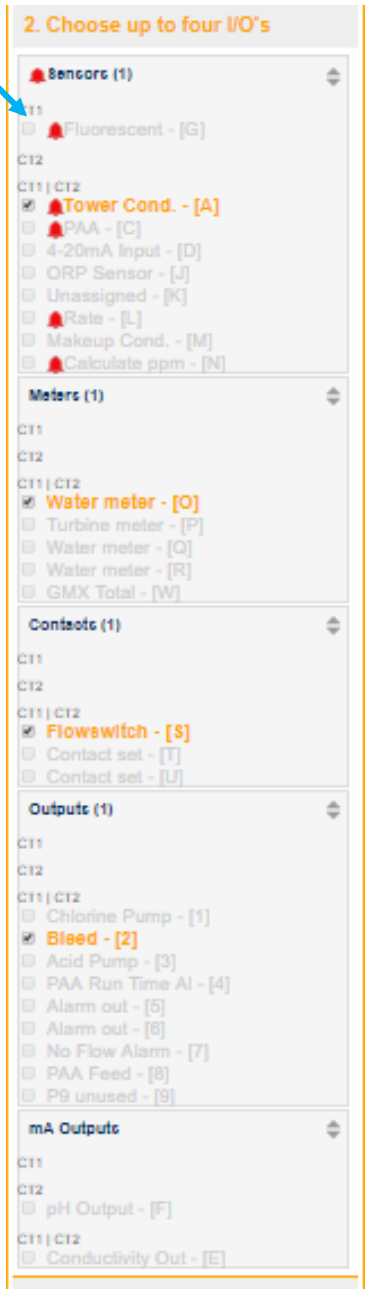


2 Select the I/O you wish to graph. Four points maximum. Checked boxes turn orange. After four boxes are checked, the remaining choices grey out and cannot be selected without un-checking one of the four.



3 Press the Download button.

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

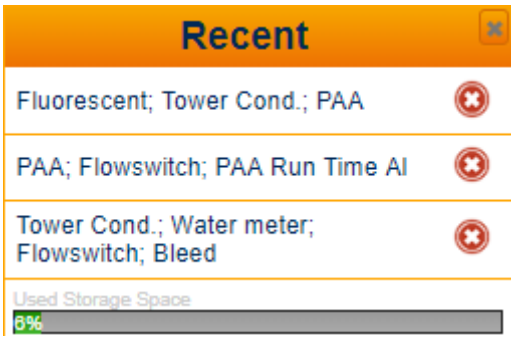
? Access the controller manuals
Exit from the report menu back to the Live view
Show/hide the report menu
Manage the report database
Show/hide the controller header
Show/acknowledge current alarms

Note the trend zoom tools.

Click on this icon to export as a picture

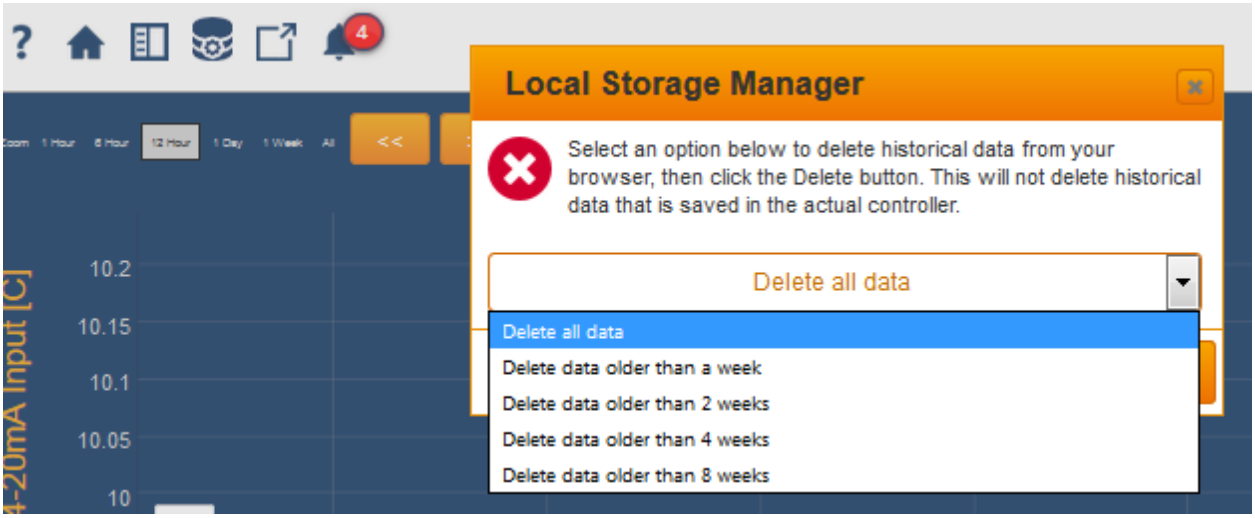
1.4.5 Manage the report database

When you create a graph by selecting I/O points, the browser downloads the data for the chosen points. This data is stored on your device (PC, smart phone, etc). Different browsers allow different amounts of memory to this file. The graph page keeps track of previous selections and expresses the total size of all downloaded data in a bar graph.

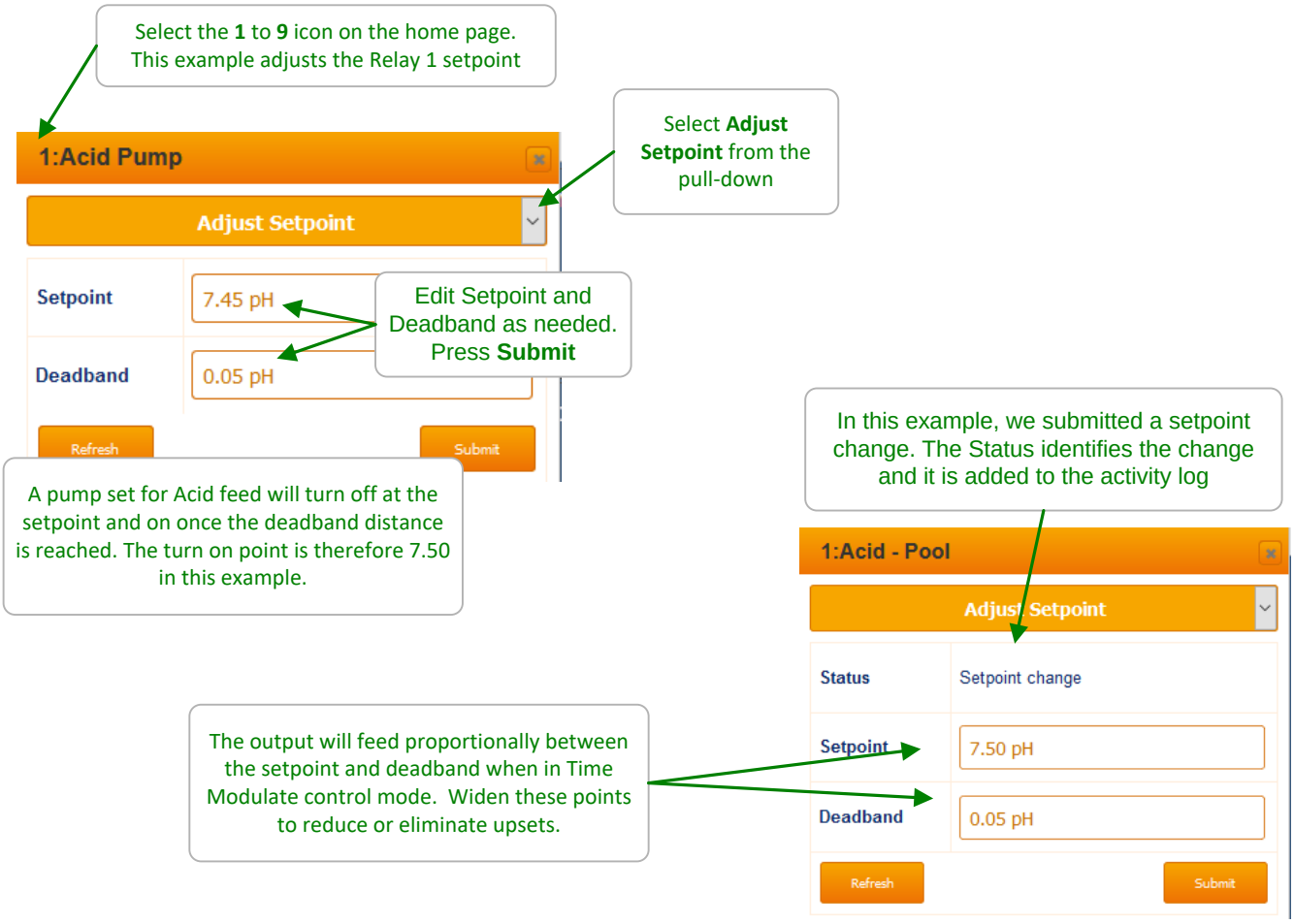


This picture depicts three previous graph configurations that have data in the graphing database. Click on one to create a graph, or remove them by selecting the X.

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



DCM510 Browser
1.5 View & Adjust Setpoints 1 of 2

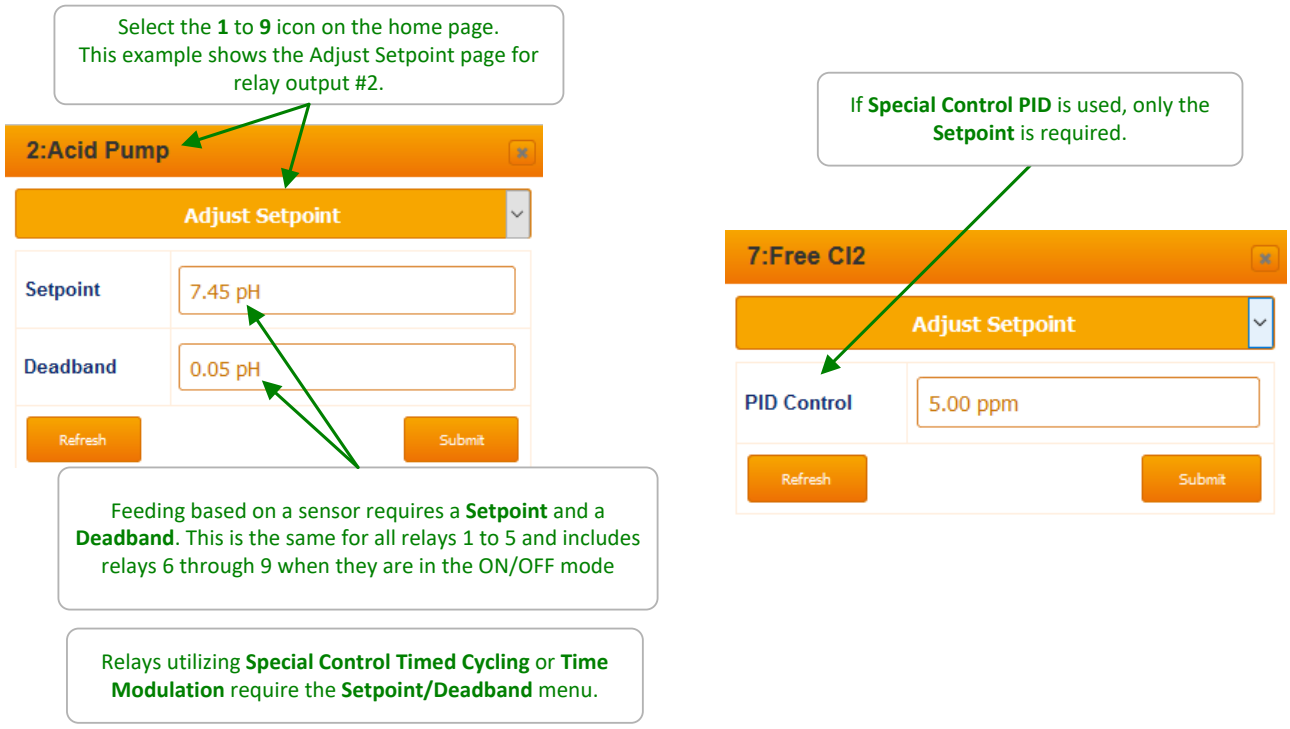


Sidebar:
Relays controlled by sensors power Pumps and Solenoids ON and OFF.
(Relays are outputs **1** to **5** & outputs **6** to **9** set to 'ON/OFF')
Frequency controlled Pumps feed chemicals at varying rates.
(Frequency controlled pumps are outputs **6** to **9** set to 'Pulse Output')

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. If pH swings continue, consider using Special Control programs like Timed Cycling or Time Modulation to delay the controller response to applications that have a long lag time.

DCM510 Browser
View & Adjust Setpoints 2 of 2

The Setpoint page varies with the configuration and type of control output; ON/OFF or variable frequency (pulse).



Sidebar:

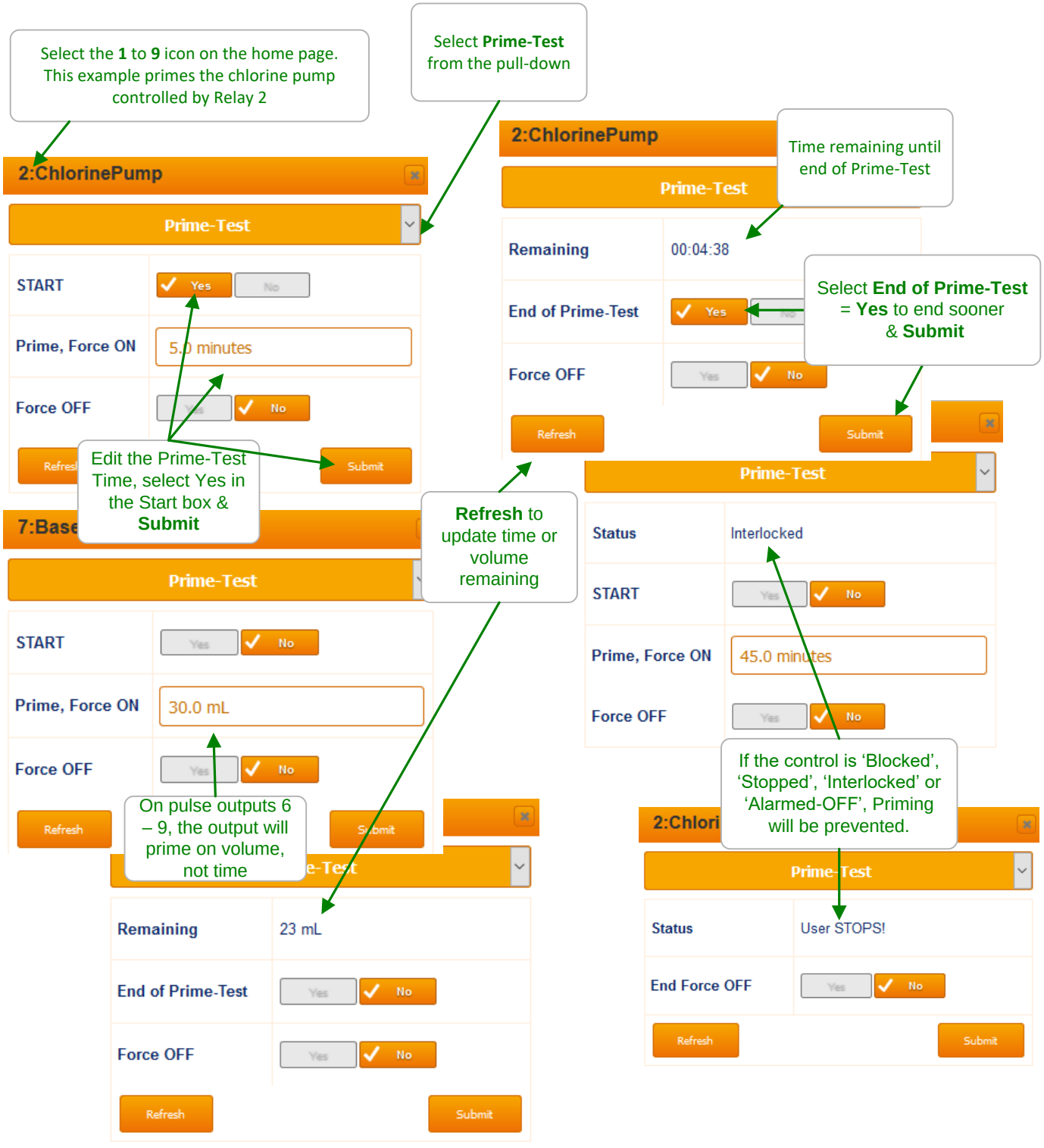
Controls may be configured to prevent one chemical feeding while another feeds (See 'Blocking') into a common injection header.

Pumps, feeders, solenoid or valve controls may be turned OFF when the flowswitch shows no sensor header flow. (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. This is how the program relates to physical devices.

You may modify the name of the pump, feeder, valve or solenoid but you'll need to know which output is controlling so you can check that controller hood indicating light is ON when the pump, feeder, valve or solenoid is ON. (Relays 1-5 on the Left Hand Side & Pulse 6-9 on the Right Hand Side)

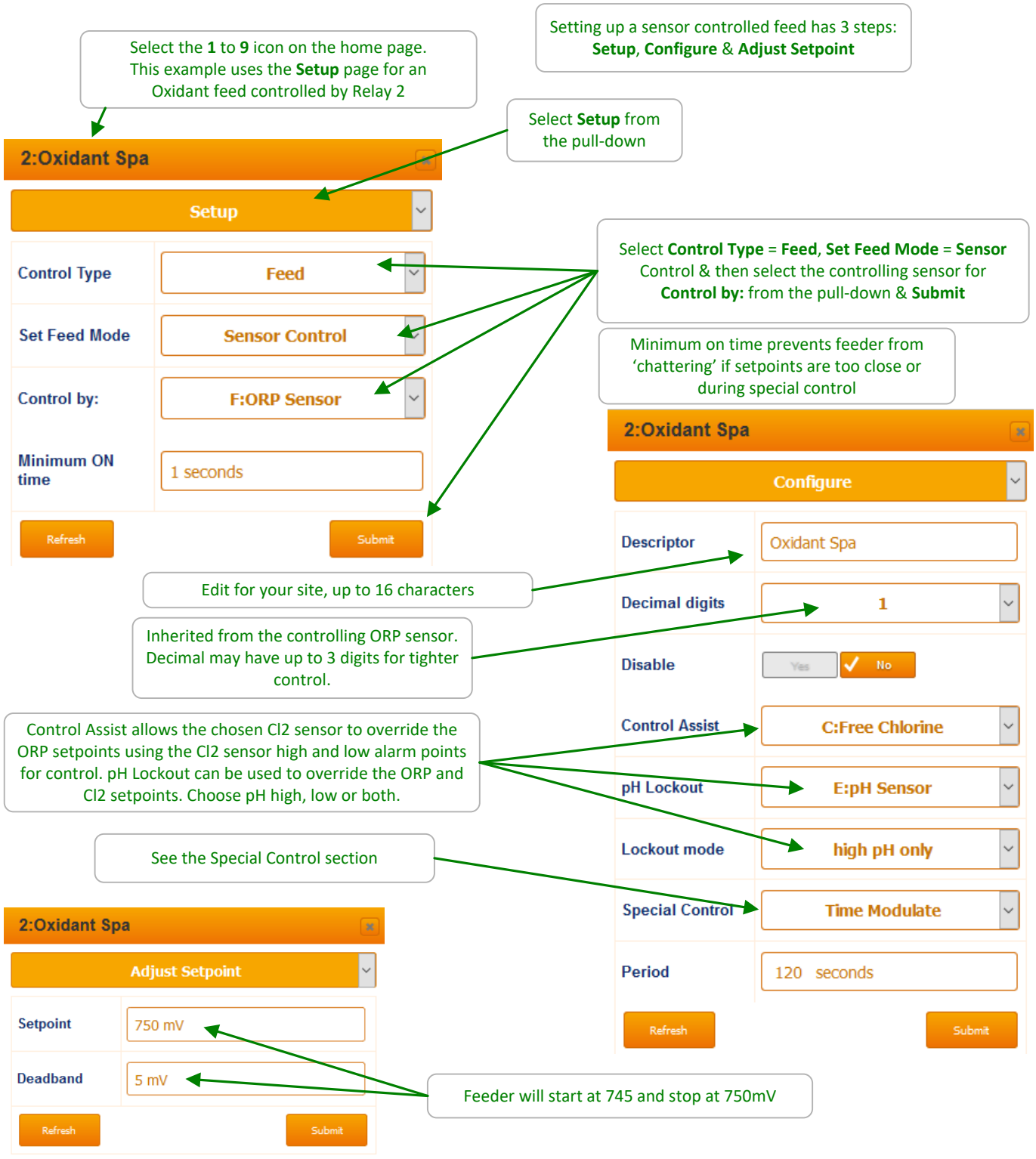
1.6 Priming-Testing Pumps, Feeders & Solenoids



Sidebar:
Priming may also be used to slug feed on system start-up in addition to testing pumps, feeders, valves or solenoids. Run Time Limit alarms (minutes per actuation or volume at maximum strokes per minute) may stop priming. See also Blocks and Interlocks. See also section 8 4-20mA Outputs.

2 Chemical Feed Controls: Oxidant, Acid

2.1 Sensor Controlled Feeds 1 of 3



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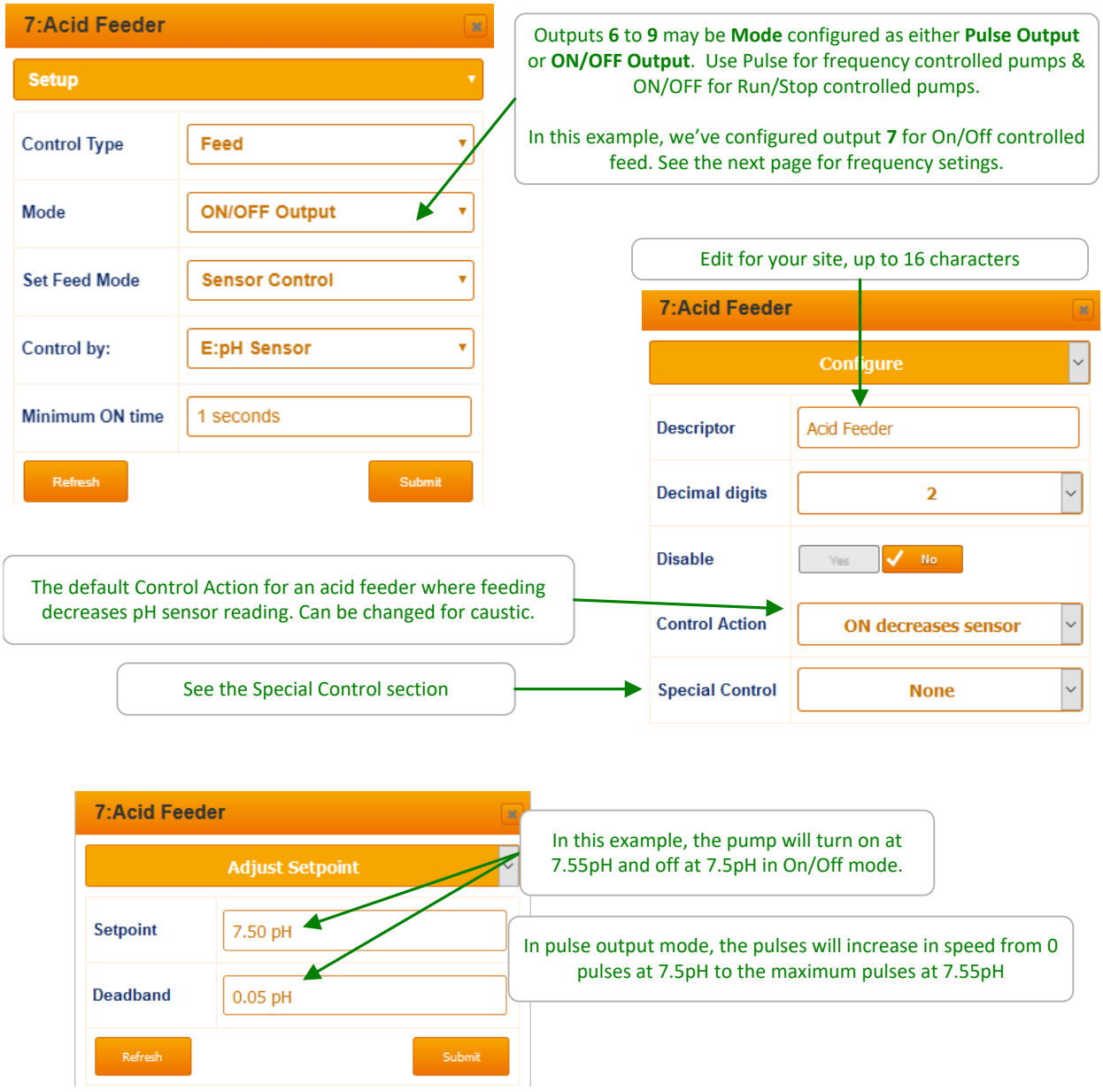
Sensor Controlled Feeds 2 of 3



Sidebar:
Sensors controlling 4-20mA outputs are detailed in section **8**
VFD outputs are described in section **5.3.1**

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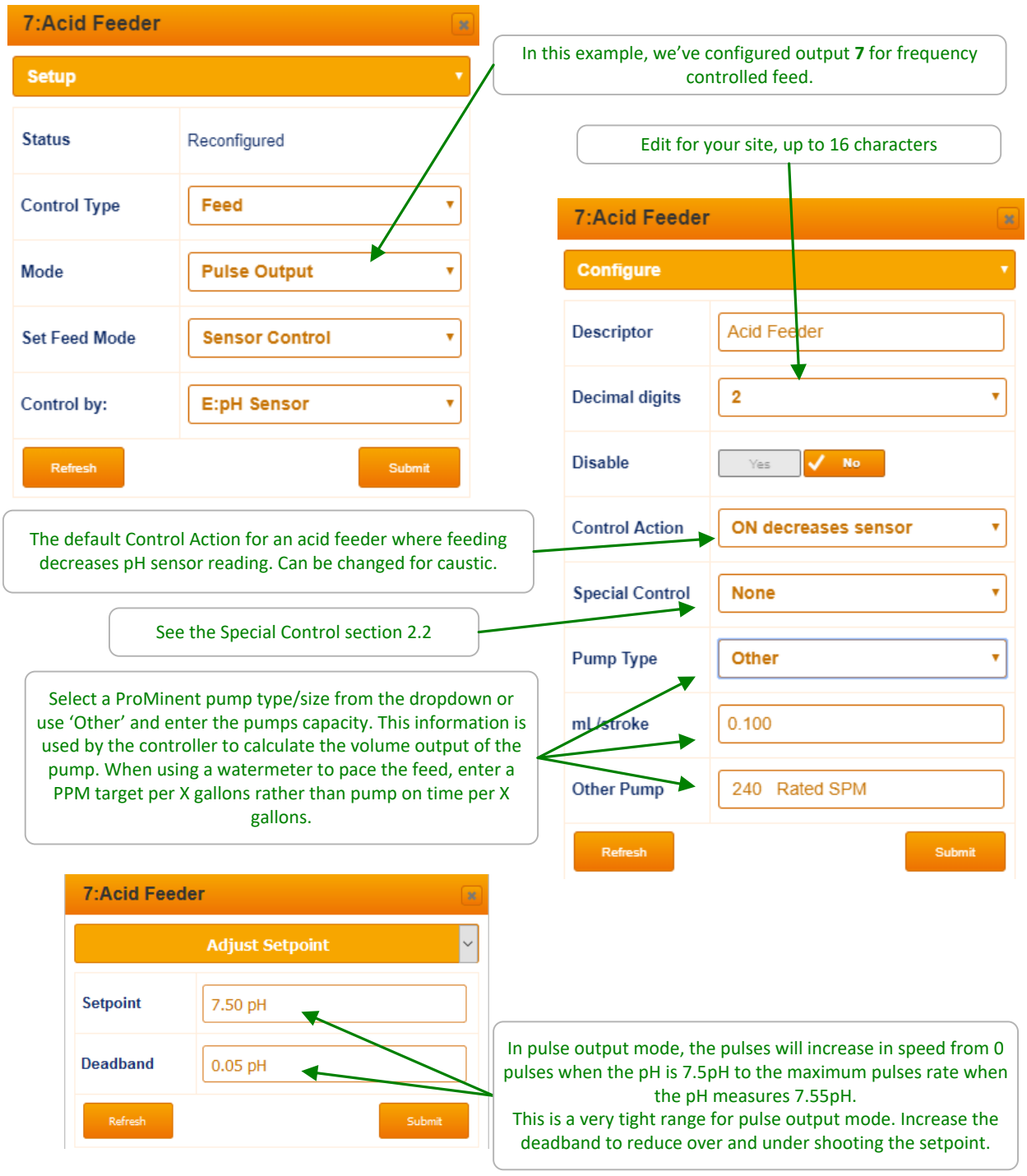
Sensor Controlled Feeds 3 of 3

