Assembly and Operating Instructions

DULCOMETER®
Aegis-X Water Treatment Controller

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

Use the Quick Start Guide to dive right into monitoring and editing the controller.

This document can be downloaded from the www.ProMinent.us website. Search for **AegisX**.

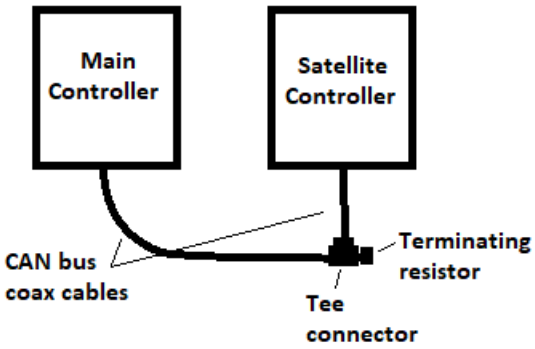
Forward

Be sure to see the Quick Start Guide on the following page!

The Aegis X controller embodies the flexibility of the past Aegis controllers on an **expandable platform**. With the addition of CAN bus (**C**ontroller **A**rea **N**etwork), ProMinent pumps, sensors and Aegis X expansion satellites can be added to the base controller to create a plant-wide control system. The base unit includes one satellite.

While keeping the same sensors and control schemes as before, control a single system, or branch out to multiple applications.

The purpose of this manual is to detail the workings of the Aegis X controller via the keypad, WiFi and LAN connections. A complete explanation of all programming steps follows the Table of Contents on page 5.



The Table of Contents is a list of links. Find what you are looking for in the table and click on the link to go to that section.

There are two basic ways to use the controller:
Use the keypad to quickly monitor the controller status, adjust setpoints and alarms,
AND/OR
Use a WiFi or network connection to your smart phone or PC for setpoint adjustments, calibrations, configuration changes, or to create a graph.

NOTICE

At a minimum, please read the Quick Start Guide on the following pages. It will tell you everything you need to know to get started and where to find details if you need a full explanation.

Terminology

With respect to digital signals, please consider the following to be synonyms throughout this manual:

0, Off, open and False
1, On, closed and True
Inactive, Normal or de-energized.
Active or Energized. This output is switched from Normal.

Typically, an output is open or off when inactive. This is called **Normally Open.** Normally Open indicates the state when not energized. When this output is energized; it becomes closed or turns on.
A **Normally Closed** output is on until energized and will turn off when energized or active.
The terms active and inactive indicate that a relay is energized or not.

WiFi Module

pH/ORP Module

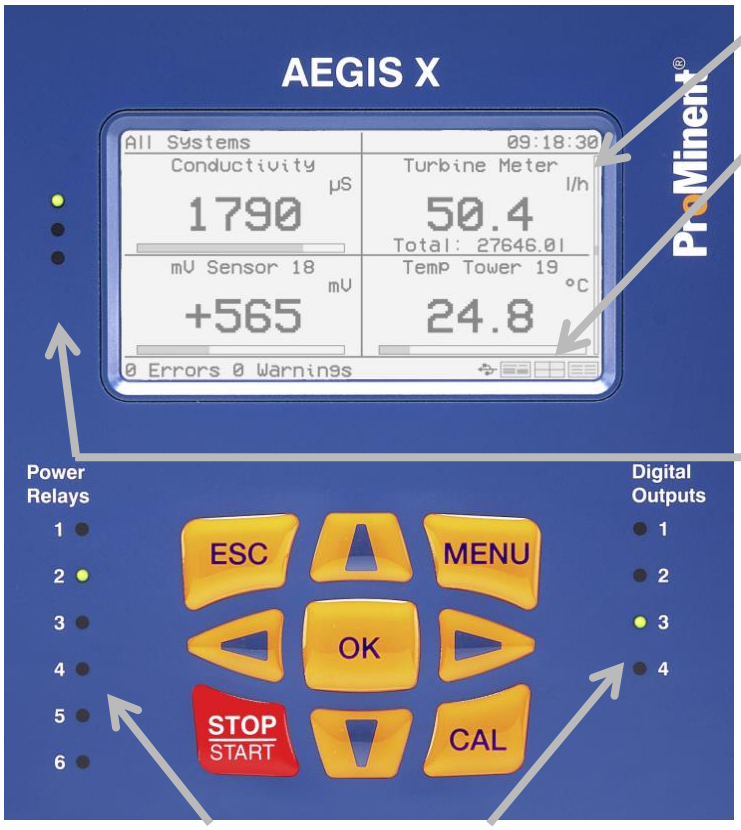
The term ‘module’ refers to small plug-in circuit boards or driver cards.
All analog I/O requires a module for connection. The Aegis X has 6 I/O modules.
All digital I/O terminations are made directly to the lower board.

The term ‘program’ generally refers to the portion of the Aegis X that can be changed by logged in users. In the case of uploading a new program from ProMinent, it also refers to the instructions our software engineers create for the computer chip inside the controller.

Only users that logon can make edits.

Quick Start Guide

The Quick Start Guide does not include all the safety messages included in the manual. Any wiring should be performed by qualified personnel! See section **4 Safety and Responsibility.**
The Quick Start Guide is highly recommended as the place to start your new experience. The remainder of this document has a complete explanation of the controller including specifications and part numbers.



The default view shows 4 applications. Change the view format (1 app, 4 apps or 9 apps) using the **right and left arrows**. Use the **up and down arrows** to scroll through the remaining applications.
The 3 icons in the lower right-hand corner show the current view format. In the single view pane format, you can edit setpoints and force outputs. Use the arrows to locate your app, and then press Menu.

Use the **CAL** button to calibrate any sensor. Follow the step-by-step procedure. When in calibration mode 'Continue with CAL' will move to the next step and 'Press OK' will open a new window for the stated purpose.

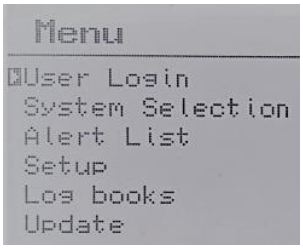
The three LEDs on the upper left side indicate the controller status.
Bottom light blinking Green represents all clear.
Middle Light blinking Orange represents a warning.
Top Light blinking Red represents an alarm.
Top Light solid Red represents all controlling outputs Stop. (4-20mA = 4mA).

Use the **Start/Stop** button to stop all controlling outputs.

Use **ESC** to return to previous menu or exit the menu system.

Power Relays and **Digital Outputs** status LEDs;

On or blinking **green** when output is on. Blinking green represents pulsing outputs.
Red indicates an alarm condition. Outputs in alarm are currently off.
Yellow represents a warning condition. The outputs continue to operate.
No light indicates the relay is off.



MENU
Monitor the applications from the keypad or logon to edit them. (Administrator/3356).
System Selection allows you to see all apps or limit to a single system.
The **Alert List** covers warnings, alarms and acknowledgements.
The **Setup** choice covers Applications for setpoint and alarm edits as well as Save/Load your configuration, Network settings and General Settings for Time and Date needs.
Logbooks are for data downloading and **Update** for new firmware.

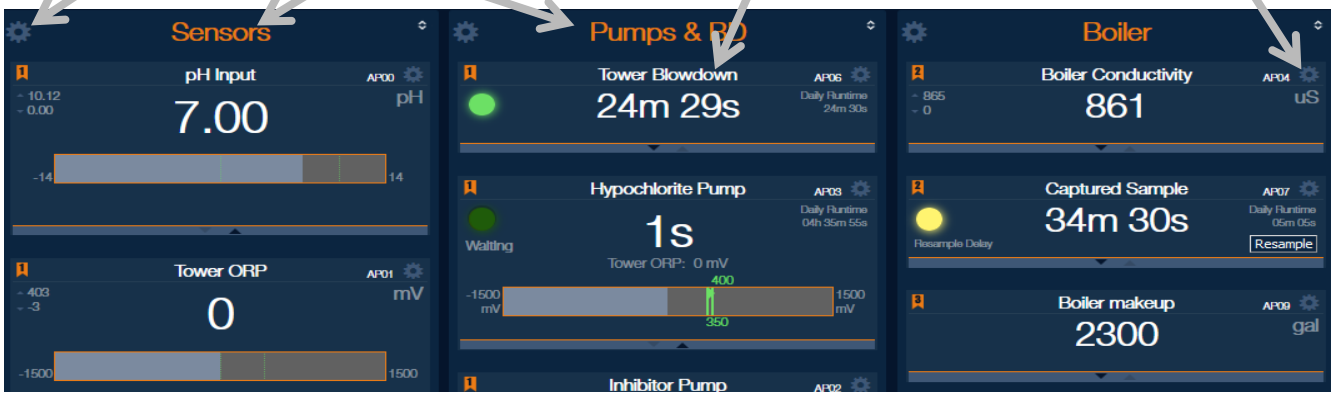
To create or delete applications, you need to edit the configuration. Connect to the controller with an Ethernet cable or use WiFi with a computer or smart phone. Find the controllers Ethernet and WiFi addresses in the Setup/Device/Network Settings menu. For connection setup help, consult section **7 Communication** in the table of contents.

Once a physical or wireless connection is established, connect with a browser. Use 10.10.6.106 as the address to bring up the controller application page. Logon as Administrator/3356. Username is case sensitive. (Logon icon )
See section **11.3.2 Setup Menu** to add new users.

Use a browser connection to create and edit the applications, change alarm and warning limits, setpoints, input and output scales, create a graph, upload and download the program/firmware and more.

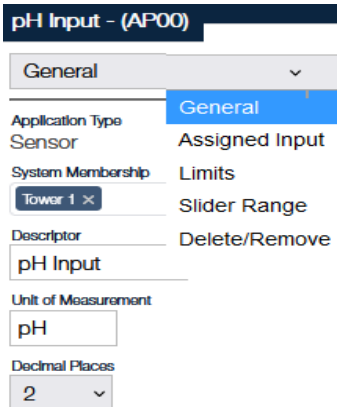
Applications are the control program.

Container menu icon Containers (3 shown) Applications (8 shown) Application menu icon



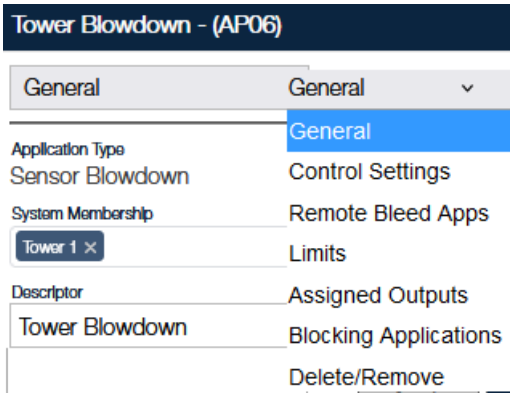
Click on application icon gear for menu.

Typical sensor app menu General page with drop-down.



←(Shown)
←Select sensor from Hardware pg.
←Set alarm and warning setpoints
←Edit the bar graph
←Delete the app

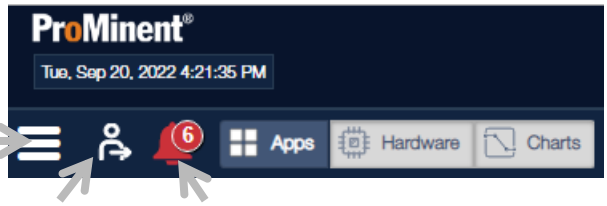
Typical relay app menu General page with drop-down.



Use the Control Settings choice for setpoint edits.

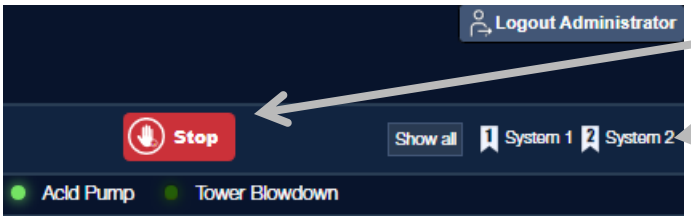
The Controller settings menu handles system maintenance issues like time and date, adding new users, creating and describing the purpose of new containers on the application page, firmware versions, and more.
See also section **11.3 Controller Settings Menu**

Apps page of Browser screen – Top left section



Logon Alarms Pages

Apps page of Browser screen – Top center and top right



Stop/Start the controller program and disable/enable all outputs. (4-20mA output goes to 4mA)

Choose which system(s) to view. See **11.3.2.3 Systems**

LED Status panel. See **11.3.2.4 LED Header Panel**

See section **11 Using a Browser** for a quick understanding of how the browser works. Consult the Table of Contents for more detail on applications including examples of usage.

Table of Contents

1 Operating Concept

This manual includes Ethernet, WiFi, CAN bus and MODBUS communications instructions and how to program the unit via a PC, tablet or Smartphone. **Most programming operations are more easily performed using a smart phone or PC over a network connection.**

Each controller includes one expansion satellite controller connected via CAN bus.

1.1 The Front Panel

The Aegis X uses an 8 square inch LED text display to indicate real time I/O values and programming information. The front cover LEDs provide relay and digital output status as well as alarms for immediate attention. A nine button keypad allows for local operator interface.

Status LEDs

In the event of an alarm, red status LEDs along the left side of the display will illuminate.

For internal digital indicator LEDs, see **Section 8.1 Digital Input and digital output relay status indicators**.

1.2 Functions of the Keys

The basic understanding of the keypad is shown in this chart. A complete explanation of the keys and menus follows in section **2 Navigating the Keypad and Local Display.**

Key	Function
OK	Confirmation in the menus: Confirms and saves any changes.
ESC	Back to the HOME display or to the previous menu.
MENU	Main menu
CAL	Enables direct access to the controller's calibration menu from the HOME display. Does not work if not logged in.
STOP START	Start/Stop all **control** outputs from any display. (4-20mA = 4mA). Front panel LED is solid red. Does not affect **non control** outputs.
 	(Up Arrow) Increases a displayed number value or moves upwards in the menus. (Right Arrow) Moves the cursor to the right.
 	(Down Arrow) Decreases a displayed number value or step down in the menus. (Left Arrow) Moves the cursor to the left.

This helpful icon represents the keypad key choices available to you.

In this example, from top left; **Escape, up arrow**, **OK** and **down arrow** are available.

1.3 Changing the Operating Language

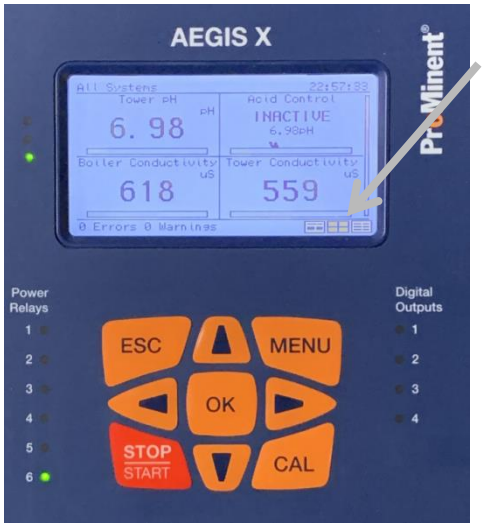
The operating language is currently offered in English, Spanish and French through the USA office. The language of the local display is set from the factory. Browser users may choose other languages from their PC or smartphone.

1.4 Keypad Lock

The keypad password is the same as the password used in the browser connection. Browser users can logon independently of local users. See section **11.2 Logging on.**

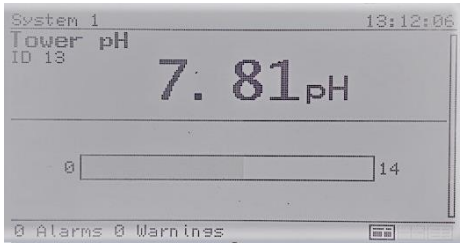
2 Navigating the Keypad & Local Display

Most of the menu features are self-explanatory but some items will be covered in detail. Creating applications is not available to keyboard users. Use a browser on a smartphone or PC via an Ethernet or WiFi connection. See section **7 Communication**.

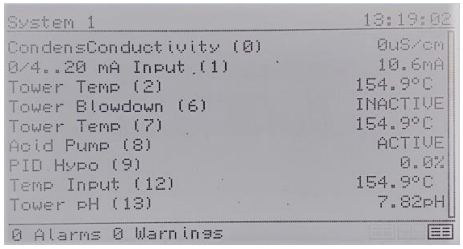


The power-up screen will default to showing four of the apps at a time. Use the **up** and **down arrows** to scroll through the remaining apps. Use the **right** and **left arrows** to switch the display to show one, four or nine apps at a time.

Single display →



Nine apps/page →



2.1 Stop/Start Button

The **Stop/Start** button reduces all control outputs to an off or zero output state or returns these outputs to their programmed function. It does not affect mA outputs that are used for measurement, non-control purposes. (An operator can continue to see the pH even though the pump is “Stopped”.) The controller display indicates which STOP button was pressed, the controller and/or the satellite. Whichever button(s) are pressed must be pressed again to restart the outputs. If stopped from the browser, the main stop button is the only way to start again.

Anytime the controller power is interrupted accidentally or on purpose, the controller can be configured to restart in the Stop mode or run mode. If in Stop mode, press the main controller Stop/Start button to return to normal program action. This choice is selectable in the Device Setup menu. See section **11.3.2.1 Device Setup**.

2.2 The Escape Button

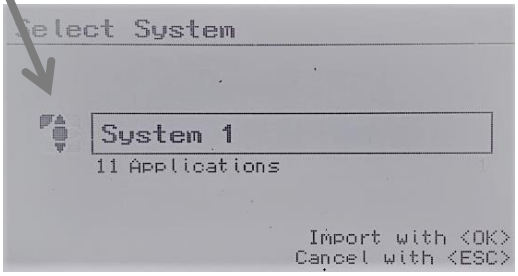
The Escape button will return to the previous menu level. Multiple pressings will return the screen to the power up display.

2.3 The CAL (Calibration) Button

You must be logged on to use this command. See section **2.4 The Menu Button**.
Use the CAL button or Setup menu to calibrate sensors.
You can only calibrate measurement apps, not the hardware input.

The keypad icon shows which keys are available; Escape, up OK and down.

To select an app, press OK, then use the up and down arrows to locate it. If your apps are divided into systems, you can choose that system and then scroll through only those apps that are in that system.
To create a measurement app, see section **13 Programming the Applications.** To divide apps into systems, see section **11.3.2.3 Systems.**
After you invoke the calibration procedure, press OK to select a system, and then use the down arrow to locate the system where your sensor resides and then select the sensor. ‘OK’ will select what you have chosen and ESC will revert back a step.
Once you select a sensor, choose ‘Start Calibration’ and press OK.

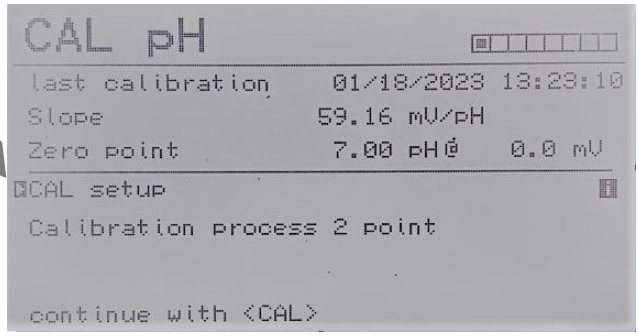


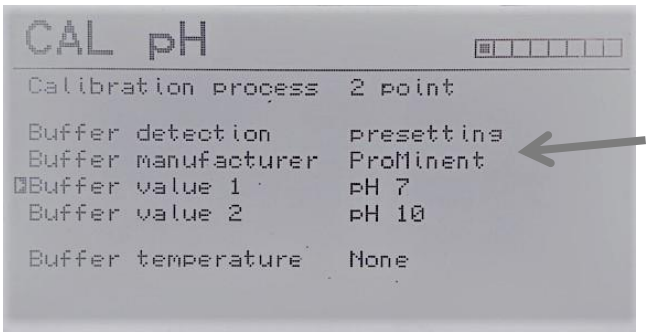
Now that the calibration has started, the CAL key is used to step through the process while the OK button is used to make selections within the process. Look for instructions in the lower part of the display.

Two point pH calibrations are shown as an example. Other calibration procedures are similar.

2.3.1 Two-point pH calibration

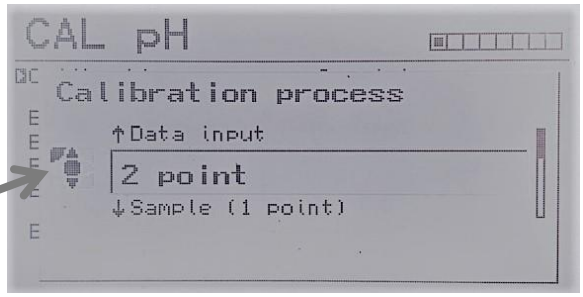
Note the cursor next to CAL setup. Press the OK key to edit the setup menu or press the CAL button to start the calibration.





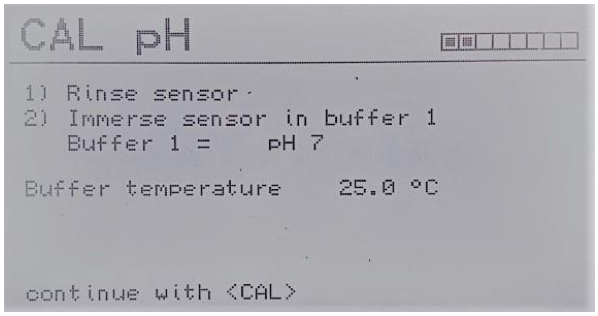
If you choose the Setup page, scroll through the choices and then press OK to edit. Press escape when done to return to the CAL menu.

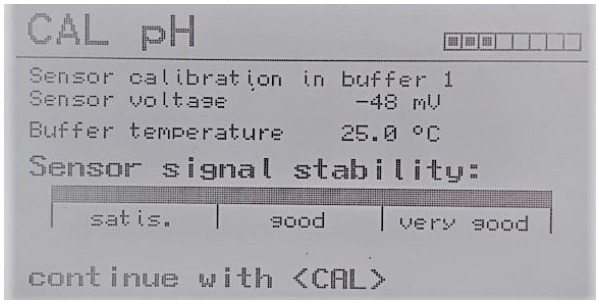
For example, if you selected the Calibration process, use the up and down arrows to peruse the choices. Press OK to select and exit back to the previous page. Go through all the choices to familiarize yourself with this program.



The keypad icon shows which keys are available; Escape, up OK and down on this page.

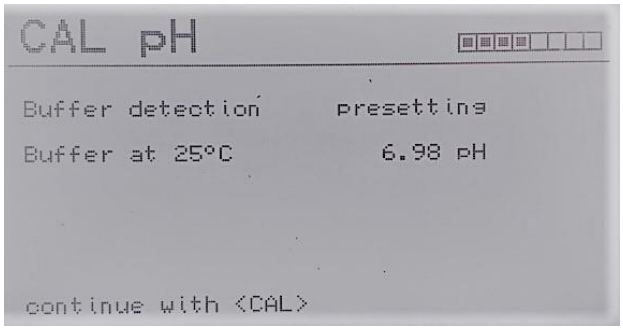
When ready, press CAL to start. Follow the process directions.

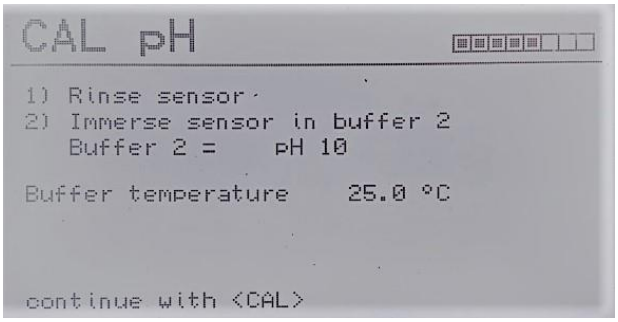




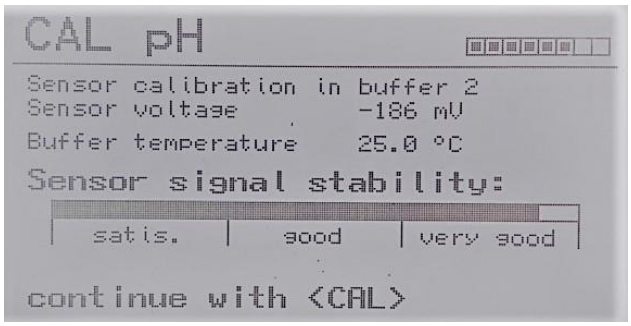
The blocks in the upper right-hand corner indicate your completion progress.

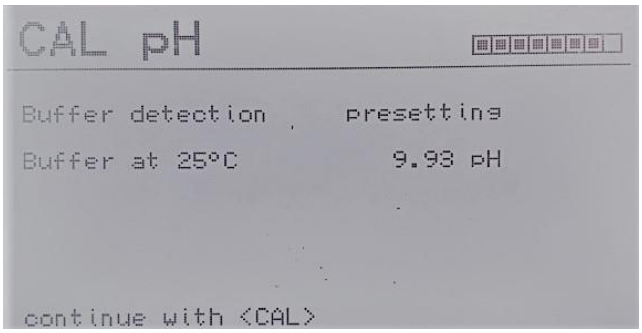
The process will check for signal stability.

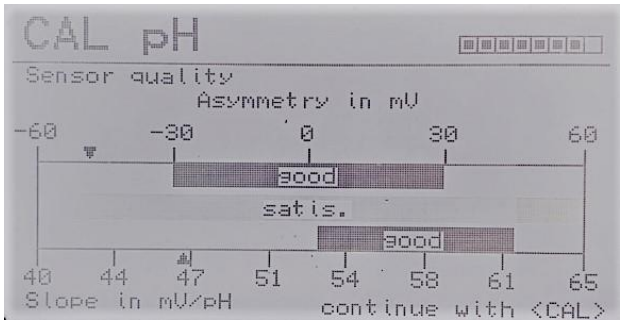


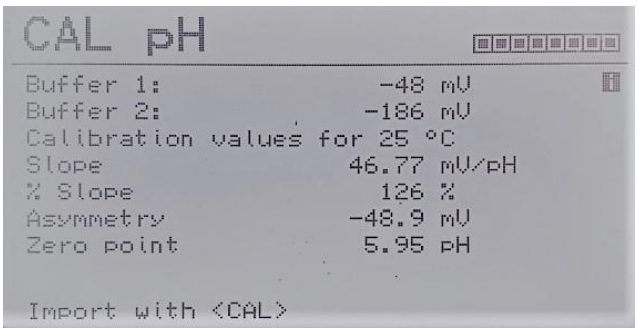


Step through the procedure pressing the CAL key as directed.



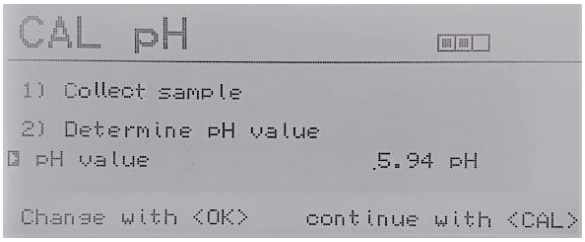




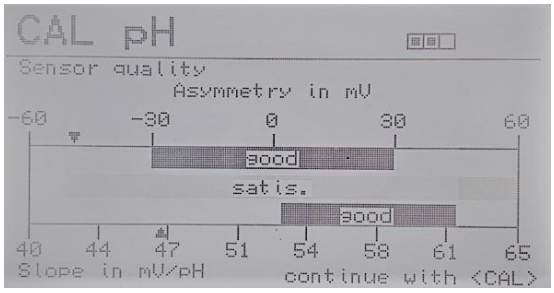


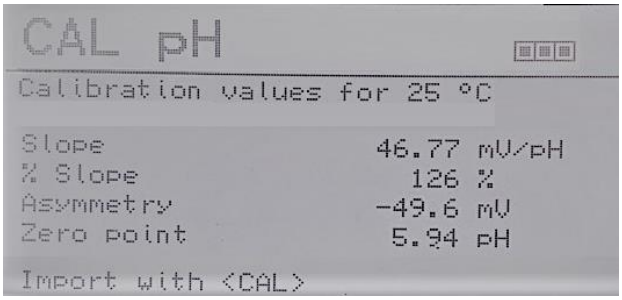
The calibration process will automatically adjust the pH per the buffers and report the condition when complete.
This report is two pages, Sensor quality in graph format and the data page.
The Sensor quality graph above shows that the Asymmetry in mV is between -30 and -60. (See the pointer in the graph.) The data page lists it as -48.9. The 'satis.' value is just under 47. (See pointer.) The data page lists it as 46.77mV/pH. Neither value is in the 'good' range. We recommend cleaning the sensor and re-calibrating. If still outside the good range, consider replacing the sensor.

If you choose Sample 1-point calibration from the previous page, you will need to manually edit the reading on this page to equal the buffer value.



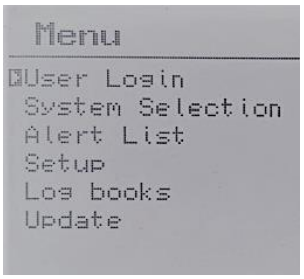
Determine the pH from a sample, then adjust the 'pH value' above. Press OK to edit. Then press CAL to continue.





Finish the calibration – Press CAL

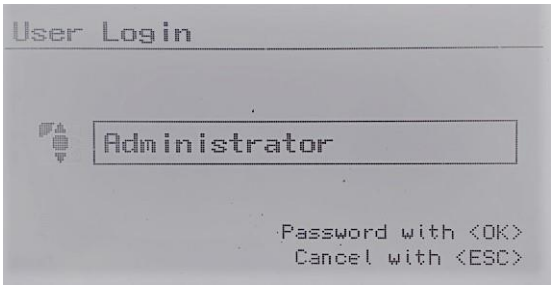
2.4 The Menu Button



The menu button displays a list of available user actions.

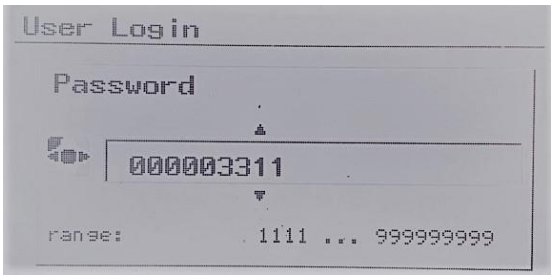
2.4.1 User Login

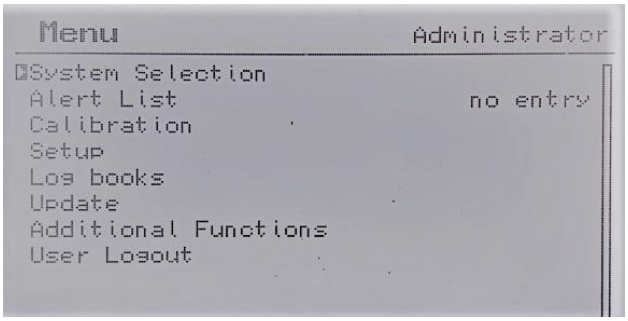
Allows access to other menu choices depending on user access level.



Defaults to Administrator or use up and down arrows to select another user.

Use the arrows to enter the password.



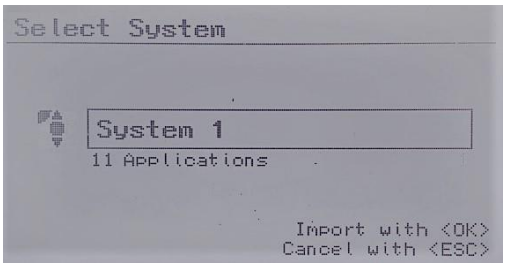


The complete menu is now available and described below.

2.4.2 System Selection

Manage which apps are displayed and what shows in the Alerts and Calibration lists.

If you divide the applications into systems, you can limit the display to one system at a time so as to help locate a specific app. This is most useful when multiple satellites are in use. See section **11.3.2.3 Systems.**



2.4.3 Alert List

The Alert List shows current and unacknowledged alarms. See section **11.4 Alerts, Alarms Warnings and Errors**.

2.4.4 Calibration

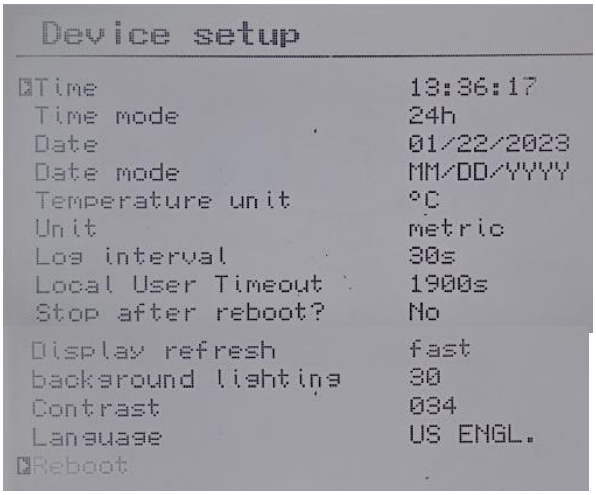
See **2.3 The CAL (Calibration) Button**. You must be logged on to use this command. See **2.4 The Menu Button**.

2.4.5 Setup

Most setup options must be configured using a browser connection. In the Application menu, you can choose a sensor and edit the alerts using the arrows to choose type, setpoint and delay or turn off the alert.

The **Setup/Device** menu has three sections; **Device setup, Network Settings and Save/Load Configuration**.

Device setup: Most of the device setup choices are intuitive. Choose an item to edit. Escape when done.



Copy this data to a USB for use with browser graphing feature on a Logbooks section below.

The ***log interval*** is the frequency of saved data. a spreadsheet, or use the connected PC. See the

Stop after reboot allows you to let power cycle or wait for human do you want the controller to resume *restored?*

the controller continue after a intervention. If power is lost, chemical feed after power is

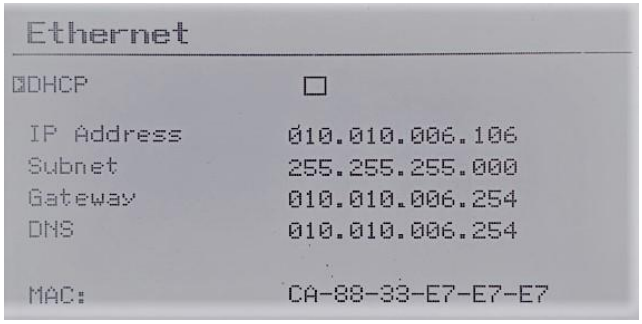
Language**:** Several languages are at a later date.

available. More may be added

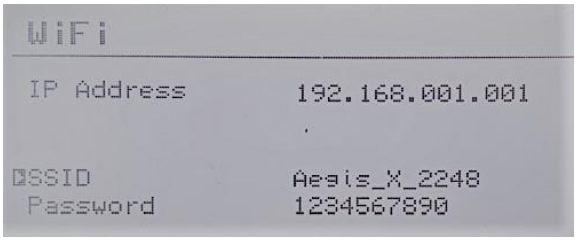
A ***Reboot*** will restart the controller time or sequence and clears alarms. This choice is not available to operator level users.

which clears out any owed

Network Settings: lets you choose DHCP to automatically set the controller addresses or manually enter your own addresses. DHCP will get the address as provided by the plant network. If not on the plant network, set up the addresses manually.



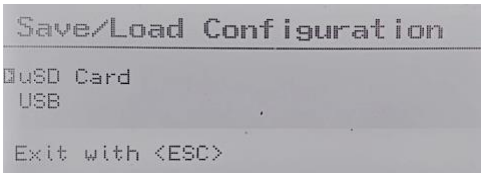
This menu is the same for WiFi as it is for Ethernet except WiFi does not have DHCP.



Select SSID (Service Set ID) and edit the name to avoid confusion if more than one controller is at an account. Cooling Tower 1, Boiler Room, etc.

The SSID is what you look for when trying to connect to the controller from your phone or PC. Edit the WiFi password here to deter unwanted users.

Save/Load Configuration: You can save the controller configuration to the uSD card in the controller, or a USB thumb drive to protect against loss or corruption of the file. The current configuration can also be downloaded to a WiFi connected device via the browser. See **11.3.4 Downloads**. (Choices are greyed out if not available. Wait ≈ 20 seconds for the controller to recognize a newly inserted thumb drive.)



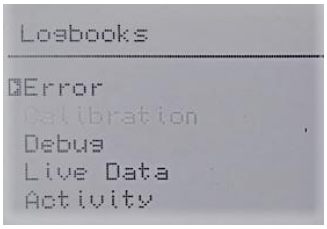
When loading a configuration, ensure that the driver cards in the controller are in the same slots as the new configuration. This includes the satellite slots. Load a configuration from an earlier saved version or from another controller (Cloning).

Setup/Applications: Use this menu to edit sensor setpoints and pump control settings. Not capable of creating an app.

Setup/Hardware: Use this menu to temporarily turn on or off (active/inactive) any digital output or temporarily set the output of a mA output.

2.4.6 Logbooks

Download Error messages, Live Data and Activity logs to a USB drive. All data is saved in CSV format (comma separated variables) for ease of import into Excel.



Error log example;

Date	Time	App Name	App ID	Transition	Alert Message	Alert Code	Alert Type	User ID	User Name	User Level
8/16/2022	14:45:24	Tower Blowdown	6	cleared	input app	220	none			
8/16/2022	14:54:14	Acid Pump	8	new	input app	220	error			
8/16/2022	14:54:14	PID Hypo	9	new	input app	220	error			

Activity log example:

Date	Time	ID	Message Type	Message	User Name
1/3/2023	13:58:39			Satellite Unit_1 start key pressed	none
1/3/2023	14:00:28			main unit reboot stop cleared	none
1/3/2023	14:01:53		remote user	logged in	Administrator
1/3/2023	14:02:44	AP01	configuration changed	limit_1 type set to disable	Administrator
1/3/2023	14:03:16	HW54	configuration changed	error mode driver set to app alarms	Administrator

Live Data Log;

App config. changed at	1/8/2023	17:15:00						
Number of apps	6							
	Descriptor	PID	0/4..20 mA Input	Alert Monitor	pH Input	DI XK1 test	Digital Control Test	DI XK1 test
	ItemId	AP00	AP01	AP02	AP03	AP05	AP06	HW00
	TypeId	284	1	286	1	8	289	48
	Unit	%	mA	sec	pH	sec		State
Date	Time							
1/8/2023	17:15:00	0	10.6	-21	6.93	276	83	595
1/8/2023	17:15:30	0	10.6	-51	6.96	306	113	625
1/8/2023	17:16:00	0	10.6	-81	6.99	336	143	655

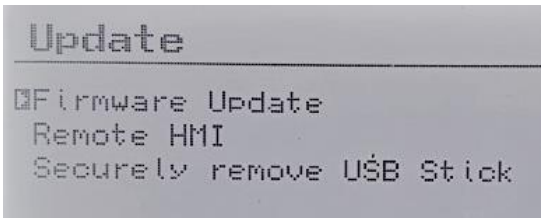
2.4.7 Update

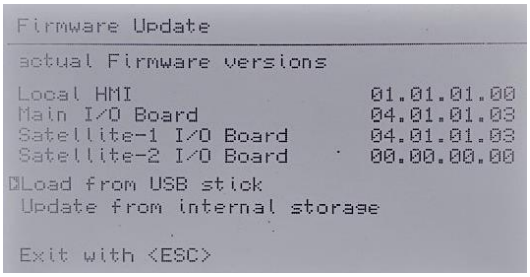
In the event a firmware update is needed, obtain the new firmware from ProMinent.

Save the current configuration prior to the update! See section **2.4.5 Setup**.

Load the 'Update' directory onto a USB drive, insert the drive into the USB port and use these instructions to load the new files.

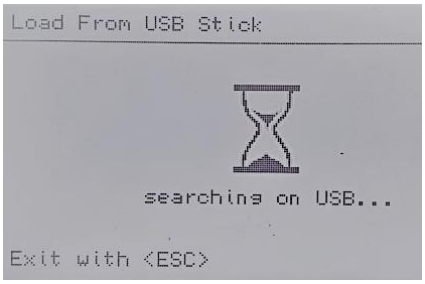
You must be logged in to use the update program. See section **2.4 The Menu Button**.

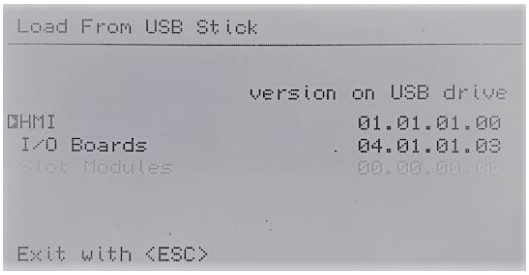




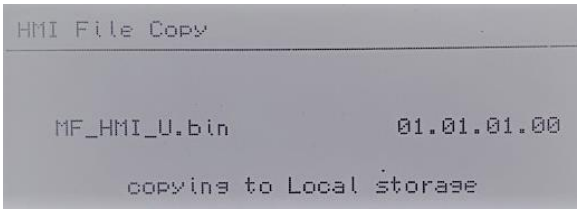
On the keypad, navigate to the Update directory and press OK to start the Firmware Update process. The screen shows the existing firmware versions of the Local HMI (for the keypad) and the controller firmware for the main and satellite(s) boards. With the cursor on **Load from USB stick**, press OK.

Local HMI update steps: (About 4 minutes to complete.) If the controller does not find the USB or cannot locate the files, retrace the steps above.





Once the files are located, note the versions for HMI and I/O Boards. Loading the Slot Modules is rare. Press OK to start the HMI loading process.



After a few minutes, the screen will darken and the controller will reboot.

Press the menu key, login and navigate to the Update screen as before. When you reach the Load from USB Stick page, move the cursor down to **I/O Boards** and press OK. The I/O Boards firmware pertains to all the I/O.

The screen will note that the DMB file is copying to the local storage, then see the **Update is running…**page**.**

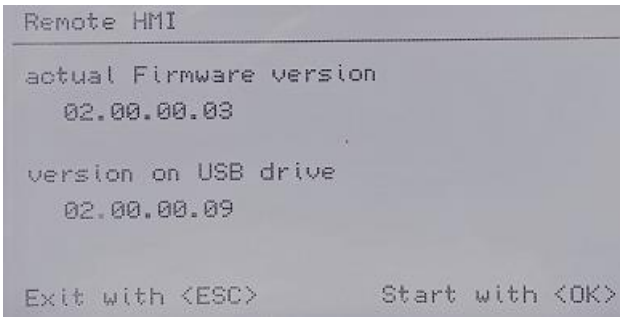
When done…

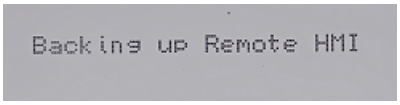
Press OK and then ESC until you reach the Update page.

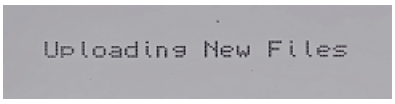
Choose **Remote HMI**. These files control the browser screens.

Remote HMI update steps: (Over 4 minutes to complete.)

Note the firmware versions. Press OK.



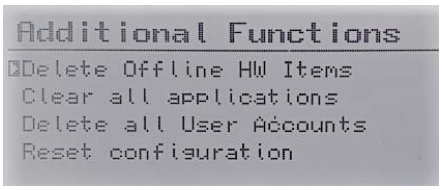




The Remote HMI will be backed up and upload the new files. ESC to exit.

Once completed, reload your configuration. See section **2.4.5 Setup**.

2.4.8 Additional Functions:



Delete Offline Hardware Items will remove unused boxes from the System Selection for the sake of clarity.

Clear all applications will remove all apps.

Delete all User Accounts will not delete the factory installed Administrator and does not affect the current password.

Reset Configuration will reset to the factory configuration. This configuration is controller specific based on the original order.

2.4.9 User Logout

Logs you out of the keypad. Has no bearing on browser users.

3 Identcode

All ProMinent products use an identification code (Identcode) product configuration system. The Identcode is an alpha-numeric string of characters, starting with a 4 digit code describing the basic product type, followed by as many digits as needed to describe all options. The 4 character designation for the Aegis X is AGIx.

AGIx	Version																	
	Regional Version																	
	EU	Europe																
	US	North America																
		Mounting Type																
		W	Wall															
			Version															
			0	with ProMinent logo														
				Function														
				CT	Cooling Tower													
				B1	Boiler													
				BC	Boiler/ cooling tower													
				PC	Pool controller (later release)													
				WW	Waste Water (later release)													
				A1	Agriculture and Irrigation (later release)													
					Device type													
					A	Main unit												
					B	Satellite (no display)												
					C	Main Hood Upper Part												
					D	Lower Part (W / Base Brd complete)												
					E	Satellite Hood Upper Part												
						Operating voltage												
						6	100-240V 50/60hz											
							24V (Disabled)											
							Communication Interface											
							W0	None (WIFI and LAN standard)										
							0	Satellite – No WiFi, No LAN, With CAN bus										
								Continued										

Expansion Slot 1

XX	None	
D1	Serial Sensor input - Monitor	Dual serial driver
D2	Serial Sensor input - 1 Blowdown	Dual serial driver
D3	Serial Sensor input - 2 Blowdown	Dual serial driver
L3	Cond/ Cond Temp	Dual conductivity driver
V1	mV/ mA / Temp input	mv/mA/Temp driver
C1	Cooling tower cond/temp monitor	Dual conductivity driver
C2	Cooling tower cond/temp 1 relay	Dual conductivity driver
C3	Cooling tower cond/temp 2 relay	Dual conductivity driver
H1	mA/ mA output	Dual mA output driver
J2	Dual boiler Cond 1 BLD	Dual conductivity driver
J3	Dual boiler Cond 2 BLD	Dual conductivity driver
K1	Condensate Cond/Temp Monitor	Dual conductivity driver
K2	Condensate Cond/Temp 1 BLD	Dual conductivity driver
K3	Condensate Cond/ Temp 2 BLD	Dual conductivity driver
AA	mA/ mA input monitor	Dual mA input driver
I1	mA/ mA input 1 control	Dual mA input driver
I2	mA/ mA input 2 control	Dual mA input driver
V2	mV/mV input monitor	mV/mV driver
E1	Dual pH monitor	Dual mV input driver
E2	Dual pH 1 control	Dual mV input driver
E3	Dual pH 2 control	Dual mV input driver
F1	Dual ORP monitor	Dual mV input driver
F2	Dual ORP 1 control	Dual mV input driver
F3	Dual ORP 2 control	Dual mV input driver
G1	pH/ORP monitor	Dual mV input driver
G2	pH /ORP dual control	Dual mV input driver
G3	pH /ORP pH control	Dual mV input driver
G4	pH / ORP ORP control	Dual mV input driver
CL	CLB (Disabled)	CLB driver

Expansion Slot 2

SAME AS SLOT 1

Expansion Slot 3

SAME AS SLOT 1

Expansion Slot 4

SAME AS SLOT 1

												Pump outputs						
												O	No presets					
												P	Power Relays					
												V	Digital Relays (frequency)					
												W	Combination					
													Continued					
													Prewired Plugs					
													0	None				
													1	One				
													2	Two				
													3	Three				
													4	Four				
													5	Five				
													6	Six				
														Outputs Inhibitor / Boiler feed				
														0	None			
														1	One			
														2	Two			
														3	Three			
														4	Four			
														5	Five			
														6	Six			
															Biocide Outputs			
															0	None		
															1	One		
															2	Two		
															3	Three		
															4	Four		
															5	Five		
															6	Six		
																Approval		
																7	MET	
																1	CE	
																8	CE + MET	
																9	CE + EAC (Russia)	
																6	UKCA (UK)	
																	Language	
																	DE	German
																	EN	English
																	ES	Spanish
																	FR	French

4 Safety and Responsibility

4.1 Introduction

Target group of document

General knowledge of measuring and control technology and the swimming pool technology is required in order to understand the document. Furthermore, the planning and use of measuring and control technology requires technical specialist knowledge, which is not communicated in this document. The minimum requirement of personnel is “trained user”. See Section **4.5 User qualifications** unless otherwise specified.

Assembly and operating instructions

The printed version of the assembly and operating instructions is naturally not updated. We would therefore ask you to regularly visit the manufacturer’s homepage www.ProMinent.us to find out about the new electronic versions of the assembly and operating instructions. These versions may contain, among other things, information about new fault remedies or spare parts.

4.2 Labelling of Warning Information

Introduction

These operating instructions provide information on the technical data and functions of the product. These operating instructions provide detailed warning information and are provided as clear step-by-step instructions.

The warning information and notes are categorized according to the following scheme. A number of different symbols are used to denote different situations. The symbols shown here serve only as examples.

DANGER!
Nature and source of the danger
Consequence: Fatal or very serious injuries.
Measure to be taken to avoid this danger.
Description of hazard
– Denotes an immediate threatening danger. If the situation is disregarded, it will result in fatal or very serious injuries.

WARNING!
Nature and source of the danger
Possible consequence: Fatal or very serious injuries.
Measure to be taken to avoid this danger.
– Denotes a possibly hazardous situation. If the situation is disregarded, it could result in fatal or very serious injuries.

CAUTION!
Nature and source of the danger
Possible consequence: Slight or minor injuries. Material damage.
Measure to be taken to avoid this danger.
– Denotes a possibly hazardous situation. If the situation is disregarded, it could result in slight or minor injuries. May also be used as a warning about material damage.

NOTICE!

Nature and source of the danger

Damage to the product or its surroundings.

Measure to be taken to avoid this danger.

– Denotes a possibly damaging situation. If the situation is disregarded, the product or an object in its vicinity could be damaged.

Type of information

Hints on use and additional information.

Source of the information. Additional measures.

– *Denotes hints on use and other useful information. It does not indicate a hazardous or damaging situation.*

4.3 General Safety Information

WARNING! Live Parts!

Possible consequence: Fatal or very serious injuries

– Measure: Ensure that the devices are de-energized before opening the housing or carrying out assembly work.
– Disconnect damaged or faulty devices from the power supply, as well as devices that have been tampered with.
– Make sure that the process that you are measuring and controlling remains safe.

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

WARNING!
Unauthorised access!
Possible consequence: Fatal or very serious injuries.

- Measure: Ensure that there can be no unauthorised access to the device.

WARNING!
Operating faults!
Possible consequence: Fatal or very serious injuries.

- Ensure that the device is only operated by adequately qualified and technically expert personnel.
- Please also observe the operating instructions for sensors and fittings and any other units which may be fitted, such as sample water pumps etc.
- The operator is responsible for ensuring that personnel are qualified.

NOTICE!
Correct sensor operation
Damage to the product or its surroundings.

- Correct measurement and metering is only possible if the sensor is working perfectly.
- Check and calibrate the sensor regularly.

Protection of radio reception
This equipment is not intended to be used in residential areas and cannot guarantee appropriate protection of radio reception in these environments.

4.4 Intended Use

The unit is designed to measure and regulate water treatment. The labelling of the measured variables is indicated in the controller display and is absolutely binding.

The protection provided by the device can be impaired if this device is sued in a manner not specified in the operating instructions.

Only use the unit in accordance with the technical details and specifications provided in these operating instructions and in the operating instructions for the individual components (such as sensors, fittings, calibrations devices, metering pumps, etc.

The controller can be used in processes which have a time constant of > 30 seconds.

All other uses or modifications are prohibited.

Interference resistance

The device complies with the interference resistance provisions in accordance with EN 61326-1 and is intended for use in industrial electromagnetic environments and in residential areas.

WARNING!

Disturbance signal emissions class A or B / Protection for radio reception

The device complies with the disturbance signal emissions test requirements for residential areas as a Class B (Residential area), Group 1 unit.

With devices with communication interface

- B = Profibus,
- E = LAN,
- G = Profinet,

the unit only complies with the limit values for a class A device (other areas apart from residential), Group 1.

This device is then not intended to be used in residential areas and cannot guarantee appropriate protection of radio reception in these environments.

4.5 Users' Qualifications

WARNING!

Danger of injury to inadequately qualified personnel!

The operator of the plant / device is responsible for ensuring that the qualifications are fulfilled.

If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage.

All work on the unit should therefore only be conducted by qualified personnel.

Unqualified personnel should be kept away from the hazard zone

The pertinent accident prevention regulations, as well as all other generally acknowledged safety regulations, must be adhered to.

4.6 Training

Training	Definition
Instructed personnel	An instructed person is a person who has been instructed and, if required, trained in the tasks assigned to him/ her and possible dangers that could result from improper behavior, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfills the requirements of an instructed person and who has also received additional training specific to the system from ProMinent or another authorized distribution partner.
Trained qualified personnel	A qualified employee is deemed to be a person who is able to assess the tasks assigned to him/her and recognize possible hazards based on his/her training, knowledge and experience, as well as knowledge of pertinent regulations. The assessment of a person's technical training can also be based on several years of work in the relevant field.
Electrician	Electricians are deemed to be people, who are able to complete work on electrical systems and recognize and avoid possible hazards independently based on his/her technical training and experience, as well as knowledge of pertinent standards and regulations. Electricians should be specifically trained for the working environment in which they are employed and know the relevant standards and regulations. Electricians must comply with the provisions of the applicable statutory directives on accident prevention.
Electrical technician	An electrical technician is able to complete work on electrical systems and recognize and avoid possible dangers independently based on his technical training and experience as well as knowledge of pertinent standards and regulations. An electrical technician must be able to perform the tasks assigned to him independently with the assistance of drawing documentation, parts lists, terminal and circuit diagrams. The electrical technician must be specifically trained for the working environment in which the electrical technician is employed and be conversant with the relevant standards and regulations
Customer Service department	Customer Service department refers to service technicians, who have received proven training and have been authorized by ProMinent to work on the system.

4.7 Warranty Guide

As of this date, the physical controller is warranted for 2 years from the date of purchase as explained in the complete ProMinent warranty. The complete warranty is found in the ProMinent catalog Introduction and is available online at www.ProMinent.us. Changes to this warranty may not be shown in this manual.

Sensors are typically warranted for 8 months.

The warranty does not apply to goods that become defective for the reason of:

a) Unsuitable or unreasonable use
b) Faulty assembly, installation or servicing by the purchaser or any third party
c) Faulty or careless handling
d) Repairs performed without permission from the ProMinent technical department
e) Acts of God; (Flood, Earthquake, Tornado, etc.)

5 Functional Description

The DULCOMETER® AEGIS X is a Multi-parameter control and analysis platform from ProMinent. In the remainder of this document, the term 'controller' is consistently used for the DULCOMETER® AEGIS X. The controller has been developed for continuous measurement and control of liquid analysis parameters in water treatment processes in industry. The controller can operate together with conventional analog and digital sensors and actuators. The controller is also equipped to communicate with some sensors (CTFSensor) using a proprietary serial bus. CAN bus is also used to communicate with pumps, sensors and 'satellite' controllers to enhance efficiency of large projects. Modbus is available for Pyxis sensors and communication with local customer systems.

The twelve power relays (6 in the main controller box and 6 in the included satellite) can be used to control pumps, solenoids and relays up to 5 amps with limitations as described in the installation section. See section **9.6.6 Wiring Relays 1, 2 and 3 Using an External Power Source.**

Typical applications:

- Cooling water treatment
- Data and event logger
- Boiler water treatment
- Industrial process water treatment
- Potable water treatment
- Waste water treatment
- pH and temperature compensation for free chlorine measurement

Standard Features:

- One main controller and one satellite coupled via CAN bus
- A nine button keypad for local operator interface.
- 8 square inch OLED display
- Sixteen multi-purpose digital inputs for turbine, contact water meters and limit switches.
- Twelve Power Output Relays with On-Off, Captured Sample, Pulse Width Modulation, PID, Percent Time, Timed Event, Blowdown, Watermeter based, Timed Cycling, Two Way, Prebleed Lockout, Bleed & Feed and Bleed then Feed programs.
- Saving and transfer (cloning) of controller configuration via USB.
- Upgrading of the firmware using USB Flash Drive or via Ethernet from your laptop.
- Ethernet LAN connection for remote operation or configuration.
- WiFi wireless network for smart phone and PC connection.
- CAN bus connection for communication with pumps, sensors and expansion satellites
- MODBUS connections for Pyxis sensors (Main controller only)
- Data-logging all I/O at 30 second rate.
- Graphing sensor and relay data.
- Logging live data, operator activity, errors and debug information for ProMinent technical.

Optional accessories:

- Up to eight analog sensor input/output modules including:

INPUT MODULE TYPES

Dual pH/ORP with temperature
Single pH/ORP with temperature and one 4-20mA input
Dual Boiler Conductivity (Conductive)
Dual Conductivity/Temperature/Flowswitch (CTFS)
Dual 4-20mA Input

OUTPUT MODULE TYPES

Dual 4-20mA output

- Signals from most 4-20mA devices are compatible with the 4-20mA input. Sensors include: All ProMinent amperometric sensors, (Chlorine, Bromine, Peracetic Acid, etc.), Toroidal Conductivity and fluorometer.

6 Mounting and Installation

User qualification, mechanical installation: trained qualified personnel, see Chapter **4.5 Users' qualifications**.

CAUTION!

Controller must be installed in a manner that the power plug can be pulled out easily or the power disconnect switch can be reached easily.

NOTICE

Mounting position and conditions

The controller is rated for IP 65/66 liquid protection, and is equivalent to NEMA 4X (indoor) for air tightness. These standards are only achieved if all seals and threaded connectors are correctly rated and installed.

Electrical installation should only be performed after mechanical installation.

Ensure that there is unimpeded access for operation

Secure, low-vibration installation

Avoid direct sunlight

Permissible ambient temperature of the controller at the installation location: -5 to 50°C (23 to 122°F) at max. 95% relative air humidity (non-condensing)

Take into consideration the permissible ambient temperature of the connected sensors and other components.

The controller is only suitable for operation in closed rooms. If operated outside, the controller must be protected against the environment by a suitable protective enclosure

All above conditions apply at or below an altitude of 2,000 meters or 6,500'.

