DULCOMETER
DCM3® 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

Certified to NSF/ANSI Standard 50

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 with DCM3 controllers on an accompanying USB flash drive. The part number for the USB drive is: _____

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 DCM3 controller using an Ethernet connection, or wirelessly via WiFi from a PC, tablet or smart phone. Secondly, to give examples of how to configure the outputs, calibrate sensors and/or view the parameters of the pool or spa. It is not intended to be so comprehensive that all possible combinations of configurations are shown, but rather a few examples of common arrangements are used to demonstrate configurations can be created or changed to fit your needs.

The accompanying Installation and Operation manual has detailed sensor information, keypad instruction and controller details and specifications not included in this manual.

The following sections detail connecting your WiFi enabled 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.

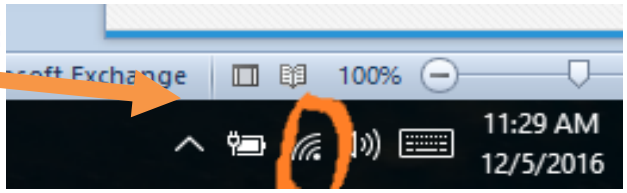
1.1 The WiFi Connection

A **WiFi** connection eliminates cables and the need to change your computer's IP address. It works pretty much the same as connecting to the internet hot-spot when visiting your local restaurant or coffee shop.
There are two steps needed to fully connect to the controller. **Step 1**: Connect your smart device to the wireless network or "Hotspot" that is your controller. **Step 2**, Enter the IP address of the controller in any common browser application on that smart device.

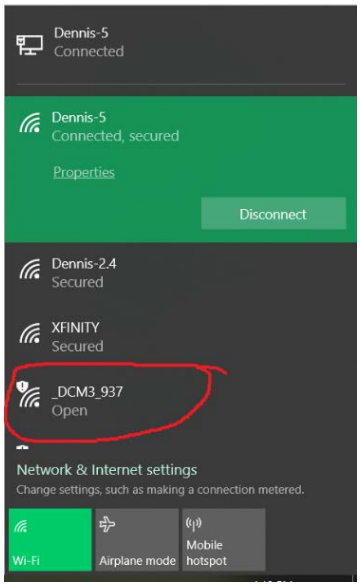
Step 1 is provided in three parts, 1.1.1 Using a PC, 1.1.2 Using a Tablet and 1.1.3 Using a Smartphone

1.1.1 Using a Windows 10 PC or Laptop:

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



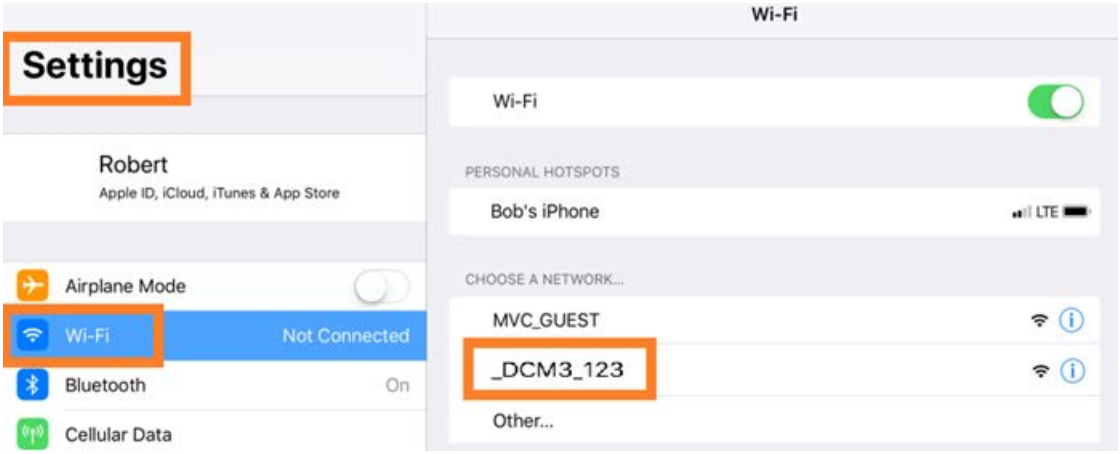
Click on the _**DCM3**_### choice and press the Connect button.
The number ### in this example will be different on each controller. These 3 digits are taken from the last 3 digits of the controller serial number. This allows you to differentiate between controllers if more than one is within **WiFi** range.
Further differentiate your controller WiFi name by changing it to a description of the body of water. See Section 7.3 Communications.



Your computer is now connected to the DCM3 **WiFi** hotspot.
Continue with section 1.1.4 Opening the Browser page

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. If there are more than one controller in WiFi range, this page should show all the controllers with their WiFi transmitters on, each with a different serial number indicated.

Further differentiate your controller WiFi name by changing the SSID name of the network. See **7.3 Communications**

Your tablet is now connected to the DCM3 **WiFi** network.
Continue with section 1.1.4 Opening the Browser page

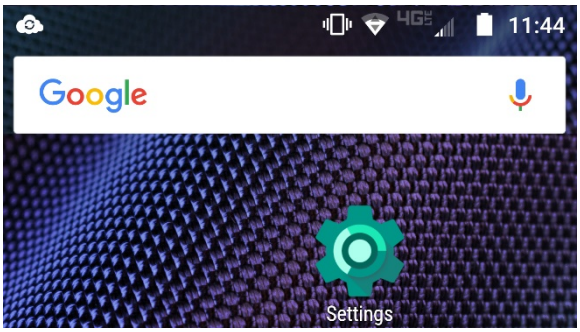
Sidebar:
Once you are connected to a controller, you can edit the SSID (WiFi name) to make identification easier than trying to remember the three digits. (highly recommended)
See section **7.3 Communications** to make this change.

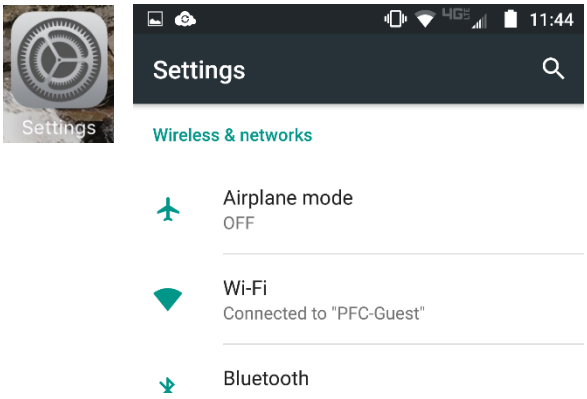
1.1.3 Using a Smartphone

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 number's last 3 digits with the options on the phone. Select your controller. The status should change for that choice. See example picture below; DCM3_123 is 'Connected, no Internet'.

Again,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.

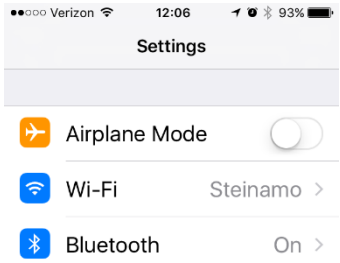
Your computer is now connected to the DCM3 **WiFi** network.
Continue with section 1.1.4 Opening the Browser page using WiFi

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. (highly recommended)
See section **7.3 Communications** to make this change.

1.1.3.2 Setting up WiFi using an iPhone

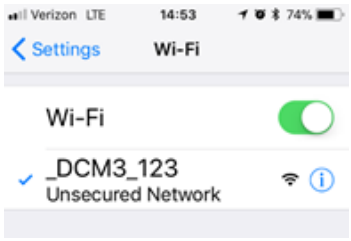
To connect your iPhone to a DCM3 controller
Select the Settings button from your desktop.

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 **7.3 Communications**

Your computer is now connected to the DCM3 **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. (highly recommended)
See section **7.3 Communications** to make this change.

1.1.4 Opening the Browser page using WiFi

Once a WiFi “hot-spot” connection is established, continue here with the second part **(Step 2)**.

To connect to the controller and see the embedded website screen, open a browser and enter the controller’s **WiFi** IP address. (Not the LAN IP).
The WiFi address is always **192.168.1.1**. This address cannot be changed.

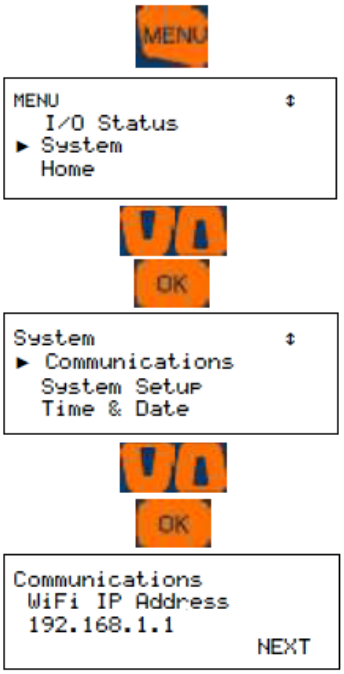
If you cannot remember the IP address, you can find the controller’s **WiFi** IP address using the controller keypad.

1) Press the **MENU** key

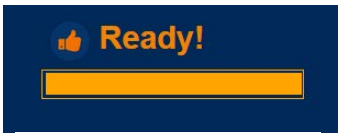
2) Press the up arrow (scroll up) until you see **System**. Press **OK**

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

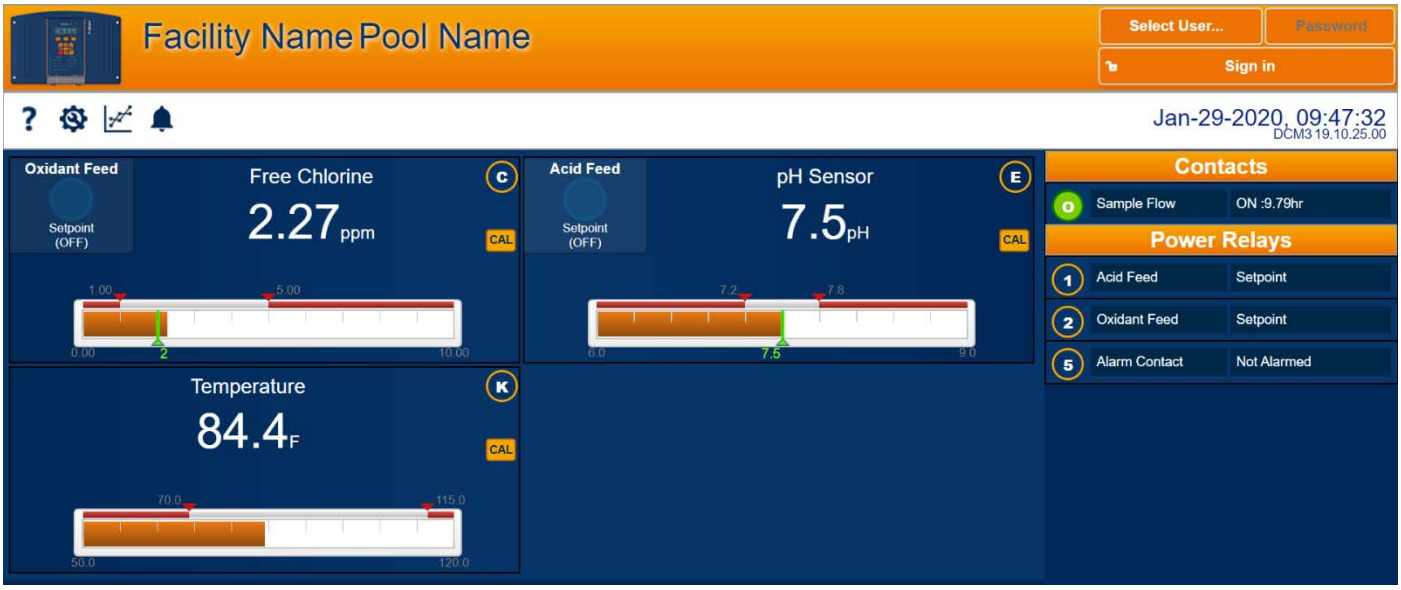
4) You will see the LAN IP address. Press the down arrow twice to see the WiFi IP Address.
This is the address you need to use in the browser URL box. No need to add the WWW or HTTP. Just enter as shown here. 192.168.1.1 and press your return ↵ or ENTER key.



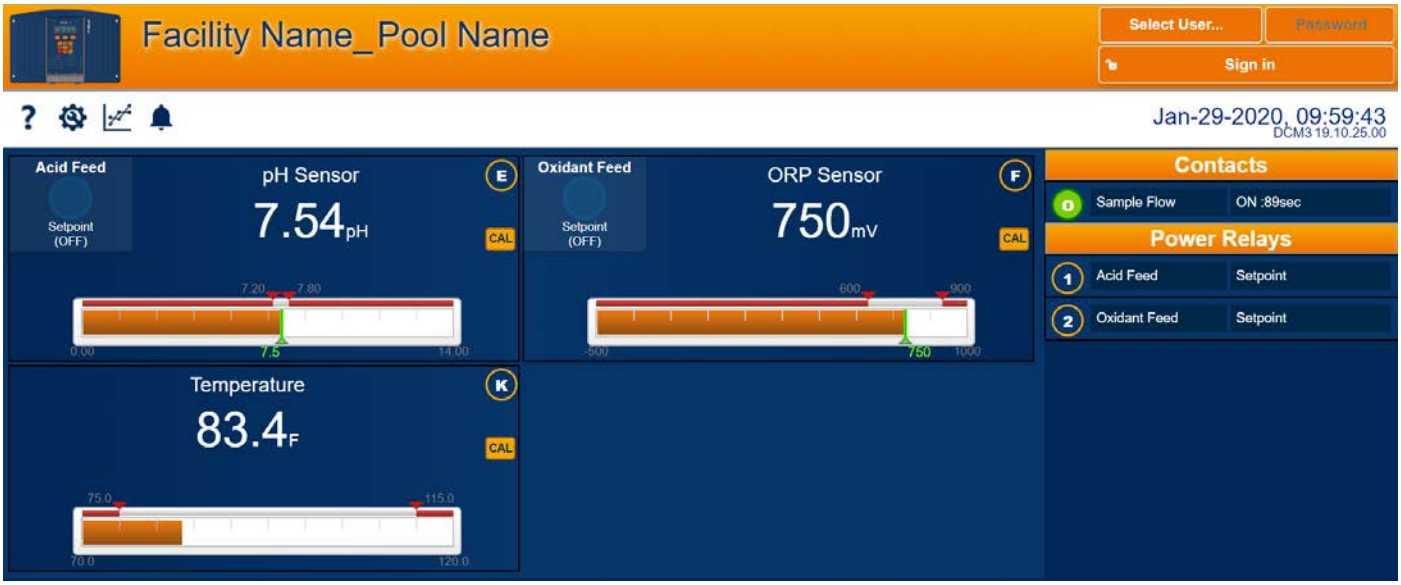
Once connected, you can see the values and status of many I/O points but you will not be able to edit or make configuration changes without logging in. This is the **HOME** screen.
See **Section 1.3 The Home Screen**



Connection status



DCM3-Cl Home Screen

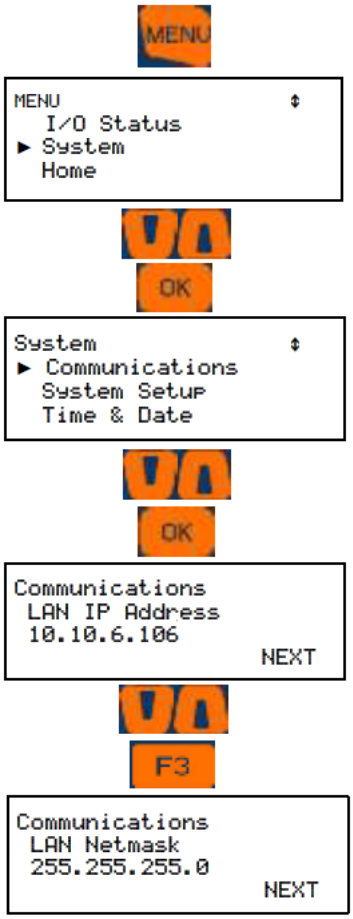


DCM300 Home Screen

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 (Ethernet) port on your PC and to the short gray ethernet cord extending from the controller or the LAN port inside the controller. (Lower left-hand corner). A green light should be seen on both ports once the cable is connected. The amber light will blink with each data packet that passes by in either direction.

1.2.1.1 Determine the LAN IP address of the controller

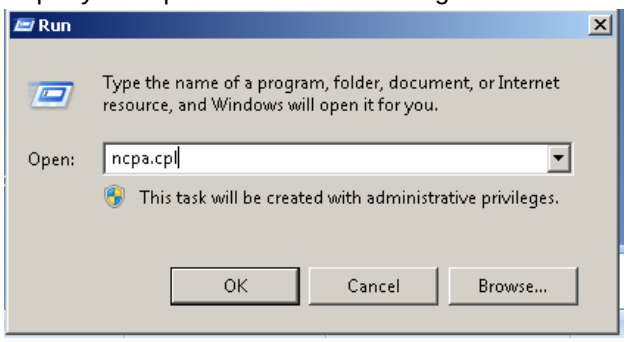
The controller's default LAN IP address is 10.10.6.106 and the LAN Netmask is 255.255.255.0.
Verify these numbers;

Press the **MENU** key on the controller
Use the up arrow to **System** and press **OK**
Scroll to Communication, then press **OK**
The LAN IP address is shown.
Pressing the **UP** arrow will scroll to the LAN Netmask.

Once you have determined the IP address and Netmask 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

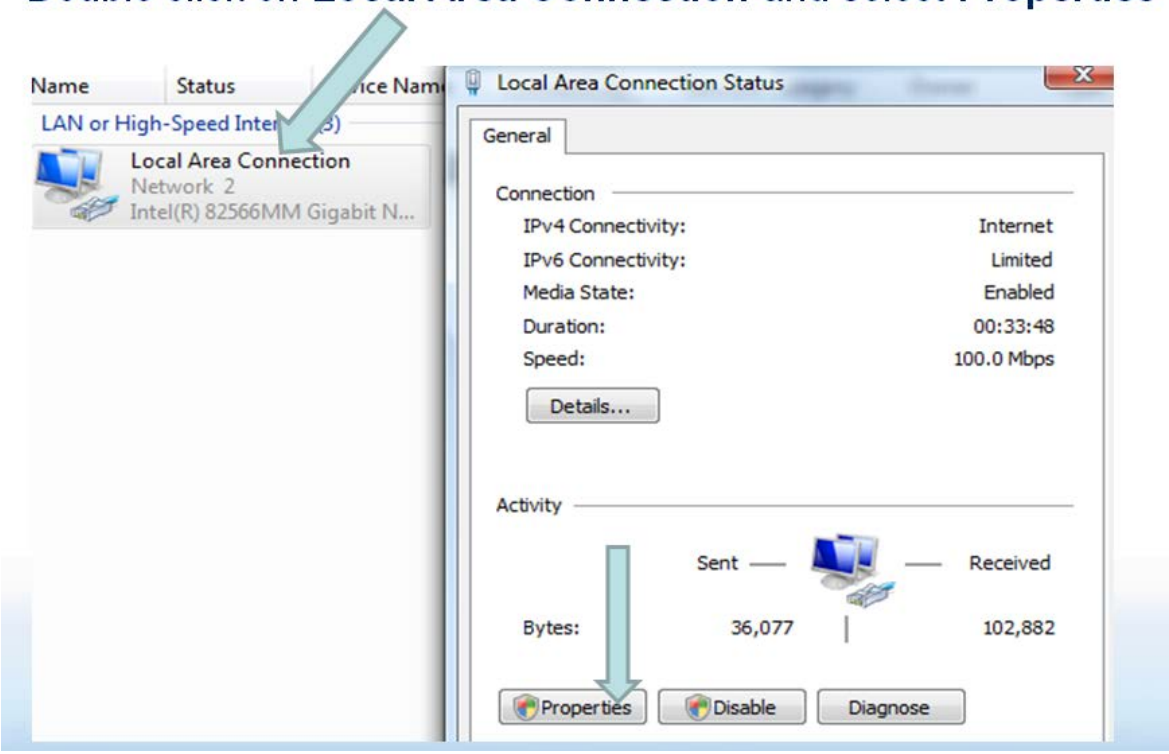
Depending on which version of Windows you are using, these instructions will vary.
The idea is to set a compatible static IP address on your PC for the Ethernet port you will use to physically connect to the controller. If you are unfamiliar with these settings or if your company IT department has the settings locked down, contact them with this manual to have them set up the networking.
Use the following instructions for VISTA, WIN7, WIN8 and WIN10.

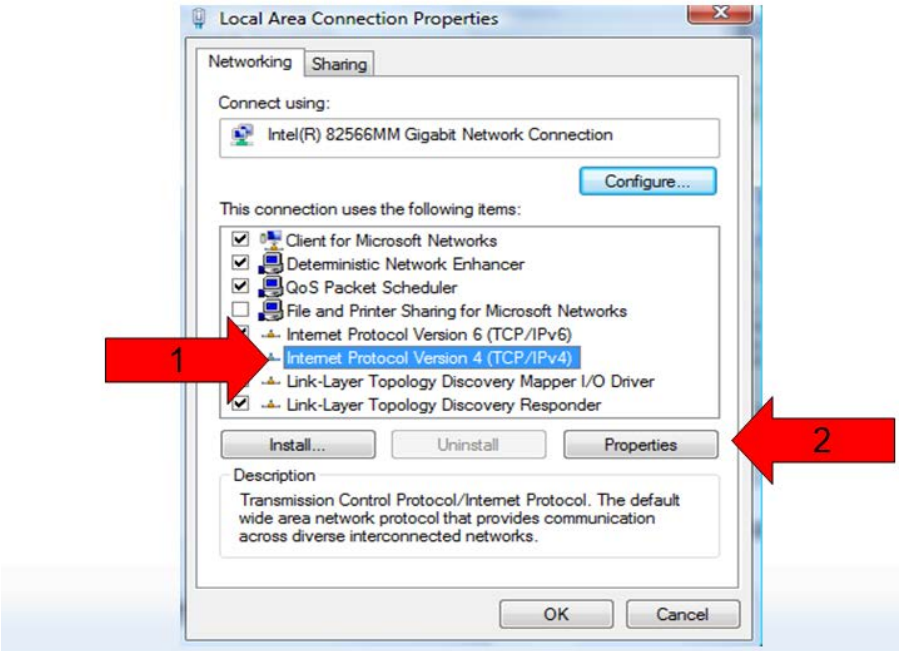


Hold down the Windows key  you press the letter 'r '.

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

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





(1) Highlight Internet Protocol **Version 4** (TCP/IPv4)

(2)Select Properties

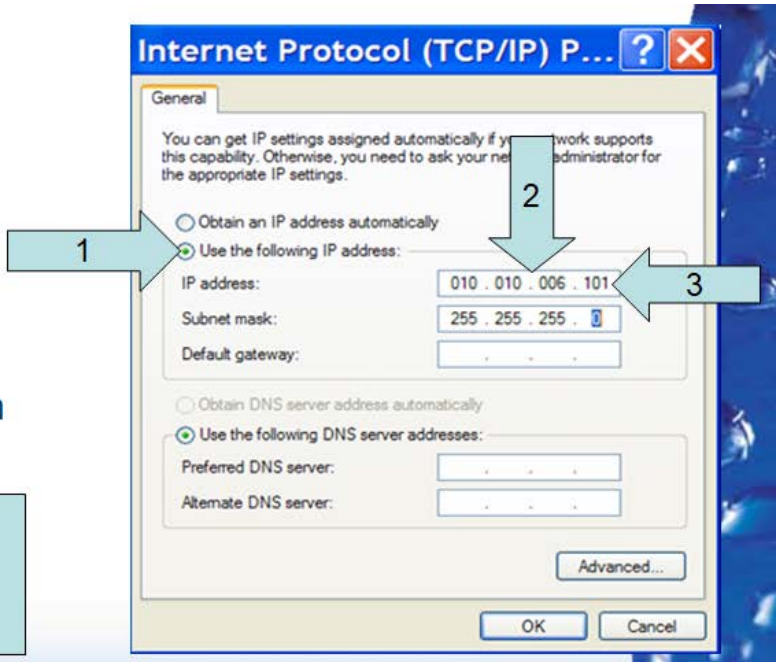
Select the 'Use the following IP address': circle (1)

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

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

10.10.6.106:100

The WiFi address will also change to include the port number requirement and is now:

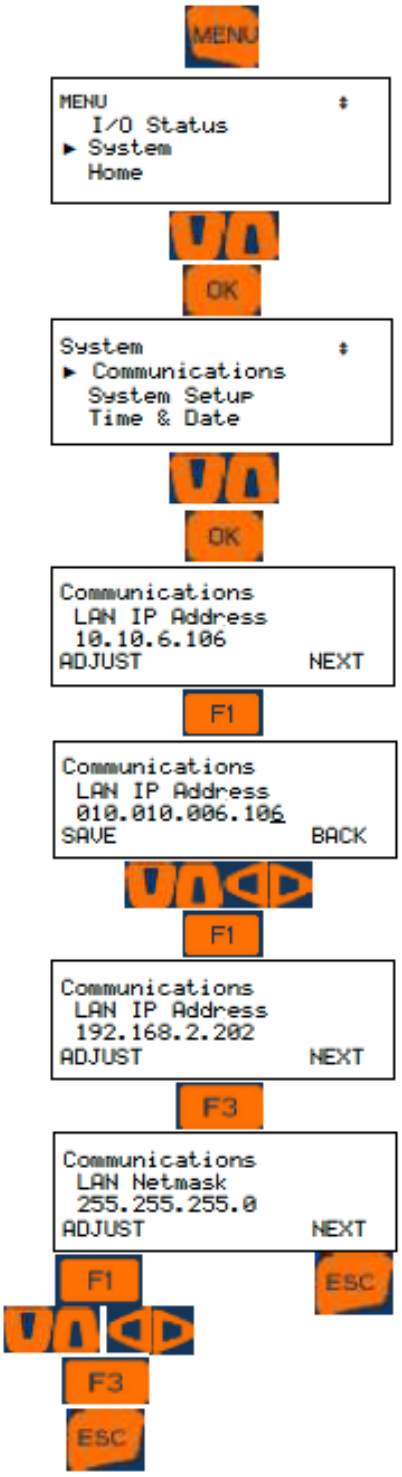
192.168.1.1:100

1.2.2 Connecting To The Building Network

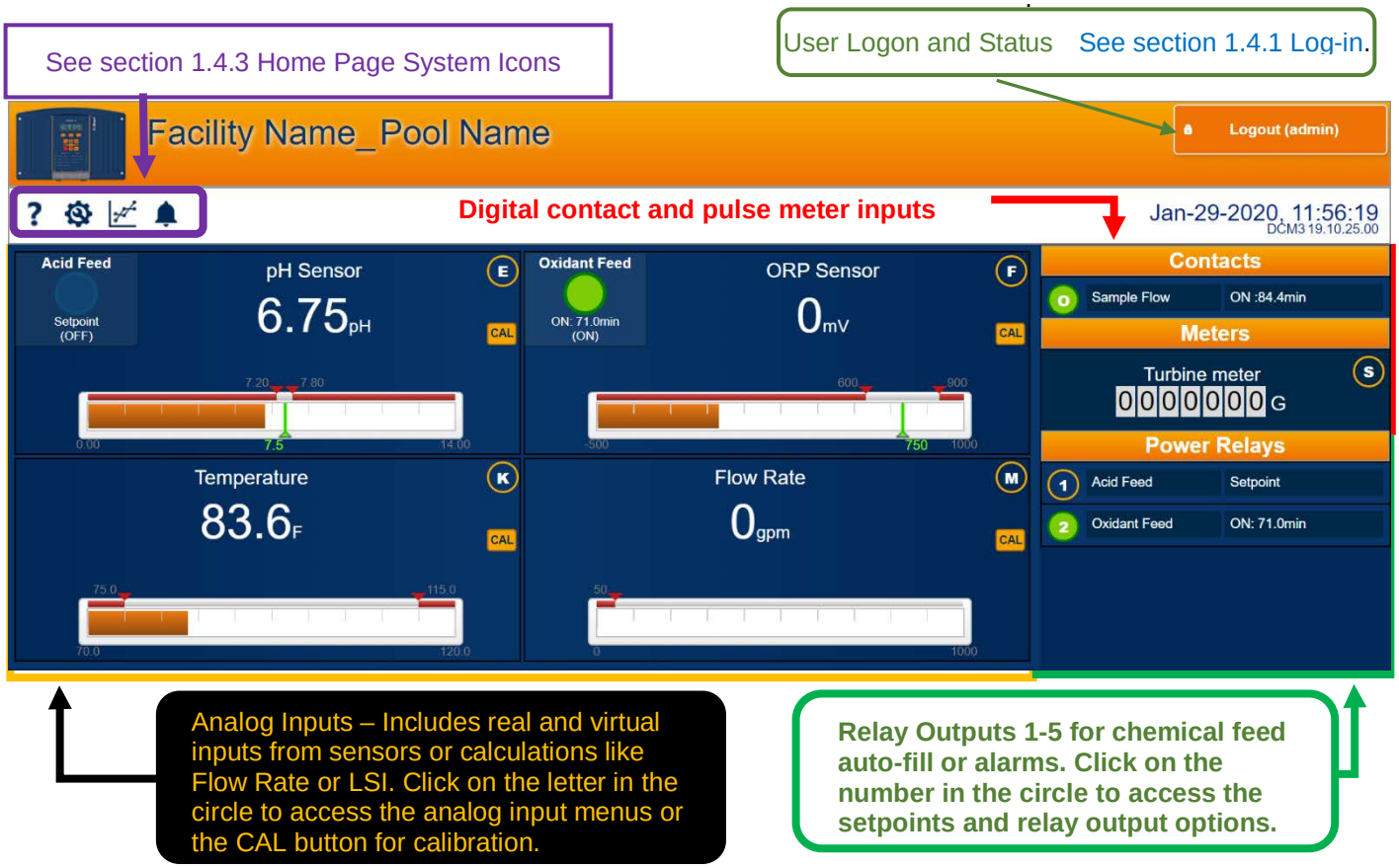
Using the Local Area Network (LAN) port to connect to the building network, you will need to acquire an IP address from the Network Administrator which will allow the controller to be compatible with this network. The address you receive must be unique on this network.