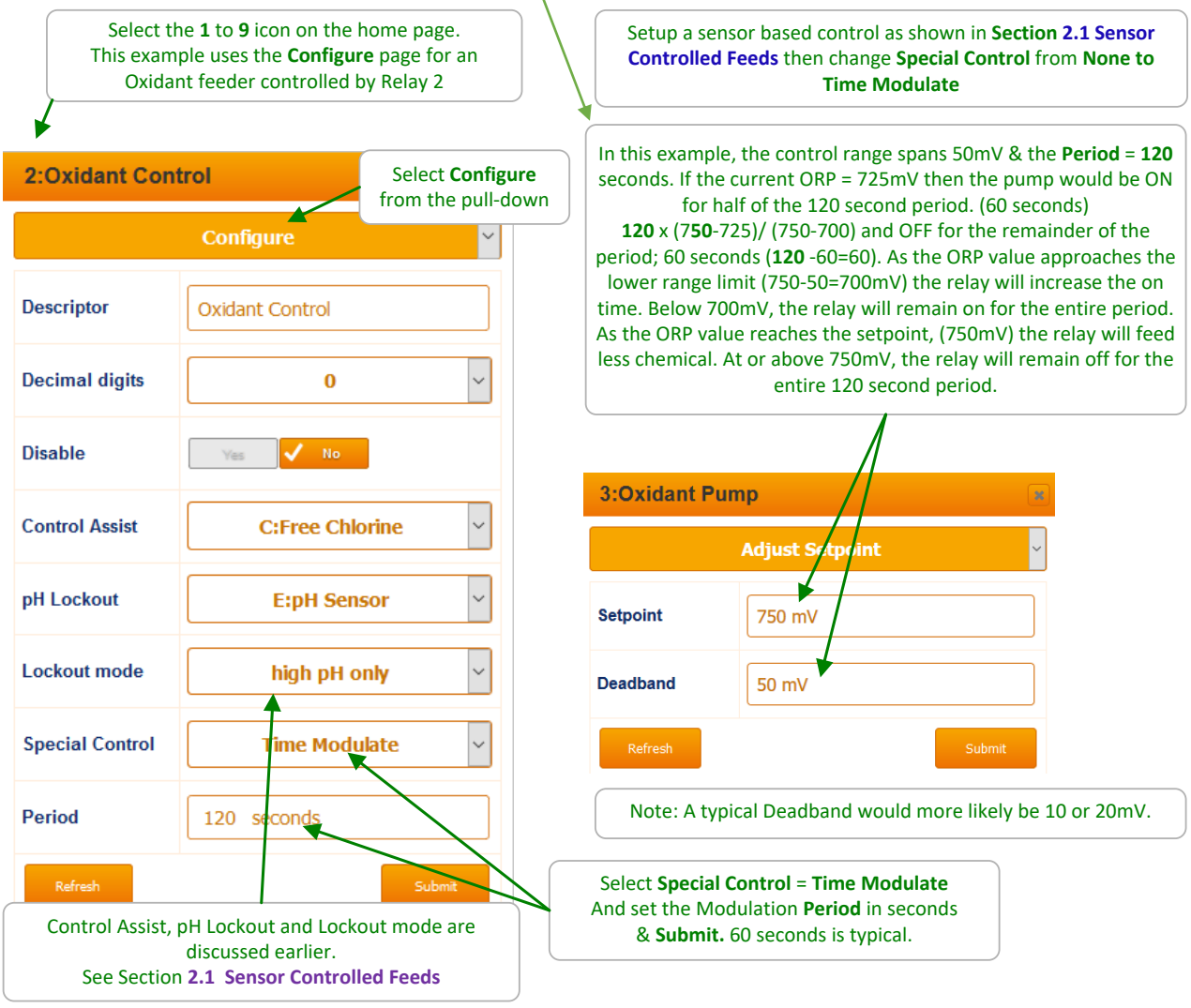


2.2 Time Modulation

Time Modulation allows an ON/OFF pump to operate proportionally, similar to a frequency or 4-20mA controlled pump. Properly sized ON-OFF pumps are typically set to maximum stroke and rate in **Time Modulation** mode.

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

Sidebar: **Time Modulate Special Control** proportions the pump on time with respect to the setpoint/deadband. At the beginning of each period, the controller compares the actual sensor value within the setpoint/deadband range and determines how long the relay will be on during that period. See example calculation below.

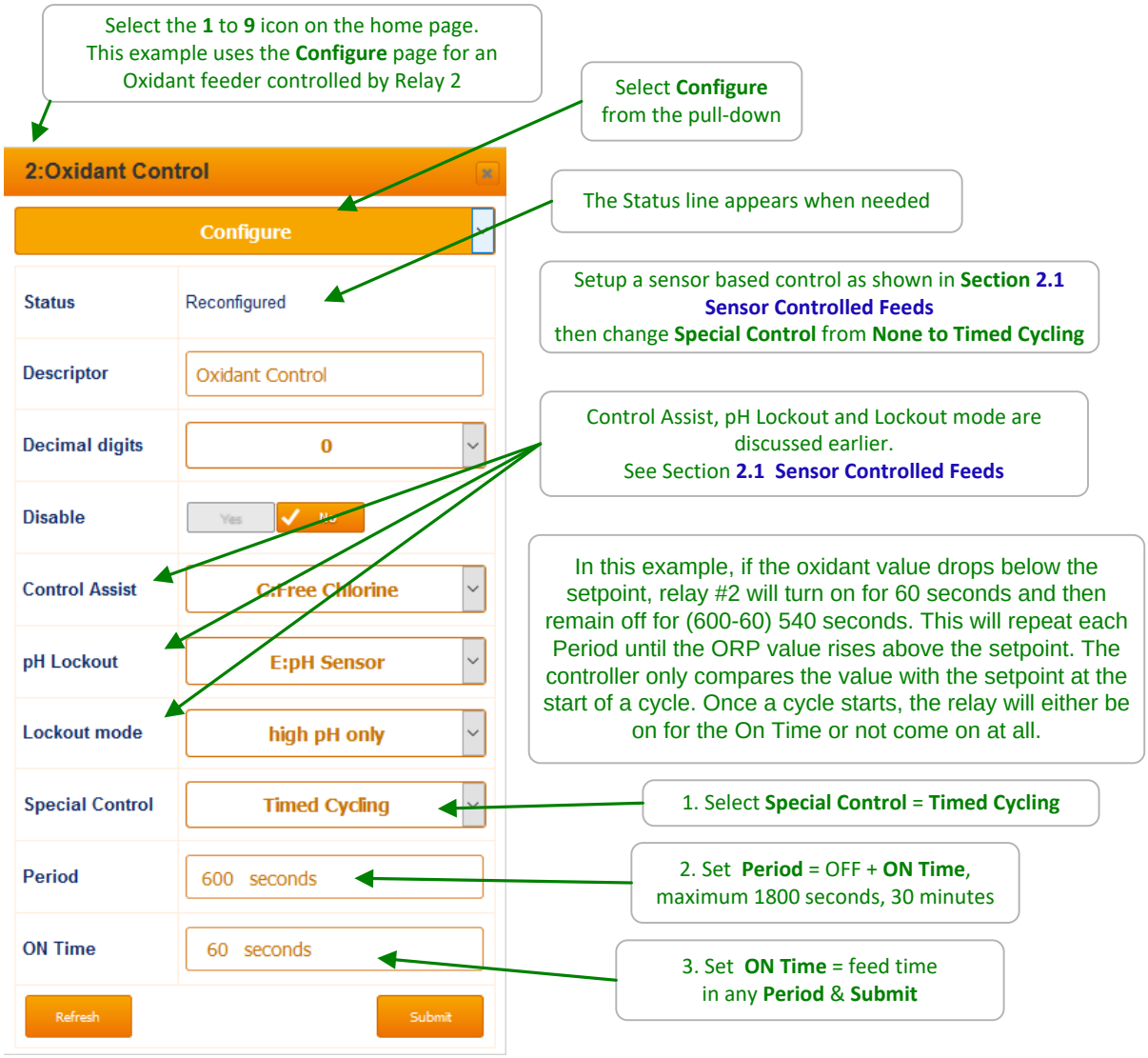


Sidebar:
Widen the difference between the setpoint and deadband to dampen oscillations. A smaller difference will control similar to On/Off control.

2.3 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 then back to the controlling sensor.

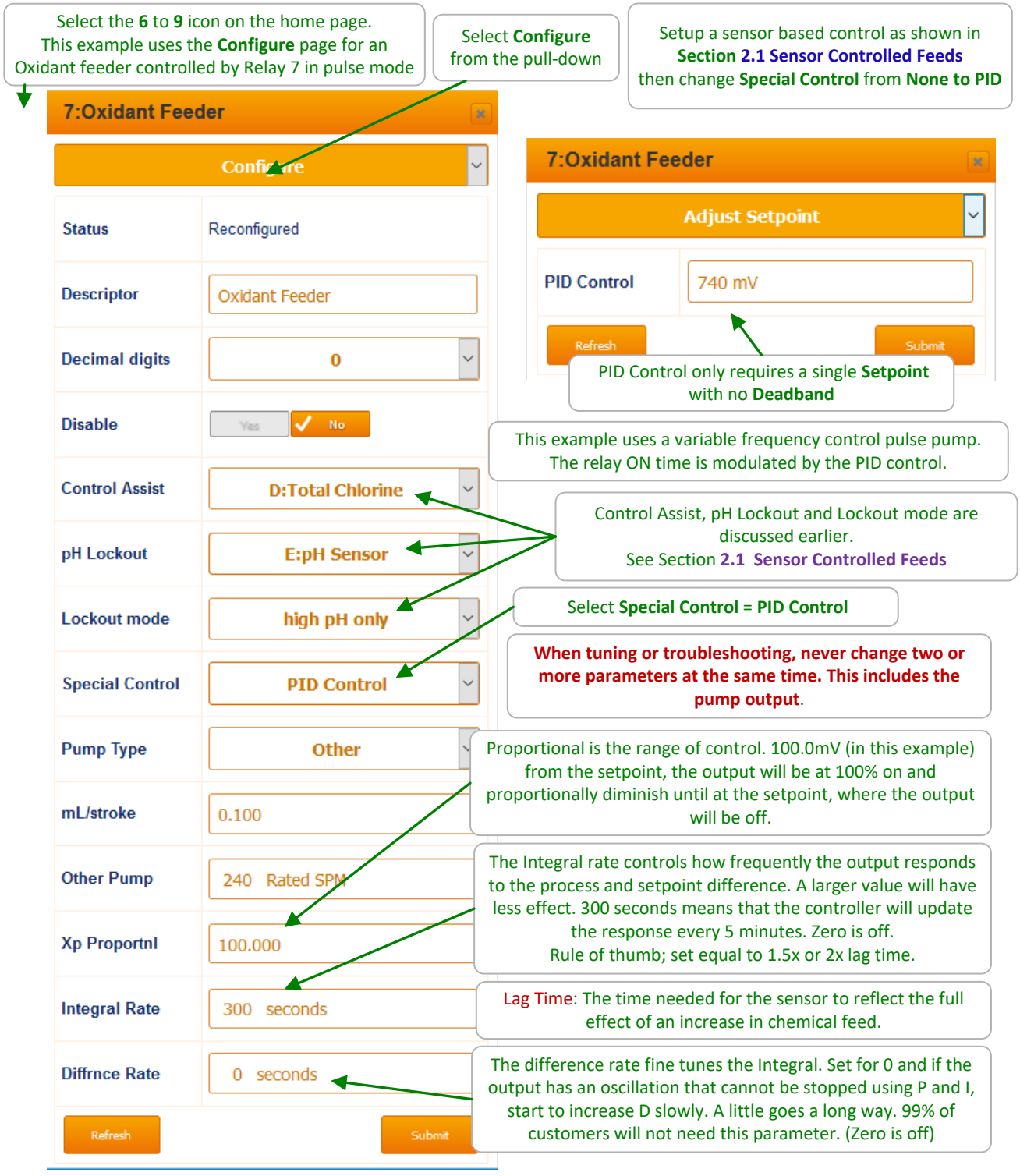
Based on the setpoint, the relay will be on for the ON time in each period and off for the remainder of the period. Once the setpoint is reached, the relay will not turn on again until the setpoint calls for chemical. It is either on for the ON Time each period, or off for the complete period if beyond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



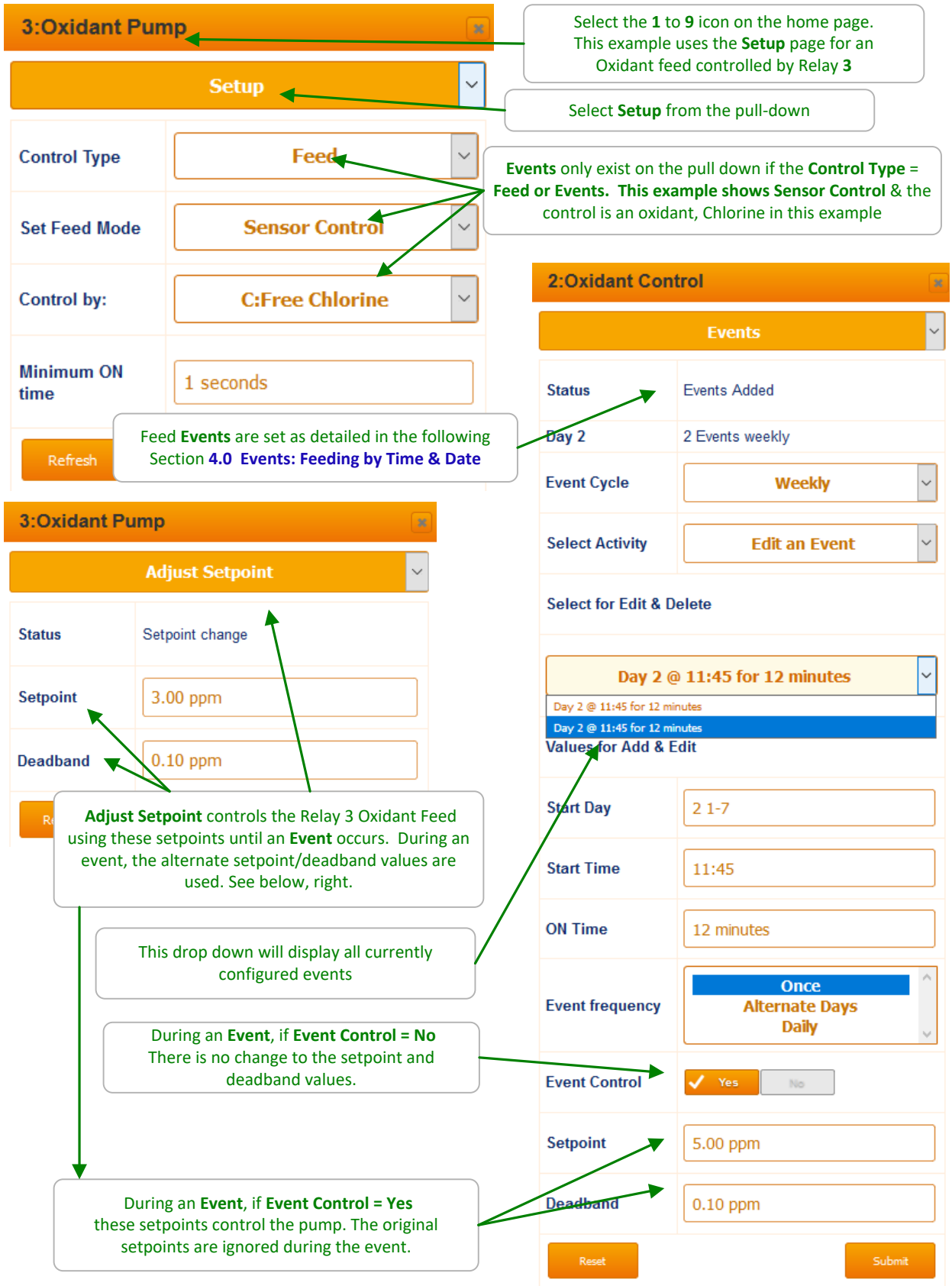
Sidebar:
Often there is a long time-delay between adding a chemical and measuring its effect at a sensor, which causes setpoint overshoot and poor control. Timed Cycling and Time Modulation are great tools for improving chemistry control.

2.4 PID Controls (Relays 6 through 9 only)

If long delays (>5 minutes) exist in your control loop, or you are not experienced in PID control with long delays, we advise that you use a different proportional control method like Time Modulation or Timed Cycling. See **Special Control**. **(Sections 2.2 and 2.3)**

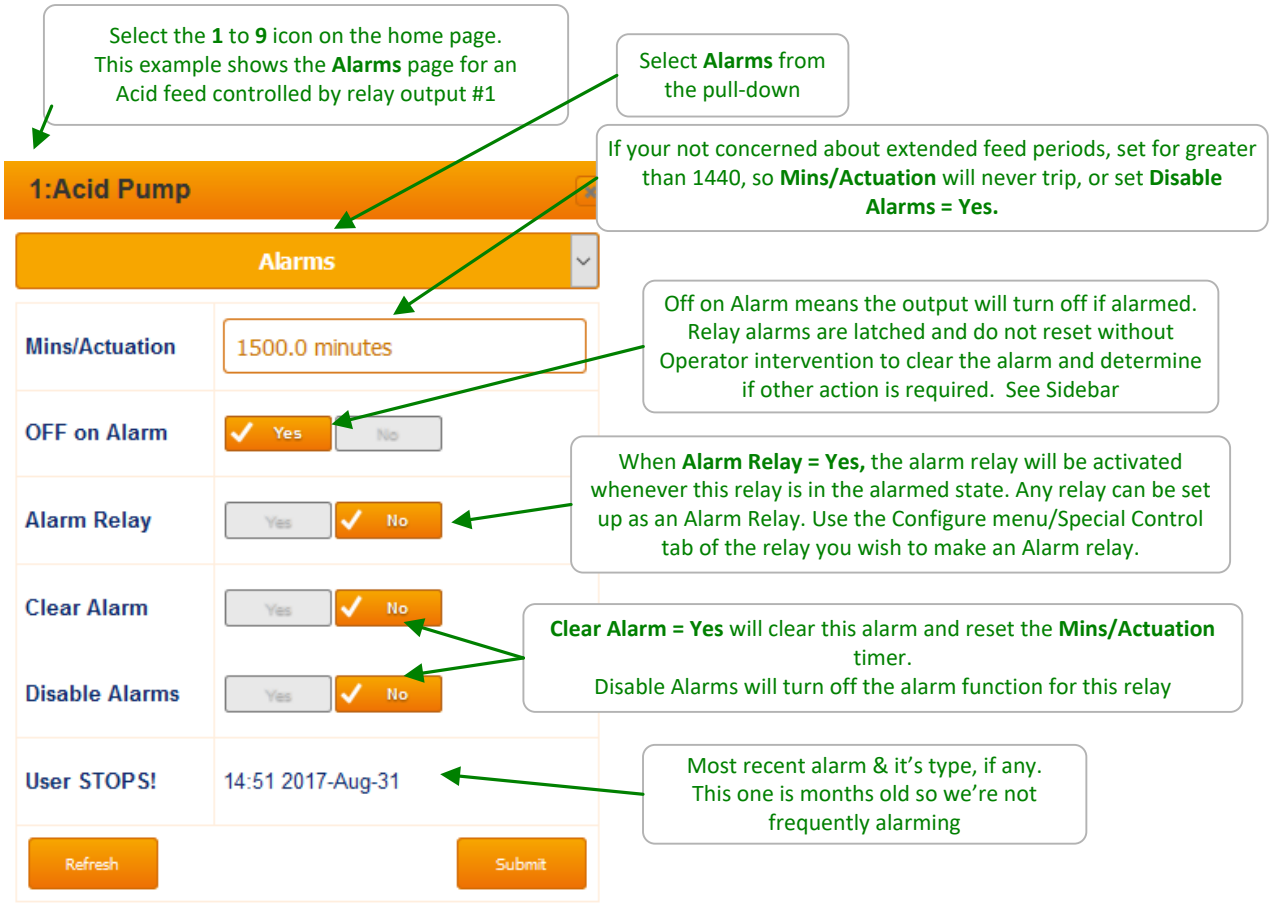


2.5 Control During Events



2.6 Limiting Feed & Alarms

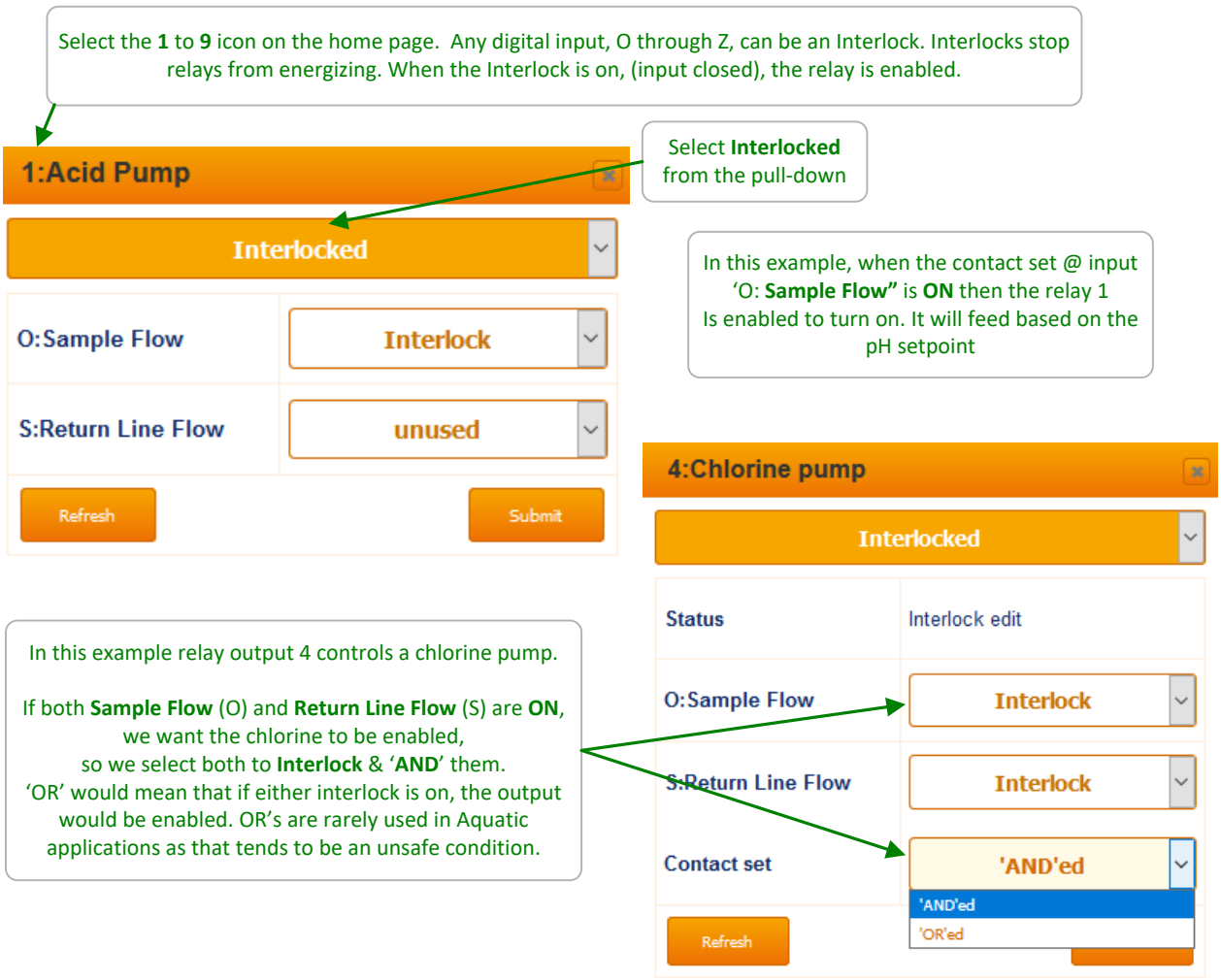
Run Time Limits are used detect and alert operators of problems with chemical feeders.



Sidebar:
If you are experiencing limit alarms, what has changed? Are you out of chemical? Was there a change in demand for chemical? Is the sensor working/calibrated? Is the chemical injector clogged?

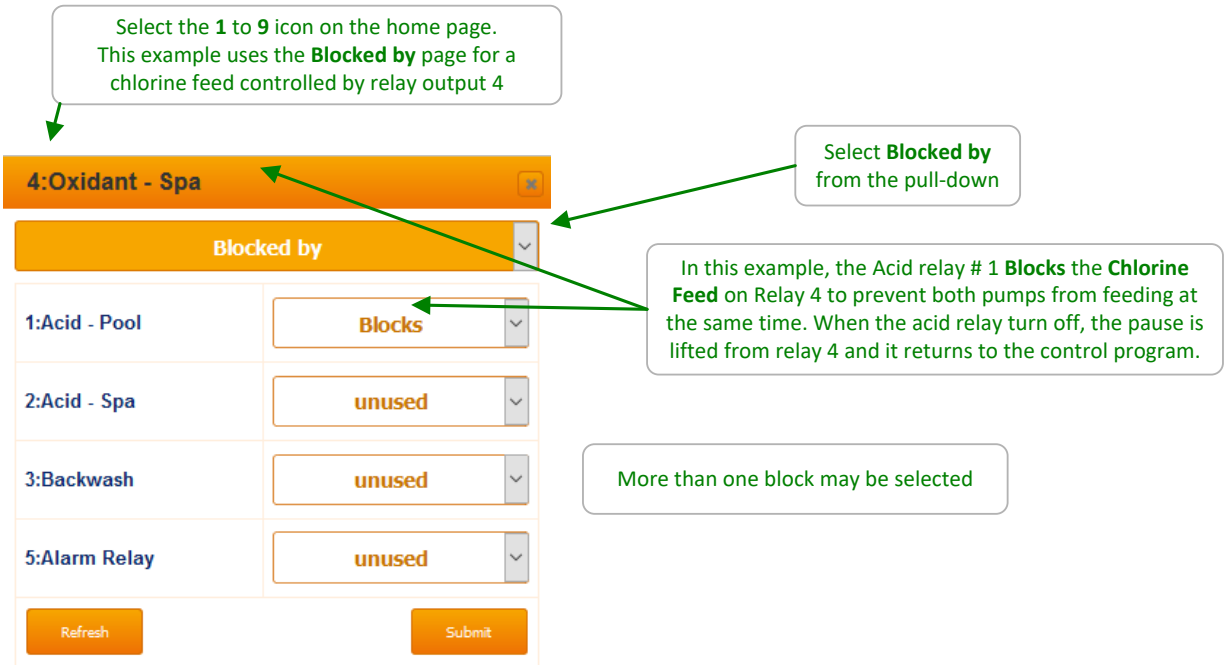
2.7 Interlocks - No Feed on No Flow

An Interlock is a dry contact digital input to the controller (O through V) that can be used to indicate the status of other equipment. This status can then be used to start or stop output relays and/or 4-20mA signals.