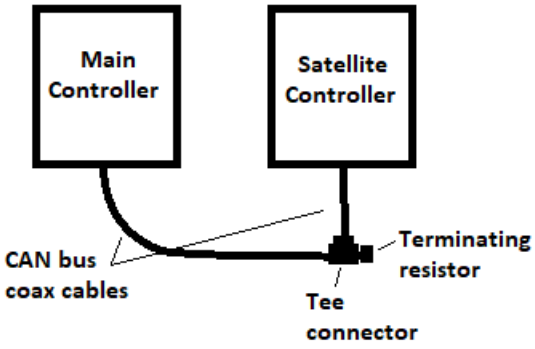
Mounting position

- Install the Aegis X at eye level to make operation easiest
- The controller is wall-mounted as standard. **The 'hood' is hinged on the left-hand side**.
- Always install the controller horizontally, so that the cable entries are facing downwards.
- Leave sufficient free space for cables and access to any sensors or sample plumbing mounted below.

6.1 Scope of supply

The following components are included as standard:

Controller: AG1x
Assembly material, complete
Operating Manual on Flash Drive
General safety notes
Satellite with CAN bus network cables, complete



6.2 Mechanical installation

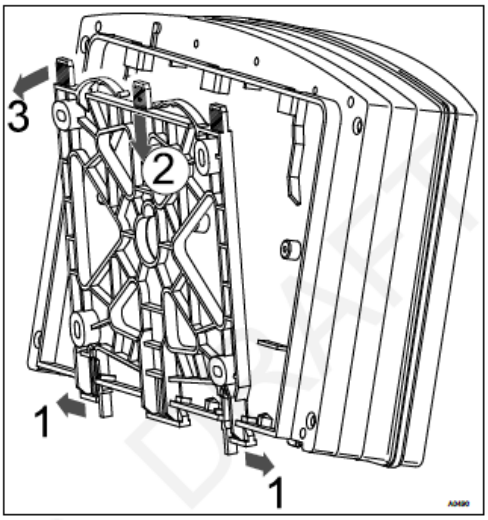
6.2.1 Wall mounting

Mounting materials (contained in the scope of supply)

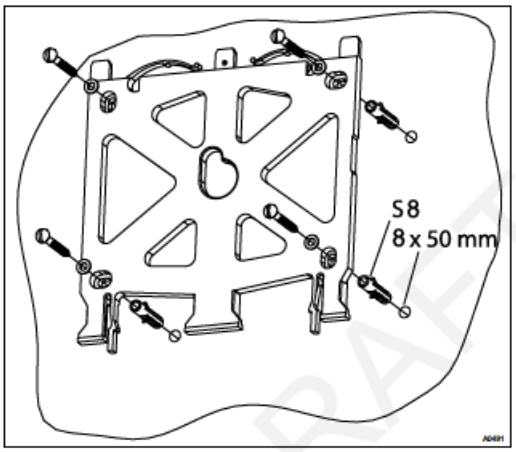
- 1 x wall bracket
- 4 x PT screws 5 x 35 mm
- 4 x washers 5.3
- 4 x wall anchors Ø 8 mm, plastic

Wall mounting

1. Remove the wall bracket from the housing
2. Press the two snap hooks (1) outwards
   ⇨ The wall bracket snaps slightly downwards.
3. Push the wall bracket downwards (2) to clear the housing and tilt it out (3)

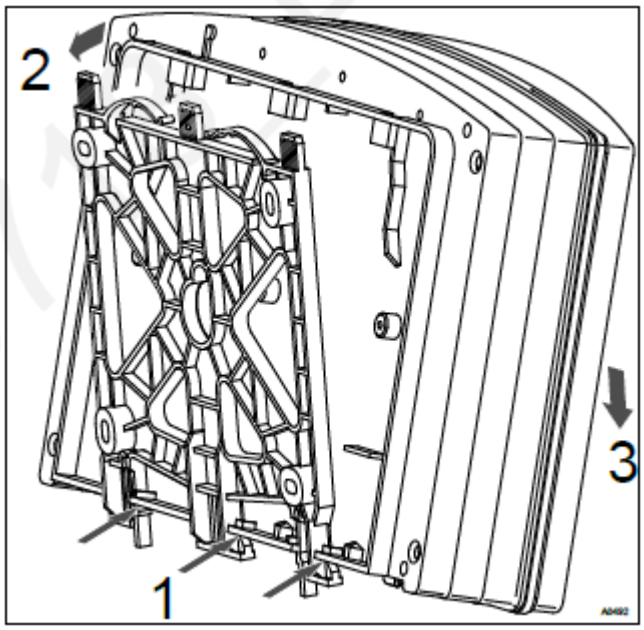


4. Use the wall bracket as a drilling template to mark the positions of 4 drill holes.
5. Drill the holes: Ø 8mm (5/16”), depth = 50mm (1.96”)



Connecting the controller to the bracket

1. Screw the wall bracket into position using the washers provided. If needed, use the wall anchors provided.
2. Hook the bottom of the controller (1) into the wall bracket
3. Lightly press the housing at the top (2) against the wall bracket
4. Then check that the housing is hooked in at the top and press down (3) until it clicks into place.



6.3 Electrical Installation

User qualification, see Chapter **4.5 Users' qualifications**

NOTICE

Moisture at the contact points

It is important that you use suitable measures to protect plugs, cables and terminals from moisture and potential corrosion. Moisture at the contact points can interfere with the operation of the controller.

WARNING! Safe operating status

Both hardware and software safety precautions must be taken to ensure that the Aegis X adopts a safe operating condition in the event of a fault.

Use limit switches, mechanical locks, and other appropriate safety devices.

During installation the device must not be electrically live.

The installation must only be carried out by technically trained personnel.

Observe the technical data in these instructions.

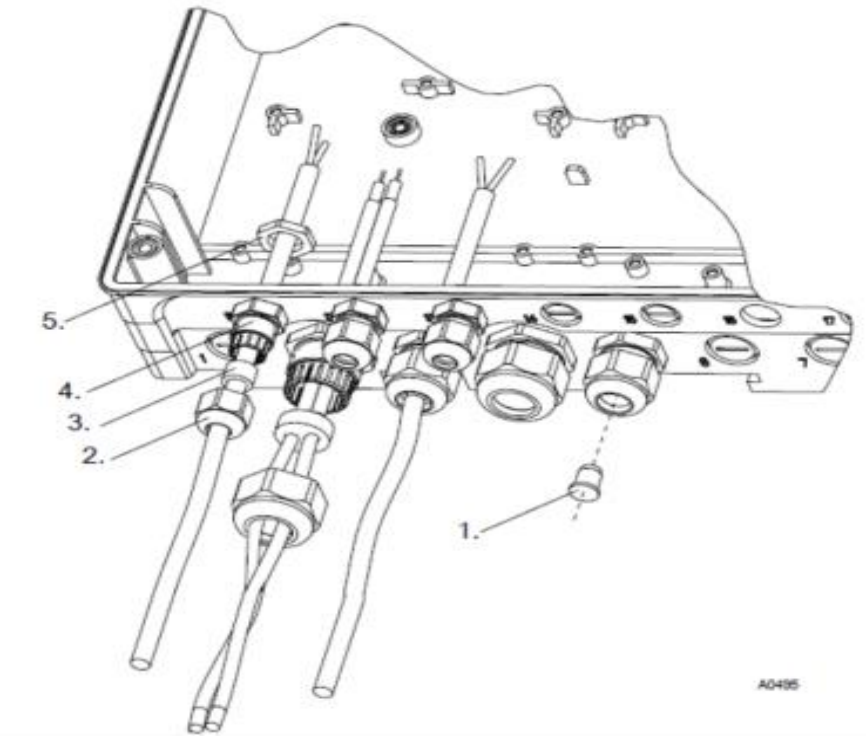
6.3.1 Specification of the cable grips and conduit entries

Sensor Seals and Termination Procedure

Select the correct fitting seals for the controller's cable openings. Seal the open holes with blanking plugs in the cord glands as shown. This is the only way to ensure an acceptable air and moisture seal. **Non-sealing dust caps are not effective for preventing non-warranty damage from moisture, corrosion or insects.** Use the parts section to order replacement parts.

Ensure that wires are not under tension when wiring is completed.

Terminating power to the controller or out to external devices is covered in Section 9 Power In and Relay Output Termination.



7 Communication

Using a PC or Smartphone to communicate with your controller greatly enhances the ability to manage your water treatment project. A PC offers a large screen and a mouse while a cell phone offers the freedom to connect quickly and it fits into your pocket. Tablets are a great trade-off offering advantages from both sides.

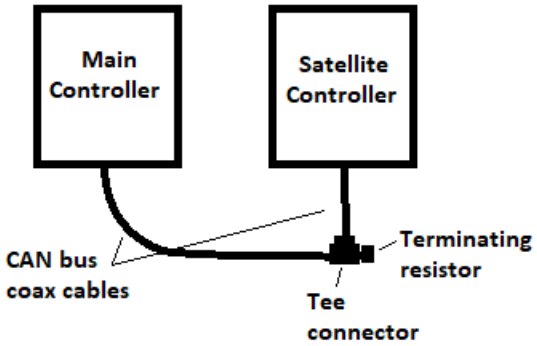
All of these devices allow access to monitoring the process and editing the programming.

The Aegis X can communicate via Ethernet and WiFi simultaneously. Network connections can be used for programming, configuration, calibration, graphing, downloading data, monitoring program control status, alarms, installing a new program or saving the current program, and updating the software.

Use Ethernet to allow controller access to plant control rooms and administrators as well as remote access via the Internet to any user anywhere there is Internet.

See section **7.1 Setting Up a WiFi Connection** and section **7.2 Setting up a LAN Connection**.

CAN bus provides direct communication between a main controller and multiple satellites. Sensors and pumps may be added in future software upgrades.



7.1 Setting Up a WiFi Connection

A **WiFi** connection eliminates cables and the need to set your IP address. Use a PC or smartphone to wirelessly connect for easy access to the controller.

There are two steps needed to fully connect to the controller.

Step 1: Use your device to find the controller's WiFi, create a wireless network and connect the two.

Step 2, Enter the IP address of the controller in a browser app. Note: All Aegis controllers within WiFi range will show as connection choices. Follow the instructions below to choose the correct unit.

Step 1

Step 1 is provided in two parts, **7.1.1 WiFi Using a PC or Tablet** and **7.1.2 WiFi Using a Smartphone**

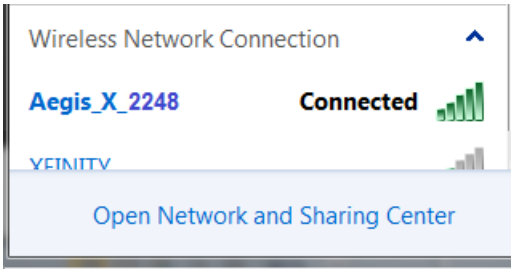
7.1.1 WiFi Using a PC or Tablet:

Click on the **WiFi** icon on your desktop to see a list of available WiFi devices.

Click on the Aegis_X_nnnn choice and press the Connect button.

The numbers nnnn are taken from the last 4 digits of the controller serial number. The serial number is located on a sticker on the outside of the AegisX. This unique name allows you to differentiate between controllers when more than one is within the **WiFi** range of your device. In the example here, the controller SN ends in 2248. Further simplify identifying nearby controllers by changing the WiFi name. **Aegis X 2248** could become **Aegis X Tower 1** for example.

You are now on the AegisX **WiFi** network. You have established a path between the two devices.



Next, you need to open a browser session to be able to communicate with the controller. This step requires you to enter the IP address of the AegisX controller.

Continue with section **7.1.3 Opening the Browser page using WiFi.**

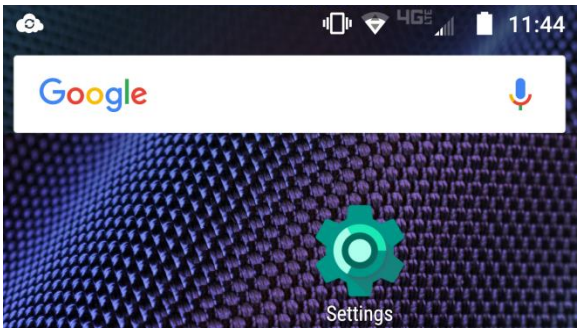
If you experience LAN or WiFi connection problems, try updating your browser to the latest version. Older versions may not be compatible. You can also turn on airplane mode to help your device limit the WiFi search. This is especially helpful if you are near other WiFi signals that you typically use.

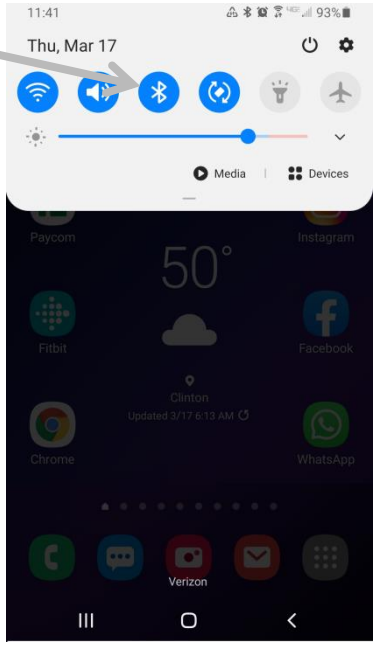
7.1.2 WiFi Using a Smartphone

The following are instructions for use with an Android or IPhone device.

7.1.2.1 Setting up WiFi using an Android phone

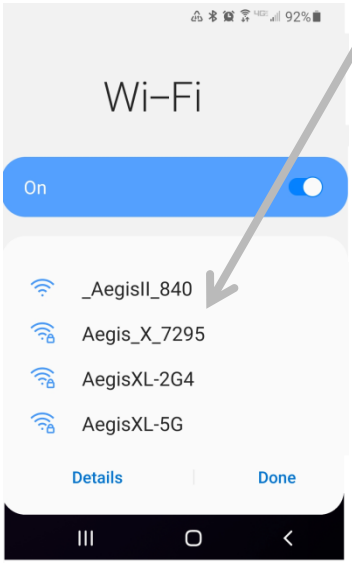
From your home page, press the settings button then choose Wi-Fi.



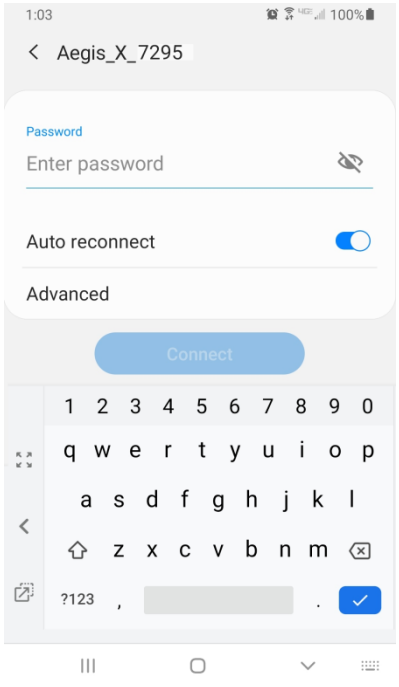


There may be more than one controller nearby. Choose your controller by comparing the serial numbers last 4 digits. The controller serial number is on a tag on the side of the controller.

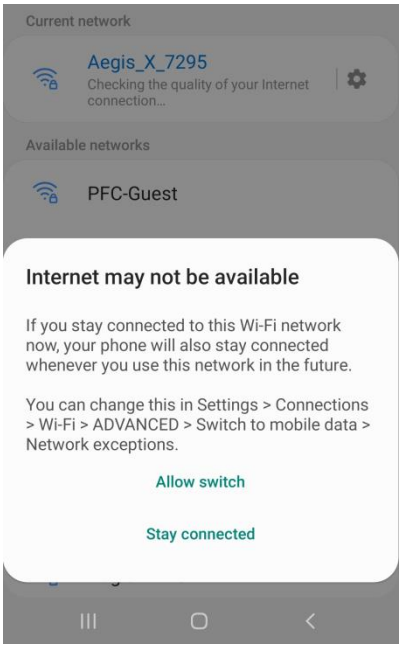
Available choices



Enter the password



Select 'Stay connected'

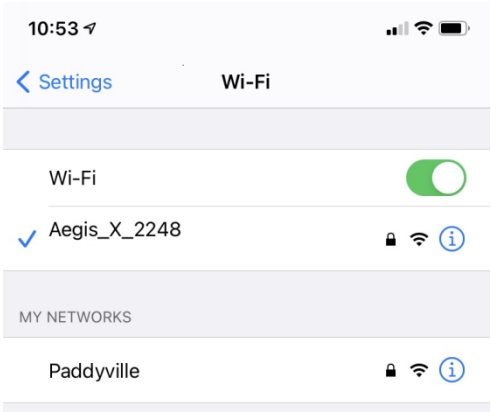


Continue with section **7.1.3 Opening the Browser page using WiFi**

7.1.2.2 Setting up WiFi using an IPhone

To connect your IPhone to an AegisX controller, make a **WiFi** connection.

Use the Settings menu to navigate to Wi-Fi and select the AegisX controller.

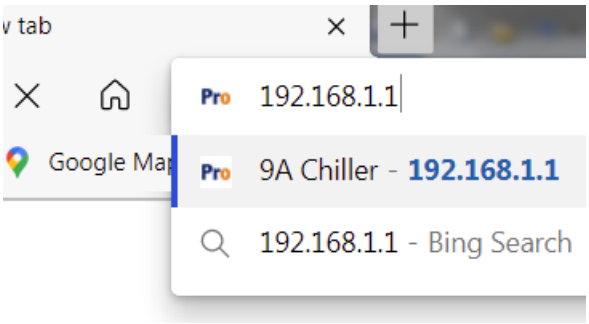


If there are more than one AegisX nearby, you will need to verify the controller by comparing the name with the last 4 digits of the serial number located on the side of the controller.

Continue with section **7.1.3 Opening the Browser page using WiFi**

7.1.3 Opening the Browser page using WiFi (Step 2)

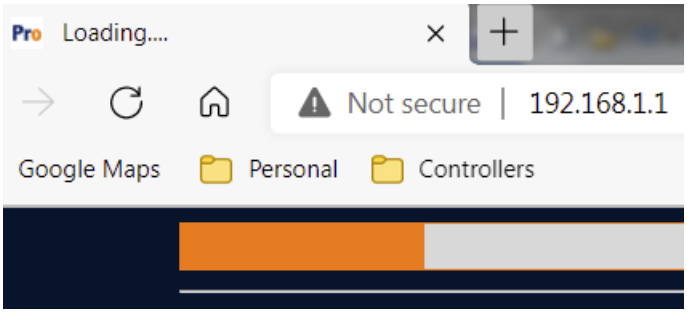
Once a WiFi network is established between the controller and your phone or PC, continue here with step 2.



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 WiFi address is 192.168.1.1. **This cannot be changed.**

If successful, you will see the loading status bar.



Once connected, you can see values and status of many I/O points but you will not be able to edit or make programming changes without logging in. The logon and programming procedures are explained in section **11.2 Logging On**.

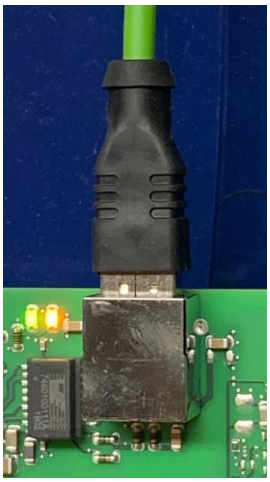
If you experience LAN or WiFi connection problems, try updating your browser to the latest version. Older versions may not be compatible. You can also turn on airplane mode to help your device limit the WiFi search. This is especially helpful if you are near other WiFi signals that you typically use.

7.2 Setting Up A LAN Connection

The most common connection is a physical Local Area Network (LAN) connection. This requires an Ethernet cable (provided) and you will need to set up the Ethernet port address on your device to be compatible with the address of the controller.

Use the included **special green Ethernet cable** to attach to the LAN port on your PC and to the LAN port on the door of the controller. A green light should be seen on your PC next to the connection. The amber light will blink with each packet that passes by in either direction.

Round 4 pin M12 connector



Open the controller and note that the LAN green and amber lights are lit on the back of the door next to the RJ45 port.

NOTICE

The Ethernet cable no longer needs to be a 'crossover' type cable. However, please note that the **Aegis X controllers require a recent version of whichever Browser you choose to use.**

7.2.1 Connect to the Plant LAN Using DHCP

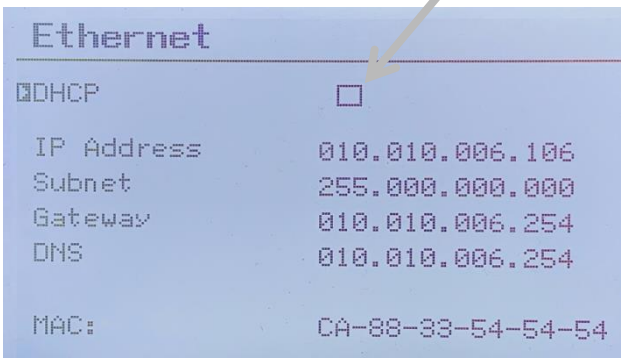
AegisX controllers can communicate directly with a PC or be part of the customer's network. Typically, the plant IT department will utilize the Dynamic Host Communication Program (DHCP) to add a new device to their network.

DHCP can be engaged from the keypad. Press Menu, Setup, Device, Network Settings and Ethernet. Check the DHCP box.

7.2.2 Determine the LAN IP address of the controller

When connecting directly to an AegisX via an Ethernet cable, the only devices on the LAN are your PC and the controller. In order to communicate, they also need to have proper addressing and compatible software. The default LAN IP address of the AegisX is 10.10.6.106.

In the event that the controller address has been modified, use the keypad to see the current address. Press the menu key then Choose Setup, Device, Network Settings and Ethernet.



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 this controller address.

If you experience LAN or WiFi connection problems, try updating your browser to the latest version. Older versions may not be compatible.

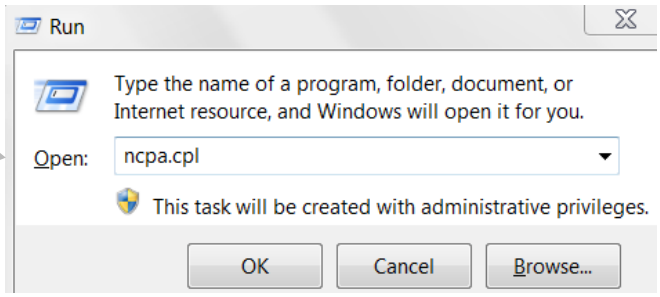
To set up the IP address on your PC using Network Connection Properties, follow these steps.

Hold down the Windows key  while you press the letter 'R' to open a "Run" window.

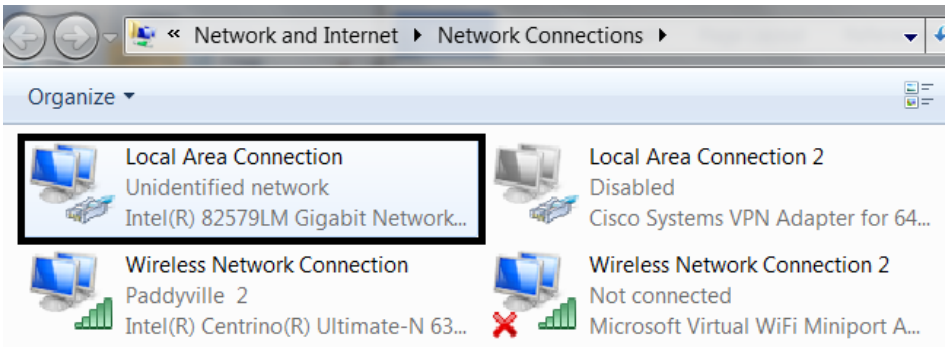
Next, enter '**ncpa.cpl**' in the Open: box.

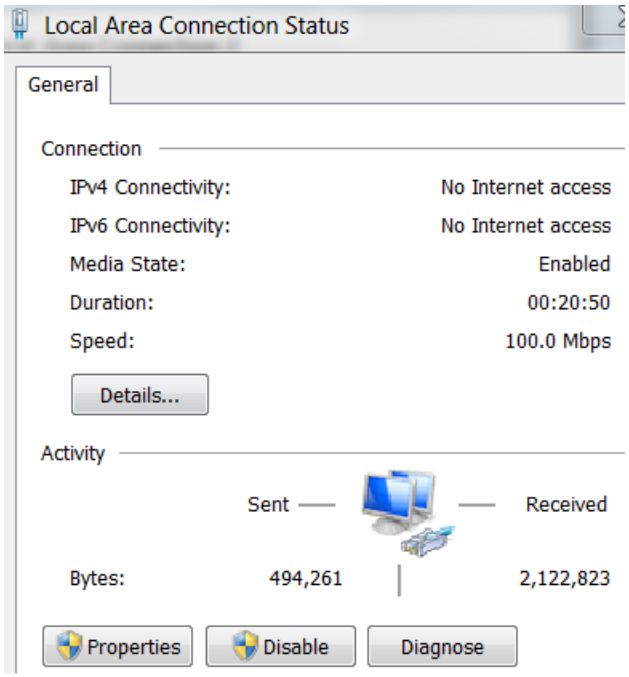
(This command is not case sensitive.)

Press OK.

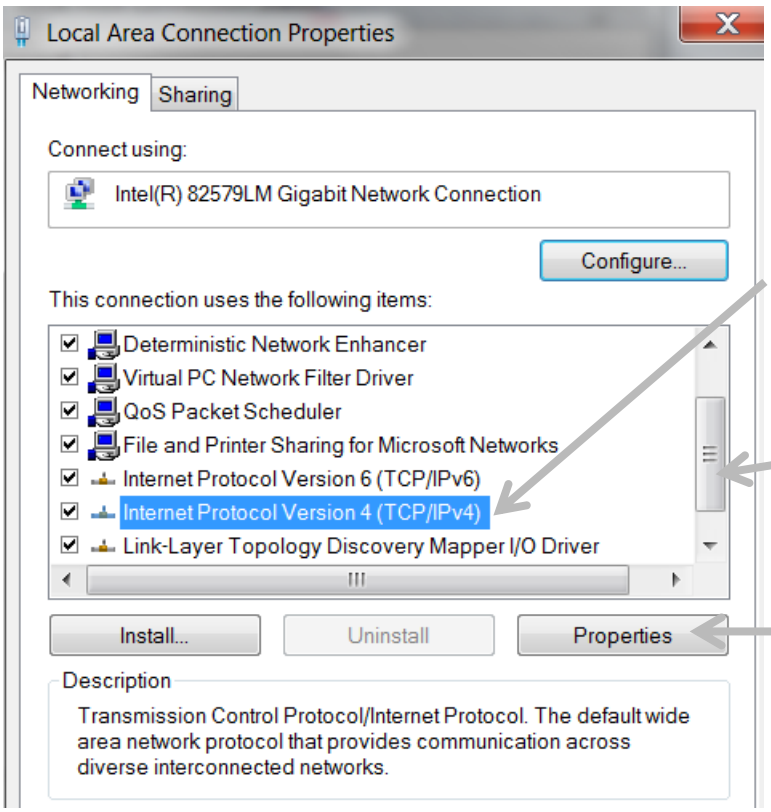


Double click on the Local Area Connection that has a status of 'Unidentified network'





Select ‘Properties’.

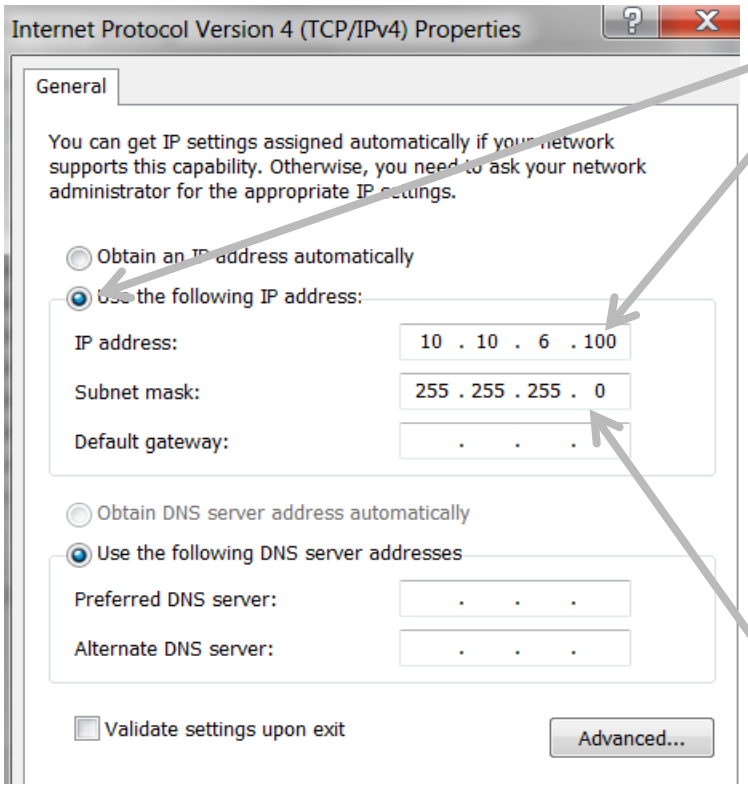


In the next window, select (highlight) ‘Internet Protocol Version 4.

DO NOT UNCHECK IT!

Often times finding the choice requires help from the slider bar.

Press ‘Properties’ again.



Select the ‘Use the following IP address:’ oblisk and enter an **IP address** and **Subnet mask** as shown.

Notice that the address for your PC is now 10.10.6.100. The controller address is 10.10.6.106. **The first three numbers must be the same.** The last number makes then unique.

If the controller is or has been on the customer network, it will most likely have a different address. Rather than change the controller and have to change it back, consider changing your PC as we have just shown.

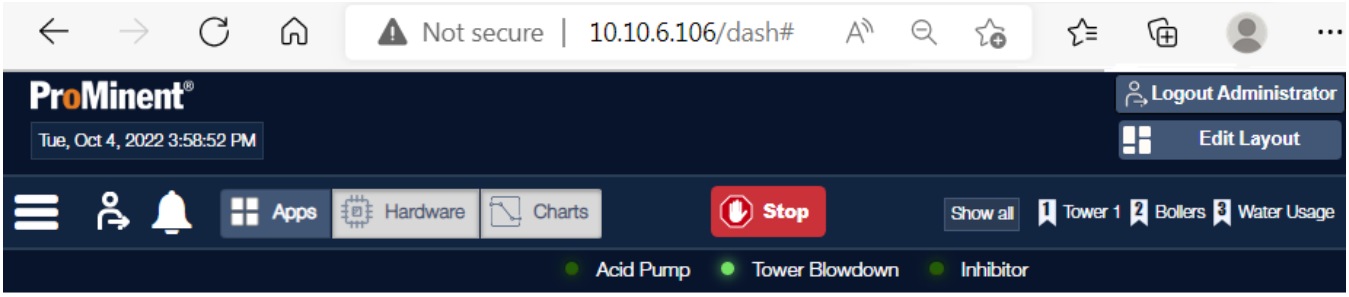
Be sure to make the first three numbers match the controller address.

The Subnet Mask must be as shown exactly; 255 255 255 0

Leave all other boxes blank and press Submit.

Now that a network is setup between your PC and the controller, open a browser and enter the controller LAN address, 10.10.6.106. This is the default address from the factory. It may have been edited since then. This address is found on the controller. See section **7.2.2 Determine the LAN IP Address of the Controller.**

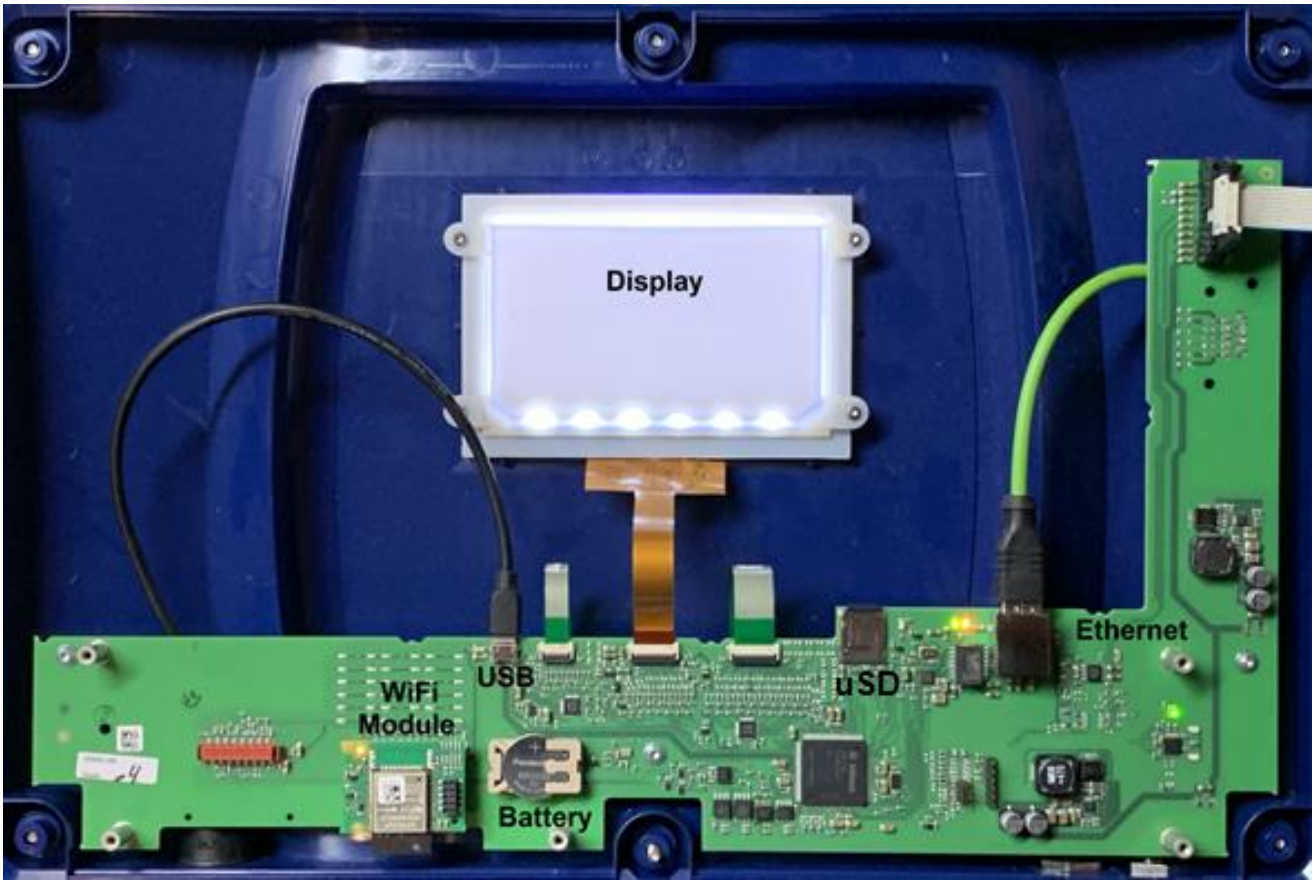
Once connected, you can see values and status of many I/O points but you will not be able to edit or make programming changes without logging in. The logon and programming procedures are explained in section **11.2 Logging On**.



8 General Layout and Terminal Diagrams

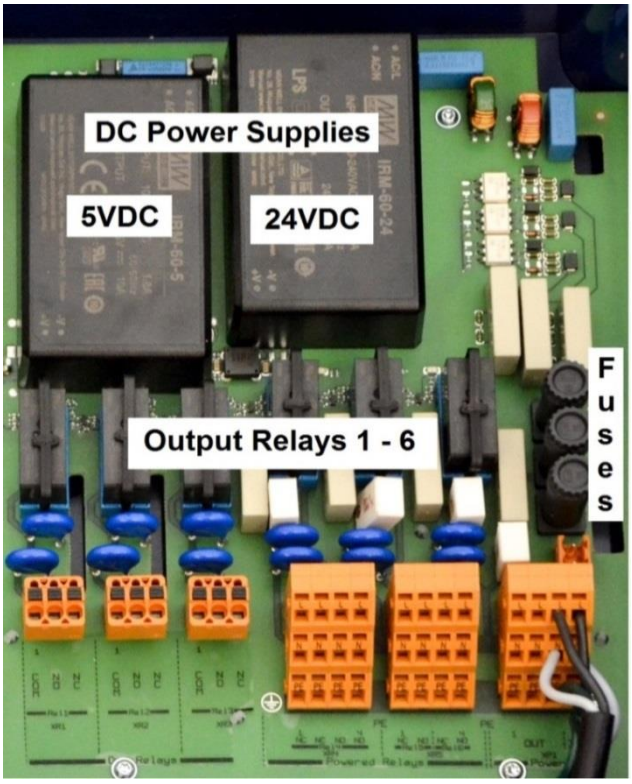
The pictures in this section show general position of electronic components and wiring terminations.

Hood Layout



Base Layout

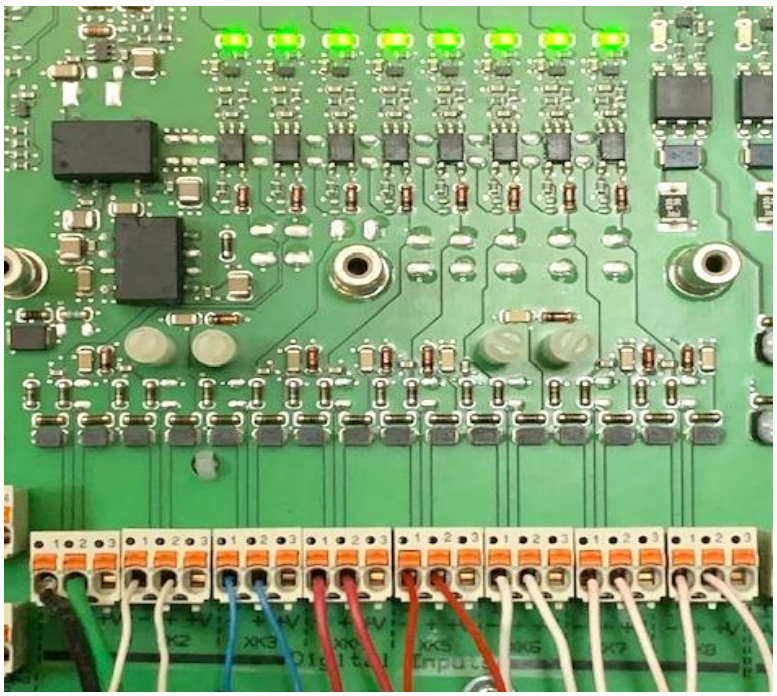
Controller power supply with safety cover removed.



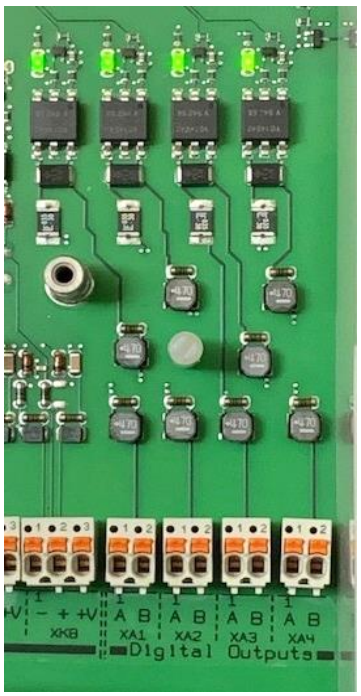
8.1 Digital input and digital output relay status indicators

Display, keypad and LED output status indicators.

Digital Inputs (8) shown with status LEDs on.



Digital Outputs (4) shown with status LED indicators on.

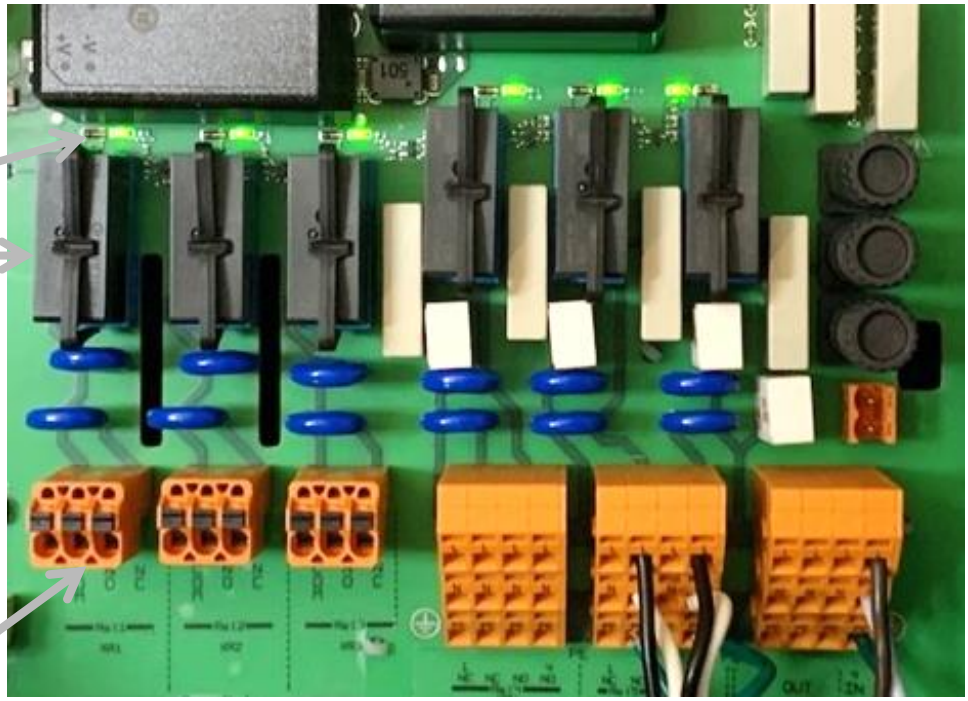


Output relays 1 through 6 shown with all status LEDs on.

Relay indicator LEDs are on when relay is energized.

Physical relays

The fuses, relays and relay indicators are located under the power supply cover. Relays are rated for 5VDC coil and 16Amp 250VAC output. The surrounding circuitry is not rated for 16Amps! See section **16 Controller Technical Data** for ratings.



Relay terminals

Relay outputs are typically used to supply power to pumps and bleed solenoid valves, etc.
See also next section **9 Wiring Inputs and Outputs**.

9 Wiring Inputs and Outputs

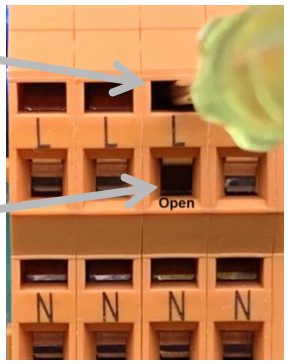
9.1 Overview

Inputs and Outputs are each broken down into four categories; Analog Inputs, Analog Outputs, Digital Inputs and Digital Outputs. Digital signals will be further separated into On/Off, low frequency and high frequency. Discrete signals (wired directly to the controller) are described first, then we will cover signals provided via a network cable like CAN bus or MODBUS.

There are five input modules and one output module. All are covered in the following sections.

9.1.1 Using Terminals

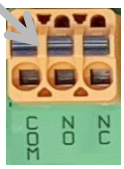
To enter wires into the terminal blocks, insert a small screwdriver or similar, into the spring box opening as shown, then push up on the screwdriver handle. This will force the spring-loaded metal slider downwards and open the wire grip.



To enter wires into the terminal blocks, depress the spring-loaded tab.

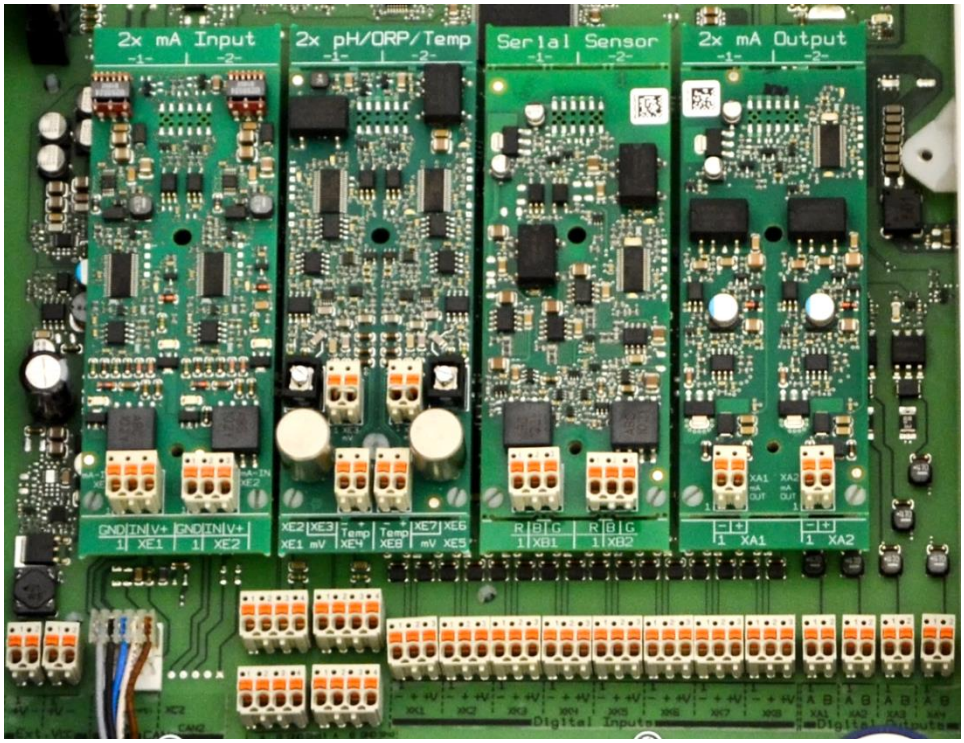
The orange output terminals accept a **maximum** of 12-gauge wire**.**

The low voltage terminal blocks accept a **maximum** of 14-gauge wire**.**



9.1.2 Wiring Sensors to the Controller

Sensors can be analog, like pH or Chlorine, or digital, like a contacting head watermeter or limit switch.
Digital signals to the controller attach to the lower printed circuit board (PCB). Analog signals wire to expansion modules.



Direct connection of analog sensors requires a module as shown here. (Sensors that connect via a network cable are discussed in section 11).

There are six module card types and four module slots. The slots can be filled with any combination of the six modules.
Each module and its accompanying sensors are discussed at length below.

9.2 Analog Inputs

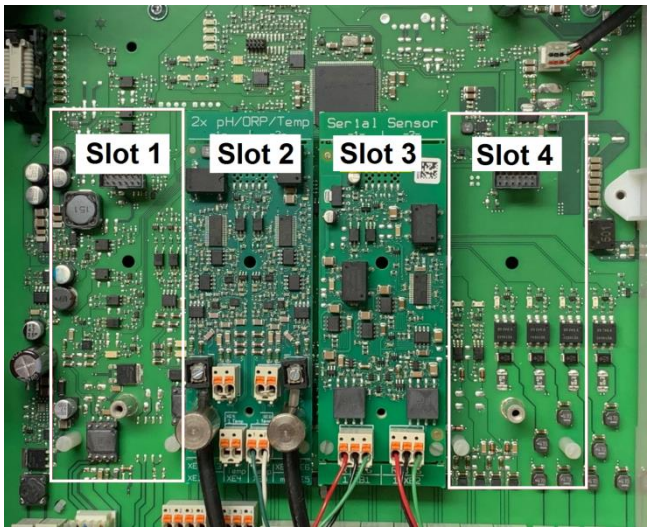
Analog signals wired directly to the controller (discrete analog signals) are covered in this section. Signals from network connections are covered in the Network section.

The discrete analog signals require input modules. Different sensors require different module types. This section describes the five input modules and the sensors they serve. The mA output module follows in the next section.

Input modules types:

Dual Serial Sensor Input Module (CTFs-LPR)
pH/ORP Temperature and mA Input Module
Dual mA Input Module
Dual Conductivity/Temperature Input Module
Dual pH/ORP Temperature Input Module

This view of the expansion module area offers detail of empty slots 1 and 4.



In this example, a Dual pH/ORP Temperature Input Module is shown in slot #2 and a Dual Serial Sensor Input Module (CTFs-LPR) is shown in slot #3.

9.2.1 Analog Module types

Analog sensor inputs and outputs require the use of various module types. ProMinent amperometric sensors like chlorine and paracetic acid as well as toroidal conductivity, Pyxis and Little Dipper sensors all require a dual **mA input** module.
Our tower conductivity/temperature/flowswitch (CTFS) and corrosion rate sensors use a **serial sensor** module.
A boiler or hot water conductivity sensor requires a **conductivty** module.
ORP and pH sensors use a **mV input** module.
A fifth input module type has one **mV and one mA input**. This module is used for pH and chlorine sensors allowing for pH compensation of the chlorine reading.
A **4-20mA output** module is the sixth card.

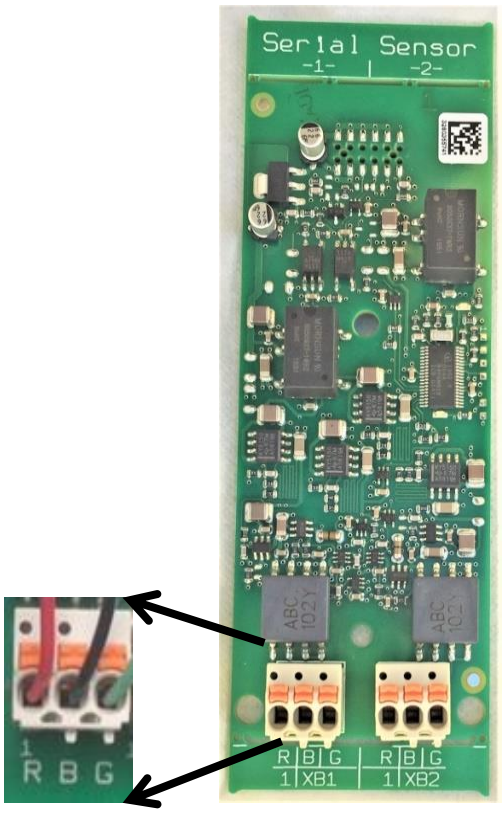
9.2.2 Dual Serial Input Module (CTFs-LPR)

Only certified ProMinent serial sensors; **CTFS** (Conductivity Temperature Flowswitch Serial), and **Log R serial corrosion rate** may be used with these inputs.

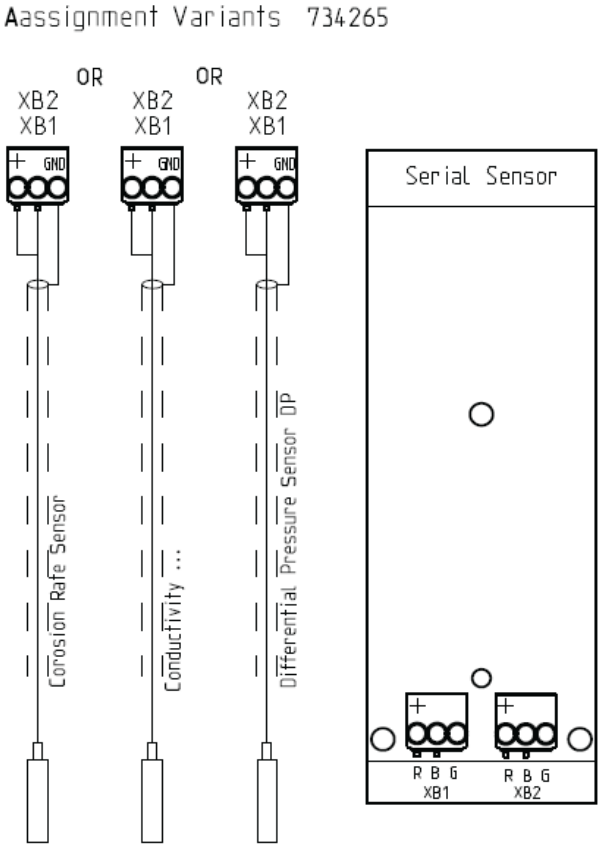
The CTFS sensor has two analog sensors, conductivity and temperature, and one digital signal, the flowswitch. The sensor converts the three signals to digital values and transmits them to the controller via a serial signal.
Maximum distance from sensor to the module is 30 meters.

2 x serial sensor HW Version: 734265 Rev. 2			
Connector	Pins	Description	Color Code
XB1 channel 1	1	5V	RED
	2	Signal UART half-duplex 1	BLACK
	3	GND	GREEN
	4	NC	
XB2 channel 2	1	5V	RED
	2	Signal UART half-duplex 2	BLACK
	3	GND	GREEN
	4	NC	

Terminals are color coded for ease of connection; R – red, B – black and G – green.



Dual Serial Module



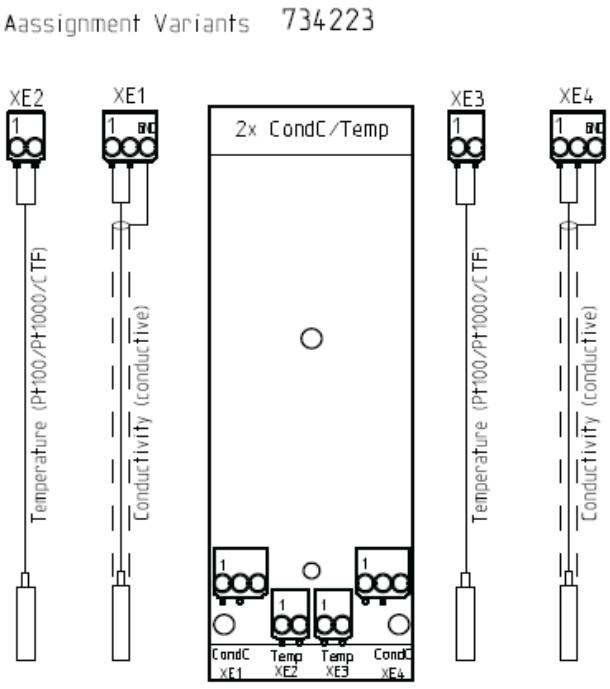
CTFS sensor (**C**onductivity/**T**emperature/**F**lowswitch/**S**erial)

These are 3-wire sensors. Do not use 4 and 6 wire sensors on this module.

9.2.3 Dual Conductivity Temperature Input Module

The Dual conductivity temperature module can be programmed for a variety of cooling, waste, condensate and boiler water sensors. This module is not compatible with the CTFS conductivity sensor, or the toroidal/inductive type sensors.
CTFS sensors require a serial sensor module. The only toroidal sensors that are compatible with the mA input module are mentioned in the mA input section, **9.2.5 Dual 4-20mA Input Module**.

The inputs can be any combination of the following ProMinent sensors;



9.2.3.1 Conductivity and conductivity/temperature sensors:

4-Wire cooling conductivity/temperature with ¾" Tee – Part number 7760200. Sensor with metric fitting - 7500811
4-Wire cooling conductivity/temperature in CTF body – Part number 7761452.
2-wire boiler conductivity - part number 7760189. This sensor is also part of the following kits: 7760001, 7760002 and 7760741.
2-Wire boiler High Temperature conductivity – Part number 7760742.
4-wire condensate conductivity/temperature – Part number 7760191. This sensor is also found in kit 7760740.

9.2.3.2 Temperature Sensors:

The temperature inputs on the CT module are designed for two types of temperature sensors, LM335 (10mV/°K), and a Pt100 or Pt1000 temperature sensors. The Pt sensors are RTD's.
The pH/ORP module does not accept the LM335 type temperature sensors and the 'H' input does not accept the Pt1000.
ProMinent stocks the following temperature sensors:

Pt1000 RTD – Part number 1080101 which is currently only available in kit form – Part number 1082254.
Solution Ground w/Temperature (SGT) – Part number 1051505. With DGMA adapter, 1051507.
Other conductivity sensors will not likely match the input circuitry.

Temperature inputs can be used for monitoring, control and/or compensation.
Do not exceed 30 meters, 100 feet, of cable length.

NOTE: To lengthen a temperature sensor signal, use the temperature transducer and input this signal on a 4-20mA input module.

Typical conductivity module connections:

2 x Cond/Temp HW Version: 734223 Rev. 2A			
Connector		Pins	Description
Channel 1	XE1	1	Conductivity sensor 1 - Not polarity sensitive
		2	
		3	shield
	XE2	1	(-) Temperature sensor 1 (LM335, Green or Pt 100, Pt1000)
		2	(+) Temperature sensor 1 (LM335,White or Pt 100, Pt1000)
Channel 2	XE3	1	(-) Temperature sensor 2 (LM335, Green or Pt 100, Pt1000)
		2	(+) Temperature sensor 2 (LM335, White or Pt 100, Pt1000)
	XE4	1	shield
		2	Conductivity sensor 2 - Not polarity sensitive
		3	

The 2-Wire boiler conductivity probe connects to XE1 or XE4, pins 1 and 2. This sensor is not polarity sensitive.

Two Wire Boiler Probe on XE1

Two Wire Boiler Probe

The 4-Wire condensate conductivity probe connects to XE1 and XE2 or XE3 and XE4 as shown. Wires conductivity wires, red and black, on XE1 and XE4 are not polarity sensitive. The temperature input on XE2 and XE3 must be connected as shown. The green is (–) and the white is (+).

Four Wire Condensate Probe
On XE3 (temperature) and XE4 (conductivity).