Use the keypad to change the address; (See flowchart)

1. Press **MENU**
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 requirements, change that as well, then press **F1 SAVE**.

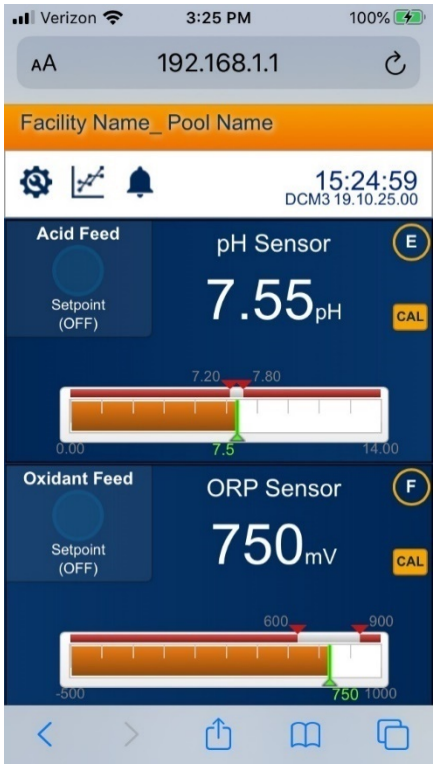


1.3 The Home Screen 1 of 2



The Home Screen 2 of 2

View from any WiFi enabled Smartphone or iPod type device. Scroll in any direction to access all I/O as shown in the PC/Tablet screen.

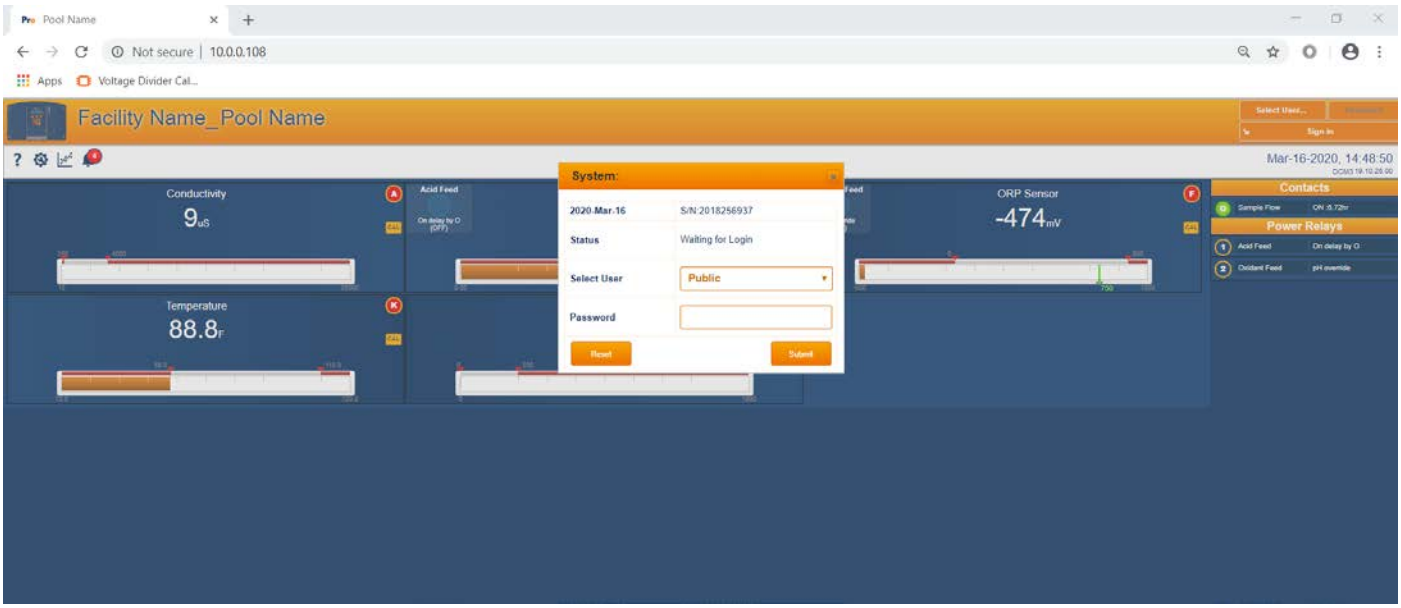


1.4 Home Page Services

From the home page, you can see all the enabled inputs and outputs (I/O). Log-in to gain access to three levels of 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. Click on the **Select User** button or click on any part of the top orange bar to have a password dialog box drop down. Select the User and enter the corresponding password followed by **Submit**.



Usernames with Default Passwords:
Operator1 = **1** Operator2 = **2** Operator3 = **3** Operator4 = **4**.
Configure5 = **5** Configure6 = **6** Configure7 = **7** Admin = **AAAA**

Login Page:
Operators can view all controller pages and have limited access to normal day-to-day operator functions like Setpoint, deadband, calibration, alarms and manual Prime/STOP. No access to most System pages.
Configure users have access to all Operator functions and can edit the configuration of most I/O. No access to most System pages.
Admin Administrator has unlimited access to all Operator and Configure functions and all system functions, including the ability to reset passwords of all other users.
Modify Passwords:
If the controller is accessible on the facility 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 detected duplicate password.

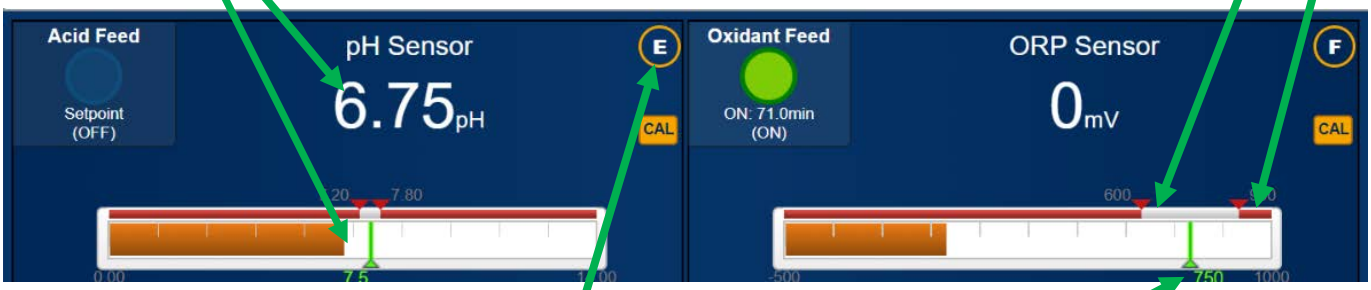
See section 7.9 User Setup to learn how to change passwords.

1.4.2 Home Page Detail

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

Current sensor reading in digital and graphical views Description and value will flash Red if the value is in alarm.

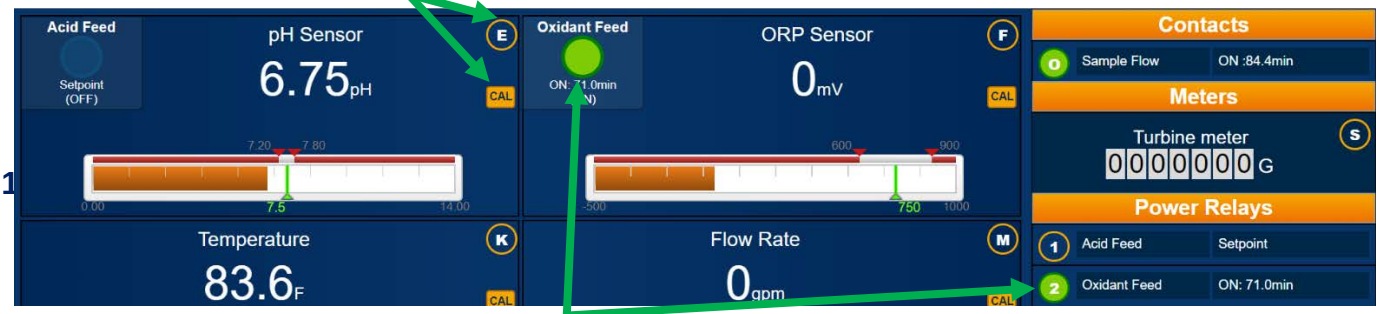
Low and high sensor alarm values are shown as red arrows and bars.



Input ID (letter in a circle) click to access full input menu. Turns red if alarming.

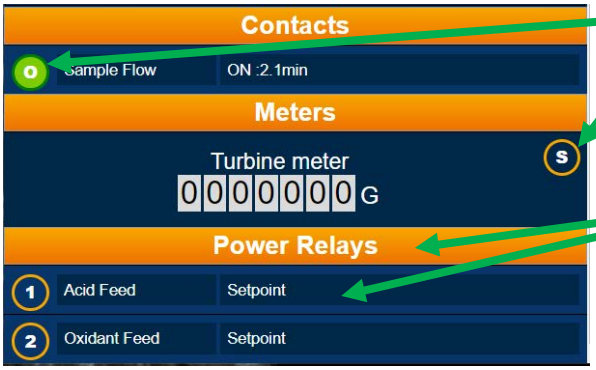
Control Setpoint is shown as a green line and a value

To calibrate the sensor, press the CAL button or press the ID icon and choose the Calibration menu.



Sensors linked to relay control outputs have a duplicate graphic status icon. Like the smaller ID icon the status icon will be green when ON, Dark when OFF and RED when in alarm. If there are more relays controlled by a single sensor, there will be a separate tile for each relay. This is common for acid and CO^2 feed in the same pool.

1.4.2.2 Digital I/O Display



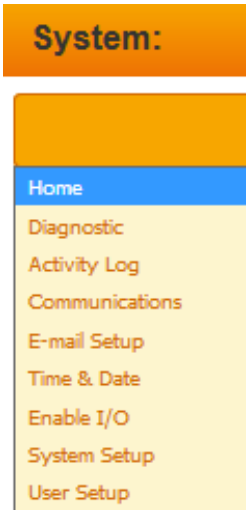
A maximum of 6 digital inputs, O through T.
Can be any combination of dry (unpowered) contacts or pulse flowmeter (Turbine Meter) signals.

1.4.3 Home Page System Icons

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

The User Manuals icon  gives you access to the two DCM3 manuals; I&O (Install and Operation), and Browser (this manual). The I&O manual explains the wiring, specifications and keypad usage. The Browser manual shows you how to connect to and program a DCM3 controller using a PC, Tablet computer or Smartphone.

The System Settings icon  has the following menus:
These menus are explained in sections **7 System Settings.**



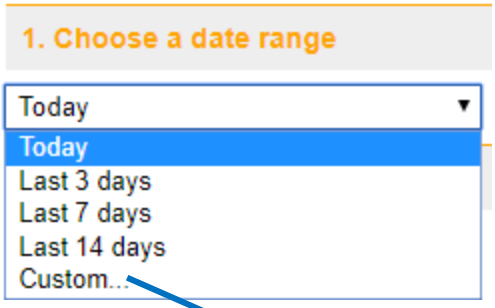
The Report icon  opens the report page for graphical trending of recent controller history. See section **1.4.4 Create a Report**

Finally, the alarm icor  or  displays current alarms. Examine and clear alarms directly by clicking this icon.

1.4.4 Create a Graphical Report 1 of 3

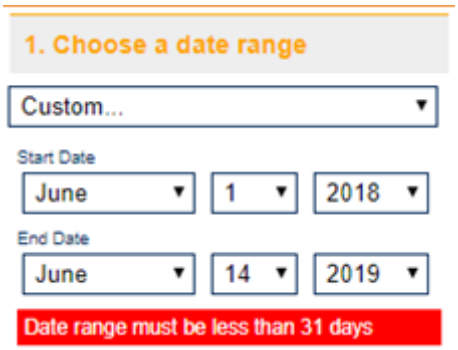
To create a graphical report, select the report icon from the upper left of the main screen.

Follow the three steps as shown.

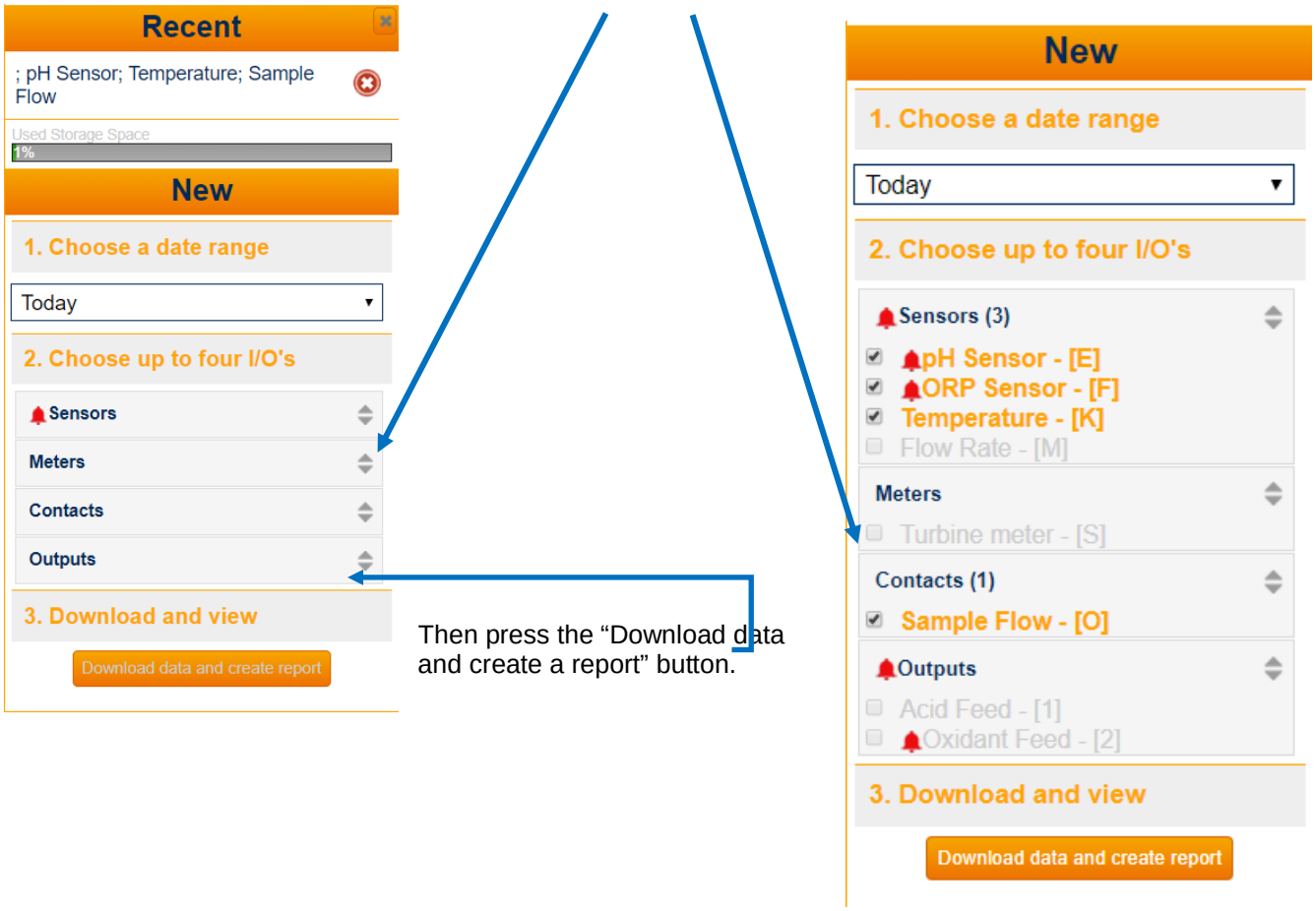


1. Choose a date range.

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



Next 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.



Once the graph is open, the new icons have the following properties:

The Icons:

? Access the controller manuals

Exit from the report menu back to the Home (Live) view

Show/hide the report settings menu

Manage the reports database on the local computer

Show/hide the controller header (maximize screen)

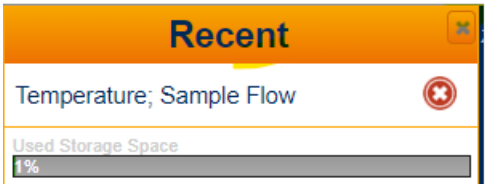
Show/acknowledge current alarms

Note the trend zoom and average tools.

Click on this icon to export as a picture

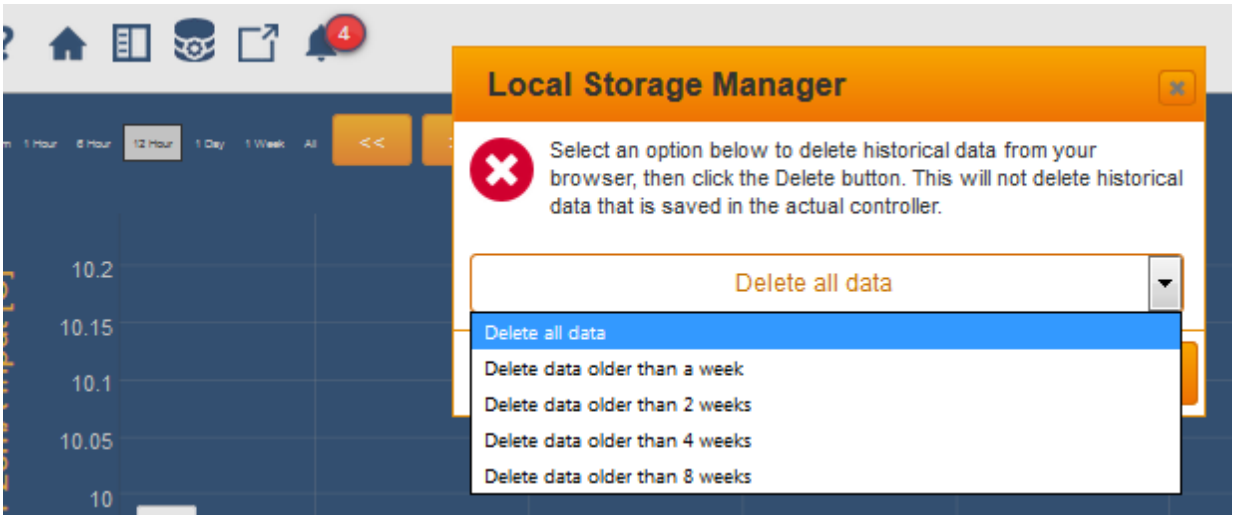
1.4.5 Manage the report database

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.

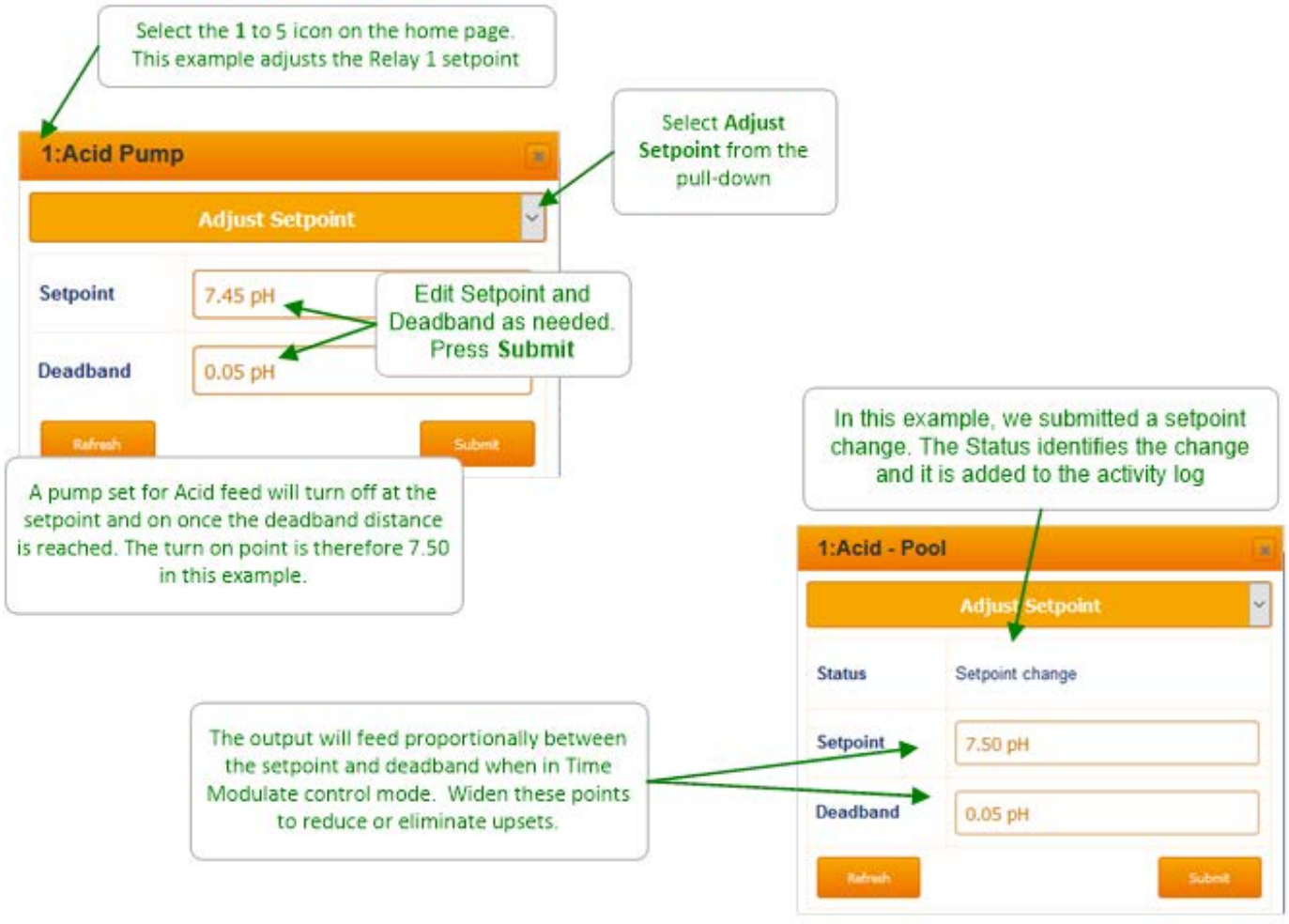


This picture depicts a previous graph configuration that has data in the graphing database. Click on it to create a saved graph, or remove it by selecting the red X.