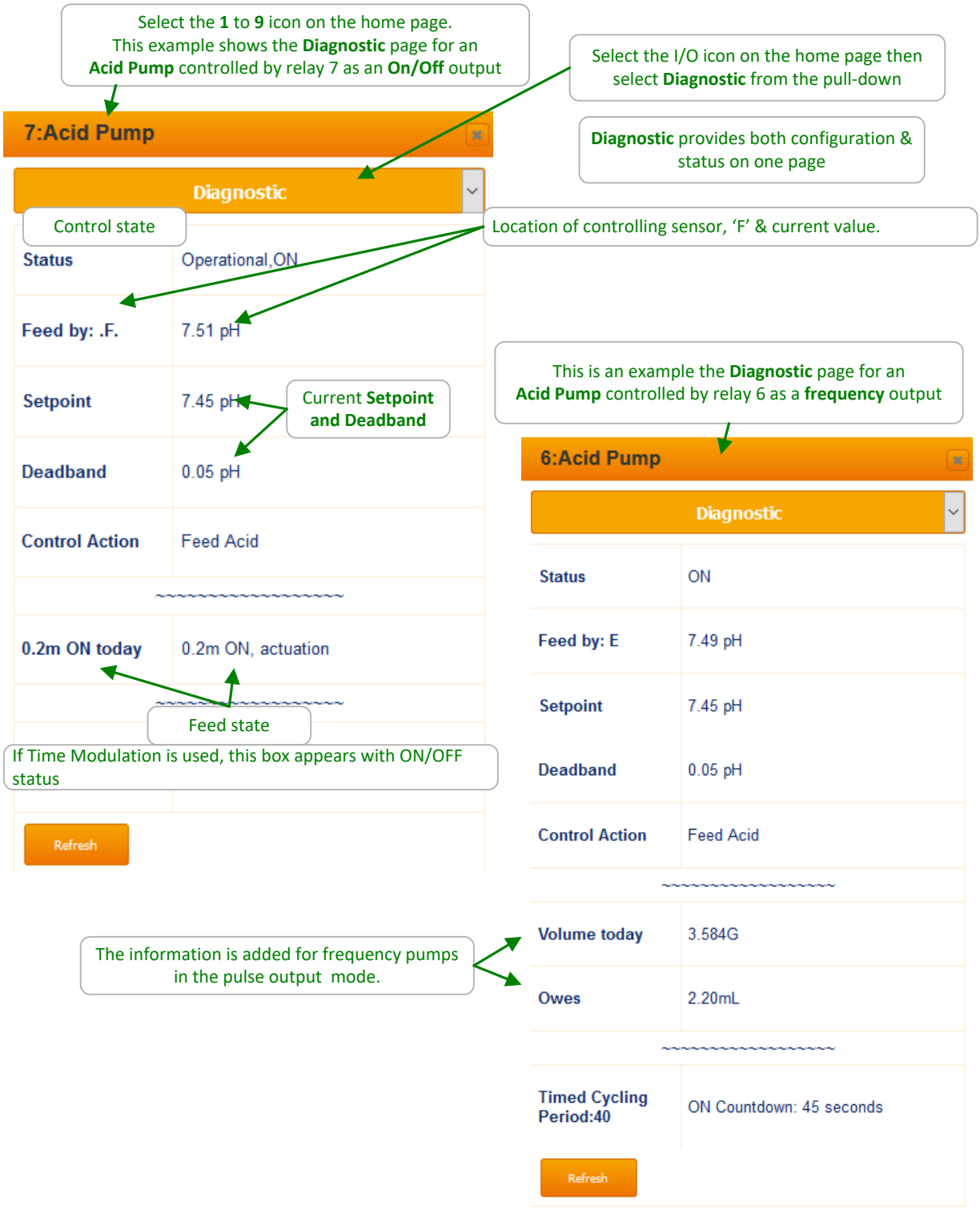
2.8 Blocking-Delaying a Feed

Interlocks are inputs that can pause outputs. Blocks are outputs that can pause other outputs.



Sidebar:
Warning: A poorly conceived block may prevent a control from maintaining setpoint.

2.9 Feed Diagnostics 1 of 2



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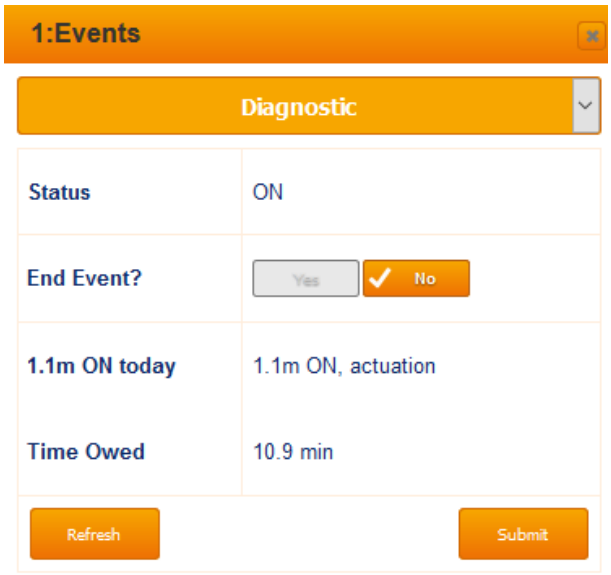
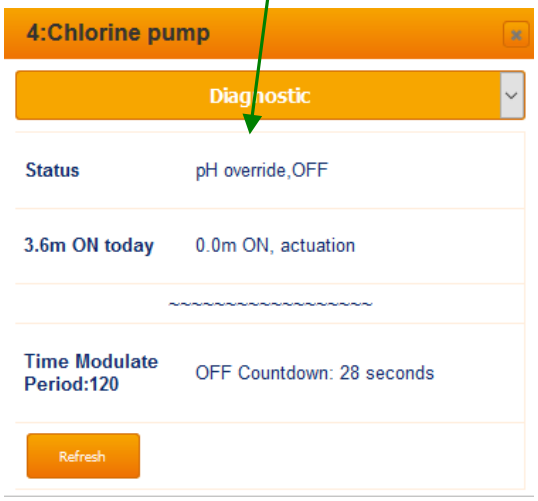
Feed Diagnostics 2 of 2

This page shows examples of Diagnostic information for relays.

An Event diagnostic allows you to terminate an active event. This does not change the schedule.



If an Oxidant relay is set up for pH override, the status will alert an override action

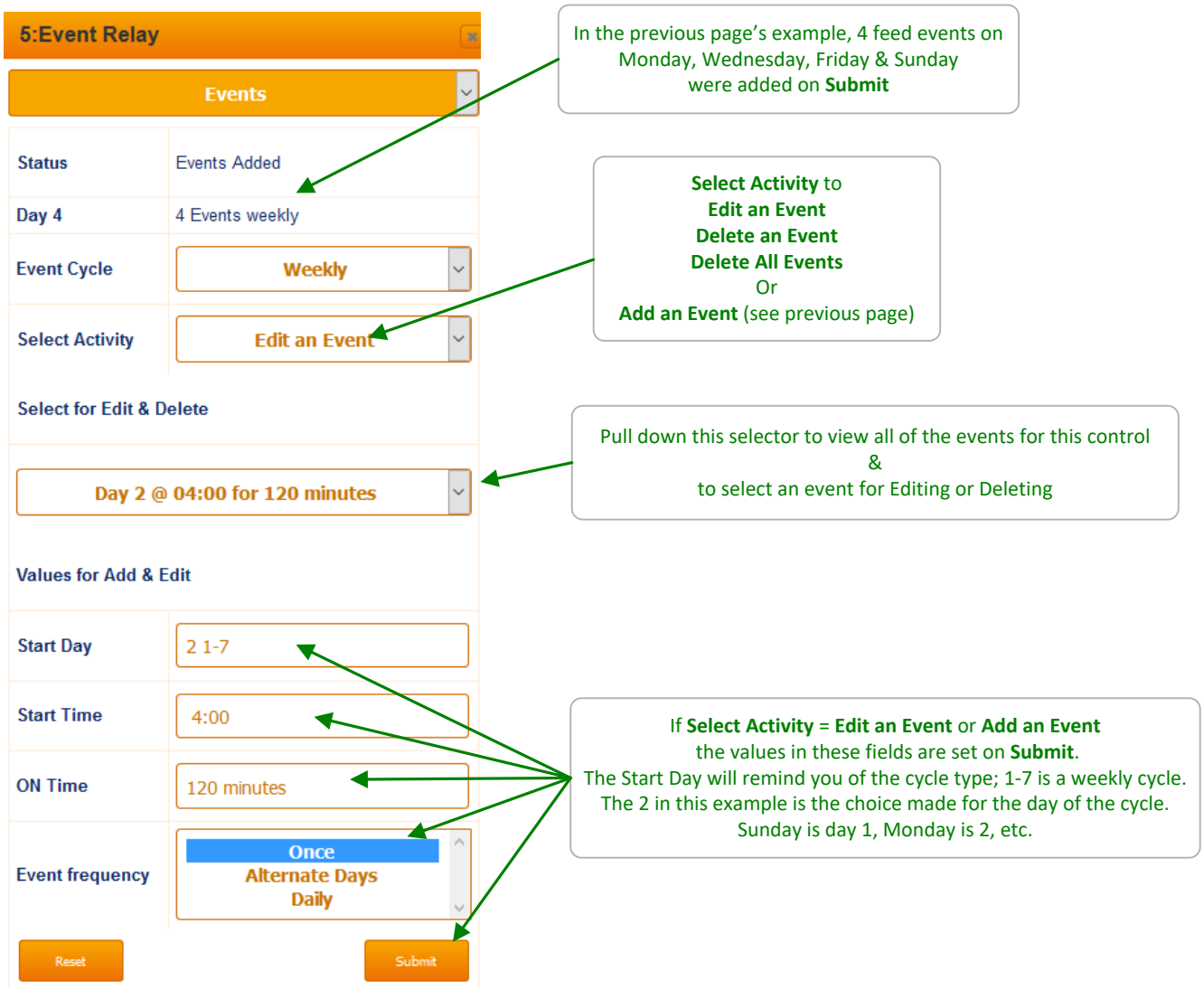


3 Events: Feeding by Time & Date

3.1 Setting & Viewing Events 1 of 2

Sidebar: Relay 1-5 and controls 6-9 in the ON-OFF mode have timed events. The pump starts at a particular time and runs for a certain number of minutes.
Pulse-frequency controls 6-9 have volume feed events. The feed is based on a volume

Setting & Viewing Events 2 of 2

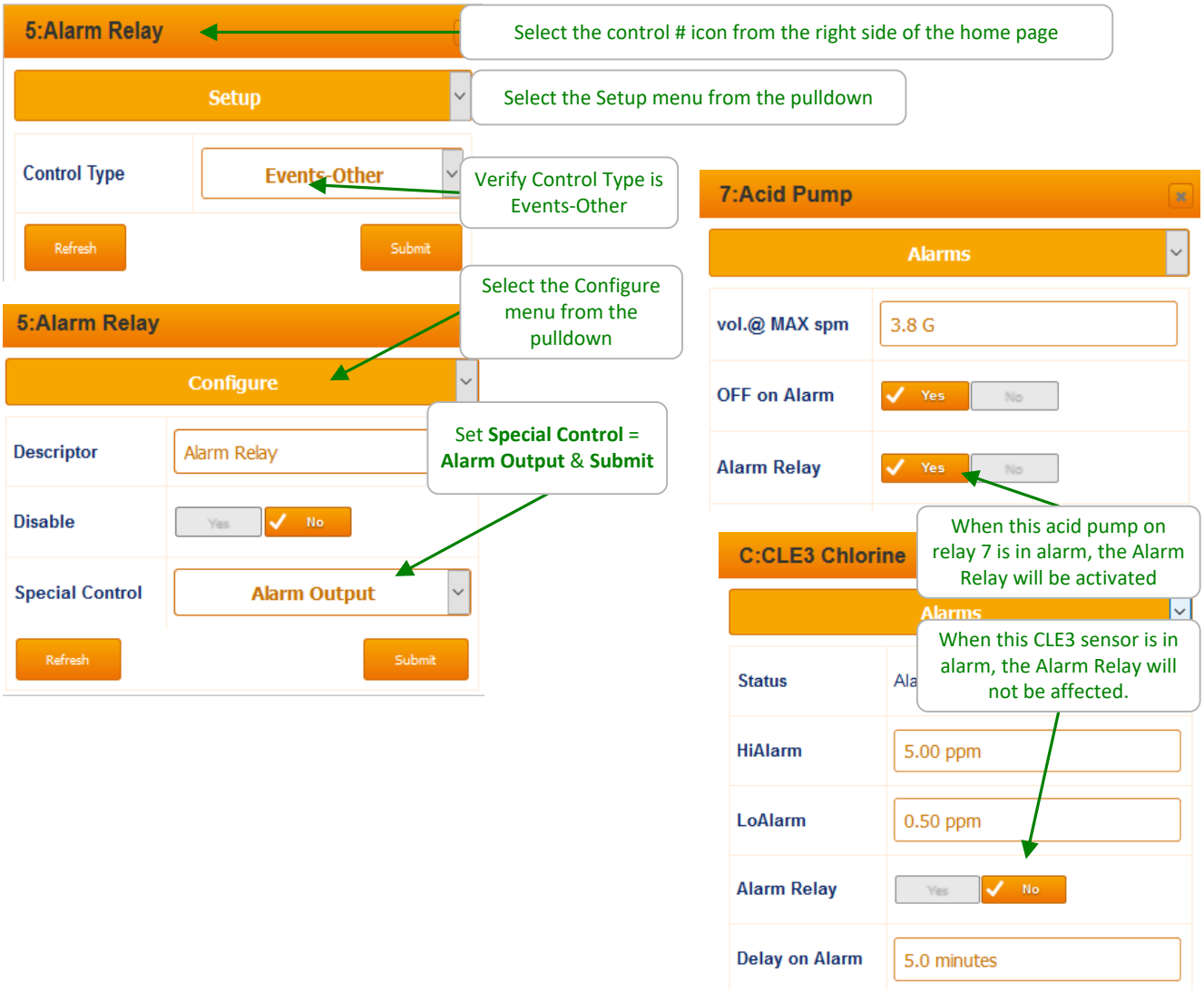


Sidebar:
Limit Alarms, Interlocking & Blocking also are used with Events.
They are set identically to those for **Chemical Feed Controls**.
Refer to Sections 3.5 to 3.7 for setup & state pages.

Timed & Volume events can also be used to wash sensors, activate solenoids,
block other controls during event times or activate alternate chemical or energy saver setpoints.

3.2 Alarm Relay

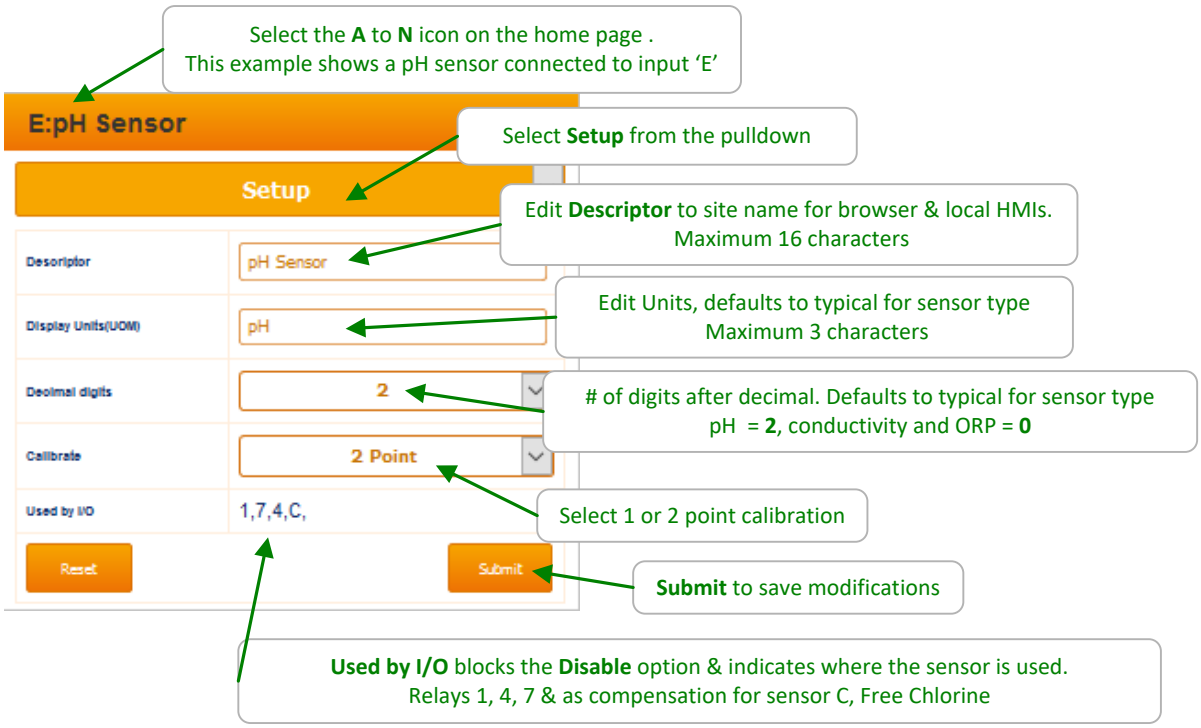
Any relay can be configured as an alarm output relay. Once a relay is designated as the alarm relay, all other I/O points have the choice to activate the alarm relay when they themselves are in alarm. They can choose to activate the alarm relay or not. Any System alarm will activate the alarm relay.



Sidebar:
Use an alarm relay to turn on an Alarm Light or Klaxon horn. Use relays 6 – 9 to send an alarm signal to a control system.
Relays 6 through 9 can be used with a maximum of 24VDC/250mA power. Wire them in either direction. They are not polarity sensitive. They can only be configured in ON/OFF mode.

4 Sensors: Amperometric, pH, ORP, Corrosion, Conductivity

4.1 Sensor Setup 1 of 2

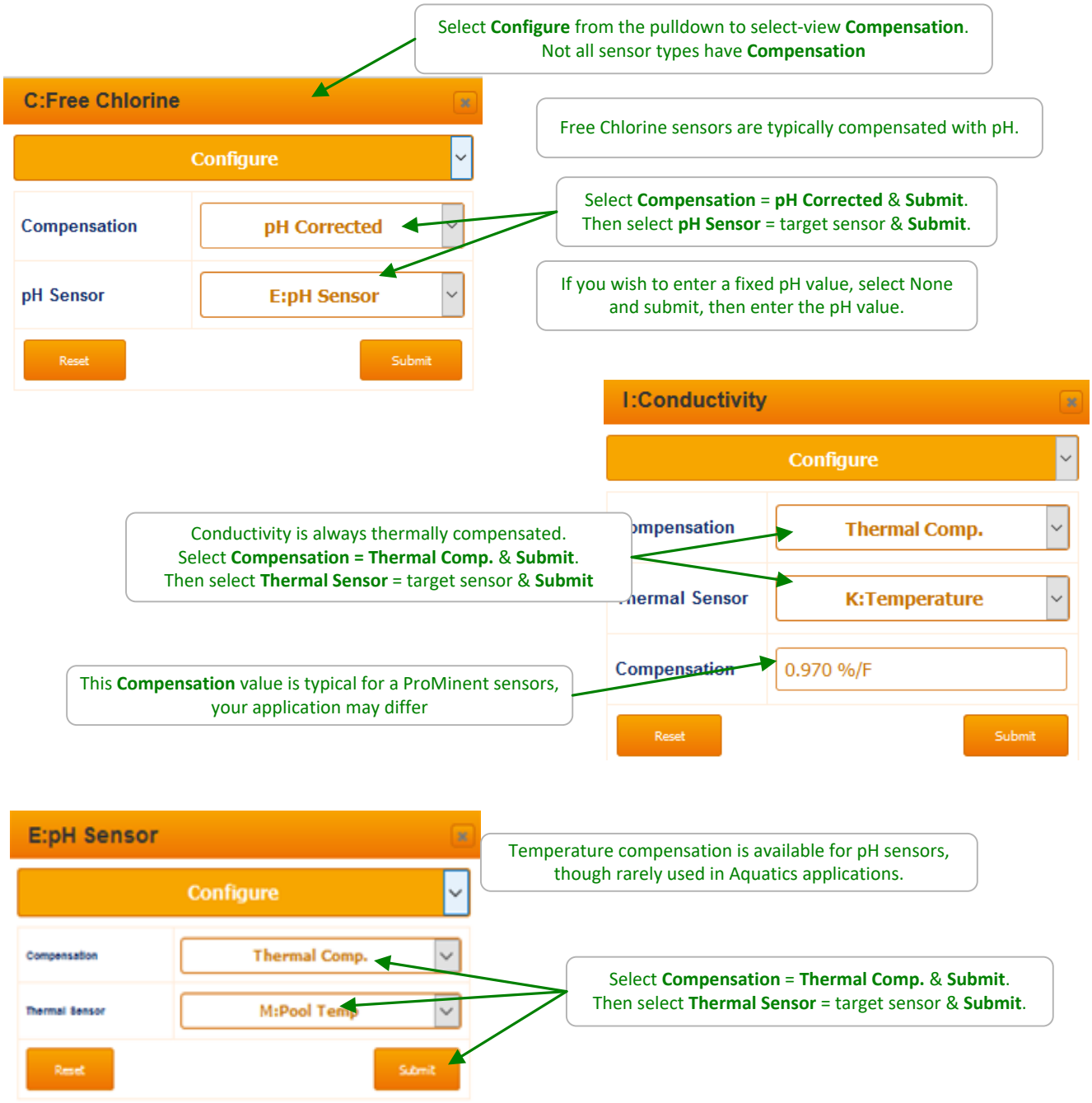


Sidebar:
Disabled sensors do not appear on either the local or browser HMIs or any pull-down option.
Sensors cannot be disabled while in use for control, interlock or compensation.
Disabled sensors can be re-enabled on the **System** / **Enable I/O** page of the Home screen.

Sensor Setup 2 of 2

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

4.2 Sensor Compensation

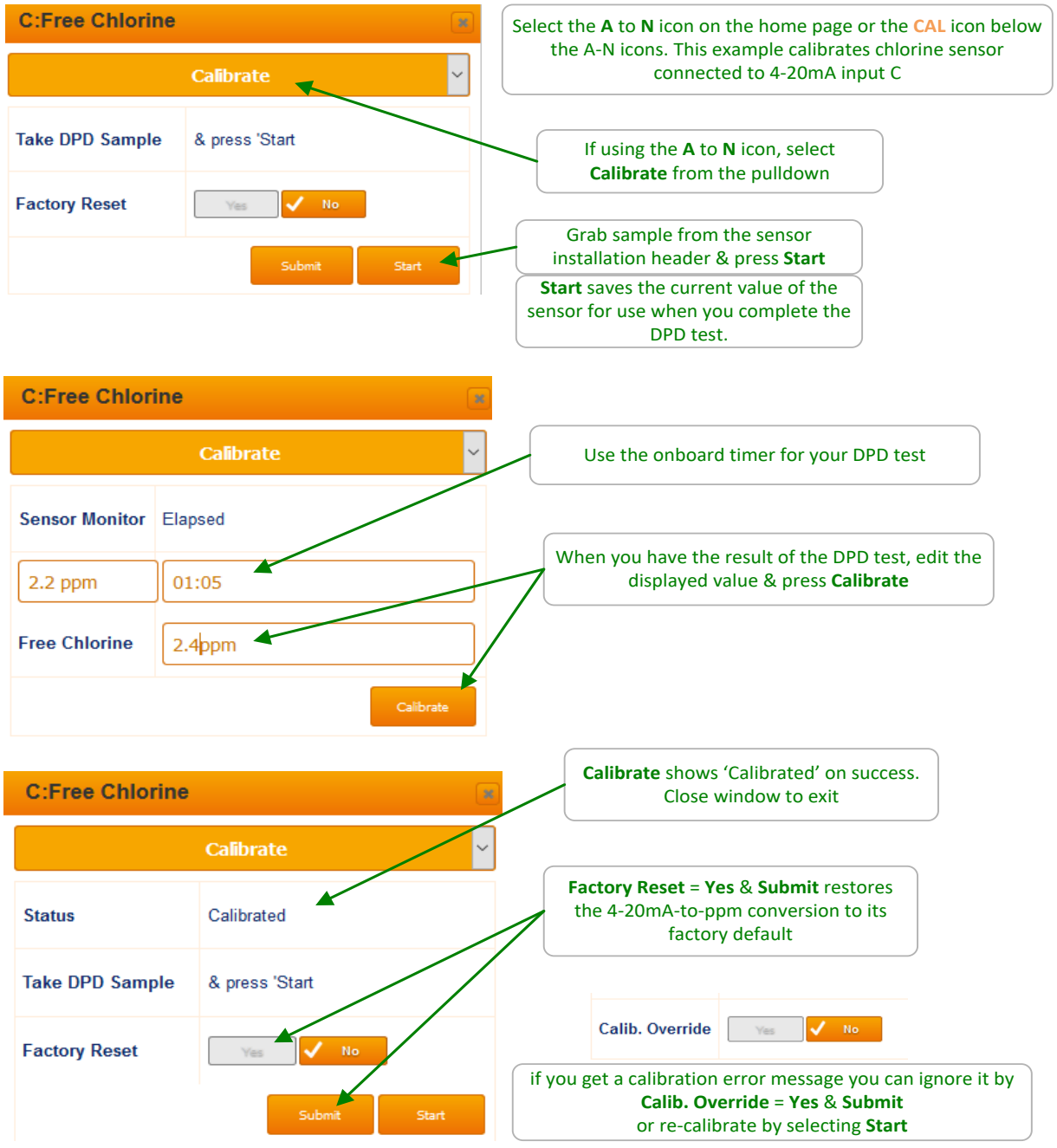


Sidebar:

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

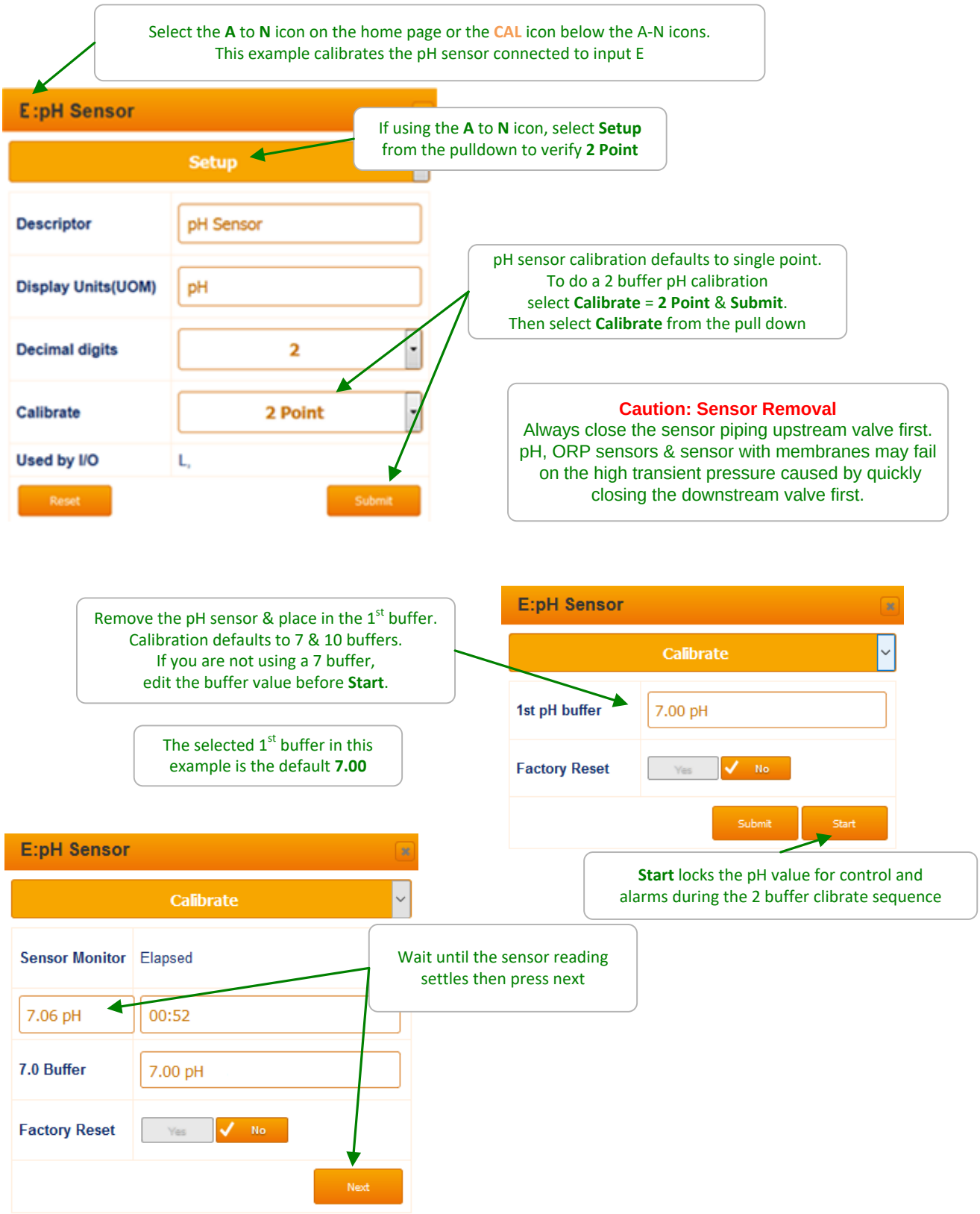
4.3 Sensor Calibration

4.3.1 DPD: Oxidant Sensors



Sidebar: Amperometric Sensors
The DPD calibration applies to CLO, CTE, CGE & CLE3 Chlorine & CBR Bromine sensors. All of these sensors connect to 4-20mA input driver cards. The G input does not have the necessary voltage to power a loop for the ProMinent amperometric sensors.