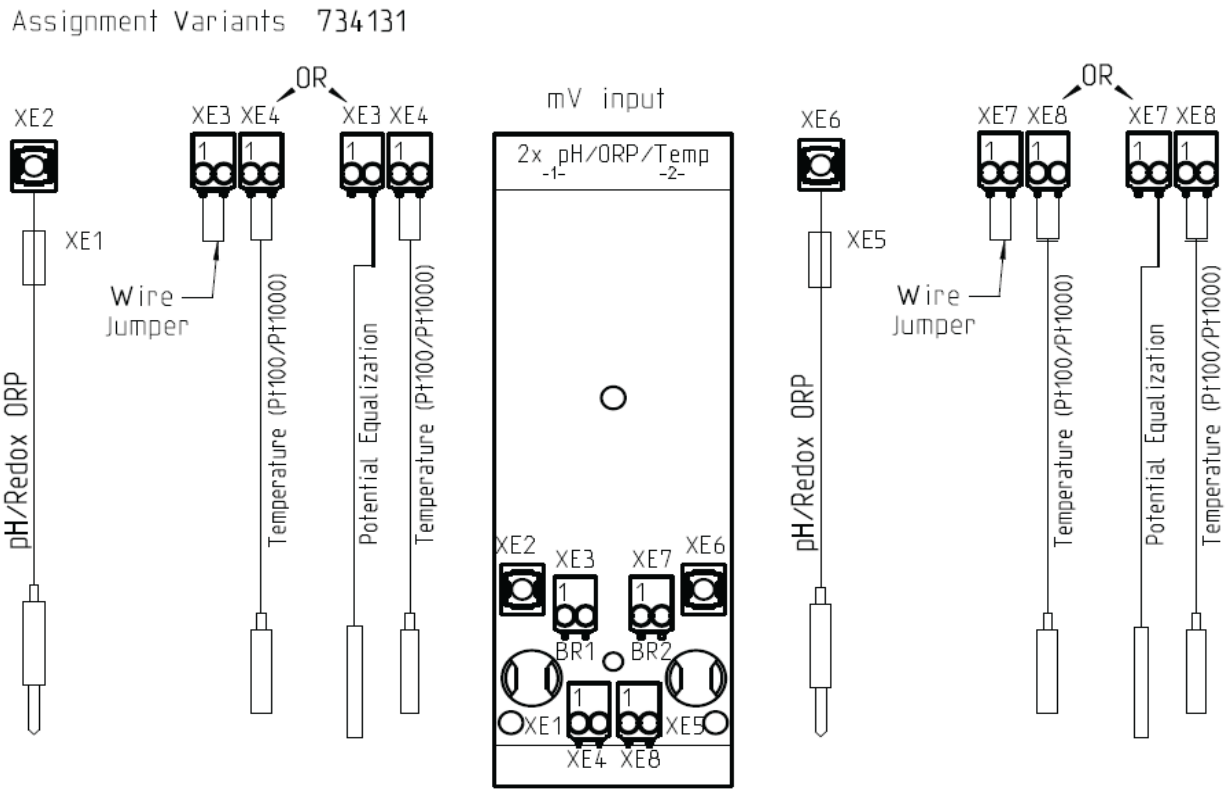
Four Wire Condensate Conductivity

9.2.4 Dual pH/ORP Temperature Input Module

The Dual pH/ORP temperature module can accommodate two sensor inputs which can both be pH or both be ORP, or one of each. In addition, there are two temperature sensor inputs.
Any 2-wire pH sensor will work if the mV/pH is ~59.1
Any 2-wire ORP will work if mV is in the range of +/- 1,000mV
The temperature sensor input is compatible with Pt100 and Pt1000 RTD sensors only.
The pH and ORP sensors can be extended a maximum of 10 meters/30 feet from the controller. For longer pH and ORP distances, use a 4-20mA sensor transducer and a mA input module.

Temperature can be used for monitoring, control and/or compensation.
If an electrical potential exists in the water, it should be removed. If it cannot be removed, a potential equalization electrode (also called “liquid potential” or “solution ground”) connection can be used.
If a potential equalization electrode is used, the default wire jumper(s) on XE3 and XE7 must be removed before connecting the potential equalization electrode to input XE3: Pin 2 and/or XE7: Pin 2. If not using a potential equalization electrode, leave the default jumpers in place on XE3 and XE7.

Dual pH/ORP Module



Dual pH/ORP input Module Connections

Dual pH/ORP with Temp Input HW Version: 734131 Rev.3			
Connector		Pins	Description
Channel 1	XE1	-	Reference electrode (Shield)
	XE2	-	Measurement signal (glass electrode)
	XE3 Without liquid potential	1	Short circuit using jumper
		2	
	XE3 With liquid potential	1	NC
		2	Liquid potential
	XE4	1	Temperature sensor (Pt100 or Pt1000)
		2	Temperature sensor (Pt100 or Pt1000)
Channel 2	XE5	-	Reference electrode (Shield)
	XE6	-	Measurement signal (glass electrode)
	XE7 Without liquid potential	1	Short circuit using jumper
		2	
	XE7 With liquid potential	1	NC
		2	Liquid potential
	XE8	1	Temperature sensor (Pt100 or Pt1000)
		2	Temperature sensor (Pt100 or Pt1000)

Dual pH-ORP-Temp Connections

When is potential equalization (Solution Ground) used?

Potential equalization (also called “liquid potential” or “solution ground”) is used if the pH/ORP measurement is interfered with by disturbance potential (millivoltage) from the measurement media. For example, a disturbance potential can be caused by electric motors with incorrect interference suppression or due to insufficient galvanic insulation of electrical conductors etc. Potential equalization does not remove this disturbance voltage; however it does reduce its effect on the measurement. Therefore it is ideal to remove the source of the disturbance potential.

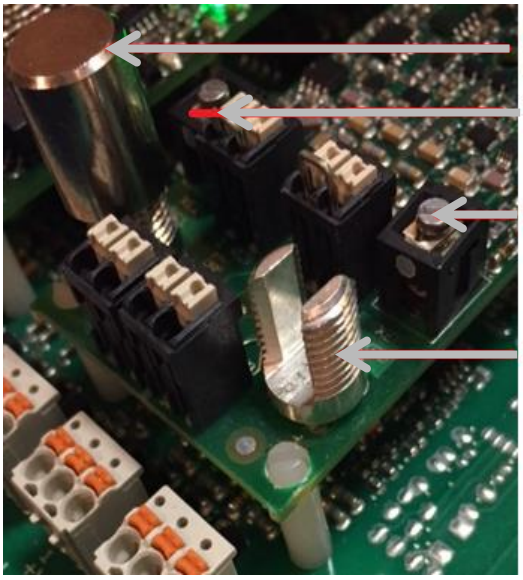
If a “liquid potential” jumper and a potential equalization electrode are both or neither connected, it will cause incorrect sensor readings.

Always leave the jumper connected if not using potential equalization, or remove the jumper when connecting potential equalization.

The potential equalization electrode is connected with a single wire to the second pin/terminal.

9.2.4.1 Attaching the pH/ORP coax cable

Once the cable has been prepared, attach it to the pH/ORP module. Remove the shield grounding nut, XE5, and loosen the center conductor screw, XE6.



Coax cables accompany pH and ORP sensors. If you shorten them, be sure to create an end that is a good fit for the module termination. Insert the coax center conductor into the XE2 or XE6 terminal and tighten. Place the

Prominent Ready-made Coaxial Cable

Whenever possible, only use ready-made coaxial cables that you can select from the ProMinent catalog.

Coaxial cable 0.8 m – SN6 1 meter/31.5”, ready-made. Part number 1024105

Coaxial cable 2 m – SN6 2 meter/6.5’, ready-made. Part number 1024106

Coaxial cable 5 m – SN6 5 meter/16.4’, ready-made. Part number 1024107

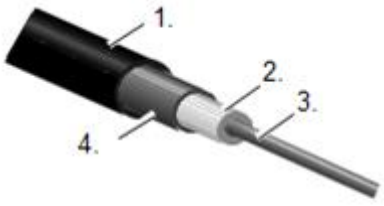
Ready-made coax

shield grounding nut on the post, screw down and tighten. This nut is smooth for a reason. Do not over-tighten!

Coax cable preparation with conductive sleeve (wrong)

Coax cable preparation with black conductive sleeve removed

Remove the black plastic layer from the inner coaxial cable. This will prevent the shield from coming into contact with the center conductor.



1. Protective Outer Sleeve 2. Insulation
3. Inner Conductor 4. Outer Conductor and braided shielding

Coaxial Cable Construction

Outer conductor (4)~10mm
Insulation (2)~7mm
Inner conductor (3)~7mm

Remove the black plastic layer from the inner coaxial cable. In doing so, ensure that individual threads of the bare wire shielding do not come into contact with the inner conductor.

9.2.5 Dual 4-20mA Input Module

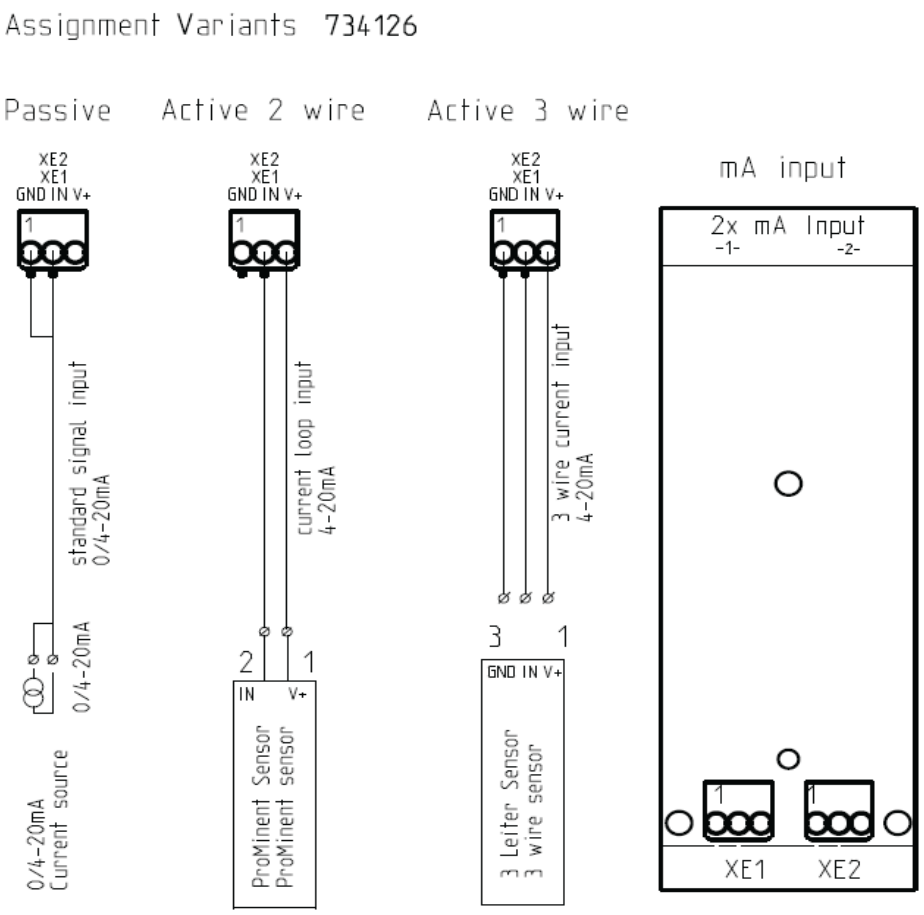
The dual 4-20mA input module can handle active and passive loops. Both inputs are isolated from each other and the lower PCB.

Most 4-20mA inputs are acceptable; however, there is no square root operation for older flow meters as found in some boiler rooms. (PFC does not provided this service.)

Enter any engineering units for the range. 4mA does not have to represent a 0 value.

Maximum load per loop is 50mA. Short circuit proof at 70mA. Reactivation after 10 seconds. ProMinent recommends a maximum length of 1,000 feet using 22 AWG wire or larger. Twisted, shielded, stranded cable is best for long distances.

2 x mA inputs HW Version: 734126 Rev. 4				
Connector	Pins	Active 2 wire mA input	Active 3 wire mA input	Passive mA input
XE1 channel 1	1	(-) NC	(-) GND	(-) GND
	2	(+) mA input	(+) mA input	(+) mA input
	3	(V+) 23V	(V+) 23V	(V+) NC
XE2 channel 2	1	(-) NC	(-) GND	(-) GND
	2	(+) mA input	(+) mA input	(+) mA input
	3	(V+) 23V	(V+) 23V	(V+) NC



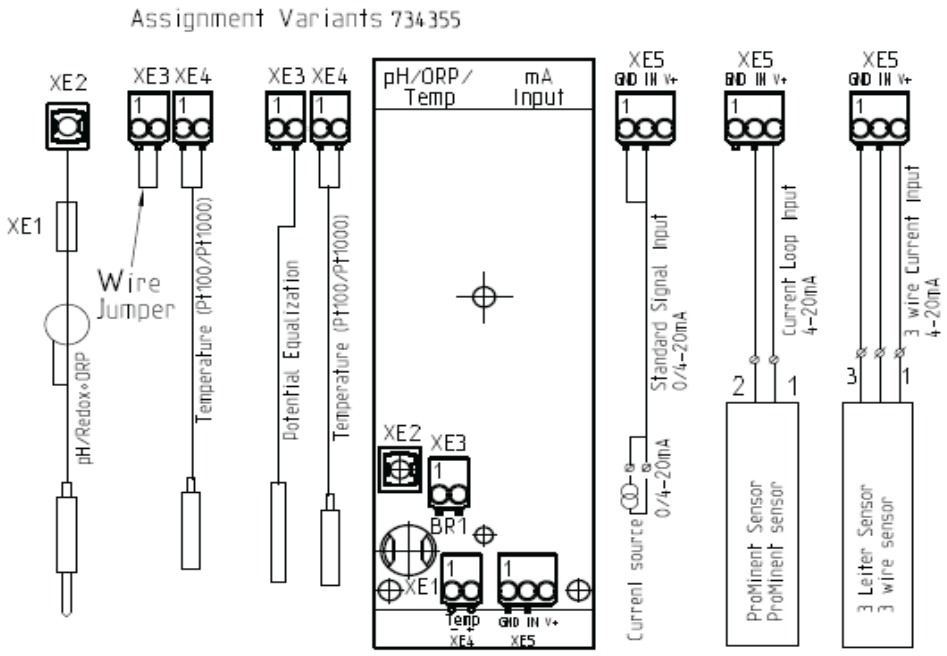
9.2.6 pH/ORP, Temperature and mA Input Module

The purpose of the module is to have a pH sensor and a ProMinent Free chlorine sensor on one card.

However:
Any 2-wire pH sensor will work if the mV/pH is 59.1.
Any 2-wire ORP will work if mV is in the range of +/- 1,500mV.
The temperature input sensor can be either a 100Ω or 1000Ω RTD.
The pH and ORP sensors can be extended a maximum of 10 meters/ 30 feet from the controller. For longer pH and ORP distances, use a 4-20mA sensor transducer and a mA input module.

Temperature can be used for monitoring, control and/or compensation.
The 4-20mA input can be connected to an active or passive loop. This input is isolated from the motherboard.
Any 4-20mA input is acceptable; however, there is no square root operation for older flow meters as found in some boiler rooms. (We have never provided this service.)
Enter any engineering units for the range. 4mA does not have to equal a 0 value.

Maximum load per loop is 50mA. Short circuit protection at 70mA. Reactivation after 10 seconds. We recommend a maximum length of 1,000 feet using 22 AWG wire or larger. Twisted, shielded, stranded cable is best for long distances.
If a potential equalization electrode is used, the default wire jumper on XE3 must be removed before connecting the potential equalization electrode to input XE3:Pin 2. If not using a potential equalization electrode, leave the default jumper in place.

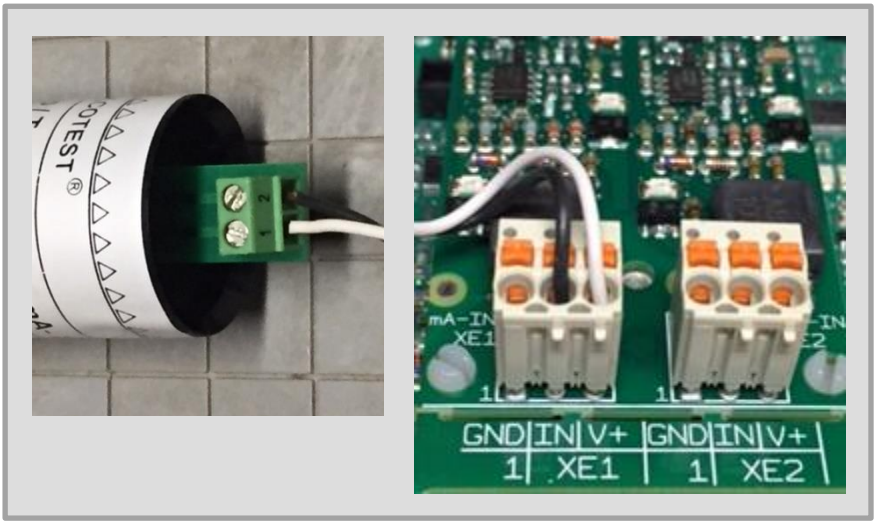


pH/ORP-Temp-4-20mA Input HW Version: 734355 RevA			
Connector		Pins	Description
Channel 1	XE1	-	Reference electrode (Shield)
	XE2	-	Measurement signal (glass electrode)
	XE3 Without liquid potential	1	Short circuit using jumper
		2	
	XE3 With liquid potential	1	NC
		2	Liquid potential
	XE4	1	Temperature sensor (Pt100 or Pt1000)
		2	Temperature sensor (Pt100 or Pt1000)

Connector	Pins	Active 2 wire mA input	Active 3 wire mA input	Passive mA input
XE5 Channel 2	1	(-) NC	(-) GND	(-) GND
	2	(+) mA input	(+) mA input	(+) mA input
	3	(V+) 23V	(V+) 23V	(V+) NC

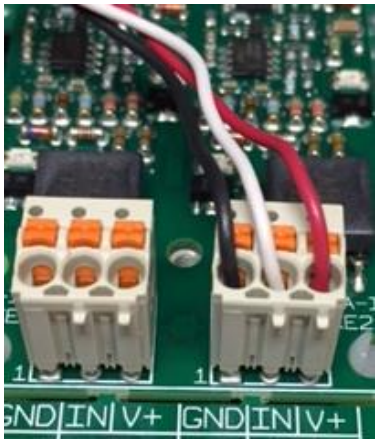
9.2.6.1 Connection of mA Amperometric Sensors

ProMinent amperometric sensors can be terminated to a 4-20mA input module.
Connect the sensor, as described in section **9.2.5 Dual 4-20mA Input Module**



The above picture shows a ProMinent amperometric probe connected via a black and white wire to the XE1 terminal. White from pin 1 on the sensor to the V+ terminal and black from pin 2 to the IN terminal. The ground terminal on the module is not used for amperometric sensors.

A second probe can be connected to XE2. The second probe can be another ProMinent amperometric sensor, or any 4-20mA device.



Loop power can be suplied by the Aegis X as shown in this picture of a three wire mA device.

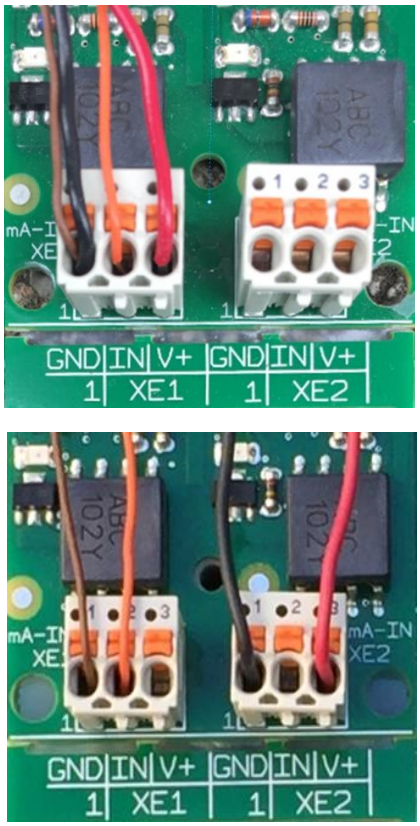
Milliamp inputs from powered devices do not need on-board V+. The + wire from the Input device, (analyzer, PLC, etc.), connects to the 'IN' terminal and the (–) wire to the 'GND'.

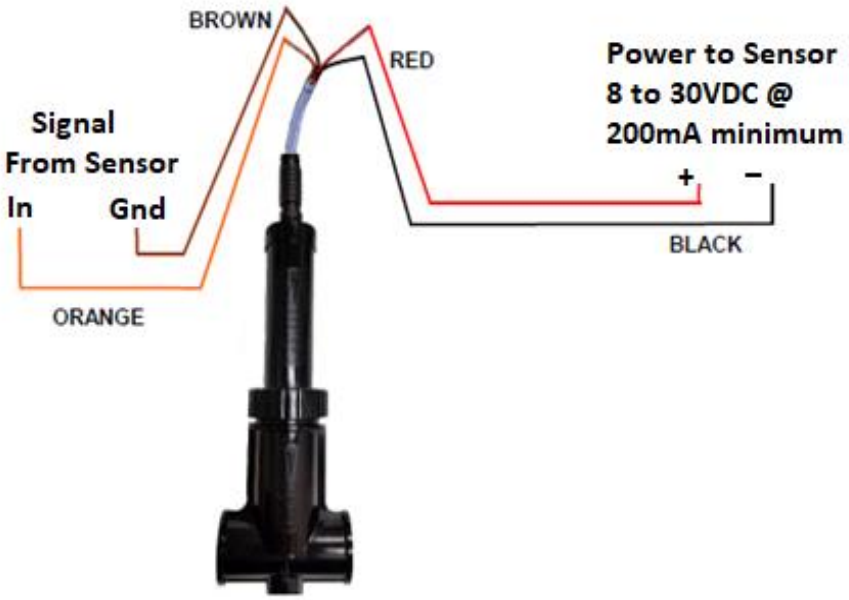
9.2.6.2 Little Dipper II mA Connection

The Turner Designs Little Dipper 2 In-Line Fluorometer can be attached to a dual mA input module. The sensor requires 8 to 30 VDC.

Figure 58 depicts the Dipper power from the same input channel and from the second channel. The red wire is terminated at +V and the black on the GND. The orange signal wire is in channel 1 on the IN terminal (center) and the brown is on signal GND.

If an internal supply is not available, an external DC supply of 8 to 30 VDC with 200mA current can be used.



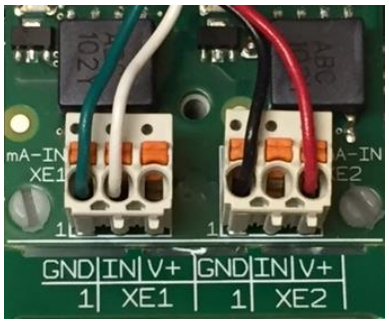


Little Dipper II typical wiring (top) and input using a second channel for power (bottom)

9.2.6.3 Pyxis Installation

The Pyxis In-Line Fluorometer can be attached to a dual mA input module or to the MODBUS Master terminal. The 4-20mA input can be wired in either of the two ways shown in the pictures below. The red and black wires supply 24VDC power to the Pyxis.

This power can be provided by the controller from the same terminal set as the signal wires.



Power can also be provided from the second input. In both ways, the red is on the V+ and black is on the GND terminals.

Wire Color	Designation
Red	24 V +
Black	24 V -
White	4-20 mA +
Green	4-20 mA -, internally connected to 24 V – (power ground)
Blue	RS-485 A
Yellow	RS-485 B
Clear	Shield, solution ground

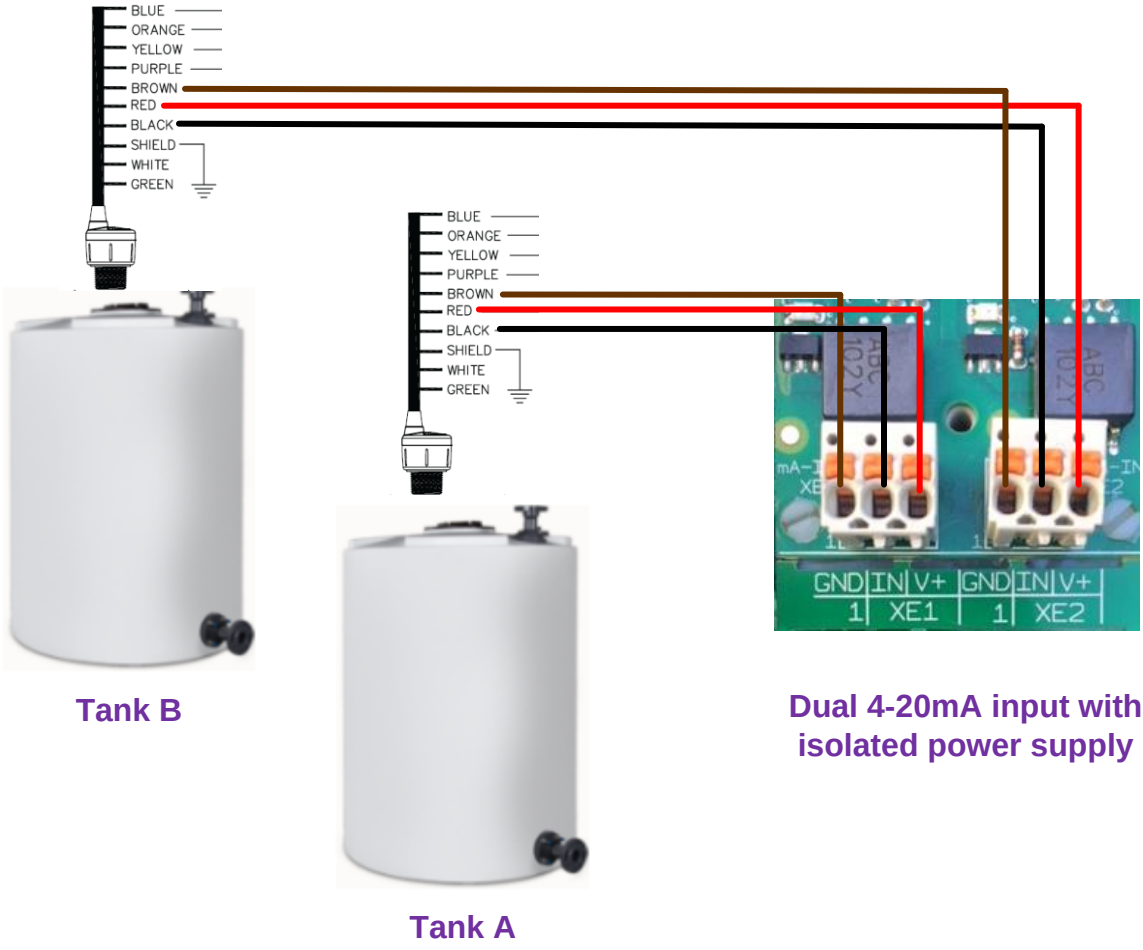
9.2.6.4 Echopod Level Sensor mA Connection

The Aegis dual mA input module can receive two Echopod tank level sensors as shown in the drawing below.

Tank A is terminated on the first input, XE1.

Connect the brown wire to GND, the black wire to IN and the red wire to V+.

A second level sensor can be received on input two as well.



Echopod level sensor connected to a dual 4-20mA input module

9.3 Analog Outputs

There is only one analog output module, the dual mA output module.

9.3.1 Dual mA Output Module

The two outputs are fully isolated from each other and from the lower PCB.

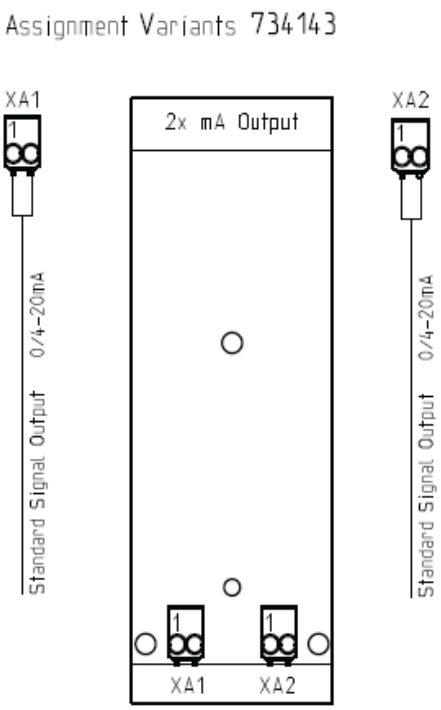
The output open loop alarm has a maximum load of 450ohm @ 21.5mA, 480 ohm @20.5mA. The drive voltage maximum is 18VDC open circuit. We recommend a maximum length of 1,000 feet using 22 AWG wire or larger. A twisted, shielded, stranded cable is best for long distances.

2 x mA Outputs HW Version 734143		
Connector	Pins	2 wire mA output
XA1	1	(-) mA output -
Channel 1	2	(+) mA output +
XA2	1	(-) mA output -
Channel 2	2	(+) mA output +

This module does not have a passive output. The loop is powered by the module.
Scale to any engineering units, forward or backward.
Examples:
4mA = 200 Gal and 20mA = 0 Gal
4mA = 32ºF and 20mA = 212ºF
4mA = -500mV and 20mA = +500mV
Can be used for proportional control of a pump or analog valve.
Can be used as a process variable, (pH, ORP, etc.) to a DCS or chart recorder.

The dual mA output module is equipped with onboard power which is used to power or excite, the output loops. Therefore, the receiving device must not power the loop. mA loops cannot be powered from two sources!

Dual mA Output with ProMinent Universal Control Cable on output 1.



Dual mA Output Connections

Dual 4-20mA Output module

The picture above illustrates a typical 4-20mA output to a ProMinent metering pump. The black (-) and brown (pause) wires are terminated together on the (-) post at pin 1. Without the brown wire tied to the black wire, the pump will pause.

This output can be set for a 0 – 20mA output range. See section **12.2.1.6 Analog Output Module Setup**.

9.4 Digital Inputs

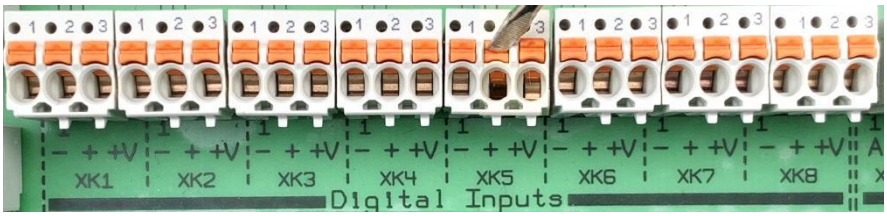
Digital Inputs can manage on/off signals that happen on occasion or 14,000 times each second. This spectrum is allowed with the help of circuitry that is adjusted based on the type of input provided. During the input setup process, the user chooses between three modes:

Contact mode: Typically for pump status or alarms. This input is debounced to prevent input chatter.

Pulse Debounced mode: Typically for contacting head watermeters where the signal does not switch more than a 120Hz rate. This input is debounced to prevent input chatter.

Pulse mode: Typically for turbine meters. The maximum input frequency is 14kHz. This input is not debounced to prevent signal attenuation.

The 8 digital inputs as shown here are centrally located along the bottom of the main PCB.



Press the orange button to open the terminal. Insert the wire and release the orange button.
They expect to monitor dry contact signals from contact head and paddlewheel watermeters or any dry contact switch or relay tip. Wire the input between the + and – terminals.

Each input has a 16 volt (+V) @ 10mA terminal available as a power source for the sensor or input device.

Digital watermeters must not supply a sine wave or powered signal. Meters with a ‘hall effect’, ‘open collector’ or ‘dry contact’ output are compatible with these inputs.

NOTICE

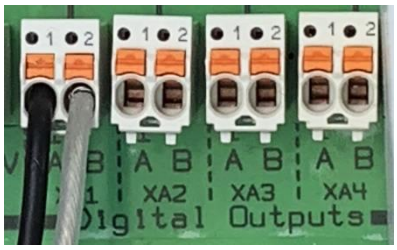
Various types of watermeter use the V+ terminal. The color and purpose of the wires does not adhere to a standard. Some meters use black for power and red for the signal. Check the watermeter manual.

Watermeters are available from your ProMinent representative. A list of meters is provided in the section **17 Spare Parts and Accessories.**

9.5 Digital Outputs

The Aegis X has 4 low voltage digital outputs and 6 AC powered control outputs. The 4 low voltage digital outputs can be used to; 1) Enable/disable a pump via a low power level switch. 2) Used as a pulse output which can be used to control the speed of a chemical pump.
AC Power relay outputs are used to control solenoids, pumps, lights, horns and other relays. Power relay outputs can handle AC or DC voltage up to 250Volts.

9.5.1 Low Voltage Digital/Pulse Outputs



Outputs XA1 through XA4 are dry, (unpowered) digital outputs rated for 24VDC / 250mA which can be configured as a Pulse or an ON/OFF output.

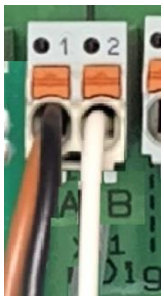
In Pulse mode, these outputs can control the speed of pulse driven pumps. The frequency outputs vary the pump speed in much the same manner as a 4-20mA signal.

Digital outputs in the ON/OFF mode will start or stop a pump. The pump speed will then be determined manually at the pump.

9.5.1.1 Using a ProMinent Universal Control Cable on a Pulse Output Relay

A ProMinent pump using the Universal Control cable will terminate using the brown, black and white wires as shown here. The black is common. The white is the pulse signal. The brown wire is for pause/enable. If the brown is not shorted to the black wire, the pump will remain in pause mode.

This connection is not polarity sensitive. The black and brown wires could be terminated on the left side as shown or on the right side with the white terminated on the left side.



Universal Control Cable on a digital output

9.5.2 Powered Digital Outputs

9.5.2.1 Overview

WARNING!

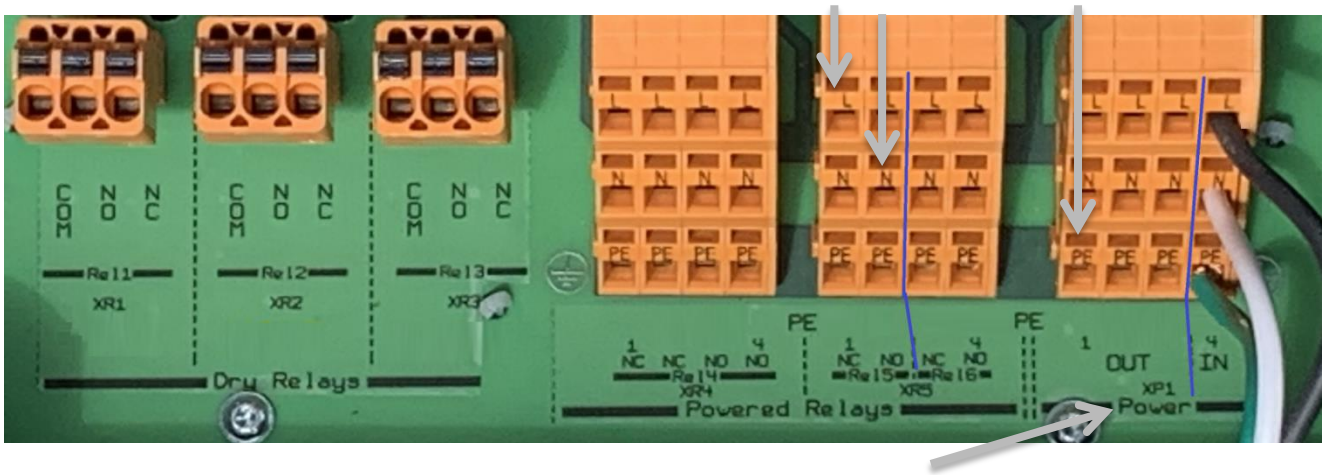
All electrical wiring shall be performed by a licensed electrician, in accordance with local and national electric codes.

NOTICE

Poor electrical connection may cause incorrect measurements. Once a wire is terminated, tug gently on the wire to ensure it is not loose.

Green wires for ground circuits and white wires for neutral are standard wire colors for AC circuits. Black wires for line power and red wires for switched power are typical. Conduits and multi-wire cables will often use other colors to differentiate multiple hot signals. Your wire colors may differ. Do not assume!

The power/relay section of the controller is shown without relay wiring. Here we can see the labels on the controller circuit board indicating (from left to right) Rel1 through Rel6, power out, and power in. Note that terminals XR1, XR2, XR3 and XR4 each serve a single relay (R1, R2, R3 and R4). Terminal block XR5 serves relays 5 and 6.
The three large orange terminal blocks on the right each have 3 levels; **L**ine, **N**eutral and Ground (**PE**).



Input power is connected to the right most column of block XP1 – “Power”.
In the USA, this connection is prewired in the factory for use with 120VAC. However, the input power supply will accommodate 100 to 230VAC at 50 to 60 Hz. No controller adjustment is required. Keep in mind that the power supplied into the controller will pass through the fuses and relays out to your devices. See schematic below.

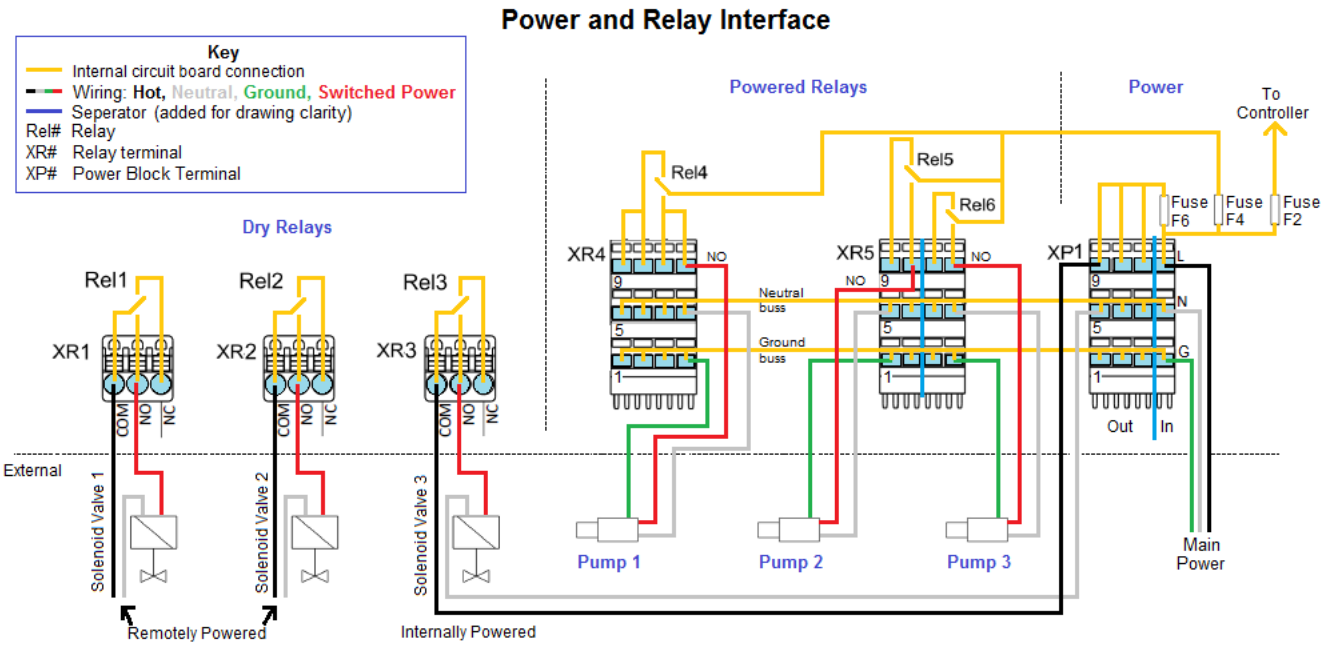
These six relays can be used in various ways. Each of the following methods is explained in detail in following pages.

Relays 4, 5 and 6 use controller power fused through fuse F4. (See schematic on next page). The sum total amperage of these relays is 8 amps not to exceed 5 amps on any one relay.

Relays 1, 2 and 3 are considered ‘dry’ contacts which do not have a power source. They can be powered from the Power block OUT terminals which use fuse F6. Again, the sum total amperage for these three relays is 8 amps when using controller power and not to exceed 5 amps on a single relay.

They can be used to power larger amperage motorized pumps up to 5 amps each. The higher amperage devices can be powered from a remote source. This remote power must be fused separately. Their total amperage could be 5 amps per relay since they are not using the on-board fuses.

Dry relays can also be used with AC or DC voltages.



This electrical diagram shows the six relay terminals with connection examples to external devices as well as how the terminal blocks are wired from the internal relays. The three replaceable fuses are shown (top right). Consult the spare parts section for fuse replacements. Notice, in this example, all devices are wired to a NO relay tip.

Relays 1-3 utilize three termination plugs XR1 XR2 and XR3. Relays 4-6 use power blocks XR4 and XR5. XP1 handles power in (pin 12) and supplies power through fuse 6 to XP1 top row, pins 9, 10 and 11. In this example, pin 9 is used to power relay 3, solenoid 3. Solenoids 1 and 2 are powered externally through relays 1 and 2. Pumps 1, 2 and 3 are powered through relays 4, 5 and 6 using fuse F4.

The main circuit board under the three power blocks ties all 12 Neutrals together and all 12 PE (ground) terminals together.

All 6 relays can be used for pumps and solenoids as well as Motor Operated Valves (MOV). MOV terminations are explained in sections **9.5.2.7 Wiring Relays 1, 2 and 3 for a Motor Operated Valve (MOV)** and section **9.5.2.4 Wiring Relays 4, 5 and 6 for a Motor Operated Valve (MOV)**

9.5.2.2 Connecting Power or a Power Cord

WARNING!

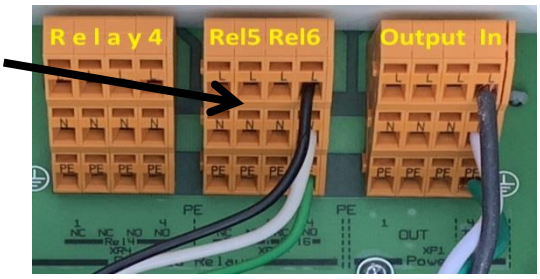
All electrical wiring shall be performed by a licensed electrician, in accordance with local and national electric codes.

A power cord is typically supplied with the controller from the factory. It can be removed if the installer is providing power through conduit. If you need to install a power cable, remove a knock-out from the bottom of the controller and install the cord using a NEMA4/IP66 cord grip as shown in section **6.3 Electrical Installation**.
Terminate the line, neutral and ground wires as shown here.

9.5.2.3 Wiring Relays 4, 5 and 6

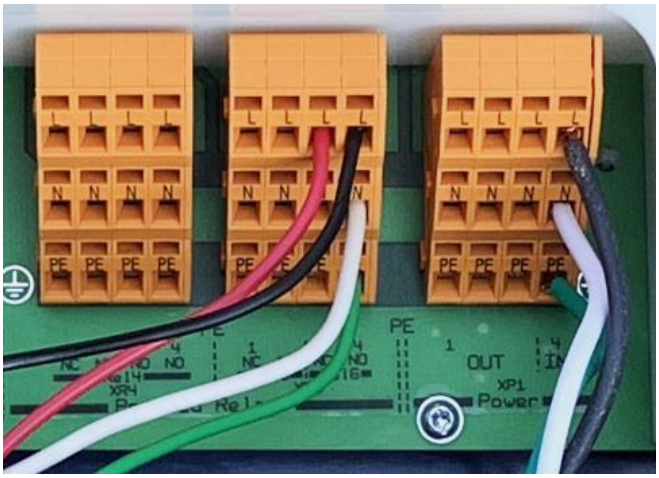
The following wiring diagrams show typical configurations, but not all possible combinations of this versatile controller.

This picture shows relay R6 wired to an outlet plug. (Plug not shown). Notice that the black, white and green wires for R6 are in the right most column of the terminal block, the NO column. This plug will supply power to the attached plug when the controller turns relay 6 on.
Powered relays R4, R5 and R6 are designed to typically operate pumps and solenoids with a 1amp rating.



9.5.2.4 Wiring Relays 4, 5 and 6 for a Motor Operated Valve (MOV)

Motor Operated valves typically have two hot wires, a neutral and a ground. The two hot wires will be terminated on the NO and NC terminals. The NO terminal will open the valve when the controller turns on the output relay. The NC terminal will close the MOV when the controller turns off the output.
The picture at right shows an MOV terminated on relay R6. The red wire is connected to NC and the black wire is connected to NO.
See also section **9.5.2.7 Wiring Relays 1 2 and 3 for a Motor Operated Valve (MOV)**



NOTICE

If the Motor Operated Valve operates backwards, (open when it should be closed and closed when it should be open), simply reverse the NO and NC wires on the controller.

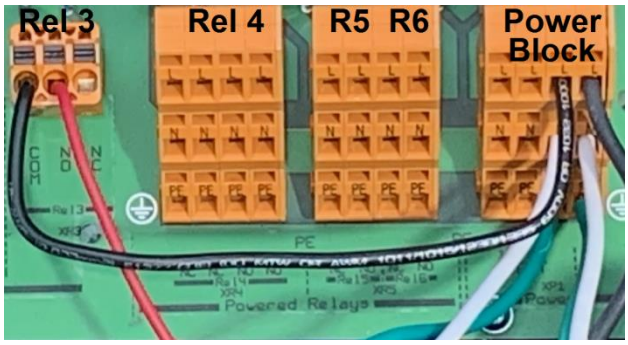
9.5.2.5 Wiring Relays 1, 2 and 3 Using On-board Power

CAUTION!

The unpowered (DRY) relays 1, 2, and 3 are not fused and any external connection to these relay terminals will require additional circuit protection provided by the installer at the time of installation. The Power block OUT terminals are powered from the Input line after passing through fuse F6.

Failure to protect these circuits can cause non-warranty equipment damage and could pose a safety hazard.

Relays 1, 2 and 3 have Dry Contact terminals. Unlike 4, 5 and 6, they have no power. This allows the user to supply power from a remote source or use power from the Output side of the power block.
Notice black jumper wire from the Power block OUT **L**ine terminal to the **Com** input on relays 3. A red wire is attached to the center (NO) terminal will power an external device, (pump or solenoid, etc.) When a relay is energized by the program, the COM terminal is connected to the NO terminal whereby power passes through to the red wire. Relays 4, 5 and 6 are not used in this example for clarity.



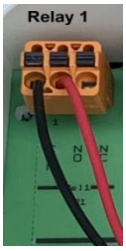
9.5.2.6 Wiring Relays 1 2 and 3 Using an External Power Source

CAUTION!

The unpowered (DRY) relays 1, 2, and 3 are not fused therefore, any external connection to these relay terminals will require additional circuit protection provided by the installer at the time of installation.

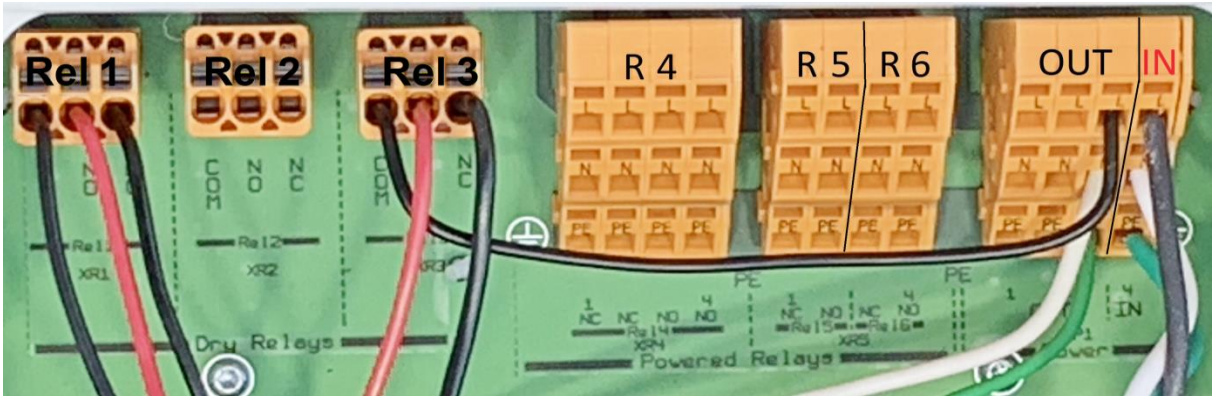
Failure to protect these circuits can cause non-warranty equipment damage and could pose a safety hazard.

An external power source can be used on relays 1, 2 and 3. The picture at right illustrates an external voltage connected to relay 3 at the COM terminal (black wire). A second wire (red) on the NO terminal is the switched output to a pump, solenoid, alarm light, etc. The neutral and ground wires are not terminated in the controller. This relay is rated for 5 amps. It can work with AC or DC volts up to 250V.



9.5.2.7 Wiring Relays 1, 2 and 3 for a Motor Operated Valve (MOV)

A **M**otor **O**perated **V**alve (**MOV**) typically has two switching hot wires, a neutral and a ground. The two hot wires will be terminated on the NO and NC terminals. The NO terminal will open the valve when the controller turns on the output relay.
The picture below shows internal power used on relay 3 and external power used on relay 1, each control an MOV.



9.6 Network Sensors

CAN bus and Modbus sensors are not yet implemented.

10 Commissioning

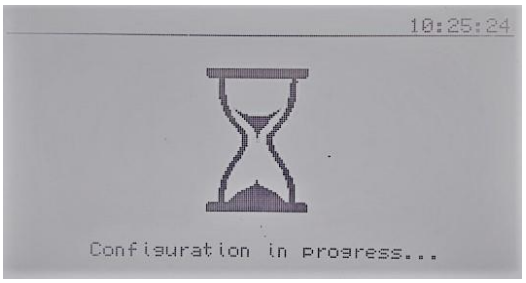
Are all parts received and in good condition?

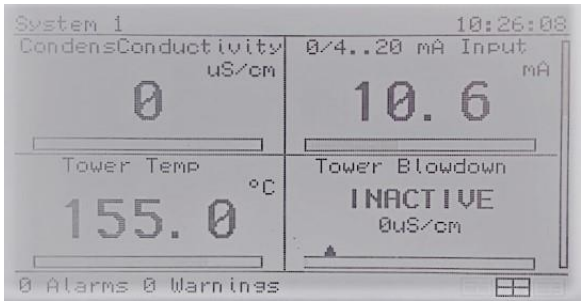
After mechanical and electrical installation, turn on the sample stream, check for leaks and purge any trapped air.

10.1 Switch-on behavior during commissioning

Switching On - First Steps.

Powering up the AegisX will display the following sequence:



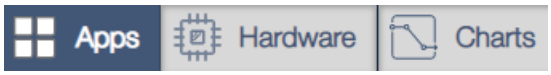


The third panel shows the current Local HMI firmware level. (01.01.01.00). This process takes about 60 seconds depending on the size of your configuration.

Read the **Quick Start Guide** on page 3 first! This short document will help you determine what, if any reading you should cover prior to using your new controller.

11 Using a Browser

Sections 11, 12 and 13 cover topics that are inter-related. You will often find references to the other chapters.

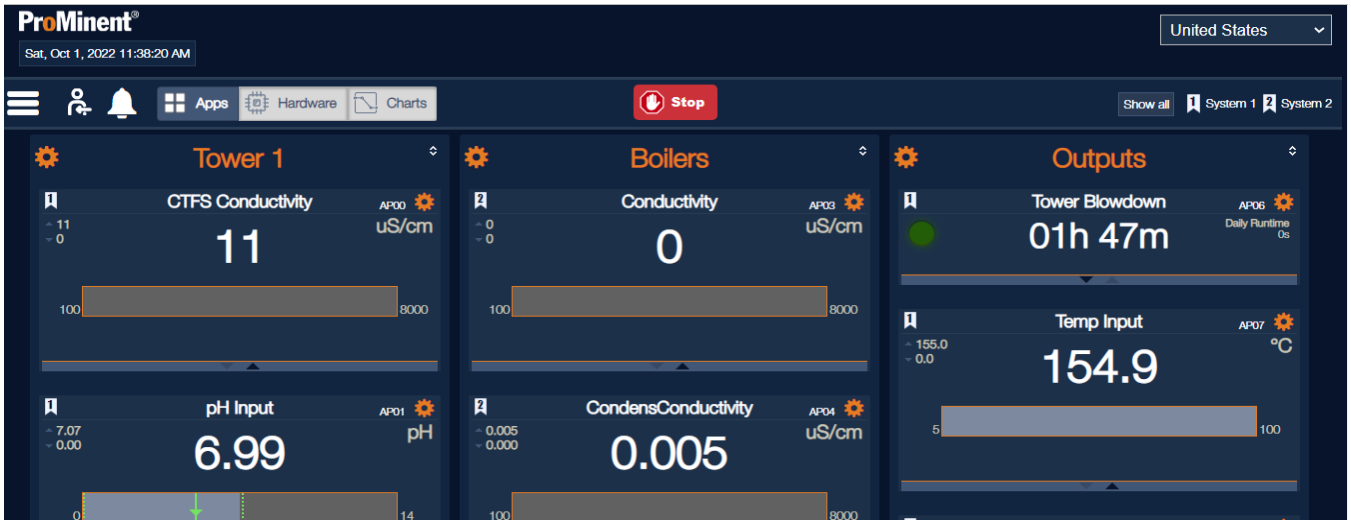


The Aegis X browser connection consists of three screens: the **Hardware** screen where the inputs and outputs (I/O) are configured, the applications (**Apps**) screen where the processes are monitored and controlled through program applications and the **Charts** screen where you can create a graph of up to four I/O points. This section describes how to logon and manage the menus and icons on the Apps and Hardware screens. The following sections show how to change setpoints and alerts, edit existing programs or start from scratch.

AegisX controllers are typically pre-programmed at the factory based on your specific order. However, should you need to add or remove applications, keep in mind that these procedures can only be accomplished with a computer or smart phone via Ethernet or WiFi. Through the keypad, you can monitor sensors, alarms and apps, or make adjustments and calibrations.

To set up a programming connection with a computer or smartphone via WiFi, revisit section **7.1 Setting Up a WiFi Connection**, or via an Ethernet LAN, see section **7.2 Setting Up a LAN Connection**.

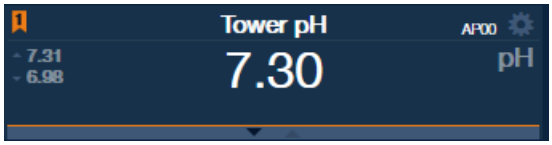
When you connect to the controller, you will see the Application Screen. Here is an example of a programmed controller. Cell phone views will differ from PCs due to a smaller window. Once you understand how the process works on a PC, the phone menus should be easy to navigate.



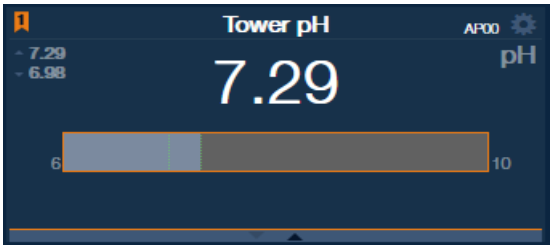
The application (app) screen consists of menu items in the upper left hand side including System Settings, the logon icon, alarms and page choices. The section on the right shows System selection and language. The Output STOP button, center and the apps are shown below the banner. Until you logon, you can monitor but cannot edit the apps and the I/O on the Hardware screen.

The applications display boxes show the current status in various manners. The bottom of most boxes on the app screen have tiny up and down arrows used to select a different size window. Some have three sizes.
Here are some examaples. The smaller the window, the more room to see apps on the initial screen.

Sensors: Small

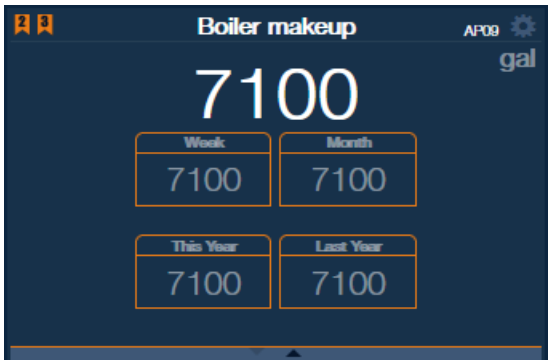


Large

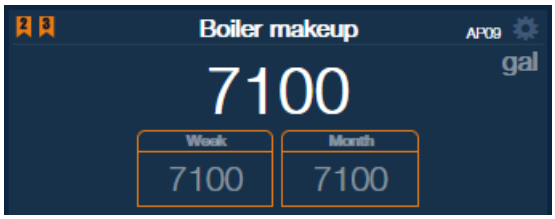


Turbine Meter - Small

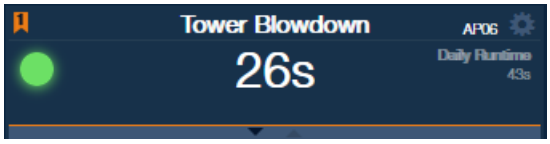
Turbine Meter - Medium



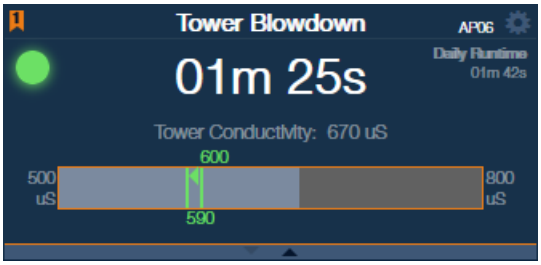
Turbine Meter - Large



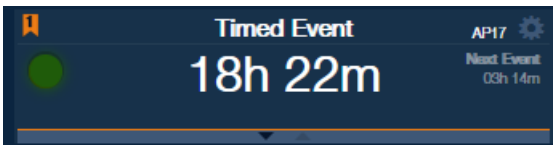
Blowdown – Small



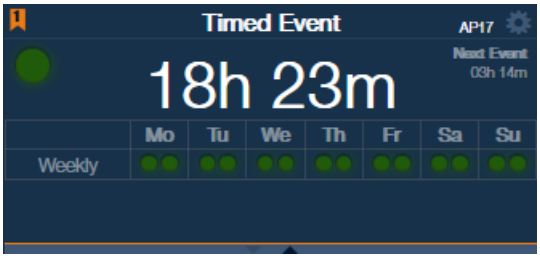
Blowdown - Large



Timed Event - Small

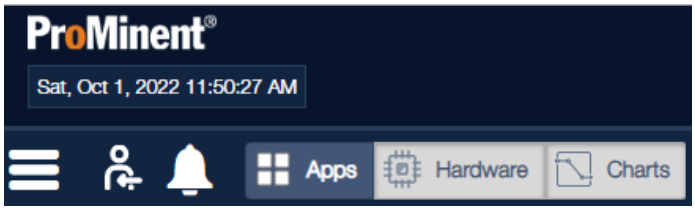


Timed Event - Large



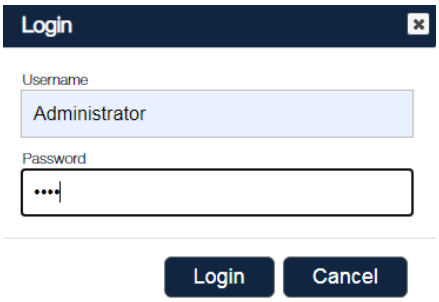
11.1 Application Screen Basics

The upper left hand portion of the browser screen is shown here and is explained in the following sections: **11.3 Controller Settings Menu**, **11.2 Logging On** and **11.4 Alerts, Warnings and Errors.** The three buttons are described in section **13 Programming the Applications**, **12 Setting up the I/O – The Hardware Page** and **14 Charts.**



11.2 Logging On

Logon using the default username and password. The default set is: 'Administrator' with password '3356'. Use the eye icon to see the password.



