Install & Setup Guide for Solidyne SAM Controllers

This document covers the initial contoller installation and configuration for a SAM controller, e.g. SAM-8, SAM-15, SAM-25 and/or SAM-V, as well as any software engineering tools such as using Workbench AX or the Sedona Application Editor. It assumes that you are an engineer, technician, or service person who is performing control system installation.

The following sections are in this document:

Overview

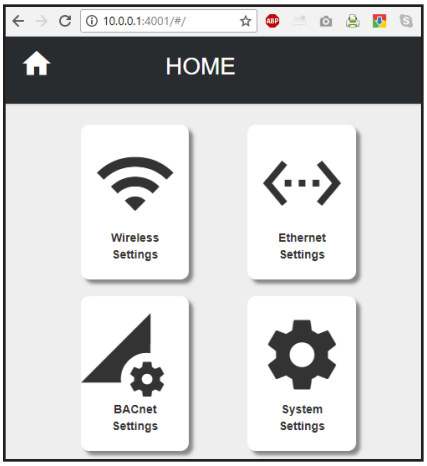
The SAM line of controllers are IP based controllers leveraging both ethernet & WIFI (802.11a/b/g/n) for BACNet/IP communcation and integration. These are unitary controllers, very similar to Solidyne's M2 line of BACNet/MSTP unitary controllers. The internal logic of the SAM family of controllers is done via Sedona, a graphical, component based programming system.

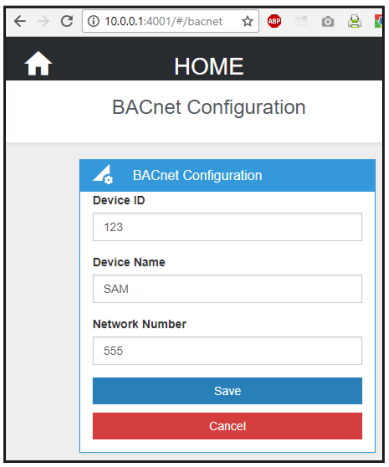
Bacnet Variables

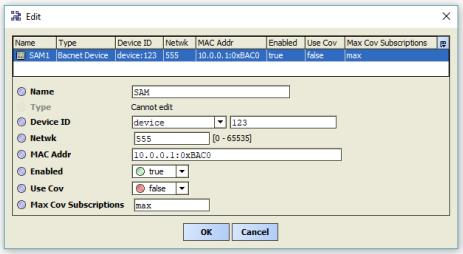
All SAM controllers have a Bacnet/IP interface. The available Bacnet points are in the table below.

	Analog Inputs	Analog Outputs	Analog Values	Binary Inputs	Binary Outputs	Binary Values
1	Input 1	Analog Output 1	CP Numeric 1	Digital Input 1	Relay 1	CP Boolean 1
2	Input 2	Analog Output 2	CP Numeric 2	Digital Input 2	Relay 2	CP Boolean 2
3	Input 3	Analog Output 3	CP Numeric 3		Relay 3	CP Boolean 3
4	Input 4	Analog Output 4	CP Numeric 4		Relay 4	CP Boolean 4
5	Input 5		CP Numeric 5		Relay 5	CP Boolean 5
6	Input 6		CP Numeric 6		Relay 6	CP Boolean 6
7	Input 7		CP Numeric 7		Relay 7	CP Boolean 7
8	Flow Sensor		CP Numeric 8		Relay 8	CP Boolean 8
9			CP Numeric 9		Triac Output 1	CP Boolean 9
10			CP Numeric 10		Triac Output 2	CP Boolean 10
11			CP Numeric 11		Triac Output 3	CP Boolean 11
12			CP Numeric 12		Triac Output 4	CP Boolean 12
13			CP Numeric 13			CP Boolean 13
14			CP Numeric 14			CP Boolean 14
15			CP Numeric 15			CP Boolean 15
16			CP Numeric 16			CP Boolean 16
17			Flow_Pa			Occupancy
18			Flow_InH2O			
19			Flow_K			
20			Flow_CFM			
21			Flow_LPS			