4.3.2 pH Dual Buffer Calibration 1 of 2



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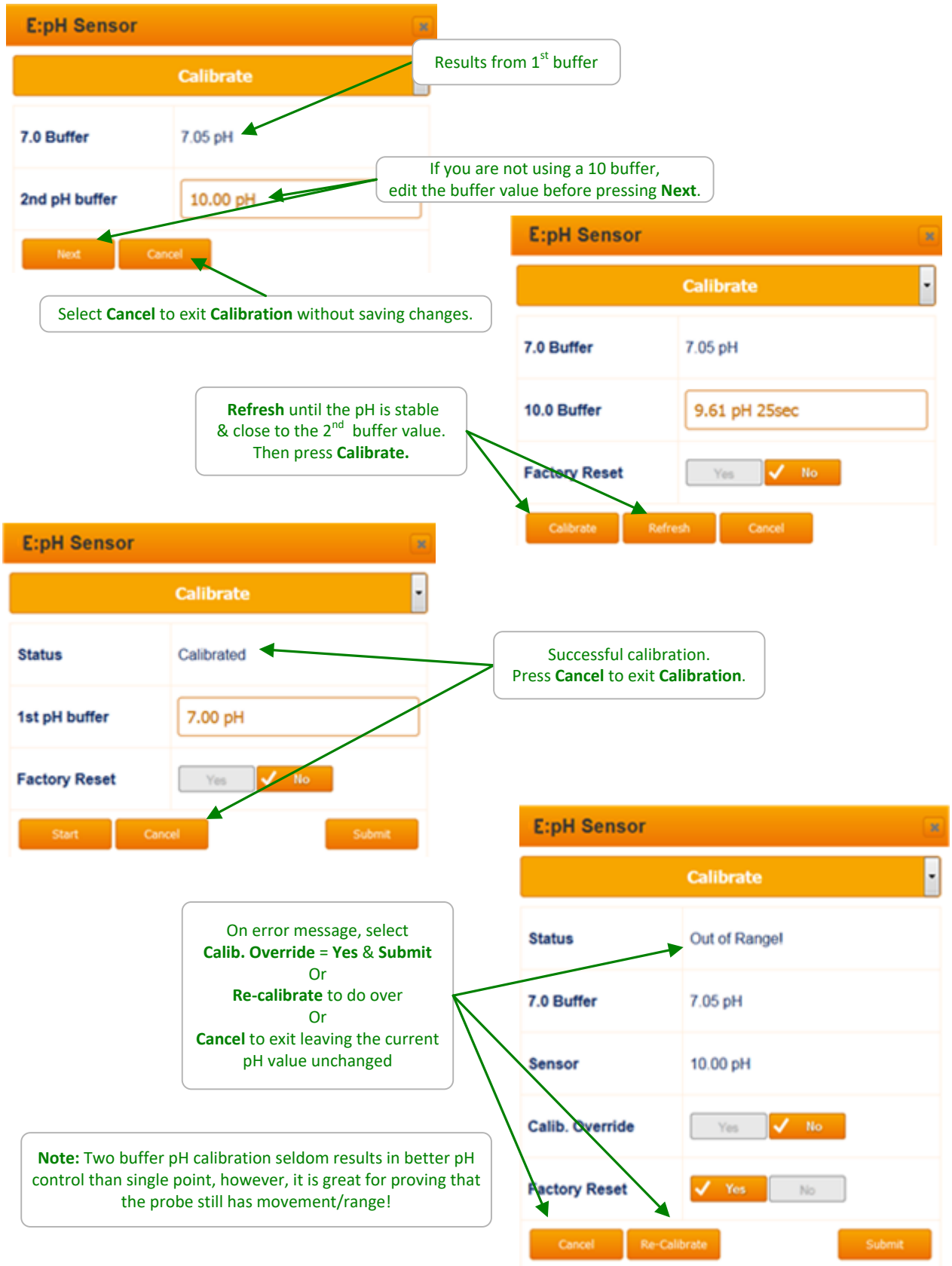
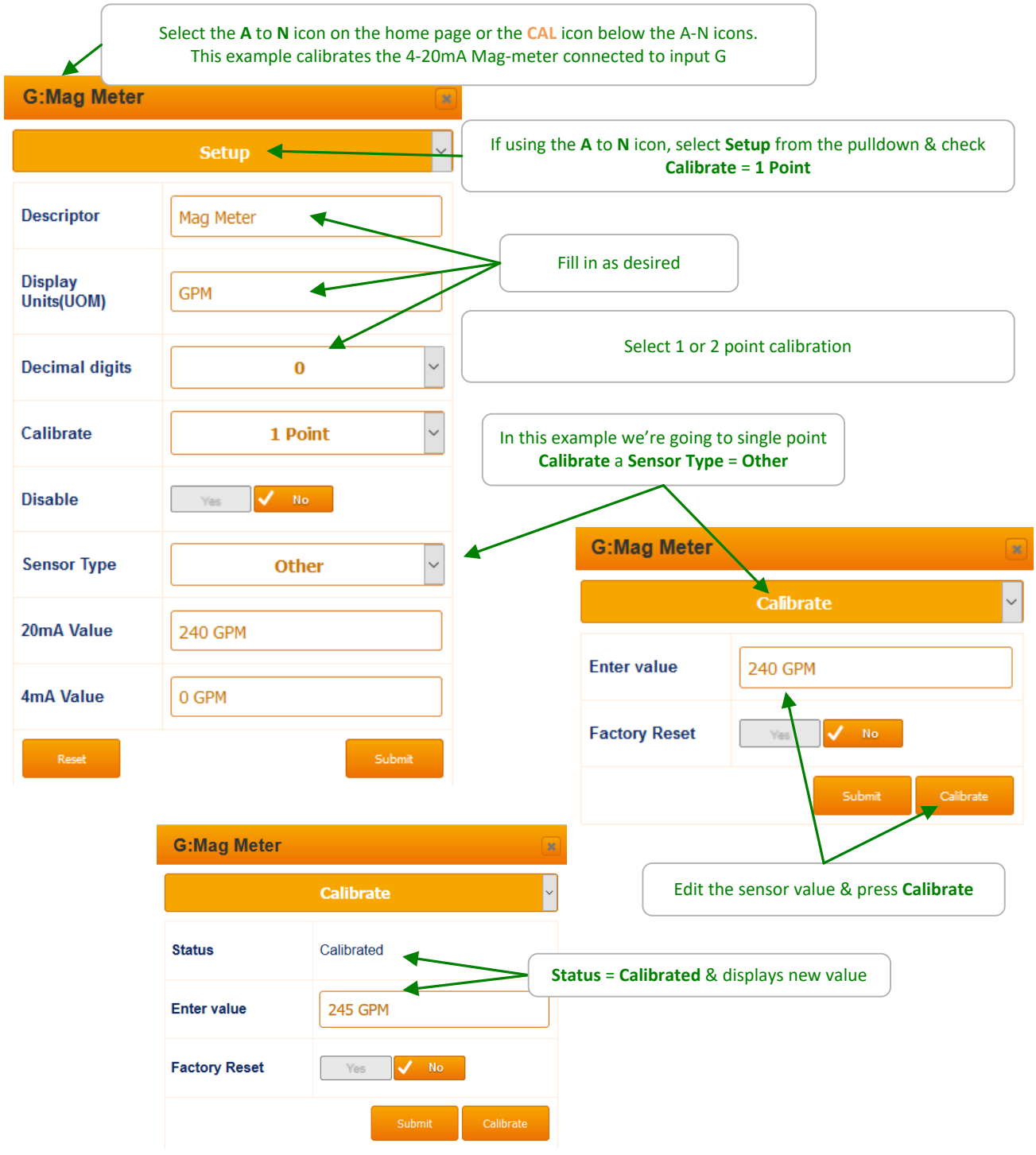
pH Dual Buffer Calibration 2 of 2



4.3.3 4-20mA Input Loop Calibration 1 of 3

4-20mA inputs may be single or two-point calibrated. This is an example of a single point calibration.
(This example does not include ProMinent amperometric sensors.)



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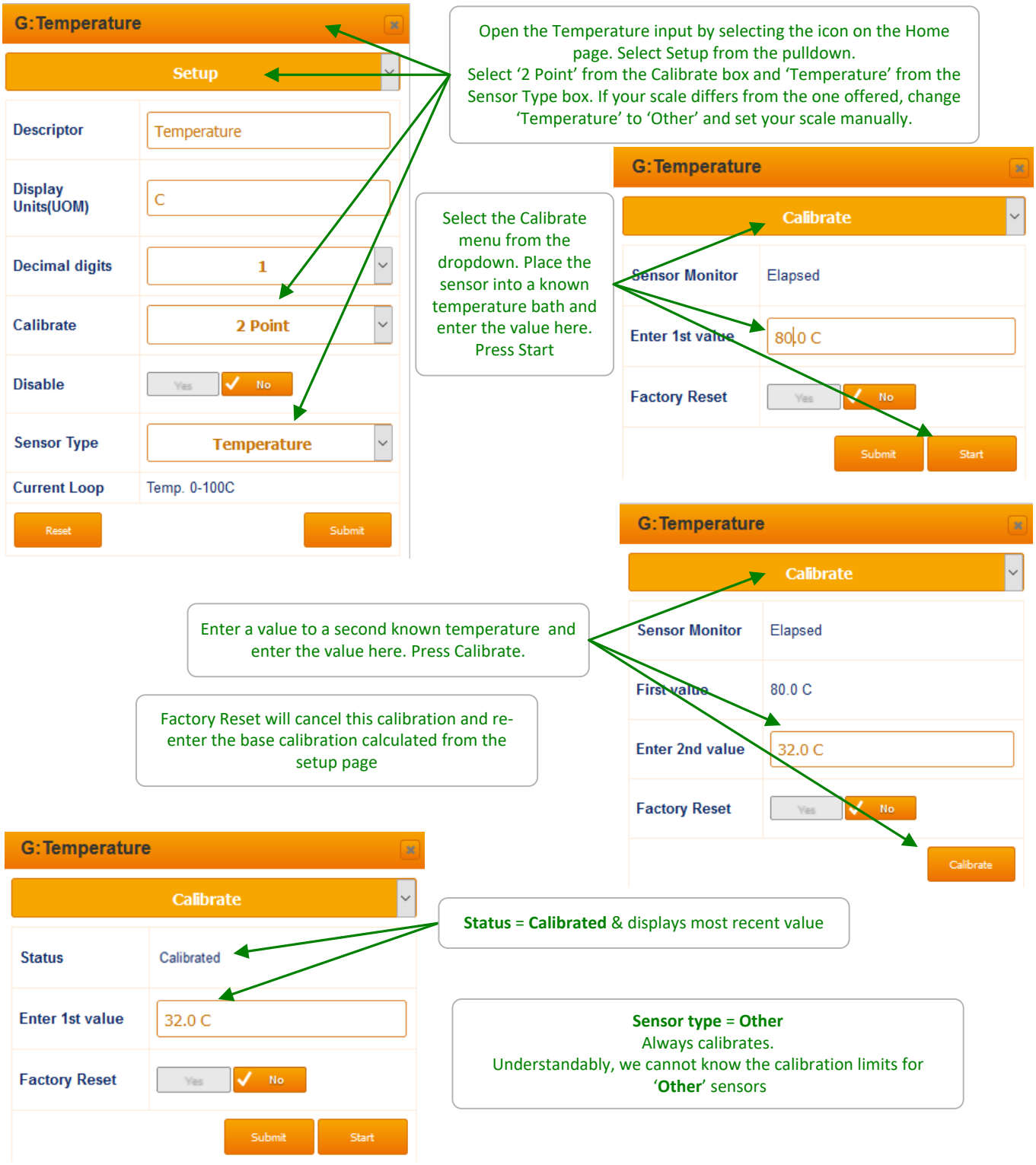
4-20mA Input Loop Calibration 2 of 3

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.



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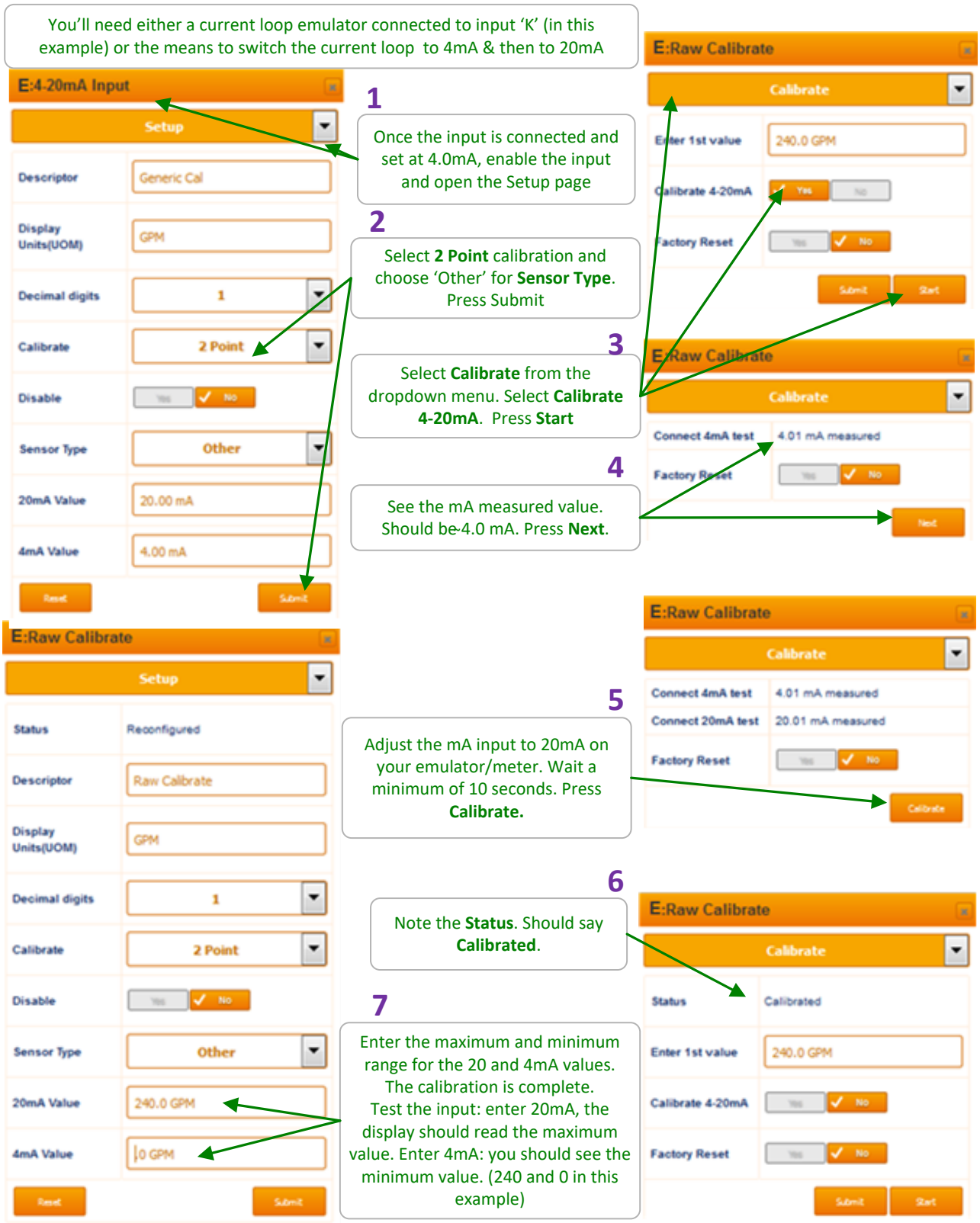
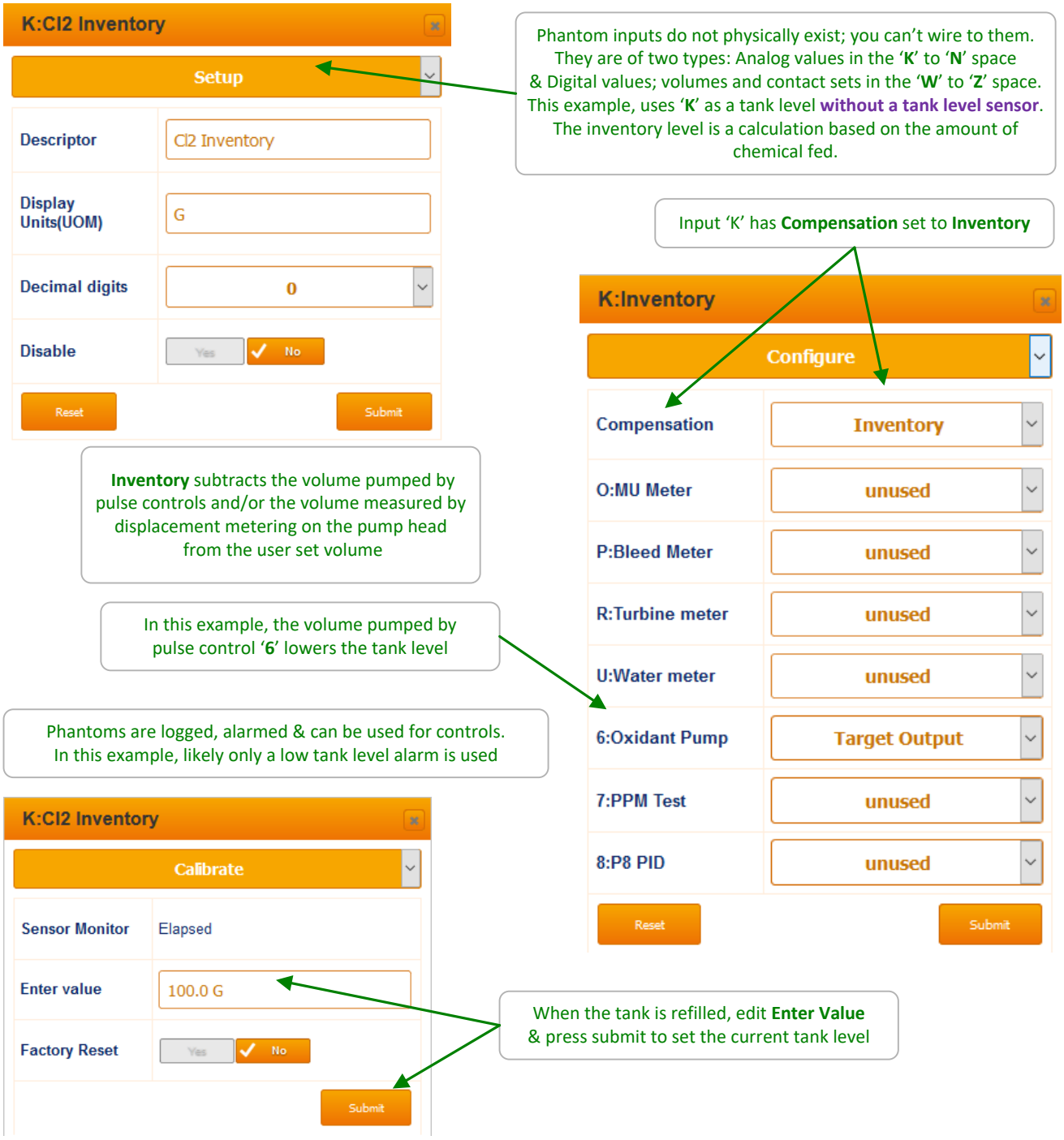
4-20mA Input Loop Calibration 3 of 3

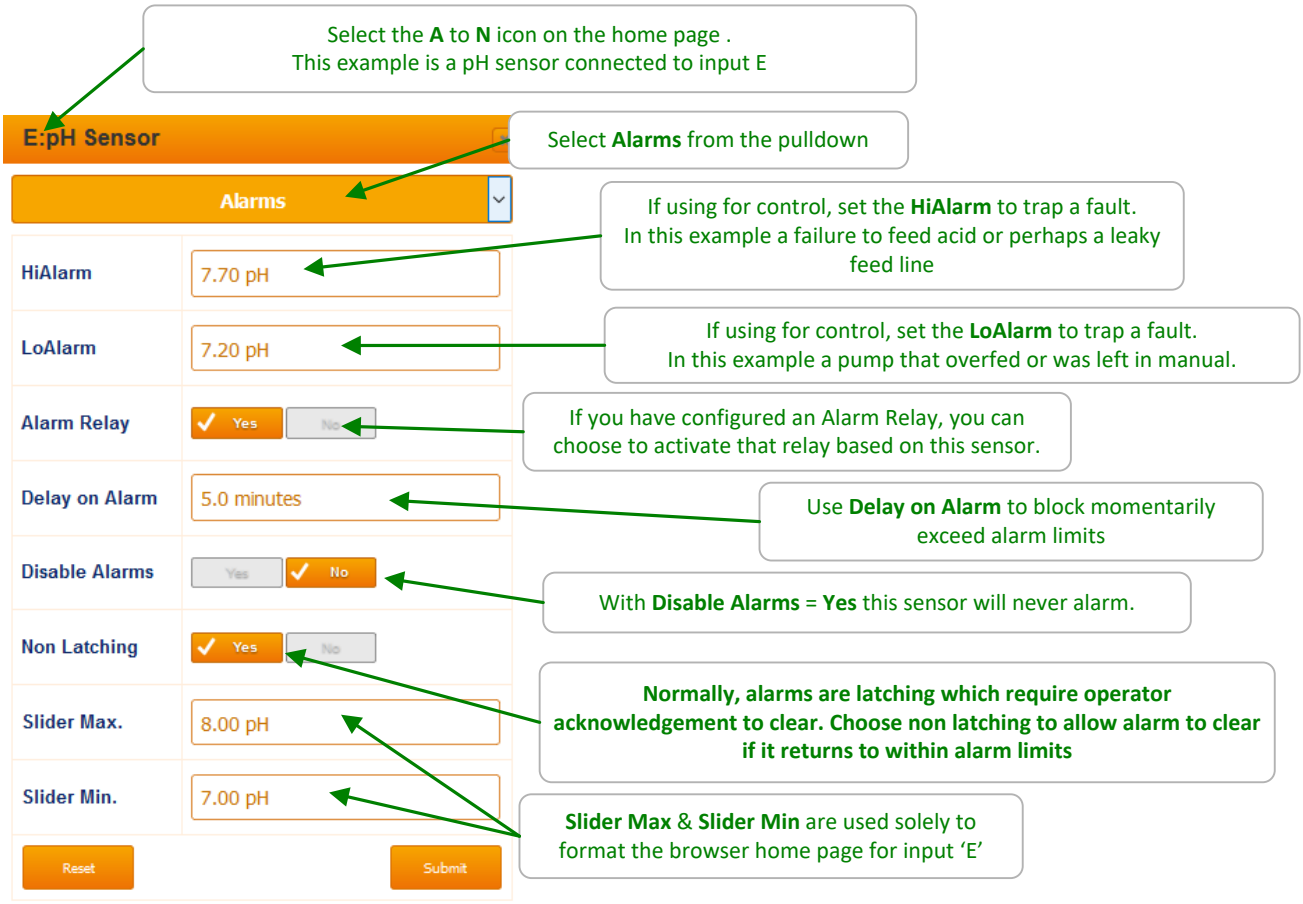
Use this method if you cannot induce the sensor to output known values. (If you do not know how much water if flowing through a watermeter, you cannot calibrate!)



4.3.4 Inventory Calibration



4.4 Sensor Alarms



Sidebar:
Every sensor, water meter, flowswitch & each control has alarms.
Typically alarms are used to detect changes in operating conditions, mechanical faults, feed issues & sensor faults

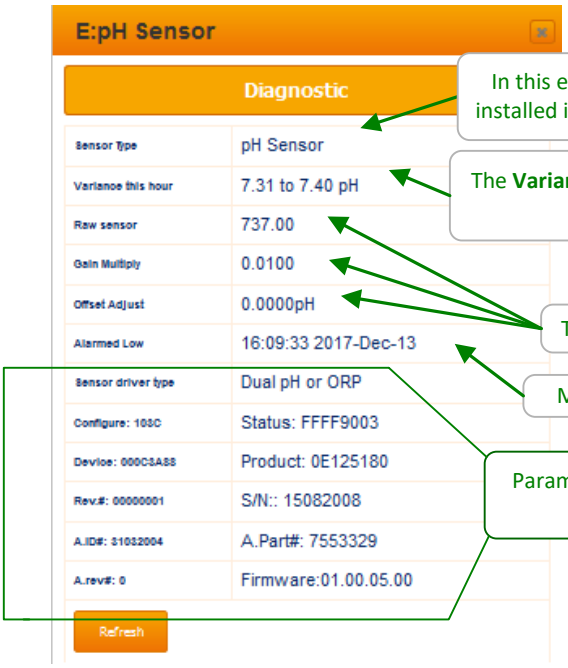
Setting alarms too tight so that they trip frequently under normal operating variances, may result in a critical alarm getting a slow or no response.

Understandably, alarms are set to reflect site practice, chemistry, plumbing & time of year.
Periodically review each control loop settings including, its sensor, interlock, pump or actuator.

4.5 Sensor Diagnostics 1 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



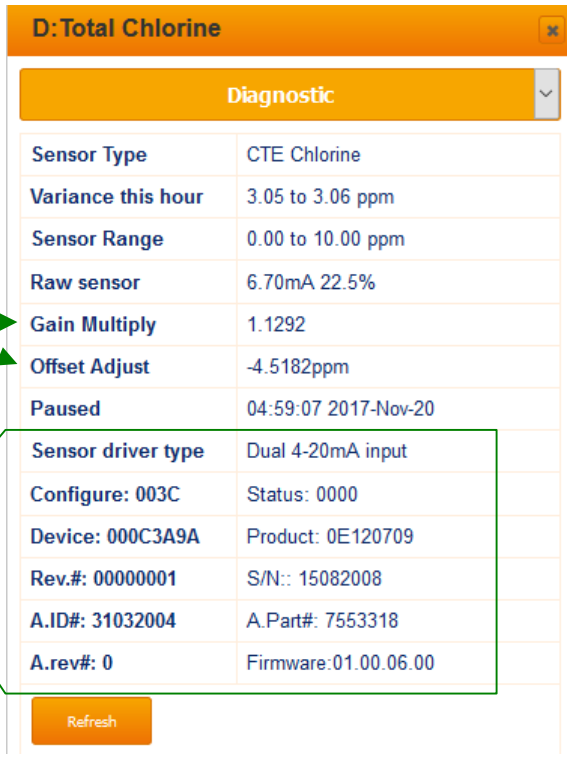
In this example, there is a pH-ORP card installed in the E-F slot & 'E' is a pH sensor

The **Variance this hour** minimum and maximum help you see at a glance how well the control is/is not working.