If you wish to keep the report configuration, but want to reduce the data on your smart device, open the Manage Report Database window by clicking this icon and make your selection, then press Delete. **NOTE:***You are not deleting any datalogged information from the controller, just a copy or copies of previously created report graph(s).*



1.5 View & Adjust Setpoints 1 of 2

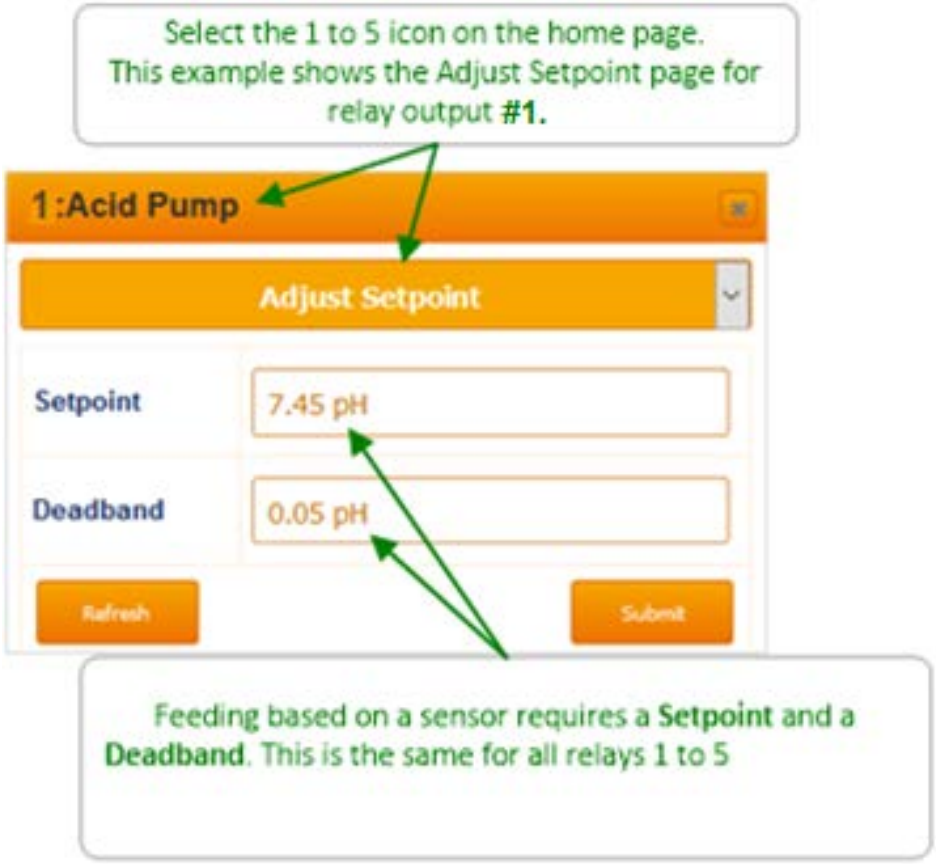


Sidebar:
Relays controlled by sensors turn the Pumps and Feeders ON and OFF.
(Relays are outputs **1** to **5**)

ON-OFF Acid pumps use setpoints 0.05 pH apart (dictated by the deadband) so that the re-circulation delay between feeding acid and measuring its pH does not cause wide pH swings. To tighten pH control, consider using Special Control programs like Timed Cycling or Time Modulation to temper the controller response and reduce overshoot.

View & Adjust Setpoints 2 of 2

The Setpoint page varies with the configuration and type of control output.



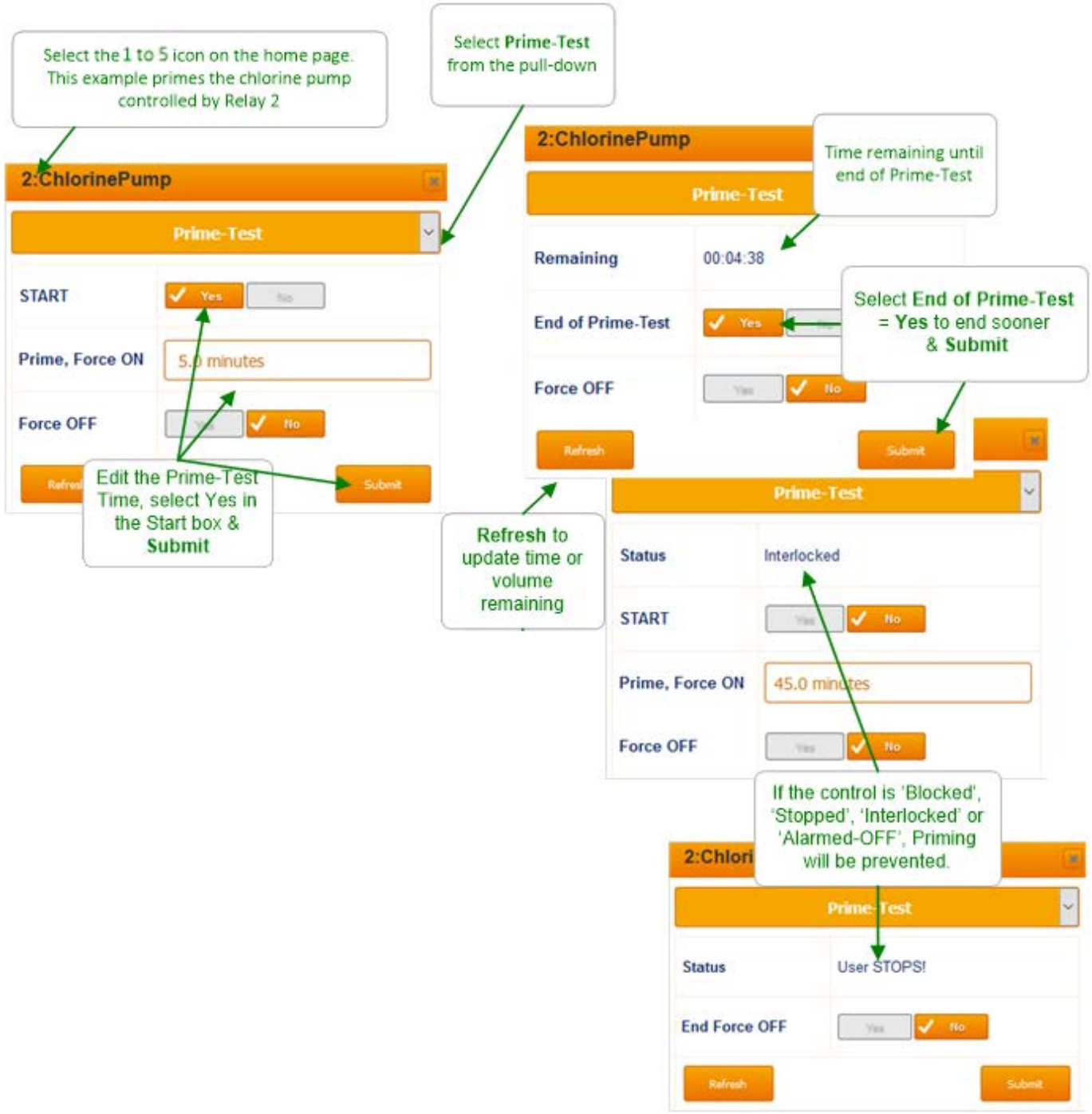
Sidebar:
Controls may be configured to prevent one chemical feeding while another feeds into a common injection header. (See 'Blocking')

Pumps, feeders, solenoid or valve controls will be turned OFF when the flowswitch shows no flow through the sensor header. (See Interlocks)

Pay attention to the number 1 to 5 that precedes the pump, valve or solenoid name.
It's the physical location of the wiring that connects to the pump, valve or solenoid feeder. This is how the program relates to physical devices. These numbers are shown on the PC board where the wiring is connected.

You may modify the name of the pump, feeder, valve or solenoid, but you'll need to know which output is controlling the process. You can then check that associated controller hood indicating light is ON when the pump, valve or feeder is ON.

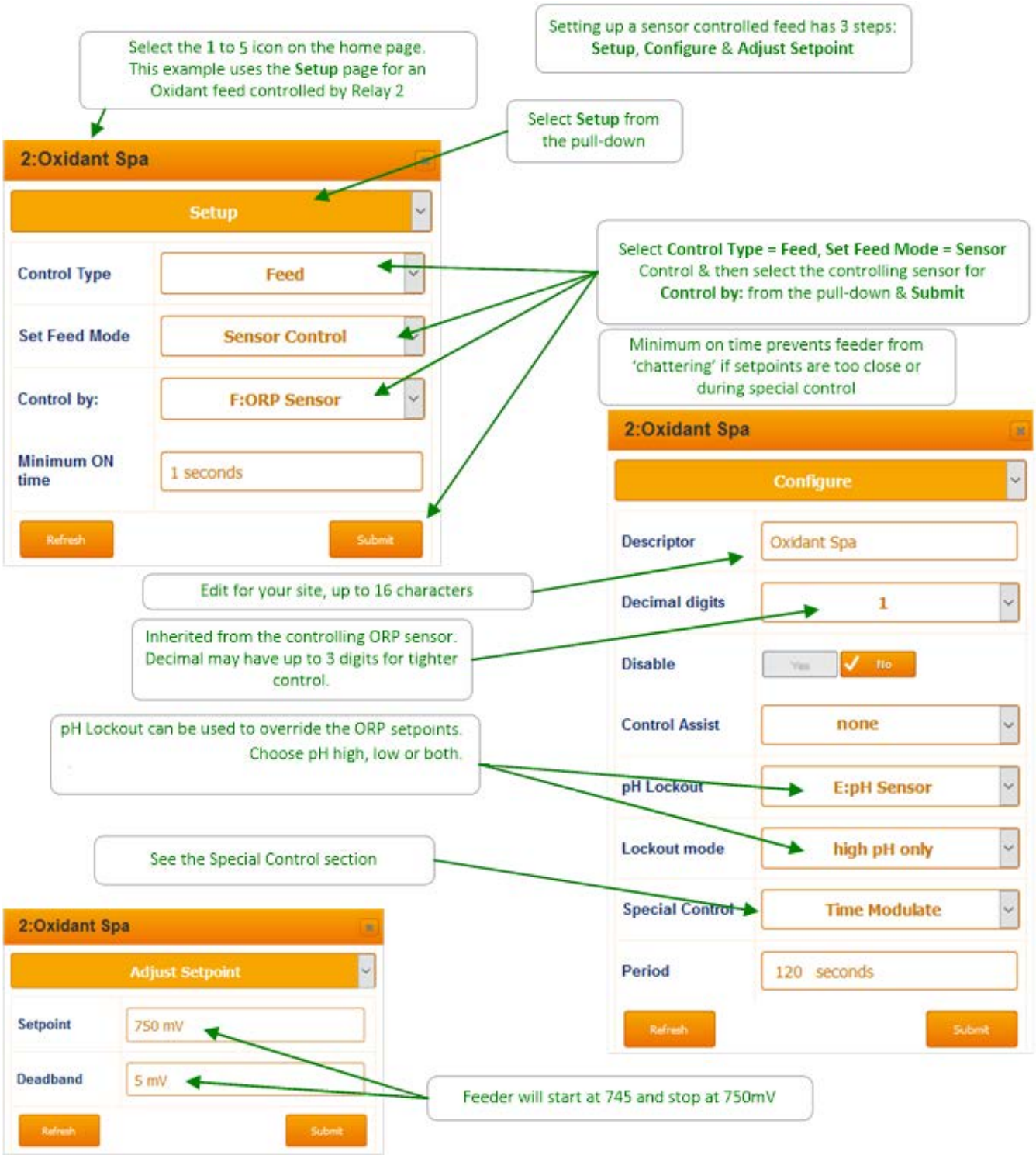
1.6 Priming-Testing Pumps, Feeders & Solenoids



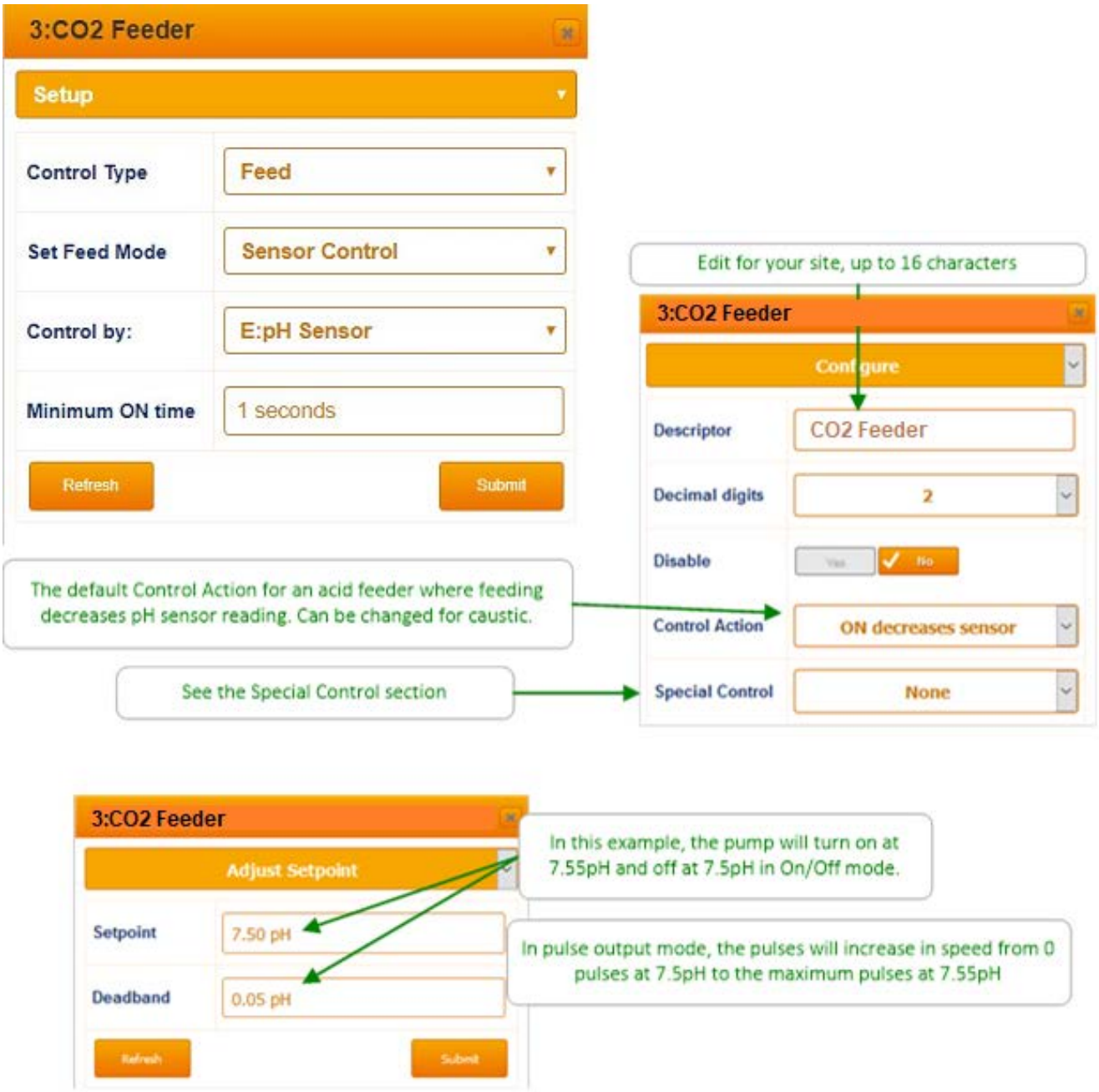
Sidebar:
Prime/Test may also be used to safely slug feed after chemical has run empty, using the prime timer. Active Minutes per Actuation alarms (run time limit) may stop priming if not cleared. See also Blocks and Interlocks.

2 Chemical Feed Controls: Oxidant, Acid, CO_2

2.1 Sensor Controlled Feeds 1 of 2



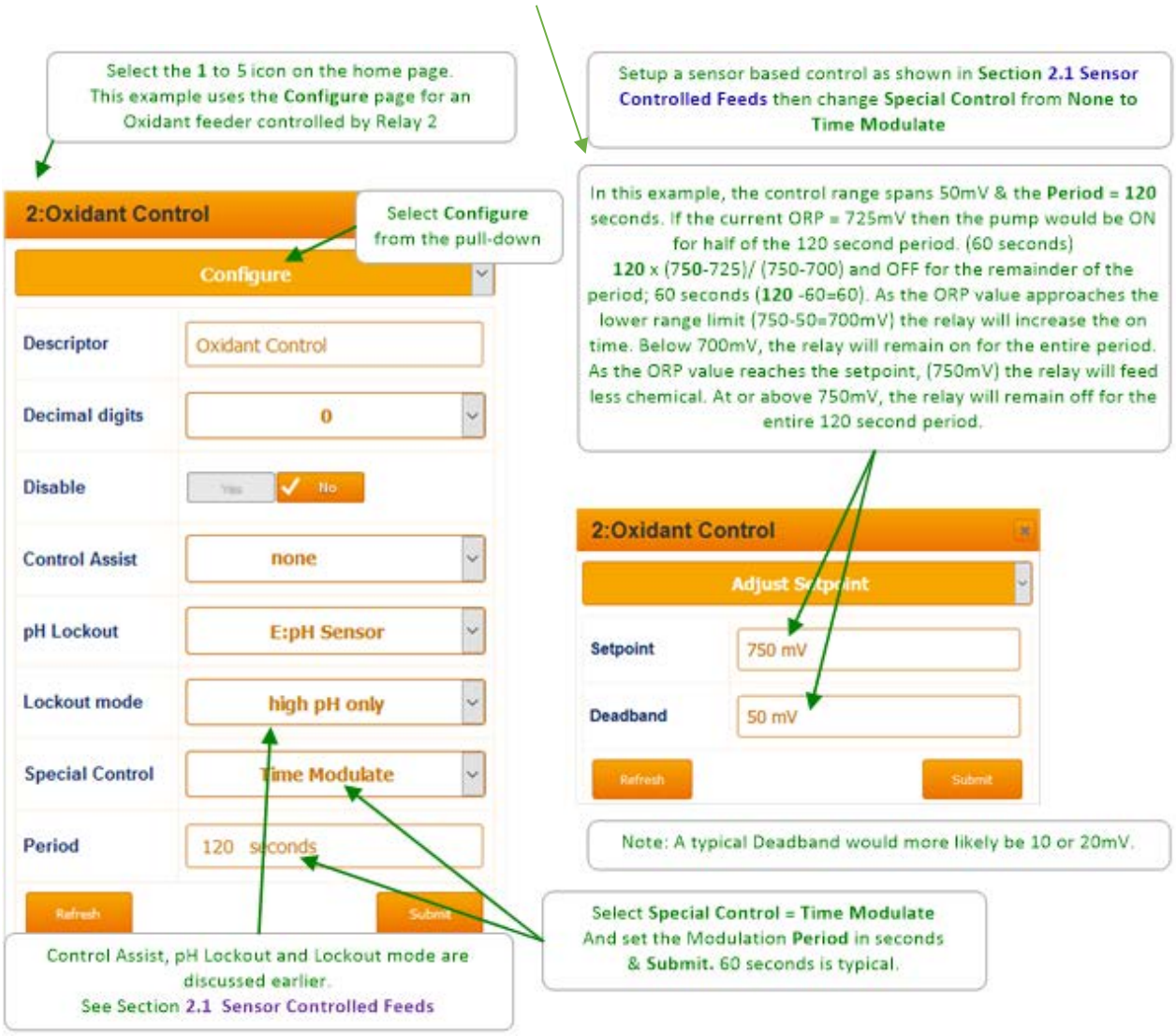
Sensor Controlled Feeds 2 of 2



2.2 Time Modulation

Time Modulation allows an ON/OFF pump to operate proportionally, similar to a frequency or 4-20mA controlled pump.

Special Control = Time Modulate is selectable on All Relays 1-5.
Time Modulate proportions the pump on-time with respect to the setpoint and the deadband. At the beginning of each period, typically 60 seconds, the controller compares the present sensor value within the deadband range and determines how long the relay will be on during that period. See example below.

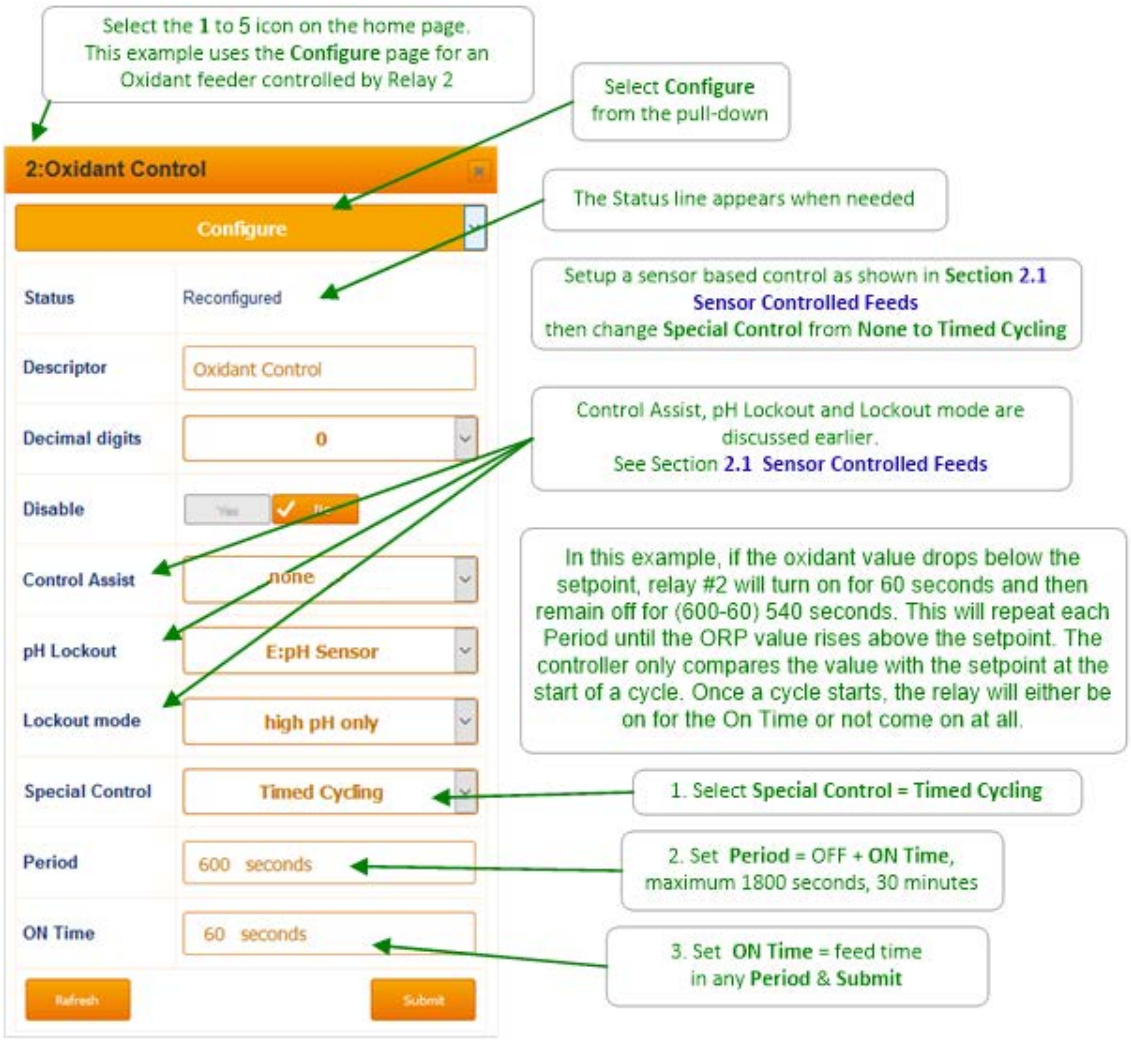


Sidebar:
Increase the deadband to dampen oscillations. A smaller deadband will control more like On/Off control.

2.3 Timed Cycling

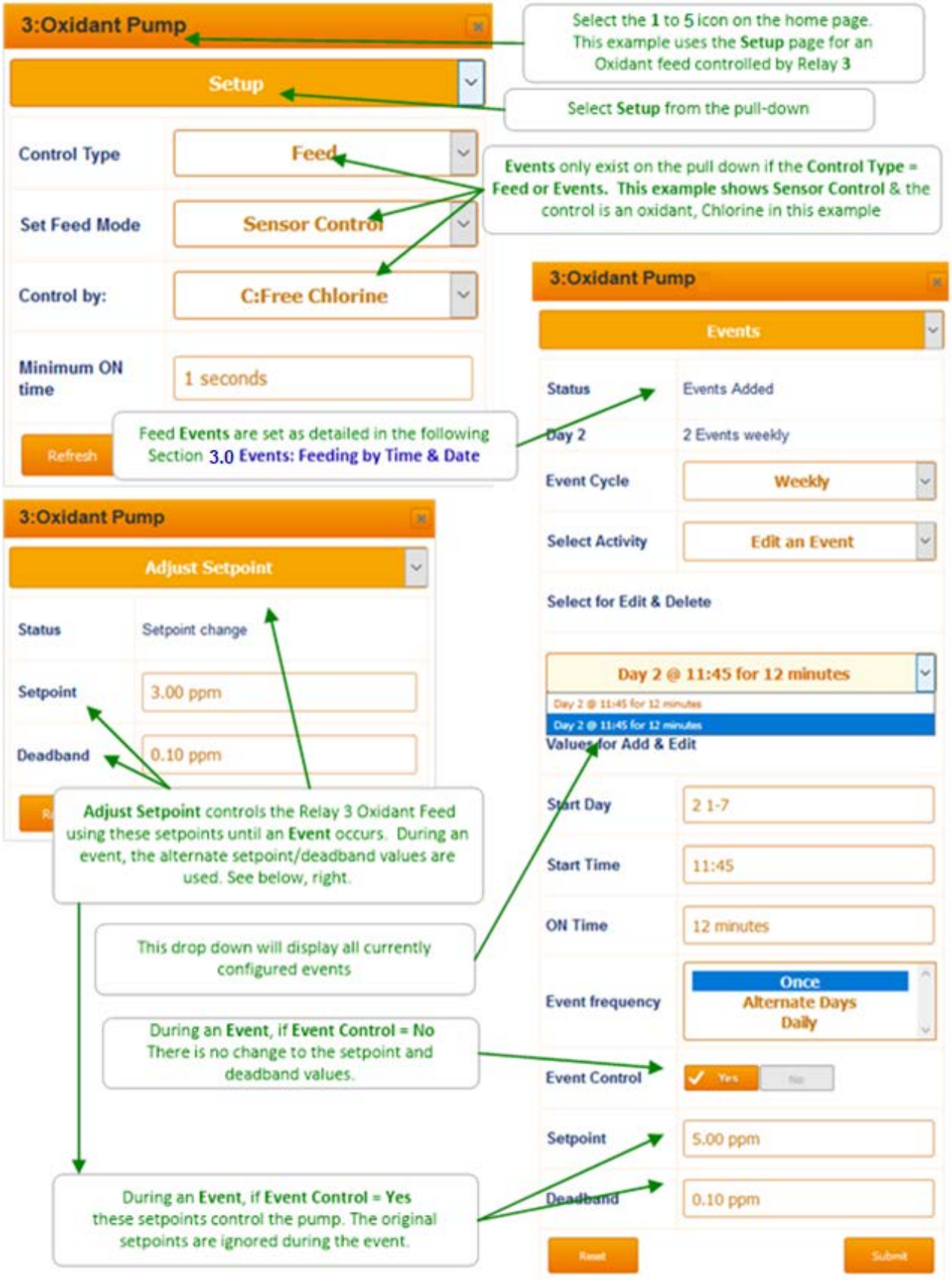
Timed Cycling allows time for the controlling sensor to measure the effect of chemical before allowing the feed of more chemical. **Timed Cycling** is used where a chemical is fed occasionally into a system with a large volume or a long lag time between chemical feed and sensor reaction to that chemical.
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.