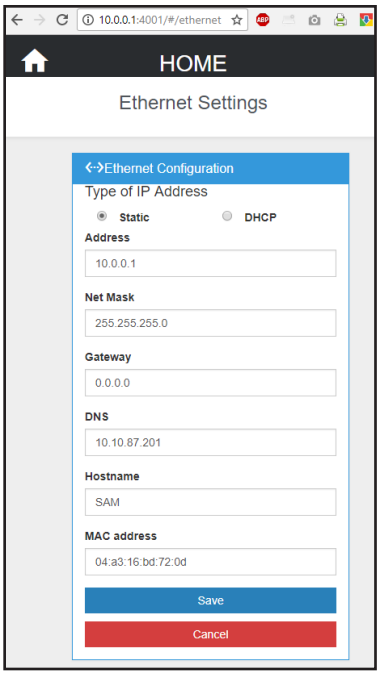
Bacnet Configuration All SAM controllers have the default Device ID of 123, Device Name of SAM and Network Number 555. To change these, you will need to log into the SAM controllers web interface by visiting http://10.0.0.1:4001 and clicking the Bacnet Setting button as shown below. Also shown below is an example of how a SAM controller would be added to Niagara using the Bacnet driver.





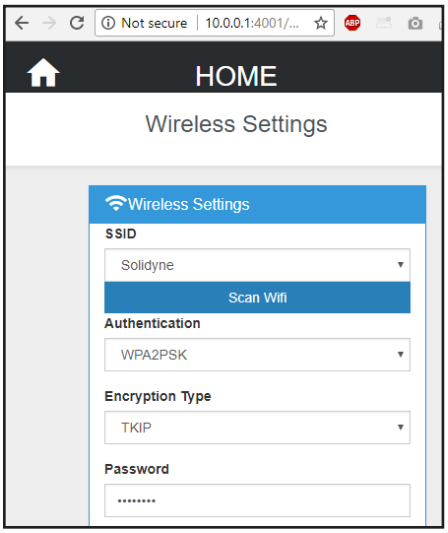


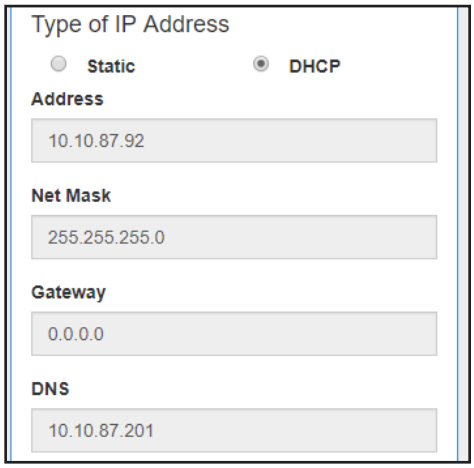
Ethernet Settings The ethernet port has a default IP address of 10.0.0.1, which can be changed or switched to DHCP via the internal web interface as show below. If the IP address of the controller has been forgot/lost, it can quickly be reset to the default 10.0.0.1 by pushing the reset button on the controller. For the location of this reset button, please refer to the SAM controller datasheet.



Wifi Settings: If equipped, the SAM controllers can be connected to a Wifi network. To connect the controller to a Wifi network, start by clicking the Wireless Settings button in the web interface and then click the Scan Wifi button. After scanning, the list of available SSID's will be listed. Select which Wifi network you would like the SAM to connect to and enter the password if necessary. The authentication and Encryption type should automatically be configured for you.

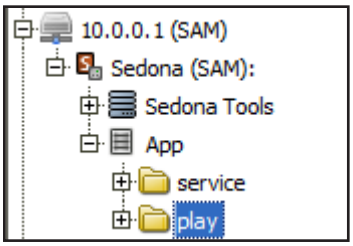
Further, the Wifi can be set for DHCP or for Static IP addresses.