Usernames are **case sensitive**, 3 to 30 characters, alphanumeric and **must not include** special characters. The *password* must be **numeric only** consisting of 4 to 10 numbers.

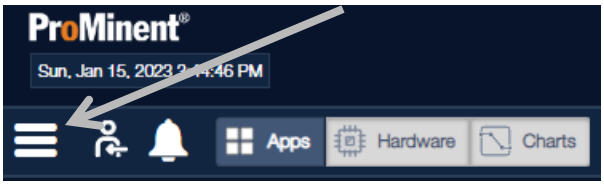
The Administrator user can add other *administrator* or *operator* users. An *administrator user* can perform any setup or programming task. *Operator users* cannot create new applications and are limited from most programming edits. Operator limitations are noted throughout this manual.

Customers frequently use one administrator account for all users. If there is no need to limit any particular person or group from certain abilities, all users can be administrators. Any actions performed by users of either type is logged. See sections **11.3.4.1 Logs** and **2.4.6 Logbooks.**

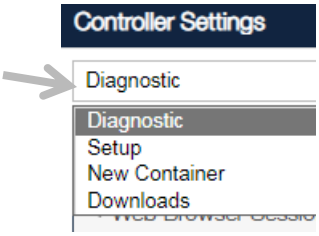
To add users and for more about Operator users, see section **11.3.2 Setup Menu**.

11.3 Controller Settings Menu

The Controller Settings menu is used to set up the Application screen and provide system information. Select the Controller Settings menu icon to access the dropdown menu.

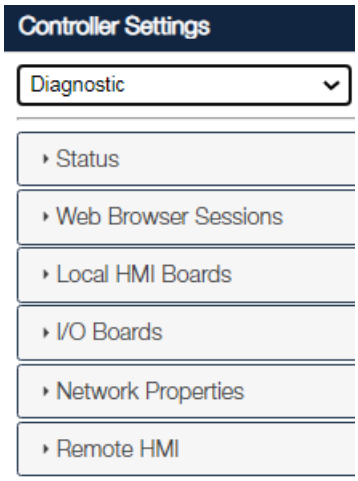


This menu contains a diagnostic section, a setup section, can create containers and Downloads.



The default selection of the dropdown is 'Diagnostics'.

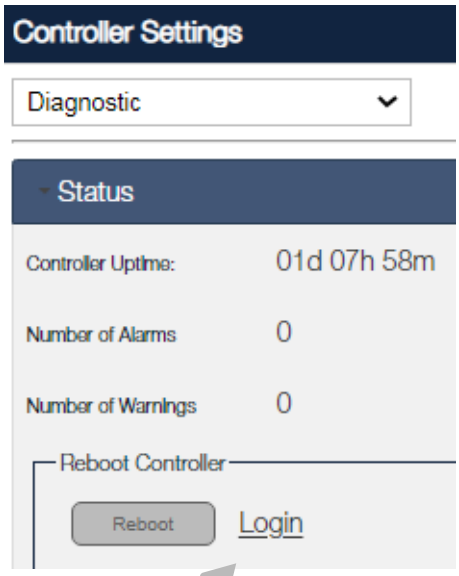
11.3.1 Diagnostics



There are six diagnostic sections.

11.3.1.1 Status

Select the **Status** diagnostic page to show application and system alarms and warnings during the current Controller Uptime period. This page also includes a controller reboot button which is available to all logged in users.



NOTICE

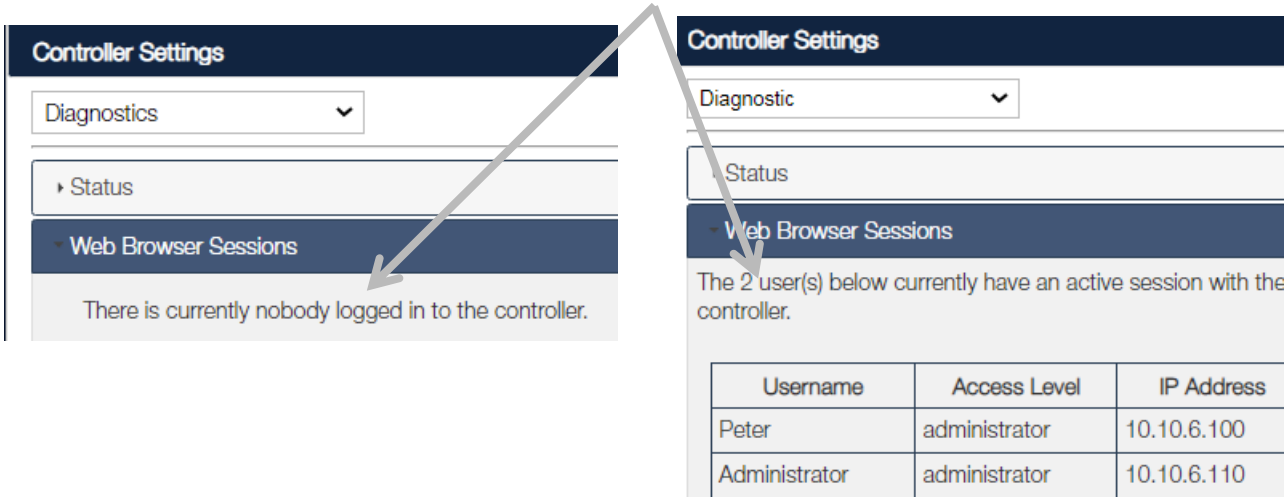
Please be very cautious of using the '**Reboot**' button from a remote position. Consider the ramifications of output relays and signals turning on or off. Notify local personnel if necessary.

Login message

The Login message appears when you need to be logged in to perform a particular function.

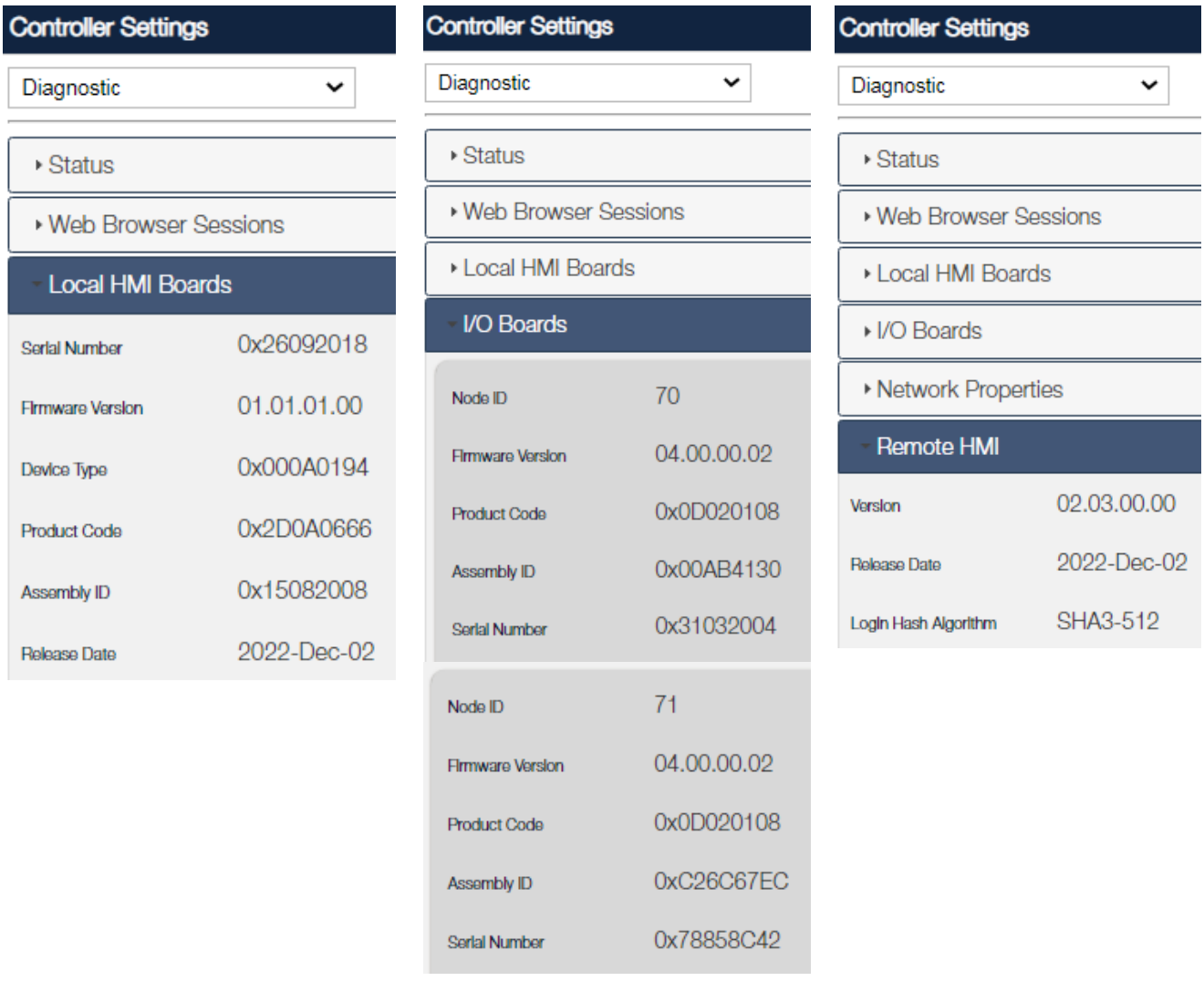
11.3.1.2 Web Browser Sessions

The Web Browser Sessions diagnostic will show all currently logged on users, if any.



11.3.1.3 Local HMI Boards, I/O Boards and Remote HMI

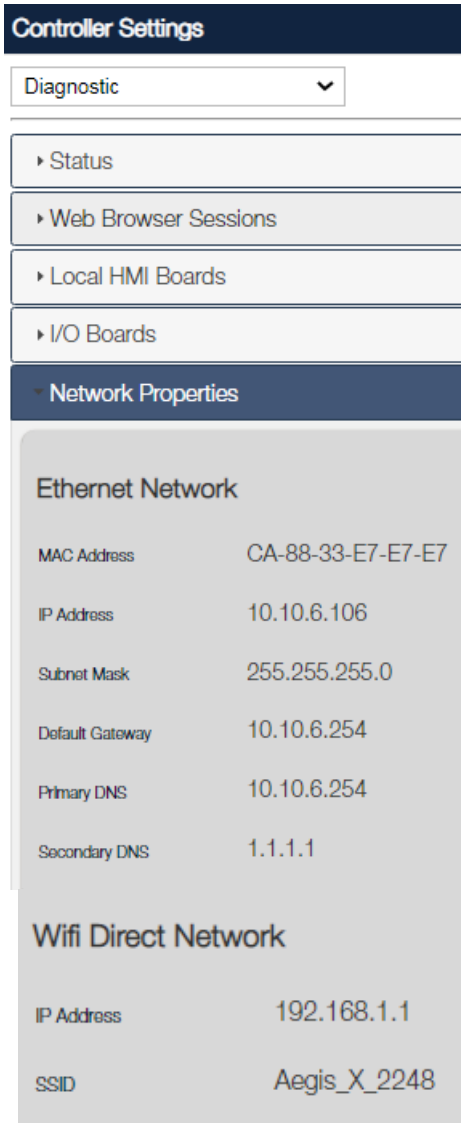
These diagnostic pages are mainly used by the manufacturer. Calls to the ProMinent Technical group may elicit request for Local and/or Remote HMI firmware versions from our technical staff. That information is on these pages.



11.3.1.4 Network Properties

The diagnostic page contains helpful information for setting up the Local Area Network (LAN).
Changes to the IP address, however, can only be accomplished via the local keypad. See section **7.2 Setting up a LAN Connection.**

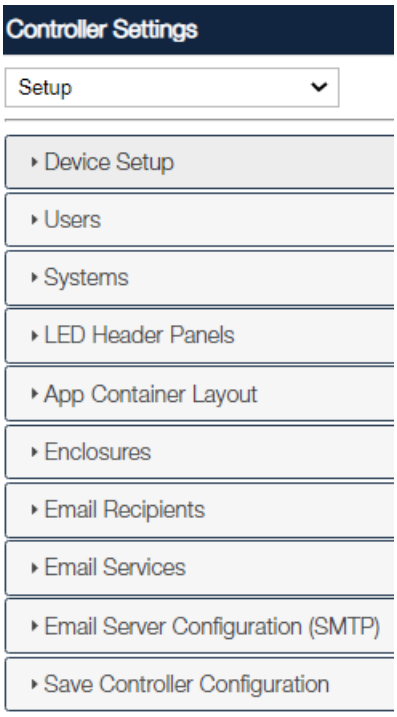
Related: See also section **7.1 Setting up a WiFi Connection**



NOTICE

Changes to the WiFi and LAN IP settings can only be accomplished via the local keypad.

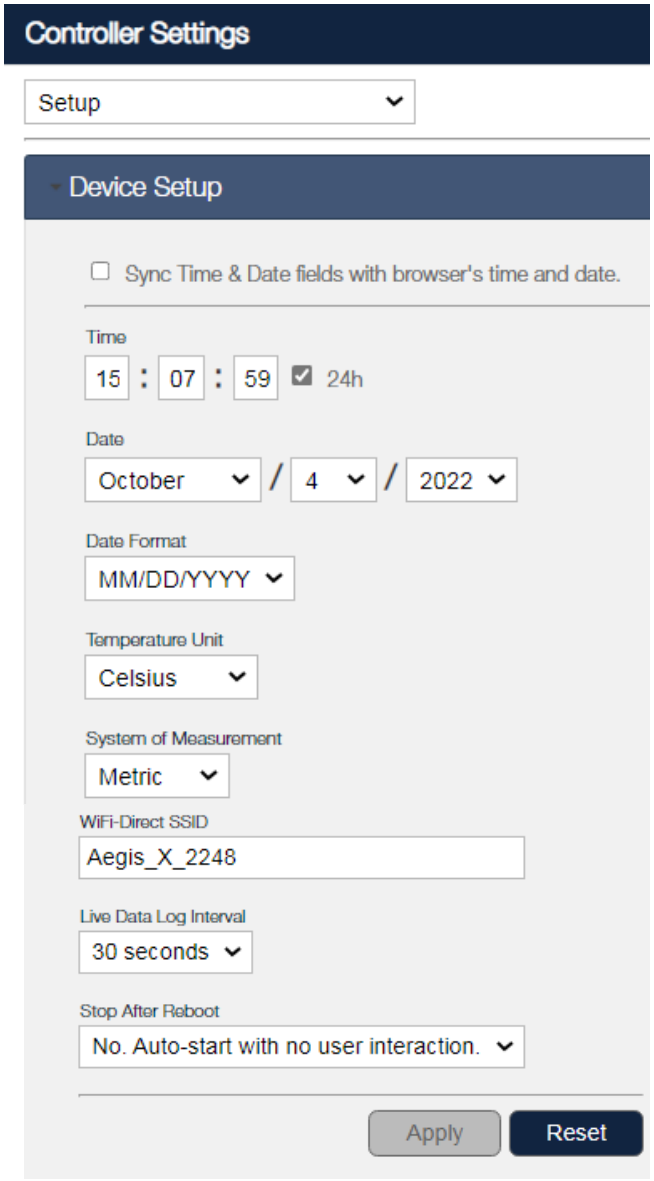
11.3.2 Setup Menu



The Controller Settings Setup menu includes **Device Setup, Users, Systems, LED Header Panels and Application Container Layout** tabs. Operators are precluded from making changes on most of these pages. Each item is described below.

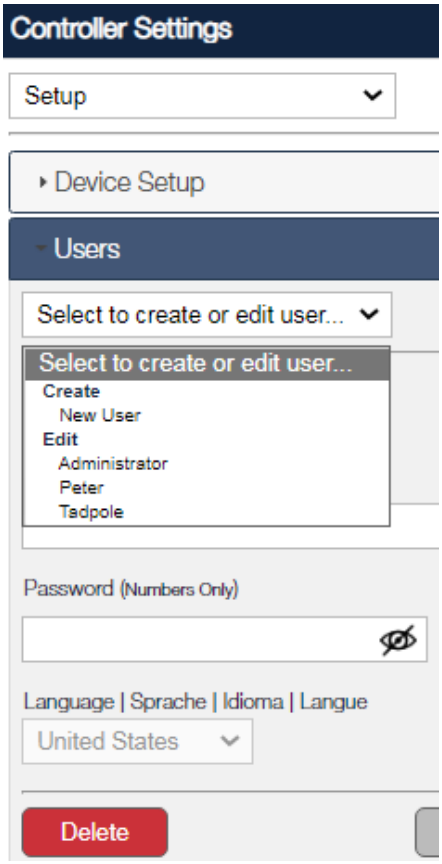
11.3.2.1 Device Setup

The **Device Setup** page allows an administrator to set the time and date or sync it to your PC or Cell phone. Change the date format, temperature unit, system of measurement and set the data log length.
Also, the controller can be set to start up after a power cycle (including a reboot) automatically or to wait for a user to press the start/stop button on the controller front keypad.



Operator users can monitor all Controller Settings pages. They **are allowed** to edit this page except for changing the time, (they can sync it but not edit it), change the date, (they can edit the date format only) and they cannot change the Stop After Reboot.

11.3.2.2 Users



Only Administrators can create new **Users.**

Choose from two user types; Administrator or Operator.

Creating new users allows customers to keep track of who makes what edits. You can also create Operator users in order to limit persons or groups from changing IP addresses or program settings. See list below.

You can create up to 10 Operator users. As the controller has one Administrator user from the factory, you can only add 9 more administrators. Up to 19 new users can be created.

Click on the Controller Settings menu icon, select ‘setup’ from the dropdown and then ‘users’. Choose an Access Level for the new user, enter a username; Operator or Administrator. Add a password, and then press Apply.

Or choose Edit to delete a user or change the username and/or password. Enter the new details and press Apply

11.3.2.2.1 Operator Permission List

Operator users have a reduced list of editing ability. They can;

Override an output

Edit the LED header

Invoke a reboot

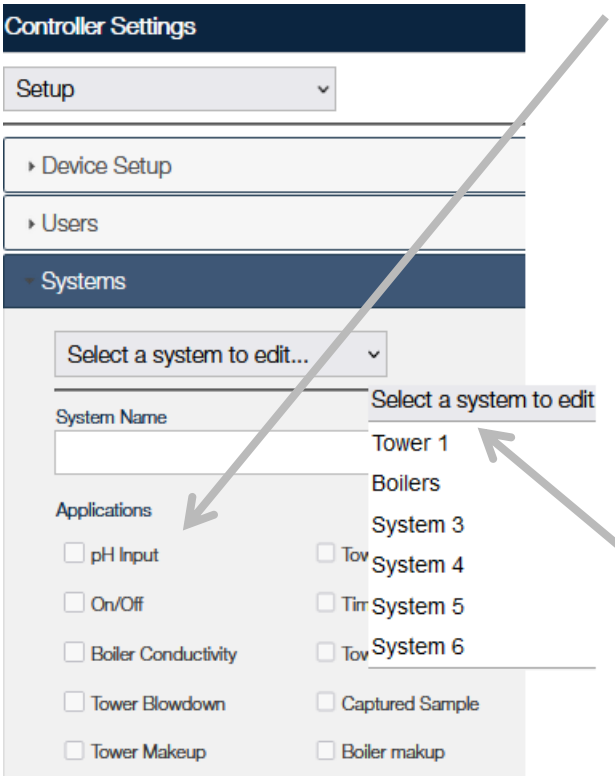
Download logbooks

Edit the containment layout (Cannot create or delete apps but can move them between containers or remove them from the page.)

11.3.2.3 Systems

The **Systems** page is used to group applications into one or more systems. Use the page to move apps to other systems or enroll an app into more than one system. Typically, you could have all the applications used on a cooling tower in a system and the boiler room apps in a second system. You could add a third system, 'Water Usage' and place any meter in the other systems into this new system. The watermeter apps would be in two apps.

Remember that containers or used to position the apps on the browser page. System flags show system membership. Membership can assist in locating an app on a controller that consists of several satellites.



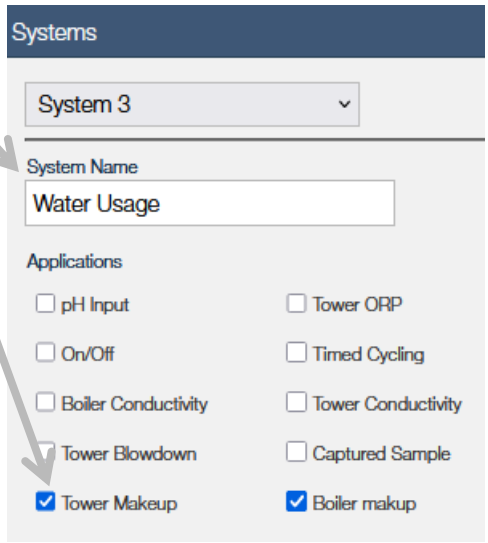
Notice that this controller has 10 apps listed. All applications across all connected controllers will be listed here. Each app has a box that tells you if that app belongs to the chosen system. An empty box (☐) indicates it is not part of any system, a grey check (☑) indicates membership with the chosen system and a blue check (☑) indicates membership with this system and at least one other.

This page does not show any membership since no system has yet been chosen. See examples below.

Press the pull down menu arrow at 'Select a system to edit…' and choose a system.

In this example, we have chosen to edit 'System 3'. We renamed it 'Water Usage' and added both watermeters to the new System by checking their boxes.

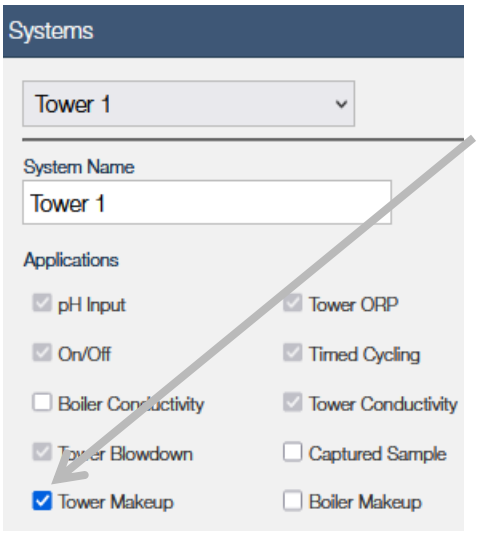
Since both meters belonged to other systems, they are now enrolled in two systems, thus the blue check box.



The Tower Makeup is in the Tower 1 system and the Water Usage system.

Boiler makeup is now in Boilers and Water Usage systems.

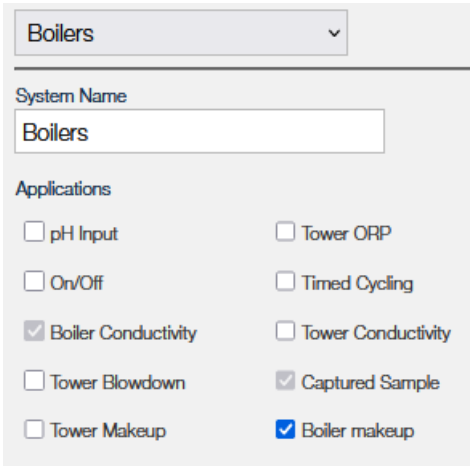
The Water Usage system has two apps.



Change the system to Tower 1. All the grey check boxes show membership with Tower 1 only! The blue check boxes indicate membership with Tower 1 and another system.

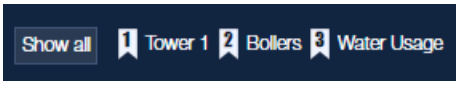
The reason the apps that are part of the Tower 1 system have greyed out backgrounds is because you cannot de-select them. If you could, they would no longer belong to any system.

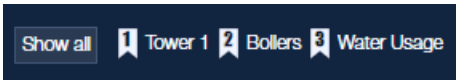
The Tower 1 system has 7 apps.



The Boilers system has three apps.
Boiler Makeup is also used in another system.

The key in the upper right-hand corner relates systems to flag numbers.



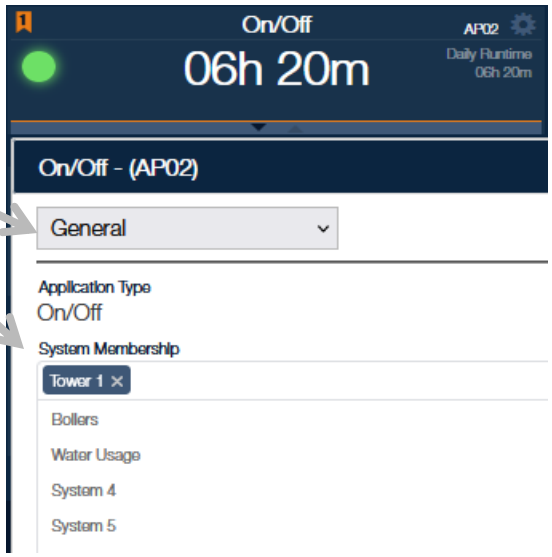


Toggle the visibility of the systems by selecting them from the key.

In the browser picture below, we can see the system flags (**shown here in orange**) in the upper left hand corner of each application.

Tower 1 apps, (flag #1) Boilers, (flag #2), Boilers and Water Usage, (flags #2 and #3).

You can also edit system membership of an app in the app menu. In the General tab, click on the System Membership box for the drop down choices.



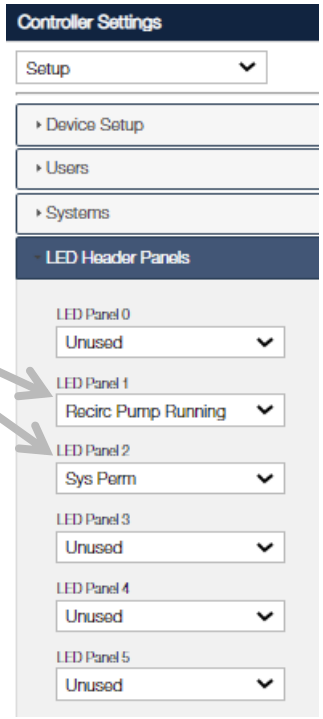
To create a new system, use the Controller Settings/ Setup/ Systems menu as explained above in section **11.3.2.3 Systems**.

For more information on working with applications, see section **13 Programming the Applications**.

11.3.2.4 LED Header Panels

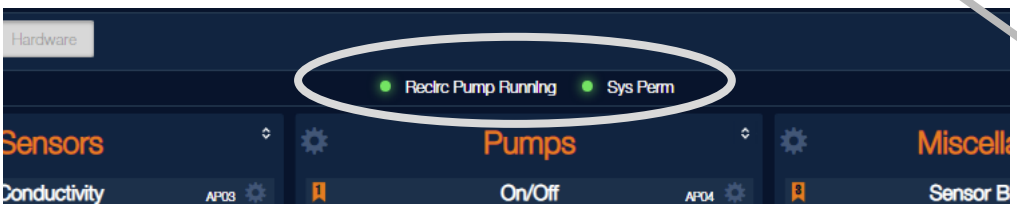
The Setup page for **LED Header Panels** provide up to six LED status indicators to be added to the browser application page. Status indicators represent digital inputs and digital outputs. They are on when the digital signal is on.

Here is an example of two:



Notice LED panel 1 and panel 2 are selected on the drop down menu.

They are now visible on the browser picture below.

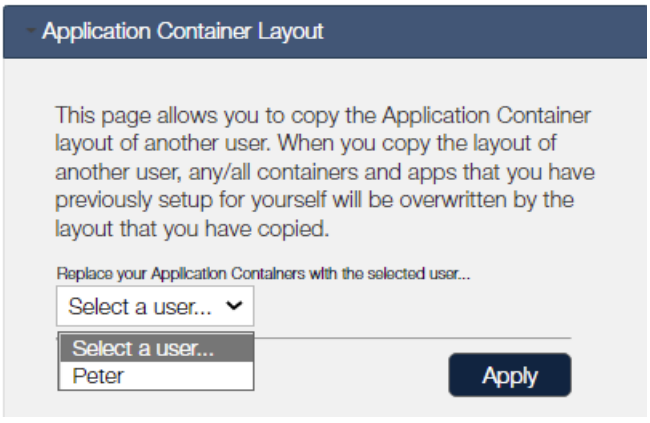


With a page full of applications, having indicators for a small group of digital signals could be helpful.

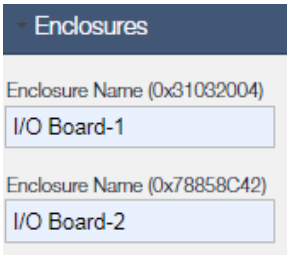
11.3.2.5 Application Container Layout

This tab is self-explanatory. If another user has set up the application in a manner that you wish to copy, use this page. Select the other user and press 'Apply'. Your apps screen will be the same as theirs.

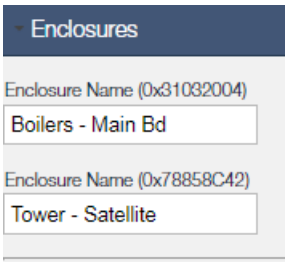
Change your mind? You can always edit your layout.



11.3.2.6 Enclosures

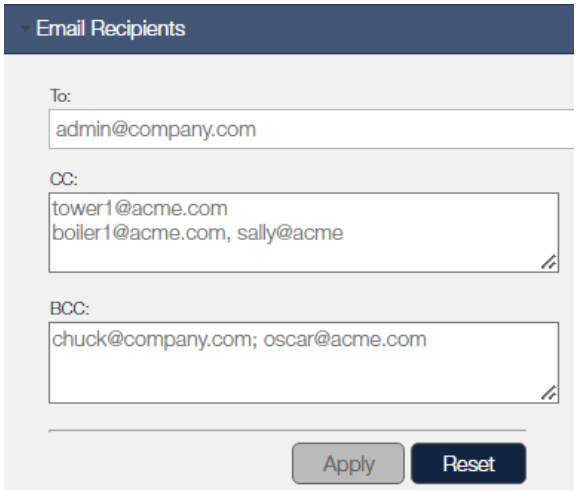


Edit the name of the enclosures to better describe which controller performs what function.

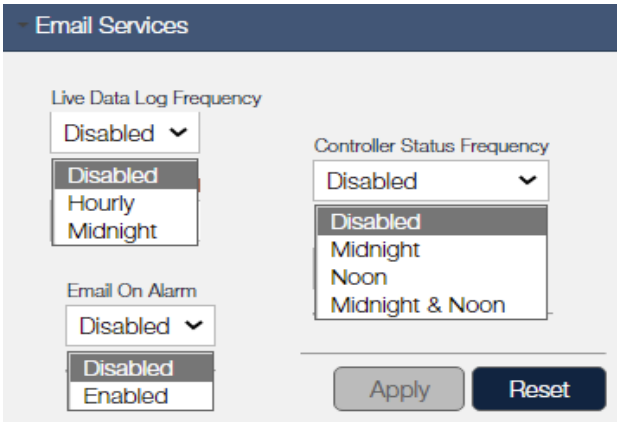


11.3.2.7 Email Recipients

Enter email addresses for all that wish to receive email from this controller.



11.3.2.8 Email Services

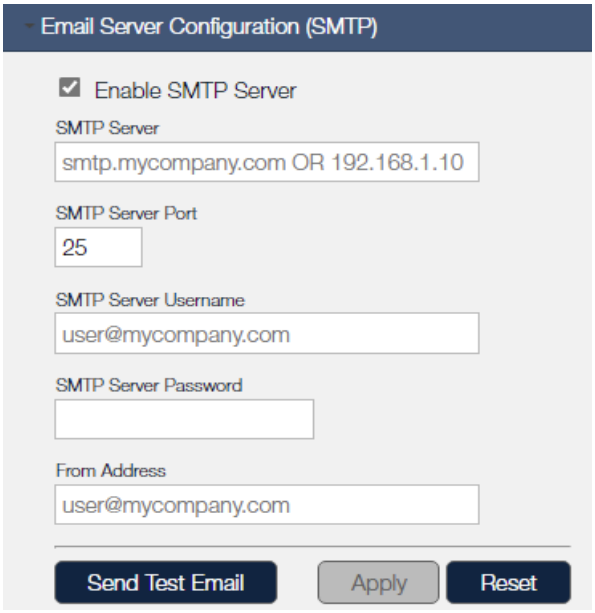


There are three types of email the Aegis X can deliver. Choose any or all types.

Set up the email action and press Apply.

11.3.2.9 Email Server Configuration (SMTP)

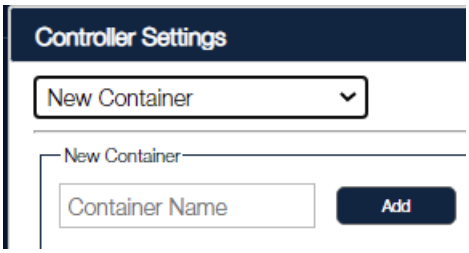
Email service requires an SMTP server. Depending on how the controller is connected to the Internet, the server can be provided by the customer if using the plant network. You may choose a wireless device with a connection via a phone company and bypass the plant network. In this case, use our server.



11.3.2.10 Save Controller Configuration

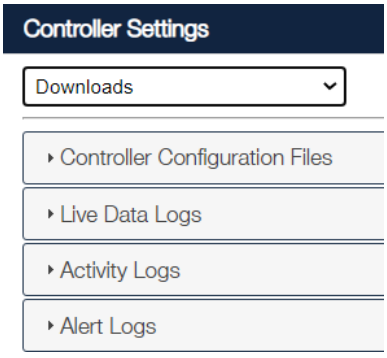
Save the current configuration of all application and hardware setup including setpoints to the uSD card inside the controller. See **11.3.4 Downloads** to copy any saved configurations to your PC. See section **2.4.5 Setup** to save the current configuration to a USB thumb drive.

11.3.3 New Container



Creating **Containers** is covered in Section **13.2 Create or Delete a Container**.

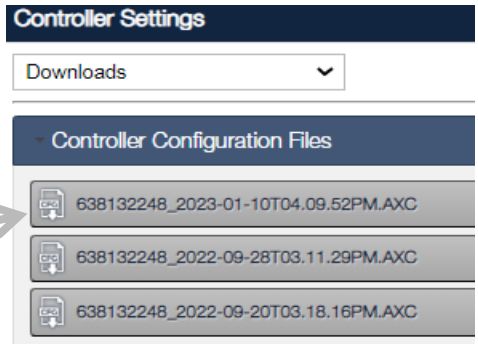
11.3.4 Downloads



The **Downloads** section has four tabs.

Use the **Controller Configuration Files** tab to save your configuration onto a PC. Click on the files you wish to add to your PCs Download directory.

The top file is the most recent. A timestamp is included in the file name.



11.3.4.1 Logs

Save **Live Data Logs** to your PC to view and import into a spreadsheet.

See examples in section **2.4.6 Logbooks**.

Live Data Logs provide a spreadsheet of data for all I/O points. Set the data logging interval in the Device Setup page. See section **11.3.2.1 Device Setup**.

Activity Logs indicate what changes were made and by whom.

Alert Logs include all alarms and warnings and errors.

11.4 Alerts, Alarms, Warnings & Errors

The Aegis X has a notification process that signals the users of controller alarms, process alarms and warnings, and user selection errors. Notification is via the red alert bell except for users errors which are identified with pop-up windows. The controller alarms are listed below and pertain to problems with the controller's physical wellbeing.

Programming **alarms and warnings** are mostly adjustable settings in the applications **Limit** tab. Analog inputs have high and low alarms and warnings, to alert the operator if a measured value is out of the normal operating range. Digital watermeters have volume alerts and output relays have adjustable run-time alerts.

Most programming alarms can be latching alarms. Latching alarms do not reset themselves if the parameter recovers back into the acceptable range. The operator must acknowledge the alarm for the alarm light and relay to reset to the OFF mode.

Latching alarms are especially helpful for remote installations where the operator checks on the system a few times a day or less. Under certain circumstances, if there is a control or feed problem and the alarm does not latch, the operator may not know there is an issue.

Alarms and warnings are indicated by the bell changing from white to red and a flashing red banner on the program panel. If the alarm is a latching alarm, it can be cleared by clicking on the bell or banner, then selecting the link that describes the alarm. If the process is still in an alarm condition, it will not clear. If the process limit includes a delay, it may clear and return after the delay.

The Aegis X also has an option to delay the alarm before alerting the operator. This feature is most helpful in applications where trapped air or other conditions cause the sensor reading to spike occasionally, but it is normal operation for that process. Without the delay the controller would have frequent nuisance alarms that would require acknowledgement by the operator. This option is in minutes and adjustable from the alarms menu. See below.

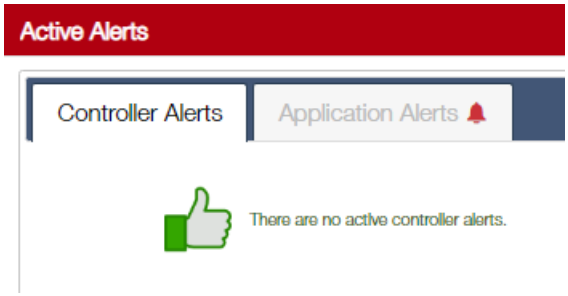
Errors occur when typing mistakes or incorrect selection choices are made by the operator. The pop-up window notices are self-explanatory.

Alarms can be acknowledged by any user.

Alarm settings for individual applications are explained in section **13 Programming the Applications**

11.4.1 Aegis X Controller Alarms

Click the bell to see the Active Alerts panel.



Here are possible controller generated alerts;

Real Time Clock Battery low	Internal SD Card Failure
Cooling Fan Failure	Temperature too high
Output fuse blown	Relay fuse blown
Power Supply overload Ext	Power Supply overload Digital Inputs
Power Supply overload CAN open	

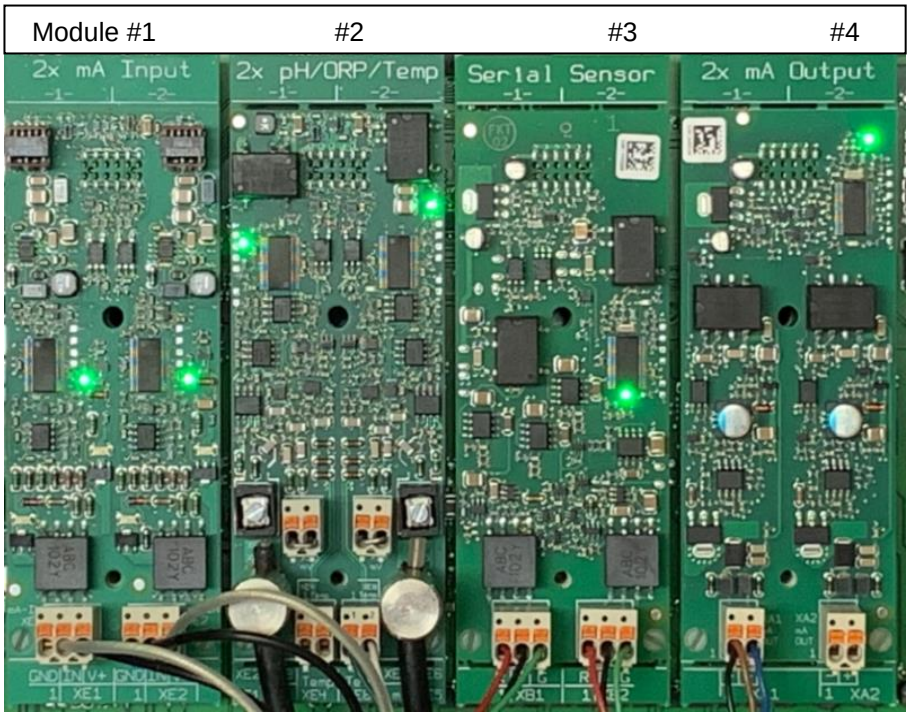
12 Setting Up the I/O – The Hardware Page

Sections 11, 12 and 13 cover topics that are inter-related. You will often find references to the other chapters.

12.1 Overview

This chapter will explain how to identify and setup the digital and analog inputs and outputs on the **Hardware page**. Once all the physical I/Os are wired to the controller, these hardware items need to be labeled and may require some minor setup. The controller program needs to know which I/O devices (sensors, pumps, valves etc.) are connected to which terminals so they can be incorporated into the applications on the Apps page.

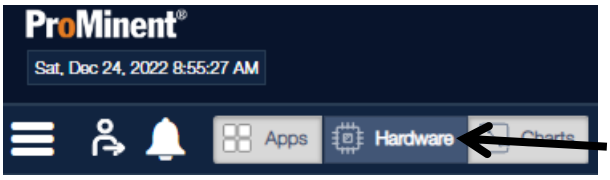
All terminated signals on the analog modules and digital terminals on the main board are viewed/edited on the Hardware page via an I/O box. The Hardware page applies an ID to each terminal starting with the four analog modules, followed by the digital outputs, digital inputs, relays and lastly, Modbus inputs. All satellite enclosures have similar I/O terminations except that currently, there are no additional Modbus terminals. **Keep in mind that up to four analog modules can be selected for every controller and/or satellite!**



The Aegis X has four analog module slots on the main board and four in the satellite. Any combination of the 6 above mentioned modules can be attached in any of the module positions. You could therefore, have up to eight of any module in the main and satellite controllers.

Choosing and wiring analog modules is discussed in section **9.2 Analog Inputs.**

Digital I/O hardware boxes follow the analog sections.



Use a browser to connect to the controller with a PC or your phone. See section **7 Communications**, and sections **11 Using a Browser, 11.2 Logging on**.

Click on the Hardware button to switch to the Hardware page.

The main purpose of the Hardware page is to locate and define the Inputs and Outputs for usage in the apps. **The layout of the boxes on this page will depend on which modules are in which module slots.**

Here is an example of the top portion of the hardware page which shows analog signal boxes for the main and satellite enclosures. In this example, Module 1 shows the I/O of the module in the main unit (a dual 4-20mA Input card – 2 boxes) and the module in the satellite unit (a conductivity card – 2 conductivities and 2 temperature input boxes).

During the controller power up sequence, the modules are discovered and signal boxes are assembled on the Hardware page based on the module type. From the factory, the boxes will be designated I/O Board #1 and I/O Board #2. To rename these controller IDs, see section **11.3 Controller Settings Menu**.

Signal boxes for each module are explained in the following sections. The complete browser page shows all modules followed by digital inputs, digital outputs and control relays. See sections **12.2.2.1 Digital Input Setup** and **12.2.2.2 Digital Outputs Setup** for more information. See also **9.1.2 Wiring Sensors to the Controller.**

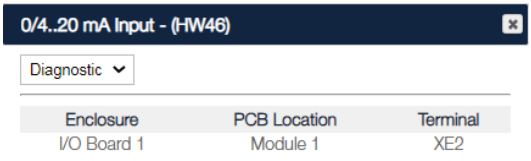
12.2 Hardware Page Boxes

The I/O boxes are used to define the device connected to a particular module and once set up, to provide diagnostic information of this point. Open an I/O box by clicking on the menu icon.

All boxes default to the **Diagnostic** page. The diagnostic information identifies the termination point on the module. The General menu is used to edit the information in this box to describe the device attached to this input/output. These and other menu items are described in this section.

Hardware box choices are greyed out to reduce accidental changes to items when in use by apps in the application window. See chapter **13 Programming the Applications**.

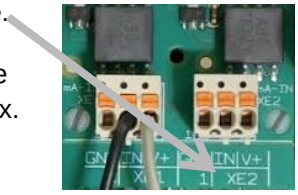
12.2.1 Analog boxes



The top banner shows the box name and hardware number. The name is editable through the General menu. (Next page). **Enclosure** indicates in which controller this point resides. In this example, the module is on I/O board #1. To rename the I/O board ID, see section **11.3 Controller Settings Menu**.

The **PCB Location** (**P**rinted **C**ircuit **B**oard) refers to the module location. Each enclosure includes 4 module slots. Each module has 2 or more terminations.

Terminal shows where the wiring termination is found as labeled on the physical module.



Each module has its own diagnostic information set. The list below shows all the possible diagnostic page data types. You will not see digital and analog information in any one box.

Online
true

Online = 'true' when the module is working

Hardware Type
Corrosion Sensor

Hardware Type = The module type. This example is a dual 4-20mA input module.

Pitting
0.05 mpy

Pitting (analog) = A corrosion sensor measurement.

Process Value
130.6 Gallons

Process Value (analog) = This value represents the calibrated variable.

Raw Value
14.4 mA

Raw Value (analog) = From the input module without calibration adjustment.

Calibration
Gain: 1 Offset: 0

Calibration = Calibration status is not included on digital hardware boxes. It shows the gain and offset value if calibrated.

Process Value
state

Process Value (digital) = Indicates if the point is open or closed after override.

Raw Value
state

Raw Value (digital) = Indicates the actual physical position of the switch.

CTFs Flow Counter
318

CTFs Flow Counter = An analog representation of the sample flow rate.

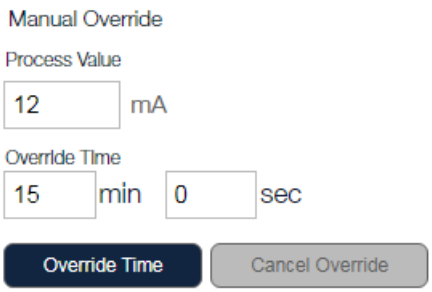
CTFs Flow Setpoint
1116

CTFs Flow Setpoint = User defined on Flow Setpoint tab, this is used to determine if minimum flow is detected. Below this value, the digital output indicates the flow is off.

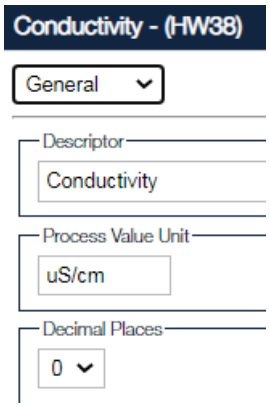
Used By
Acid Tank Level (AP02)

Used by Apps = If the application screen is using this input, it will be identified here. All apps named here are links to that app.

Analog output modules have an override section. Enter a process value and the length of time of the override. Do not exceed 999 minutes.



The second tab of all hardware boxes is for **General** setup.



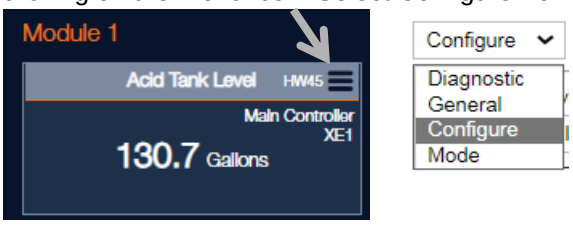
All General tabs have a Descriptor entry. Enter a unique name for the wired sensor or device. This is the ID you will use to connect this I/O to an app.

The **Process Value Unit** is typically the Engineering Units, like pH, mV, gal, etc. Digital I/O process values can be on/off or state.

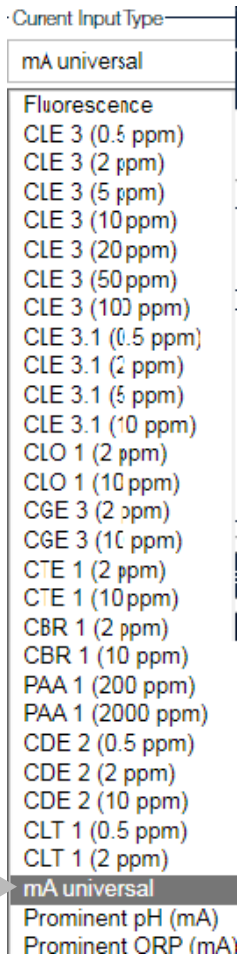
The **Decimal Places** allows you to select how many decimals will be displayed on the hardware page. This can be helpful during troubleshooting procedures. Apps have this selection again which affects the displayed value only on the app page.

When a hardware input is in use, some choices will be greyed out to reduce accidental editing.

Most boxes have a **Configure** tab. This example shows a 4-20mA input module setup. Open an I/O box by clicking on the menu icon. Select Configure from the dropdown.



Choose from the *Current Input Type* dropdown.

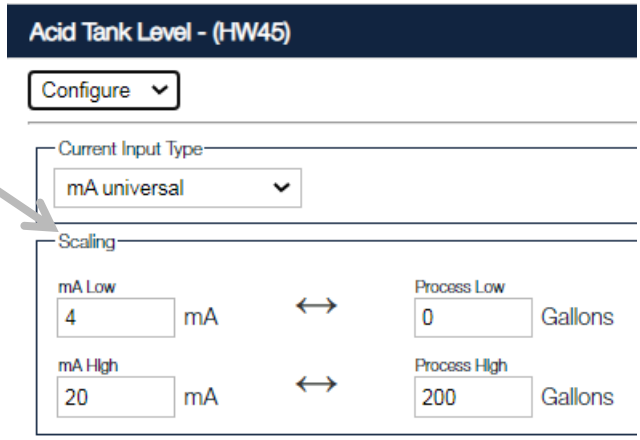


Fluorescence accepts the Little dipper and Pyxis 4-20mA signals. Or the Pyxis can be attached to the Modbus input.

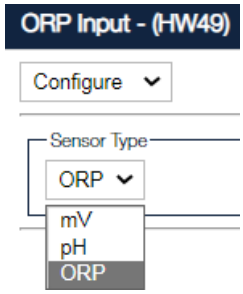
The list includes all ProMinent amperometric sensors, fluorescence, and all general 4-20mA Inputs.

The **Configure** page is used to scale the universal. 4-20mA is now equal to 0 to 200 gallons.

The mA universal input is for all other standard 4-20mA devices. This includes the ProMinent toroidal sensors. If you do not see a defined input for your device, use this mA universal input.

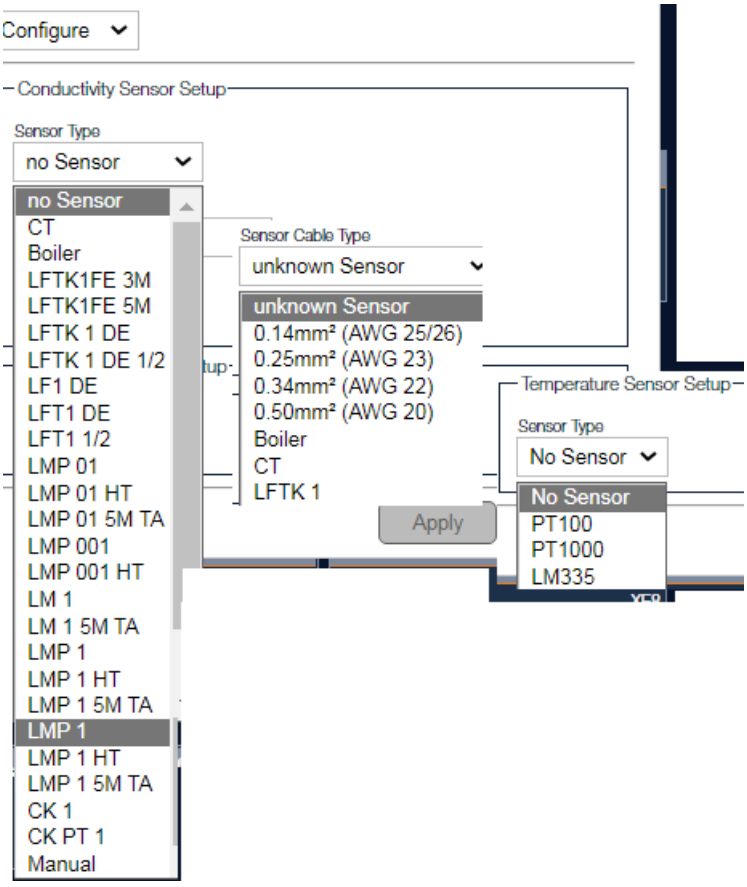


If a pH or ORP mV to mA converter is used, choose from these inputs.

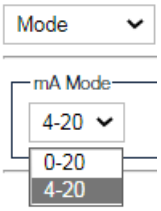


Some configuration pages use Sensor Type.

The Conductivity driver box is compatible with a large number of sensors, cable types and temperature sensors.



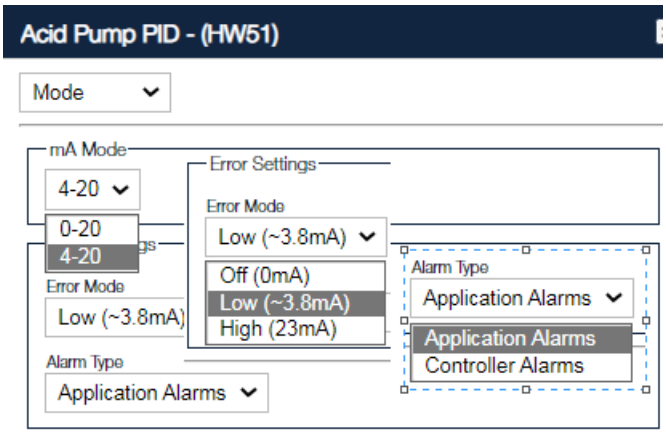
The mA input and output boxes have a Mode tab.



Choose between 4-20 and 0-20.

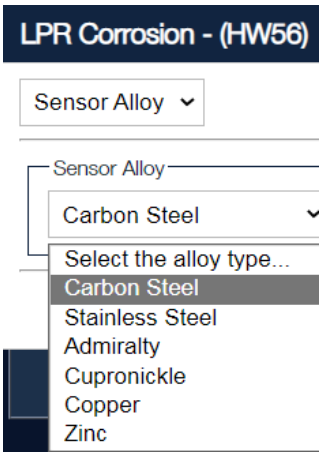
0 – 20mA Signals

The 0-20mA option is rarely used as it offers no warning if the signal line is broken. It may, however, be found on some older systems.

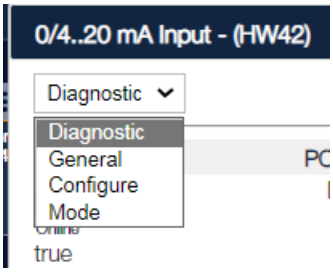


The mA output module has more to consider. Error mode lets you set the threshold for an alarm. 3.8mA is the typical low limit for a 4-20mA signal. If the line breaks or the power supply dies, the mA will drop below 3.8. If you are using a 0 – 20mA mode, you need the 0mA setting. On the high side, 23mA is the typical limit for a signal that has a power supply that has failed to regulate the current.

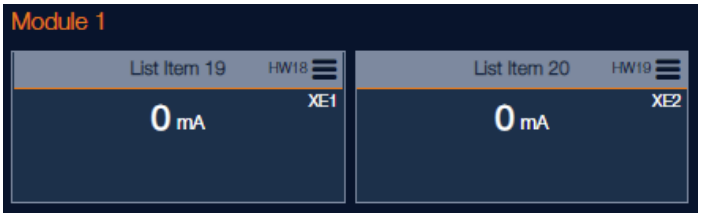
Corrosion Rate sensors have an alloy tab.



12.2.1.1 Dual mA Input Module



4-20mA current loops are common place in general industry worldwide. Like most controllers, this module can accept most standard milliamp signals. A mA signal may represent feedback from a pump, a tank level, a ProMinent amperometric probe, an analyzer or a signal from a computer/PLC/DCS to name a few.

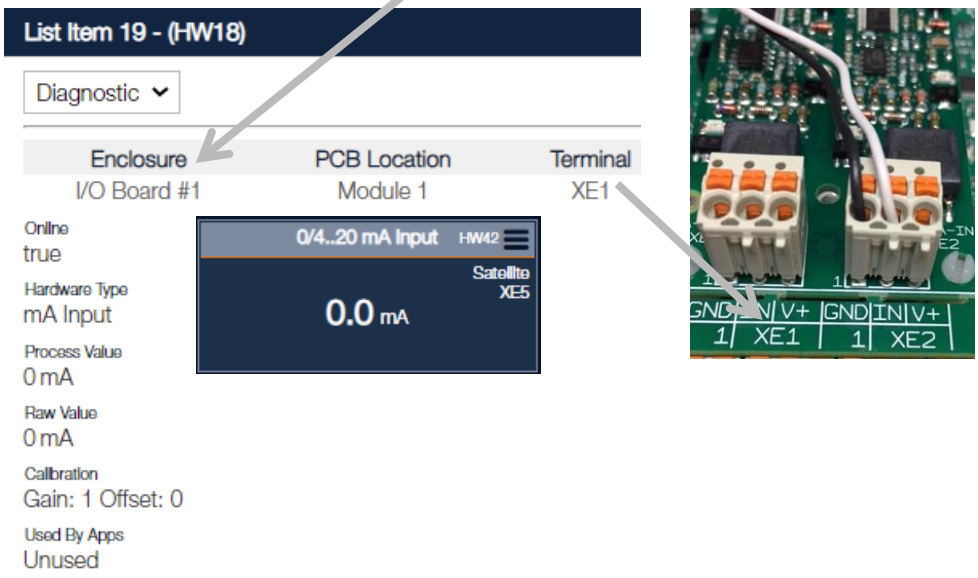


NOTICE

PLC stands for **P**rogramable **L**ogic **C**ontroller. **DCS** stands for **D**istributed **C**ontrol **S**ystem.

The Diagnostic page appears and shows where the Module is located, (I/O Board #1 is the main controller board. I/O Board # 2 would be the first satellite board, etc.) Each Enclosure, main or satelite, includes another set of up to 4 modules. Edit the enclosure/satellite names as needed.