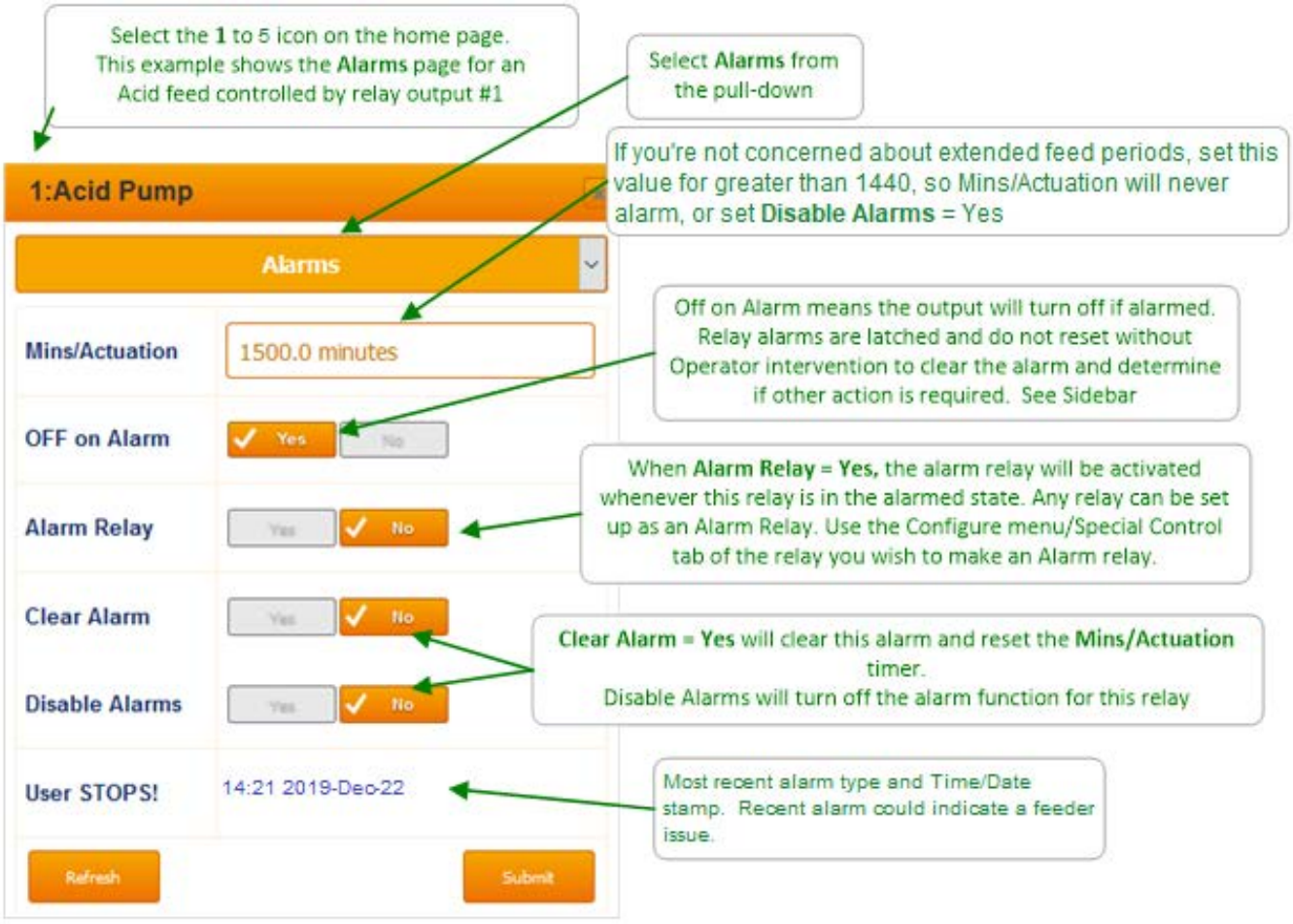
Sidebar:
Often there is a long time-delay between adding a chemical and measuring its effect at a sensor, which causes setpoint overshoot and poor control. Timed Cycling and Time Modulation are great tools for improving chemistry control.

2.4 Control During Events



2.5 Limiting Feed & Alarms

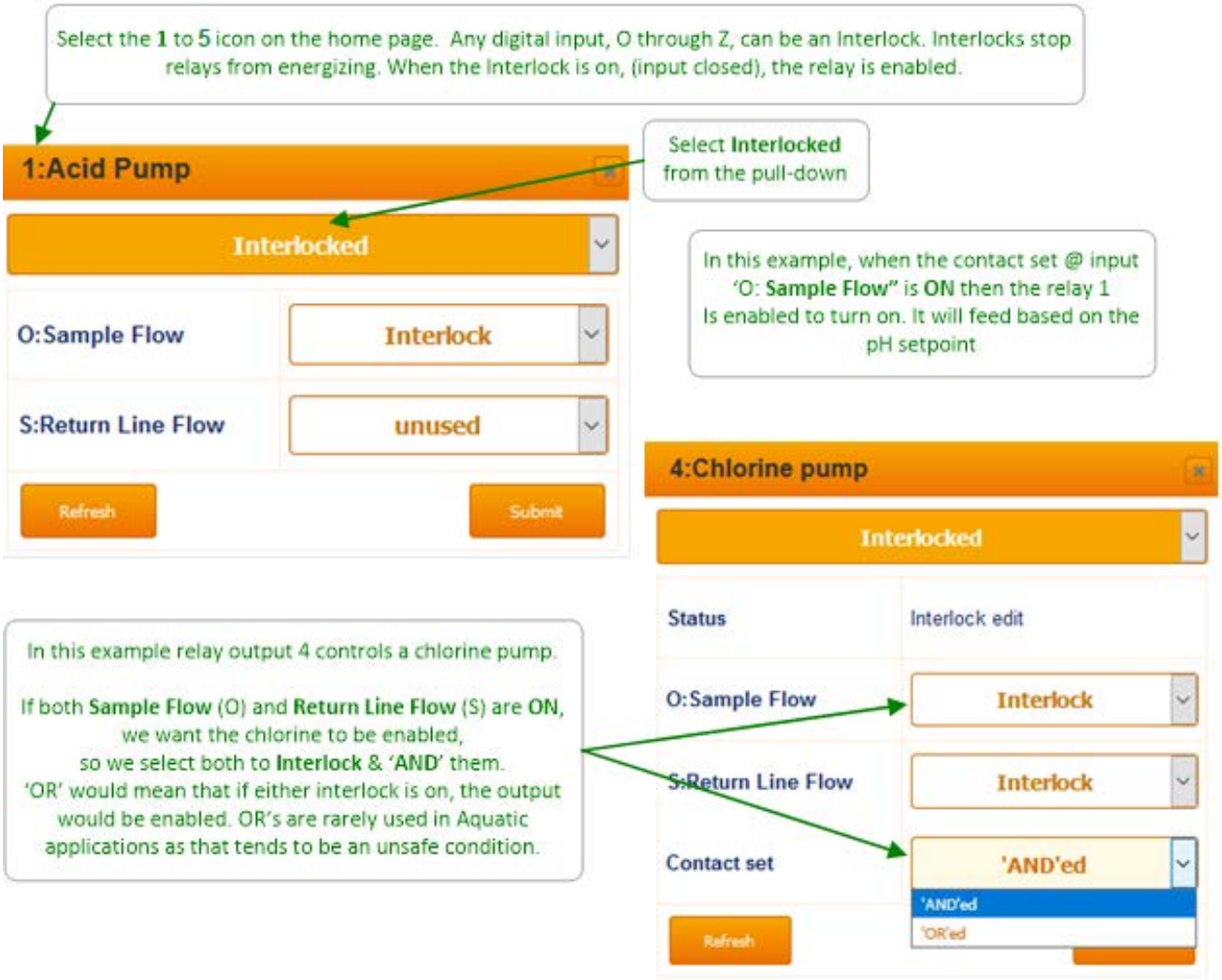
Minutes per Actuation alarms (Run Time Limits) are used detect and alert operators of problems with chemical feeders.



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

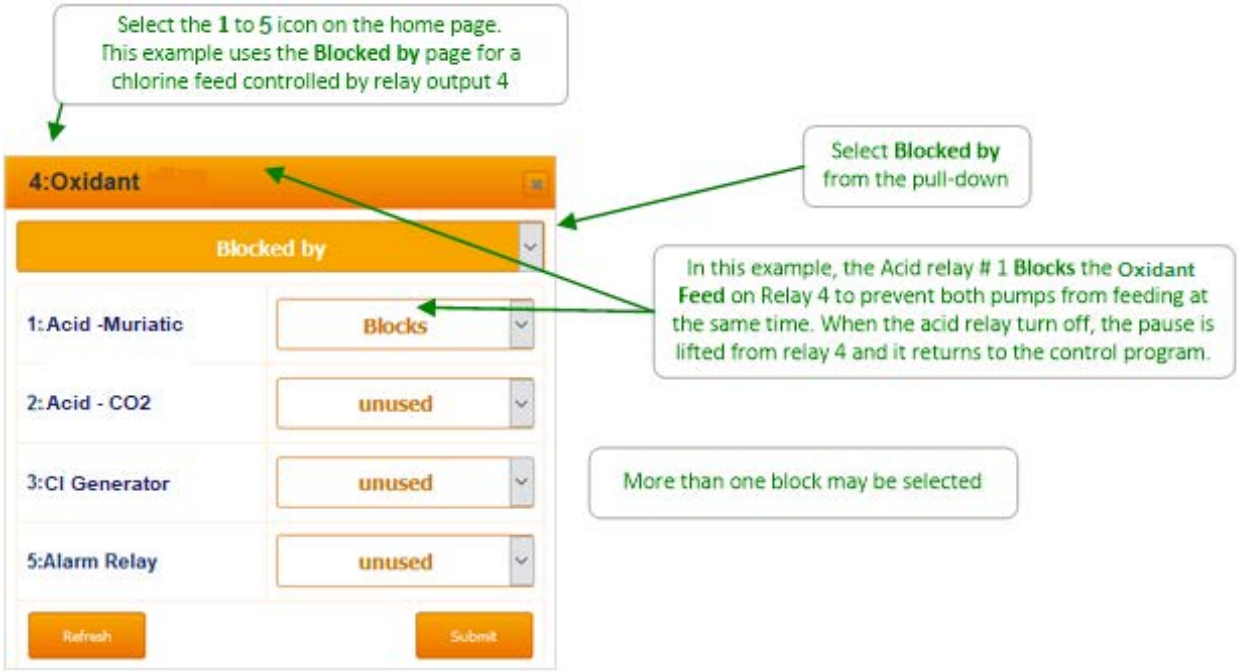
2.6 Interlocks - No Feed on No Flow

An Interlock is a dry contact digital input to the controller (O through T) that can be used to indicate the status of other equipment. This status can then be used to enable or inhibit output relays.



2.7 Blocking-Delaying a Feed

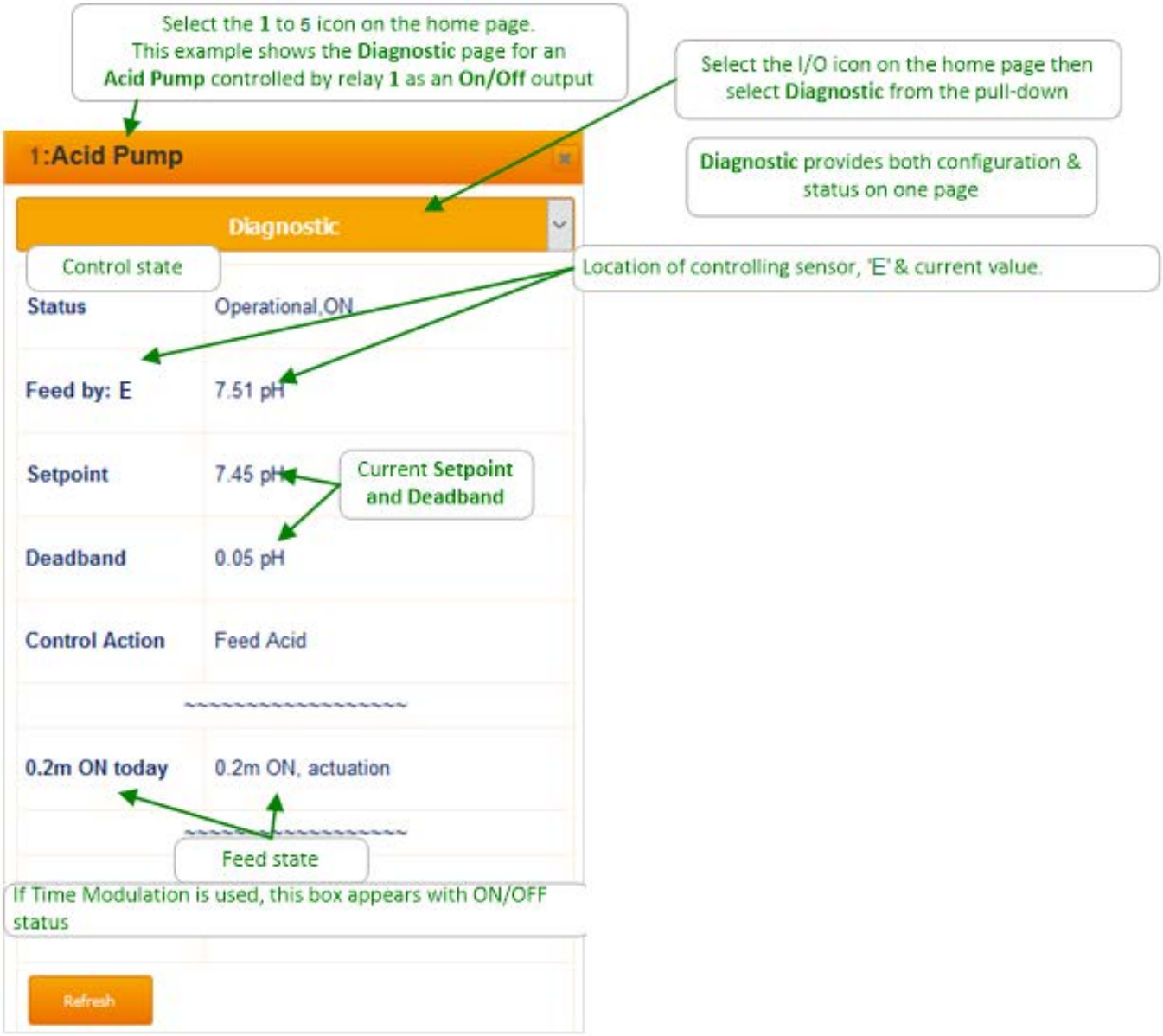
Interlocks are inputs that can pause outputs. Blocks are outputs that can pause other outputs.



Sidebar:

Note: A poorly conceived block may prevent a control from maintaining setpoint. Blocks are rare in aquatic applications but can be useful to help prevent pH runaway in low alkalinity situations.

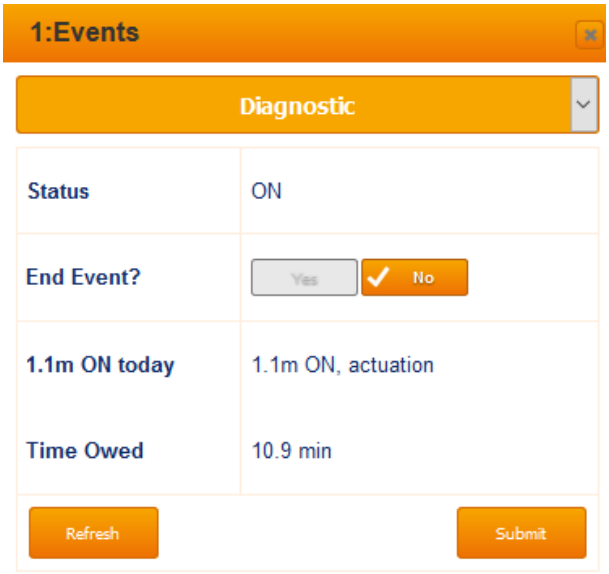
2.8 Feed Diagnostics 1 of 2



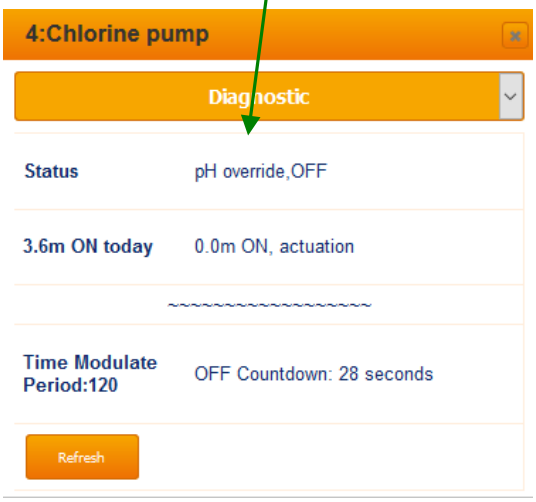
Feed Diagnostics 2 of 2

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

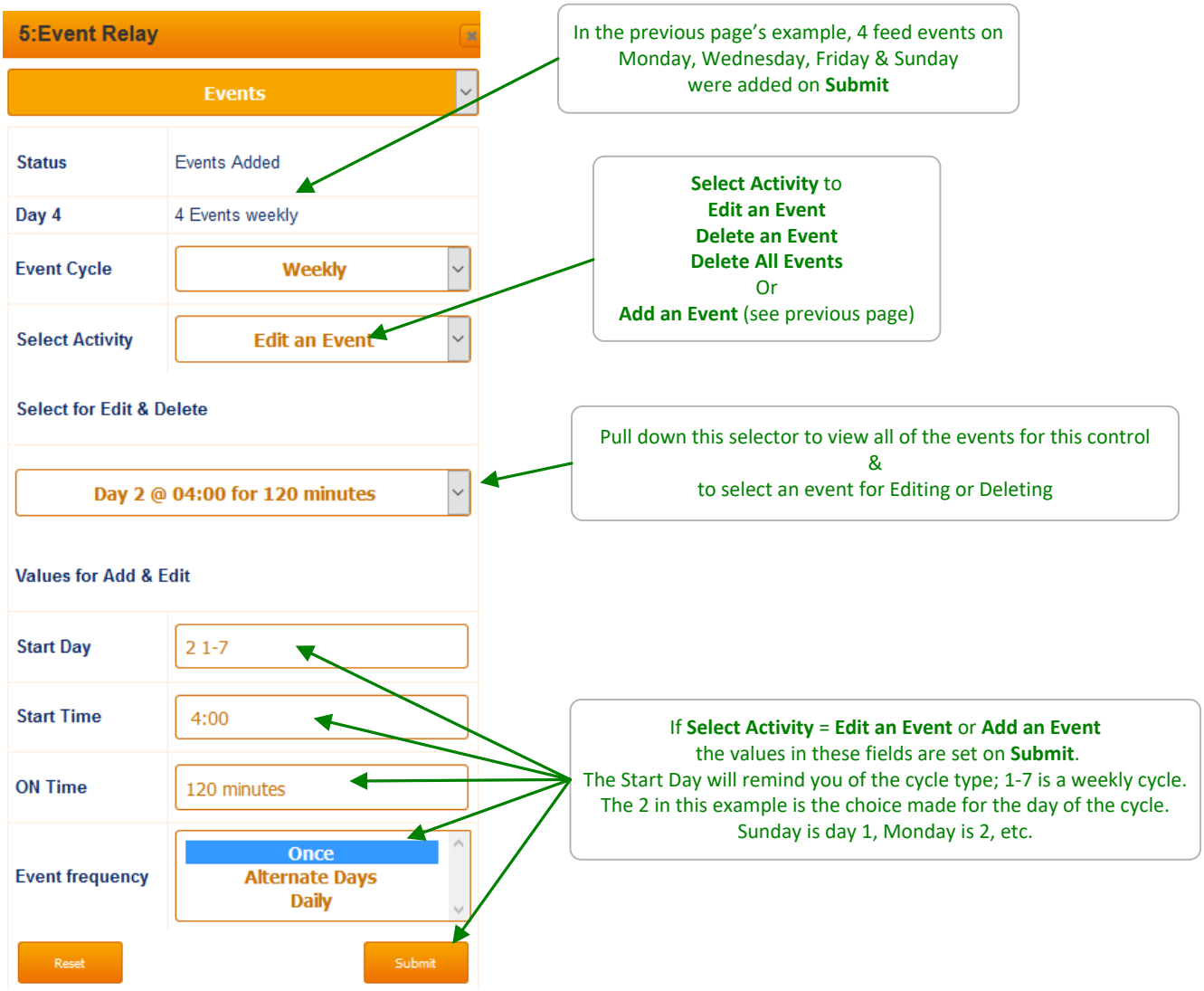


3 Events: Feeding by Time & Date

3.1 Setting & Viewing Events 1 of 2

Sidebar:
Relay 1-5 have timed events. An event (alternate setpoint, pump or enable contact**)** starts at a specified time and runs for a selected number of minutes.

Setting & Viewing Events 2 of 2

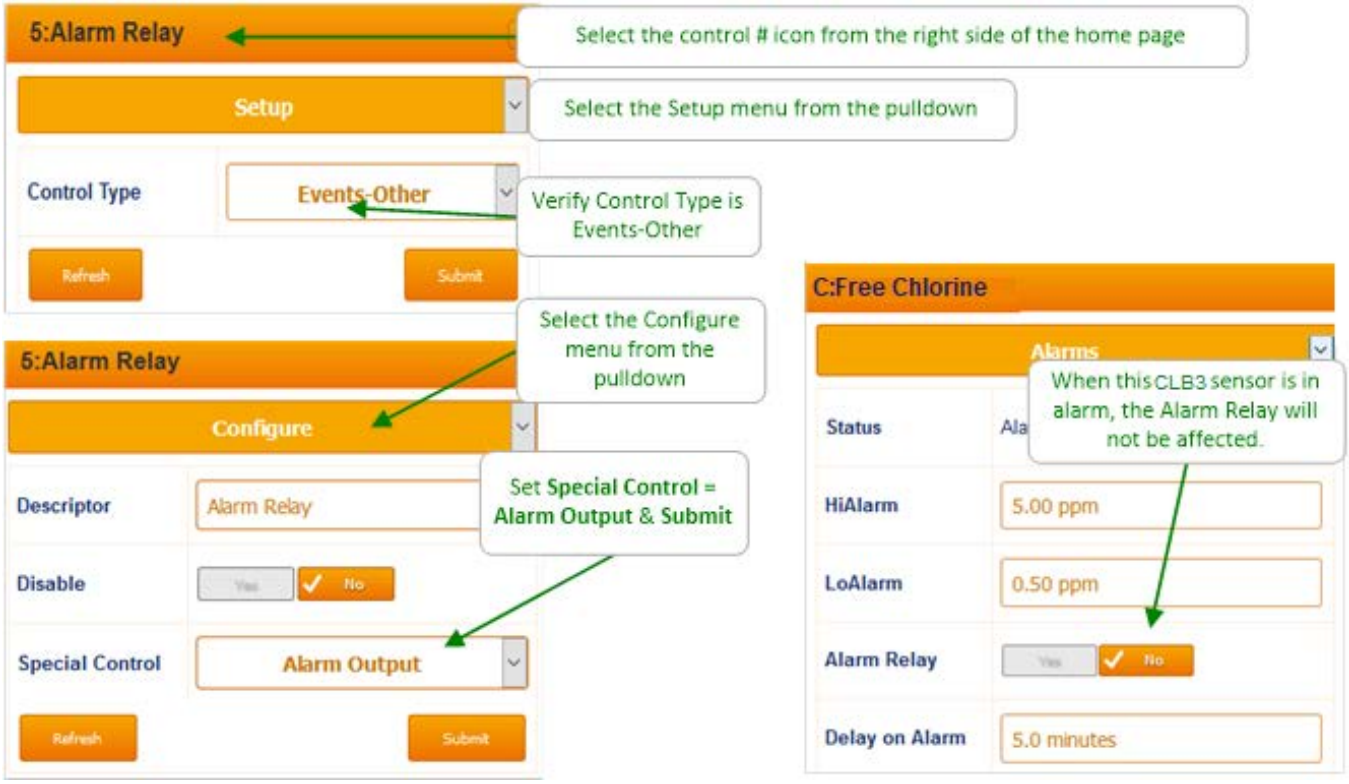


Sidebar:
Limit Alarms, Interlocking & Blocking also are used with Events.
They are set identically to those for **Chemical Feed Controls**.
Refer to Sections 2.6 to 2.7 for setup & state pages.

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

3.2 Alarm Relay

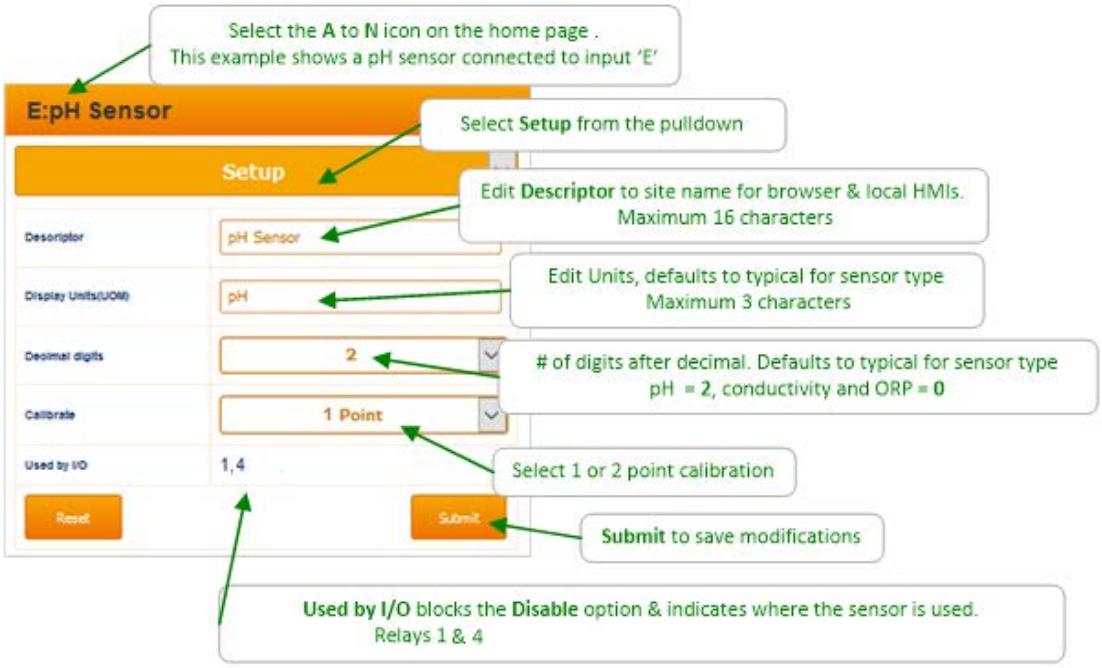
Any of the 5 relays can be configured as an alarm output relay. Once a relay is designated as the alarm relay, all other I/O points have the choice to activate the alarm relay when they themselves are in alarm. You can choose to have each input activate the alarm relay or not. Any System alarm will also activate the alarm relay.