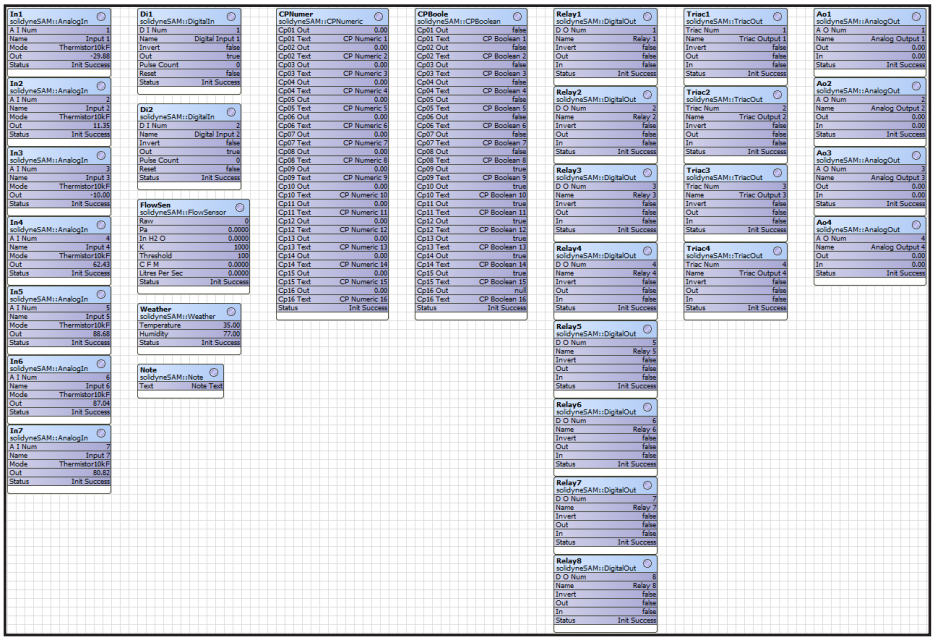


Sedona Configuration: Sedona Framework is at the core of every SAM controller. It is used for a variety of configurations, but it mostly used to program the controller operational logic. Components can be added, organized and connected to one another to achieve the desired sequence of operation for your application.

Configuration of the controllers inputs, outputs and variables is also done via Sedona. For the purposes of this documentation, the Niagara & Sedona tools will be used. To connect to a SAM controller via Niagara or Sedona workbench, select **File>Open>Open Device**. Enter the IP address of the SAM you wish to connect to and enter the user-name "**admin**" without a password. Once connected to the SAM controller, the interface should look similar to the image to teh right. Navigate to the Sedona>App>Play folder to get started.



The default wire sheet application in the SAM controller should look similar to the one below. This is where the logic and configuration of the points occurs.

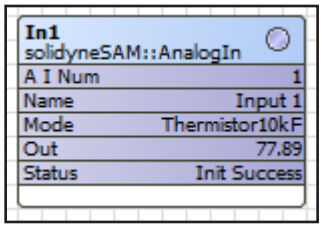


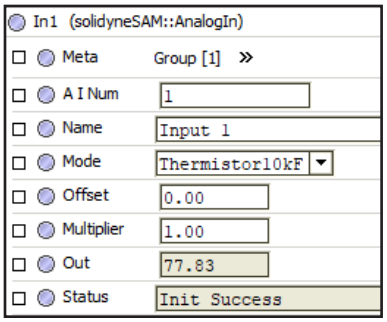
Sedona Point Configuration: Each point in a SAM controller is represented by a rectangular object in the wiresheet. A basic description of each of the components is below.

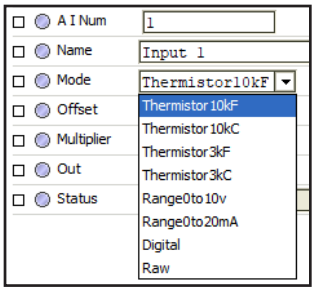
Analog Inputs

SAM controllers can have up to 7 analog inputs and can handle a large variety of input signal types. They are represented on the wire sheet as component type "**AnalogIn**". The AnalogIn component has the following slot configurations.

SLOT	DESCRIPTION
A I Num	The input number represented by the component (1-7)
Name	Text provided to describe the point, up to 32 charachters
Mode	Type of input. Thermistor, Voltage, Amperage, Raw or Digital.
Offset	Use to offset the Out value of the component
Multiplier	Use to multiply the input value, can be used in conjuction with Offset
Out	The value of the input after the Offset and Multiplier



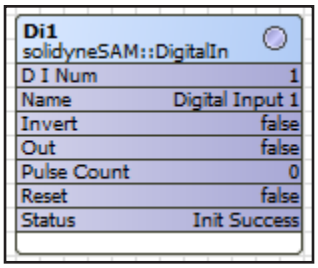


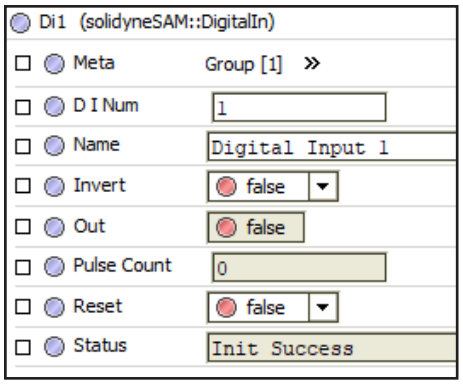


Digital Inputs

SAM controllers can have up to 2 digital inputs which are typically used for on/off status or pulse counting (up to 50hz). They are represented on the wire sheet as component type "**DigitalIn**". The DigitalIn component has the following slot configurations.