The **PCB Location** (**P**rinted **C**ircuit **B**oard) refers to the module slots and the **Terminal** is the input as labeled on the module.

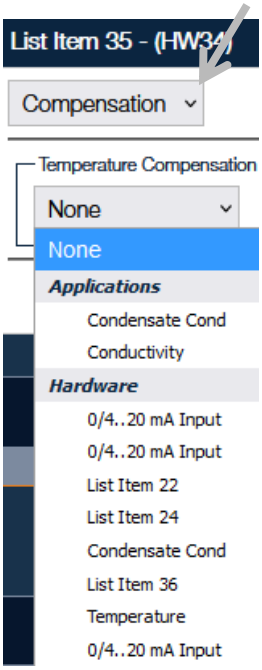


Online = ‘true’ when the module is working
Hardware Type = mA Input
Process Value = scaled Raw Value including calibration changes
Raw Value = From the input
Calibration = Shows the current Gain and Offset values. These values are affected by a calibration.
Used by Apps = If the application screen is using this input, it will be identified here. See section **9.2.5 Dual 4-20mA Input Module** for more module information.

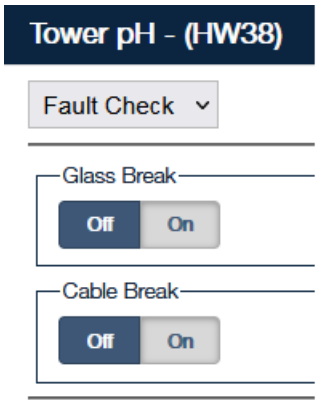
12.2.1.2 Dual mV Input Module

The mV Input Module was specifically created for use with two-wire pH and ORP sensors. The mV module has four terminal inputs, two for mV and two for temperature. For wiring and specifications see section **9.2.4 Dual pH/ORP Temperature Module**.

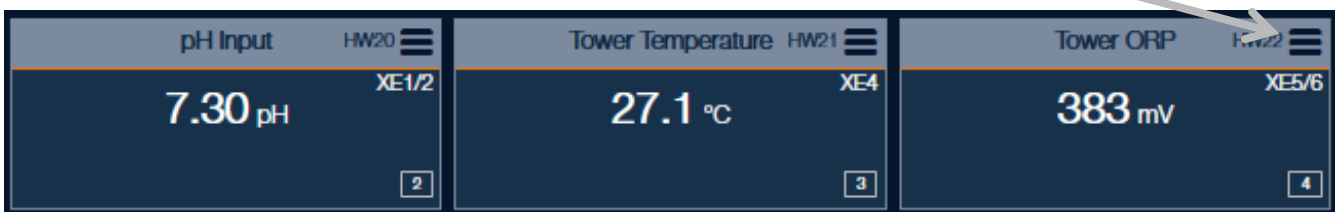
A pH sensor is typically wired to the first input and an ORP sensor to the second input of the mV Module. The hardware page boxes for a dual mV input are shown below. Each of the mV sensor boxes has an additional temperature input box available for compensation. However, the program for ORP does not allow compensation. The second temperature input is provided in the event that you have two pH sensors and compensate both. Use the **Compensation** tab to choose the appropriate temperature input.



A pH sensor has a **Fault Check** tab. If your sensor is unplugged or the glass is broken, an alarm can be generated.



Set up the ORP by choosing the menu icon of the mV box where you have wired the ORP sensor.



Typically, the pH sensor is programmed for the first input and ORP the second. However, if pH is not used or if wired otherwise, ORP could be on the first input. In any event, configure the ORP as you did with the pH.

Use the menu to edit the name of the temperature input as desired.

12.2.1.3 pH/ORP Temperature and mA Input Module

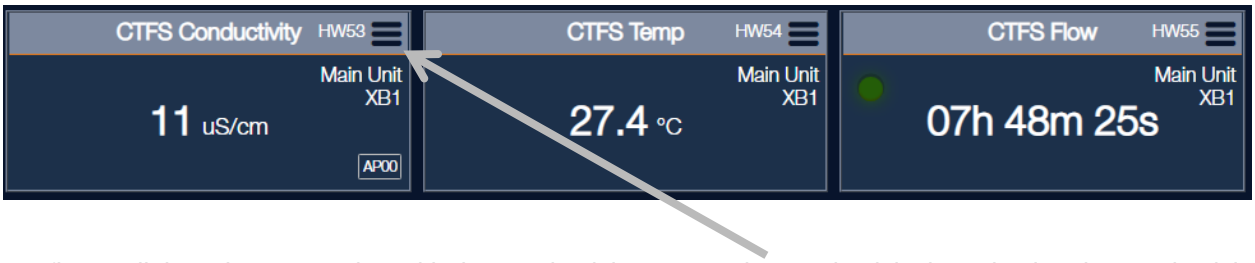
This module has three sensor inputs: a mV input for a pH or ORP sensor, a temperature input and an input for a mA sensor. The temperature can be utilized for measurement and/or control as well as compensation of this or any other pH input. The list of possible mA inputs is the same as for the dual mA input module which includes any ProMinent amperomentric sensor. The pH sensor can be used for compensation of a free chlorine sensor. If desired, the mA input can be used for most any 4-20mA or 0-20mA device.
The three inputs are represented on the browser hardware page by three boxes. They are mV, temperature and mA.

12.2.1.4 Dual Serial Input Module

The Serial Input Module is compatible with the ProMinent CTFS (Conductivity/Temperature/Flow Switch) sensor and the serial corrosion rate sensors. Both sensors are three-wire sensors. Information from the sensors is transmitted to the controller as serial data.

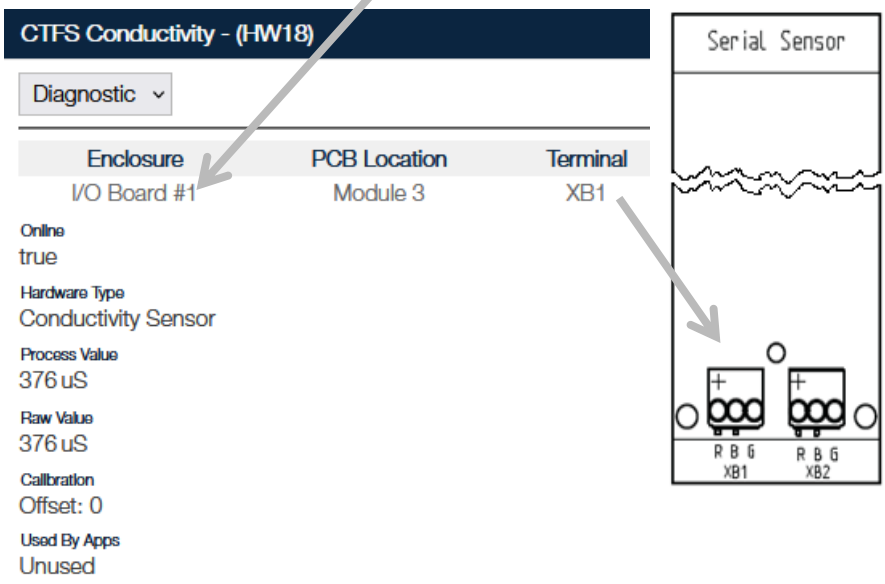
12.2.1.4.1 The CTFs Sensor Setup

The CTFS sensor combines the temperature compensated conductivity, the temperature reading and the flowswitch status; On or Off.



Configure all three boxes starting with the conductivity. Set up the conductivity by selecting the conductivity menu icon.

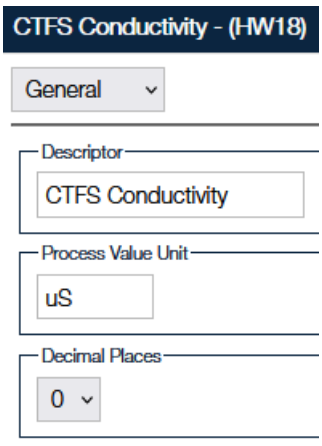
The Diagnostic page appears and shows where the Module is located, (I/O Board #1 is the main controller board. I/O Board # 2 would be the first satellite main board, etc.) Each Enclosure, main or satelite, includes another set of up to 4 modules.

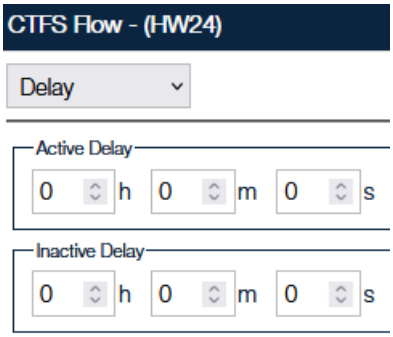


The **PCB Location** (**P**rinted **C**ircuit **B**oard) refers to the module slots and the **Terminal** is the input as labeled on the module.
Online = true when module is working
Hardware Type = Conductive Conductivity. (Not toroidal)
Process Value = scaled Raw Value and includes any calibration changes
Raw Value = From the input
Calibration = Shows the current Gain and Offset values. These values are affected by a calibration.
Used by Apps = If the application screen is using this input, it will be identified here.

For wiring and technical information, see section **9.2.2 Dual Serial Input Module (CTFs-LPR)**

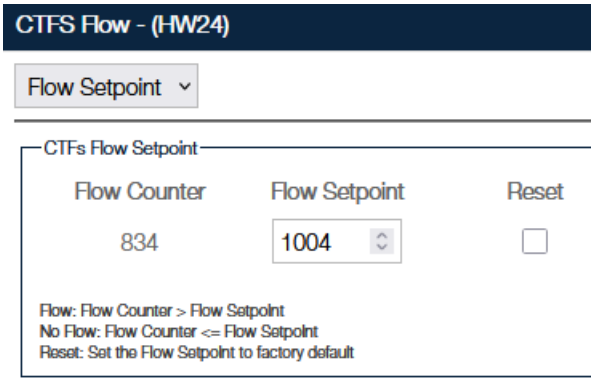
Use the **General** tab to edit the Description, Units and decimal places.



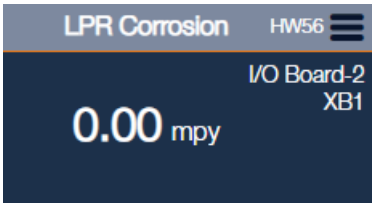


Prevent output relay ‘chatter’ by setting a delay on the Active or Inactive signal. The raw value will change states with the sensor input. The process value will wait until the delay counter is completed.

Manually edit the Flow Setpoint to improve the accuracy of the flowswitch.
For best results, note the Flow Counter value with the sample valve closed and again with the valve open. Give the readings time to settle. Calculate a value half way between the two readings and use that for the Flow Setpoint. The Reset will return the Flow Setpoint to the factory default value.



12.2.1.4.2 The LPR Corrosion Rate Setup



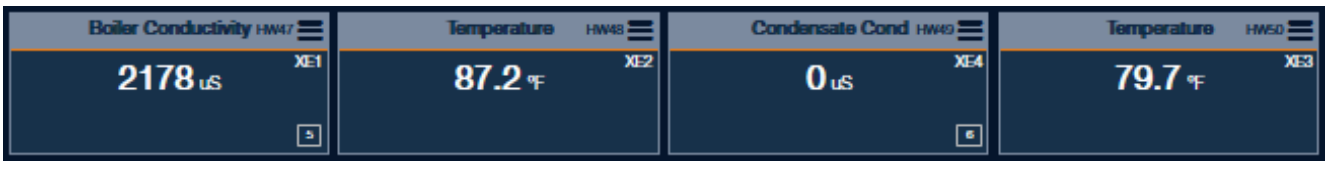
Corrosion rate utilizes a single box.

Edit the name and select the metal type.

12.2.1.5 Dual Conductivity/Temperature Module

The Dual Conductivity Temperature module has 4 boxes as shown here. This module is compatible with a variety of conductivity/temperature sensors, but not the serial CTFS. See section **9.2.3 Dual Conductivity/Temperature Input Module** for more sensor information.

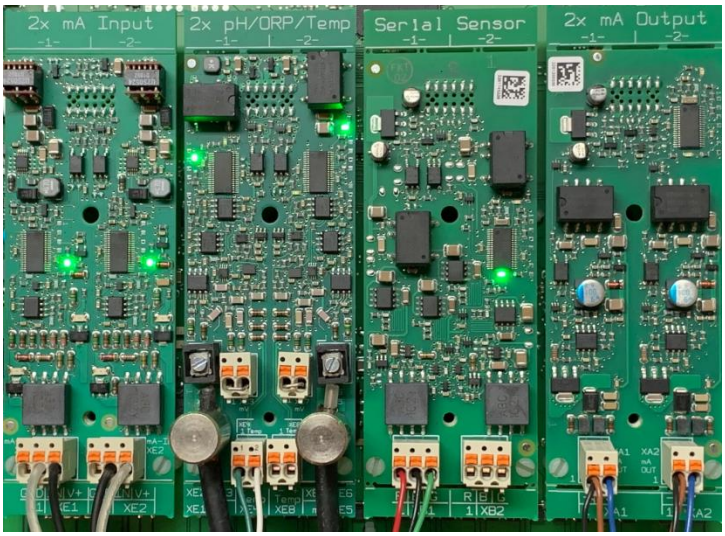
.



12.2.1.6 Analog Output Module Setup

Analog outputs signals are via the analog output modules which can occupy any or all of the 4 module slots. As an example, we have one installed in module #4.

Module #1 #2 #3 #4



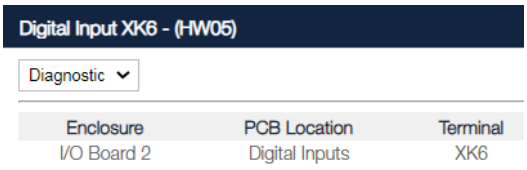
The dual analog output module can be set for 4/20mA or 0-20mA. Although somewhat rare, 0-20mA is still used.
The advantage of 4-20mA is that you have a current representing a zero valve rather than no signal. A zero value signal happens when a wire is broken or is loosened from the termination point. This problem will not generate an error message when the 0 to 20 range is selected. A 4-20mA loop will alarm if the mA value is below approximately 3.8mA.

Wiring examples and technical data in section **9.3.1 Dual mA Output Module**

Open the first output menu XA1.

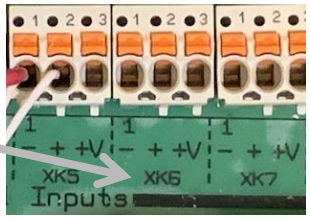
12.2.2 Digital Boxes

See also, **12.2 Hardware Page Boxes**

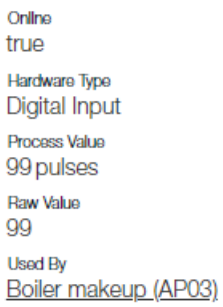


The top banner shows the box name and hardware number. The name is editable through the General menu. See section **12.2.1 Analog Boxes** for complete hardware page box explanations. **Enclosure** indicates in which controller this point resides. In this example, the module is on the #2 I/O board, it is the digital input and is the XK6 terminal. To rename the I/O board ID, see section **11.3 Controller Settings Menu**.

The **PCB Location** (**P**rinted **C**ircuit **B**oard) refers to the digital terminal location.



Terminal is the wiring termination as labeled on the board.



Online = 'true' when the module is working

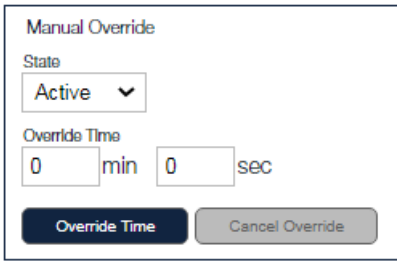
Hardware Type = Digital Input

Process Value (digital) = Indicates if the point is open or closed after override.

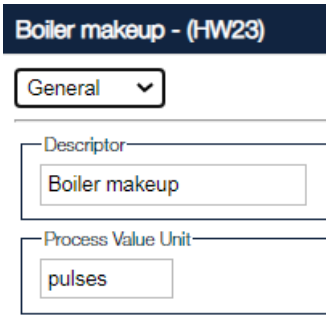
Raw Value (digital) = Indicates the actual physical position of the switch.

Used by Apps = If the application screen is using this input, it will be identified here. All apps named here are links to that app. When in use, some choices will be greyed out to reduce accidental editing.

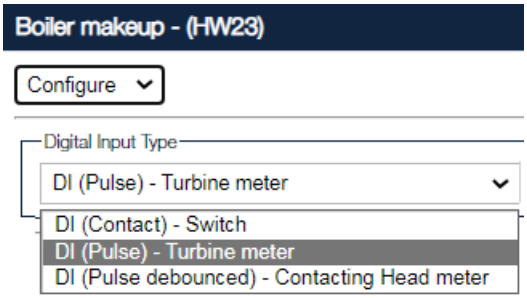
Digital Outputs have a Manual Override setting. Set the state; Active is open on a normally closed tip and closed if the tip is normally open. Enter the length of time to remain in this temporary state. Do not exceed 999 minutes.



The second tab is the **General** page. Edit the name of the box to reflect the actual input used and the Units of measure.



All digital boxes have the same choices.



The third tab is the **Configure** page. There are three configure pages. One for digital inputs, one for digital outputs and one for relays.

There are three types of digital inputs.

DI (Contact) - Switch is for any on/off dry contact

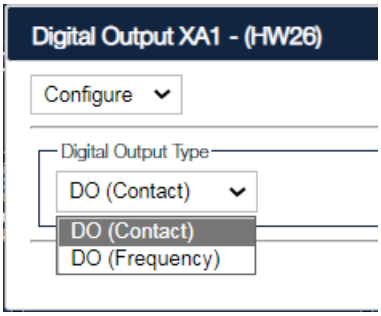
DI (Pulse) – For turbine meters

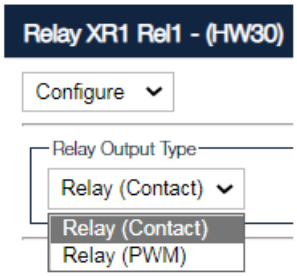
DI (Pulse debounced) – For Contact head watermeters

Digital Outputs have two types;

DO (Contact) for on/off control

DO (Frequency) to control pump speed



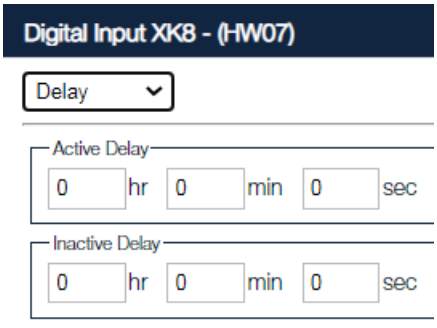


Relays are used for up to 5 amps each.

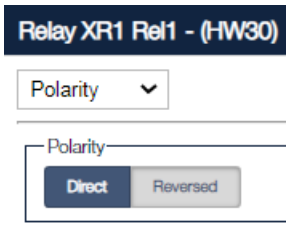
Relay (Contact) to control remote relays, a pump permissive or if powered, to run a pump or solenoid etc.

Relay (PWM) is Pulse Width Modulation. See section **12.2.2.2.3 Relay Setup** for more about PWM.

Only digital inputs have a **Delay** tab.

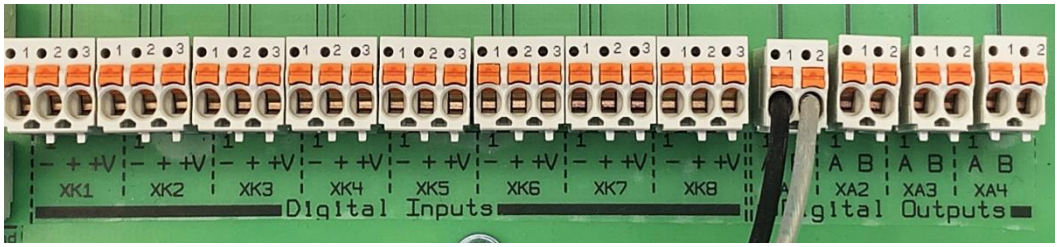


All digitals have a **Polarity** tab.

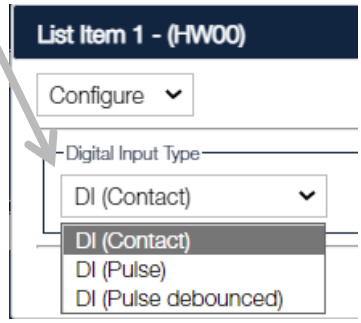


12.2.2.1 Digital Input Setup

Use the Hardware page to select the box that corresponds to the digital input terminal that is used by the input. The main controller and the satellite bot have eight digital input boxes, XK1 through XK8 located just below the analog module boxes.

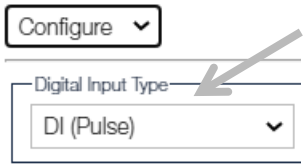


Use the Configure tab to choose a digital type. Digital Inputs have three 'type' choices. '**Contact**' for on/off signals, '**Pulse**' for frequency inputs as used on a turbine meter and '**Pulse Debounced'** which is used on **contact head** watermeters to ensure each pulse is only counted once.
The default type of digital inputs is 'Contact'.



A **Contact** input is active or inactive based on some function like a tank level alarm or permissive from the plant. To make certain the signal does not toggle multiple times when near the action point, a delay menu is available. This can prevent a chatter effect on the output.

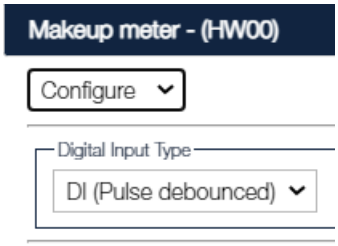
The **Pulse** input has fewer menu choices; only Diagnostic, General and Configure.

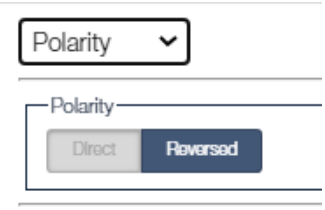


Use 'Pulse' for turbine meters and frequency inputs.

Edit the Descriptor.
Process Value Unit can be pulses per second or minute.
The **Pulse Debounced** selection improves contact head meter accuracy. Do not use on turbine meters!

This Type has the same menus as a 'Pulse' type.





Included in the menu is a Polarity choice. Notice in the diagnostic page above, the raw and process states are the same. By changing the Polarity to Reversed, the state of the Process Value will always be the opposite of the Raw Value state. This can be useful for situations where the input is opposite of the intended use. For example, if a permissive from the plant is sent to inform the controller when the process is running or not, or a tank level switch is on when the tank is low, you might need to invert them to stop pumps or valves from operating.

12.2.2.2 Digital Output Setup

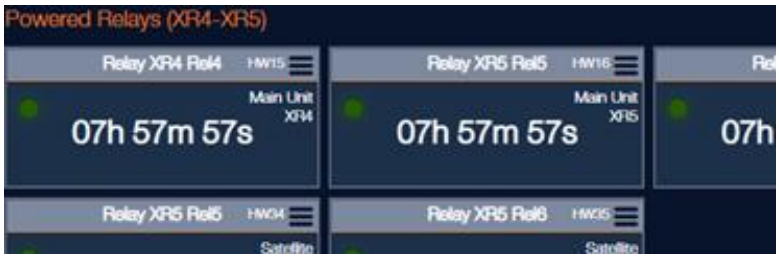
Digital outputs include four low DC voltage outputs for enabling pumps or as a pulse for controlling pump speed. These outputs relays are typically used for 30VDC or less.

There are also 6 AC power relays for controlling power to pumps and solenoids valves.

The voltage from the powered relays is the same as the line voltage fed to the controller. This can be from 90 to 250VAC. For more information about wiring these relays, see sections **9.5 Digital Outputs** and **9.5.2 Powered Digital Outputs**.

12.2.2.2.1 Low Voltage Digital Outputs

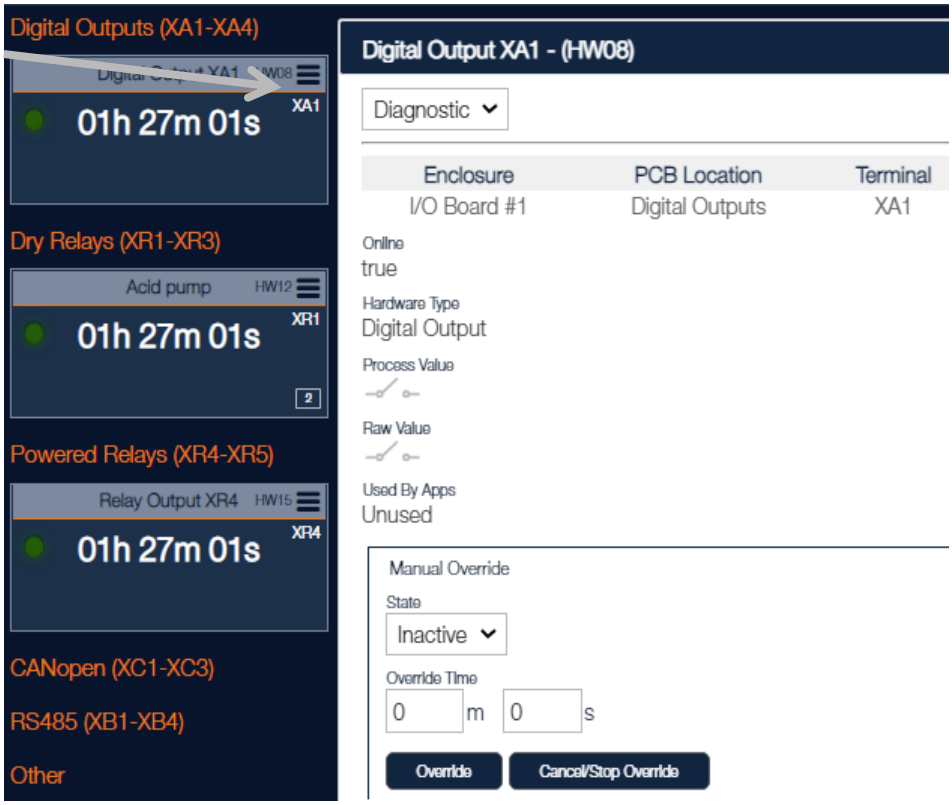
On the Hardware page, the bottom rows of boxes are allocated to the low voltage digital outputs, (four outputs for the main controller and four for the satellite) followed by the “Dry Relays” and finally, the “Powered Relays”.



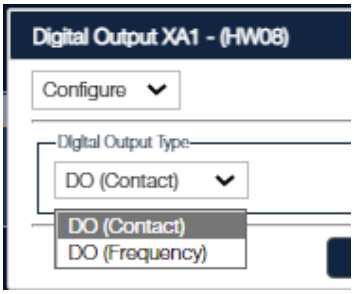
To set up a digital output, select the menu icon on a digital output XA1 through XA4.

The Diagnostic page shows the location of the output terminal. It is on I/O Board #1 – the main controller, and is in the digital output section. It is terminal XA1.

Offline; True indicates the module is running.
Hardware Type is Digital Output
Process Value shows the actual status of the output after any polarity adjustment.
Raw Value is the computed value prior to polarity adjustment.
Used by Apps will identify any App usage.

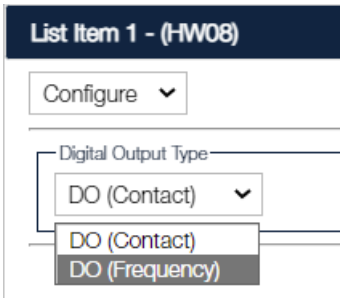


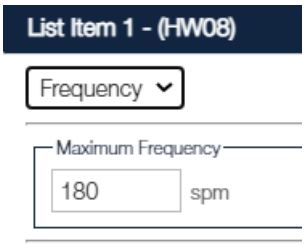
The Manual Override section allows the user to set the output on or off for up to 10,080 minutes. (1 week)



From the Configure menu, choose DO Contact for simple on/off signals as to enable/disable a pump for example. Or choose the DO Frequency to control the speed of a pump. Wiring examples are in section **9.5 Digital Outputs**.

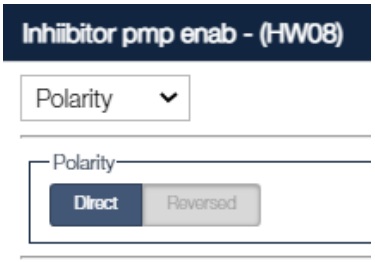
Or use the Configure page to set the output for a frequency to drive a pump speed.





Set the maximum Frequency and provide a name.

Output polarity can be reversed as well.



12.2.2.2.2 Line Voltage Digital Output Relays

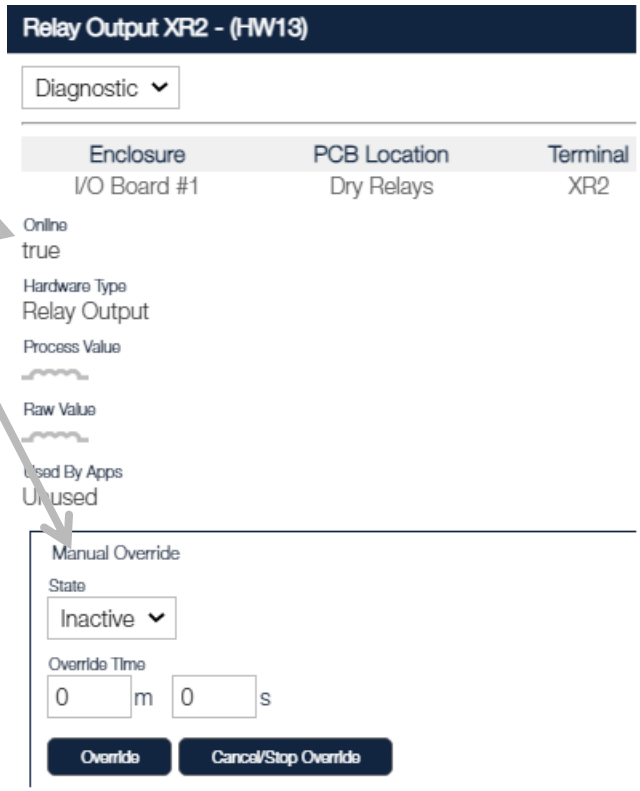
Relay outputs are used to control feed pumps, solenoid valves, alarm lights/horns or many other devices. They can also be used to enable a feed pump in the same manner as the low voltage relays.
The powered relays (XR4, 5 and6) use the line power provided to the controller. These relays are limited to 10Amps total and are generally not used for motor driven pumps.
The Dry Contact relays (XR1, 2 and 3) can use line power as well and have the same constraints, 10Amps total. They can also be used with externally provided power of AC or DC. The maximum current on any relay is 10Amps.

12.2.2.2.3 Relay Setup

The Dry and Powered relay boxes are the last two sections of the browser Hardware page. All six relays use the same menus.

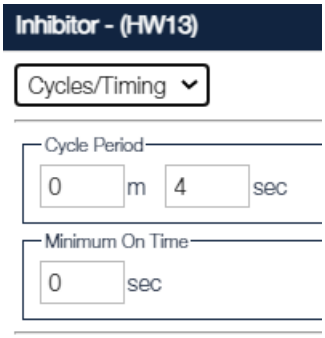
The diagnostic page shows the location at the top, the Online status, hardware type and the process and raw value states.

Manual Override can turn the relay on or off for a set period of time and be cancelled if needed.



If you are using the output in Pulse Width Modulation mode (PWM), use the General tab to name the output and set decimal places. The % duty means what percent of the cycle period should be applied at full scale.

PWM adds a new tab, Cycles/Timing. The cycles period sets the repeat rate.



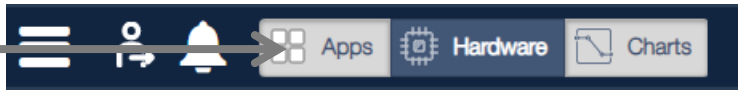
13 Programming the Applications

Sections 11, 12 and 13 cover topics that are inter-related. You will often find references to the other chapters.

13.1Introduction

In chapter **12: Setting up the I/O – The Hardware Page**, the inputs and outputs were configured. Now we can create apps to monitor sensors and meter inputs as well as use these inputs to control the digital, powered and analog outputs.

Return to the Application page to create sensor and control apps. Press the 'Apps' icon.



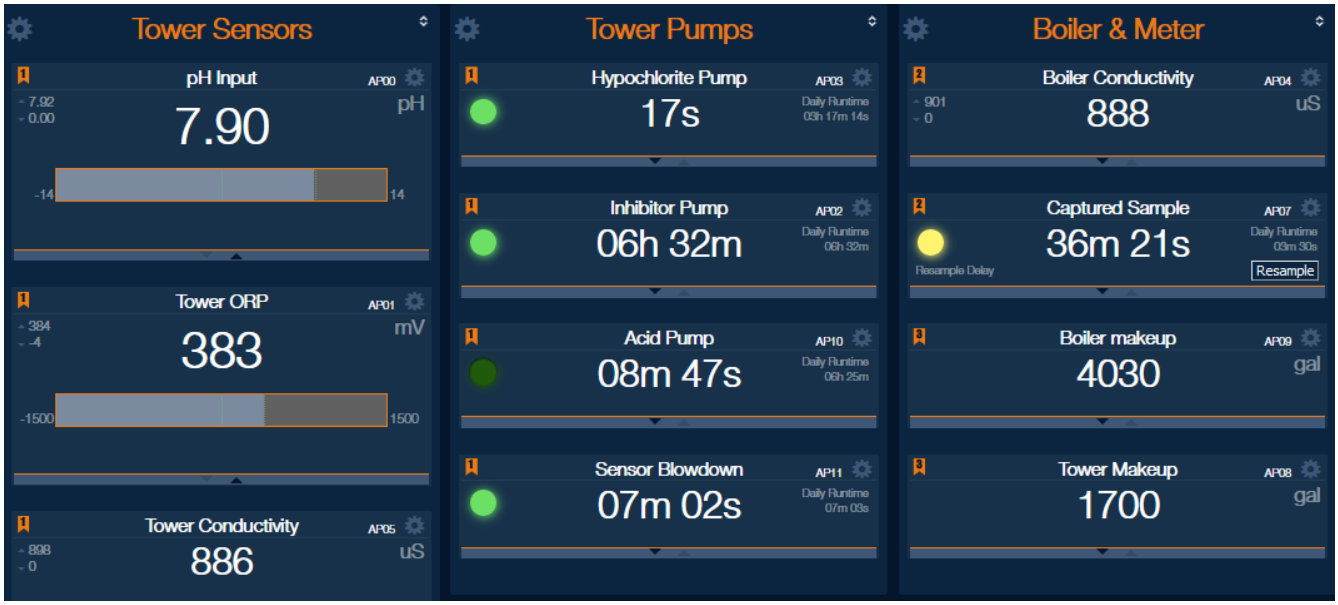
Applications reside in groups called containers. Containers are used to position the apps in a meaningful way to the user. Typically, 3 or 4 containers are used to divide the browser view into 3 or 4 columns. Now you can create apps and place them in any position inside the containers. You can always rearrange the apps at any time.

13.2 Create or Delete a Container

Containers allow the user to control the position of the apps on the browser screen. In the picture below we have chosen to create 3 containers which we labeled 'Tower Sensors', 'Tower Pumps' and 'Boiler & Meter'. In this example, I can see my tower sensor values in the left column, the tower pump status in the center and the boiler system with both water meters in the right column. I could move the tower makeup meter in one of the other containers but then I would have to scroll down to see it or make the whole page smaller to fit my PC screen.

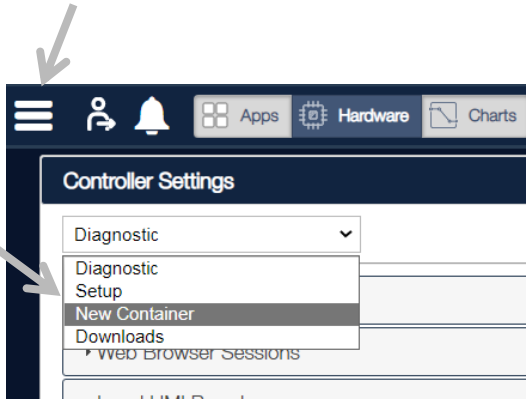
Browser Screen Adjustment

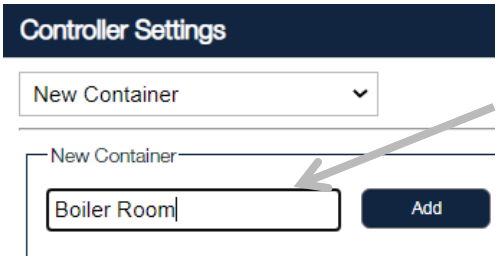
To adjust the size of any browser screen, hold down the Ctrl key and use the + and – keys.



Do not confuse containers with System Identifiers. System Identifiers group the apps based on your preferences like cooling towers, boilers, closed loops, etc. See **11.3.2.3 Systems** for more information.

To create a new container, click on the menu icon (often referred to as ‘hamburger’) on the home page and choose ‘New Container’ from the drop down.

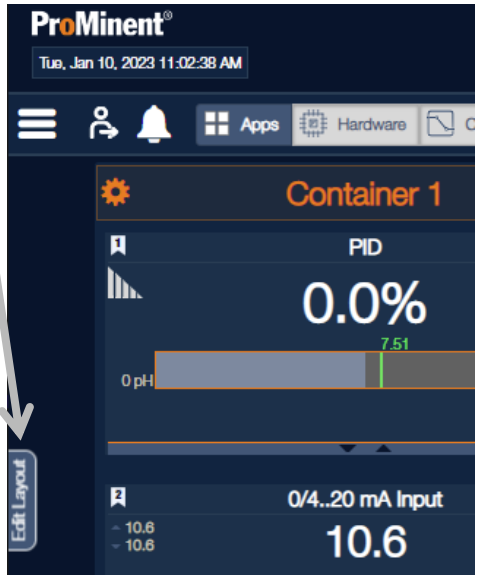


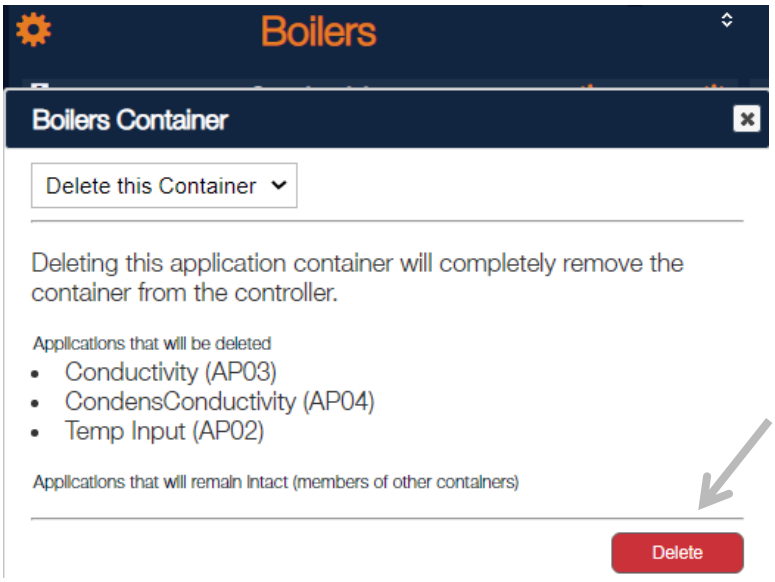


Give the Container a name indicative of the future contents. Press ‘Add’.

Add new apps and containers at any time. Move apps between containers using the **Edit Layout** button located along the left side of the browser screen.

Use the Edit Layout button to remove apps prior to deletion as any apps remaining will be deleted.



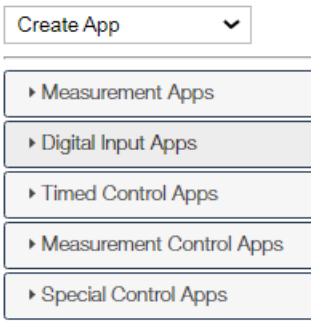


Delete containers by selecting the gear icon in the corner of the container. Choose the Delete this container tab from the dropdown. Press the Delete button.

13.3 Creating Applications

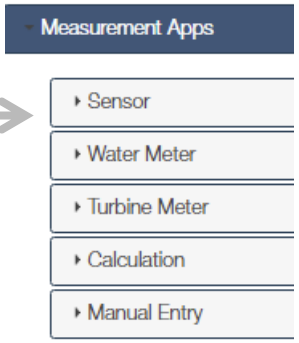
Now we can create apps in the containers.

There are several types of apps to choose from depending on your needs.



The applications are divided into 5 categories.
Measurement Apps are used to display sensors only. They do not effect an output action. They can be changed to Measurement Control at any time.
The following sections describe how to set them up and how they work.

13.4 Measurement Apps

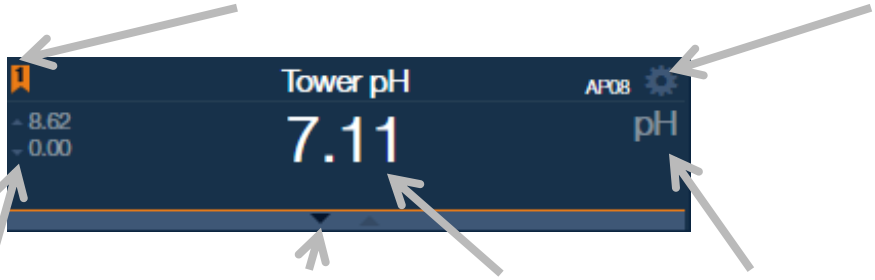


The five types of Measurement apps are used to display an analog or digital sensor. Once established, the sensor can be used for control. Control apps are covered later in this chapter. See ‘Measurement Control App’.

13.4.1 Sensor Measurement App

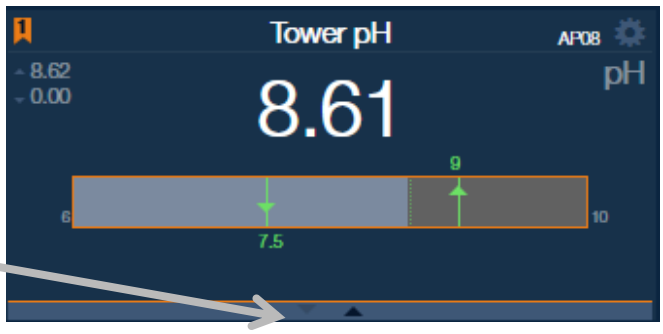
The Measurement App includes all analog sensors; mV, resistive and mA. This app allows you to display all the sensors on the Apps page with a bar graph including setpoints.

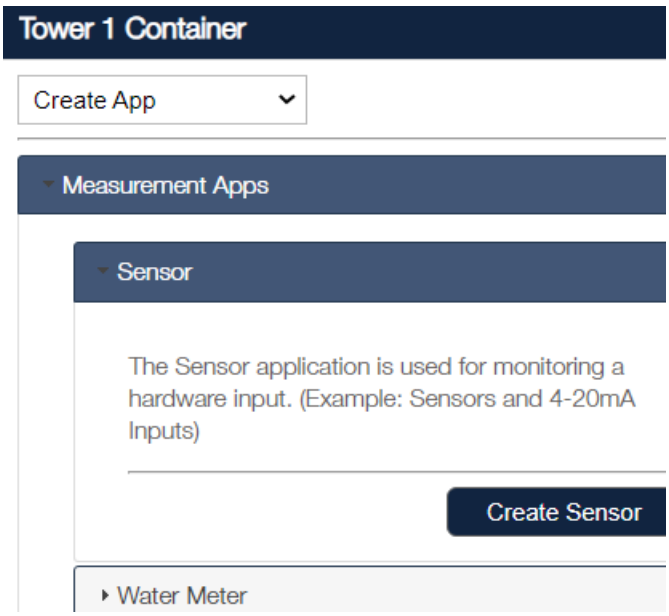
The process variable is displayed with system membership flag(s), description, app ID (AP08) and menu icon…



…High and Low maximums, expansion arrow, process variable and engineering units.

The expanded display adds a bar graph of the process variable (light blue), setpoints (green) if used and adjustable graph min and max values. The expansion/contraction arrows are located at the bottom of the display box.

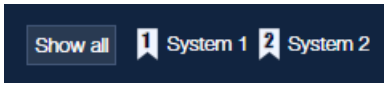


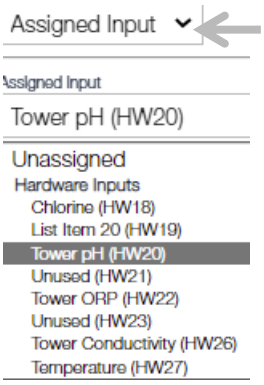


Choose a container for your new app, click on the container menu gear, then use the dropdown box to select Create New application, Measurement Apps and then Sensor. Press the Create Sensor button.

Next, in the General tab, select System Membership(s), edit the Description, Unit of Measurement and Decimal Places.

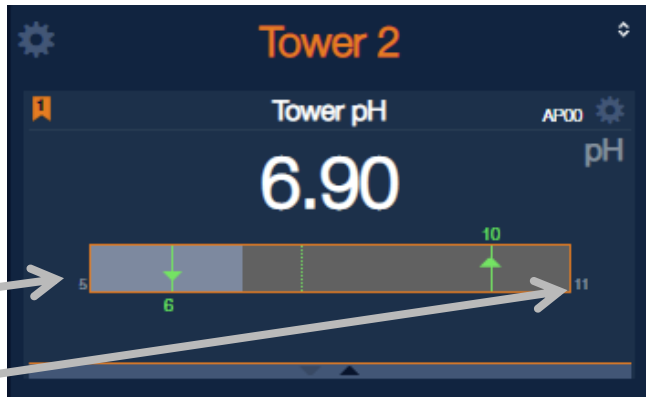
System Membership icons on the browser page allow you to select which groups are displayed.

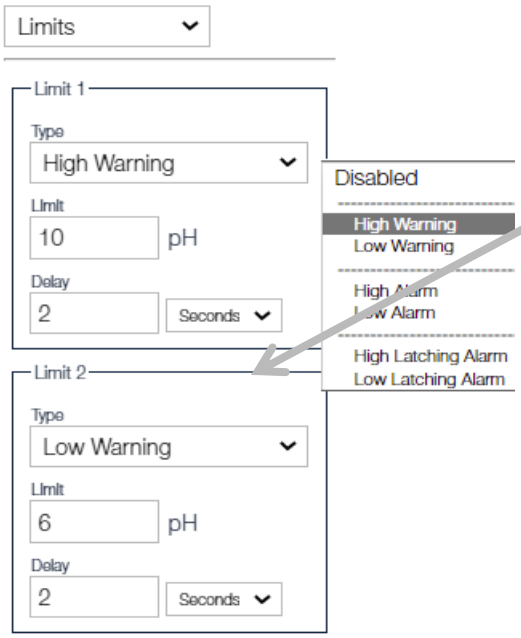




The Assigned Input tab lets you choose the sensor to be displayed from a list of available sensors. All sensors reside on the hardware page. They have HW numbers assigned. In this example, the pH sensor we have selected is labeled HW20.

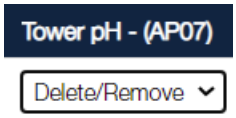
Edit the Slider Range tab for the bar graph.



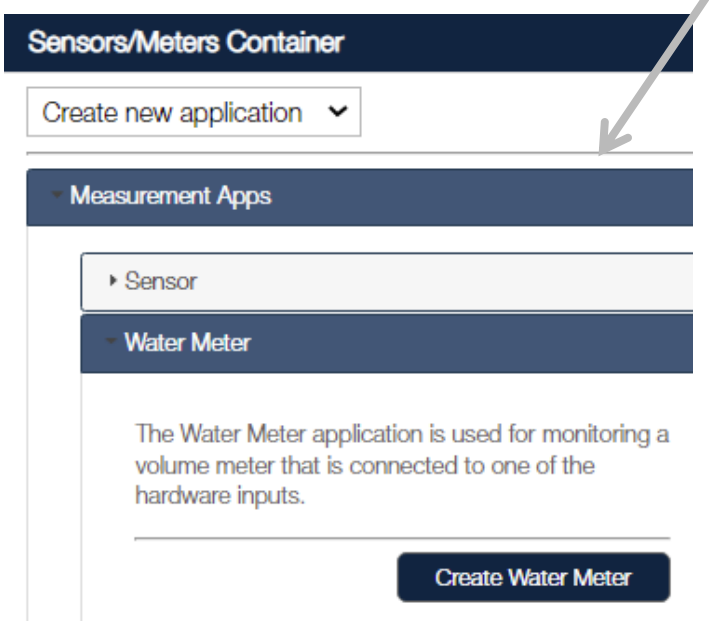


Use the Limits tab to set warning and alarm limits. Latching limits will remain in the alarm state until acknowledged. Choose two alarm conditions from a list of six types. The Delay setting eliminates output relay chatter.

The Delete/Remove page is the same for all apps. The page includes an explanation of the process.

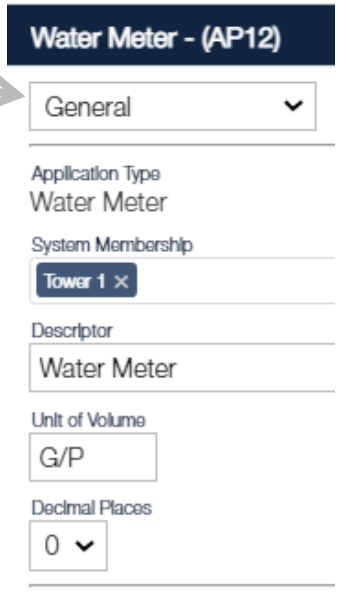


13.4.2 Watermeter Measurement App

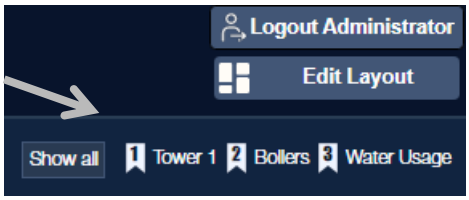


The Watermeter Measurement App is used primarily for contact head meters. Choose a container for your app, click on the container menu gear, then use the dropdown box to select Create New application, Measurement Apps and then Water Meter. Press the Create Water Meter button.

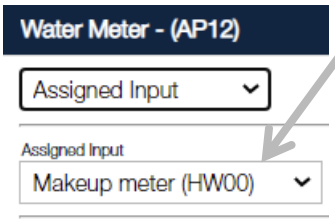
Then, in the General tab, select System Membership(s), edit the Description, Unit of Volume (Gallons or Liters, etc.) and Decimal Places.



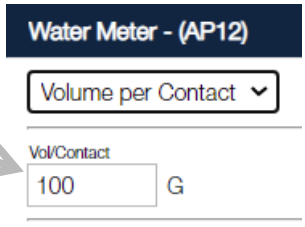
System membership icons on the browser page allow you to select which groups are displayed.



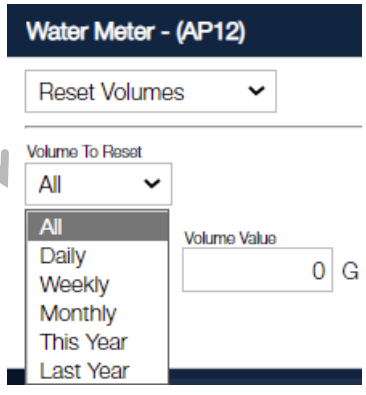
Use the Assigned Input tab to choose the meter to be displayed.



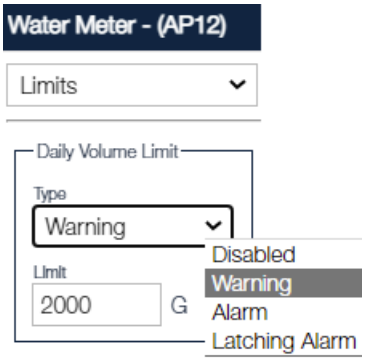
Use the Volume per Contact tab to show the meter volume per contact.



Use the Reset Page to reset the day, week or month accumulators to 0 or a value of your choosing.

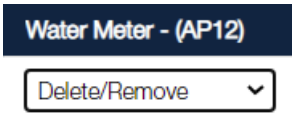


The Browser view shows the daily, weekly and monthly volumes.

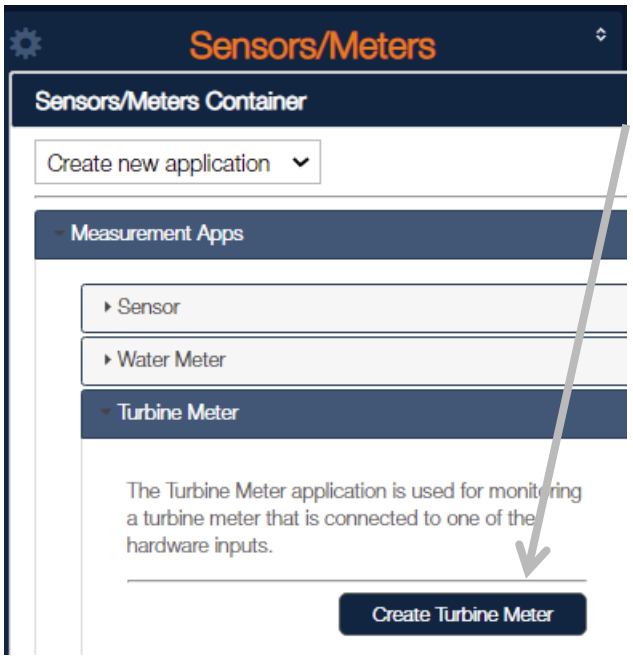


There is only a daily volume limit for watermeters. Choose from three types and set the daily limit.

The Delete/Remove page is the same for all apps. The page includes an explanation of the process.



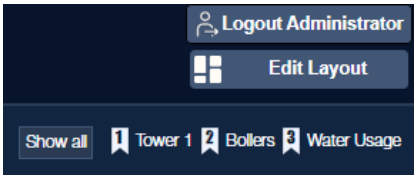
13.4.3 Turbine Meter Measurement App

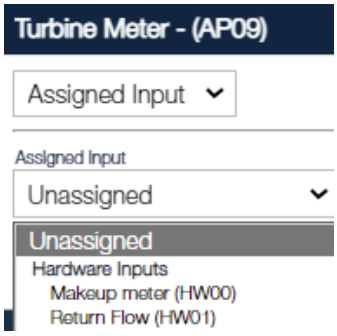


Choose a container for your app, click on the container menu gear, then use the dropdown box to select Create New application, Measurement Apps and then Turbine Meter. Press the Create Turbine Meter button.

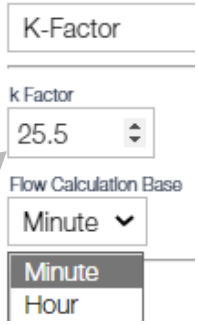
Use the General tab to label the app, set the System Membership, units of measurement and decimal places

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

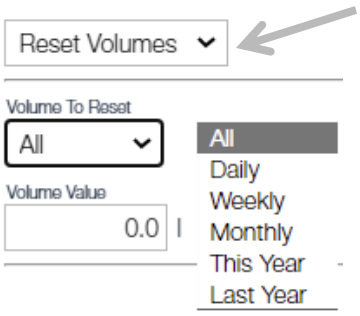




The Assigned Input tab allows you to choose from the available watermeter inputs from the hardware page.

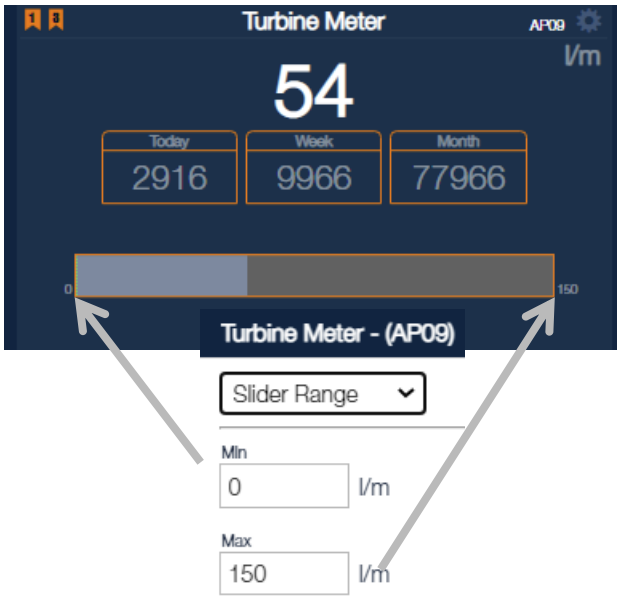


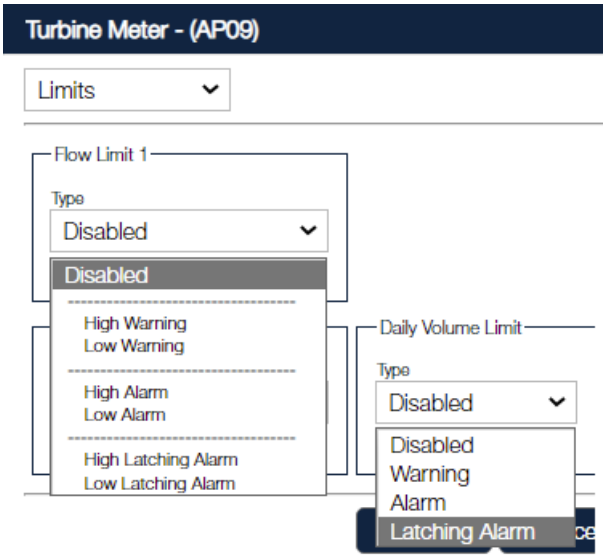
The K-factor is the number of pulses needed to indicate one Unit of volume. i.e. pulses per gallon/liter.



The Reset Volume tab resets the chosen accumulator(s) to the entered Volume Value.

The Slider Range tab is seen on the Browser display.

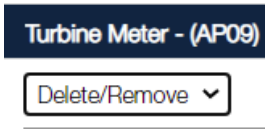




Use the Limits tab to create up to two flow rate alarms. Choose from six types; high and or low warnings and alarms. Latched alarms will not clear until acknowledged.