Sidebar:
Use an alarm relay to turn on an Alarm Light, Klaxon horn or something similar. Use relays 3 – 5 to send an unpowered contact closure alarm signal to a building management system.

4 Sensors: Amperometric, pH, ORP, Conductivity

4.1 Sensor Setup 1 of 2

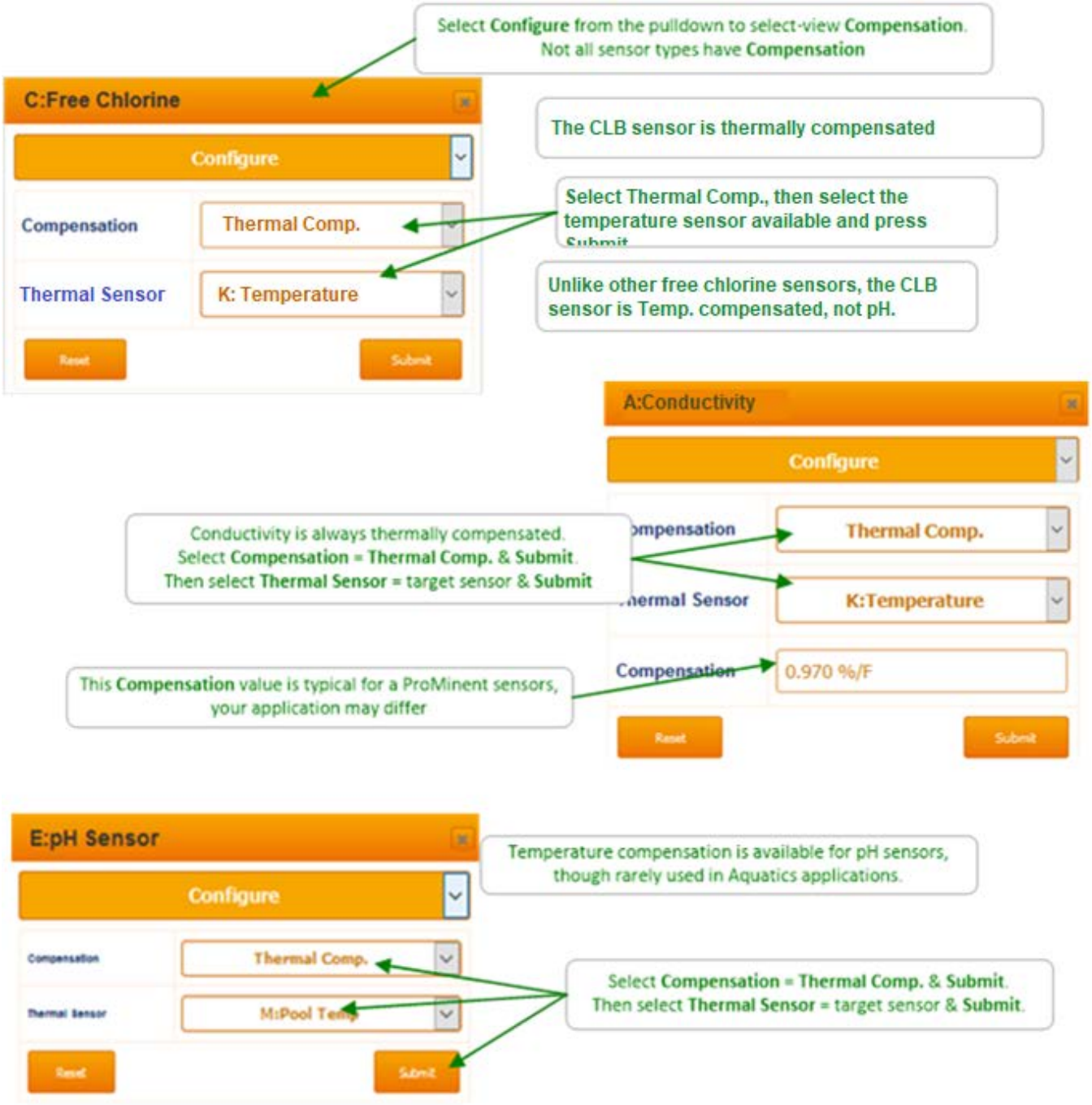


Sidebar:
Disabled sensors do not appear on either the local or browser HMIs or any pull-down option.
Sensors cannot be disabled while in use for control, interlock or compensation.
Disabled sensors can be re-enabled on the **System** / **Enable I/O** page of the Home screen.

Sensor Setup 2 of 2

Sidebar:
The **Sensor Type** is preset by the dedicated CLB sensor driver card installed in the controller.

4.2 Sensor Compensation

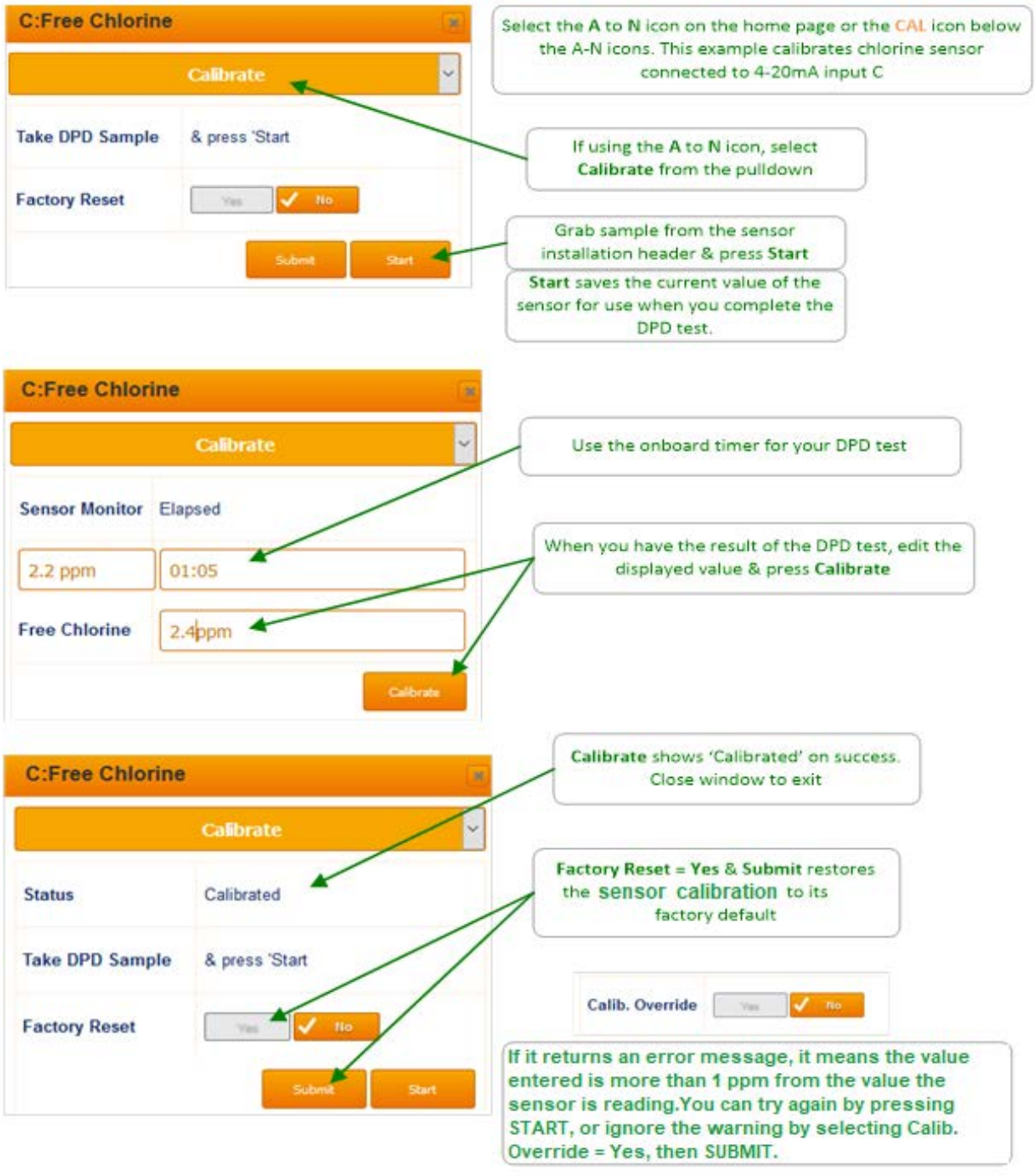


Sidebar:
If you are re-purposing a controller or removing additional sensors & controls then you may be changing-modifying the default compensation.

4.3 Sensor Calibration

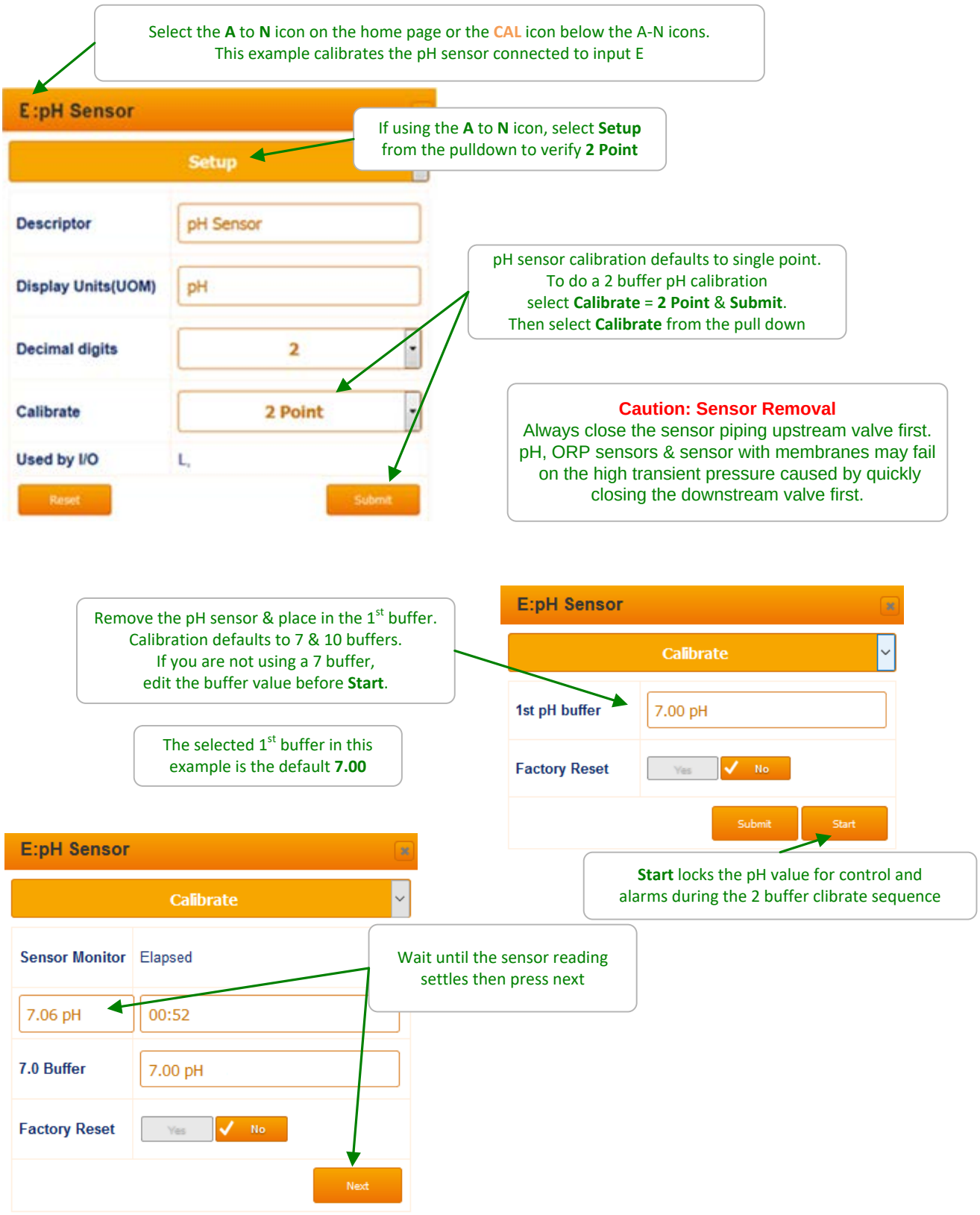
4.3.1 DPD: Oxidant Sensors

Single point calibration

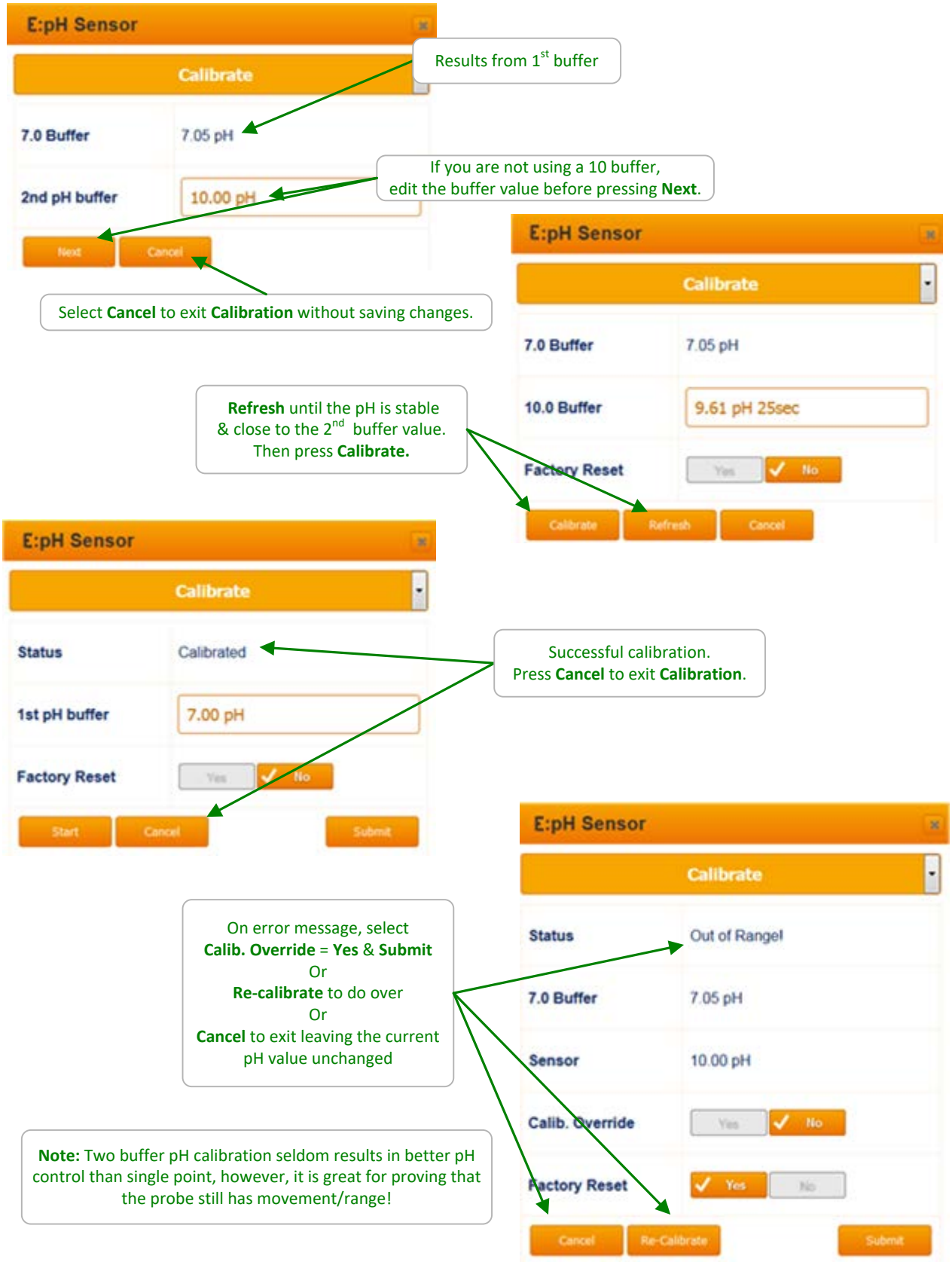


Sidebar:
Amperometric Sensors: The DPD calibration routine applies to only the CLB3 free chlorine sensor

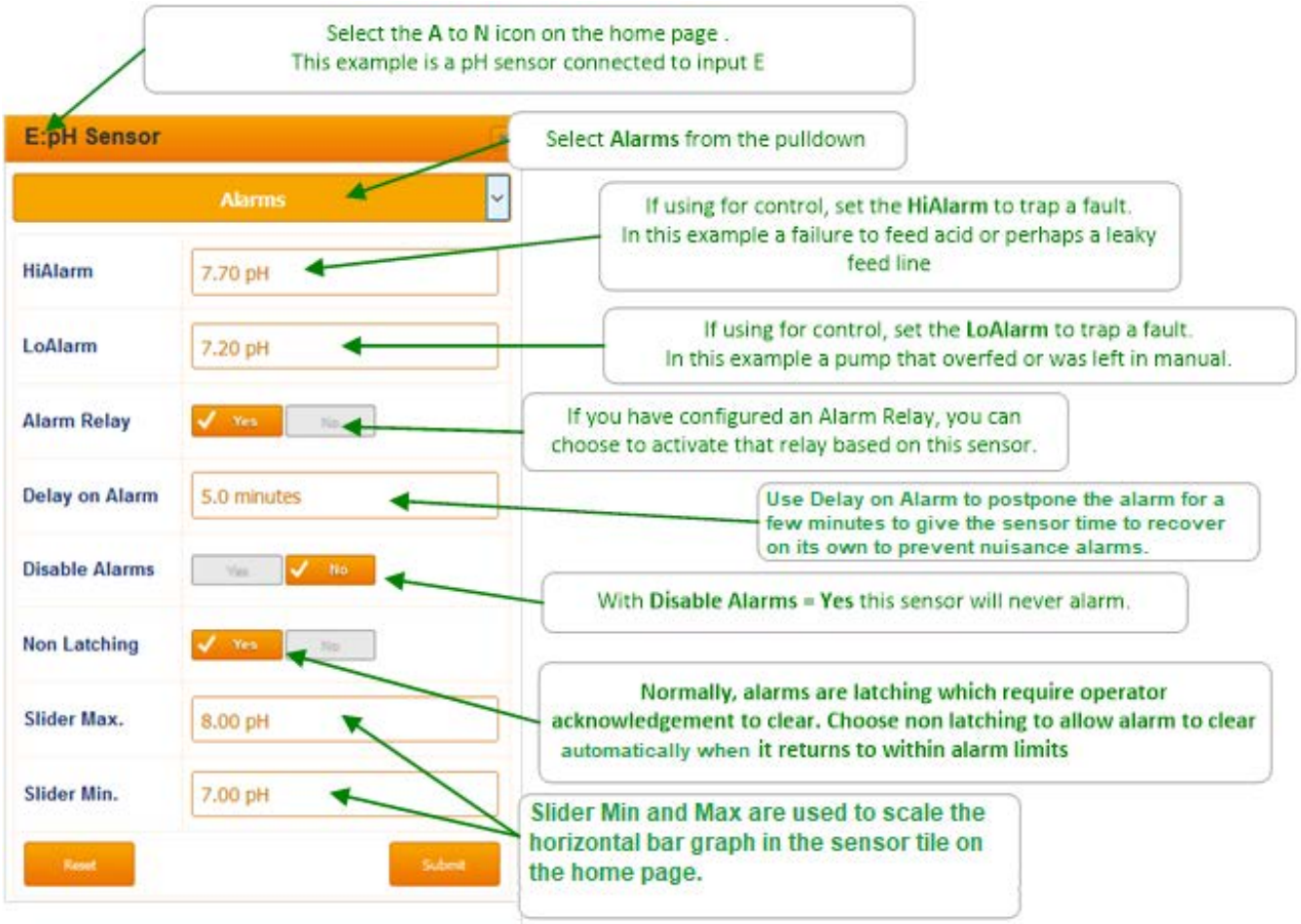
4.3.2 pH Dual Buffer Calibration 1 of 2



pH Dual Buffer Calibration 2 of 2



4.4 Sensor Alarms

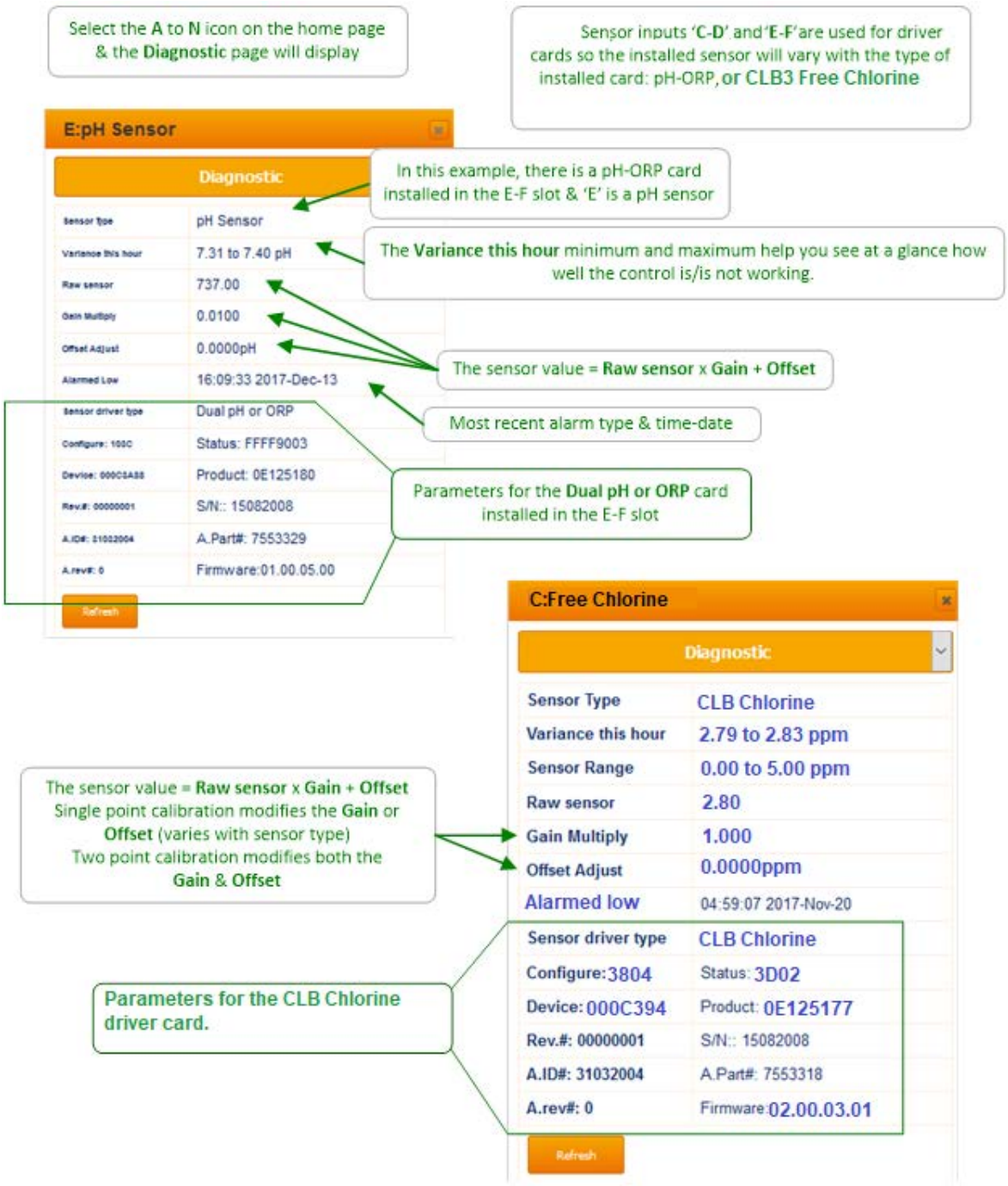


Sidebar:
Every sensor, water meter, flow switch and control output have alarms.
Typically, alarms are used to detect changes in operating conditions, mechanical faults, feed issues and sensor faults

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.

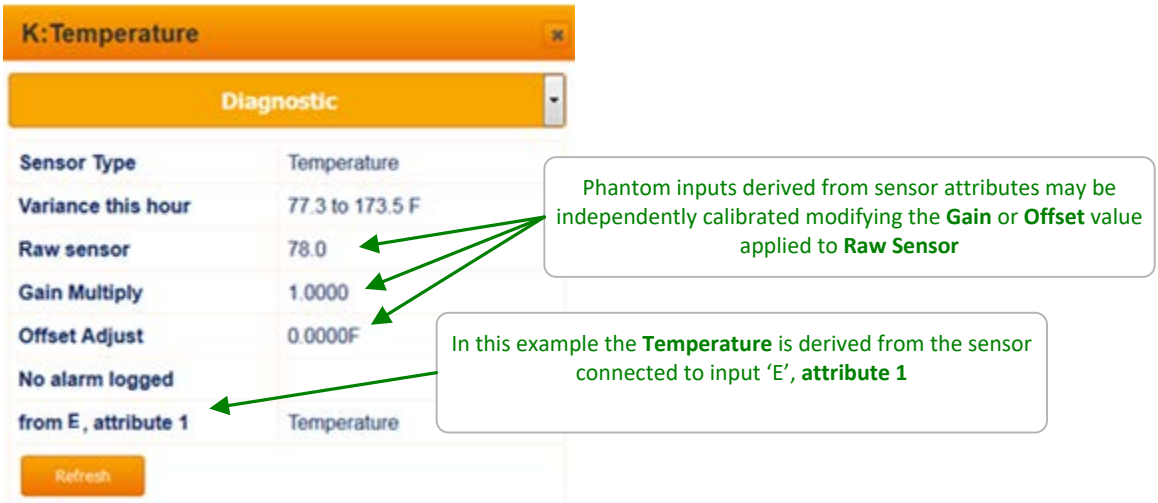
Understandably, alarms are set to reflect site practice, chemistry, plumbing & time of year.
Periodically review each control loop alarm setting including the sensor, interlock, pump or feeder.