SLOT	DESCRIPTION
D I Num	The input number represented by the component (1-2)
Name	Text provided to describe the point, up to 32 charachters
Invert	Used to invert the input signal
Out	Value of the input. Input shorted = true, open = false
Pulse Count	Amount of pulses counted since last reset
Reset	Use to reset the Pulse Count slot. Set to true to reset.



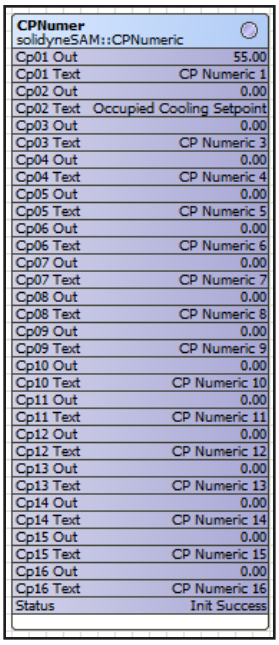


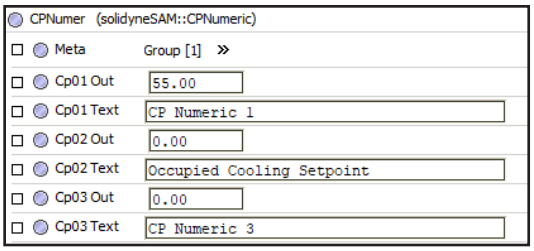
Sedona Point Configuration cont'd:

Numeric Variables

SAM controllers have 16 numeric variables. These are very similar to Solidyne's M2 controller virtual points. They are typically used for setpoints for a wide range of applications. There are also numeric writable points that can be added to the wire sheet, but where these differ is that these variables can be read and written to via Bacnet and the web interface. The component type is "**CPNumeric**". The CPNumeric component has the following slot configurations.

SLOT	DESCRIPTION
Cp## Out	The value of the variable
Cp## Name	Text provided to describe the point, up to 32 charachters

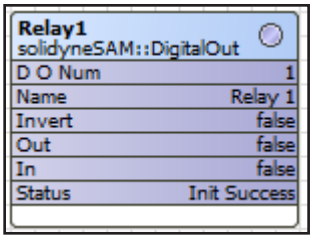


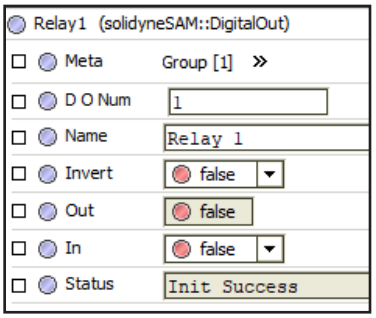


Relay Outputs

SAM controllers can have up to 8 Form C relay outputs which are typically used for controlling 24VAC loads. They are represented on the wire sheet as component type "**DigitalOut**". The DigitalOut component has the following slot configurations.

SLOT	DESCRIPTION
D O Num	The relay output number represented by the component (1-8)
Name	Text provided to describe the point, up to 32 charachters
Invert	Used to invert the relay output
Out	Value of the relay output
In	The desired state of the relay output



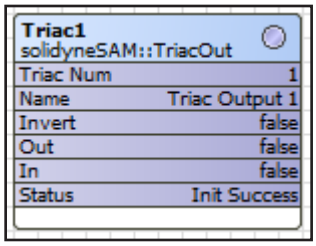


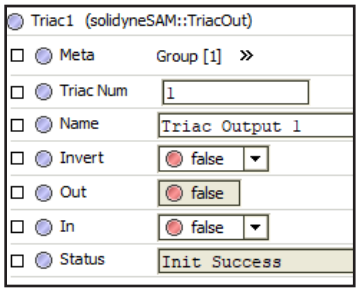
Sedona Point Configuration cont'd:

Triac Outputs

SAM controllers can have up to 4 triac outputs which are typically used for controlling 24VAC devices such as floating actuators. They are represented on the wire sheet as component type "**TriacOut**". The TriacOut component has the following slot configurations.