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 E-F 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 4-20mA input card**

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

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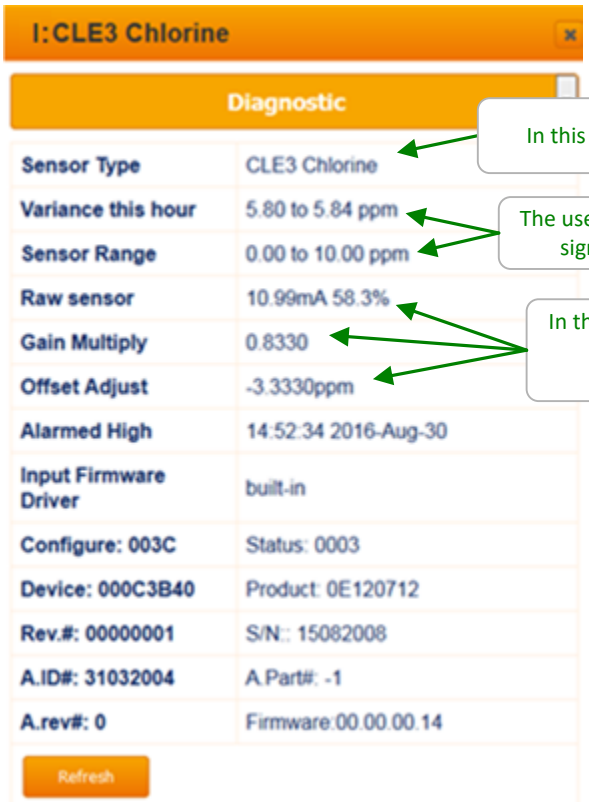
Sensor Diagnostics 2 of 3

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

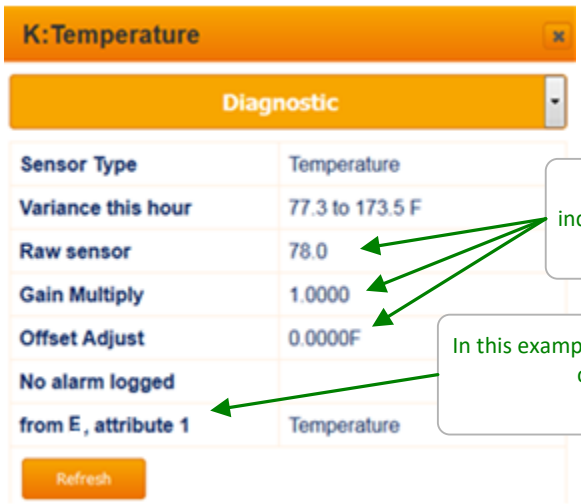
Sensor inputs '**G**' (4-20mA input) & '**H**' (10mV/C thermal sensor input) are fixed in controller hardware unlike the sensor driver slots @ **C-D**, **E-F** & **I-J**



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

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, the current sensor value.
(ppm = **mA** x **Gain** + **Offset**)



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 'E', **attribute 1**

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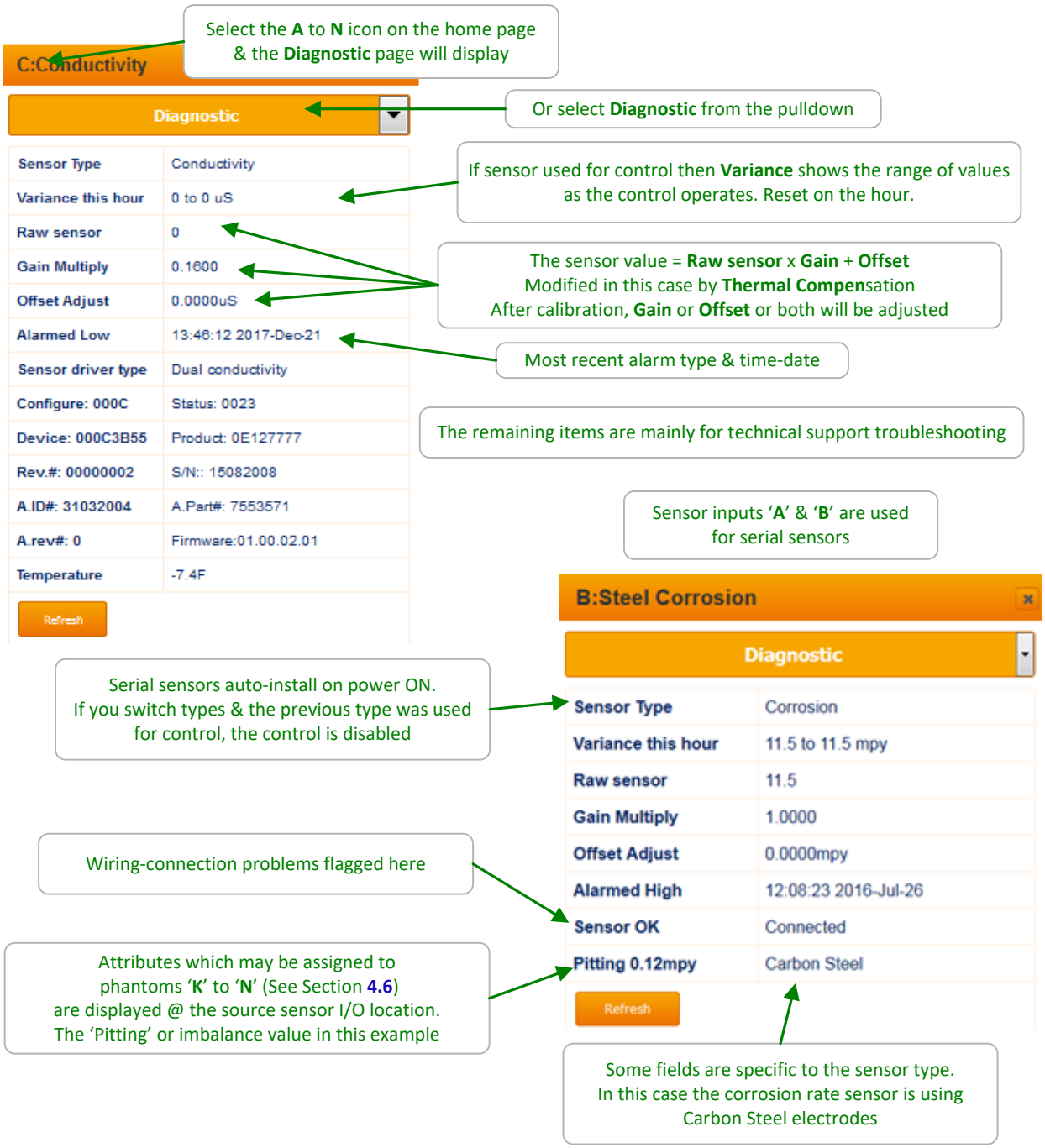
Sensor Diagnostics 3 of 3



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

4.6 Using Sensor Attributes for Phantoms 1 of 2

4.6.1 Combined Chlorine

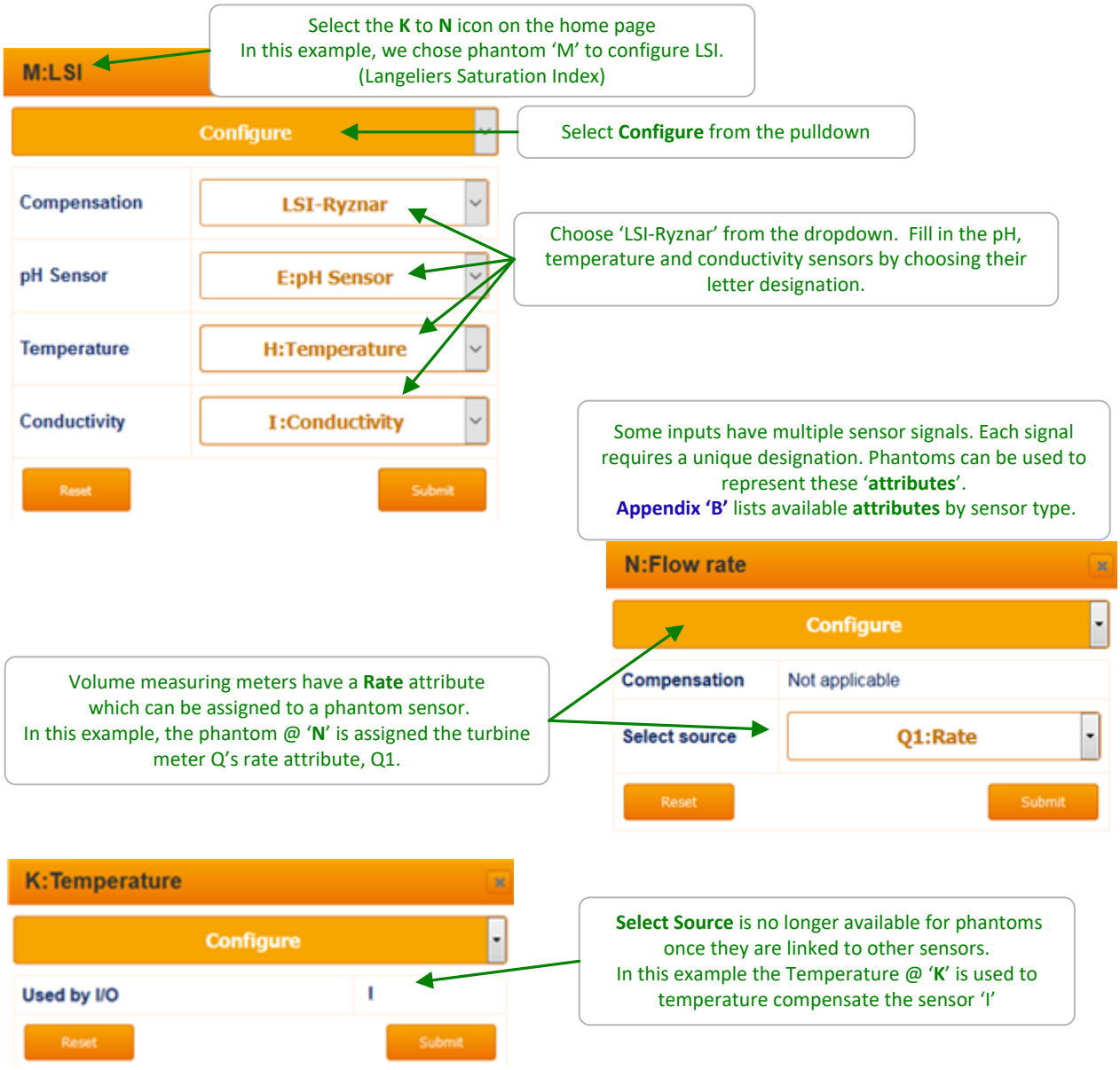
Analog phantom sensors are inputs '**K**' through '**N**' and digital phantom sensors are inputs '**W**' through '**Z**'. They can be enabled from the **System Enable I/O** page. They are phantom in the sense that they do not have wiring locations.

Once enabled, phantoms will automatically appear on the home page. Phantoms can be assigned attributes from sensors, used to accept manual entries, calculate LSI or combined chlorine.

Sidebar:
Phantom Sensors '**K**' to '**N**' and phantom meters-contact sets '**W**' to '**Z**' are logged, alarmed & can be used for compensation & controls.

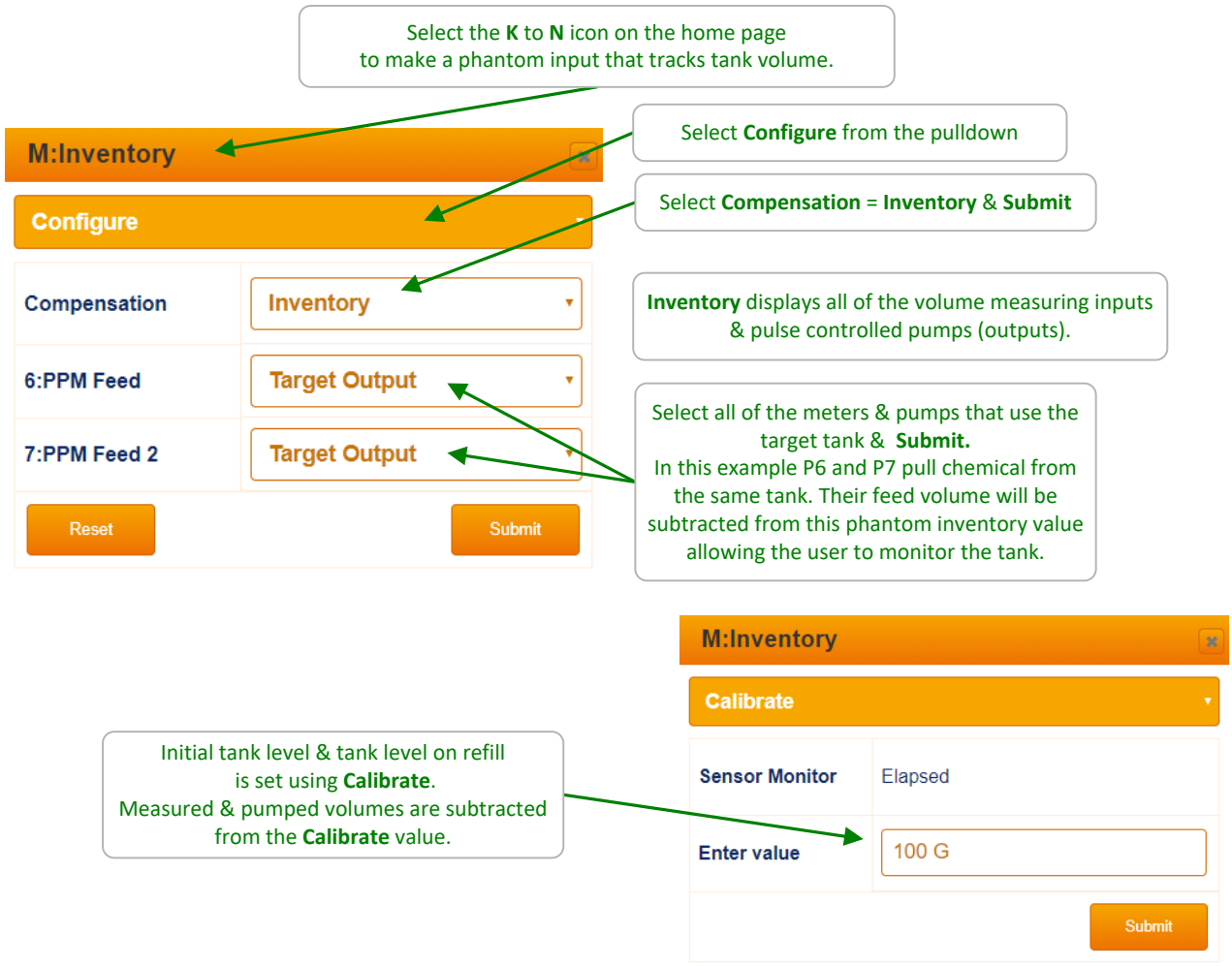
Using Sensor Attributes for Phantoms 2 of 2

4.6.2 Langeliers Saturation Index LSI



4.7 Inventory: Using feed meters & pumped volumes

Calculate chemical tank inventory by subtracting one or more pump volumes from the tank. Must use frequency pumps and re-calibrate the tank level when filled.

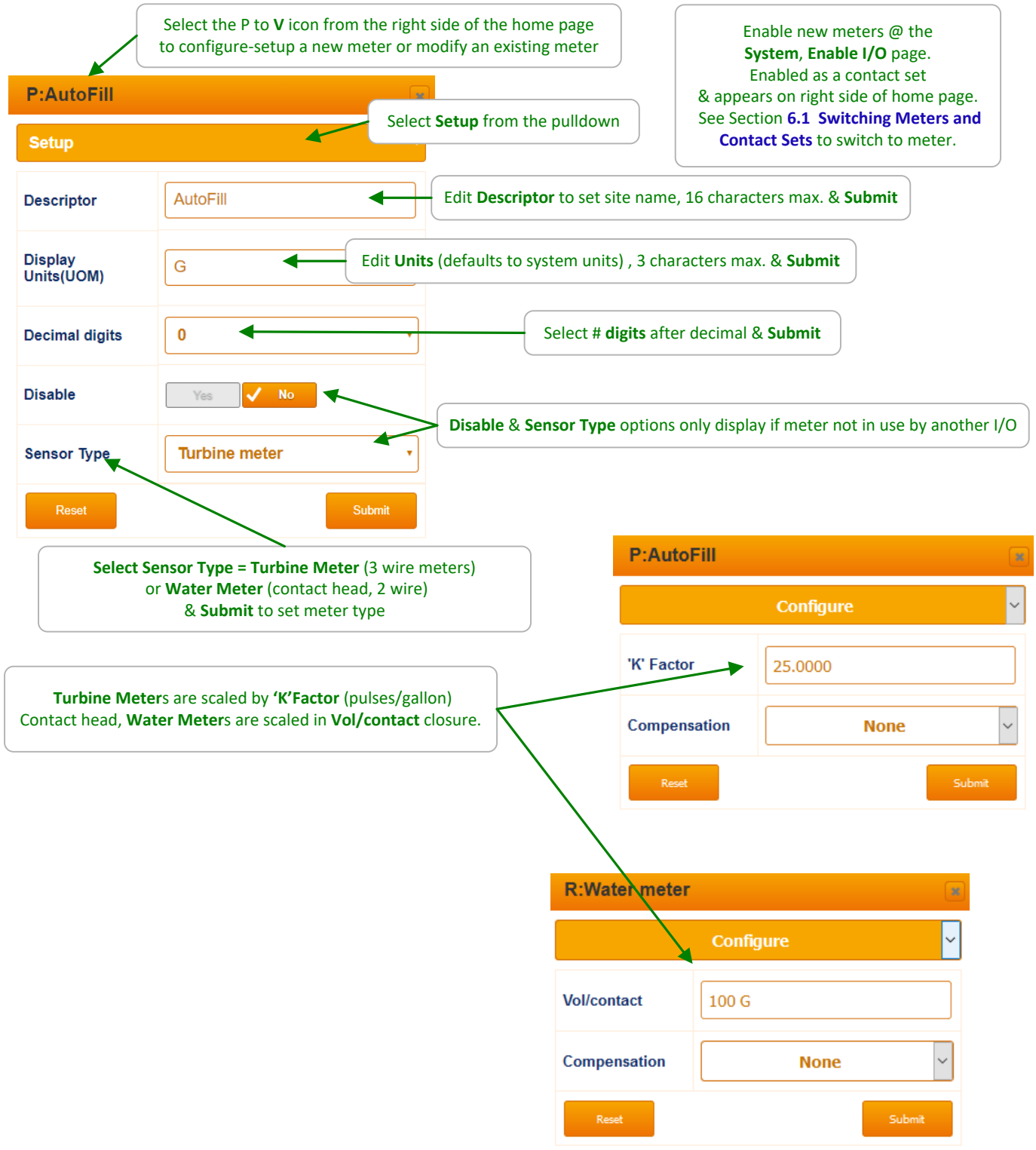


Sidebar:
Metric or U.S. units are set on the **System** / **System Setup** page. The pump setup will be in mL/stroke. The controller converts the pumped mL/stroke volume to either Liters or Gallons depending on the **System Setup Metric Units** = **Yes** - **No** setting.

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

5 Water Meters

5.1 Configuring a New Meter



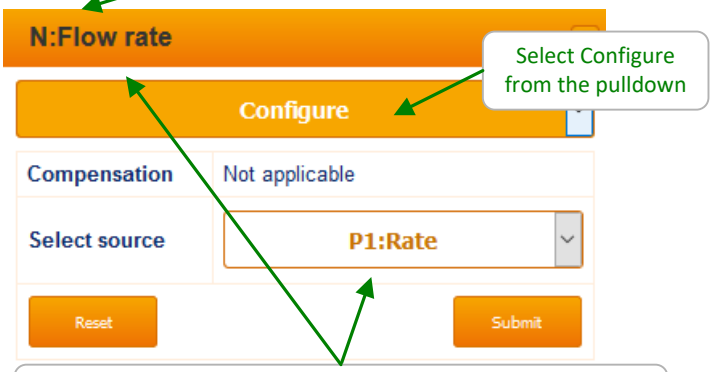
5.2 Flow Rate Alarm

A turbine meter can be used as a flow rate alarm and interlock. This process requires two phantoms, an analog 'Flow Rate' phantom to calculate a rate from a pulse, and a digital phantom to provide other outputs with an Interlock or switch.

Enable and set up a turbine meter as described on the previous page. Enable one digital phantom and one analog phantom. See section **9.6 Enable I/O** to enable the phantoms. Analog phantoms range from K to N and digital phantoms W, X, Y and Z. We are using N and Z in the following example below.

Set up the Analog Phantom first

Select the analog Phantom icon from the home page

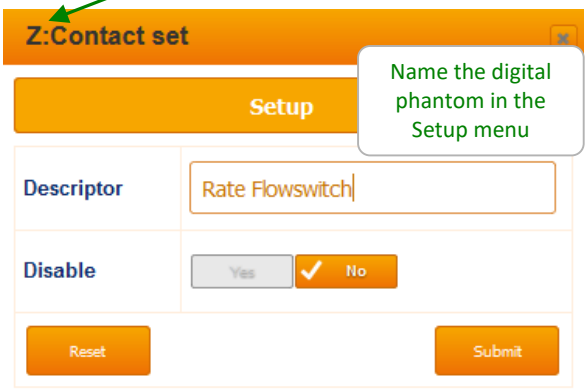


Select Configure from the pulldown

Select source box
Select the '**Rate' Attribute** from the turbine meter '**P**' created on the previous page. (Can be any turbine meter.) Press **Submit.**
The name of this phantom will change to 'Flow rate' automatically. Use the Setup menu to edit if desired.

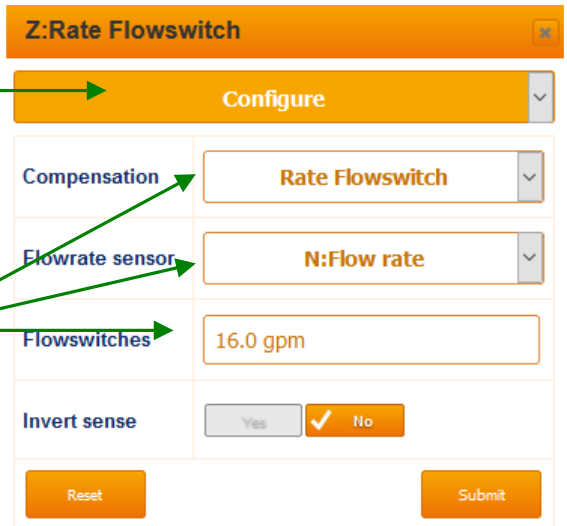
Set up the Digital Phantom second

Select the digital Phantom icon from the home page



Name the digital phantom in the Setup menu

Select Configure from the pulldown



Choose Compensation as Rate Flowswitch Press **Submit.**
Then find the analog phantom just created as the Flowrate sensor. Press **Submit.**
Third, enter a setpoint in the Flowswitches box.
Now, phantom Z can be used to interlock any and all outputs.
When the flow is above the setpoint, the output will be enabled.

5.3 Pulse to Analog Output

5.3.1 Configuration of a VFD control output 1 of 3

In addition to remotely controlling a Variable Frequency Drive (VFD) manually, the DCM510 now has the ability to control a VFD to a flow rate setpoint, and even use an alternate setpoint to control to an energy saving lower flow rate during off hours. The most common configuration will use a square wave pulse flowmeter (Signet 2536 Blue Cap) and a 4-20mA output. One of each of these will need to be enabled and configured for this purpose. The DCM510 uses its Output Events programming routines to control a VFD to a flow rate input, so a dedicated relay output will also be used.

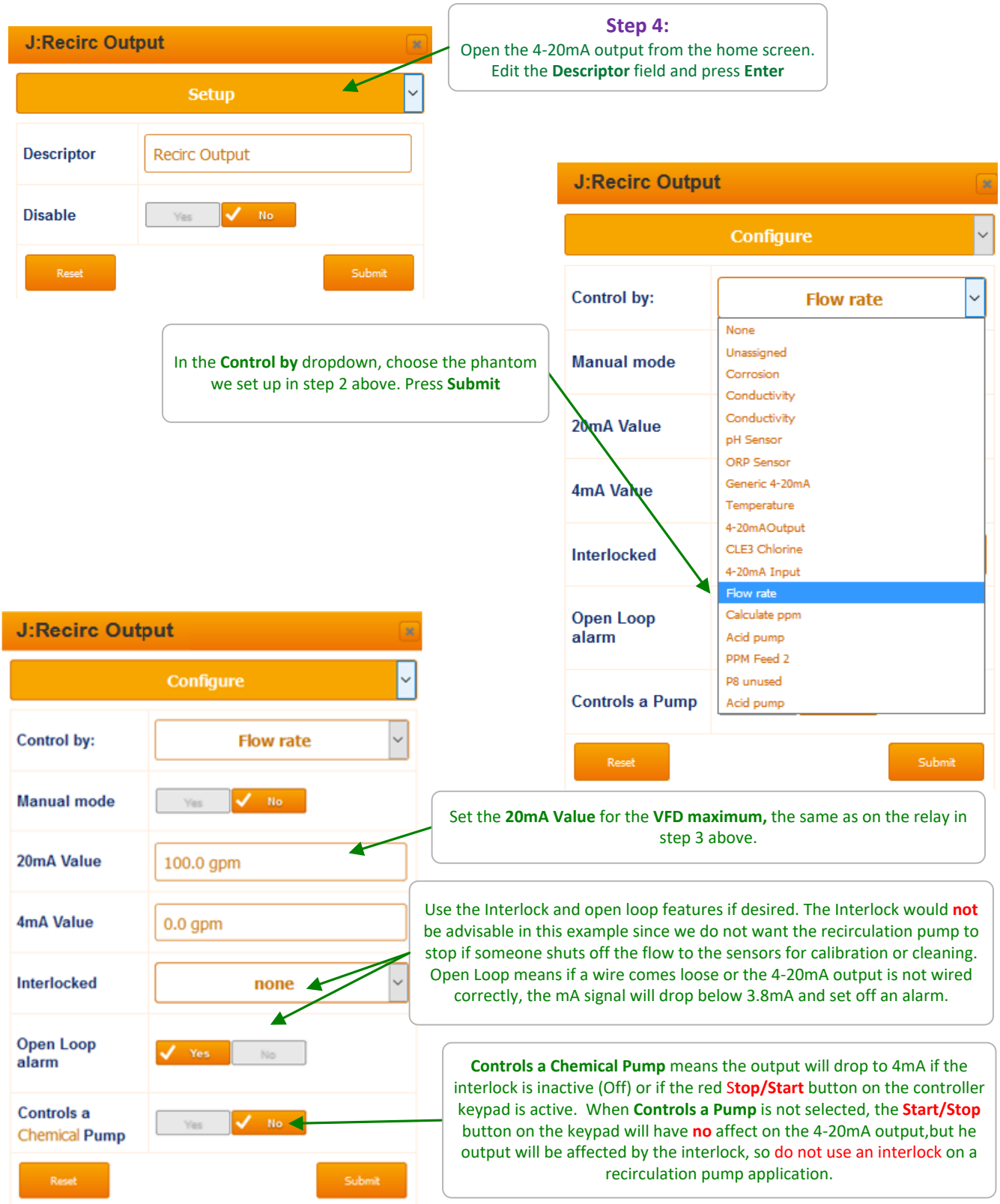
The steps in the example below will walk you through enabling and configuring the I/O's needed to control a VFD to a flow rate setpoint in Gallons per Minute (GPM).