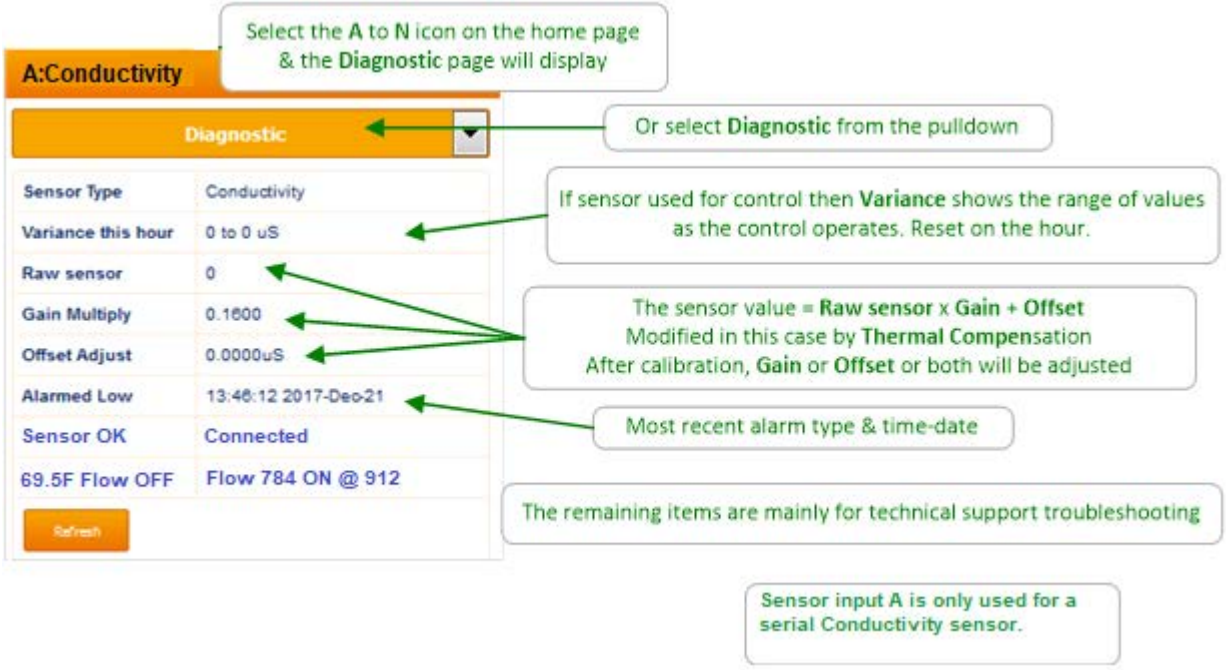
4.5 Sensor Diagnostics 1 of 2



Sidebar:
Diagnostic is a summary of the sensor state that can be very helpful when troubleshooting. Contents vary widely with sensor type.

Sensor Diagnostics 2 of 2



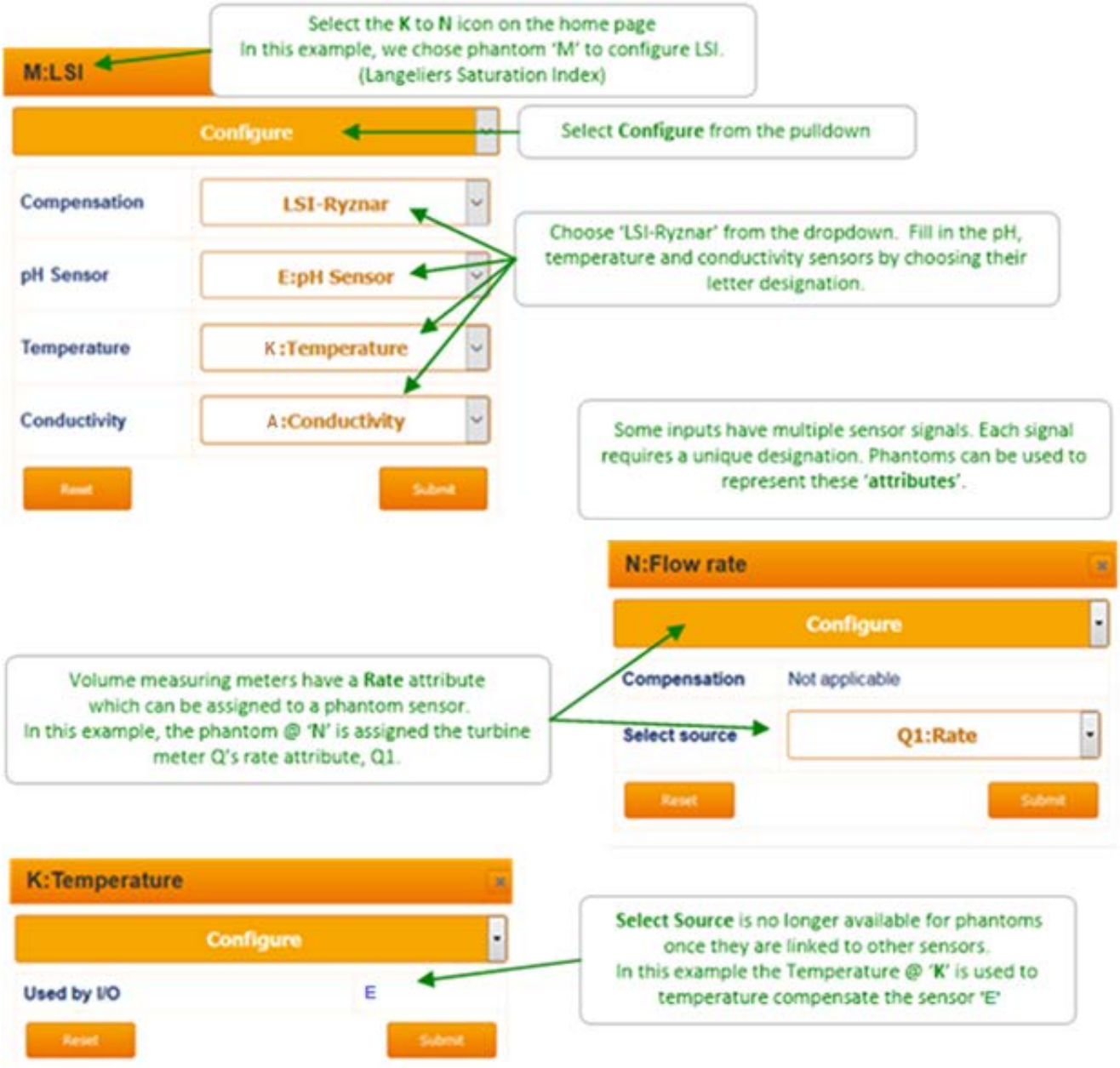


Sidebar:
Diagnostic is a summary of the sensor state that can be very helpful when troubleshooting. Contents vary widely with sensor type.

4.6 Using Sensor Attributes for Phantoms

4.6.1 Langeliers Saturation Index LSI

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

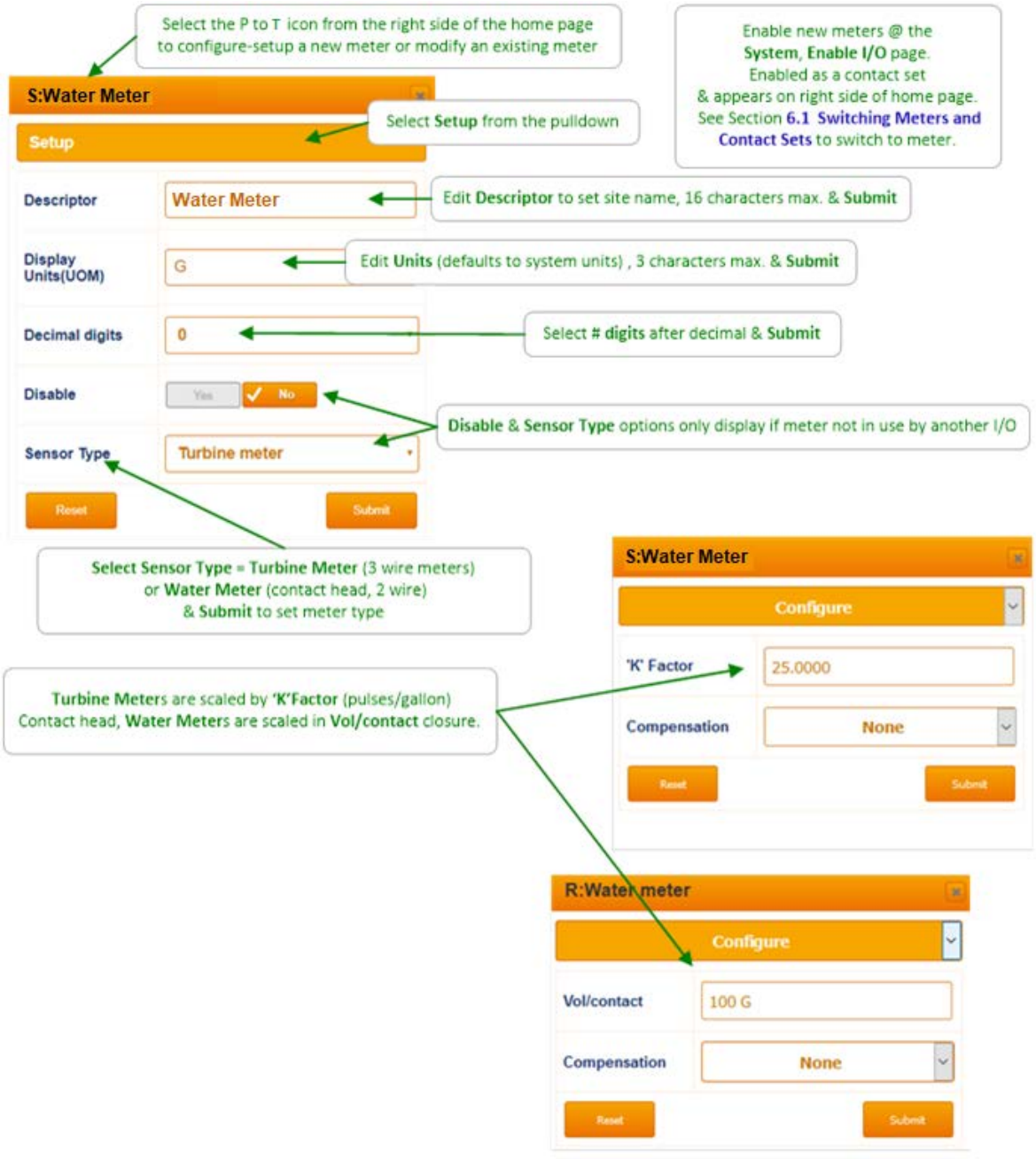


Once enabled, phantoms will automatically appear on the home page. Phantoms can be assigned attributes from sensors, used to accept manual entries, calculate LSI or gallons per minute.

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

5 Water Meters

5.1 Configuring a New Meter



Sidebar:
Contact head water meters, with gallons per pulse scaling, are rarely used in Aquatics applications, unless volumes of water used is the goal (Backwash or Fill water totalizing).

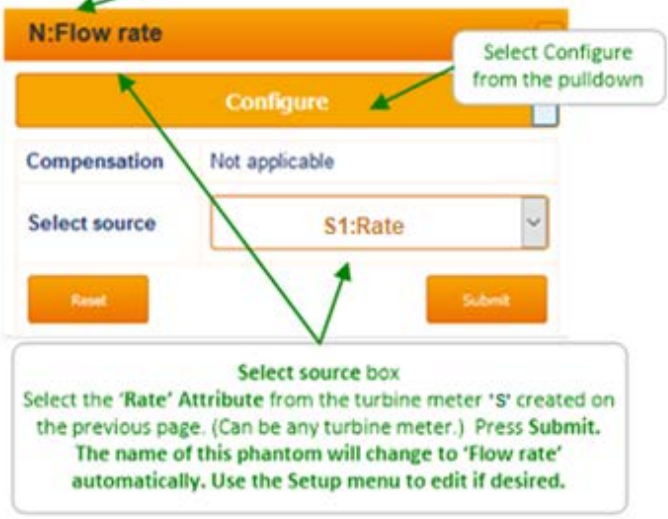
5.2 Flow Rate and Alarm

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 9.3Enable 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 **'S'** 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

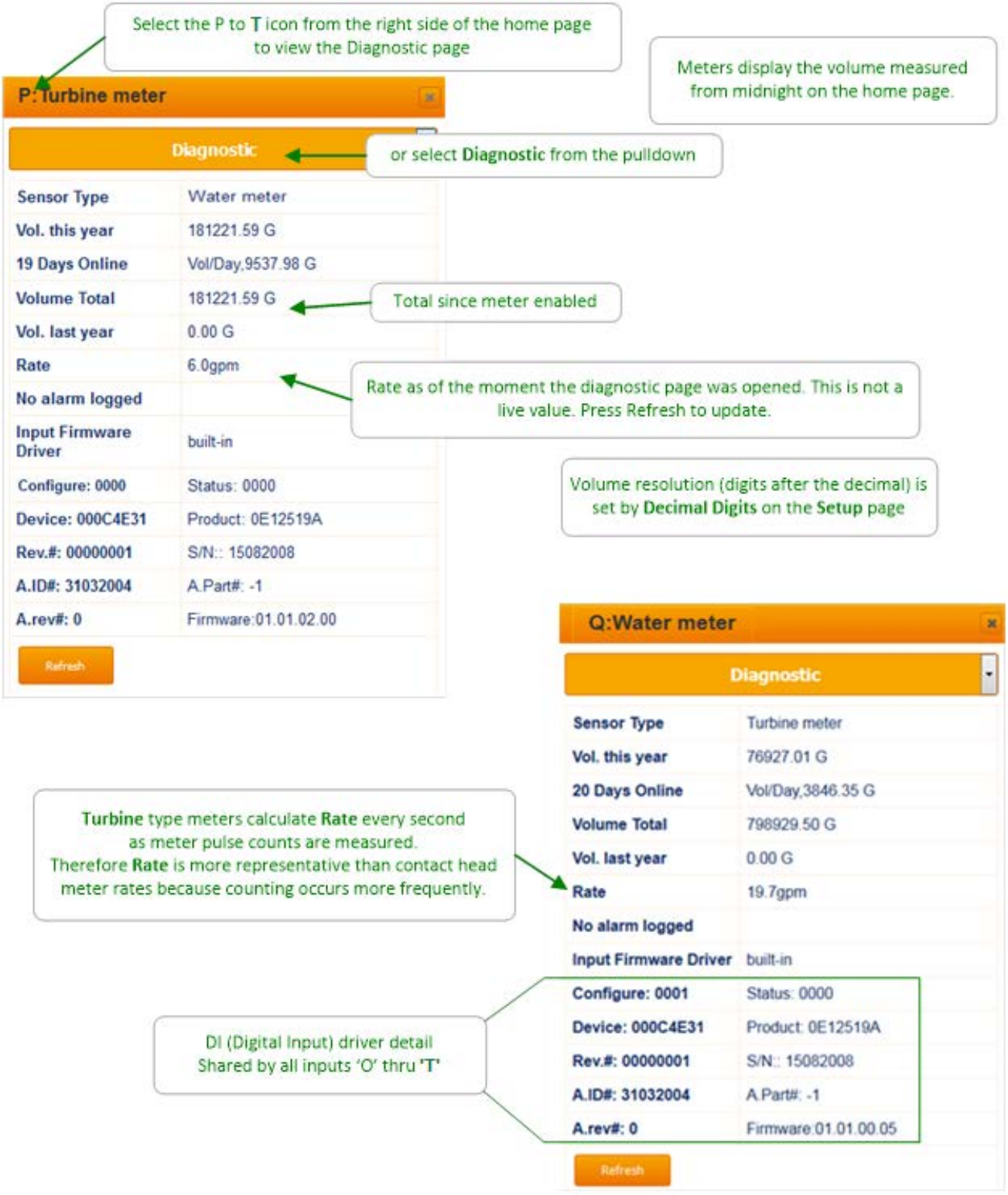
Select the digital Phantom icon from the home page

Name the digital phantom in the Setup menu

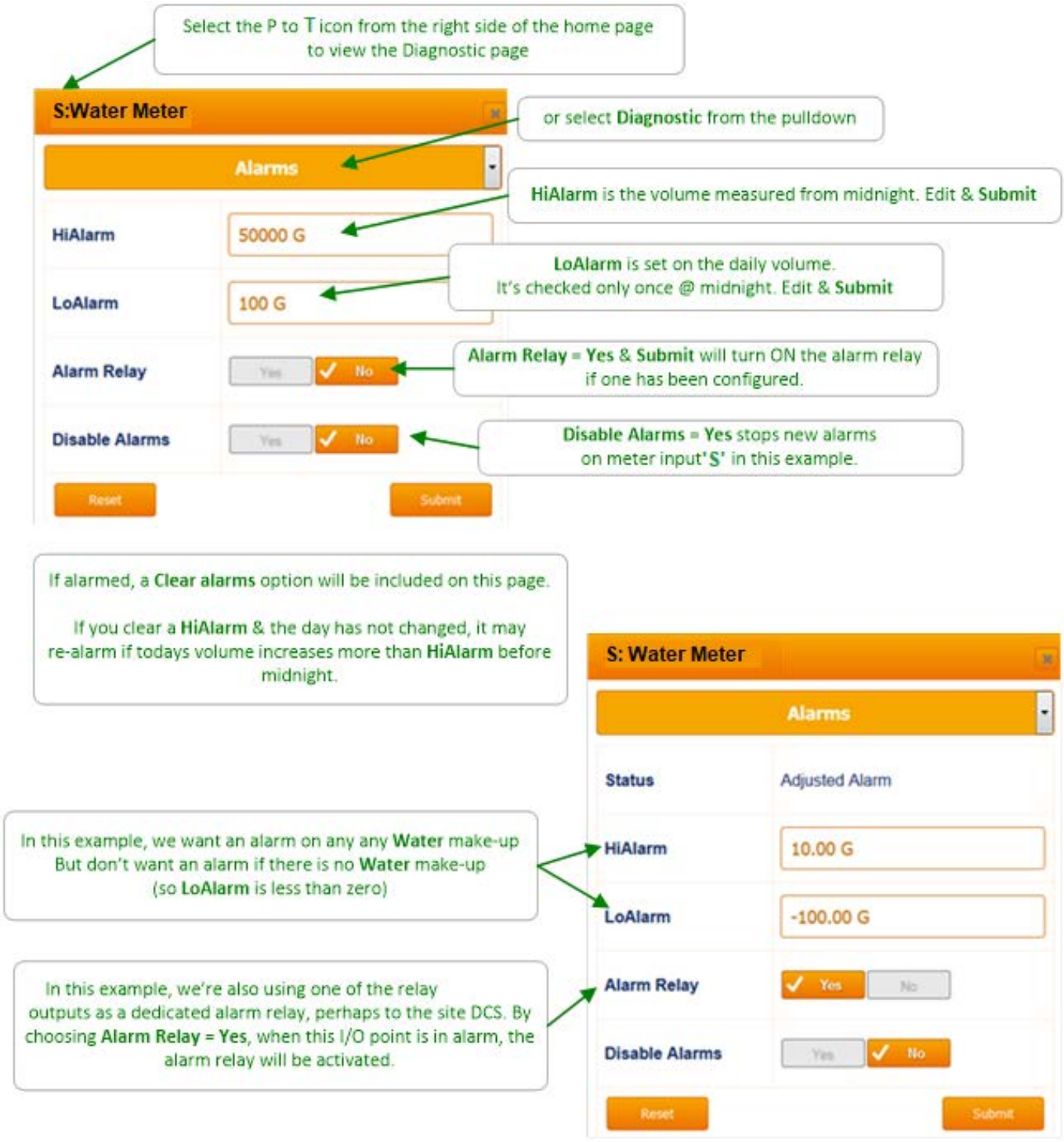
Select Configure from the pulldown

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 Meter Diagnostics



5.4 Meter Alarms



Sidebar:
Flow meter alarms.
In aquatic applications the number of gallons circulated per hour or per day is not very useful information, so alarms on this data are typically disabled. The exception is when facility management is monitoring water usage or discharge rates using this feature. Water usage can alert the facility to possible leaks or other problems. It can also be used to measure and report backwash water usage compared to fill water to document sewage charge waivers on evaporated water.

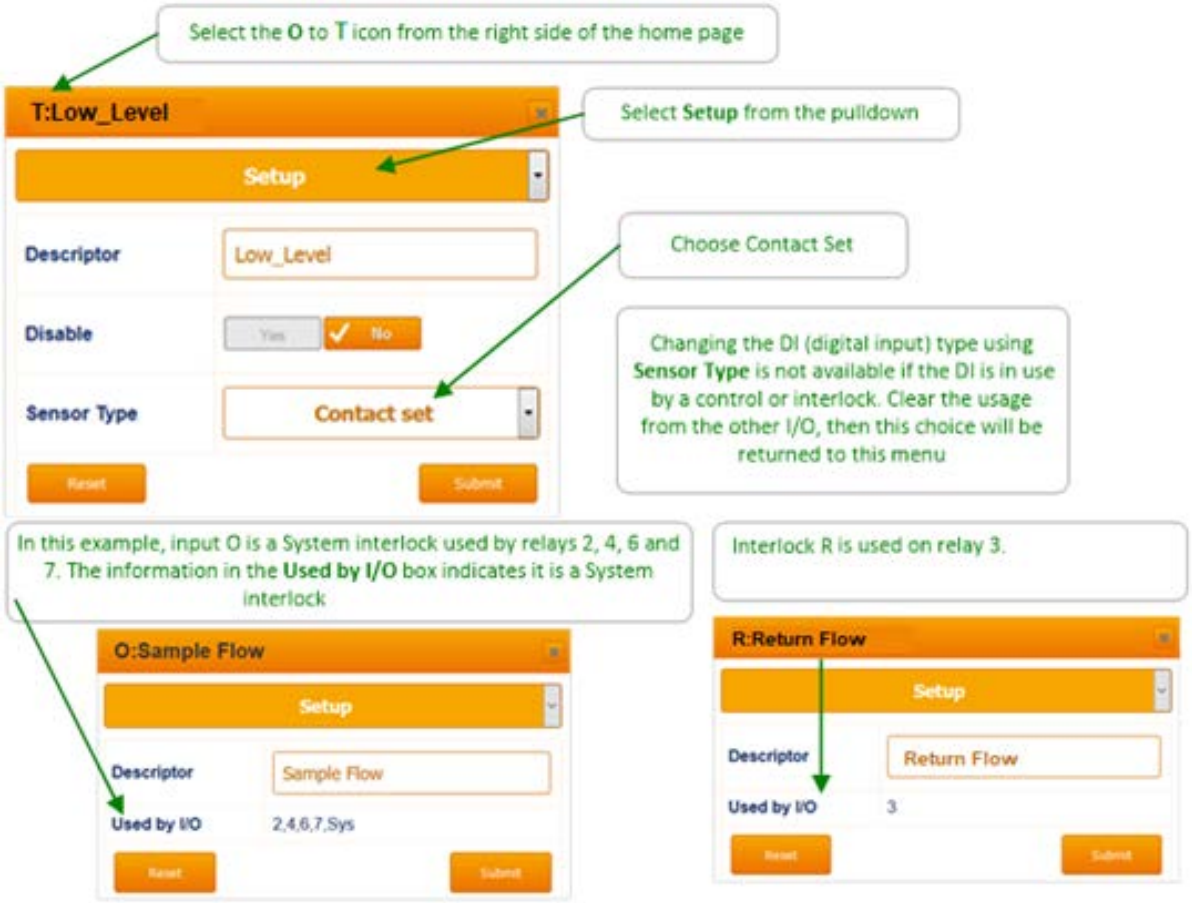
6 Flowswitches, System Interlocks & Contact Sets

6.1 Switching Meter Types & Contact Sets

Water meters and contact set inputs are connected in the '**O**' to '**T**' digital inputs.
They can also be created in the '**U**' to '**Z**' phantom inputs.
If the meter or contact set input is not configured for control, it can be re-purposed, making a contact set a meter or the inverse.

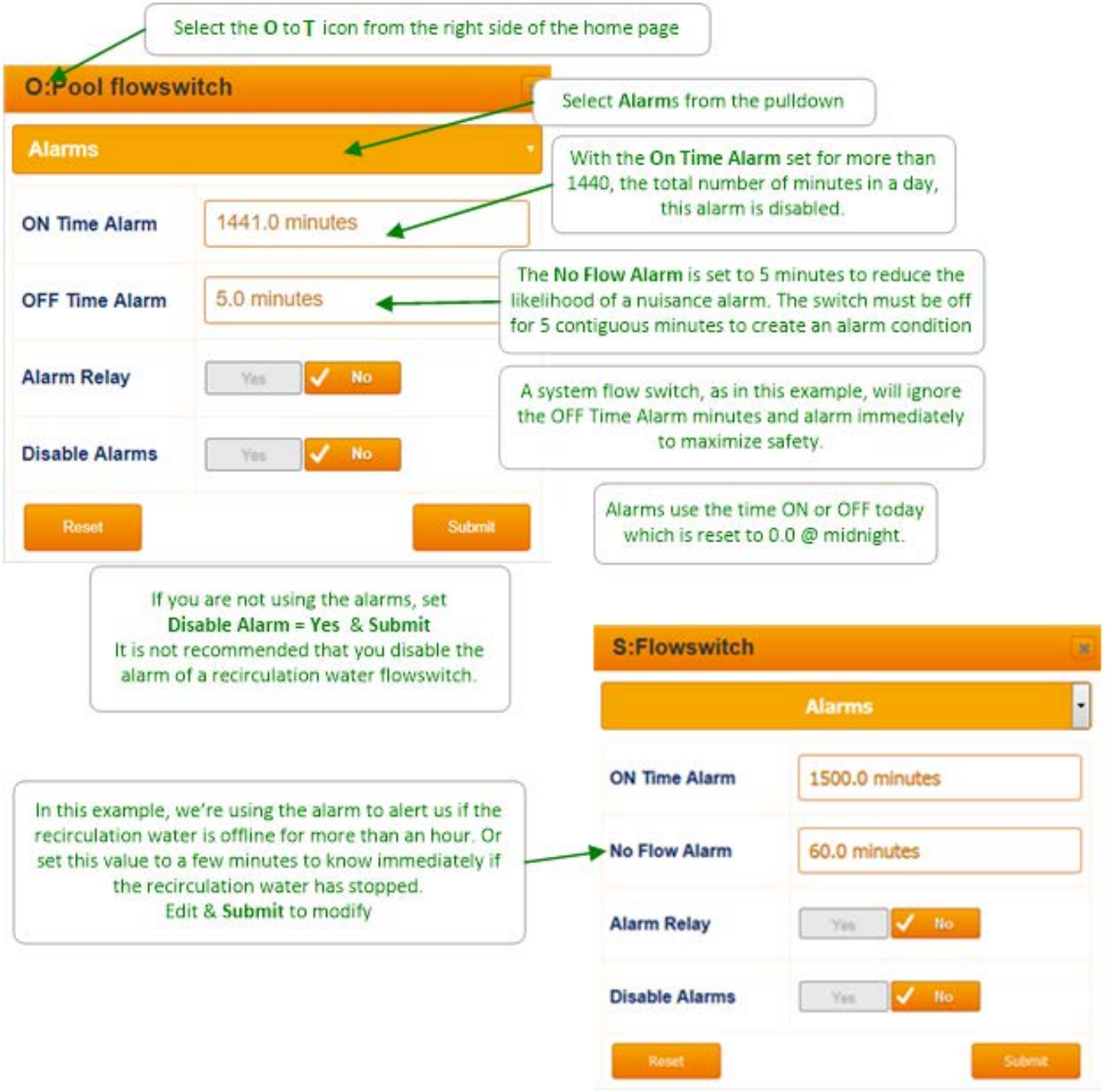
When an input in the '**U**' to '**Z**' phantom input is enabled, it's initially configured as a contact set. Any contact set designated as a system flow switch cannot be changed by the user. See Sidebar below.