SLOT	DESCRIPTION
Triac Num	The triac output number represented by the component (1-4)
Name	Text provided to describe the point, up to 32 charachters
Invert	Used to invert the triac output
Out	Value of the triac output
In	The desired state of the triac output

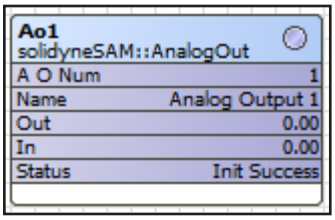


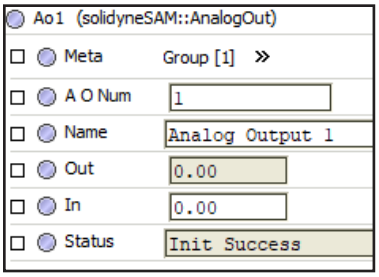


Analog Outputs

SAM controllers can have up to 4 analog outputs which are typically used for controlling 0-10vdc devices such as proportional actuators, VFD's, etc. They are represented on the wire sheet as component type "**AnalogOut**". The AnalogOut component has the following slot configurations.

SLOT	DESCRIPTION
A O Num	The triac output number represented by the component (1-4)
Name	Text provided to describe the point, up to 32 charachters
Out	Value of the analog output. 0% = 0vdc, 100% = 10vdc
In	The desired value of the analog output



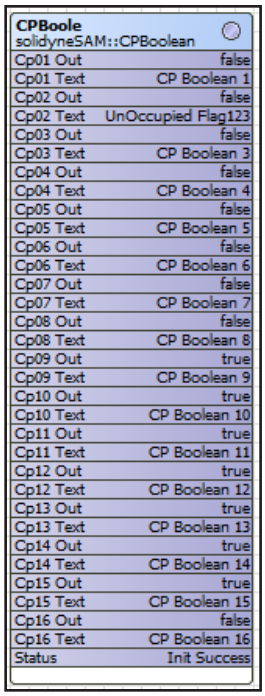


Sedona Point Configuration cont'd:

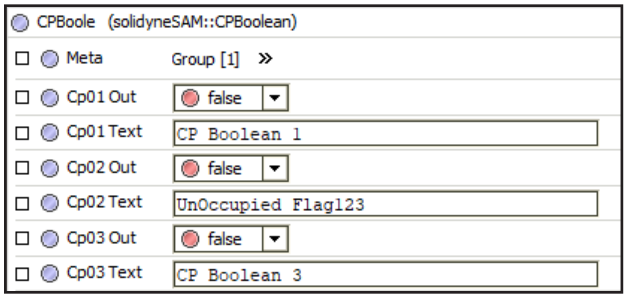
Boolean Variables

SAM controllers have 16 boolean variables. These are very similar to Solidyne's M2 controller virtual points. They are typically used for setpoints for a wide range of applications. There are also boolean writable points that can be added to the wire sheet, but where these differ is that these variables can be read and written to via Bacnet and the web interface. The component type is "**CPBoolean**". The CPBoolean component has the following slot configurations.

SLOT	DESCRIPTION
Cp## Out	The value of the variable
Cp## Name	Text provided to describe the point, up to 32 charachters



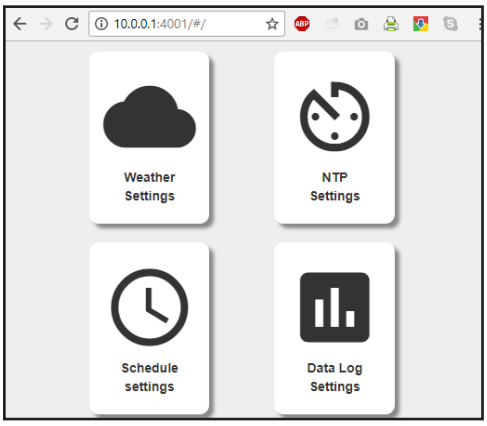
CPBoole solidyneSAM::CPBoolean	
Cp01 Out	false
Cp01 Text	CP Boolean 1
Cp02 Out	false
Cp02 Text	UnOccupied Flag123
Cp03 Out	false
Cp03 Text	CP Boolean 3
Cp04 Out	false
Cp04 Text	CP Boolean 4
Cp05 Out	false
Cp05 Text	CP Boolean 5
Cp06 Out	false
Cp06 Text	CP Boolean 6
Cp07 Out	false
Cp07 Text	CP Boolean 7
Cp08 Out	false
Cp08 Text	CP Boolean 8
Cp09 Out	true
Cp09 Text	CP Boolean 9
Cp10 Out	true
Cp10 Text	CP Boolean 10
Cp11 Out	true
Cp11 Text	CP Boolean 11
Cp12 Out	true
Cp12 Text	CP Boolean 12
Cp13 Out	true
Cp13 Text	CP Boolean 13
Cp14 Out	true
Cp14 Text	CP Boolean 14
Cp15 Out	true
Cp15 Text	CP Boolean 15
Cp16 Out	false
Cp16 Text	CP Boolean 16
Status	Init Success