DCM510 Browser

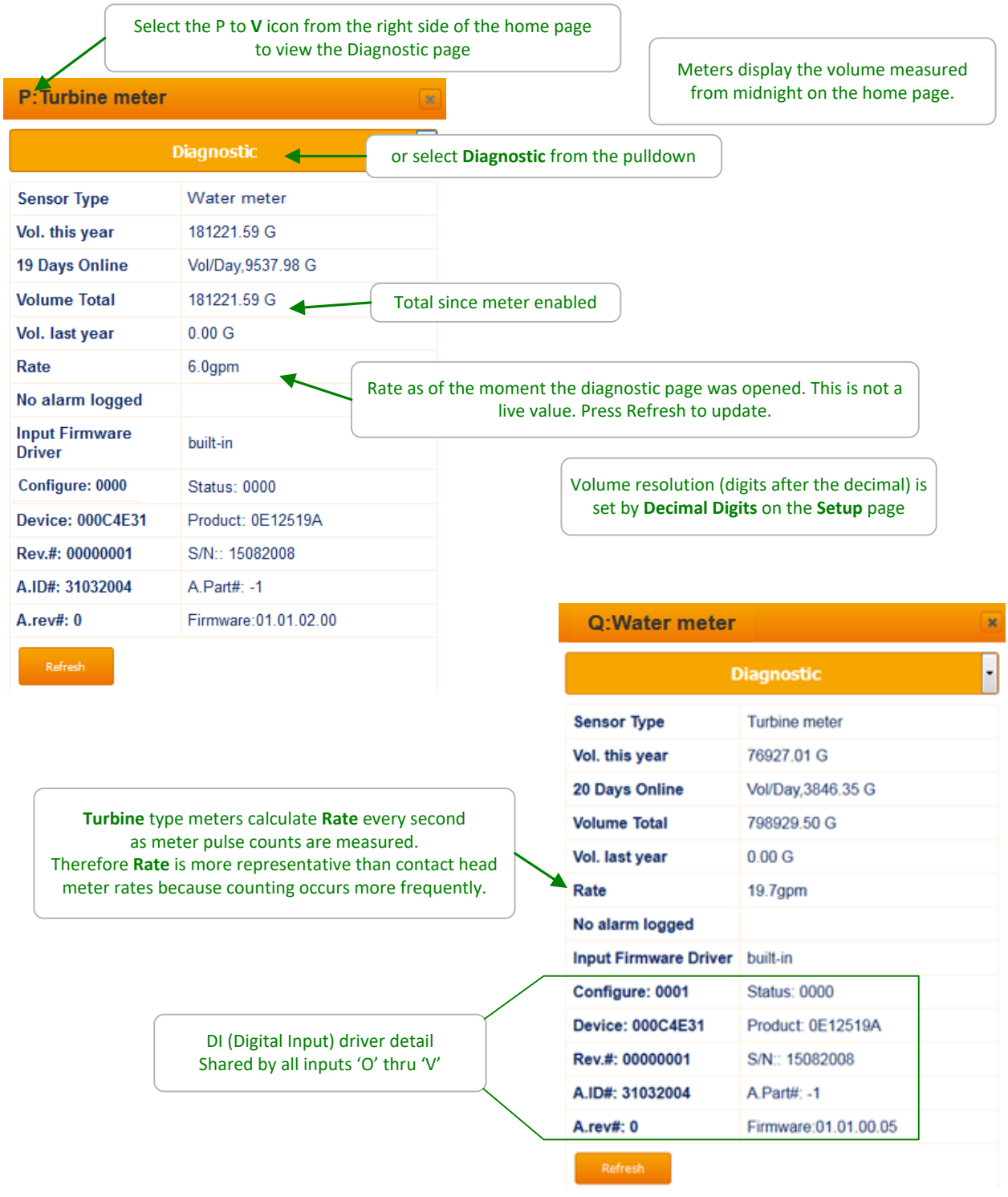
Configuration of a VFD control output 2 of 3

DCM510 Browser

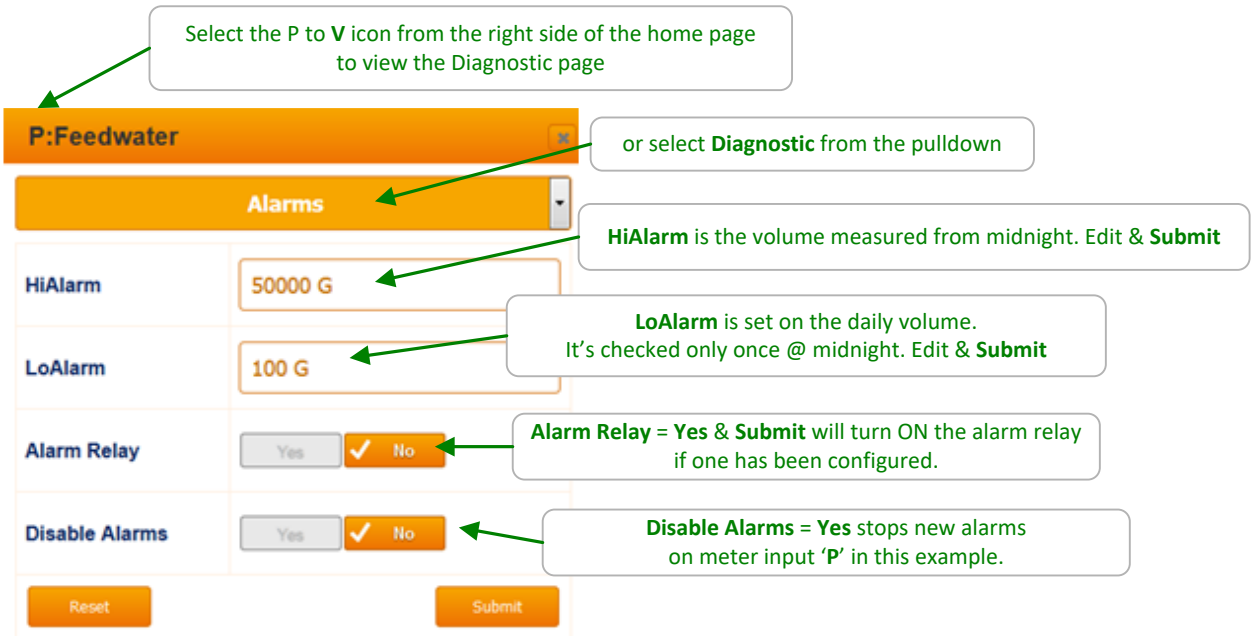
Configuration of a VFD control output 3 of 3



5.4 Meter Diagnostics

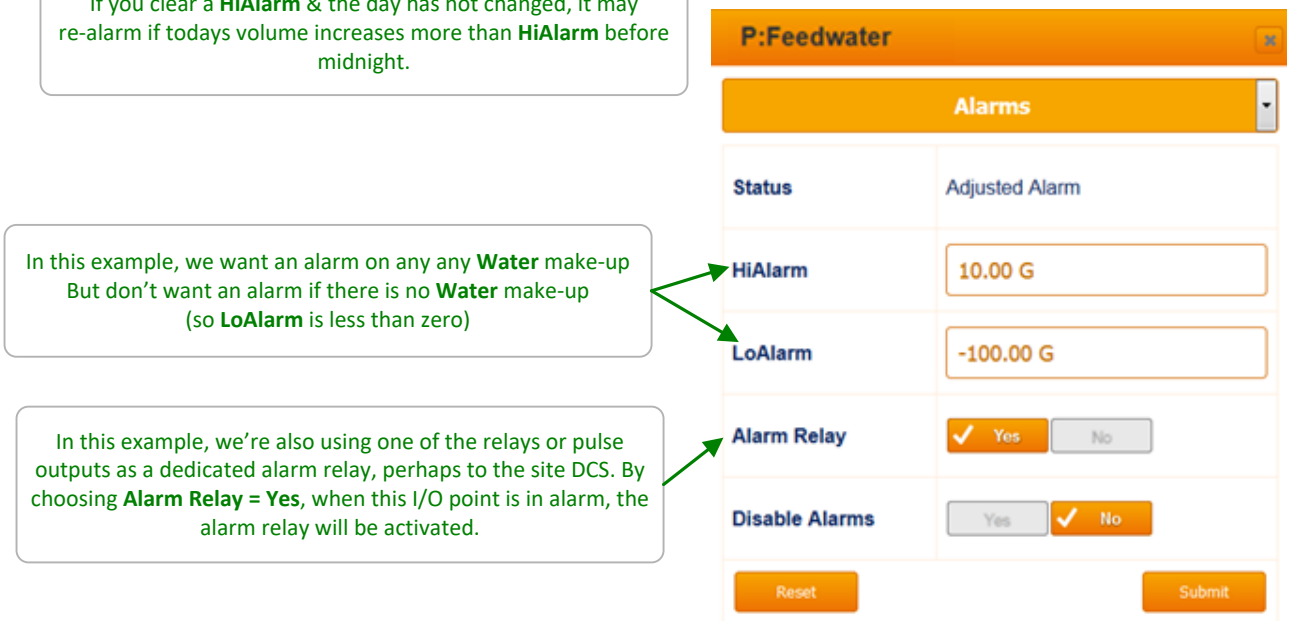


5.5 Meter Alarms



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

If you clear a **HiAlarm** & the day has not changed, it may re-alarm if todays volume increases more than **HiAlarm** before midnight.



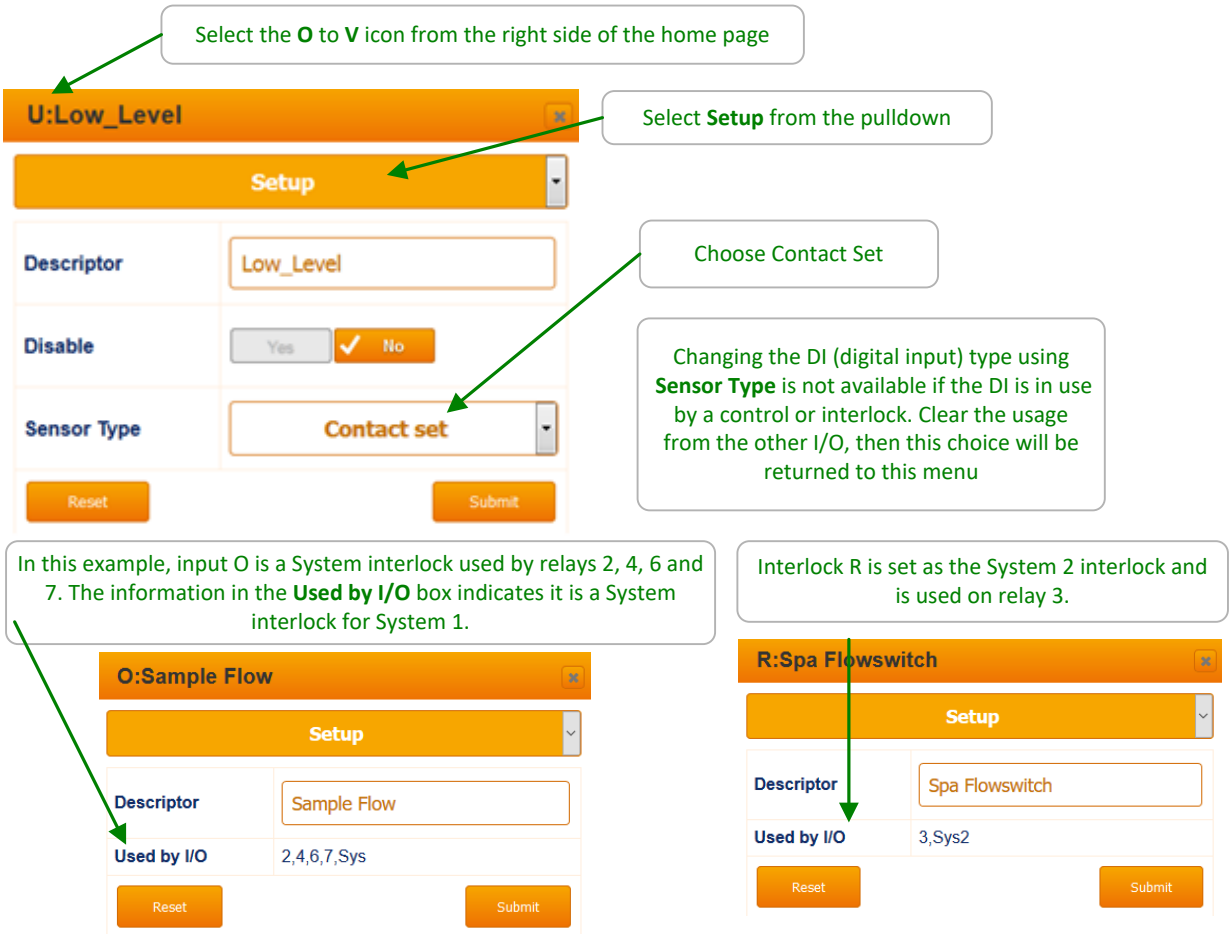
6 Flowswitches, System Interlocks & Contact Sets

6.1 Switching Meters & Contact Sets

Volume meters and contact set inputs are connected in the '**O**' to '**V**' digital inputs.
They are also in the '**W**' to '**Z**' phantom inputs.
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 inverse.

When an input in the '**O**' to '**Z**' phantom input is enabled, it's initially configured as a contact set. Any contact set designated as a system flow switch cannot be changed by the user. See Sidebar below.

Contact sets are ON when the contact set is closed. With the exception of the system flow switch(es), the logical sense of the input may be inverted so that ON = contact set open. (Refer to Section **6.3 Inverting a Contact Set**).



Sidebar: System Interlocks.
From the factory, each system will have at least one System Interlock. This input cannot be disabled by the user. This ensures that the safety flow switch cannot be accidentally ignored. Contact the factory if this needs to be changed.

6.2 Contact Set Alarms

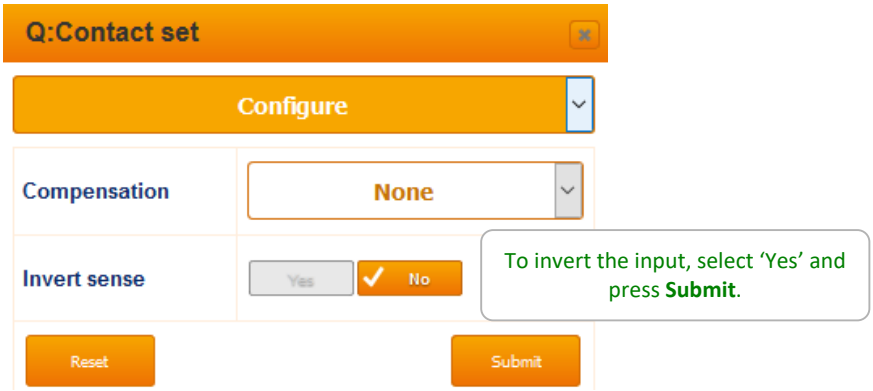
Sidebar:

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.

6.3 Inverting a Contact Set

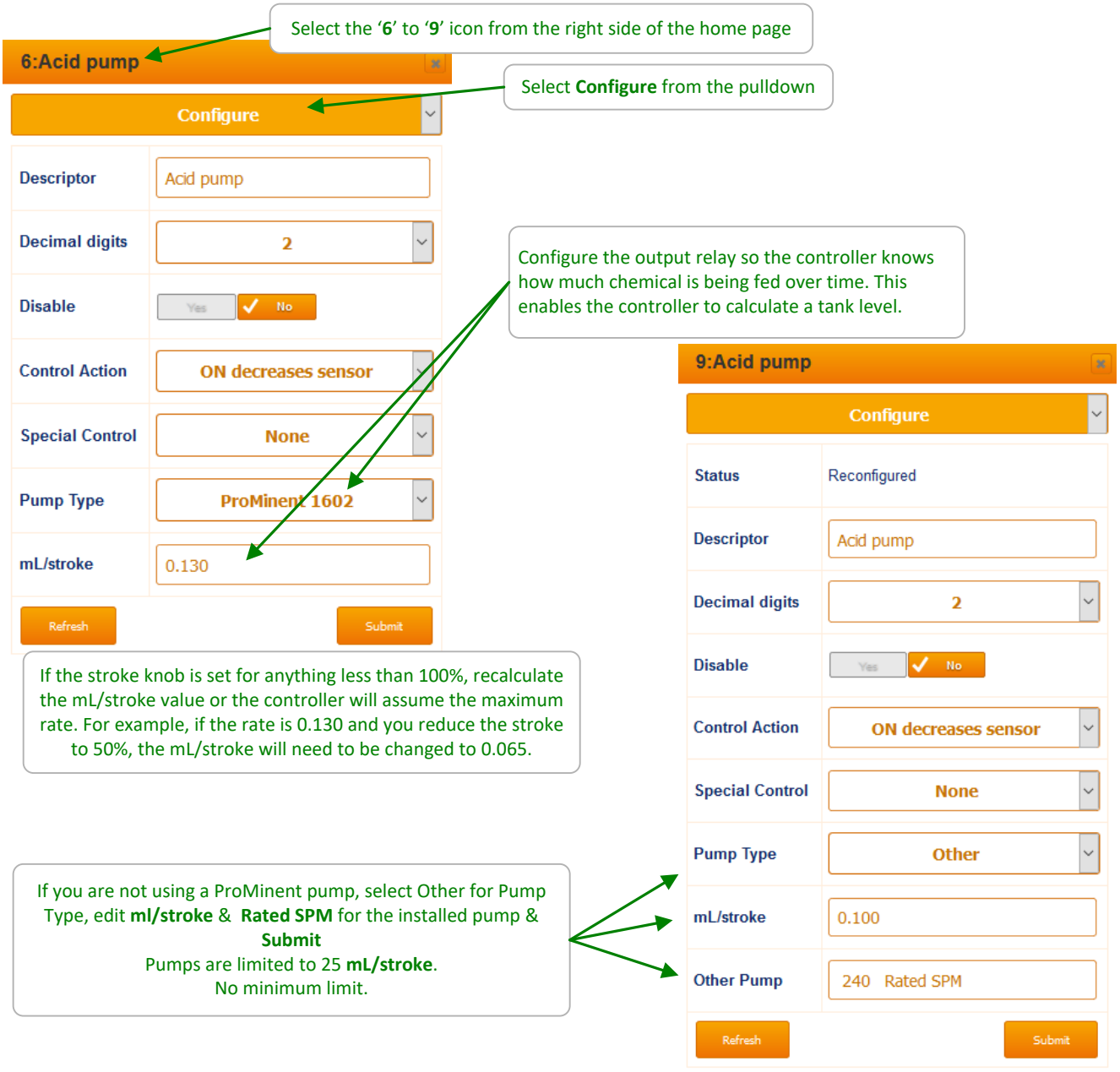
Contact sets are digital inputs that can be 'ON' when they sense a closed contact.
The controller can just as easily consider the closed contact to be an 'OFF' signal. This is the inverted sense. In this way, the controller can adjust the input from a digital device to be considered an 'ON' signal from a normally open (NO) contact or a normally closed (NC) contact.



Sidebar:
The controller will not allow you to invert the input signal from a system flow switch.

7 Frequency Controlled Pumps

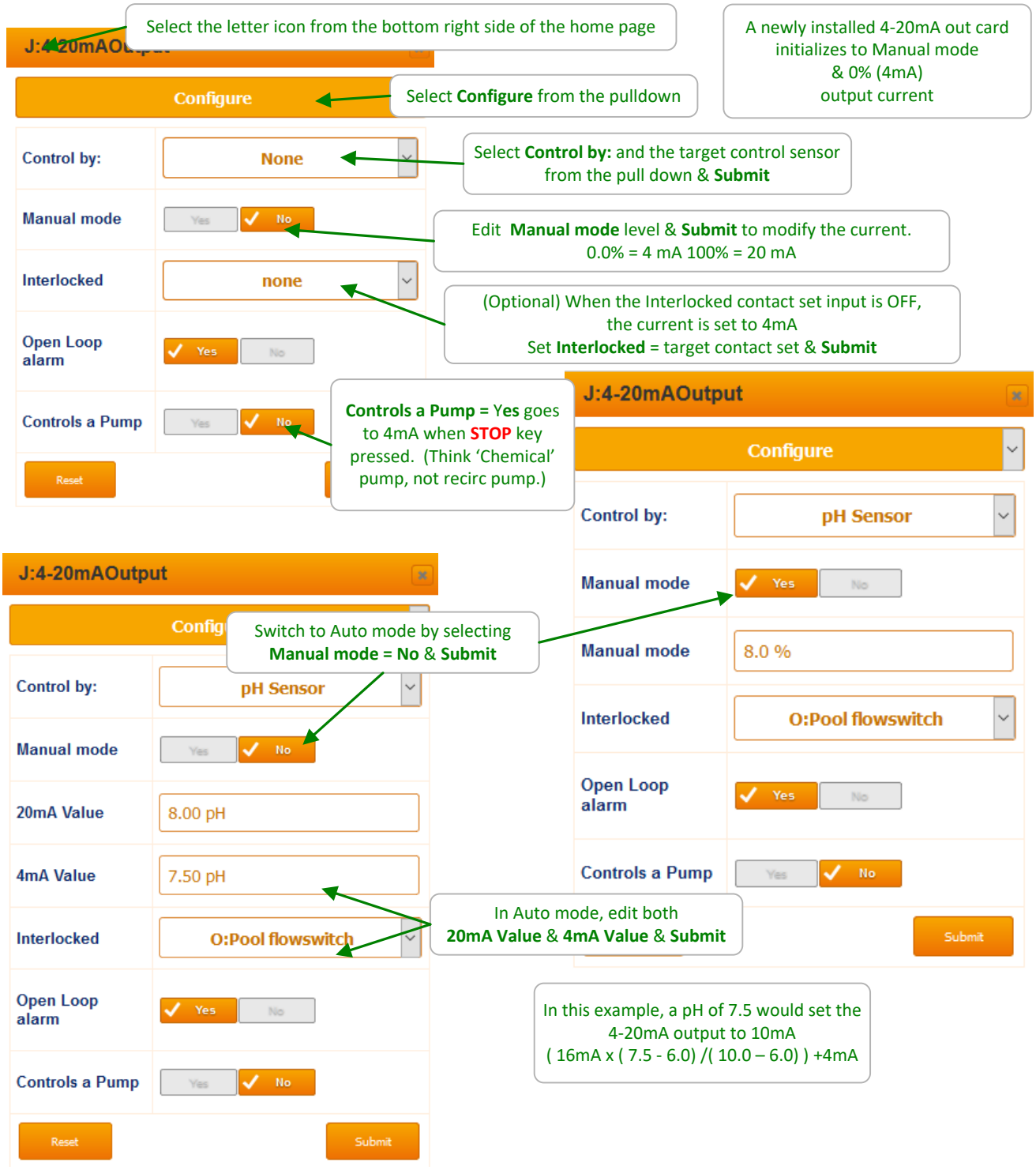
7.1 Adjusting mL/stroke



Sidebar:
Be aware that the output rate of most pumps will vary with changes in backpressure from the process. ProMinent recommends a backpressure valve to ensure the pump output pressure remains constant.

8 4-20mA Outputs

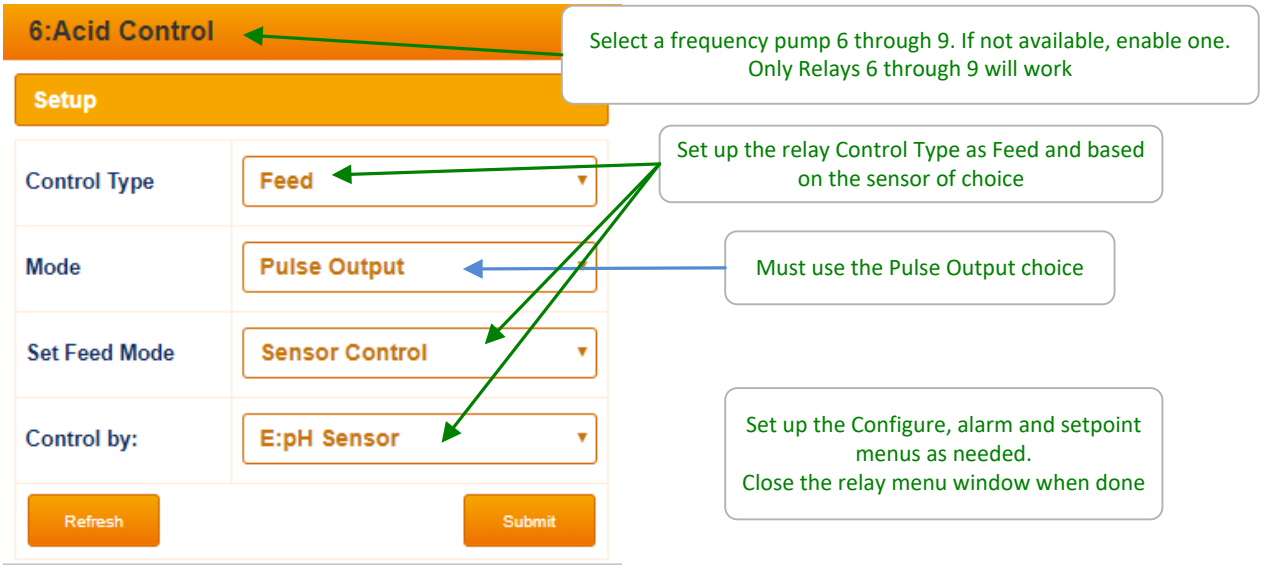
8.1 Configure: Manual-Auto Switch

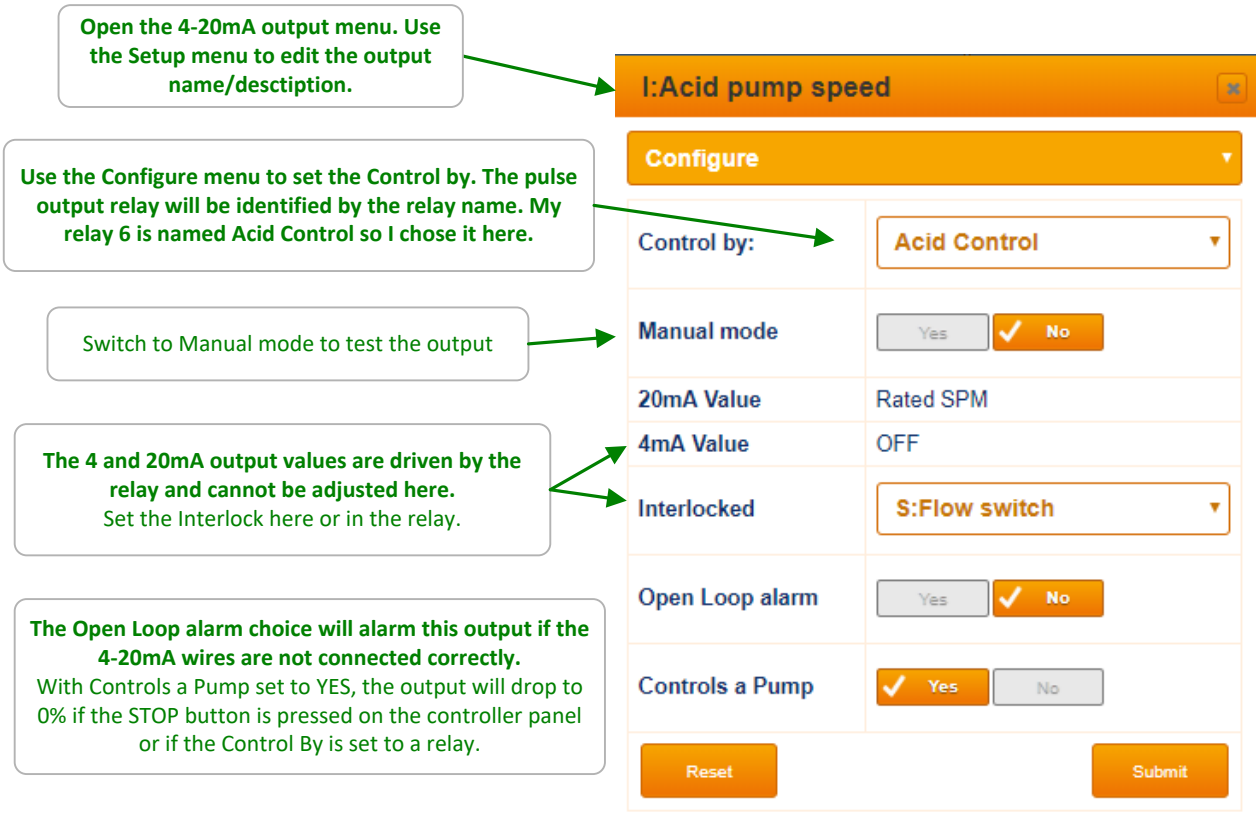


Sidebar: Manual Mode

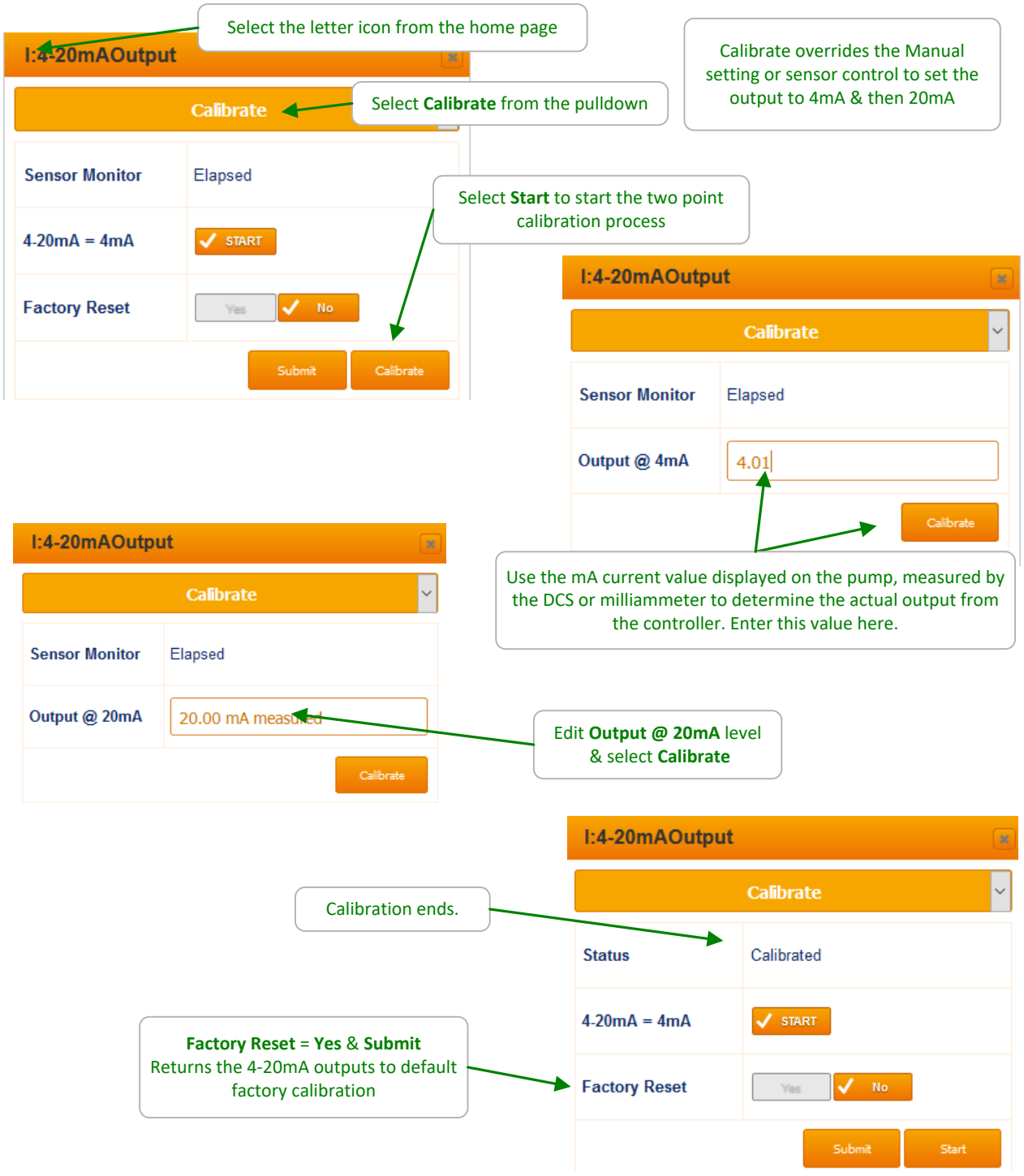
Use **Manual mode** to A) verify the pump is 100% ON=20mA, completely OFF=4mA, and B) to verify the loop span on the monitoring DCS that is using the current loop value to represent a controller pH, ORP, corrosion rate sensor or ppm calculation.