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 Flowswitch Interlock. This input cannot be disabled by the user. This ensures that the safety flow switch cannot be accidentally ignored or disabled.
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.

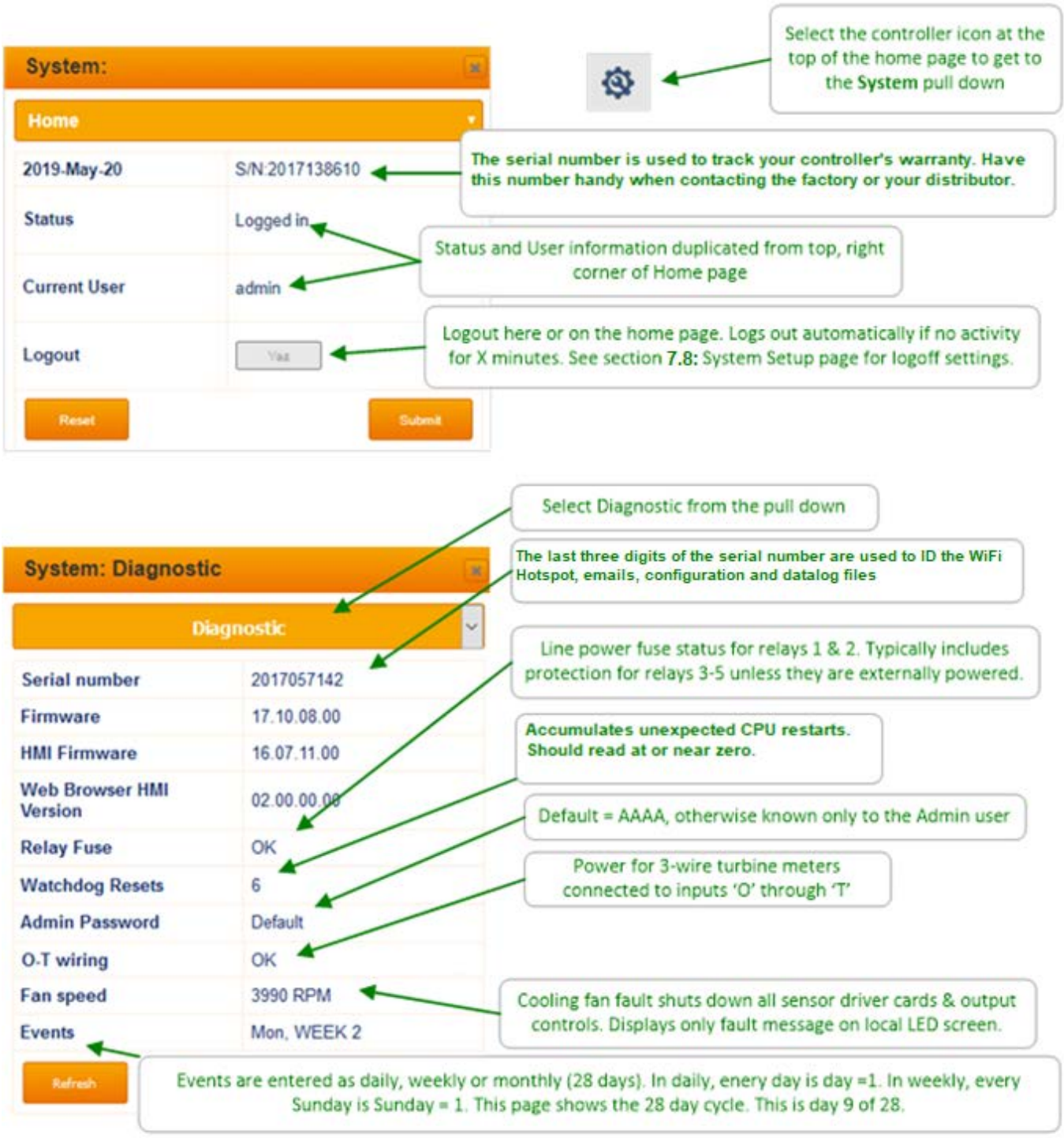
6.3 Inverting a Contact Set

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.
Example: A common usage of this feature is when using a float switch for autofill that is closed when level is full and open when water level is low. By default, if the float switch is ON the water valve would open, which is backwards for this type of float switch. Inverting the digital input sense corrects the logic, without needing to change to a different float switch with opposite logic.

Sidebar:
Note the example above is for the **Q** input. The controller will not allow you to invert the input signal from the default system flow switch **O**.

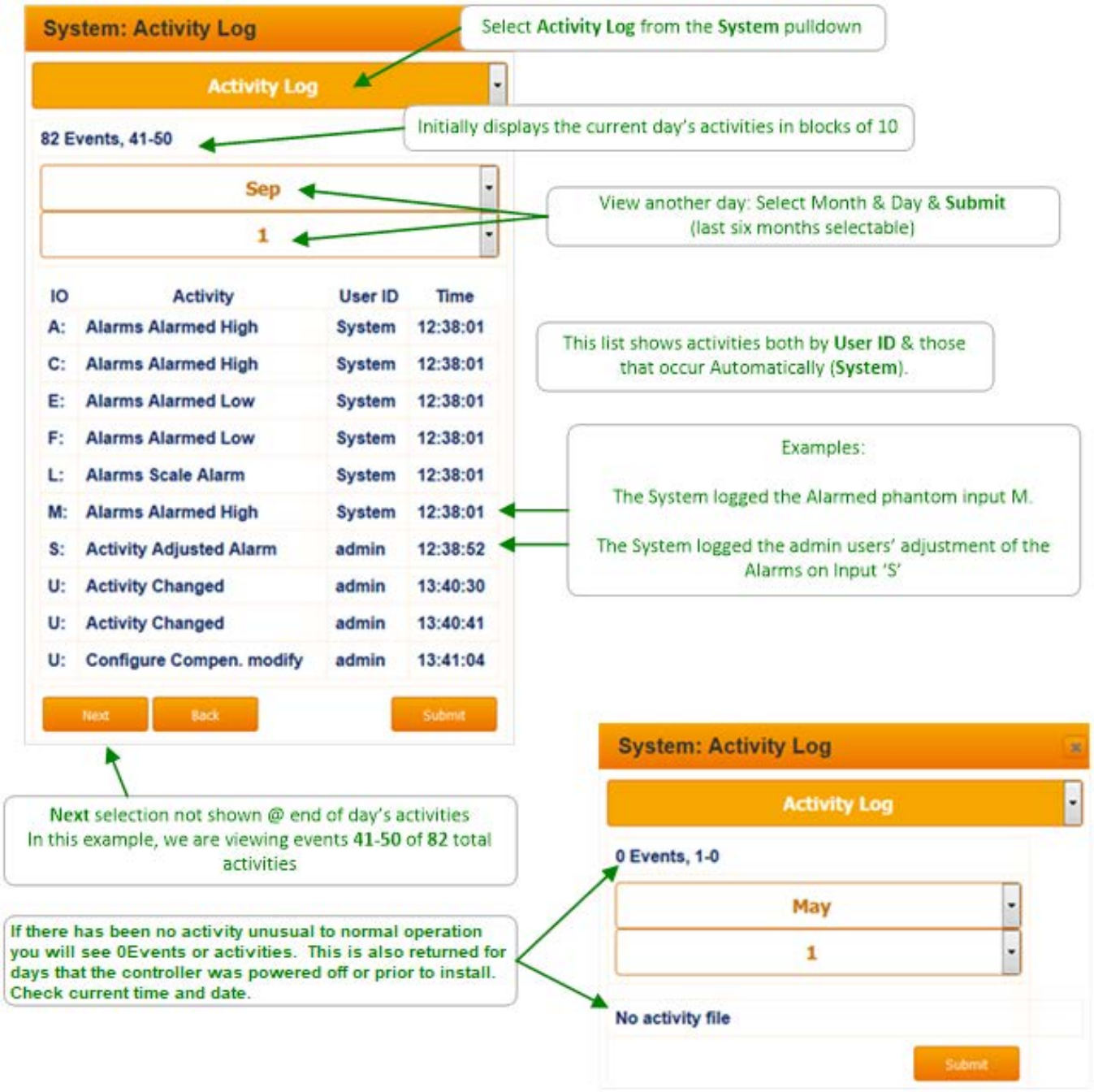
7 System Settings

7.1 Home & Diagnostic pages



7.2 Activity Log:

7.2.1 User ID, time stamp



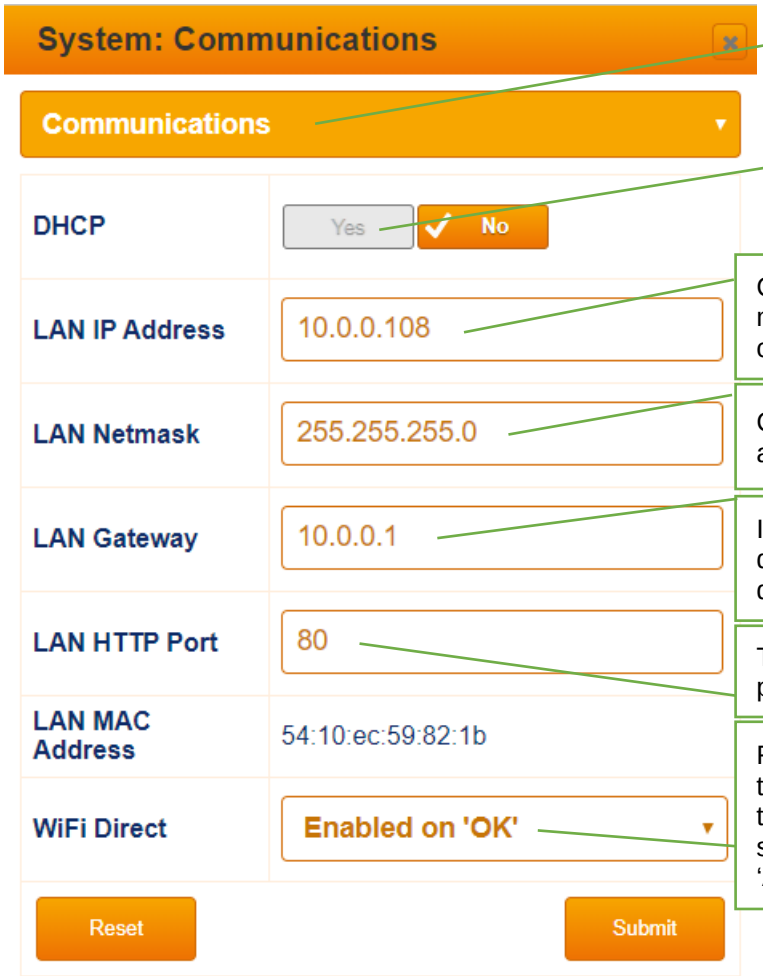
7.3 Communications: 1 of 2

7.3.1 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 DCM3 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.

Sidebar:



Select **Communications** from the **System** pulldown menu

Choose DHCP = Yes if you wish the network to assign the IP address. This ensures the controller address will comply with the required network protocol

Current **LAN** IP address of the DCM3 controller. If you modify & **Submit**, you will lose the current browser connection. Reconnect using the new IP Address.

Current LAN netmask, change as needed by LAN administrator and click **Submit.**

If you are using the e-mail functionality (Alarms and data reports) then the LAN gateway should match other devices on this network

The HTTP port is defaulted to 80, the standard browser port

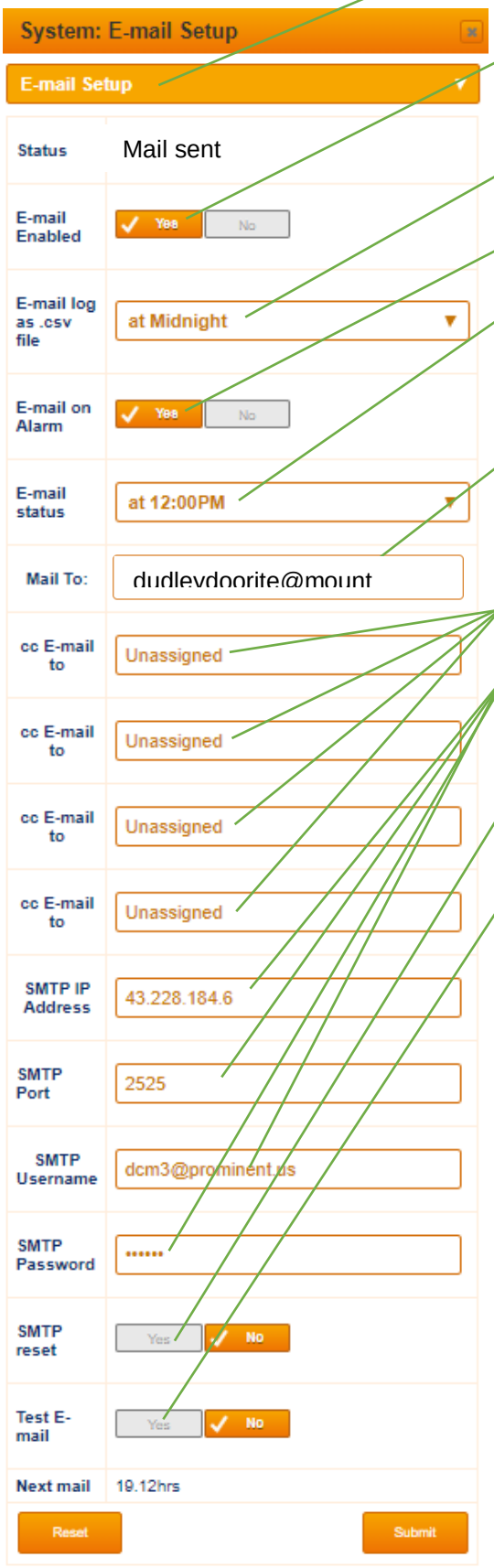
For additional security, the WiFi transponder can be set to Enabled on 'OK' so that when it is not in use, it will turn off until someone presses the OK button. The other selections are 'Always OFF' and the default setting of 'Always ON'

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** / **Up** /**System** / **OK** / **Communications / OK** & Up - Down to scroll through the settings.

LAN (Local Area Network) refers to the Ethernet port connection. WiFi refers to the wireless "HotSpot" browser connection. See Section 1 for more connection information.

7.4 E-Mail Setup – Test



Use the Pulldown menu in the System menus to select **E-Mail Setup**.

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

There are 3 choices for emailing a daily log of data to be archived **Disable, at Midnight** and **Hourly. "at Midnight"** is the default.

Select Yes to receive emails when the controller is in alarm.

E-mailing the controller status at regular times verifies to the operator that the controller is online and can email an alarm if needed. There are 4 choices, **Disable**, **at 12:00PM**, at **Midnight**, and both **12:00PM and Midnight**.

This is the primary recipient of the e-mails being sent

You can add up to 4 additional emails to the cc list so that more than 1 operator can get notified.

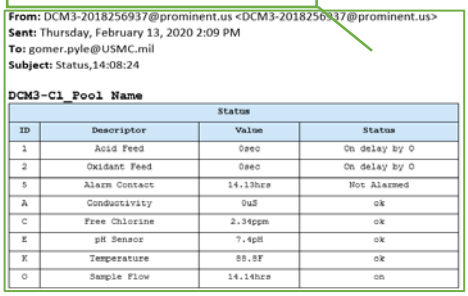
The default SMTP address and settings are shown for the ProMinent provided server. If you choose to use a different SMTP server, edit these values as needed.

Select **Yes** to revert SMTP settings to factory default values.

Test the server and settings during the initial setup and after any changes to the settings. Test by clicking **Test E-mail=Yes** and pressing **Submit.**

When testing the E-mail, after pressing Submit, the screen will change to show a change in status. As the test continues, if you press the Refresh button every few seconds, the Status will update and eventually show Mail sent. If there is a detected problem sending the e-mail, the Status will show that fault to assist troubleshooting by the IT department.

Status E-mail Example



7.5 E-mail Reports and Alarms

The E-mail setup function is diagramed above in Section 7.4 of this manual. You cannot access this feature through the keypad.

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

From the factory, the E-mail is disabled by default and must be enabled before additional setup can occur. See Section 7.4 above.

7.5.1 E-mail Types:

7.5.1.1 ALARM: Sent once when an alarm first occurs.

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

Up to 5 email addresses can be programmed to receive alarm notifications. User Enabled/Disabled.

From: DCM3-2018256937@prominent.us <DCM3-2018256937@prominent.us>
Sent: Wednesday, March 11, 2020 4:03 PM
To: alfred.e.neuman@madmagazine.com
Cc: bruce.wayne@batcave.com>
Subject: Status,16:03:11

Facility Name_Pool Name

Active Alarms			
ID	Descriptor	Info	Datetime
E	pH Sensor	Alarmed High	15:20 2020-Mar-11
F	ORP Sensor	Alarmed Low	15:21 2020-Mar-11
K	Temperature	Alarmed Low	15:20 2020-Mar-11

Status			
ID	Descriptor	Value	Status
1	Acid Feed	0sec	On delay by 0
2	Oxidant Feed	0sec	pH override
E	pH Sensor	8.38pH	alarm
F	ORP Sensor	586mV	alarm
K	Temperature	82.8F	alarm
O	Sample Flow	23 sec	on

7.5.1.2 STATUS: Sent at Noon, Midnight or Both, every day (12:00 or 23:59 or both). Verifies that the controller is operating and active on the LAN.

Includes enabled sensor, meter and contact values.

Sent @ midday so that commercial systems will have some run time and some day is left to respond to operational issues. Midnight or Both is normally used for 24 hour operations that prefer overnight verification as well as mid-day.

From: DCM3-2018256937@prominent.us <DCM3-2018256937@prominent.us>
Sent: Thursday, February 13, 2020 2:09 PM
To: gomer.pyle@USMC.mil
Subject: Status,14:08:24

DCM3-Cl_Pool Name

Status			
ID	Descriptor	Value	Status
1	Acid Feed	0sec	On delay by 0
2	Oxidant Feed	0sec	On delay by 0
5	Alarm Contact	14.13hrs	Not Alarmed
A	Conductivity	0uS	ok
C	Free Chlorine	2.34ppm	ok
E	pH Sensor	7.4pH	ok
K	Temperature	88.8F	ok
O	Sample Flow	14.14hrs	on

7.5.1.3 Data Logs: Sent @ midnight (23:59) every day for archiving, or hourly for troubleshooting. Can also be used to verify that the controller is running and active on the network.

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

All datalog files are delimited. They are comma separated values (CSV); one line per each 5-minute time stamp.

The beginning of the downloaded text file looks like this:

```
DCM3,,,,,,,,
Serial number,Site name,Controller name,,Firmware,,,,
2018256937,Facility Name_,Pool Name,,19.09.10.00,,,,
Log records,,,,,,,,
I/O,Location,E,F,K,O,1,2,
I/O,Units,pH,mV,F  ,sec,sec,sec,
Date ,Time ,pH Sensor,ORP Sensor,Temperature,Sample Flow,Acid Feed,Oxidant Feed,
11/03/20,00:00:00,  7.550,748.000, 84.123,   300.000,       0,       0,
11/03/20,00:05:00,  7.551,748.000, 84.122,   300.000,       0,       0,
11/03/20,00:10:00,  7.551,748.000, 84.122,   300.000,       0,       0,
11/03/20,00:15:00,  7.551,748.000, 84.122,   300.000,       0,       0,
11/03/20,00:20:00,  7.551,748.000, 84.122,   300.000,       0,       0,
11/03/20,00:25:00,  7.551,747.000, 84.122,   300.000,       0,       0,
11/03/20,00:30:00,  7.551,747.000, 84.122,   300.000,       0,       0,
11/03/20,00:35:00,  7.551,747.000, 84.121,   300.000,       0,       0,
11/03/20,00:40:00,  7.551,747.000, 84.121,   300.000,       0,       0,
11/03/20,00:45:00,  7.552,747.000, 84.121,   300.000,       0,       0,
11/03/20,00:50:00,  7.552,747.000, 84.121,   300.000,       0,       0,
11/03/20,00:55:00,  7.552,747.000, 84.121,   300.000,       0,       0,
11/03/20,01:00:00,  7.552,747.000, 84.121,   300.000,       0,       0,
11/03/20,01:05:00,  7.552,747.000, 84.121,   300.000,       0,       0,
11/03/20,01:10:00,  7.552,747.000, 84.121,   300.000,       0,       0,
11/03/20,01:15:00,  7.552,746.000, 84.121,   300.000,       0,       0,
11/03/20,01:20:00,  7.553,746.000, 84.121,   300.000,       0,       0,
11/03/20,01:25:00,  7.553,746.000, 84.121,   300.000,       0,       0,
11/03/20,01:30:00,  7.553,746.000, 84.120,   300.000,       0,       0,
11/03/20,01:35:00,  7.553,746.000, 84.120,   300.000,       0,       0,
11/03/20,01:40:00,  7.553,746.000, 84.120,   300.000,       0,       0,
```

When opened using Microsoft® Excel® or a similar spreadsheet program, the data will look more organized, like this:

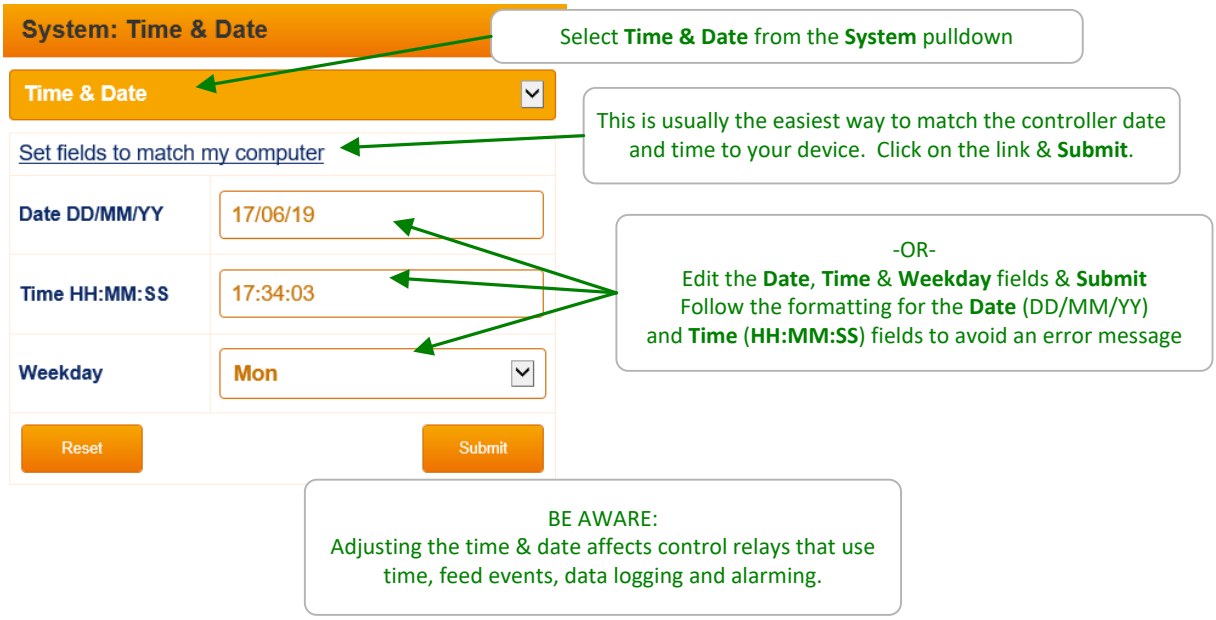
A1 | DCM3

	A	B	C	D	E	F	G	H
1	DCM3							
2	Serial number	Site name	Controller name		Firmware			
3	2018256937	Facility Name_	Pool Name		19.09.10.00			
4	Log records							
5	I/O	Location	E	F	K	O	1	2
6	I/O	Units	pH	mV	F	sec	sec	sec
7	Date	Time	pH Sensor	ORP Sensor	Temperature	Sample Flow	Acid Feed	Oxidant Feed
8	11/3/2020	0:00:00	7.55	748	84.123	300	0	0
9	11/3/2020	0:05:00	7.551	748	84.122	300	0	0
10	11/3/2020	0:10:00	7.551	748	84.122	300	0	0
11	11/3/2020	0:15:00	7.551	748	84.122	300	0	0
12	11/3/2020	0:20:00	7.551	748	84.122	300	0	0
13	11/3/2020	0:25:00	7.551	747	84.122	300	0	0
14	11/3/2020	0:30:00	7.551	747	84.122	300	0	0
15	11/3/2020	0:35:00	7.551	747	84.121	300	0	0
16	11/3/2020	0:40:00	7.551	747	84.121	300	0	0
17	11/3/2020	0:45:00	7.552	747	84.121	300	0	0
18	11/3/2020	0:50:00	7.552	747	84.121	300	0	0
19	11/3/2020	0:55:00	7.552	747	84.121	300	0	0
20	11/3/2020	1:00:00	7.552	747	84.121	300	0	0
21	11/3/2020	1:05:00	7.552	747	84.121	300	0	0
22	11/3/2020	1:10:00	7.552	747	84.121	300	0	0
23	11/3/2020	1:15:00	7.552	746	84.121	300	0	0
24	11/3/2020	1:20:00	7.553	746	84.121	300	0	0
25	11/3/2020	1:25:00	7.553	746	84.121	300	0	0
26	11/3/2020	1:30:00	7.553	746	84.12	300	0	0
27	11/3/2020	1:35:00	7.553	746	84.12	300	0	0
28	11/3/2020	1:40:00	7.553	746	84.12	300	0	0

Consult your spreadsheet program instructions for how to change or import the data so the date is shown as MM/DD/YYYY.