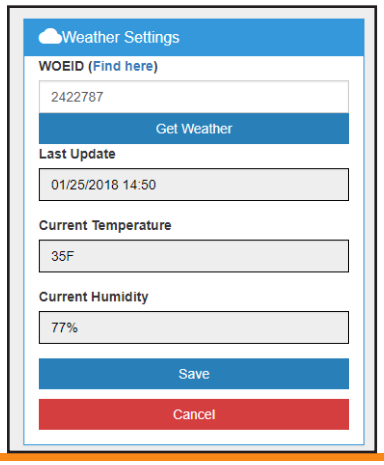


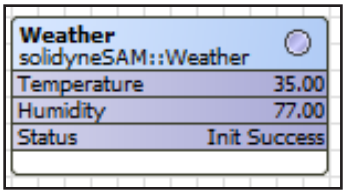
Weather

SAM controllers, if they have proper internet access, can obtain the outdoor temperature and humidity from external weather services such as Yahoo!. This component is represented on the wire sheet as component type "**Weather**". The Weather component has the following slot configurations. Further, visit the web interface for Weather and click the "Find WOEID" link to find the weather code for your geographical location. Once found, enter the WOEID and click the Save button at the bottom of the window.

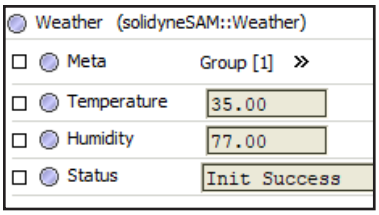
SLOT	DESCRIPTION
Temperature	Current outdoor temperature
Humidity	Current outdoor humidity







Weather solidyneSAM::Weather	
Temperature	35.00
Humidity	77.00
Status	Init Success

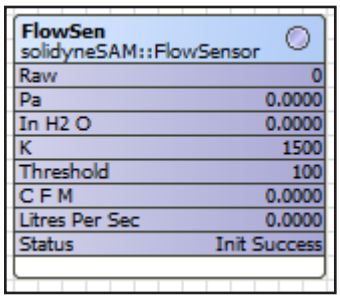


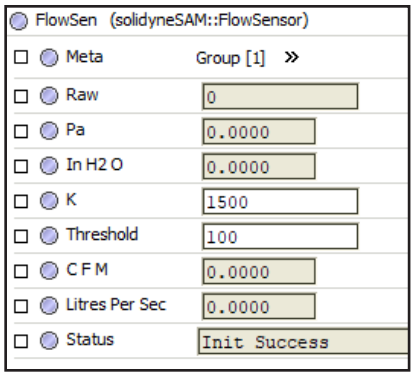
Sedona Point Configuration cont'd:

Flow Sensor

SAM controllers can have 1 flow sensor which is typcially used to sense differential pressure for applications such as CFM/Ls for VAV and air filter status. It is represented on the wire sheet as component type "**FlowSensor**". The FlowSensor component has the following slot configurations.