8.2 Adding Special Control to 4-20mA Outputs

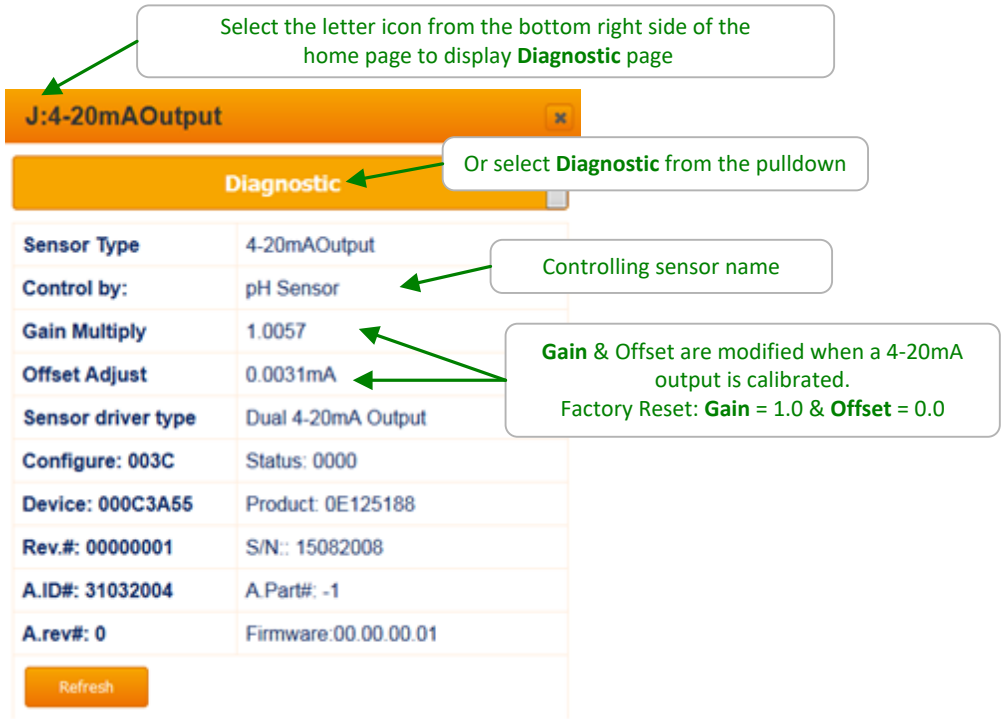


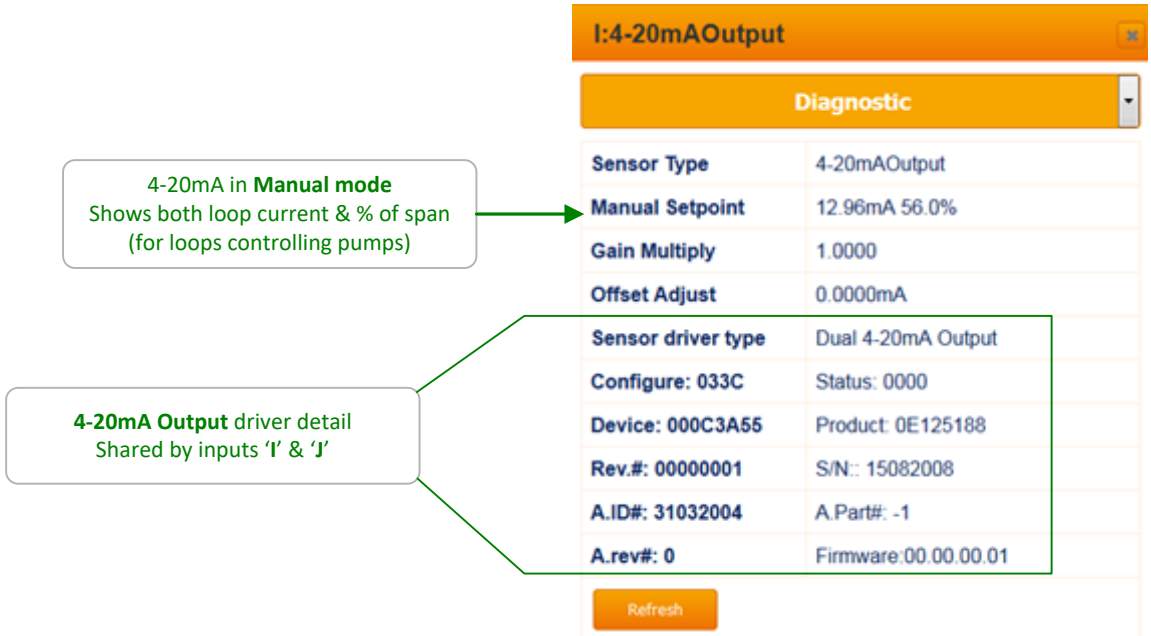


8.3 Calibrate 4-20mA Outputs



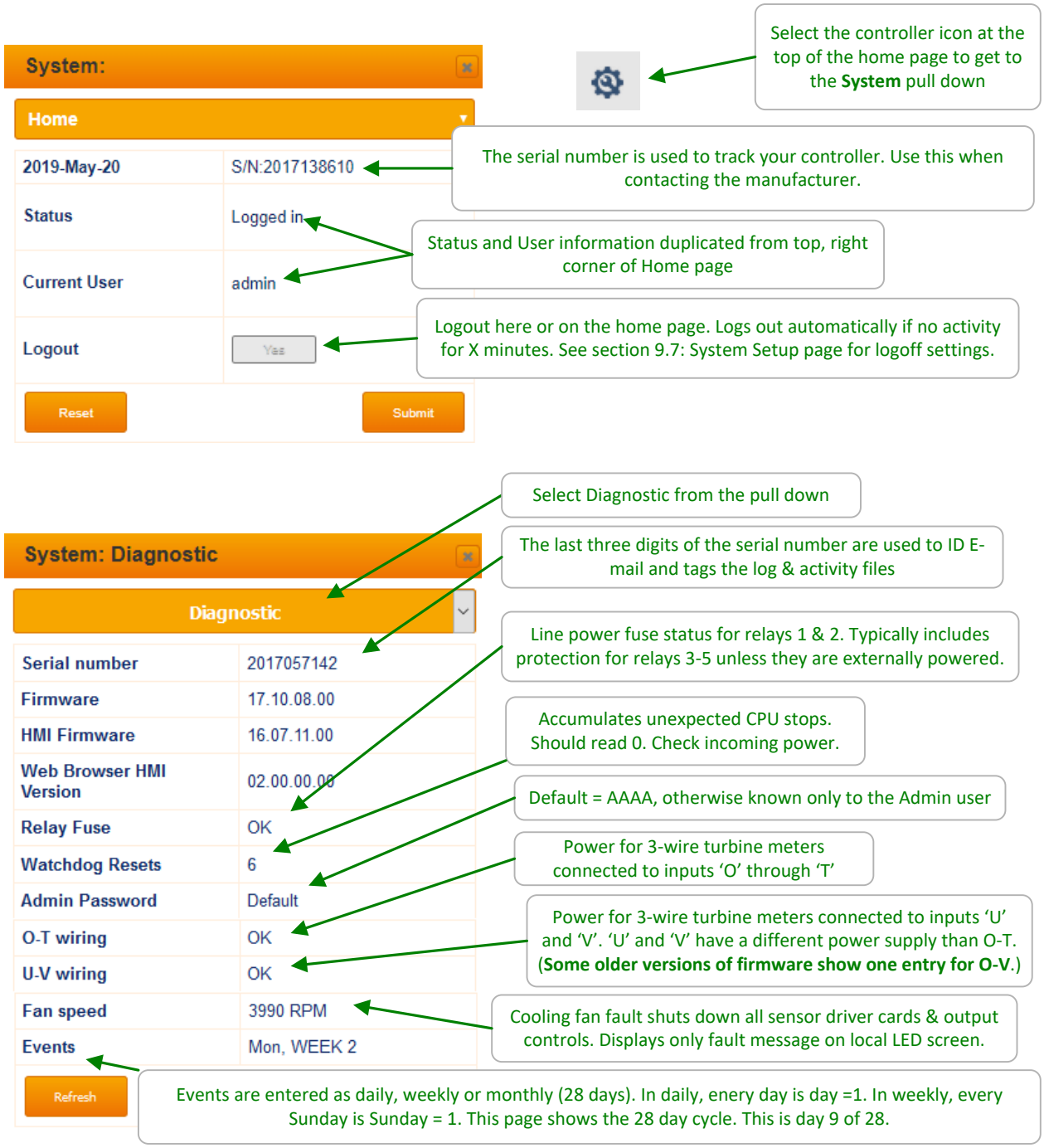
8.4 Diagnostic – 4-20mA Outputs





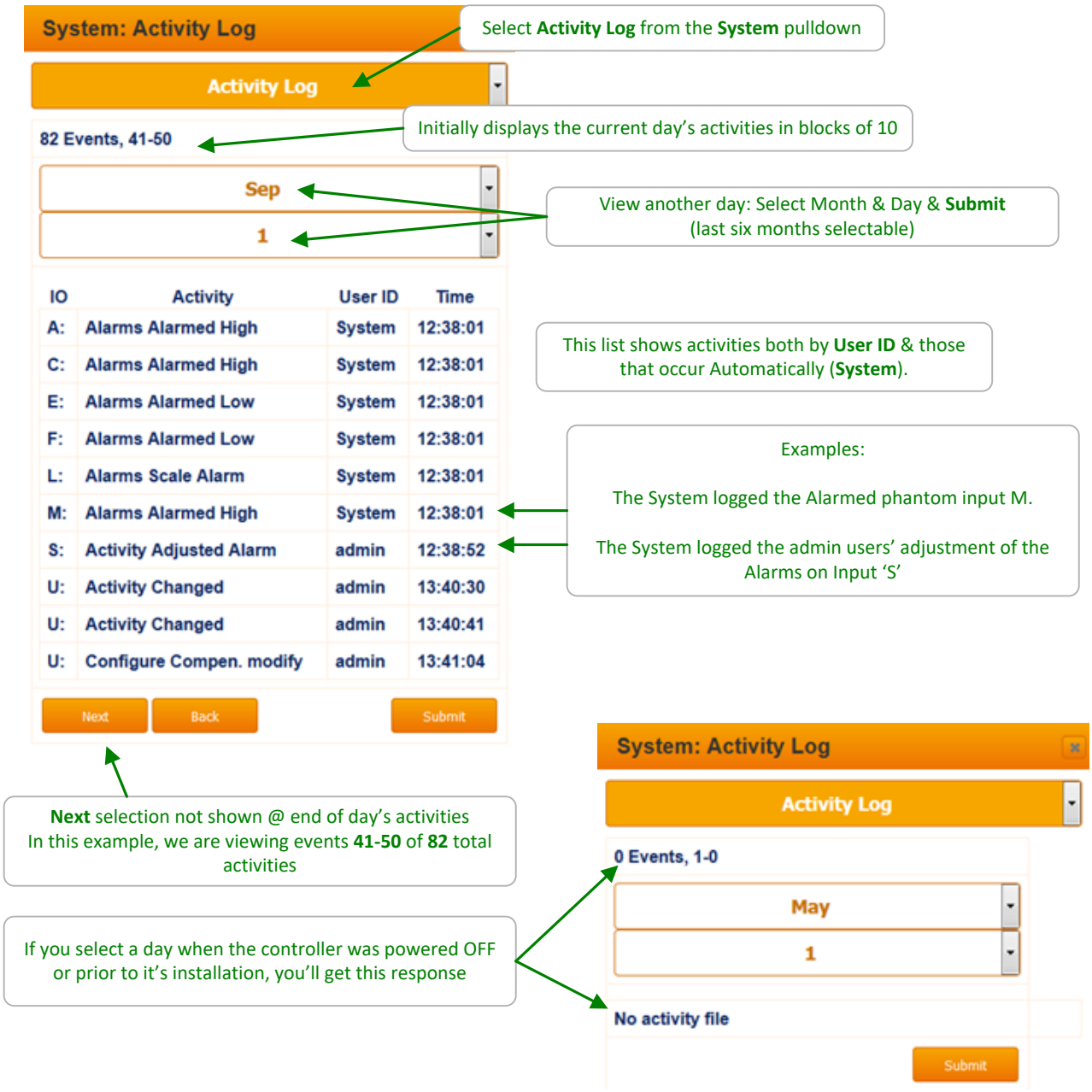
9 System Settings

9.1 Home & Diagnostic pages



9.2 Activity Log:

9.2.1 User ID, time stamp

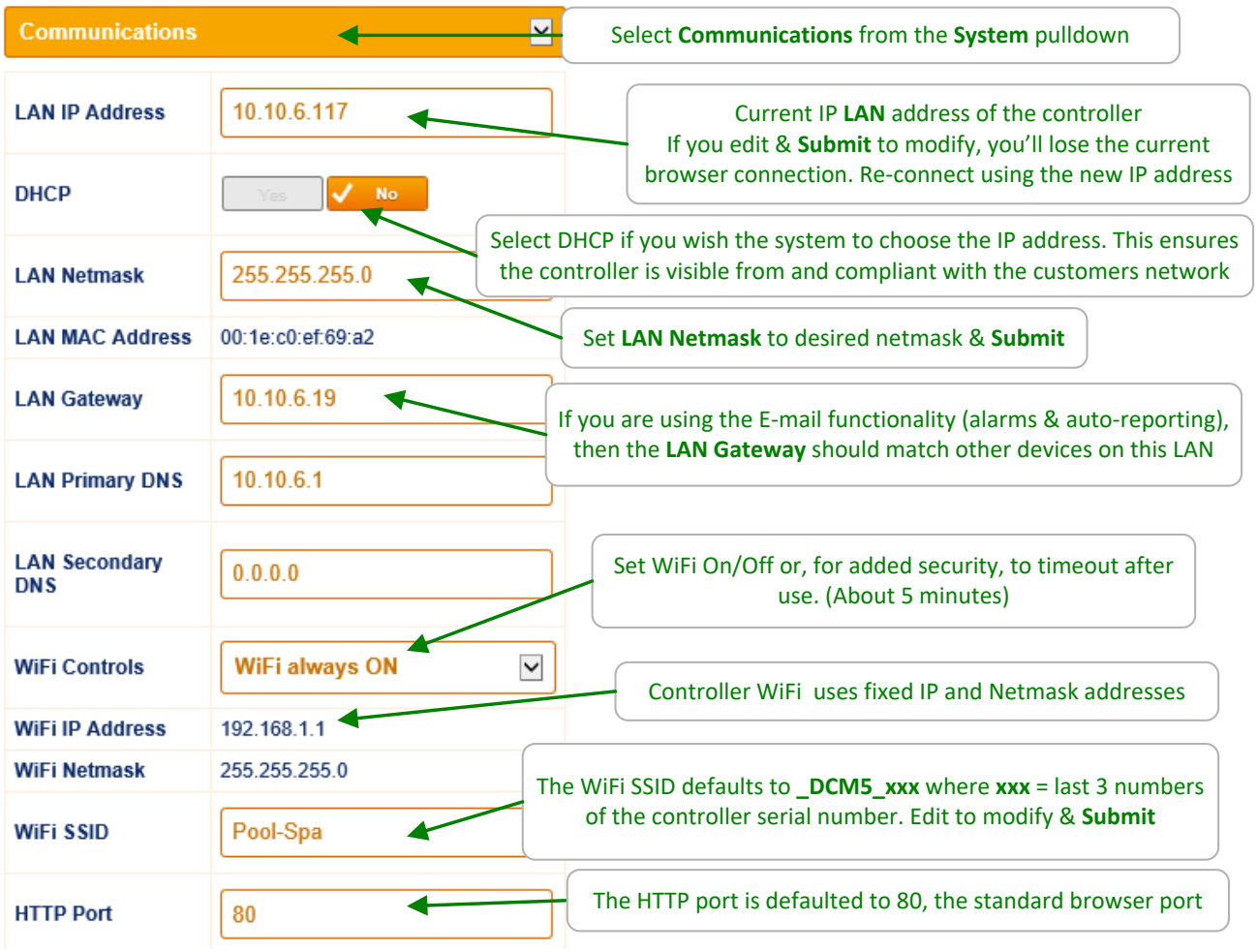


9.3 Communications: 1 of 2

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

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

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



(Continued)

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

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

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

Communications: 2 of 2

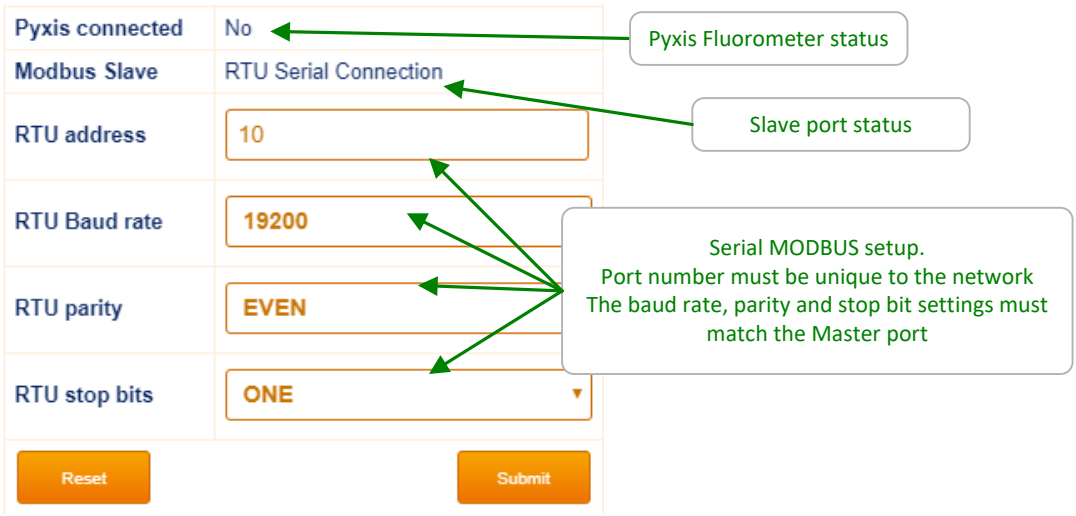
9.3.2 Com card setup

(Continued)

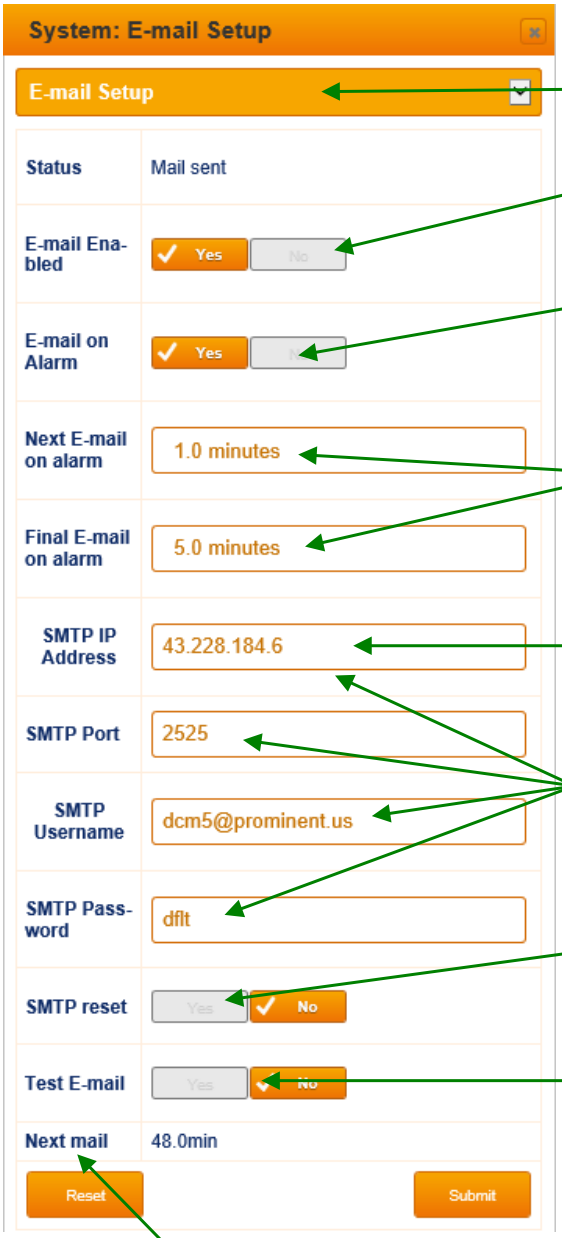
The communication card adds the option of communicating with a wide range of standard equipment protocol. This card includes a serial slave port for connection with a plant serial MODBUS, or a variety of Gateways for access to MODBUS TCPIP, serial or IP BACnet or most any protocol with the proper Gateway.
The communication card includes two 4-20mA outputs while allowing a dual 4-20mA input card to be piggy-backed on the com card.
The Pyxis fluorometer is compatible with the MODBUS Master serial port or a 4-20mA input card.

Consult the Addendum: DCM510 Communication Driver manual for complete instructions.

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



9.4 E-Mail Setup – Test



Use the pull down menu to select 'Email Setup'

Select Enable Yes to see this menu page. See the User Setup page for more instructions and to add an email address.

Select Enable Yes to see this menu page

The **Next E-mail on alarm** and **Final E-mail on alarm** boxes are used to set a time delay between user alarm notifications. Each user has a notification level which determines when he/she gets the email. There are three notification levels; First, Next and Final. These two boxes allow you to set the delay between First and Next (1 minute in this example) and the delay between Next and Final (5 minutes in this example). The notification level is set by the Admin user in the User Setup menu.

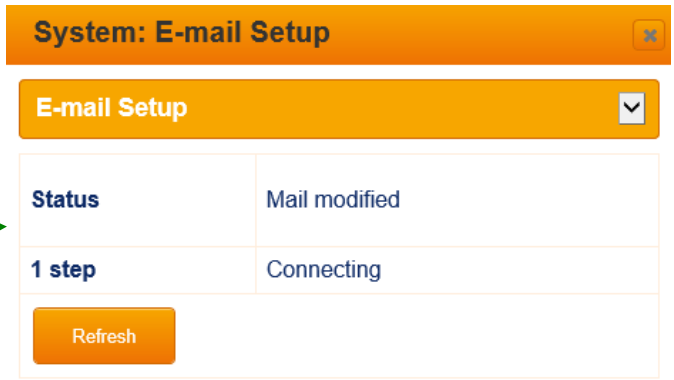
This is the default SMTP server address. If this does not work, the customers IT personnel should be notified. They are blocking this traffic.

The default SMTP address, Port and Password will direct this controller to the ProMinent server. If you wish to use another SMTP, edit these four SMTP boxes.

The SMTP reset will return the above boxes to the ProMinent default server

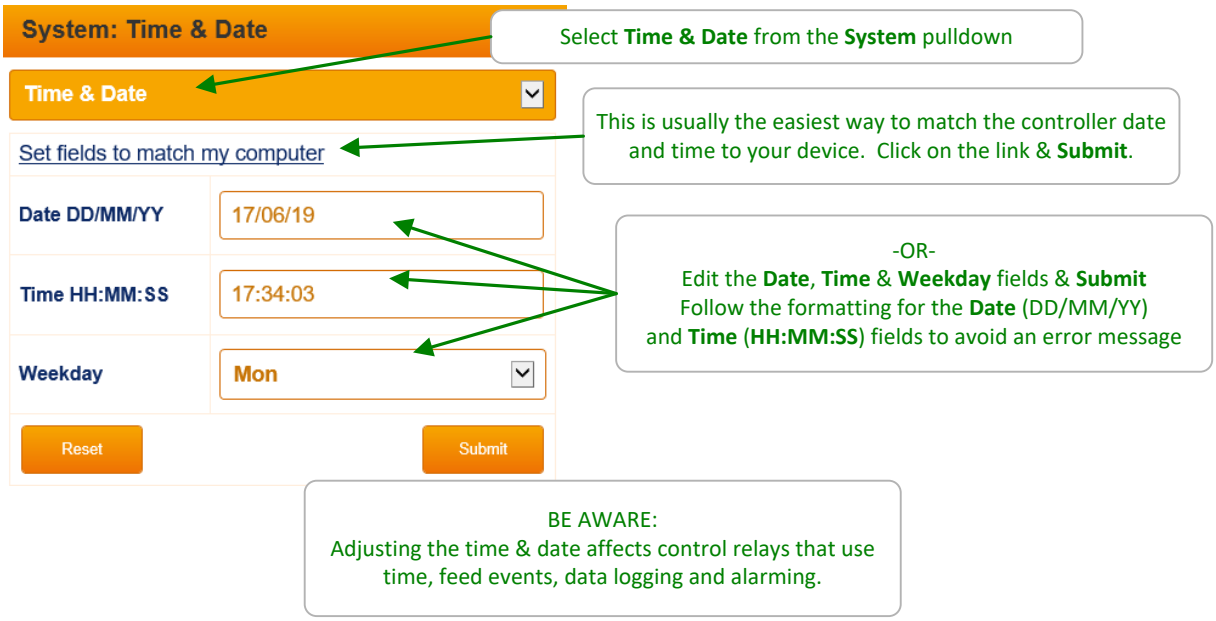
Test the server and settings during the initial setup and after any changes are made to this page.
If you test the server, or if the Next mail timer calls for an email, the Status box at the top of this menu will keep you posted on the process.

When using the Test E-mail function, the menu will change to look at the status of the process. Press the Refresh button to see changes until 'Mail sent' is displayed. If the email fails to send, perform troubleshooting techniques or notify the IT department.