7.6 Time & Date:

7.6.1 Sync to Device Clock

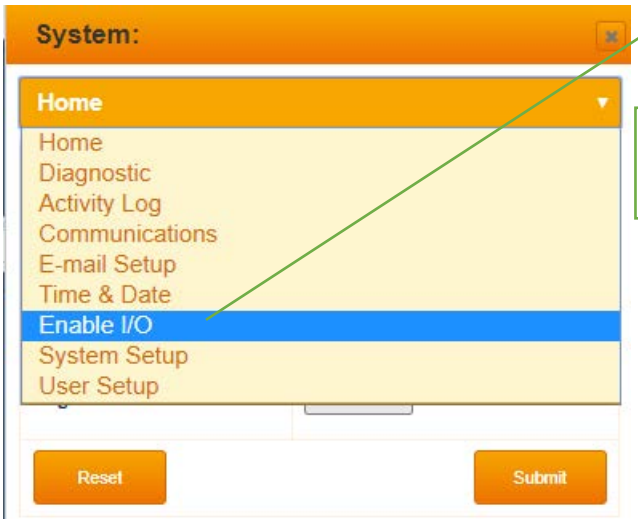


7.7 Enable I/O:

7.7.1 Enabling Analog and Digital Inputs and Outputs

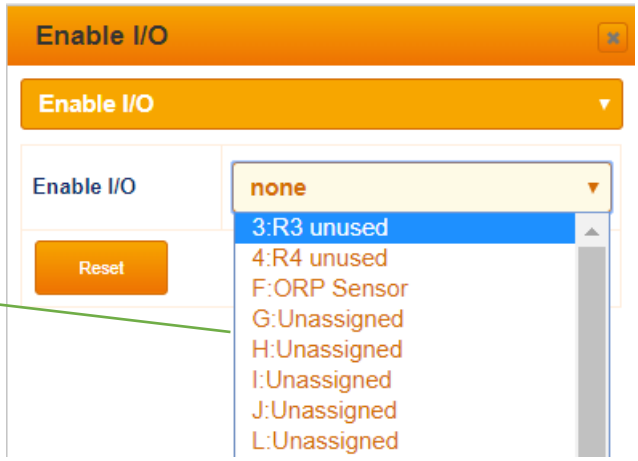
NOTE: You will need to be logged in as "admin" to be able to enable Inputs or Outputs (even phantoms).

This includes all analog and digital inputs, other than the serial conductivity sensor.
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.



From the System Home menu select **Enable I/O**

This window will appear



Only disabled I/O's will be shown in the dropdown list. Select the I/O to be enabled from the choices shown, then press **Submit.**

After each I/O is enabled, the menu will revert back to this window to allow you to select the next I/O to activate. If no other I/O's are to be enabled, close the window to return to the main browser screen.

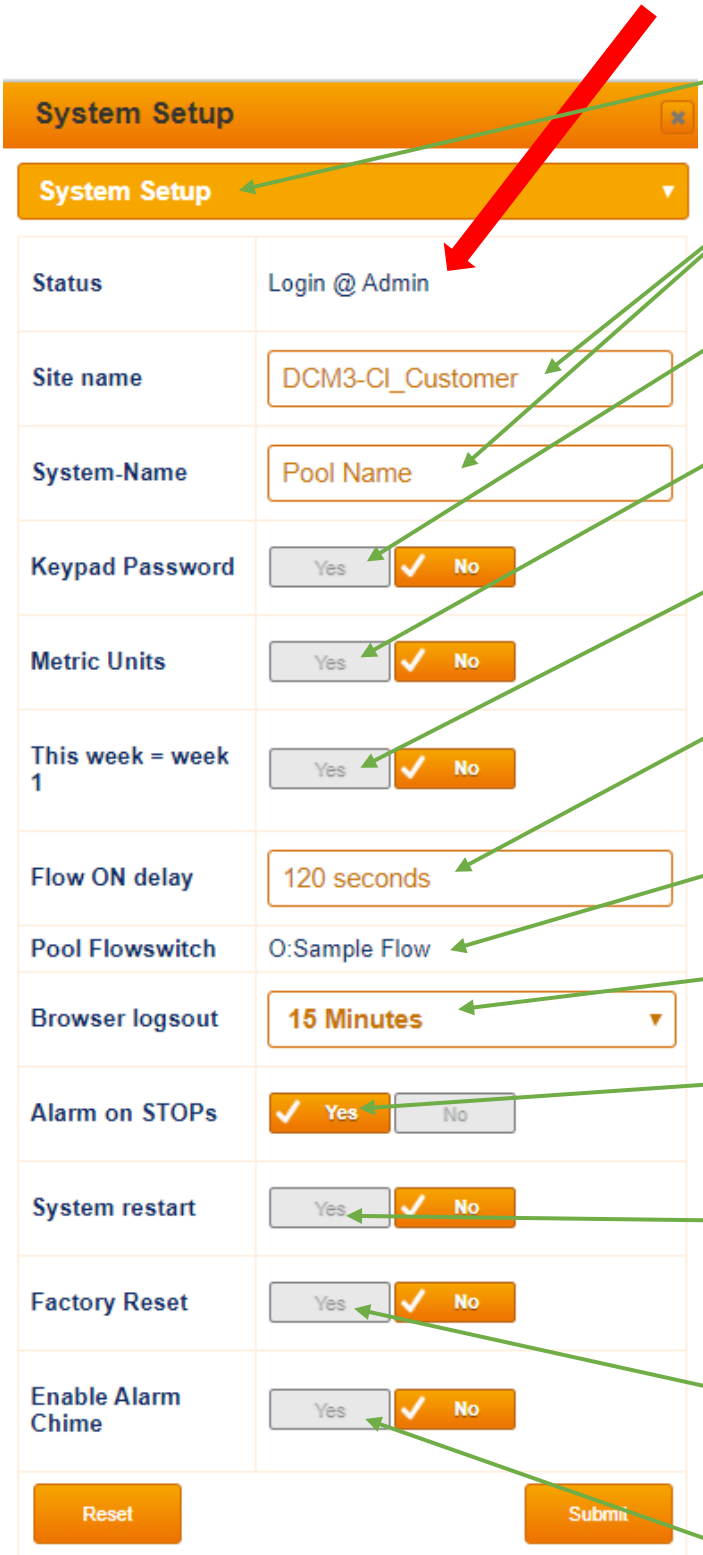
After enabling the I/O, configuration of each is explained in other sections of this manual. For Analog Input configurations see Section 4 Sensors, for configuring Digital inputs see Section 5 Water Meters and Section 6 Flowswitches, System Interlocks & Contact Sets. For Phantom or Virtual inputs see Section 4.6 Using Sensor Attributes for Phantoms. For Digital outputs (relays) see Section 2 Chemical Feed Controls or Section 3.2 Alarm Relay.

The DCM series of controllers is extremely flexible. If there is something you would like to do with the I/O's provided, but you aren't quite sure if it can be done, or how to do it, please contact your ProMinent distributor and they should be able to help you achieve your goals.

7.8 System Setup:

7.8.1 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 Login @ Admin if you are not allowed to modify the current page.



Select System Setup from the System pulldown

Site Name and **System Name** will tag your graphs and emailed alarms to help differentiate between multiple controllers.

To require users to login, Select **Keypad Passwords** = **Yes** and **SUBMIT**

Metric Units = Yes then **SUBMIT** changes Units to °C and measures volumes in Liters. **Metric units = No** shows units in °F and

This Week = Week 1 refers only to the 28 day event cycle. Daily and weekly events do not have to distinguish which Sunday

After a No-Flow condition, chemical feeders will be delayed by this period to allow the sensors to correct after flow is restored. Click to adjust then press **SUBMIT**

For safety reasons, the Sample Flow switch assignment cannot be changed or disabled. If the unlikely need to change it occurs, contact ProMinent Fluid Controls.

Choose how long the browser stays connected after the last keystroke.

Choose **Alarm on Stops = Yes** then **SUBMIT** to be alerted if a feeder is forced off individually or by pressing the red STOP button

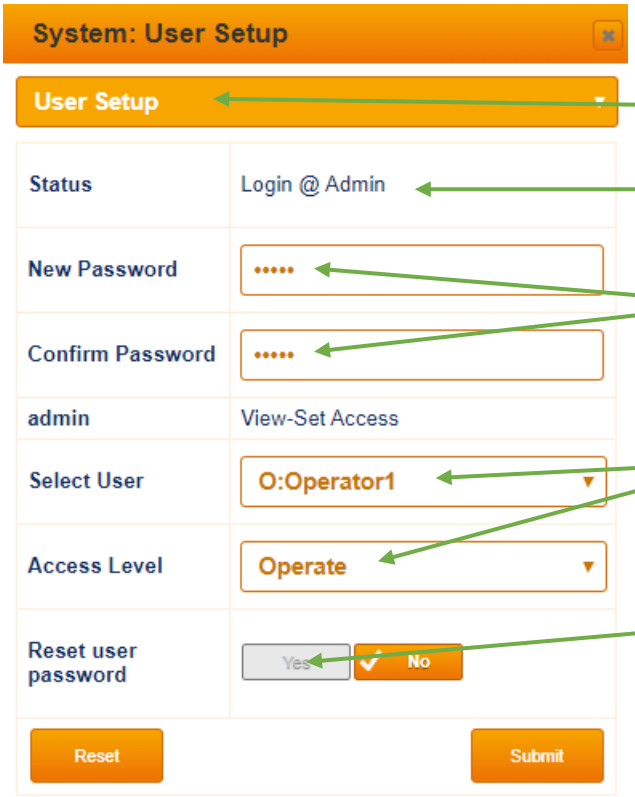
Choose **System restart = Yes** then **SUBMIT** to reboot the controller. The same as turning the power off for 30 seconds then back on, but this can be done remotely!

CAUTION: Selecting Factory Reset = Yes and SUBMIT will erase all programming and require a new configuration file to be loaded. *DO NOT perform a factory reset without having a saved configuration to load via USB Flash drive!*

Enable Chime Alarm = Yes then **SUBMIT** to have a chime sound on your computer to alert you when there is an alarm on the controller.

7.9 User Setup:

7.9.1 View-Set Access Level and Passwords



From the System menu select the User Setup choice

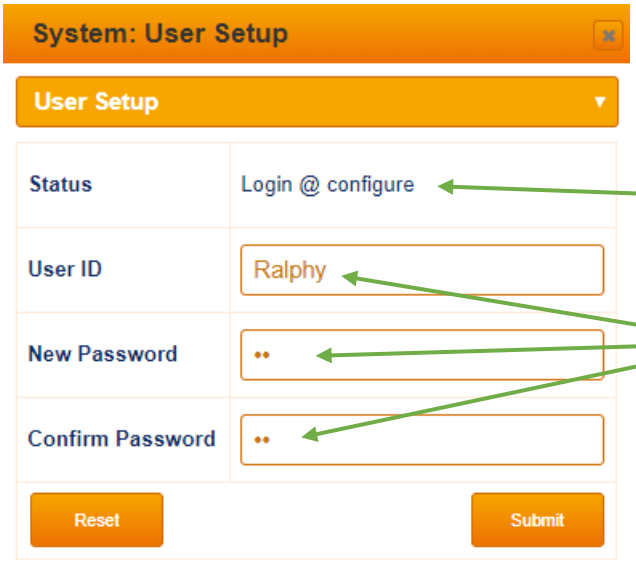
Status will show the current access level.

Password can be edited by each user, up to 8 alpha-numeric characters, no special characters.

Note the Admin user cannot change their user ID.

Admin can change access level of the other users by selecting the user and selecting a different access level and clicking **SUBMIT.** Admin CANNOT change another user's password

Admin can reset a user password to the factory default for that user. The Admin or anyone, can then log in as that user and change both the user name and password.



User can see what level of access the Admin has assigned to him/her.

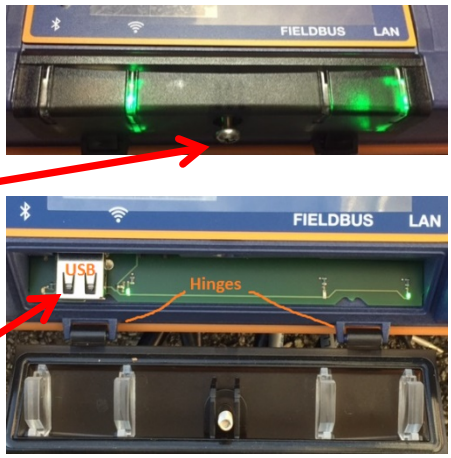
The non-admin user can only change his Username and password from the User Setup menu.
Usernames are up to 11 alpha numeric characters (Letters and numbers, no spaces)
Passwords are up to 8 alpha numeric characters including these special characters:
~ ! @ # $ % ^ * ( ) _ + = ` - [ ] \ { } / .

Illegal characters are **& | ? , < >** and spaces

8 Using the USB Port

8.1 Capturing Data

The DCM3 logs all sensors, flow switches, meter values, relay ON times, and status every 5 minutes. This data is easily captured from the USB port located behind the communication light cover. Downloading the data logs is not possible from the Browser interface, so this section is provided for your reference.



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

USB drive active Offline, All STOP LOG UPDATE CONFIG F1 F2 F3

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

Select upload size ESC to previous DAY WEEK MONTH

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 connections are locked.*

A. The display will show the progress of the download.
B. 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.
C. Don't forget to close and re-secure the access door to assure the interior of the controller is not subjected to moisture, vermin or corrosive fumes from the environment.

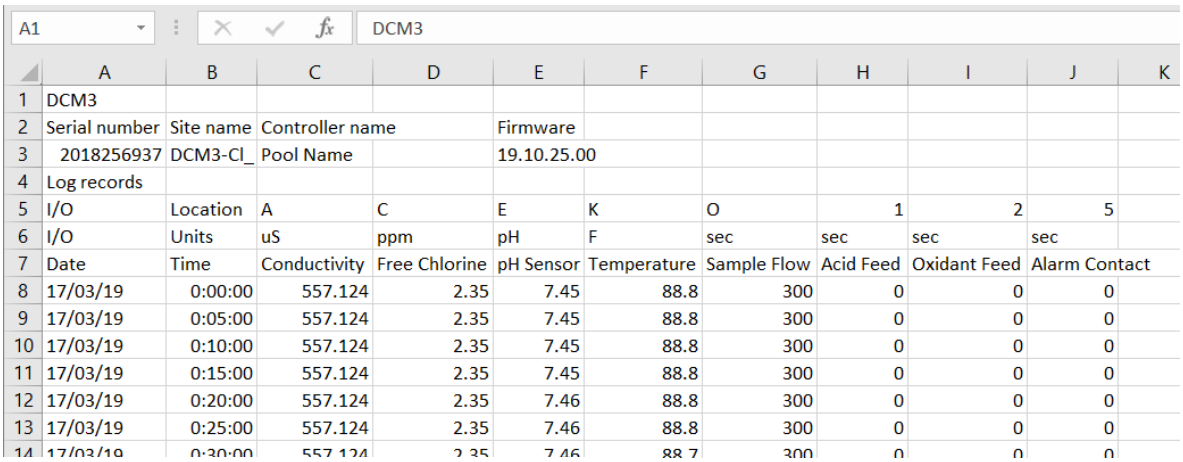
Select upload size ESC to previous Log#38 of 288

AX917_20_033.csv 2288 Log records Remove USB drive

DCM3 Browser

Once downloaded and saved to the USB flash drive, no special conversion program or Excel add-in is needed to import the CSV formatted data into Microsoft® Excel® or similar spreadsheet programs.
Just find the file name that was shown on the controller screen on the USB Flash drive and open it up as you would any other text file.

Refer to your spreadsheet or graphing software product to learn how to import CSV data. (CSV = Comma Seperated Values). 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.



A1 | DCM3

	A	B	C	D	E	F	G	H	I	J	K
1	DCM3										
2	Serial number	Site name	Controller name		Firmware						
3	2018256937	DCM3-Cl_	Pool Name		19.10.25.00						
4	Log records										
5	I/O	Location	A	C	E	K	O	1	2	5	
6	I/O	Units	uS	ppm	pH	F	sec	sec	sec	sec	
7	Date	Time	Conductivity	Free Chlorine	pH Sensor	Temperature	Sample Flow	Acid Feed	Oxidant Feed	Alarm Contact	
8	17/03/19	0:00:00	557.124	2.35	7.45	88.8	300	0	0	0	
9	17/03/19	0:05:00	557.124	2.35	7.45	88.8	300	0	0	0	
10	17/03/19	0:10:00	557.124	2.35	7.45	88.8	300	0	0	0	
11	17/03/19	0:15:00	557.124	2.35	7.45	88.8	300	0	0	0	
12	17/03/19	0:20:00	557.124	2.35	7.46	88.8	300	0	0	0	
13	17/03/19	0:25:00	557.124	2.35	7.46	88.8	300	0	0	0	
14	17/03/19	0:30:00	557.124	2.35	7.46	88.7	300	0	0	0	

8.2 Save or Load the Program Configuration

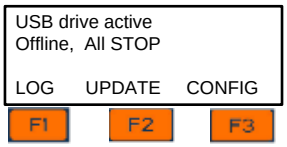
THIS IS NOT THE FIRMWARE UPGRADE INSTRUCTIONS. See 8.3 Firmware Upgrade

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 the settings of another controller. (Save from one controller and Load the configuration onto another.)
To see how to access the USB port, see section **8.1 Capturing Data**.

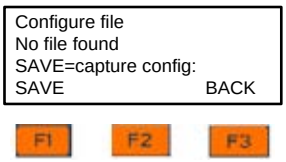
8.2.1 Saving to the USB

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

2- Press F3 Config



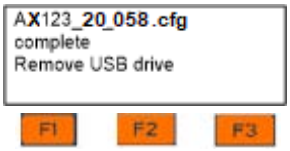
If you have not previously saved a program on this USB you can only SAVE (F1) a copy to the USB flash drive.



If you have a previously saved program on the USB drive, you have the choice of SAVing (F1) the current configuration or LOADing (F3) a saved configuration. The NEXT (F2) key is used to scroll through the different configuration files currently saved in the controller's flash memory.

Embedded in the configuration file name is the date of the saved configuration and the serial number of the controller. The syntax of the file name is: AX###_YY_DDD.cfg.

AX designates this as a DCM3 configuration,
represents the last 3 digits of the controller serial number (from which this file was saved),
YY is the two digit year, and
DDD represents the 3 digit Day of the Year where 001 is January 1st and 365 or 366 is December 31st.



Press **SAVE** (F1) to save the current configuration to the USB drive. When the save is complete, the display will show the file name of the configuration file saved, and notify you to remove the USB drive.

Sidebar:
It is a good practice to make note of the file name of the configuration just saved, and any significant programming changes made prior to saving the configuration.

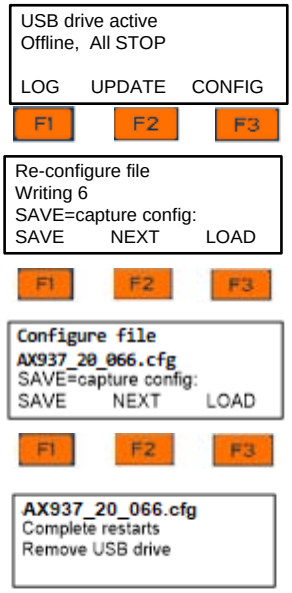
8.2.2 Loading from the USB

1- To load a previously saved program from the USB flash drive to your DCM3 controller, insert a flash drive into the USB port located behind the Communication panel.

2- Press F3 **CONFIG**.
Press F2 to find the specific saved configuration you would like to load, by pressing F2 **NEXT** until the desired file is shown.

3- Press F3 **LOAD** to upload the cfg file shown on the screen.

4- The controller then loads the program from your USB drive and notifies you to remove the drive. “Complete restarts” indicates the controller will reboot as soon as the USB drive is removed.



Sometimes referred to as “Cloning”, a saved program file can be loaded onto a different DCM3 controller. They will then have the same configuration. Afterwards, you can edit either program via the keypad or with any device using a browser. Please note that although the DCM3 and DCM5 controllers share this feature, a DCM5 configuration cannot be uploaded to a DCM3, nor can a DCM3 configuration be uploaded into a DCM5.

8.2.3 Saving to/from Flash Memory

Just like saving and loading from a USB flash drive, you can also save or load a saved configuration from the internal flash memory of the controller. The instructions and menus are the same. Use the **Menu/System/Configurations** menu path.

8.3 Firmware Upgrade

Firmware is **not** your “program configuration” which determines which sensors are enabled, and which relay operates when and how. We just reviewed that above in Section 8.2 (how the program configuration can be saved and if needed, re-loaded, or copied to another controller).

Firmware is the basic operating system or program which tells the controller’s internal computer how to operate as a pool/spa chemistry controller.

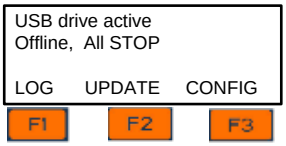
If necessary, your controller firmware program can now be field upgraded.

Only One hex File Please

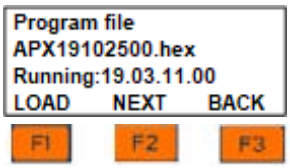
To avoid accidents and confusion with this important process, please remove all files from the USB drive prior to adding the .hex file. The controller will only recognize one hex file. Be sure you copy the correct file to the USB. If you have more than one, be sure only the correct one is copied to the root directory of the USB flash drive.

1- Obtain the firmware hex file from your distributor or ProMinent and save it to the root directory of USB flash drive. *Be sure it is the **only** file in the root directory ending in ".hex" (without the quotation marks).*
2- Insert USB flash drive with the new hex file into the USB port located behind the Communication panel.

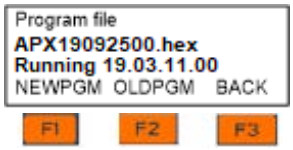
3- Press F2, **UPDATE**

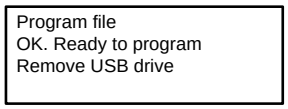


4- The display shows the one file from the USB drive; **`Program file APX19092500.hex`** and the current hex file in use; "**`Running:19.03.11.00`**". NOTE: These numbers are date codes, year, month and day, 2019.March.11th. '00' indicates they were loaded via the USB drive.
F2 "OLDPGM" is a prompt to list previous hex programs stored on the controller (in case the newest upgrade needs to be returned to a previous version). You can load a previous program from this list by pressing OLDPGM (F2) then scroll through the choices by pressing NEXT (F2). When the desired version is shown, or if you want to re-load the same version of the firmware, press NEWPGM (F1).



5- There will be one more screen to be sure you really want to change the base operating program. To proceed with the program change, press **LOAD** (F1). To abort the program change, press **BACK** (F3).
.

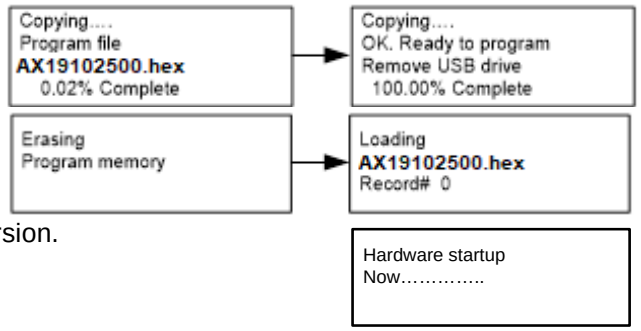




6- Remove the USB drive when prompted.

7- The firmware is first copied to the controller's internal memory. When complete, the controller will notify you to remove the USB drive.

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



9- Once the new firmware is installed, the controller will restart (reboot). All of your control parameters and user names and passwords should be unchanged.

Firmware update is a major change to the controller. Communication settings, clock, calendar and Email setup may change and should be checked and verified after any firmware change.

Embedded Website Upgrade

Normally, the website embedded in the controller does not need to be upgraded. There are some exceptions and if your website requires upgrade, contact ProMinent or your local distributor for assistance.

9 Appendices:

9.1 IO Namespace: Letters & Numbers

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

The numbers ‘1’ to ‘5’ refer to digital output controls (relays). These can be AC relays, or dry contact relays for either AC or DC or unpowered contact use. They can be programmed for On/Off, Time Modulate or Timed Cycling control.

Users can assign site specific names to all of the I/O’s, A-Z and 1-5. The I/O letters & numbers are a convenient, compact way to describe both the physical location of the I/O within the controller enclosure and the capabilities of each I/O.

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

I/O	Type	Notes
A	Serial sensor	3 wire Conductivity Temperature sensor
B	Not available on the DCM3	
C	CLB sensor driver card	Free ppm sensor
D	Not available on the DCM3	
E-F	Dual sensor driver card pH+ORP	pH-ORP: configurable as pH-ORP 2 standard DCM3 types: DCM300 (pH+ORP) and DCM3-Cl (pH+PPM)
G-N	Phantom sensors	Calculated (LSI/Ryznar, Flow Rate) or derived from other sensors & meters
O-T	Volume meter & contact set inputs	Each of 5 inputs configurable as Turbine, Contact Head meter or Contact Set. A second System flowswitch will reduce this to 4 inputs.
U-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 Both Fused with 5A fuse
3-5	Dry or line powered control relays	Form C, may be used dry or powered. If powered internally fused by the same 5A fuse. If powered externally, external 5A fusing is required
6-9	Not available on the DCM3	

9.2 Input Attributes & Phantoms

Many of the sensors connected to the controller have additional attributes in addition to the default value.
For example, a Turbine Meter sensor measures Gallons of water, and Flow Rate. The Gallons is the default value of the sensor connect to input 'S' (attribute S0) and the Flow Rate is a second attribute, S1.
Attributes can be assigned to phantom inputs where they are logged, alarmed and can be used for control.
A phantom input cannot be assigned to another phantom. (this prevents circular references).

Phantoms in the **G-N** space are analog sensors. Those in the **U-Z** space are volumes and contact sets.

I/O	Type	Attribute x = I/O	Phantom Available
A	Serial Conductivity	A0 Conductivity A1 Temperature	G-N G-N
C E-F	CLB Driver card pH-ORP driver card	C0 ORP or pH C1 Temperature if pH E0 pH E1 Temperature-pH side	G-N G-N G-N G-N
O-T	Volume meters	x0 Volume Today x1 Rate	U-Z G-N

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. This is unusual for Aquatics applications.

9.3 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 and 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. 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** or **E-F** driver card is removed, all of the dependencies are removed on the next power ON. Outputs that use the removed driver sensor(s) for control have the control 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 the driver for one pH & one ORP sensor when the controller is booted at power up.

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.