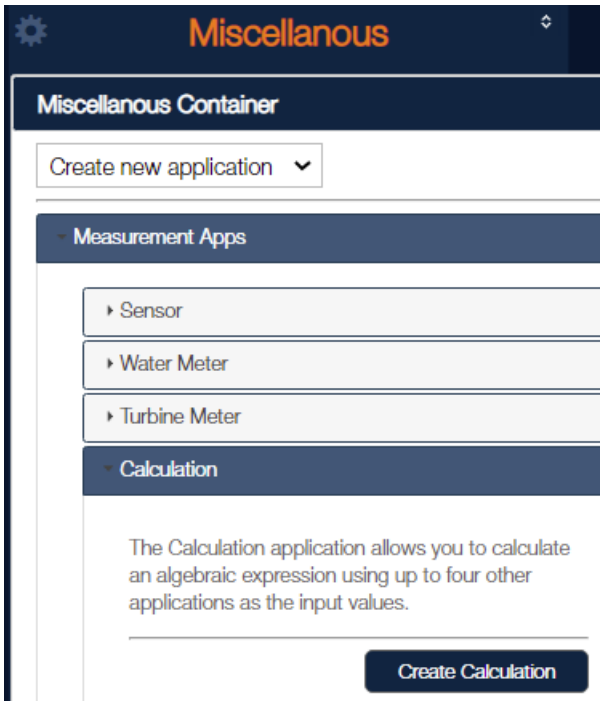
A third alarm for Daily Volume Limit is also available with four type choices.

The Delete/Remove page is the same for all apps. The page includes an explanation of the process.



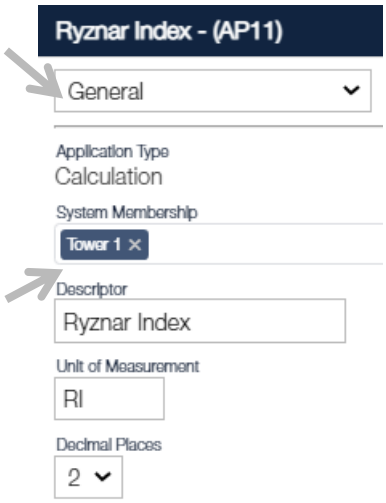
13.4.4 Calculation Measurement App

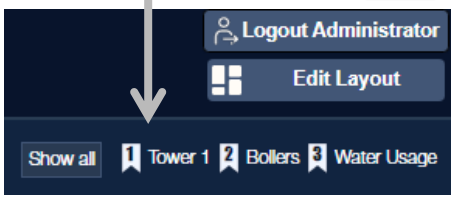
The Calculation Measurement App can perform math functions on up to four other applications as well as multiple constants. The four apps can include other calculation apps which extends the total number of apps that can be included in a calculation.
Choose a container for your app, click on the container menu gear, then use the dropdown box to select Create New application, Measurement Apps and then Calculation. Press the Create Calculation button.

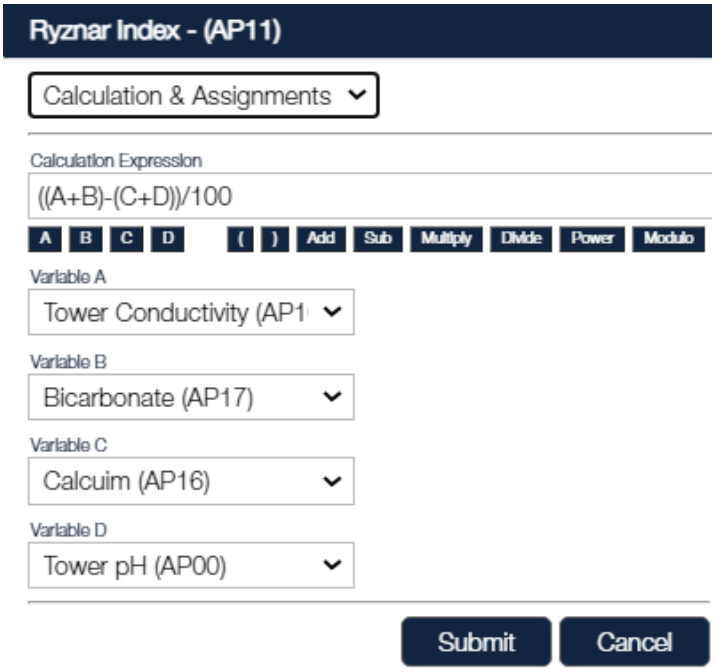


Use the General tab to label the app, set the System Membership, units of measurement and decimal places.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

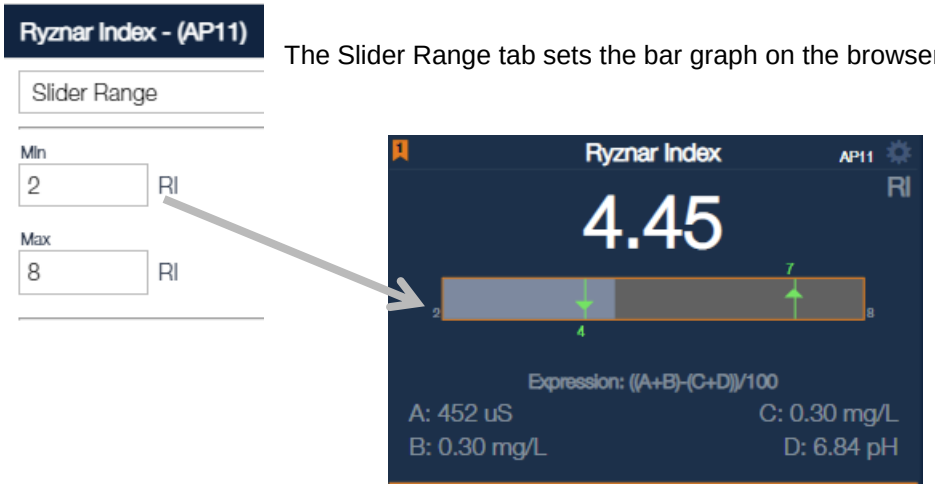




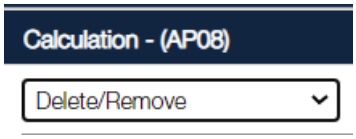


Use the Calculation & Assignments tab to create a mathematical expression that can include exponential values and parenthesis as shown in the example below. The result of the calculation can be used to control chemical pumps or valves, create alarms, be included in graphs or be exported as a 4-20mA analog signal.

Use the Limits tab to create up to two limits from a list of six types of high and/or low warnings and alarms. Latched alarms will not clear until acknowledged. The Delay will eliminate output relay chatter.

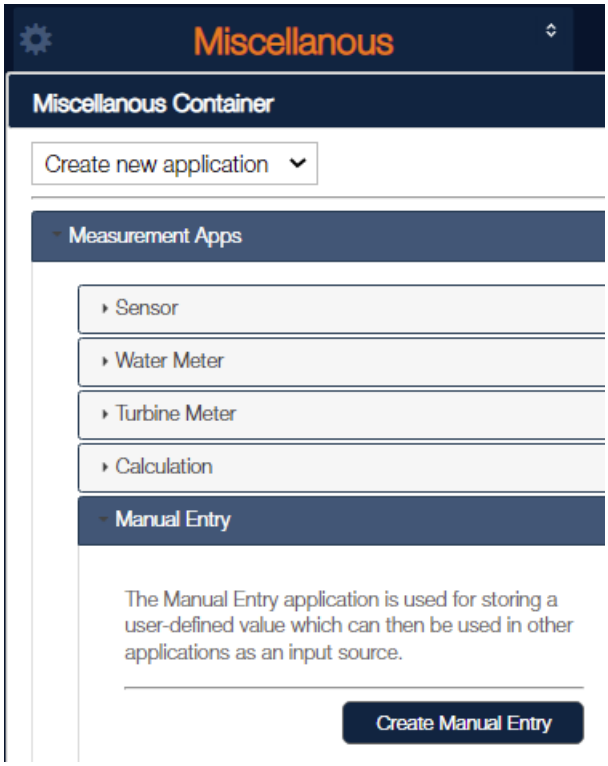


The Slider Range tab sets the bar graph on the browser display.



The Delete/Remove page is the same for all apps. The page includes an explanation of the process.

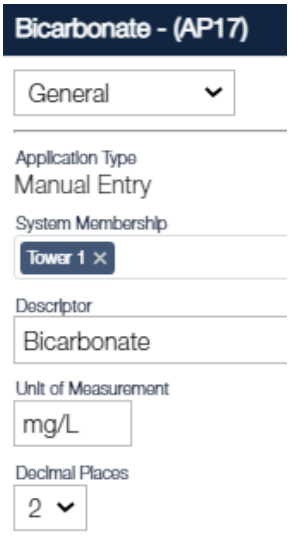
13.4.5 Manual Entry App



Expected Use:

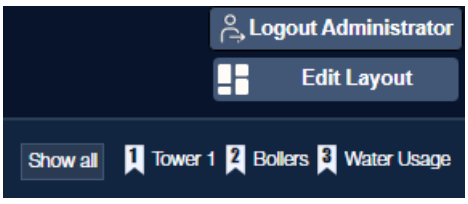
Periodic wet test results are time stamped and can be graphed with other chemistry and plant events. Manual entries can be used in formula like LSI or Ryznar indexes.

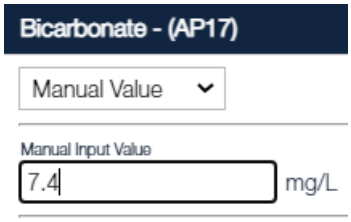
Choose a container for your app, click on the container menu gear, then use the dropdown box to select Create New application, Measurement Apps and then Manual Entry. Press the Create Manual Entry button.



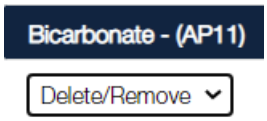
Use the General tab to enter the System Membership, descriptor, units of measure and decimal places.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.



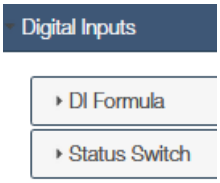


Use the Manual Value tab to enter your wet test or reportable value.



The Delete/Remove page is the same for all apps. The page includes an explanation of the process.

13.5 Digital Inputs



Digital Input Apps are used to display a digital input and if desired, use it for control purposes in other apps. The most frequent use is by the CTFs flow switch sensor which is used as a permissive for tower blowdown and chemical feed. Any control app can choose a Digital Input on the blocking page to pause that output.

There are two methods of using the flow switch in a Digital Input App. The Status Switch App is typical and easy to use. The DI Formula App allows for multiple digital values to be used in a formula using Boolean operators. Boolean operators are explained below.

13.5.1 DI Formula App

The DI Formula app is used to mesh multiple digital inputs with Boolean operators to elicit a digital permissive. Our DI Formula app uses only three operators; **AND**, **OR** and **NOT**. In the app, AND is denoted by the ampersand, '&', OR is represented by a pipe '|', and NOT by an exclamation point, '!'.

With respect to digital signals, please consider the following to be synonyms throughout this manual:

1, On, Closed and True
0, Off, Open and False.

To clarify: active and inactive pertain to the controllers relays. If the Normally Open output is chosen, it is open until the relay becomes active. If Normally Closed terminal is chosen, it is on until the relay is active. When a relay is active, the output is switched from the normal state.

13.5.1.1 Boolean Operators

Boolean Logic is relatively simple. Two values **AND**ed must both be true in order for the output to be true. Therefore, A **AND** B nets an active output only when both A and B are true.
The logic of **OR** is such that if either of the inputs, A **OR** B is true, the output is true.
A Boolean **NOT** will simply toggle the value. A value of 0 becomes a 1 and a 1 becomes a 0.
Therefore, if A = 0, then (**NOT** A) = 1. If A = 1, then (**NOT** A) = 0.

Example of Boolean operators **NOT** and **AND**:
The letters below represent four digital inputs. In this example, these four inputs will determine if an output will be enabled.

A = Chemical tank low	Input is true when the tank is low
B = System running	Input is true when the system is running
C = Circulation water valve open	Input is true when the valve is open
D = Emergency stop active	Input is true when the E-Stop has been activated

If we want the output to be true when the tank is not low and the system is running and the valve is open and the E-stop is not on. The inputs will look like this when we want the output to be on: A = 0, B = 1, C = 1, D = 0.

An **AND** statement will only net a positive output when all the inputs are 1's. So we **NOT** the two 0's to make them 1's and the formula works.

Formula: (**NOT** A) **AND** B **AND** C **AND** (**NOT** D) or (!A)&B&C&(!D).

Therefore, if chemical tank is not low and the system is running and the circulation water valve is open and the emergency stop is not on, then the output is true.

Example of Boolean **OR** logic: Formula: A **OR** B

A = High pH
B = High Conductivity

Explanation: If either the pH is high or if the conductivity is high, the output is true. If both A and B are low, the output is false.

AND's, **OR**'s and **NOT**'s can be used in the formula together. Be sure to use parenthesis () to control what happens first.

You can Google 'Boolean operators' for more examples and explanations. Remember, the Aegis X only uses the three operators mentioned.

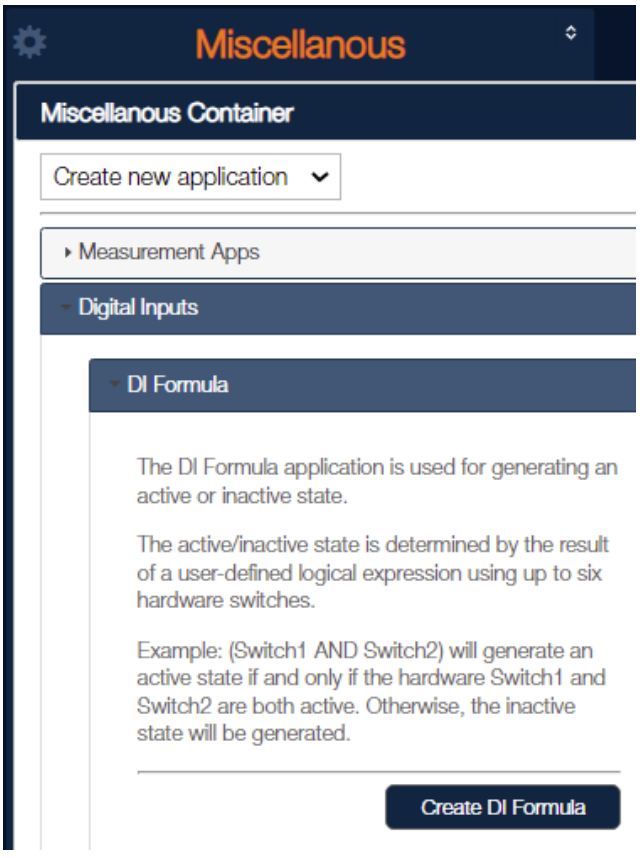
13.5.1.2 DI Formula Setup

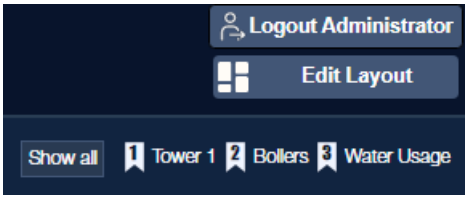
The DI Formula app relies on multiple digital inputs to determine a digital output value. Boolean logic is used as explained in the preceding section.

The DI Formula app does not directly control an output but any output can choose the DI result in their Blocking Applications tab.

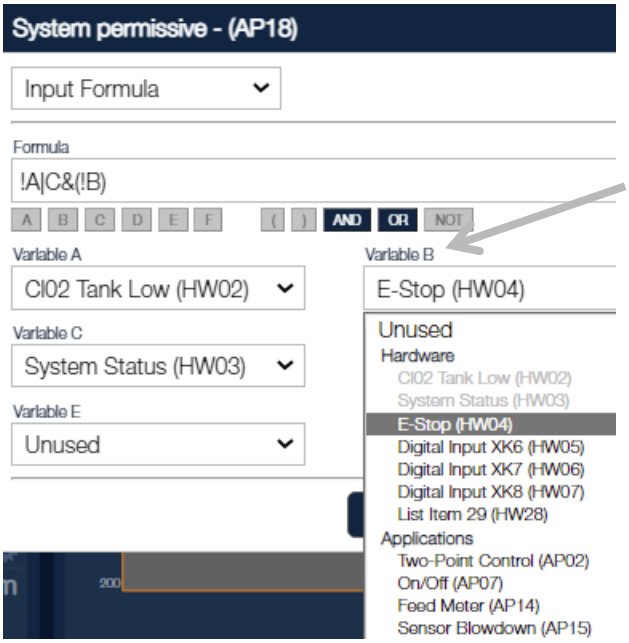
Choose a container for your app, click on the container menu gear, then use the dropdown box to select Create New application, Digital Inputs and then DI Formula. Press the Create DI Formula button.

Use the General tab to select a system membership and name the operation.





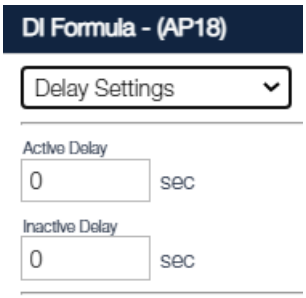
System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

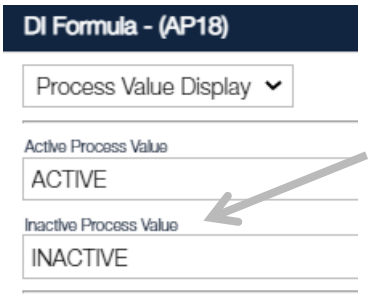


The Input Formula page has up to 6 input variables that can be used in the formula. Select the inputs from the dropdown list. This list is comprised of all digital inputs and applications (Lettered A through F) that are currently in your program. Add Boolean operands to create the action you desire.
If you have more than 6 digital inputs, create a second Input Formula and choose the first formula as an input to the second Input Formula.

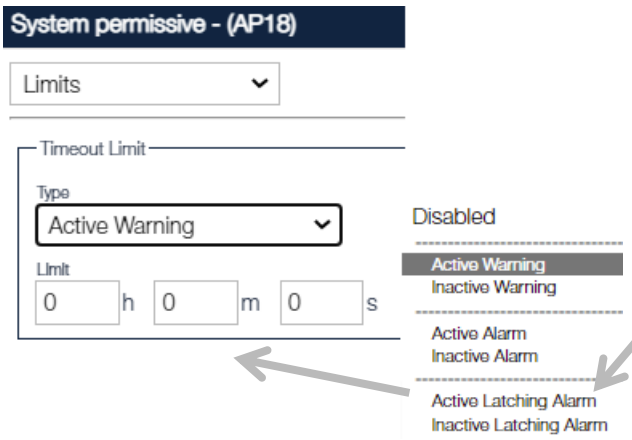
See Boolean examples in Section **13.5.1.1 Boolean Operators**.

To avoid output relay chatter, use the delay settings page to add a delay when switching to on or to off or both.



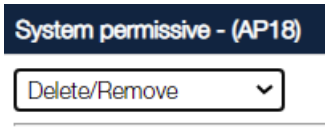


You can edit the name given to the output value like On and OFF or True and False etc.



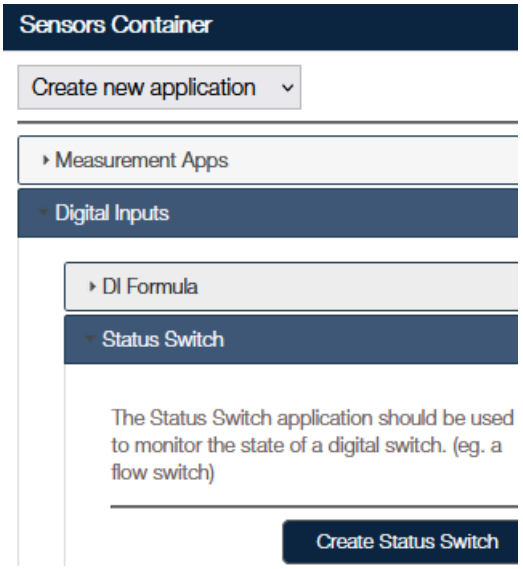
Choose warnings or alarms from the drop down of the Limits tab. Latching alarms will not clear until acknowledged.

The Delete/Remove page is the same for all apps. The page includes an explanation of the process.

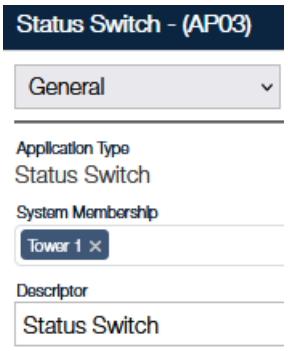


13.5.2 Status Switch App

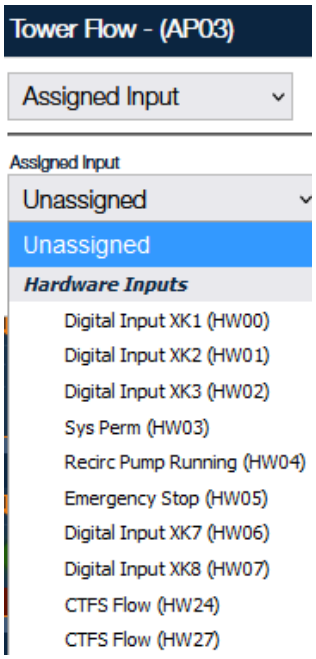
Choose a container for your app, click on the container menu gear, then use the dropdown box to select Create New application, Digital Inputs and then Status Switch. Press the Create Status Switch button.

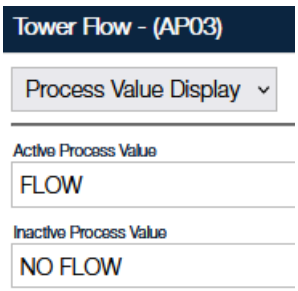


Use the General tab to edit the app descriptor and to choose which system or systems that this input will belong.



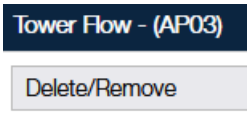
Use the Assigned Input tab to select the input from the Hardware level inputs.





Use the Process Value Display to describe the on and off values

The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.



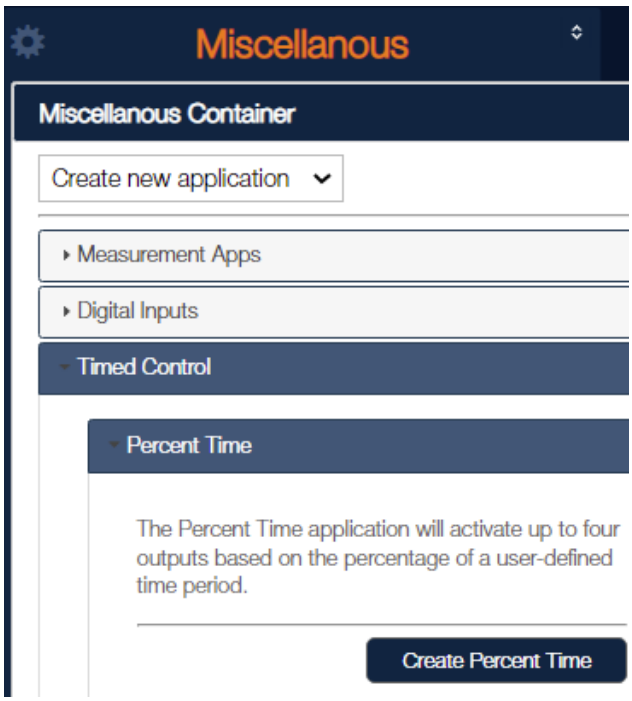
13.6 Timed Control Apps

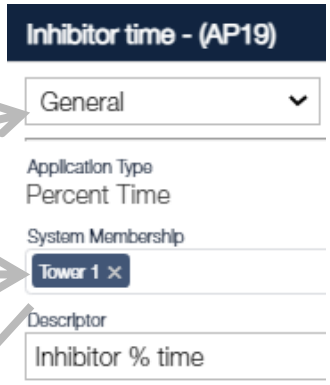
Timed Control apps include Percent Time, Timed Event and Timed Event Volume.

13.6.1 Percent Time Control App

The Percent Time App will control outputs for a pre-set percent of a pre-set time period. Use this app if you wish to base feed a chemical and your pump is too large to run constantly.
This app is similar to Timed Cycling. The difference is that a percent time control has an on and off time. The timed cycle app has an auto and off time. During the auto time, the pump will control based on a setpoint. See section **13.7.6 Timed Cycling App.**

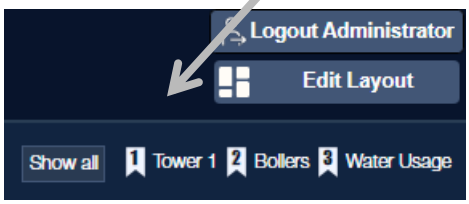
Choose a container for your app, click on the container menu gear, then use the dropdown box to select Create New application, Timed Control and Percent Time. Press the Create Percent Time button.

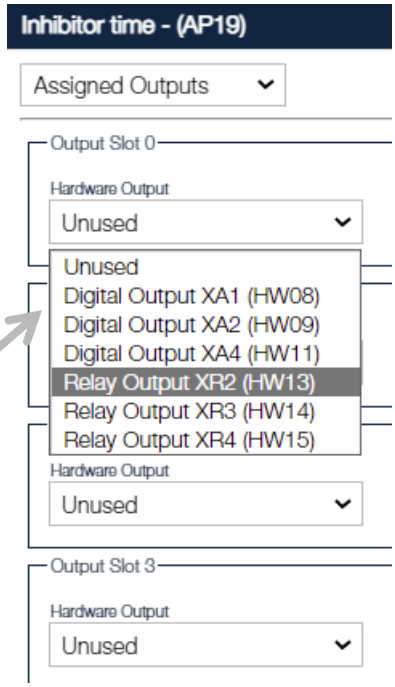




Use the General tab to edit System Membership and the app name.

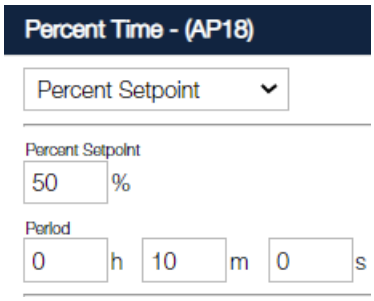
System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

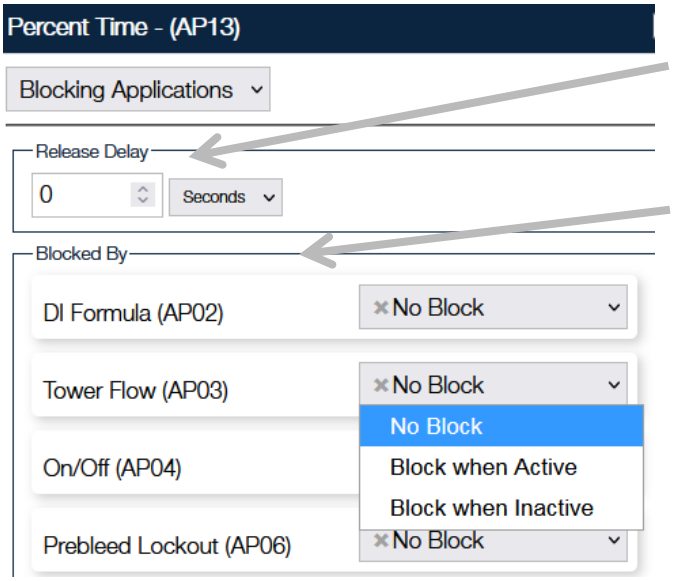




From the Assigned Outputs tab, select up to four digital and relay outputs. All available choices will show in the dropdowns.

Use the Percent Setpoint tab to select what portion of the period the relay will be on. The default period is 10 minutes. A 50% setpoint would have the relay on for 5 out of every 10 minutes.



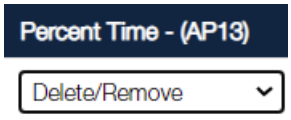


The Release Delay will add to the blocking time to help reduce chatter or to allow the system to finish a process or reaction, etc.

The Blocking Applications tab lets you choose which other applications if any, will temporarily stop this output and the release delay can add seconds or minutes to the off time.

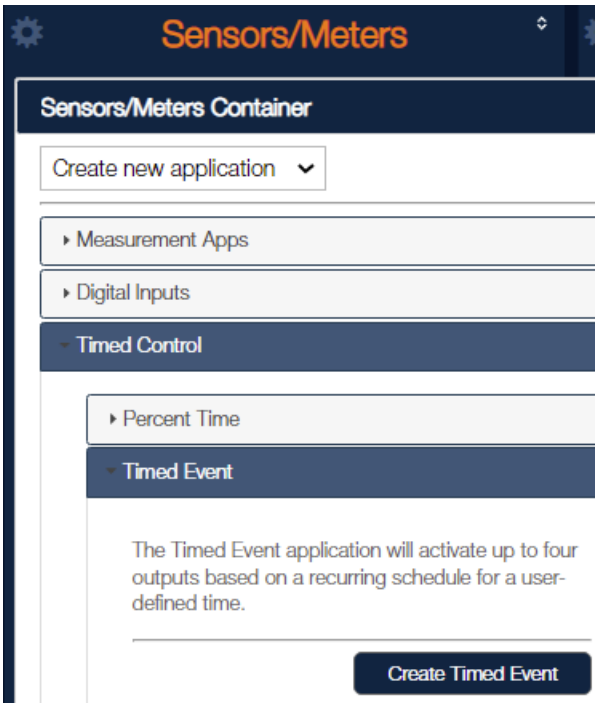
Choose to block by another app when the app is on or off.

The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.



13.6.2 Timed Event App

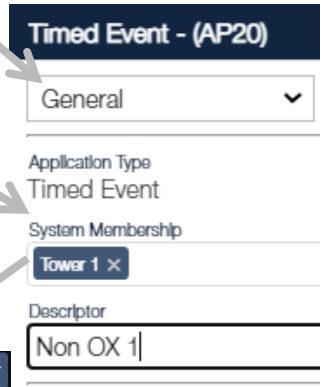
A timed event allows the user to activate a digital output periodically for a set length of time. Perhaps a probe wash that starts at noon each day for 2 minutes. Or an oxidant to shock the system each week. This app only turns on a relay. If you need to lockout the blowdown, use the pre-bleed lockout app.

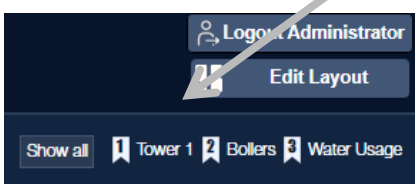


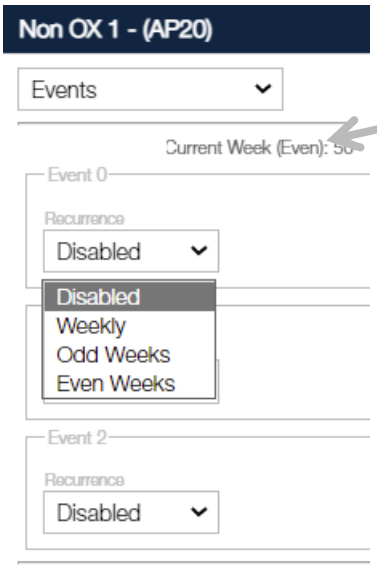
Create a Timed Event app; Click on the container gear where you wish to add this app. Select Create new application, Timed Control and Timed Event. Press the Create Timed Event button.

Use the General tab to assign the System Membership and a description.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

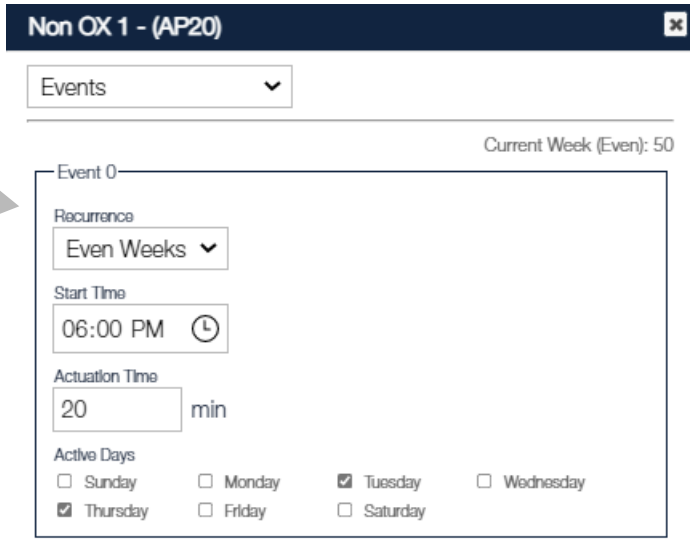




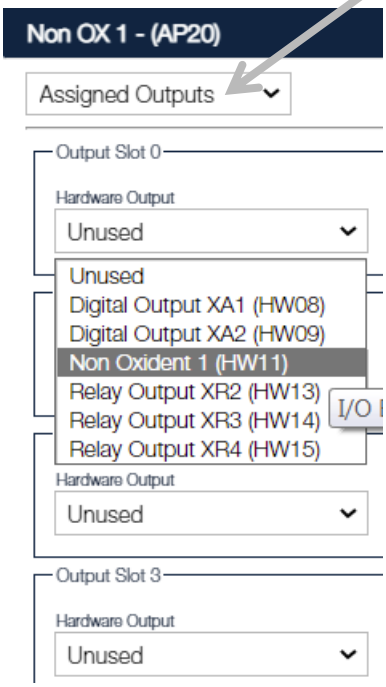


Under the Events tab, you can set up three events. Choose weekly, odd weeks or even weeks. Notice the current week status is shown on this tab. “Even”.

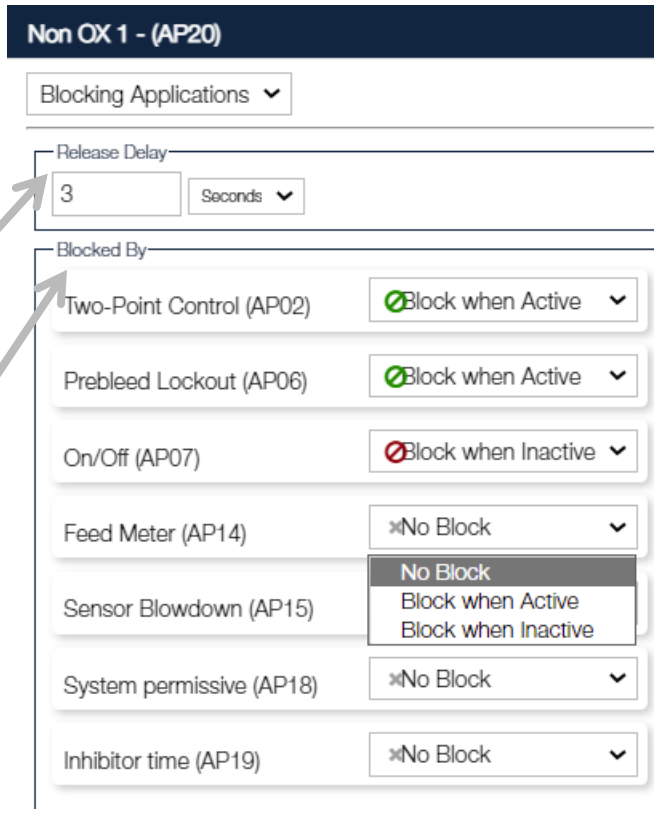
Set a start time, duration and day(s) of the week. The events will repeat indefinitely.

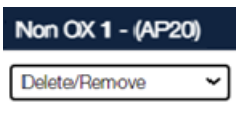


Use the Assigned Outputs tab to select the Digital Output or Relay. Choose up to four outputs. Only unused outputs will be on the list.



Blocking Applications tab show all other outputs that can be used to stop this output when they are on,(block when active) or off, (block when inactive). The Release Delay will hold this output off for a few extra seconds, or minutes, if needed. Notice the heading says ‘Blocked By’. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.

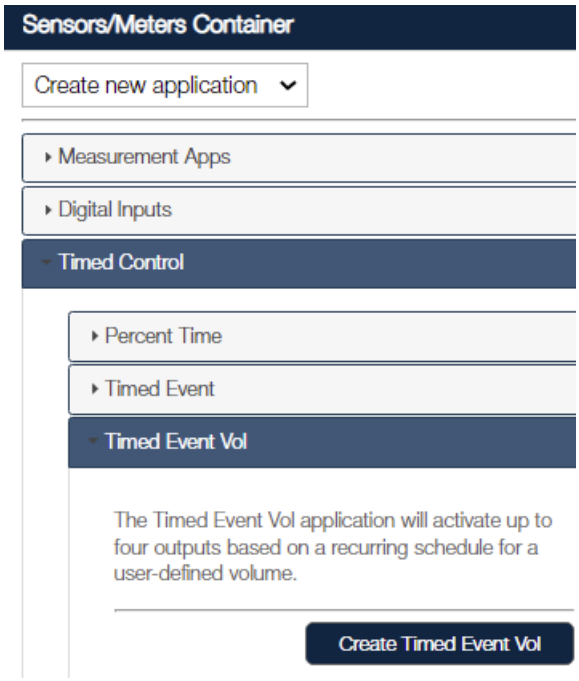




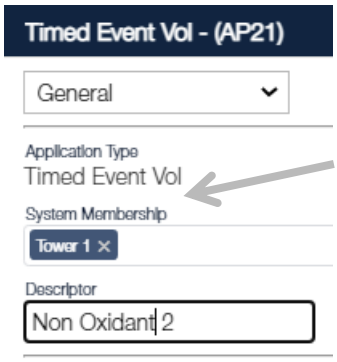
The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

13.6.3 Timed Event Volume App

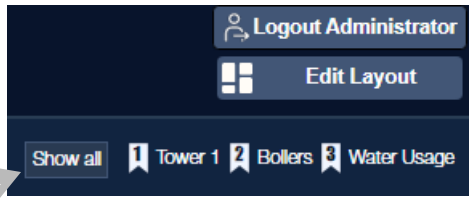
This works similar to the Timed Event app except it terminates after a set volume is dispensed rather than after a set amount of minutes.



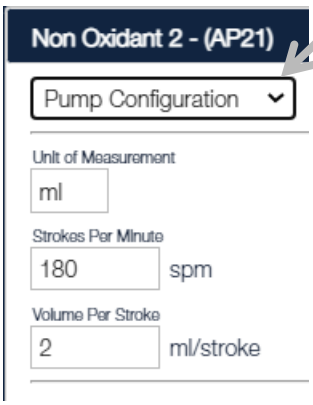
Choose a container for your new app, select Create new application, Timed Control and then Timed Event Vol.
This Timed Event app will activate the output(s) until a volume is reached rather than a time limit.



Use the General tab to choose a System Membership and to give this app a name.

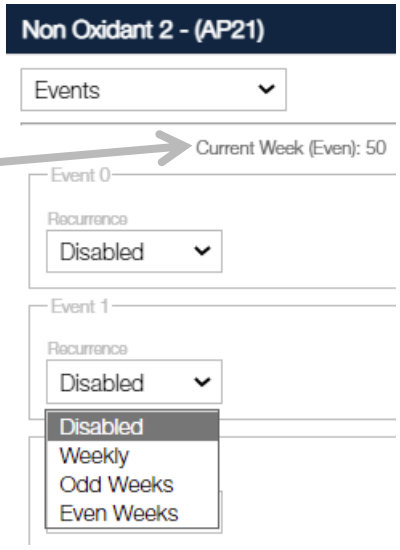


System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.
Set up the Pump Configuration next. If the pump speed will be adjusted, enter the new value here. If the stroke volume on the actual pump is adjusted, the volume per stroke will need to be adjusted as well on this tab.

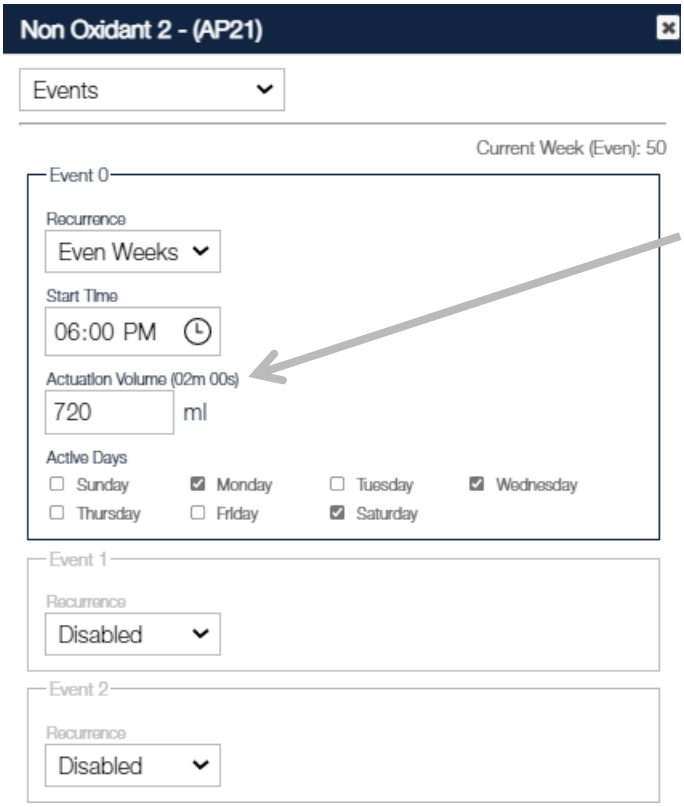


Use the Events tab to enter the Recurrence frequency.
Create up to three events for weekly, odd weeks or even weeks. The current week type is shown on this tab. (Even).

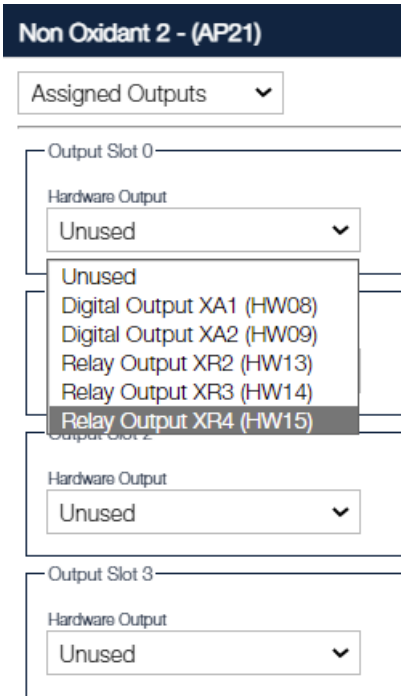
Once you choose a Recurrence, the menu opens to a larger format, below.



Fill in the start time, volume to be fed and on which days. The app will remind you of the range of possible value choices based on the Pump Configuration information you entered.

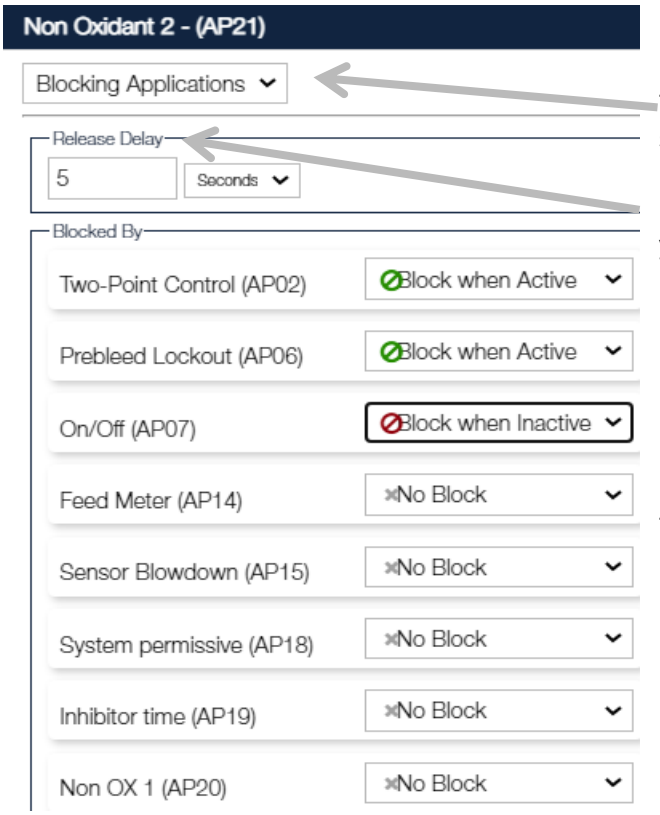


Enter a start time, a target volume and select the days you wish the event to take place.
Once you fill in the boxes and submit the edit, the Actuation Volume box will tell you how long it will take to feed that volume based on the pump data you entered. 2 Minutes in this example



Use the Assigned Outputs tab to choose a digital or relay output. You can control up to 4 outputs. Only outputs that are not controlled by another app are available.

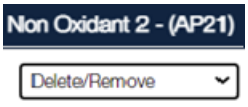
The Blocking Applications tab shows all the other outputs that can be used to stop this output when they are on, (block when active) or off, (block when inactive).



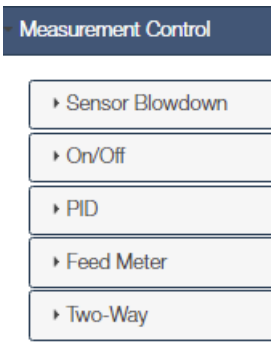
The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says ‘Blocked By’. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.

The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.



13.7 Measurement Control Apps



Measurement Control Applications activate digital and relay outputs based on sensors that have been created as measurement apps. See section **13.4 Measurement Apps**. These apps can control multiple outputs including digital relays and 4-20mA analog outputs.

13.7.1 Sensor Blowdown App

The Sensor Blowdown App was created to control the conductivity of a cooling tower application and works as well on a boiler that uses continuous blowdown.
For cooling tower applications, see section **13.7.1.2 Tower and Continuous Boiler Blowdown**.

13.7.1.1 Continuous Boiler Blowdown

Boiler Blowdown Savings

Heated and chemically treated boiler water offers a great savings when it returns as condensate!

It is typically hotter than fresh makeup and has been chemically treated.

WARNING!

By design, boilers are of high pressure and temperature. The boiler and its associated plumbing are dangerously hot. Even supports and conduit can burn the skin.

Wear appropriate PPE when in near proximity to a boiler.

Continuous Boiler blowdown is common on larger, high pressure boilers that route a continuous low flow sample stream through a sample cooler that feeds a thermally compensated conductivity sensor. (4-wire probe). The blowdown valve is installed on a parallel line to the flash tank. The sensor provides a constant conductivity reading to the controller and thus can control the blowdown valve in the same manner as a cooling tower blowdown. Use section **13.7.1.2 Tower and Continuous Boiler Blowdown** for application setup.

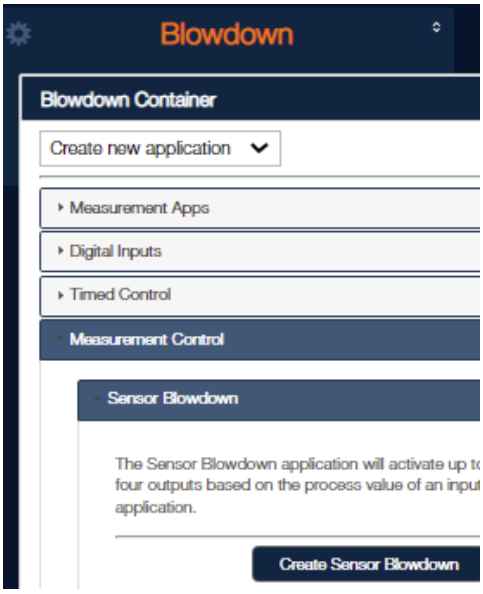
Most boilers, however, utilize the captured sample routine to manage the life of the probe through periodic sampling rather than the cost of a constant cooling water stream.

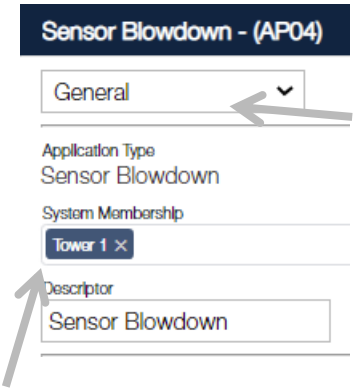
For the captured sample control app, see section **13.8.4 Captured Sample App.**

13.8.1.2 Tower and Continuous Boiler Blowdown

This app can be used for standard cooling tower blowdown and continuous boiler blowdown where the sensor has a **continuous sample**. The tower blowdown program can be used in conjunction with Prebleed Lockout for feeding non-oxidizing biocides. See section **13.8.1 Prebleed Lockout**.

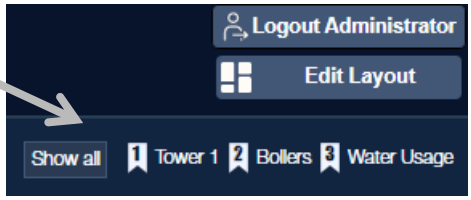
Choose a container for your new app, click on the menu gear and select Create new application. Then choose Measurement Control and Sensor Blowdown. Press Create Sensor Blowdown button.

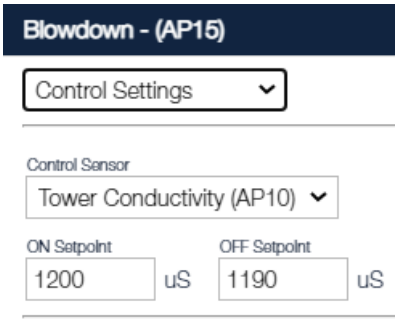




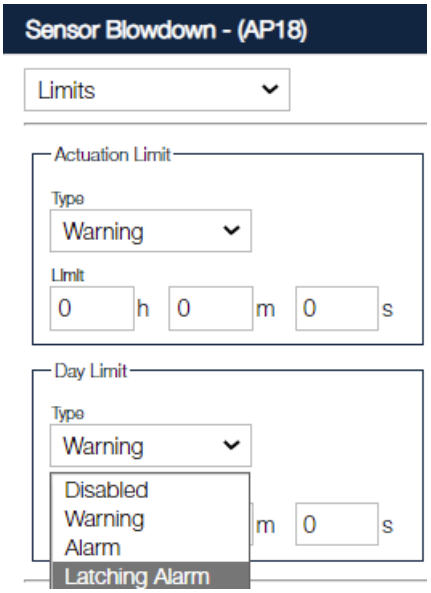
Use the General tab to edit the app name and system membership as desired.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

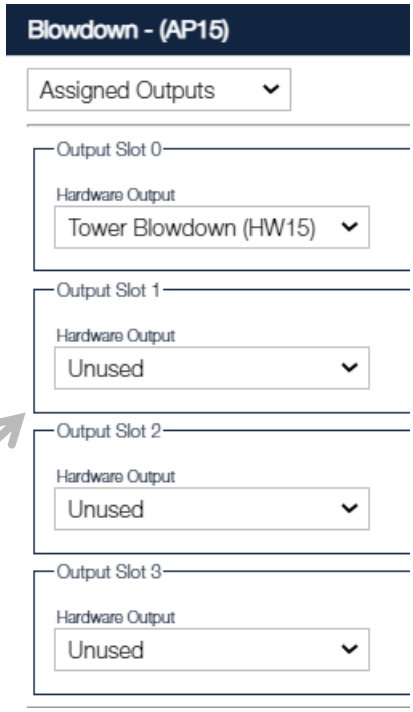




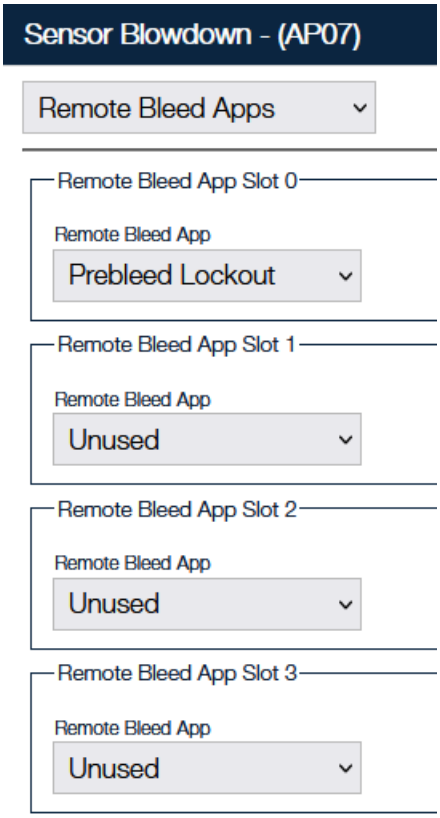
Use the Control Setting tab to choose the controlling sensor and control setpoints.



Use the Limits tab to set up warnings and alarms. The Actuation Limit helps to identify a failed sensor that calls for blowdown after the setpoint is reached. The Day Limit will notify the user that the bleed rate may be degraded possibly due to blowdown line fouling or valve failure. Check all settings as well.



Use the Assigned Outputs tab to select relays from a list of unused outputs. Select up to 4 outputs.



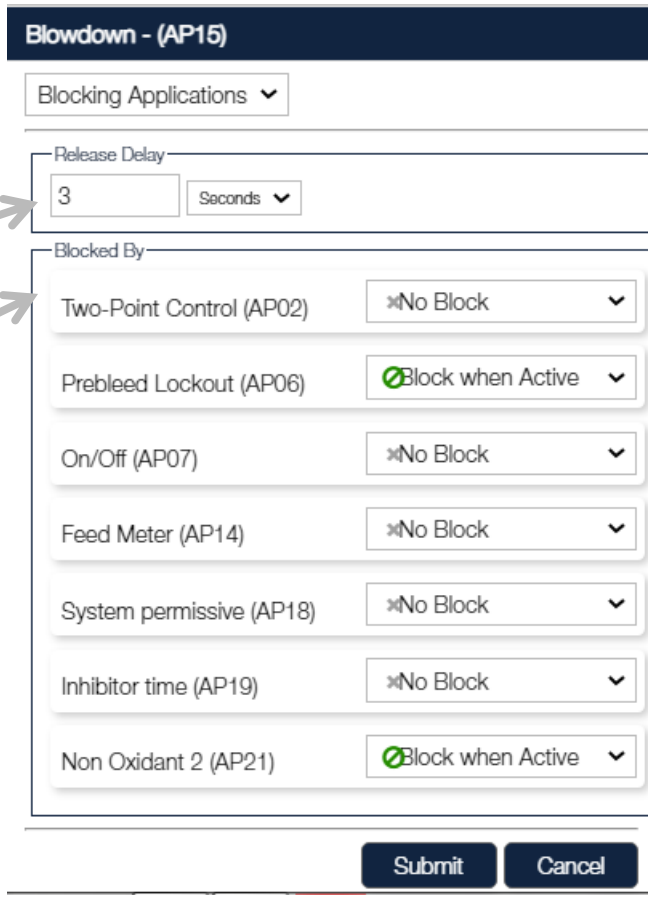
Remote Bleed Apps refers to, for example, the Prebleed Lockout app. As seen here, if you have a prebleed lockout app, you will need to choose it from this menu or choose this blowdown app from the prebleed app.

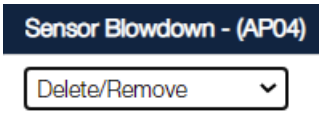
If you do not have a prebleed app, there will not be any available choices in the drop down menus here.

The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says 'Blocked By'. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.

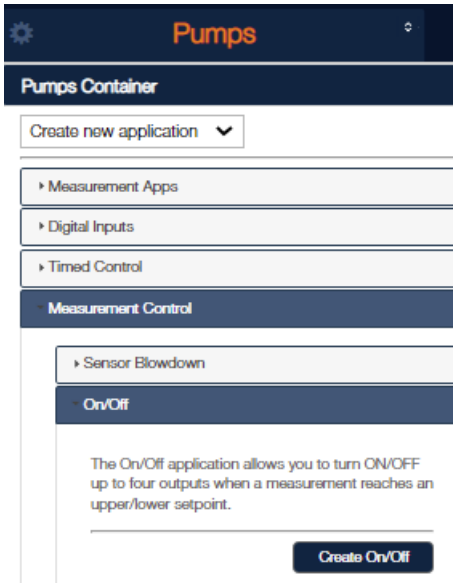




The Delete/Remove tab is the same for all apps. It includes an explanation of the Delete/Remove process.

13.7.2 On/Off App

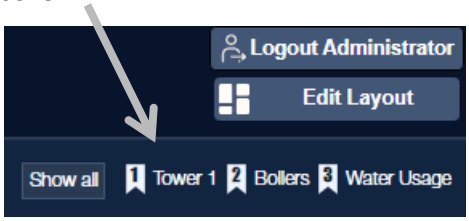
The On/Off app is the standard pump or valve control with two setpoints.

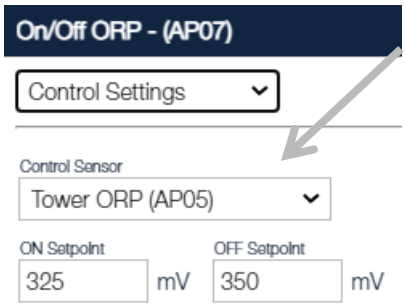


Choose a container for your new app, click on the menu gear and select Create new application, then Select Measurement Control and ON/OFF. Press the Create On/Off button.