9.5 Time & Date:

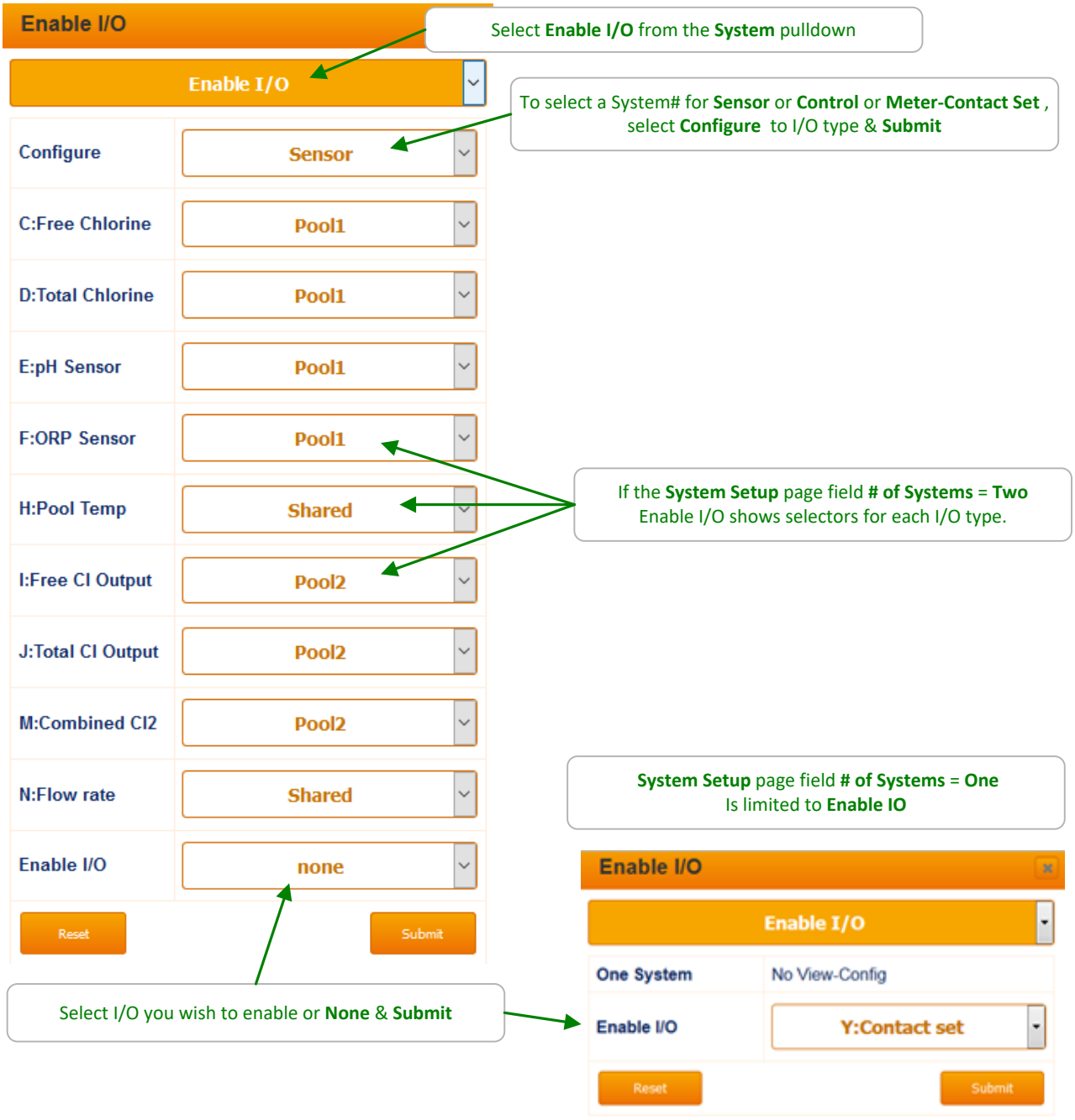
9.5.1 Sync to Device



9.6 Enable I/O:

9.6.1 Enable IO, Assign to System#

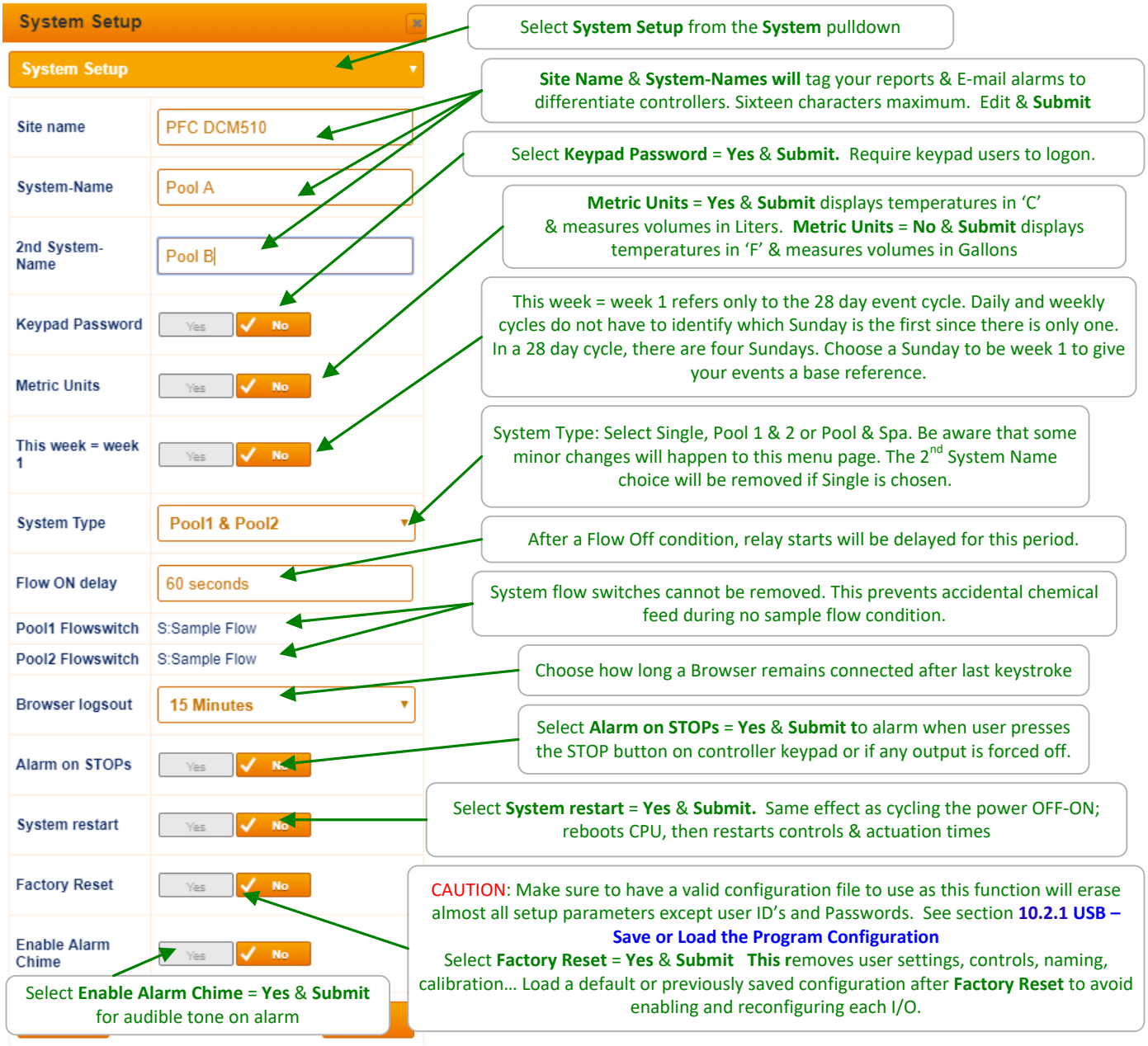
All I/O points can be enabled and used by the controller. Enabled points are displayed on the main screen. If a point is disabled, it is removed from the main screen and has no programmable function.
If you select two systems, (See System Setup menu, section **9.7 System Setup**) you will see the menu on the left. This menu page will allow you to select which system each I/O is a part of. A single system user will see a different menu, shown in the lower right corner of this page.



9.7 System Setup:

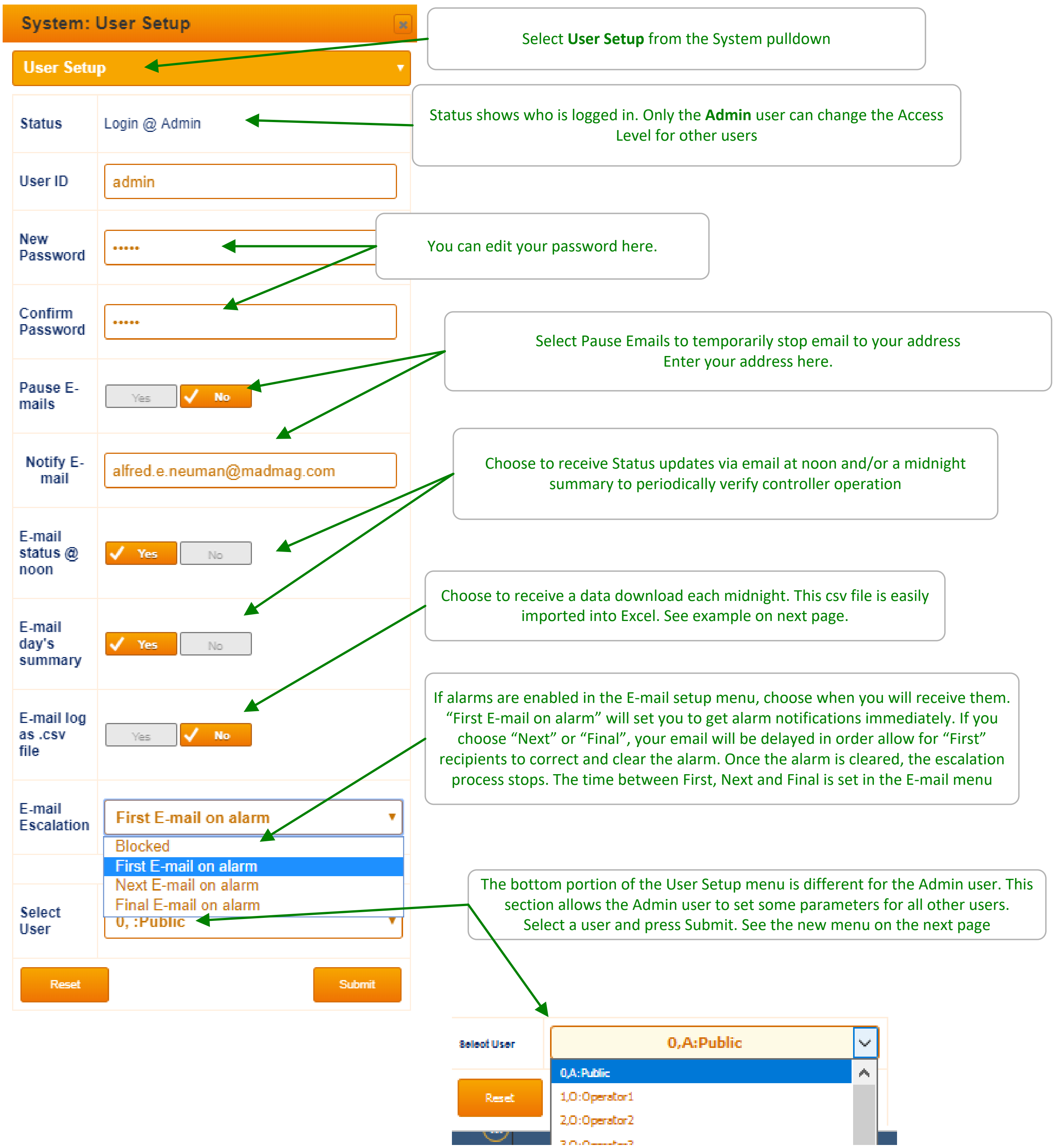
9.7.1 Naming, Sunday=Day1 ,Metric Units, Restart Options

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



9.8 User Setup:

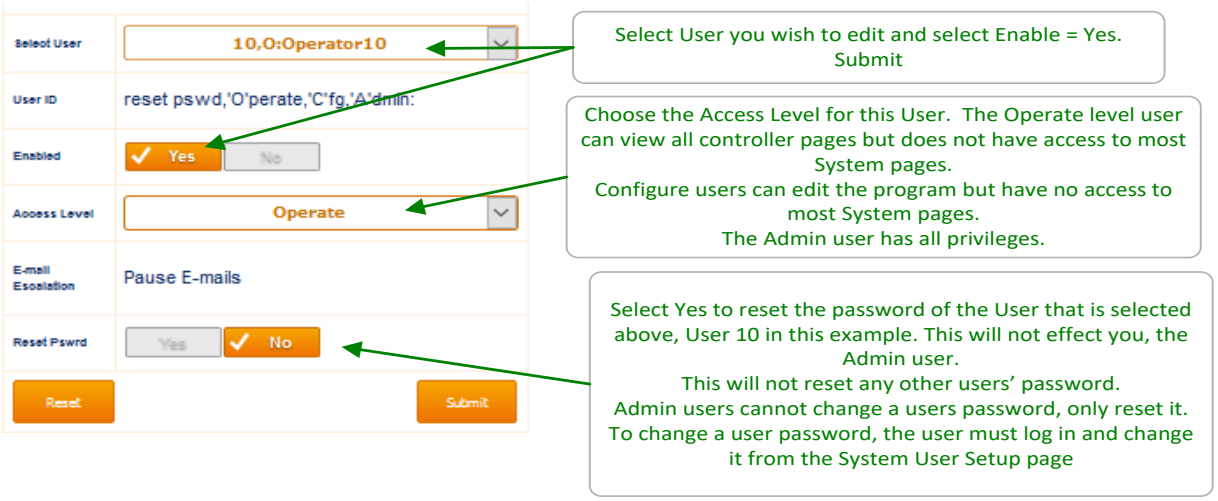
9.8.1 View-Set Access Level and Passwords



DCM510 Browser

View-Set Access Level and Passwords - Continued

The Admin user can set several parameters for other users



Example of midnight CSV data file:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
3																						
4	2017057142	Typical Customer	Pool A		19.03.11.00																	
5	Log records																					
6	I/O	Location	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
7	I/O	Units			ppm	ppm	pH	mV	mA	F	ppm		ppm		ppm	pH	sec	GPM	G	G	sec	sec
8	Date	Time	Unassigne	Unassigne	Free Chlor	Total Chlo	pH Sensor	ORP Sens	4-20mA in	Temperat	50ppm fre	Unassigne	Combinec	Unassigne	Free Chlor	pH Sensor	Filter Run	Turbine m	Water me	Water me	Sample Fl	Contact s
9	18/06/19	0:00:00	-100000	-100000	1.071	2.196	9.34	114	45	-100000	50	-100000	7.64	-100000	-100000	-100000	300	109.095	300	-100000	0	300
10	18/06/19	0:05:00	-100000	-100000	1.07	2.195	9.31	113	45	-100000	50	-100000	7.6	-100000	-100000	-100000	300	118.766	300	-100000	0	300
11	18/06/19	0:10:00	-100000	-100000	1.071	2.197	9.32	114	45	-100000	50	-100000	7.63	-100000	-100000	-100000	300	118.14	300	-100000	0	300
12	18/06/19	0:15:00	-100000	-100000	1.068	2.193	9.33	113	45	-100000	50	-100000	7.63	-100000	-100000	-100000	300	125.144	300	-100000	0	300
13	18/06/19	0:20:00	-100000	-100000	1.068	2.194	9.35	113	45	-100000	50	-100000	7.64	-100000	-100000	-100000	300	117.142	300	-100000	0	300
14	18/06/19	0:25:00	-100000	-100000	1.068	2.193	9.35	113	45	-100000	50	-100000	7.65	-100000	-100000	-100000	300	120.979	300	-100000	0	300
15	18/06/19	0:30:00	-100000	-100000	1.069	2.195	9.29	113	45	-100000	50	-100000	7.6	-100000	-100000	-100000	300	111.961	300	-100000	0	300
16	18/06/19	0:35:00	-100000	-100000	1.07	2.196	9.3	113	45	-100000	50	-100000	7.61	-100000	-100000	-100000	300	130.752	300	-100000	0	300
17	18/06/19	0:40:00	-100000	-100000	1.066	2.194	9.33	113	45	-100000	50	-100000	7.65	-100000	-100000	-100000	300	122.59	300	-100000	0	300
18	18/06/19	0:45:00	-100000	-100000	1.068	2.195	9.34	113	45	-100000	50	-100000	7.65	-100000	-100000	-100000	300	129.884	300	-100000	0	300
19	18/06/19	0:50:00	-100000	-100000	1.067	2.195	9.33	113	45	-100000	50	-100000	7.62	-100000	-100000	-100000	300	112.752	300	-100000	0	300
20	18/06/19	0:55:00	-100000	-100000	1.069	2.196	9.34	114	45	-100000	50	-100000	7.64	-100000	-100000	-100000	300	120.175	300	-100000	0	300
21	18/06/19	1:00:00	-100000	-100000	1.073	2.195	9.29	113	45	-100000	50	-100000	7.6	-100000	-100000	-100000	300	118.954	300	-100000	0	300
22	18/06/19	1:05:00	-100000	-100000	1.069	2.196	9.35	114	45	-100000	50	-100000	7.65	-100000	-100000	-100000	300	110.591	300	-100000	0	300
23	18/06/19	1:10:00	-100000	-100000	1.069	2.194	9.33	113	45	-100000	50	-100000	7.64	-100000	-100000	-100000	300	129.544	300	-100000	0	300
24	18/06/19	1:15:00	-100000	-100000	1.07	2.194	9.3	113	45	-100000	50	-100000	7.6	-100000	-100000	-100000	300	122.894	300	-100000	0	300
25	18/06/19	1:20:00	-100000	-100000	1.071	2.195	9.32	113	45	-100000	50	-100000	7.61	-100000	-100000	-100000	300	102.629	300	-100000	0	300
26	18/06/19	1:25:00	-100000	-100000	1.069	2.194	9.3	113	45	-100000	50	-100000	7.59	-100000	-100000	-100000	300	113.995	300	-100000	0	300

10 Using the USB Port

10.1 Capturing Data

The DCM510 logs all sensors, flow switches, meter values, relay ON times, fed volumes and status every 5 minutes. This data is easily captured from the USB port located behind the communication light cover.

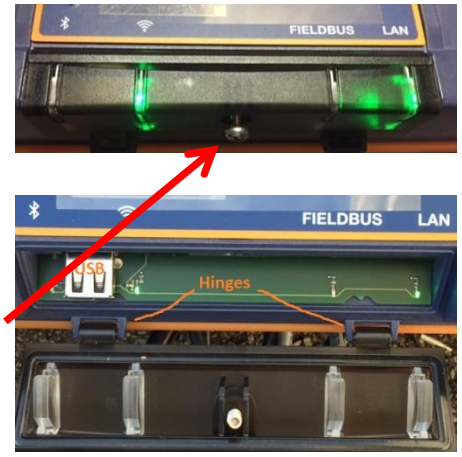
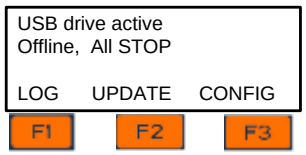


Figure 65 USB Access Door Closed [Top] and Open [Bottom]

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



Phillips head screw

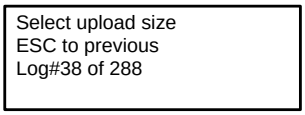
2- Choose F1, LOG to set up the download.

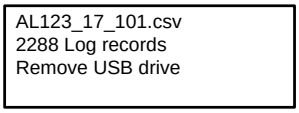
3- Choose the amount of history, DAY [F1], WEEK [F2], or MONTH [F3]. When you choose the period, the download starts.

During the download, the keypad and browser connection are locked.

4- The display will show the progress of the download

5- Once complete, the display will show the file name uploaded to the USB flash drive (ending in “csv”), the size of the file in number of records or time stamps, and instructs you to remove the drive to return the controller to normal operation.





6- Don’t forget to close and re-secure the access door to assure the interior of the controller is not subjected to moisture or corrosive fumes from the environment.

No special conversion program or Excel add-in is needed to import the CSV formatted data into Microsoft Excel® or similar spreadsheet programs. Refer to your spreadsheet or graphing software product to learn how to import CSV data. (CSV = Comma Seperated Value). The I/O data is stored in 5 minute intervals. (Not adjustable).
Values shown are as taken, not averaged over the 5 minute period. Relays show ON time in seconds if on/off. Frequency outputs in volume (mL).

	A	B	C	D	E	F	G	H	I	J	K
1	DCM5										
2	Serial nun	Site name	Controller name		Firmware						
3											
4	123	W P Stein	Hot Tub		17.06.05.00						
5	Log records										
6	I/O	Location	A	B	C	D	E	F	G	H	I
7	I/O	Units	uS	mpy	ppm	ppm	pH	mV	mA	F	mA
8	Date	Time	Conductiv	Corrosion	CLE3 Chlo	CTE Chlori	pH Sensor	ORP Sens	4-20mA in	Temperat	4-20mAO
9	20/06/17	10:45:00	0.85	0.002	0	0	6.73	-4	0.017	68.242	20
10	20/06/17	10:40:00	0.85	0.002	0	0	6.73	-4	0.015	68.109	20
11	20/06/17	10:35:00	0.85	0.002	0	0	6.75	-4	0.017	67.693	20
12	20/06/17	10:30:00	0.85	0.002	0	0	6.74	-4	0.017	68.319	20
13	20/06/17	10:25:00	0.85	0.002	0	0	6.74	-4	0.017	67.822	20
14	20/06/17	10:20:00	0.85	0.002	0	0	6.75	-4	0.017	68.071	20
15	20/06/17	10:15:00	0.85	0.002	0	0	6.78	-4	0.015	68.093	20

Table 20 Partial example of captured data

10.2 Save or Load the Program Configuration

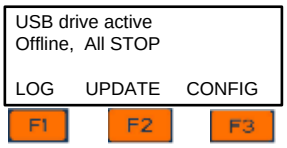
THIS IS NOT THE FIRMWARE INSTRUCTIONS. See 10.3 Firmware Upgrade

A program configuration is a list of instructions that the user can edit. Set-points, calibrations, names of I/O are all saved in the program configuration. You can save the configuration via a USB drive for backup purposes or to clone another controller. (Save from one controller and Load the configuration onto another.)
To see how to access the USB port, see section **10.1 Capturing Data**.

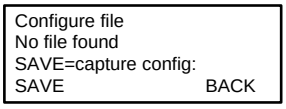
10.2.1 Saving to the USB

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

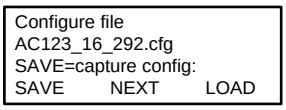
2- Press F3 Config



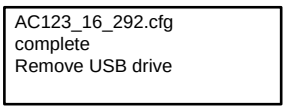
If you have not previously saved a program on this USB you can only F1 SAVE a copy to the USB.



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

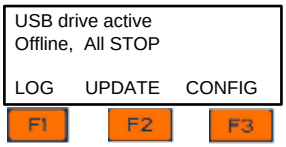


In either case, press F1 SAVE to copy the current configuration to the USB drive. When the save is complete, the display will notify you to remove the USB drive.



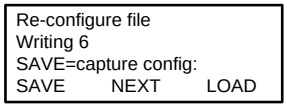
10.2.2 Loading from the USB

1- To load a previously saved program from the USB to your controller, insert a USB into the USB port located behind the Communication panel.

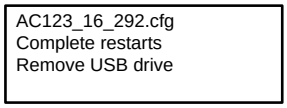


2- Press F3 Config.

3- Press F3 Load.



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



Sometimes referred to as “Cloning”, a saved program file can be loaded onto a different DCM510 controller. They will then have the same configuration. Afterwards, you can edit either program via the keypad or with a PC, etc.

10.2.3 Saving to/from Flash Memory

Save a copy of your program settings in flash memory using the keypad. Use the System/Configure menu.

10.3 Firmware Upgrade

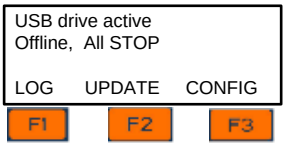
If necessary, your controller can have the firmware upgraded. Firmware is a set of instructions which tell the controller CPU how to operate. Firmware is not your 'program configuration' which determines which relay operates when and how. The program configuration can be saved and if needed, re-loaded, or copied to another controller. See section, **10.2 Save or Load the Program Configuration**

1 File Please

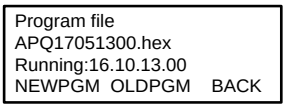
To avoid accidents and confusion with this important process, please remove all files from the USB drive prior to adding the .hex file. The controller will only allow you to view one file. Be sure you copy the correct file to the USB. If you have more than one, you may load the wrong file.

1- Obtain the hex file from ProMinent and insert thumb drive with the new file into the USB port located behind the Communication panel. See section **10.1 Capturing Data**.

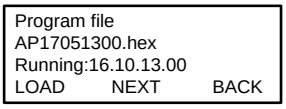
2- Press F2, UPDATE



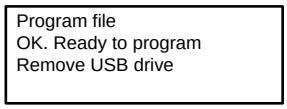
3- The display shows the one file from the USB drive; APQ17060500.hex and the current hex file in use; Running:16.10.13.00. NOTE: These numbers are date codes, year, month and day. '00' indicates they come from the USB drive.



F2 "OLDPGM" is a list of hex programs on the controller. If OLDPGM is not a choice, there are no other backup hex files in the controller memory. You can load a previous program from this list.



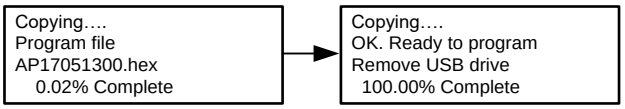
4- **If the file on line 2 is the new firmware file**, press F1 NEWPGM to select the new hex file. Press F1, Load to install the new hex file.



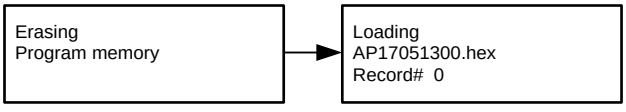
5- Remove the USB drive when prompted.

NOTE: OLDER FIRMWARE VERSIONS USE STEP 6.

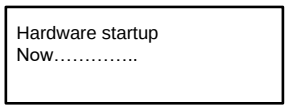
6- The firmware is copied to the controller. When complete, the controller will notify you to remove the USB drive.



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



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



10.4 E-mail Reports and Alarms

The E-mail function is explained in the DCM510 Browser manual. You cannot access this feature through the keypad. The following explanation is for informational purposes only.

The E-mail tool can send three types on information; Alarms, Status and Daily data. Setup is via a PC or smart phone browser.

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

10.4.1 E-mail Types:

10.4.1.1 ALARM: Sent once when an alarm first occurs.

Lists all active alarms.

Includes enabled sensor, meter & contact values for alarm context

User Enabled/Disabled.

10.4.1.2 STATUS: Sent @ noon every day (12:00). Verifies that the controller is running & on the LAN.

Includes enabled sensor, meter & contact values.

Sent @ midday so that commercial systems will have some run time and some day is left to respond to operating issues.

10.4.1.3 DAILY: Sent @ midnight (23:59) every day. Verifies that the controller is running & on the LAN.

Includes enabled output run times or volumes and sensor, meter & contact values. User Enabled/Disabled.

All types send comma delimited values (CSV); one line per I/O or Alarm so that the both the subject & body can be easily parsed into a logging app, a typical use for the DAILY type.

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

11 Appendices:

a. IO Namespace: Letters & Numbers

The controller uses the letters ‘A’ to ‘Z’ to refer to sensors, meters, contact sets & 4-20mA outputs.

The numbers ‘1’ to ‘9’ refer to digital output controls. These can be AC relays, dry contact relays or digital solid state DC outputs for pulsed or on/off control.

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	Used with legacy DCM5 ‘SGT’ temperature sensor
K-N	Phantom sensors	Calculated (Inventory, Manual, Combined Chlorine, LSI/Ryznar, Flow Rate) or derived from other sensors & meters
O-V	Volume meter & contact set inputs	Each of 7 inputs configurable as Turbine, Contact Head meter or Contact Set. A second System flowswitch will reduce this to 6 inputs.
W-Z	Phantom volume meter & contact set inputs	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 analog 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 analog 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 or to have additional levels of alarms.

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
Unassigned	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 0-2ppm	4-16	G=0.167, O=-0.667
	CGE 0-10ppm	4-16	G=0.833, O=-3.333
CLE3 Chlorine	CLE 0-2ppm	4-16	G=0.167, O=-0.667
	CLE 0-10ppm	4-16	G=.8333, O=-3.333
	CLE 0-20ppm	4-16	G=01.56, O=-06.6
	CLE 0-50ppm	4-16	G=4.125, O=-16.50
	CLE 0-100ppm	4-16	G=8.333, 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
pH-transducer	pH 0 to 14	4-20	4mA=-15.45pH 20mA=-1.45pH pH outside of 0-14 blocked G=-1.056, O=19.675 5.373mA=14pH, 18.6mA=0pH
ORP-transducer	ORP 0-1000mV	4-20	G= 62.5, O=-250
Temperature	Temp. 0-100C	4-20	G= 6.25, O=-25
Turbidity	Turb. 0-5000NTU	4-20	G= 312.5, O=-1250
Ultraviolet	UV 0-100%	4-20	G= 6.25, O=-25
	UV 0-1000wm2	4-20	G= 62.5, O=-250

Notes:
1. Gain & Offset return to the table values @ Calibrate = Factory Reset
2. The preceding table applies to the ChemFeed version of the DCM510

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

Inputs A-Z cannot be disabled if in use by another I/O for control, compensation, phantom link, etc.

The disable option using the browser or keypad 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 configuration 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.