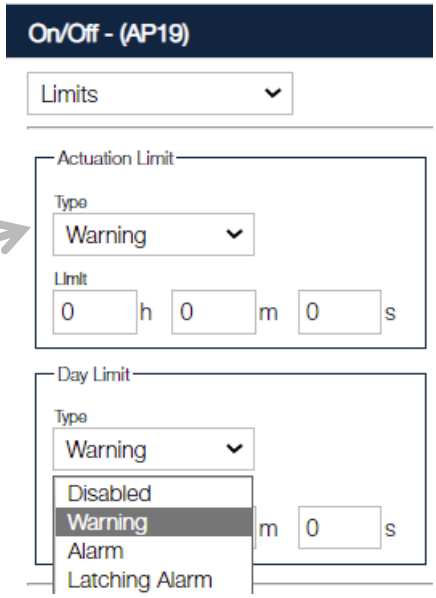
Use the General tab to edit the name of the app and select a System Membership as desired.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

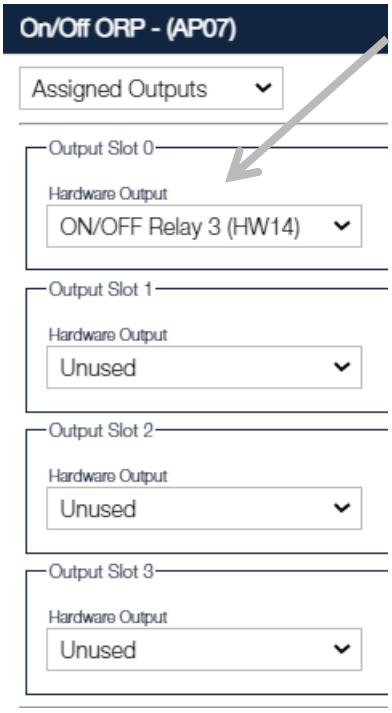




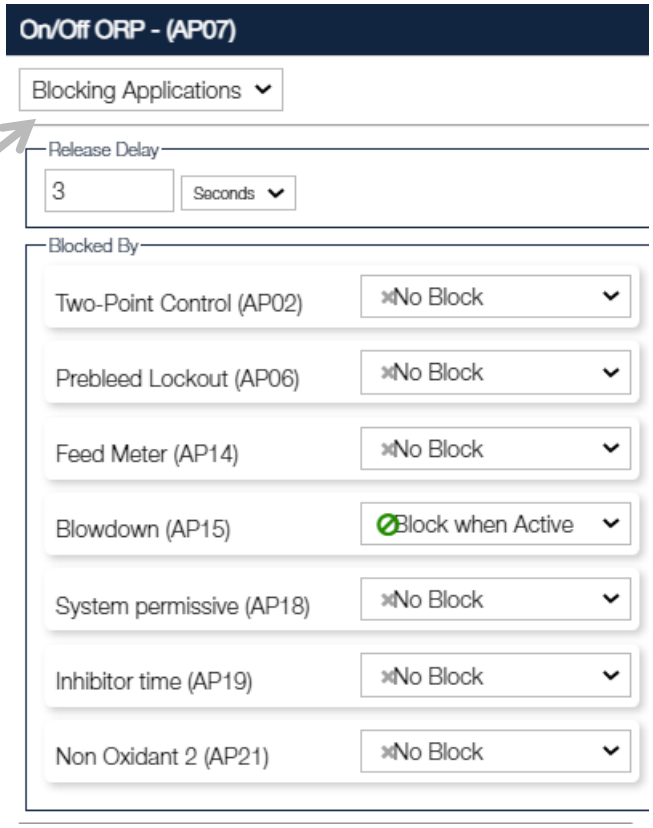
Use the Control Settings tab to select the controlling sensor and add the on/off setpoints.



Use the Limits tab to set up warnings and alarms. The Actuation Limit helps to identify a failed sensor that calls for blowdown after the setpoint is reached. The Day Limit will notify the user that the bleed rate may be degraded possibly due to blowdown line fouling or valve failure. Check all settings as well.



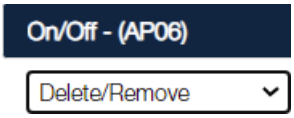
Use the Assigned Outputs tab to choose up to four pump and/or valve outputs. Only unused outputs will be available.



The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

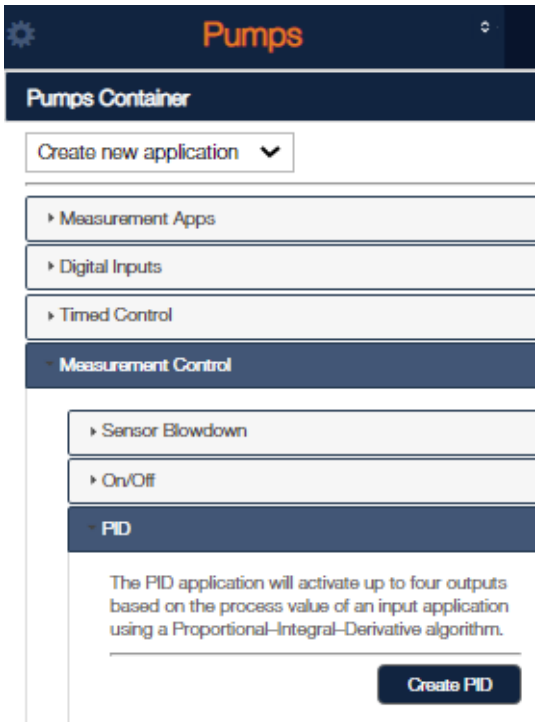
Notice the heading says 'Blocked By'. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.

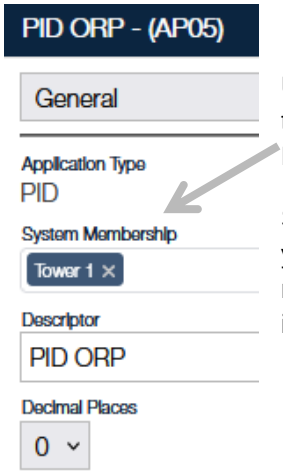


The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

13.7.3 PID App

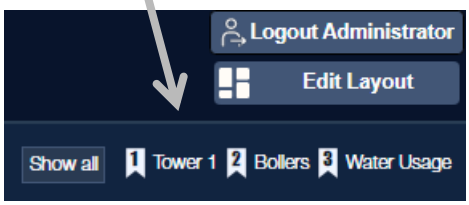
Choose a container for your new app, click on the menu gear and select Create new application, then Select Measurement Control and PID.
Press the Create PID button.

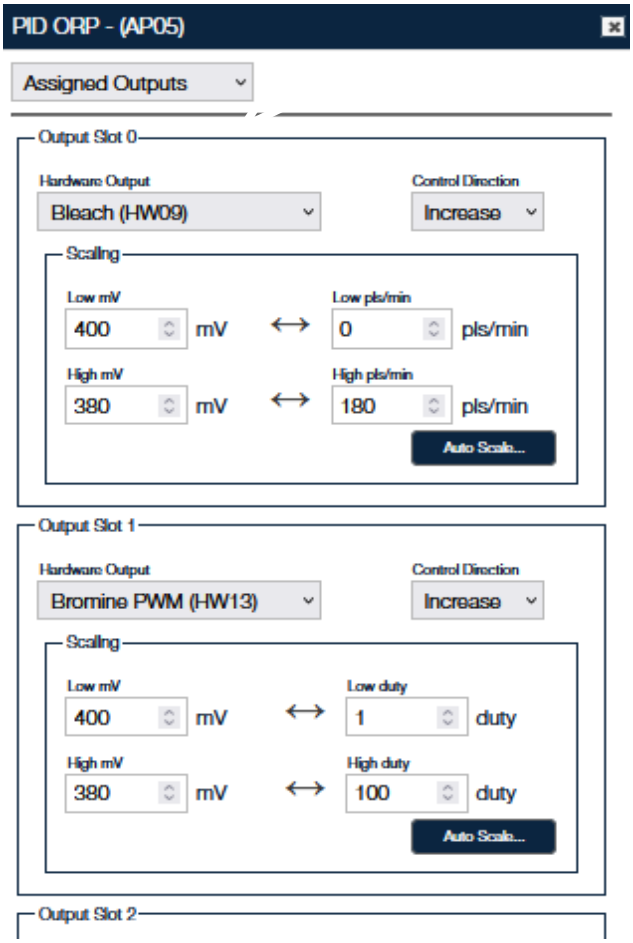




Use the General tab to edit the name of the app and select a System Membership as desired.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.



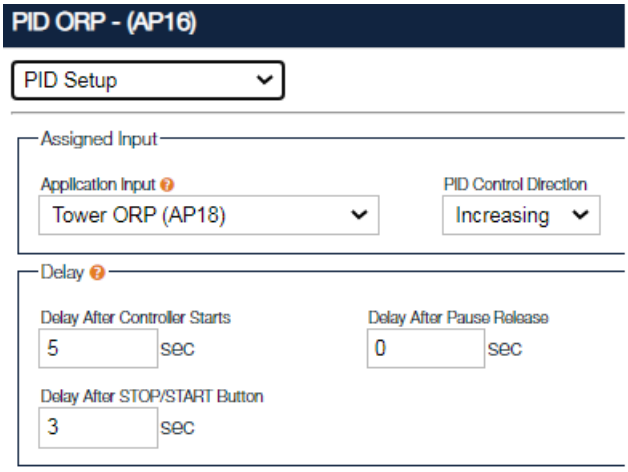


Use the **Assigned Outputs** tab to select an available output from the Hardware page.
Here we have selected two types of outputs. Both are from the group of six power output relays.

Choose a Control Direction based on how the process will respond to the output being in the on state. (An acid pump will '**Decrease**' a pH and a Hypochlorite pump will '**Increase**' an ORP.)

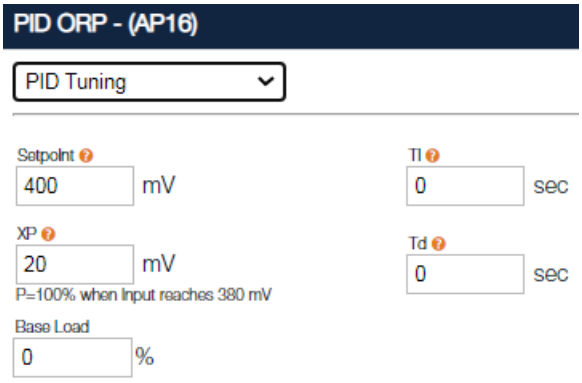
The Scaling section allows you to set a pump speed proportional to a scaled input. In this example, at a 400mV ORP sensor reading, the pump will be at 0 pulses per minute. As the mV drops to 380, the pulses will proportionately increase to a maximum of 180 pulses per minute.
Pulses per minute is the designation used on the output as set via the Hardware page. If you used a 4-20mA output, you can ratio the output proportionately to whatever engineering units the output uses.

The PID app does not have a **Limits tab**. Pumps tend to run constantly at faster or slower rates. On time cannot be used to flag problems.



Use the **PID Setup** tab to select the Application Input sensor. In this example, we have chosen an ORP sensor. Since the output will feed Hypochlorite, the process will rise as the pump increases. This means the PID Input Direction is increasing.

The Delay section can hold the output so as to give time for other processes to start or for a fresh sample to reach the sensor, etc. The three boxes are for 1): following a controller reboot, 2): following the pressing of the Start/Stop button on the controller keyboard, and 3): following the release of the 'Pause' signal via the pump cable. ProMinent pumps have control cable options that include a pause function. (Brown wire). See the pump manual for more information.



Use the PID Tuning tab to enter a setpoint and the PID values. In this example, the process variable is an ORP measurement.

XP is the proportional factor. It denotes that the output will vary proportionally over the XP range from the setpoint.
In this example, the ORP setpoint is 400mV and the XP is 20mV. 20mV is the range of operation for the output. This sets the controller to output 0 speed when the process value is at setpoint and 100% output when the process value is XP (20mV) below the setpoint. (400 – 20 = 380). As the process drops from 400 to 380, the pump will increase from 0 (off) to 100% proportionally. At a process value of 390, the output would be 50%.

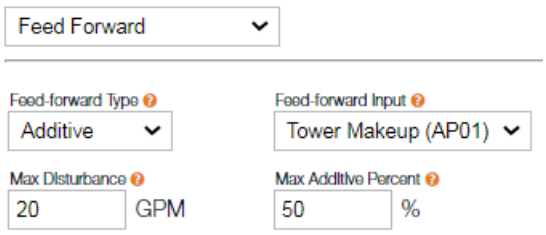
The **Ti** value (Integral Time) is the amount of time the program uses to determine how quickly it will try to reach the setpoint as opposed to instantly. An entry of 5 seconds would have the output ramp up quickly to the maximum output within 5 seconds. Typically, this value is determined by the amount of lag, or the time it takes for a change in the chemical feed until the ORP sensor measures the change.
You can determine the lag time by stopping the pump and wait until the process variable starts to react to this change. Use this as a starting point for control. Increase and decrease the Ti until the process variable shows the least variation yet reacts quickly to upsets.

The Td value is the differential or derivative setting. This adjustment adds quickness to the control based on the rate of change in the process variable. If the ORP makes a sudden change, the Td setting will speed up the response of the output. This is especially useful in control loops that have very short lag times of less than 30 seconds. Since most cooling applications have lag times in excess of 5 minutes, this would not be useful. Potable water applications, RO detox loops or other industrial control may require a Td addition.
If used, start with a small adjustment, less than 1 second, and increase as needed.

A Base Load will add or subtract a percent of the PID calculation result to the output. Enter a value from -100% to +100%. This can be helpful when you need to offset the output in one direction.

13.7.3.1 Feed Forward

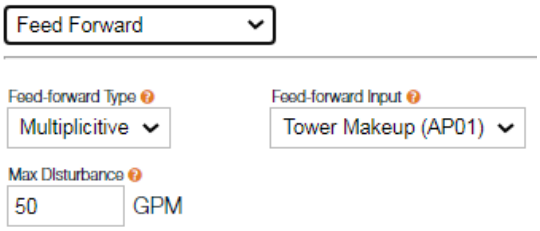
Feed Forward has two setting types, Additive and Multiplicative.



The **Additive** factor adds an extra percentage to the PID calculation based on a disturbance signal. A **disturbance signal** might be a flow rate that is helpful in the feed rate of a sensor driven chemical. When the flow changes significantly, increasing or decreasing the chemical feed is necessary to maintain a steady treatment level. Additive Feed Forward uses a formula to calculate how much of an increase to add to the PID calculation.
Final PID Output = Calculated PID rate (%) + [Max Additive % * Current disturbance (GPM) / Max Disturbance (GPM)].
The **Calculated PID rate** is the output derived with feed forward disabled. See PID Setup and PID Tuning above.
The **Max additive %** is used to limit the amount of disturbance that can be added to the PID output. And in any event, the final PID output cannot exceed 100%.
The **Current Disturbance** is the actual value from the disturbance input as a percent of full scale.
The **Max Disturbance** is used to set the disturbance range from 0 to the highest value that you will normally experience. If you have a watermeter input that is rated for 0 to 240GPM but the plumbing will not allow more than 120GPM, set this value for 120. Now the formula will ratio the disturbance to this value.

This setup page requires the **Feed Forward** (disturbance) **Input** signal from the app page. Press the down arrow to see all possible choices. This example shows a tower makeup meter.

Multiplicative Feed Forward



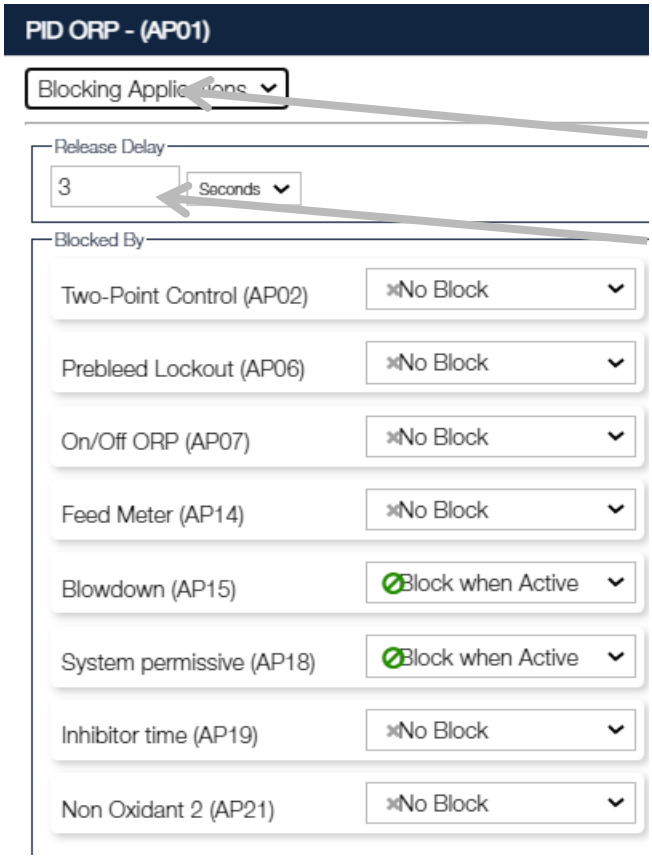
The PID output control variable is **multiplied** by this feed forward value as a percent.
Output = PID rate * Current disturbance rate / Full range disturbance rate.

In this example, when the tower makeup flow is at 50 GPM or above, the PID output will be multiplied by 100%, or 1.0, thus having no effect on the PID output. As the flow drops below the Max Disturbance rate, the multiplier will drop proportionally. At 25 GPM, the multiplier is .5, thus reducing the PID output by half.

Example: PID calculated output is 20% based on the pH setpoint. The flow rate (disturbance) is at 25 GPM.

Output = PID rate * Current flow/Max flow
Output = 20% * 25/50
Output = 20% * .5 = 10%

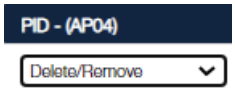
The Max Disturbance sets the range of the multiplier. It can be higher or lower than the range of the input device. This setting sets the proportional range of the disturbance factor.



The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

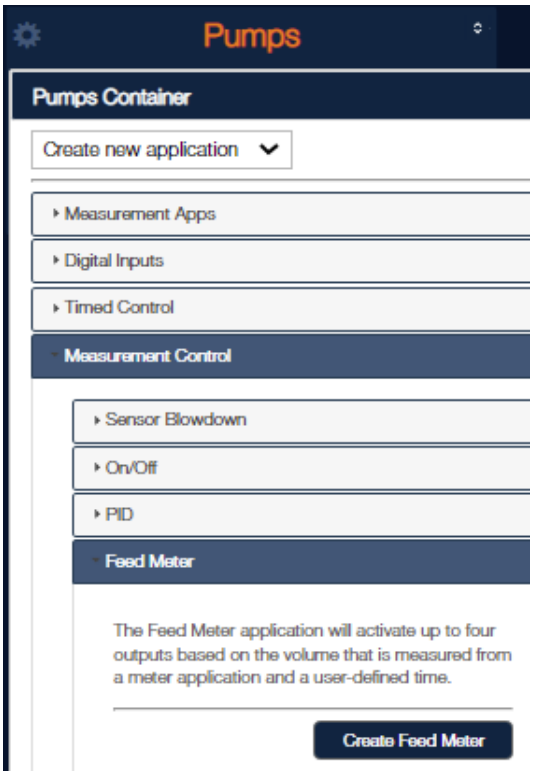
Notice the heading says ‘Blocked By’. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.



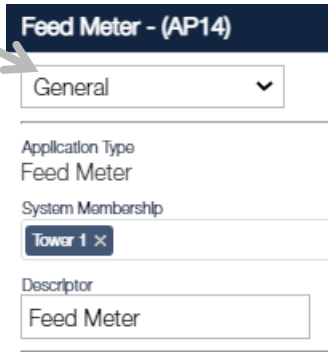
The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

13.7.4 Feed Meter App

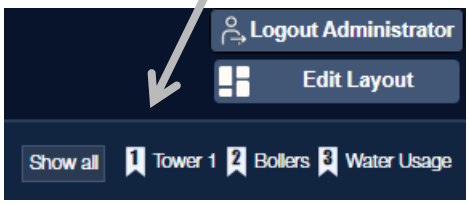
Create a Feed Meter app; Click on the container gear where you wish to add this app. Select Create new application, Measurement Control and Feed Meter. Press the Create Feed Meter button.



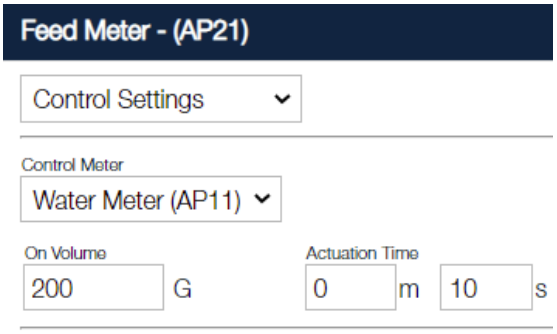
Use the General tab to edit the name of the app and select a System Membership as desired.

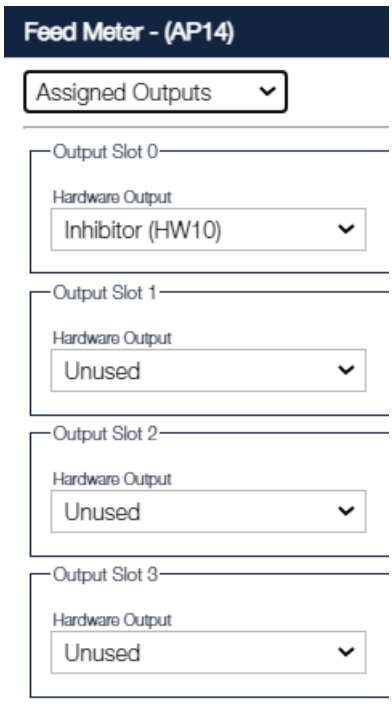


System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.



Choose a water meter from the Control Settings tab. All available meters will be shown. Set the On Volume and Actuation Time.

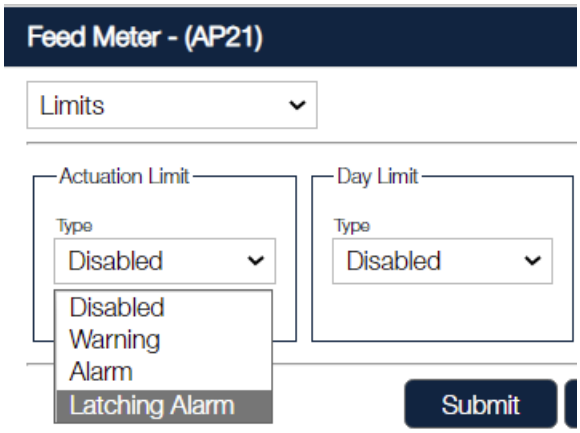


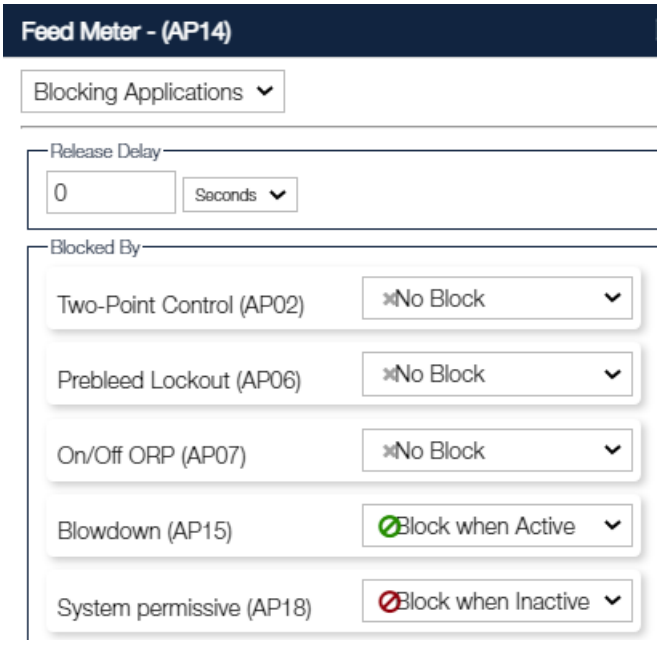


Choose an output from the Assigned Output tab. All available outputs will be shown.

Use the Limits tab to set up warnings and alarms. The Actuation Limit may indicate an output that is stuck in the on state or an error in the settings.

The Day Limit might be due to a leak in the cooling system. Summertime temperatures may require you to increase this value while wintertime temperatures may necessitate a lower value.

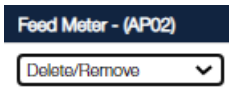




The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says 'Blocked By'. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.

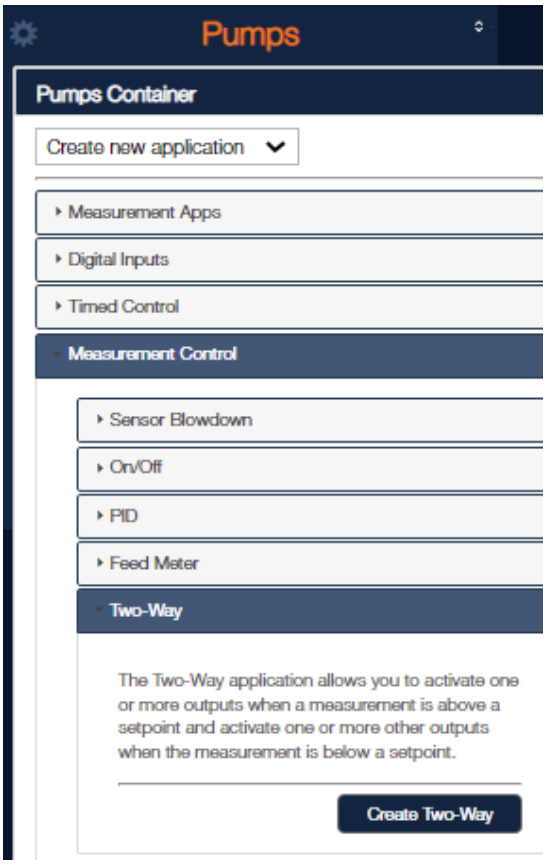


The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

13.7.5 Two-Way App

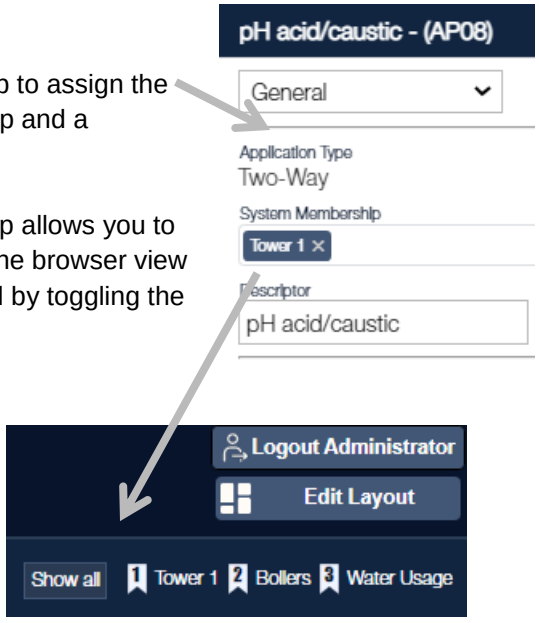
A two-way app is helpful if you need to adjust the chemical feed to manage a system where the process can vary above or below the setpoint without chemical feed. A typical example is pH control with acid and caustic.

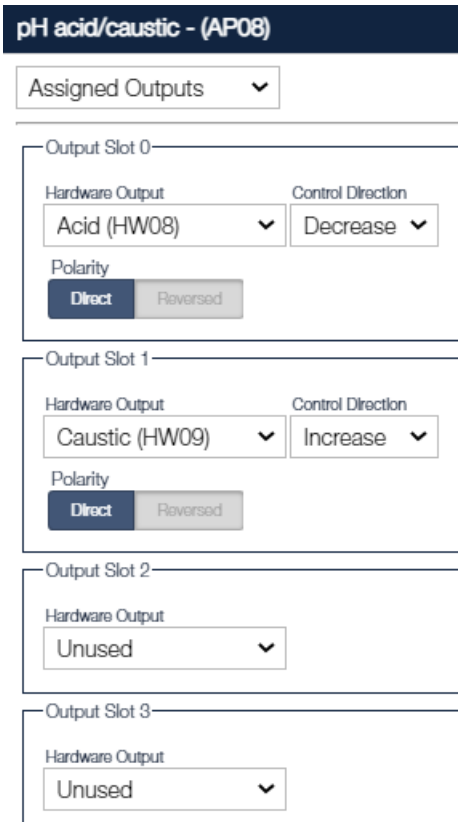
Create a Two-Way app; Click on the container gear where you wish to add this app. Select Create new application, Measurement Control and Two-Way. Press the Create Two-Way button.



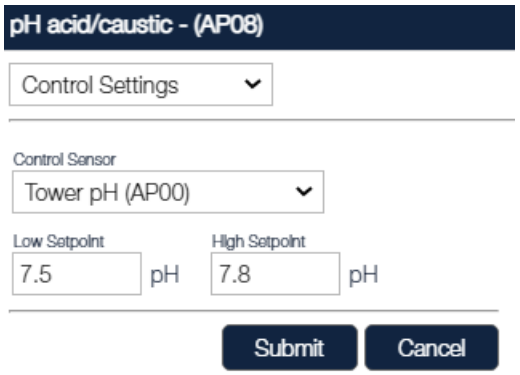
Use the General tab to assign the System Membership and a description.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.





Choose an output from the Assigned Output tab. All available outputs will be shown.
The Control Direction indicates which direction the process variable is expected to travel when the output is active. Acid will decrease the pH and Caustic will increase the pH.

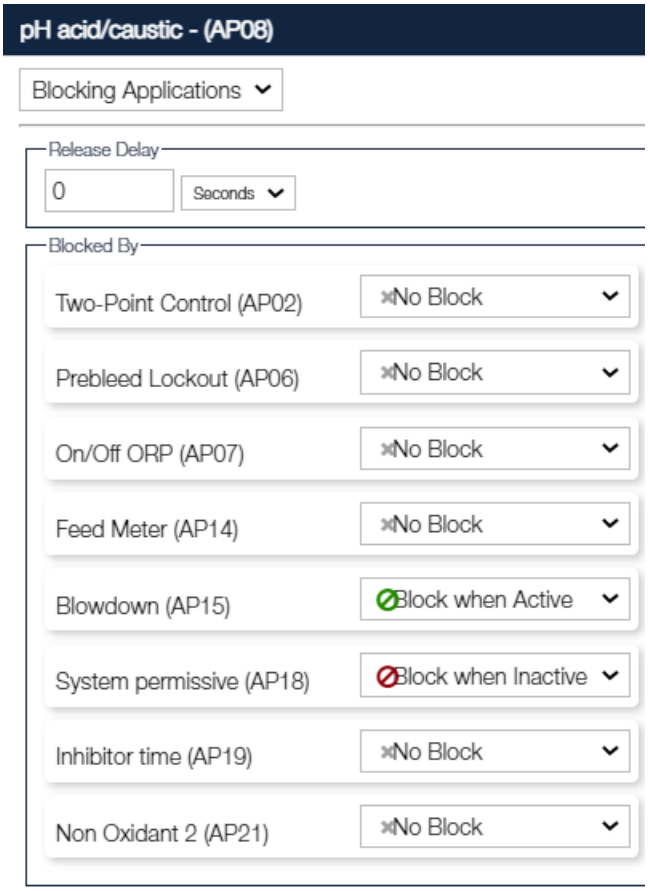


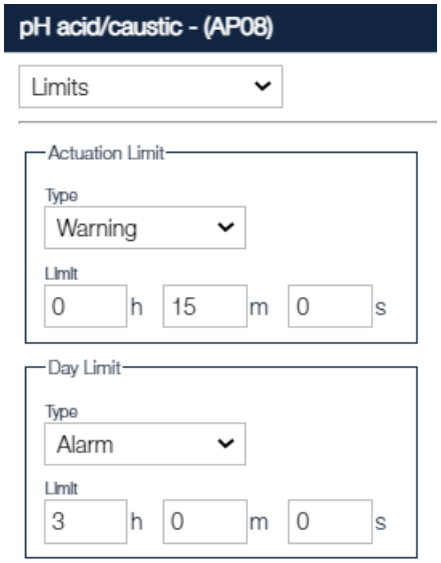
Use the Control Settings tab to choose the controlling sensor and edit the Low and High Setpoints. In this example, the acid pump will turn off when the pH is below 7.8 and the Caustic pump will shut off when the pH is above 7.5.

The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says ‘Blocked By’. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.





Use the Limits tab to set up warnings and alarms. The Actuation Limit may indicate an output that is stuck in the on state or an error in the settings.

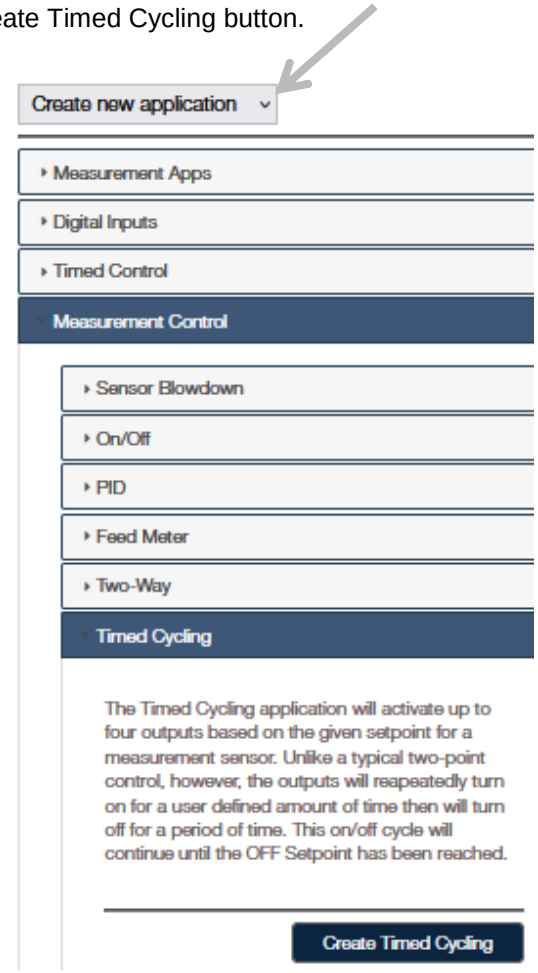
The Day Limit might be due to a leak in the cooling system. Summertime temperatures may require you to increase this value while wintertime temperatures may necessitate a lower value.

The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

13.7.6 Timed Cycling App

The Timed Cycling App is a simple but effective way of averaging chemical feed when a sensor controlled pump is not able to keep the process in control when there exist a lag between when the chemical is fed and the sensor experiences a change. The pump stays on too long causing the setpoint to be overshot, then stays off too long causing the process to bypass the setpoint in the other direction.

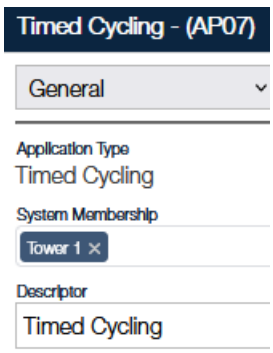
Create a Timed Cycling app; Click on the container gear where you wish to add this app. Select Create new application, Measurement Control and Timed Cycling. Press the Create Timed Cycling button.



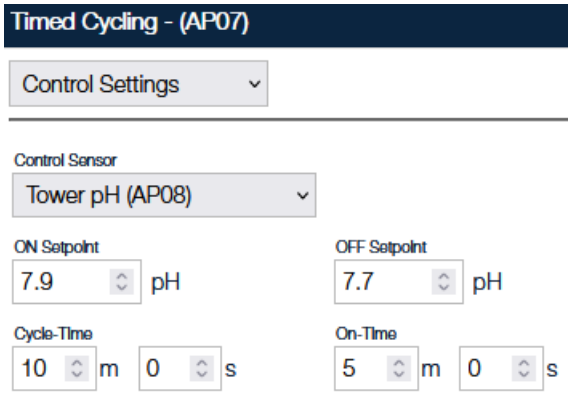
Timed Cycling allow you to pause the setpoint control for a portion of a user defined period giving the sensor time to see feed changes.

As we show how to set up a Timed Cycle app, we will explain how to determine the values we use and how to test them in an actual process.

The Timed Cycling app is similar to the Percent Timed Control app. Timed cycling has an off period and an automatic period where the output is based on a setpoint. Percent timed control has an on time and an off time. It never runs in auto. See section **13.6.1 Percent Timed Control App**



Use the General tab to edit the Descriptor for this app and add as a member to a system or systems.



Use the Control Settings tab to choose the controlling sensor, the setpoints and the timed cycling times in minutes.

The example here shows that during every 10 minutes (cycle time) the controller will attempt to control the process for 5 minutes (On Time) and turn the output off for the remaining time (10 – 5 = 5). During the control time, the output will be on when needed and off for as long as the setpoint is satisfied. In this example, below 7.7pH the output will be off no matter if in control time or not. The output will be on when above 7.9 if in control time.

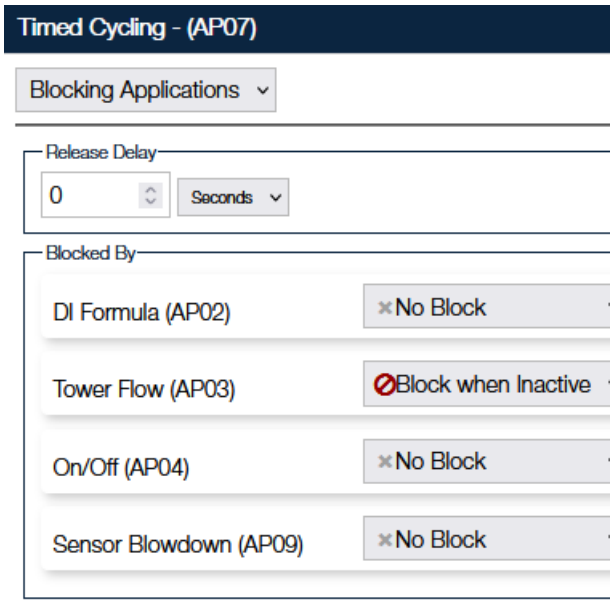
Successful Cycle-times and On-Times will depend on your system. Start by using an On/Off app. If control is too erratic, try this app with the times shown above as a starting point. Monitor the system for a few cycles. (Pump turns on and off a few times.) Make adjustments to see if control is improved or not and adjust as necessary.

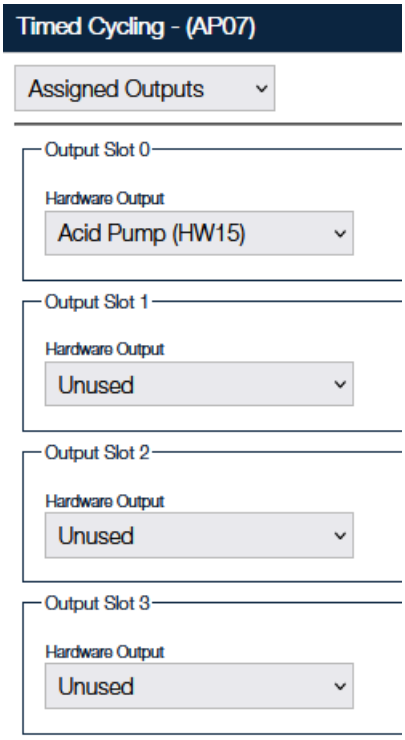
As a rule of thumb, the 'Off time' should be about equal to the lag time.

The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

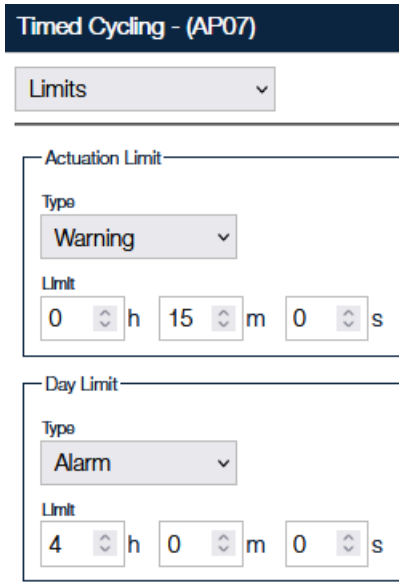
The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says 'Blocked By'. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here



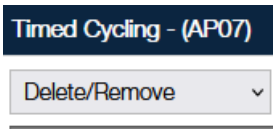


Use the Assigned Outputs to choose the one that is wired to your pump or valve. All available outputs will appear in the dropdown. Outputs cannot be chosen by multiple apps.



Use the Limits tab to set up warnings and alarms. The Actuation Limit may indicate an output that is stuck in the on state or an error in the settings.

The Day Limit might be due to a leak in the cooling system. Summertime temperatures may require you to increase this value while wintertime temperatures may necessitate a lower value.

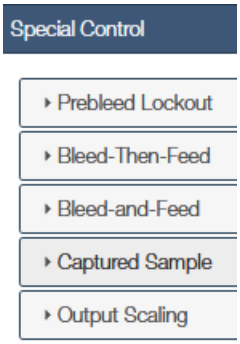


The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

SPECIAL CONTROL TIP:

When using Timed Cycling, Time Modulate or PID control, best results for tuning the loop are achieved if you only change one variable at a time and wait for two or three cycles to observe the effect of this change. This would include changing the stroke % of the pump and any setting in the special control program.

13.8 Special Control Apps



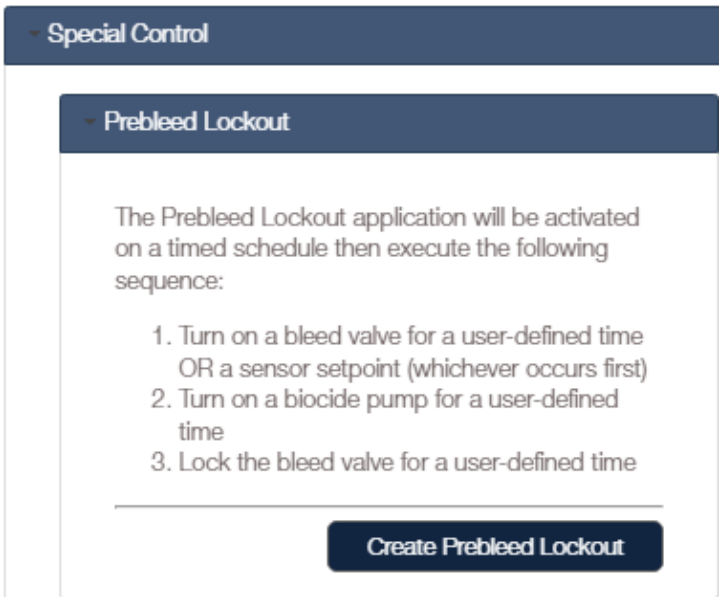
Special Control applications are used to handle more complex control schemes especially ones involving multiple relays. Prebleed Lockout, Bleed then Feed, Bleed and Feed and Valve control are explained below.

13.8.1 Prebleed Lockout

The Prebleed Lockout app runs in conjunction with a tower blowdown app.

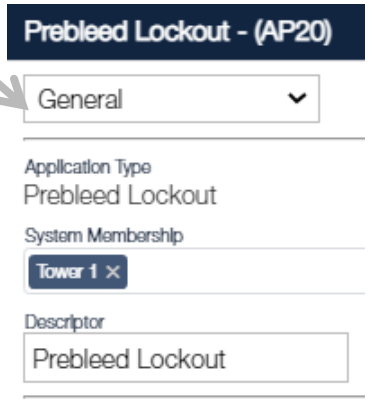
The purpose of Prebleed Lockout is to set up a cooling tower to accept and hold a non-oxidizing biocide without ramping up the conductivity. The program is initialized with a timed event. If the conductivity is not below a programmed setpoint, (typically lower than the blowdown setpoint), the tower will open the bleed valve for a programmed number of minutes. Once this timer is complete, or if the conductivity drops below the new setpoint, the valve closes and the feed event starts. The event includes one timer for the biocide pump and another for the additional blowdown lockout time. The extra time allows the biocide to attain its goal. Once the lockout time expires, the blowdown operation returns to normal conductivity sensor control.

To set up a blowdown application, see section **13.7.1.2 Tower and Continuous Boiler Blowdown**.

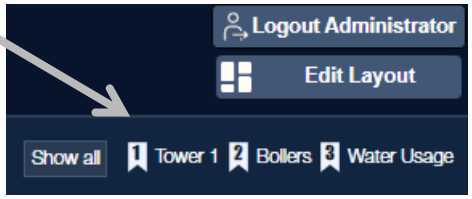


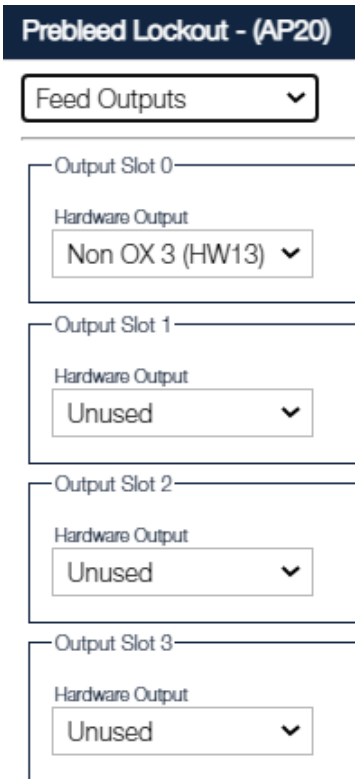
To Create a Timed Cycling app, click on the container gear where you wish to add this app. Select Create new application, Special Control and Prebleed Lockout. Press the Create Prebleed Lockout button.

Use the General tab to edit the name of the app and select a System Membership as desired.



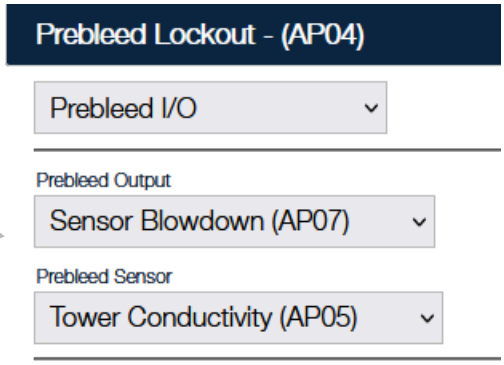
System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

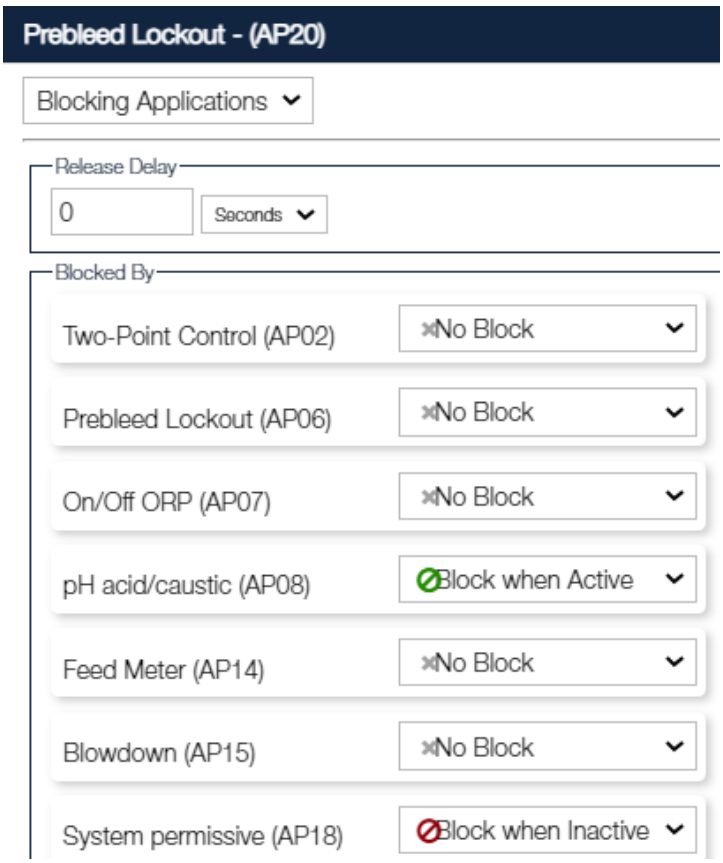




Use the Feed Outputs tab to select your output from a list of all available outputs.

Use the Prebleed I/O to select the blowdown app and the conductivity app used in the blowdown app.



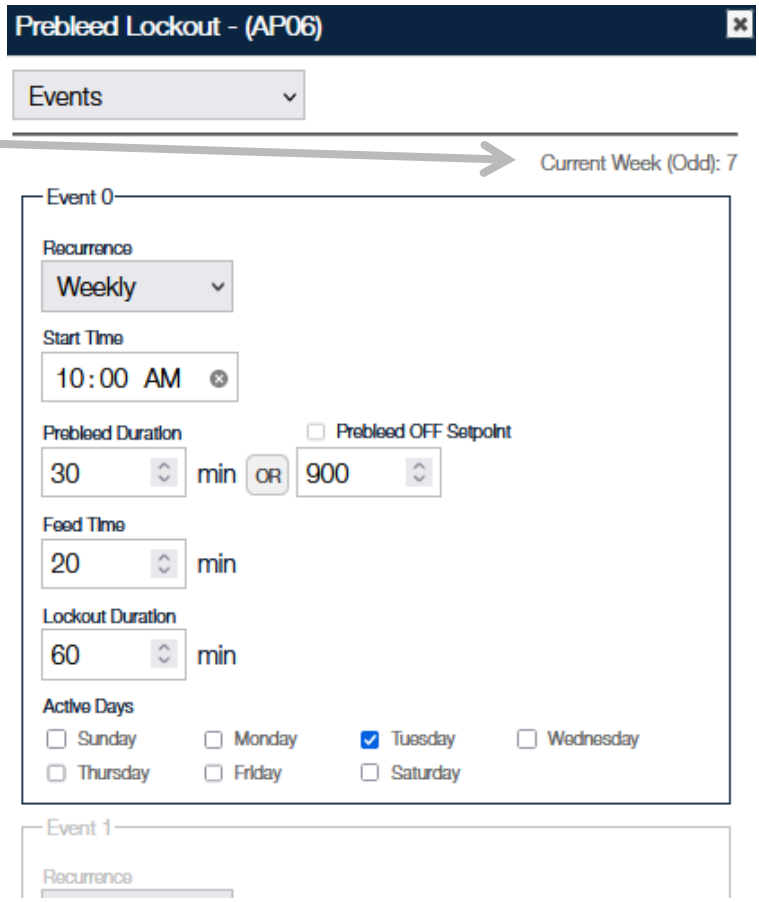


The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says 'Blocked By'. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.

There are no alarm **Limits** settings for this app.



Notice that the Events window shows your current weekly even/odd status.

This app allows you to choose up to three events.

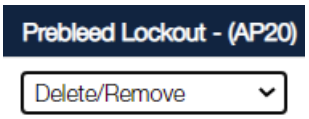
The recurrence setting can be weekly, odd weeks or even weeks. Within the weeks, the Active Days are chosen for a maximum of three events every day.

If you choose Odd Weeks and select Tuesday as we did here, and if today is after Tuesday of this week, this event will not happen today, nor any day next week! The next odd week Tuesday is almost 2 weeks away.

Be sure to include the Feed Time into the Lockout Duration. In this example, the feed time is 20 minutes and the lockout duration is 60 minutes. Therefore, after the feed is complete, the lockout will continue for another 40 minutes.

The Prebleed OFF Setpoint means that your blowdown app setpoint will be ignored during this event. Typically, the Prebleed OFF Setpoint is lower than the normal blowdown setpoint. Consider how quickly the conductivity will ramp up when the tower blowdown is locked out when you enter this value to ensure you do not increase the tower scaling coefficient. In this example, when an event starts, the blowdown valve will open if it is not, and remain open until either 30 minutes has elapsed, or until the conductivity drops down to 900uS. At that point, the bleed valve is closed for, in this example, 60 minutes and the pump runs for 20. This gives a non-oxidizing biocide ample time to achieve its goal.

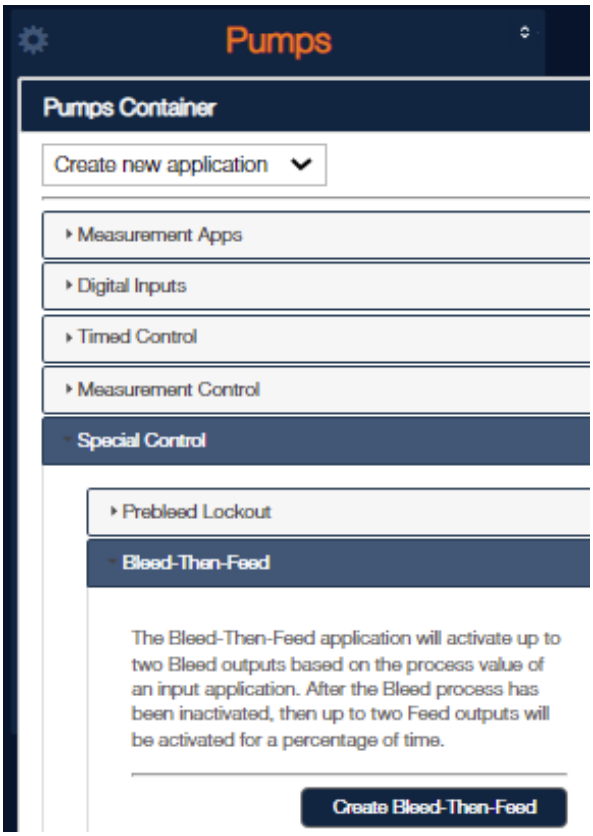
The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.



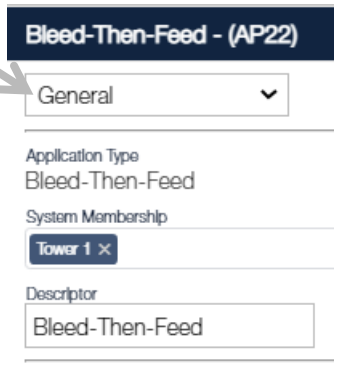
13.8.2 Bleed Then Feed

Bleed Then Feed is typically used to ensure an inhibitor pump is not feeding chemical while a cooling tower is blowing down.

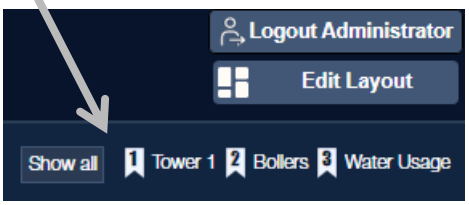
Create a Bleed Then Feed app; Click on the container gear where you wish to add this app. Select Create new application, Special Control and Bleed-Then-Feed. Press the Create Bleed-Then-Feed button.



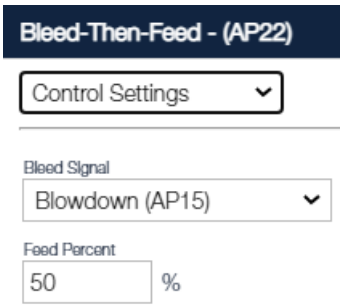
Use the General tab to assign the System Membership and a description



System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

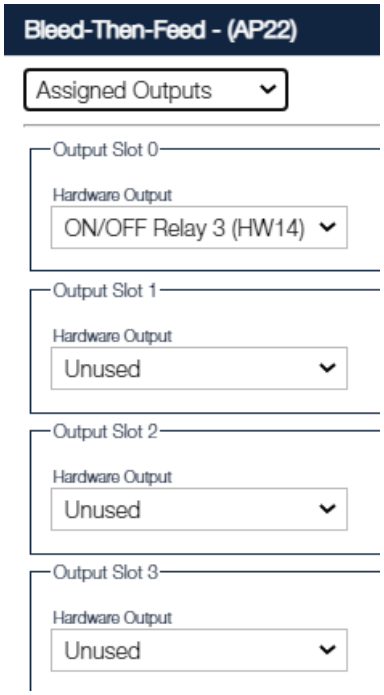


Use the Control Settings tab to select the blowdown meter, the % on time and the period. At the end of the period, the controller calculates the amount of time needed to activate the pump.



In the example to the left, the period is 5 minutes and the % is 50. If the blowdown valve is on for 4 minutes, at the end of the 5 minute period, the inhibitor pump will be activated for half (50%) of the 4 minutes.

If the bleed last for 6 minutes, the pump will start at the 5 minute period and run for 2.5 minutes. At the end of the second 5 minute period, the pump will run for an additional 30 seconds, 50% of the extra 1 minute.

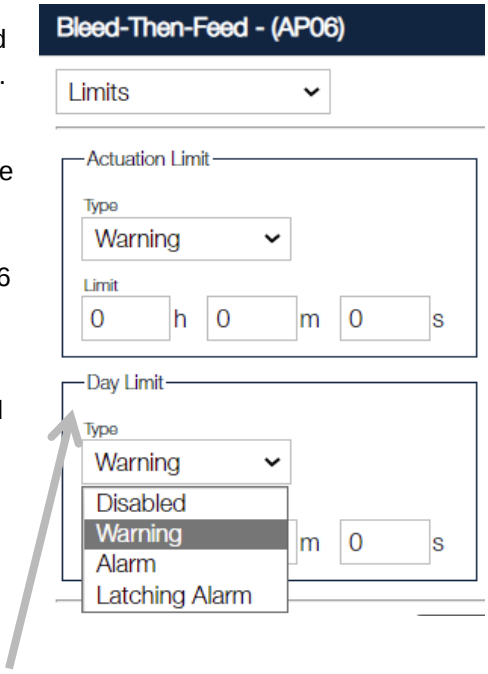


Choose an output from the Assigned Output tab. All available outputs will be shown.

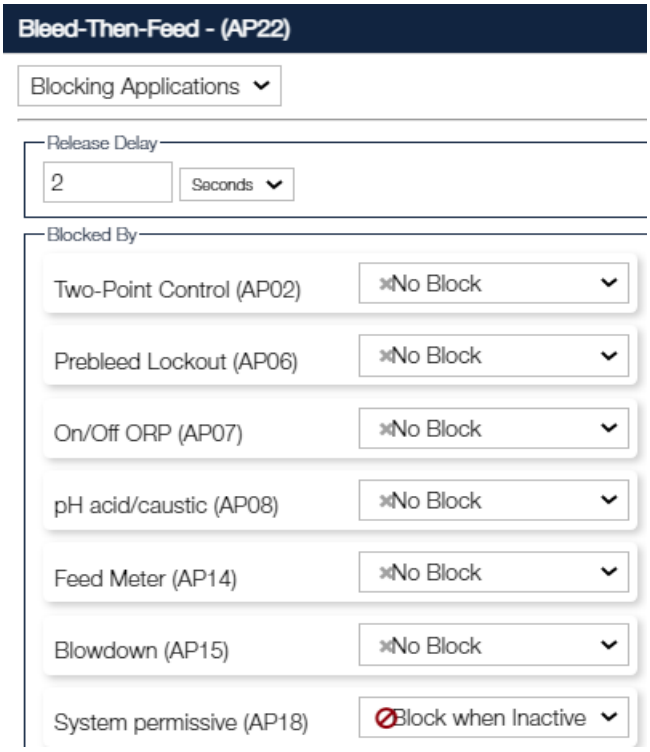
Use the Limits menu to set alarms and warnings per actuation and/or per day.

If the pump relay is not using the blocking tab, and if you set a 10 minute period and the pump % on time is 50%, the pump should never run for more than 5 minutes per actuation. A 6 minute warning will let you know that something has failed.

If the pump is blocked by another feed app, the pump output relay will accumulate owed time. You would definitely need to increase the 6 minute limit in this example.



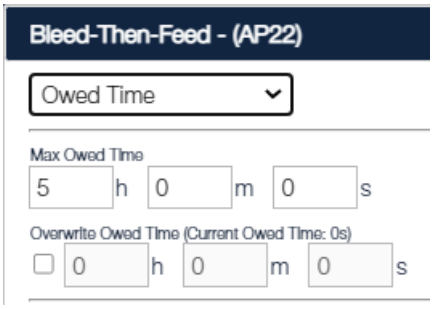
The daily limit helps notify you of an overfeed incident or an erroneous setting in the program.



The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says ‘Blocked By’. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.



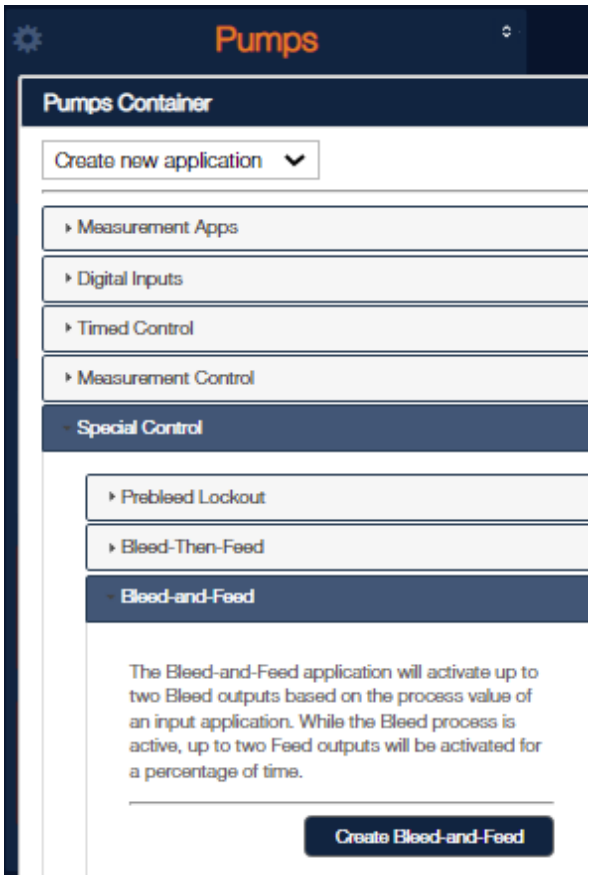
Owed Time happens whenever the output is delayed due to a blocking action. Once the block is removed, all of the time that was saved is used to catch up. If blocking last for an excessive amount of time, it may no longer be appropriate to feed all of the missed chemical. Use this tab to limit this time.

The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

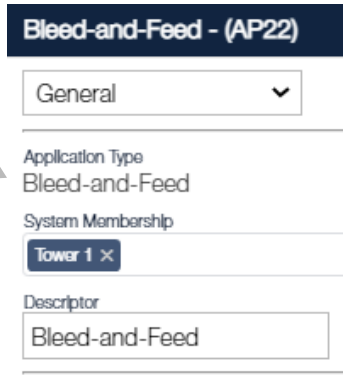
13.8.3 Bleed And Feed

Bleed and Feed apps are typically used to feed inhibitor while blowdown is in progress. While not preferred in most cases, if the blowdown is open for extended periods, a Bleed **then** Feed pump may not have enough time to keep up with the PPM target.

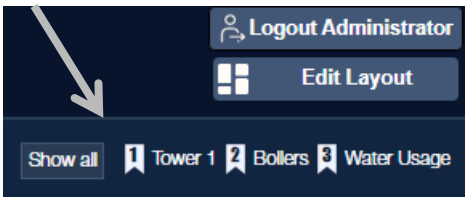
Create a Bleed Then Feed app; Click on the container gear where you wish to add this app. Select Create new application, Special Control and Bleed-Then-Feed. Press the Create Bleed-Then-Feed button.

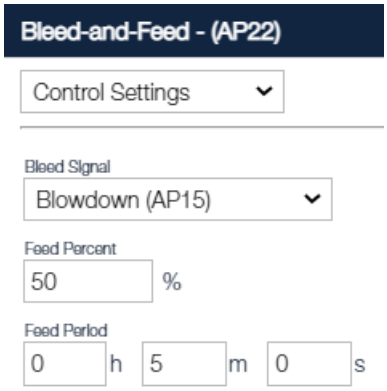


Use the General tab to assign the System Membership and a description.



System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.

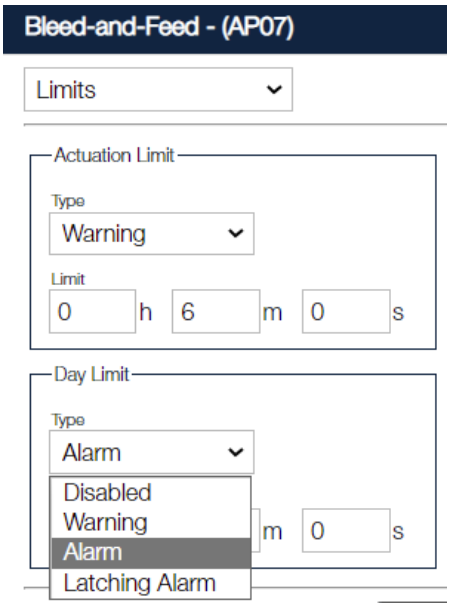




Use the Control Settings tab to select the blowdown meter, the % on time and the period. At the end of the period, the controller calculates the amount of time needed to activate the pump.

In the example to the left, the period is 5 minutes and the % is 50. If the blowdown valve is on for 4 minutes, at the end of the 5 minute period, the inhibitor pump will be activated for half (50%) of the 4 minutes.

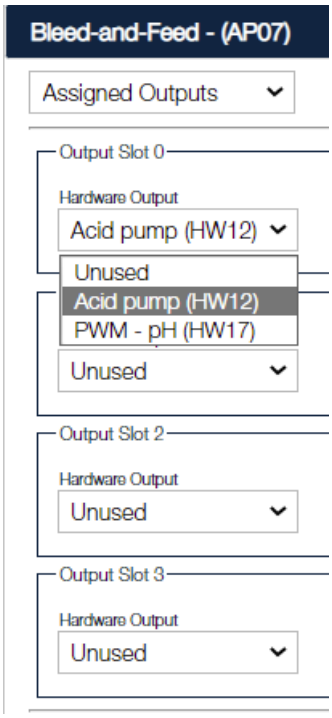
If the bleed last for 6 minutes, the pump will start at the 5 minute period and run for 2.5 minutes. At the end of the second 5 minute period, the pump will run for an additional 30 seconds, 50% of the extra 1 minute.



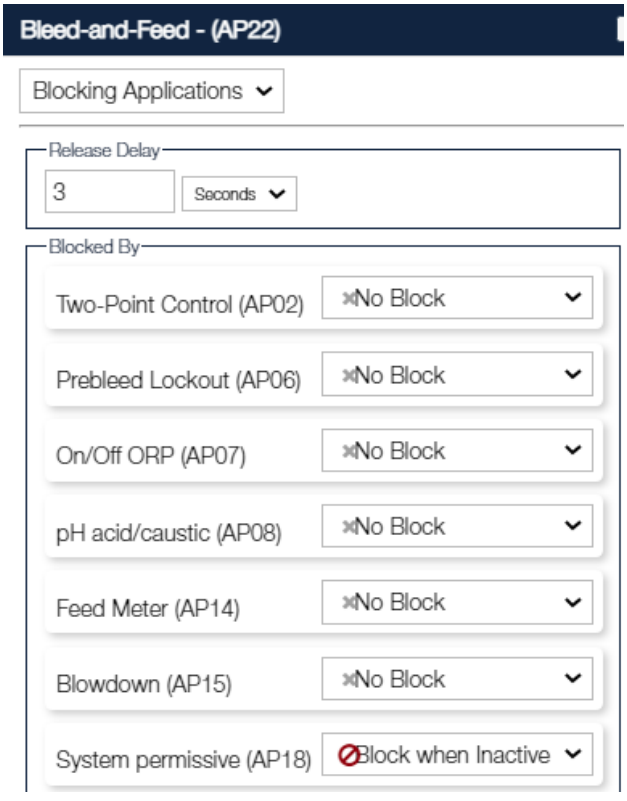
Use the Limits menu to set alarms and warnings per actuation and/or per day.

If you have a 10 minute period and the pump % on time is 50%, the pump should never run for more than 5 minutes per actuation. A 6 minute warning will let you know that something has failed.

The daily limit helps notify you of an overfeed incident.



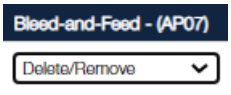
Choose an output from the Assigned Output tab. All available outputs will be shown.



The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

Notice the heading says ‘Blocked By’. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.



The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

13.8.4 Captured Sample

The Captured Sample routine is used to control boiler conductivity. However, there are typically two methods used to achieve boiler conductivity control, continuous blowdown and captured sample blowdown.

See section **13.7.1 Sensor Blowdown App** to configure a continuous boiler program.

Captured Sample is the preferred method for smaller and medium sized boilers because it does not require a continuous sample, sample cooler or cooling water supply. A continuous sample on a small boiler would drop the conductivity too quickly. Controlling the conductivity level would be extremely difficult, wasting water that has been treated with chemicals, filtered and heated.

Blowdown Savings

Heated and chemically treated boiler water offers a great savings when it returns as condensate!

WARNING!

By design, boilers are of high pressure and temperature. The boiler and its associated plumbing are dangerously hot. Even supports and conduit can burn the skin.

Wear appropriate PPE when in near proximity to a boiler.

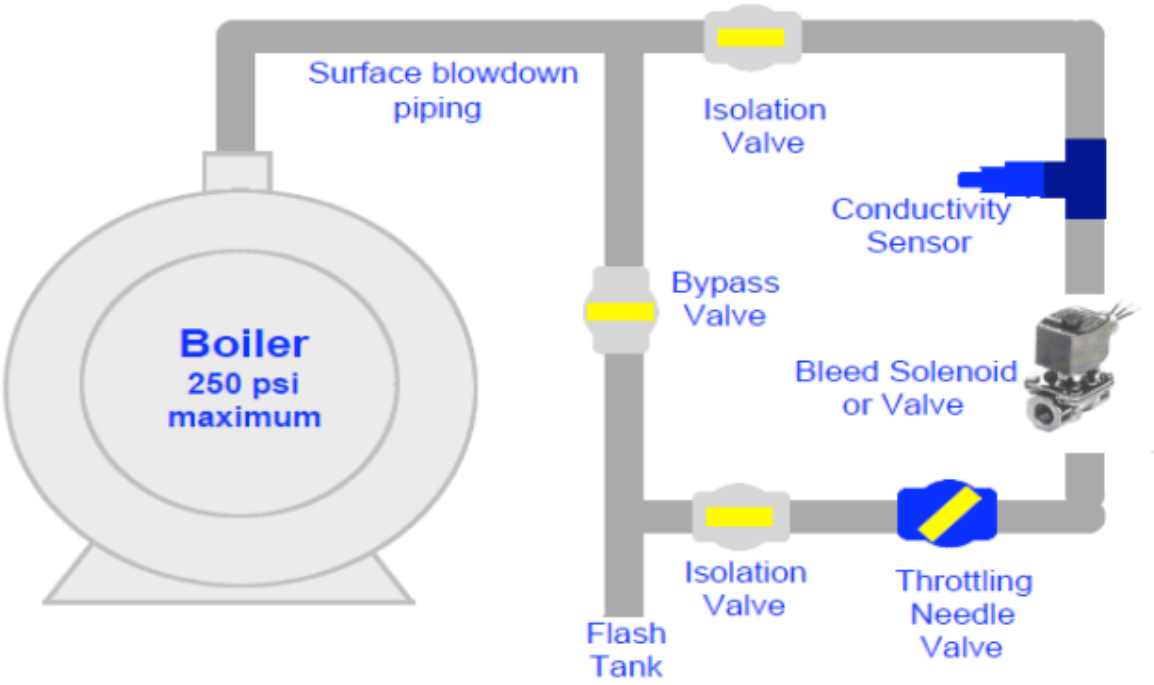
WARNING!

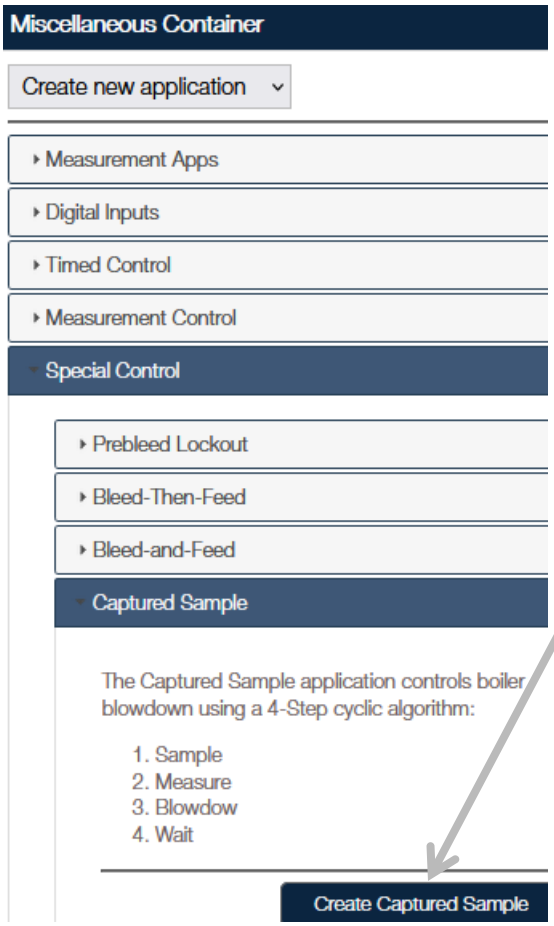
The Aegis X controller is not designed to automate a bottom boiler blowdown valve!

Bottom blowdown is typically used for sludge removal and should not be automated!

The most important piece of a captured sample control program is the plumbing! As always, isolation valves are needed to allow for maintenance of the conductivity sensor, blowdown solenoid and throttling needle valve. The placement of these items is crucial to providing a stable conductivity reading. The position of the sensor, solenoid and throttling valve must be in the order shown. The point here is that when the solenoid is opened to bring a fresh sample to the sensor, the throttling valve provides a resistance to the flow, thereby controlling at which point the flashing will occur. This restriction causes the boiler side pressure to maintain boiler drum pressure while the downstream side of the throttling valve approaches atmospheric pressure causing the sample to flash after the valve. This method ensures that air pockets are not trapped on the high pressure side where the sensor resides.

An air pocket at the sensor will give an extremely low reading!

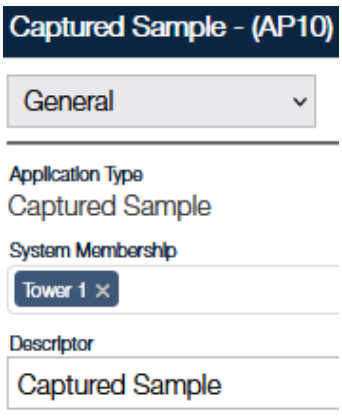




The 2-wire conductivity sensor used in the Captured Sample method is not thermally compensated since by design, boilers maintain a reasonable constant temperature and pressure. Therefore, the Measure sequence requires a reading from a steady temperature sensor. Flashing is disruptive to this method, so plumbing is critical to a proper reading.

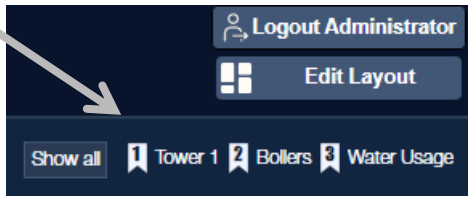
by periodically sampling the steam drum through the top blowdown line. The conductivity reading is compared to a setpoint and if exceeded, the controller will open the valve for additional time then re-sample. Bleeding and re-sampling continues until the conductivity is below the lower setpoint at which point, the controller returns to periodic sampling.

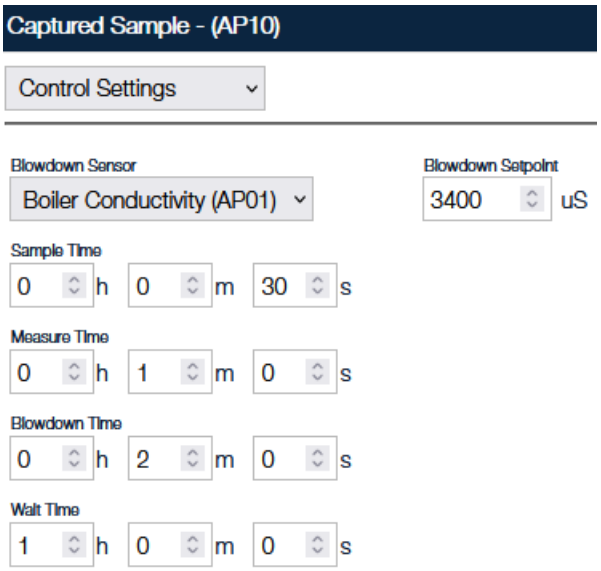
Create a Captured Sample app; Click on the container gear where you wish to add this app. Select Create new application, Special Control and Captured Sample. Press the Create Captured Sample button.



Use the General tab to assign the System Membership and a description.

System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.



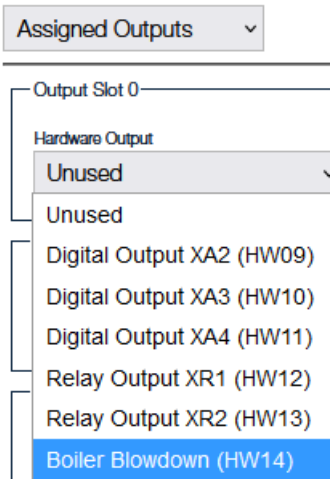


Use the Control Settings tab to select the boiler conductivity sensor and add a blowdown setpoint.

The Sample time must open the blowdown valve long enough to ensure a fresh sample reaches the conductivity sensor. When done, the valve closes for the duration of the Measure Time.

Measure time should be 1 minute. This allows the sample to cool to a point where the cooling rate of the sample starts to level off. When the temperature is changing rapidly, repeatability is less accurate.

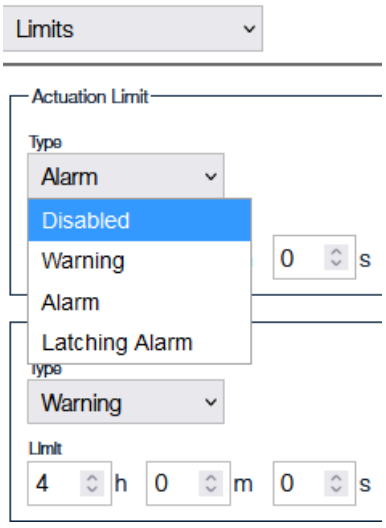
At the end of the measure time, a snapshot of the probe value is logged and compared to the setpoint. If the reading is above the setpoint, the routine moves to the sample stage and opens the valve again, as in the beginning, for the sample time. After the sample time, the valve closes as before and lets the sample cool during the Measure Time. Another snapshot of the sensor value is taken and compared to the setpoint. This loop continues indefinitely until the reading falls below the setpoint. Now the routing skips the blowdown time and goes to the final step. At the end of the wait time, a new routing starts.



Use the Assigned Outputs tab to select the blowdown valve output.

Use the Limits tab to set alarms should the output surpass a length of time you deem to be problematic. There are two types; per Actuation and per Day. Each can be set as a Warning, an Alarm, or a Latching Alarm.

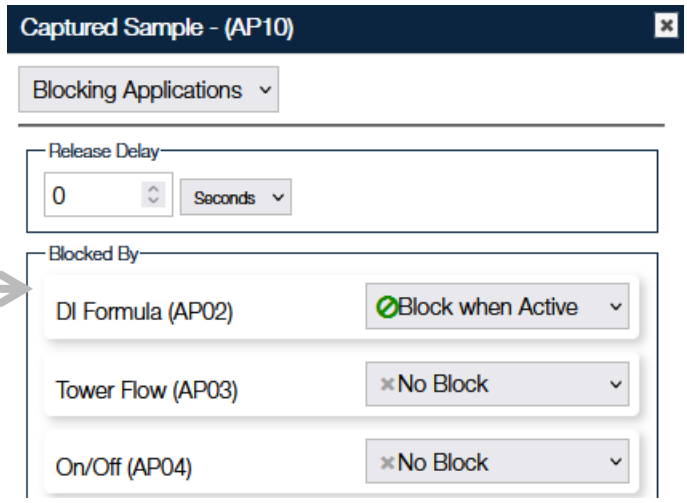
Per Actuation is not very helpful in this application, however, the daily limit can warn of expensive over-bleeding.

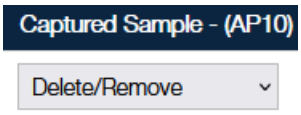


The Blocking Applications tab shows all the other outputs that can be used to pause this output when they are on, (block when active) or off, (block when inactive).

The Release Delay will hold this output off for a few extra seconds, or minutes, if needed.

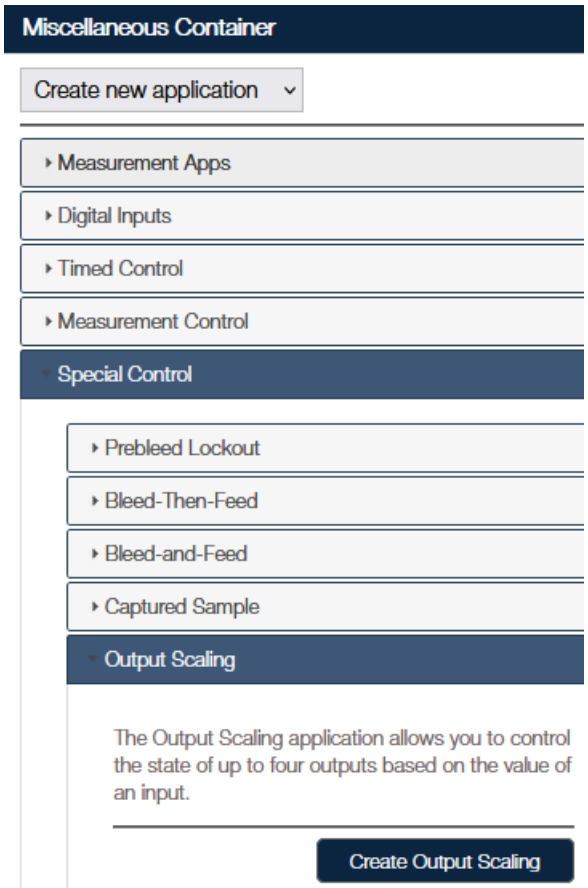
Notice the heading says 'Blocked By'. Use this to remind you that the output you just created is, in part, controlled by the outputs selected here.





The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

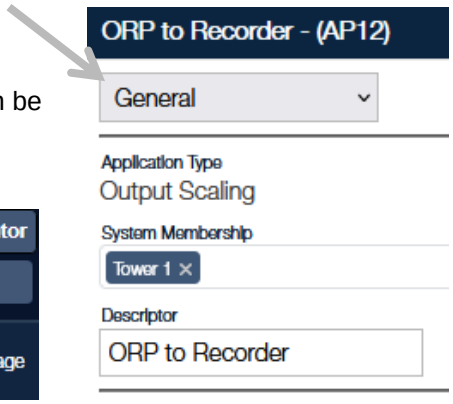
13.8.5 Output Scaling

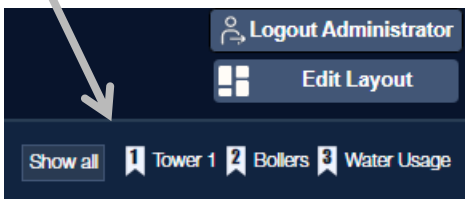


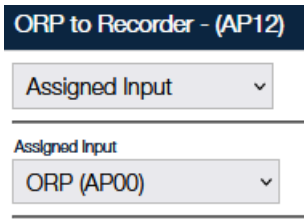
Create an Output Scaling app; Click on the container gear where you wish to add this app. Select Create a new application, Special Control and Output Scaling. Press the Create Output Scaling button.

Use the General tab to assign the System Membership and a description.

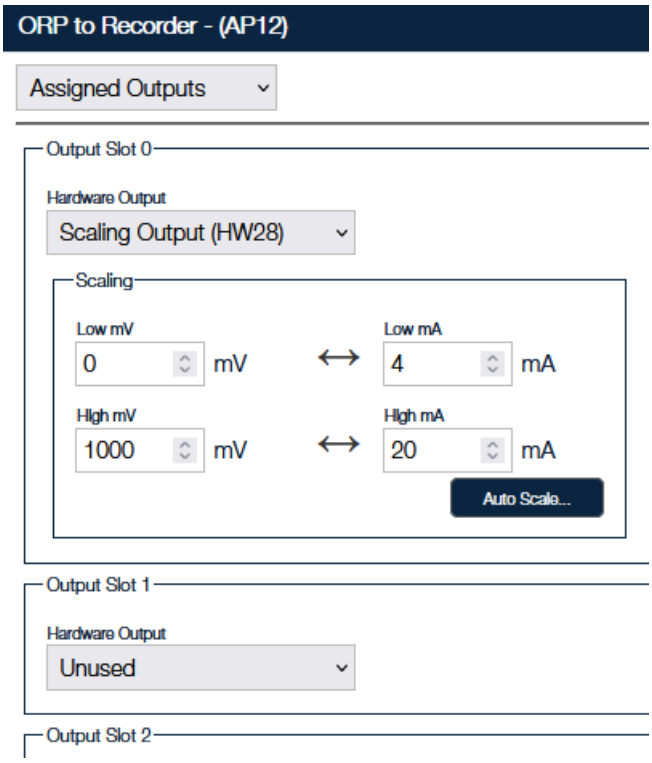
System Membership allows you to group your apps. The browser view can be manipulated by toggling the membership icons.





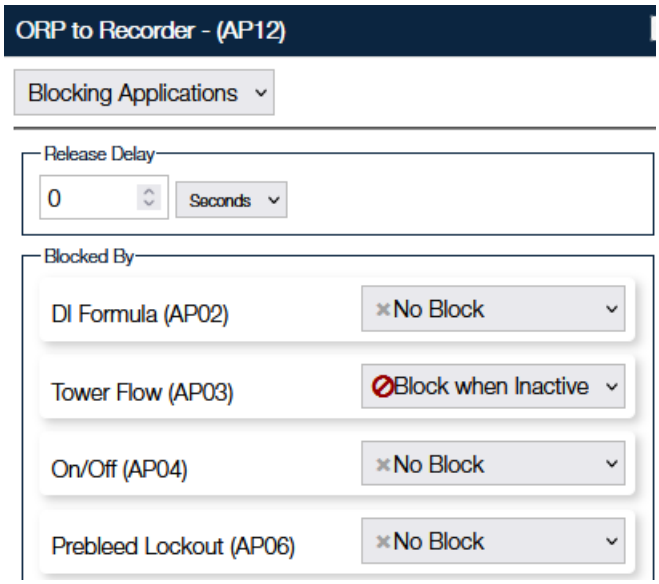


Use the Assigned Input tab to choose the sensor or app that will be output.



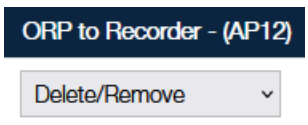
Use the Assigned Outputs tab to select up to 4 outputs. Choose each output from the Hardware Output dropdown list and scale the output as desired.

In this example, an ORP sensor is being scaled from 0 to 1000 as a 4-20mA output.



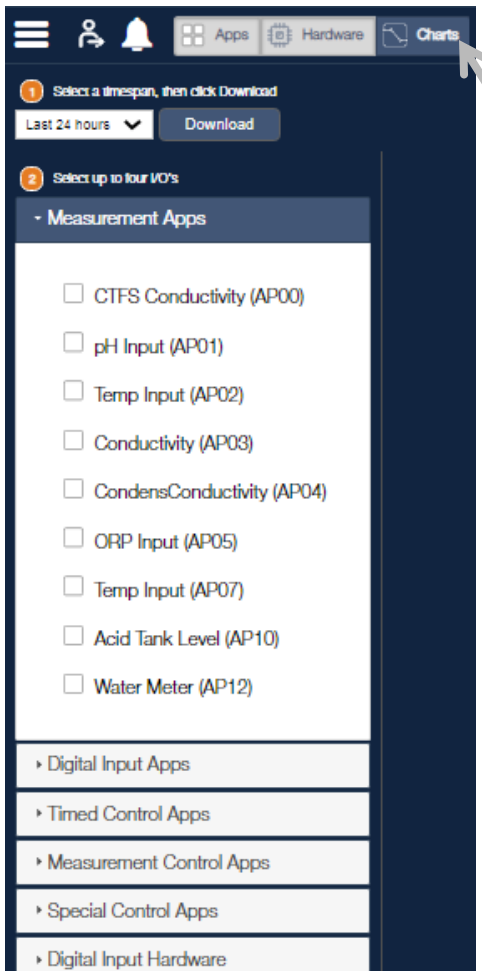
Use the Blocking Applications tab to disable the output based on the status of other outputs. Choose from three states of the blocking output; No blocking, block when active or block when inactive.

Typically, a 4-20mA signal to a recorder or to the customers DCS is not blocked by other outputs as the signal, ORP in this instance, is still viable information.

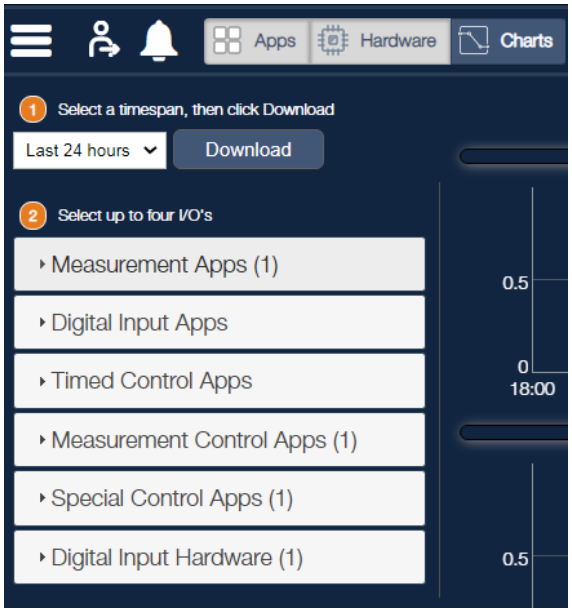


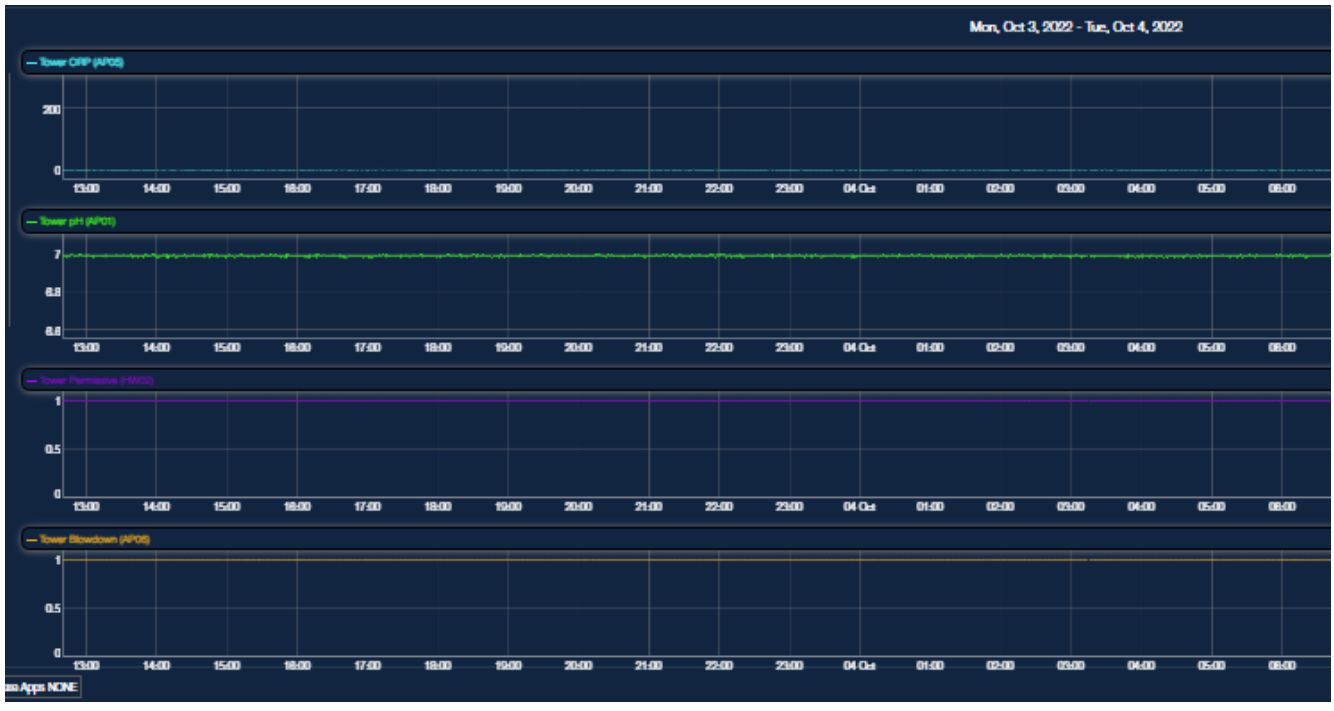
The Delete/Remove page is the same for all apps. It includes an explanation of the Delete/Remove process.

14 Charts



Use the Charts tab in the browser screen to chart up to 4 I/O at a time.





15 Analog Sensor Care

Read the sensor manual!

All of the control equipment in the world cannot correct for bad information from a failed sensor!

This section covers ProMinent (1) amperometric sensors, (2) mV and conductive conductivity sensors and (3) other sensors.

Amperometric sensors are shipped with an extensive manual specific to that sensor.

Here is an example of the table of contents of a CLE 3 probe. Be sure to consult the sensor specific manual for installation, maintenance, troubleshooting and especially the run-in period.

Some excerpts from amperometric sensor manuals:

Accurate measuring and metering is only possible if the sensor is working correctly. This includes correct plumbing and sensor installation as well as proper calibration equipment to test the sensor through to the controller.

The first step in a proper calibration of an amperometric probe is to adhere to the run-in time as noted in the probe operating instructions. (Located in the probe box).

The run-in period means how long the sensor must see the chemical it will monitor to wake it from the absence period. The probe will lose its ability to measure whenever the absence of chemistry is for a considerable time. See the probe instructions for this metric as well.

It may take a whole day to run-in some sensors!

There has to be adequate feed chemical in the sample water for your application (e.g. 0.5 ppm chlorine)

ORP and pH sensors include manuals that present a wide variety of necessary information.

CAUTION!

pH and redox-ORP electrodes have a limited shelf life, which is why we do not recommend storing them for more than three months.

Do not use distilled water for soaking, since this will lead to premature ageing and damage to the reference system.

ORP sensors measure more than just chlorine.

The only acceptable calibration is to a calibrated mV source, not an oxidant residual. ProMinent recommends testing the probe for movement and adjusting the set-points if necessary, to reach the desired oxidation control range.

15.1 Cleaning mV probes:

Kind of deposit	Agent and duration of application
General deposits	Non-abrasive household cleaner like Dawn® or 409®
Scale or metal hydroxides	Diluted hydrochloric acid (approx. 0.1-3 %, 1-5 minutes)
Oil, grease	Solvents, like alcohol
Biofouling	Mixture of diluted hydrochloric acid and pepsin, several hours.
	Solvents (e.g. acetone) must not be used to clean electrodes as they can damage the plastic

All pH and ORP probes should regularly (once a month) undergo a visual check and be cleaned if necessary.

If deposits on the glass electrode withstand cleaning with a soft, moistened cloth, or a soft toothbrush the following cleaning agents may be used:

It is essential that the probes are rinsed thoroughly after cleaning or using a buffer solution.

If the laterally arranged ceramic diaphragm of the reference electrode is blocked, it may be cleaned like the glass electrode. In addition it may be cleaned by cautious scraping with a finger nail, a razor blade or a fine file, but care must be taken that the diaphragm is not scratched.

CAUTION!

Do not rub the sensor

This might create damaging static electricity and false readings.

Sensor Compensation:
Conductivity sensors should always be temperature compensated, with the exception of the boiler conductivity probes.
pH sensors can be temperature compensated.
The following Chlorine sensors can be pH compensated;
CLE3
CLE3.1
CBR
CTE

15.2 Calibrating an Amperometric Sensor

Expected Gain and Offset values of ProMinent amperometric sensors:

Sensor Type	Span Options & units	mA Span	G=Gain, O=Offset Span not user modifiable
Unassigned	Other 0-100%	4-20	User modifiable span G=6.25, O=-25
CBR Bromine	CBR 0-2ppm	4-16	G=0.167, O=-0.667
	CBR 0-10ppm	4-16	G=0.833, O=-3.333
CGE Chlorine	CGE 0-2 ppm	4-16	G=0.167, O=-0.667
	CGE 0-10ppm	4-16	G=0.833, O=-3.333
CLE3 Chlorine	CLE 0-2ppm	4-16	G=0.167, O=-0.667
	CLE 0-10ppm	4-16	G=0.833, O=-3.333
	CLE 0-20ppm	4-16	G=1.67, O=-6.67
	CLE 0-50ppm	4-16	G=4.17, O=-16.6
	CLE 0-100ppm	4-16	G=8.33, O=-33.3
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	4-16	G= 6.25, O=-25
Fluorescent	Fluor 0-200ppm	4-16	G= 12.5, O=-50
PAA 0-200ppm	PAA 0-200ppm	4-16	G=16.67, O=-66.67
	PAA 0-2000ppm	4-16	G=166.67, O=-666.67
pH-transducer	pH 0 to 14	4-20	4mA=-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
Toroidal	Tor. 0-10000uS	4-20	G= 625, O=-2500
	Tor. 0-100000uS	4-20	G= 6250, O=-25000
Flow	0-100%	4-20	G= 6.25, O=-25
	0-1000GPM	4-20	G= 62.5, O=-250
	0-10000GPM	4-20	G= 625, O=-2500
Pressure	0-100psi	4-20	G= 6.25, O=-25
	0-30psi	4-20	G= 1.875, O=-7.5
Turbidity	0-5000NTU	4-20	G= 312.5, O=-1250
UV	0-100%	4-20	G= 6.25, O=-25
	0-1000wm2	4-20	G= 62.5, O=-250

16 Controller Technical Data

Note: Installation or removal of the printed circuit boards requires a Torx T10 screw driver. The door is secured with a No. 2 Phillips screw driver. The controller mounting bracket includes 5 mm by 25 mm Phillips screws.

16.1 Fuse Specification

Component	Rating/type	vendor	Part#
Mains Input	2.5 Amp at 250 VAC, 5x20 mm	PFC	732413
Line out fuse for XP1:	10 Amp at 250 VAC, 5x20 mm. Max load 8 Amp (due to ambient temp rating)	PFC	733855
Relay fuses R4, R5 and R6	10 Amp at 250 VAC, 5x20 mm. Max load: 8 Amp (due to ambient temp rating)	PFC	733855
Inrush Current	Maximum inrush current 8.0Amps	PFC	AGIb

Fusing Relays XR1, XR2, and XR3 for external power usage

Relays R1, 2 and 3 can be wired using on-board power as shown in section **9.5.2.5 Wiring Relays 1, 2 and 3 Using On-board Power** or powered from an external source as shown in section **9.5.2.6 Wiring Relays 1, 2 and 3 Using an External Power Source**. When using external power, fusing must be provided by customer.

These relays are rated for a maximum of 5 amps each. When using on-board power, the total draw of these three relays must not exceed the on-board fuse which is rated for 8 Amps.

16.2 Switching digital outputs (XA1 to XA4)

Type of Load	Ohmic
Isolation Voltage	500Vpp max.
Switching Voltage	30V ACpp or DCmax.
Switching current	Max. 250mA
Leak Current (open)	Max. 10µA
Switching Frequency	Max. 100Hz
Max. cable length	30m (EMV-Norm 61326)
Relay Type	Optomos

16.3 Digital Inputs with Power Supply

Isolation Voltage	500Vpp max.
Max Input Voltage	18V
Short Circuit Current **(or capacitive drawn current)**	max. 10mA
Max. Switching Frequency Hardware	10kHz
Max. Frequenz	8kHz
Max. Cable Length	30m (EMC-Standard 61326)
Supply Voltage	12 - 16VDC / max. 10mA
Contact Resistance open	>100kΩ
Contact Resistance closed	<100Ω
Switch Type	Mechanical contact or open collector (electrical potential-free)

16.4 CAN-Bus (XC1 to XC3)

Local CAN-Bus with external power supply 20VDC/400mA

Shield has no connection to PE

16.5 Modbus Slave

Standard RS-485 module

120 Ohm Termination Resistor can be activated by software.

XB1 / XB2 Pins	Signal	Function
1	A	„A+“ not inverted / data positive
2	B	„B-“ inverted / data negative
3	GND	C / GND / common
4	Shield	Connected to GND with 1n || 1MΩ

16.6 Modbus Master

Standard RS-485

120 Ohm Termination Resistor along with 680 Ohm Symmetry Resistor can be activated by software.

XB1 / XB2 Pins	Signal	Function
1	A	„A+“ not inverted / data positive
2	B	„B-“ inverted / data negative
3	GND	C / GND / common
4	Shield	Connected to GND with 1n || 1MΩ

16.7 External DC Power Supply (XP2 and XP3)

Output Voltage	22.5 – 24.5 VDC
Max Output Current (current is limited)	100mA

16.8 Controller Specifications

Description	Technical Data
Control characteristic:	ON/OFF, P, PID, Pulse Frequency control
Control:	10 Relays (see below)
Signal current output:	4-20 mA electrically isolated, max. load 450 Ω, range and assignment (measured, correction, control variable) can be
Control output:	4 relays optional pulse frequency outputs or ON/OFF, for control of metering pumps
	3 relays Line Power 3 Relays dry contact
	8 Maximum 4/20 mA
Alarm relay:	Any relay can be programmed as an alarm
Electrical connection:	90-253 V, 50/60 Hz, 40 Watt
Operating temperature:	Ambient temperature -5 to 50 °C (23 to 122 °F) (for inside deployment or with a protective enclosure)
Power cable temperature rating:	≥ 70 °C (160 °F)
Storage temperature:	-20 to 70 °C (-4 to 160 °F)
Degree of protection:	Wall mounted: Rated for IP 66/67
	NEMA 4X (leak-tightness)
Pollution degree	3
Overvoltage category	2
Reference to standards	EN 61010-1 (General safety requirements for the following types of electrical equipment and their accessories) EN 61316-1 (Electrical equipment for measurement, control and laboratory use – EMC requirements)
Tests and certification:	CE, MET (corresponding to UL as per IEC 61010)
Material:	Housing PC with flame proofing configuration
Dimensions:	42.0 x 30.0 x 14.0 mm (WxHxD)
Weight:	net 3.7 kg
Wire sizes	Power block: 14 to 18 gauge. Outputs R1, 2 & 3 up to 12 gauge. Frequency outputs and digital inputs: 14 to 24 gauge.

16.9 Sensor Specifications

Measuring Range/Measured value	
Measuring range connection type mV:	pH: 0.00 ... 14.00
	ORP voltage: -1500 ... +1500 mV
Connection type mA (amperometric measured variables, measuring ranges according to the sensors):	Chlorine
	Bromine
	Peracetic acid
	Toroidal Conductivity
Connection type mV (potentio- metric measured variables, measuring ranges according to the transmitters):	pH
	ORP millivoltage
Conductivity (variable ohm)	0 – 5,000µS
Conductivity (measuring ranges according to the transmitters):	0 – 5,000µS in a digital signal
Temperature:	via Pt 100/Pt 1000, measuring range 0 ... 150 °C
pH resolution:	0.01
ORP voltage:	1 mV
Temperature:	0.1 °C
Amperometric analysis	(Chlorine 0.001/0.01 ppm, 0.01 Vol. %, 0.1 Vol. % etc.):
Accuracy: based on the full-scale reading	0.3 %
pH/ORP measurement input:	Input resistance > 0.5 x 10^{12} Ω
Correction variable:	Temperature via Pt 100/Pt 1000
Temperature compensation range:	0 … 150 °C
pH compensation range for chlorine:	6.5 … 8.5

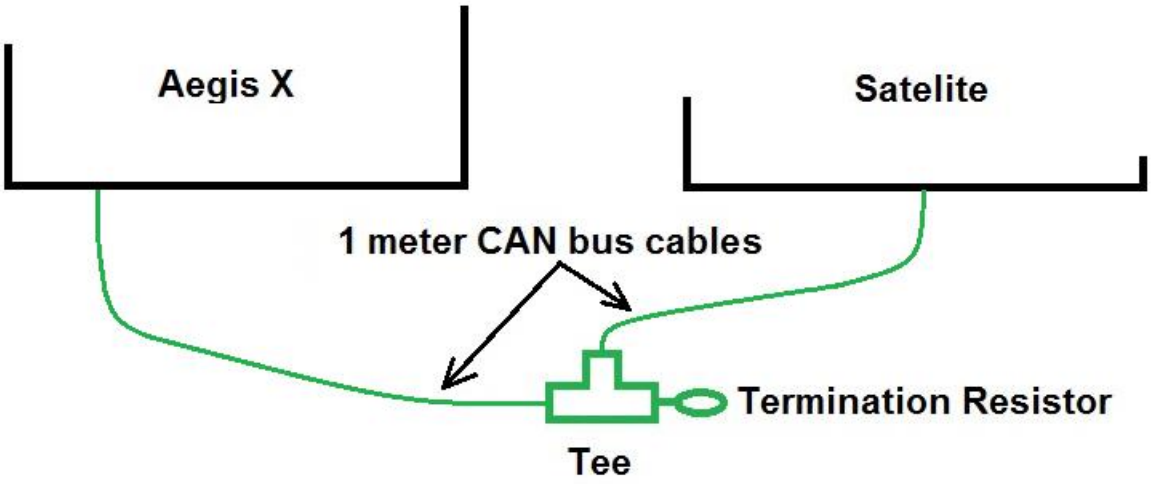
17 Spare Parts and Accessories

Aegis X Controller – Bottom assembly for main and satellites

-Base assembly with PCB, gasket, bag-o-cord grips, power cord, CAN bus set, and Programming……Call PFC

-Bag-O-Cord grips 1092176
-Base gasket……1076642

- Ethernet cable 15' external with 4 pin M12 and standard Ethernet RJ45 jack. 1026715
-Double RJ45 extension kit includes 2 M20 cable grips, IP65……1092176
-Fuse, Main circuit boards; 2.5A at 250VAC, 5 x 20mm 732413
-Fuse, Line fuse for XP1: 10A at 250VAC, Max load 8A, 5 x 20mm…….. 733855
-Fuse, for Relays 4, 5 & 6, (XR4 and XR5), 10A at 250VAC Max load 8A, 5 x 20mm 733855
-Mounting bracket for Aegis X…… 1025597
-CAN bus set; cables with Tee, terminator and two 1 meter cables 1026902



-CAN Terminating resistor, M12 Female……1022154
-CAN internal cable assembly 1080366
-Power section fan. Fan 5VDC 50*50*10mm tachom output 733328
-USB Cable assembly USB jumper (USB A Micro USB DCPa) 1081560
-Battery BR2032 3V (Also at box stores and pharmacies) 732829
-Termination clip 3 port for power relays 733768
-Termination clip – 2 port for pulse relay outputs Call PFC
-Termination clip – 3 port for digital inputs Call PFC
-Power output relays (5VDC coil, 16A 250VAC contacts) 732154

Aegis X Controller – Hood

-Standard Hood with printed circuit board including battery, Special 12” internal Ethernet cable with RJ45 and LAN M12, 4 pin round connector, Ethernet 4 pin double LAN M12 pass-through connector, micro memory chip, hood to base 9 pin ribbon cable, Special internal USB cable with pass-through end, WiFi module, door screws and programming……..Call PFC

- Ethernet cable, Special 12” **interna**l 4 pin double LAN M12 and Ethernet RJ45 jack. 1080560
-uSD Micro memory chip with files (Do not remove without PFC technical advice)
-W-LAN WiFi module 1122705
-Ribbon cable, 10 pin, hood to base board 1080128

-Satellite Hood with printed circuit board including, hood to base 9 pin ribbon cable, door screws and programming…….. Call PFC

Cable

-Cable, 2 conductor 22ga Quantity in feet 7760527

Use this cable to lengthen 2-wire boiler probe wire or any 4-20mA signal.

Aegis X Controller – Modules

AegisX dual 4-20mA Input module	734126
AegisX dual 4-20mA Output module	734143
AegisX dual pH & ORP with temp Input module	1081805
AegisX dual cond/temp Input module	734223
AegisX dual serial sensor Input module	734265
AegisX pH/w temp and mA Input module	1081872

Sensors and Accessories

Serial CTFS sensor (Conductivity-Temperature-Flow)

CTFS Sensor **Assembly** (includes * items)	7500979
* Cond-Temp-Flow Serial Sensor	7761529
* O-Ring seal for CTFS/CTF/TF Ass’y	7760577
* Sensor entry fitting CTFS/CTF/TF	7760445
* ¾” PVC Tee TxTxT Sch80	7741484

Serial Corrosion Sensor (LPR)

LPR Sensor **Assembly. No Tips** (Includes * items)	7761473
* LPR Sensor Only. No tips 125 psi 50^0 C	7760792
* O-Ring seal for CTFS/CTF/TF Ass'y	7760577
* Sensor entry fitting CTFS/CTF/TF	7760445
* ¾" PVC Tee TxTxT Sch80	7741484
Admiralty Brass corr replacement tips set w/Oring CRS-AM	7760238
Cupro/Nickle corr replacement tip set w/Oring CRS-CN	7760239
Carbon Steel corr replacement tip set w/Oring CRS-CS	7760240
Copper corr replacement tip set w/Oring CRS-CU	7760241
304SS corr replacement tip set w/Oring CRS-SS	7760243
Zinc corr replacement tip set w/Oring CRS-ZN	7760244

LPR serial sensor assembly includes Tee, O-ring entry fitting and shown with tips

Potentiometric Sensors and Accessories

ORP sensor – Aquatics	7500442
Kll pH sensor – Aquatics	7500441
PHED 112 SE sensor	741036
RHEP Pt SE ORP sensor	150094
Coax cable, SN2 x Clamp, 32”	1024105
Coax cable, SN2 x Clamp, 6’	1024106
Coax cable, SN2 x Clamp, 30’	1024107
PHED/RHEP Long body probe holder	7746422
¾” PVC Tee TxTxT Sch80	7741484
Metric PHED/RHEP long body probe holder w/T	1001493
PHED to 4-20mA converter	809126
RHEP to 4-20mA converter	809127
Conductivity sensor, boiler 2/wire 250psi, ¾” NPT,	7760189
Conductivity/Temp 4-wire, 250psi @ 450ºF condensate	7760191
Conductivity boiler ¾” cast iron Tee	7760384
Temp sensor **Assembly*** PT1000 & adapter for DGMA	1082254
*Resistance thermometer Pt-1000-SE	1080101
*Temp sensor adapter for SGT or PT1000 to DGMA	1051504
Temp Sensor, SGT, H2O Ground 316SS ¼” MNPT 36”	1051505

Temperature sensor 1080101 and adapter 1051504

Amperometric Sensors and Accessories

CLE 3-mA-2 ppm sensor 0.02 to 2.0 mg/l	792920
CLE 3-mA-10 ppm sensor 0.10 to 10.0 mg/l	792919
CLO 1-mA-2 ppm sensor 0.02 to 2.0 mg/l	1033871
CLO 1-mA-10 ppm sensor 0.10 to 10.0 mg/l	1033870
CGE 3-mA-2 ppm sensor 0.02 to 2.0 mg/l	1047959
CGE 3-mA-10 ppm sensor 0.10 to 10.0 mg/l	1047975
CTE 1-mA-2 ppm sensor 0.02 to 2.0 mg/l	740685
CTE 1-mA-10 ppm sensor 0.10 to 10.0 mg/l	740684
CBR 1-mA-2 ppm sensor 0.02 to 2.0 mg/l	1038015
CBR 1-mA-10 ppm sensor 0.10 to 10.0 mg/l	1038014
PAA 1-mA-200 ppm sensor 1 to 200 mg/l	1022506
PAA 1-mA-2000 ppm sensor 1 to 2000 mg/l	1022507
Membrane cap for CLE3	790488
Sensor cap for CLO 1	1035197
Membrane cap for CGE/CTE 1	792862
Membrane cap for CBR 1	741274
Diaphragm cap for PAA 1	1023895
Accessory set CGE 2/CTE 1 (2/5/10ppm) 2 caps/elect	740048
Accessory set CLE (2 mem caps + 100mL electrolyte)	1024611
Accessory set PAA 1 (2 mem caps + 100mL electrolyte)	1024022

Accessory set CLO 1 (100mL electro, grinding disc. Plug)	1035482
Accessory set CBR 1 (2 mem caps + 100mL electrolyte)	1038984
Electrolyte for all CLE chlorine sensors 100mL	506270
Electrolyte CGE/CTE/BRE sensors 50mL	792892
Electrolyte PAA 1 100mL	1023896
Electrolyte CLO 1 100mL	1035191
Electrolyte CBR 1 100mL	1038017

Watermeters

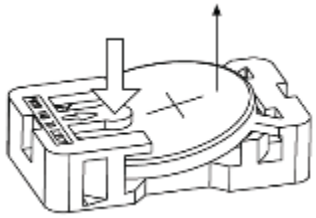
Size	For Cooling - Contact Head	For Cooling - Paddlewheel	For Hot Water - Paddlewheel
.75"	7760518	7760514	7760277
1"	7760515	7760508	7760279
1.5"	7760516	7760509	7760278
2"	7760517	7760510	7760280
3"	NA	7760511	7760281
4"	NA	7760512	7760282
6"	NA	7760513	NA

18 Maintenance

The Aegis II Controller is maintenance free. Replace the battery after 10 years as a precautionary measure.

Battery type: BR2032, 3 V approx. 190 mAh

The battery is clamped in a holder on the circuit board located on the back of the hood just under the display.



AegisX battery

NOTICE!

Hazardous waste

The battery is hazardous waste. It must be disposed of separately. Observe the conditions which apply on your site.

Removing the battery

1. Unscrew the four retaining screws at the front on the housing upper section and take the housing upper section off from the housing lower section.
2. Press on the holder lug to release the battery from the holder.
3. Insert a new battery in the holder, In so doing avoid pressing with the fingers on the battery poles. This will result in poor contacts.
4. Place the housing upper section on the housing lower section
5. Manually tighten the four retaining screws

CAUTION!

Solvent

Do not under any circumstances use solvent to clean the surfaces. Solvent can attack the surfaces.

Clean the housing with a damp cloth. Then rub dry.

19 Contact Us

ProMinent US is located at 136 Industry Drive, Pittsburgh, PA. 15275-1014

To contact ProMinent by email: www.ProMinent.us

To contact ProMinent by phone: 412/787-2484

To purchase a controller, ask for Sales.

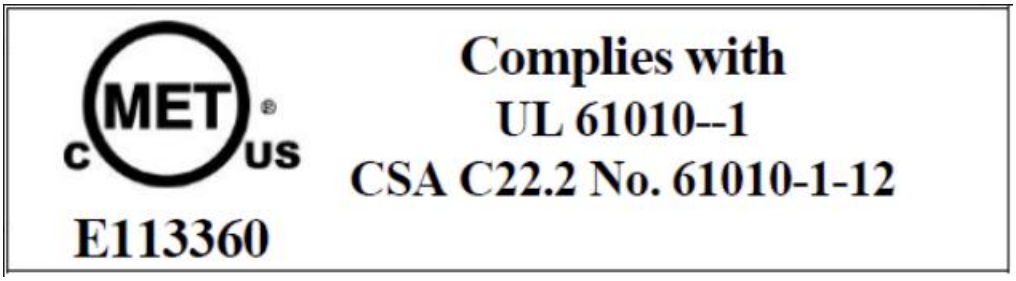
If you need spare parts or have questions about shipments, ask for Sales support.

If you need technical assistance, ask for Technical.

20 Certifications

The Aegis X Controller is built to conform to UL/CSA/IEC 61010-1 for safety. Additional information can be found on our website www.ProMinent.us.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.



Achieved Certification to the following standard(s):
UL 61010-1: UL Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements - Third Edition; Including Revisions through April 29, 2016
CSA CAN/CSA-C22.2 NO. 61010-1-12: Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements - Third Edition; Update No. 1: July 2015; Update No. 2: April 2016

20.1Agency Approvals

Safety: UL 61010-1, 3rd Edition
CSA C22.2 No. 61010-1-12, 3rd Edition
IEC 61010-1, 3rd Edition
EN 61010-1, 3rd Edition

21 Necessary formalities

21.1 Disposal of used parts

Users' qualification: instructed persons, see Section **4.5 Users' qualifications**.

NOTICE!
Regulations governing disposal of used parts
– Note the current national regulations and legal standards which apply in your country

ProMinent Fluid Controls, Inc.
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