SLOT	DESCRIPTION
Raw	Raw data coming from pressure sensor
Pa	Differential pressure displayed in Pascals
In H2O	Differential pressure displayed in inches of water ("wc)
K	The amount of CFM @ 1"wc. Used for calibrating CFM/Ls
Threshold	Raw value must exceed this value before a reading is calculated
CFM	Cubic feet per minute of airf low
Litres Per Sec	Litres per second of air flow



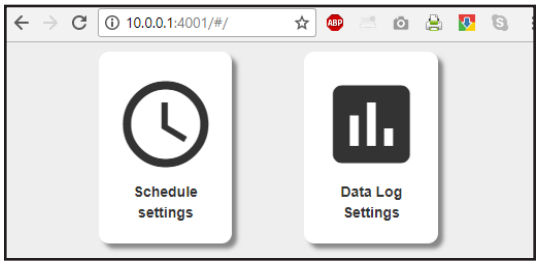


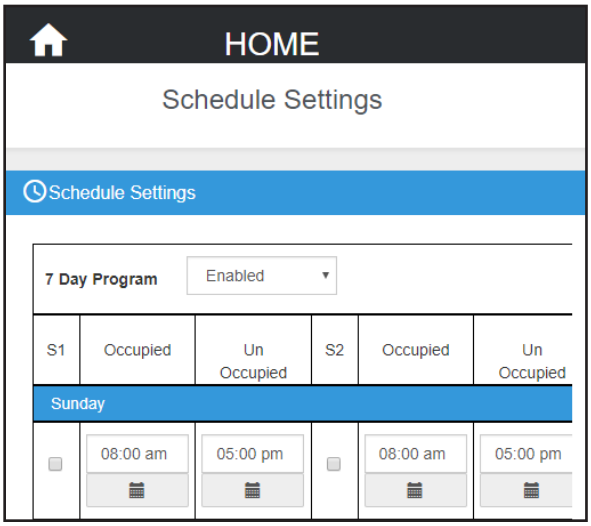
Sedona Point Configuration cont'd:

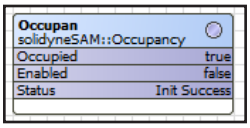
Occupancy

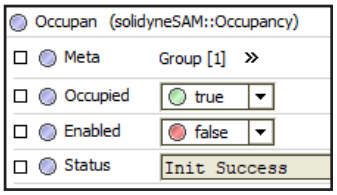
SAM controllers have 1 internal schedule that has the option of up to 2 occupied periods. The occupancy point is a boolean point and can be controlled via the SAM internal schedule or it can be controlled via Bacnet/IP. The internal schedule is edited via the web interface as shown below. It is represented on the wire sheet as component type "**Occupancy**". The Occupancy component has the following slot configurations.

SLOT	DESCRIPTION
Occupied	Occupancy state. Occupied = true, Unoccupied = false
Enabled	Occupied slot controlled via Bacnet = true, Internal schedule = false





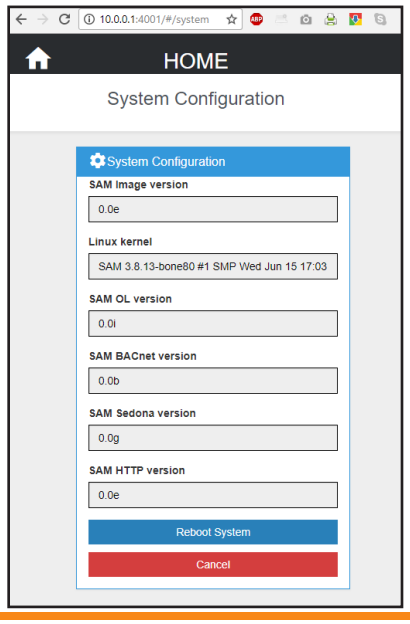




Web Interface: SAM controllers have an internal web interface for configuration properties of a wide variety of aspects of the controller. To view the web interface of the SAM controllers, you can navigate to http://10.0.0.1:4001 or http://<ipaddress>:4001. There is no username or password to enter. The web interface is built in an HTML5 environment and should work just as well on a mobile device as it does on a computer. Below are some of the features of the web interface not already decribed in this document.

System Settings

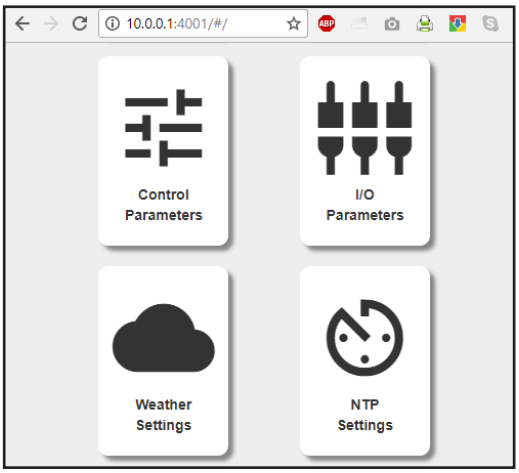
This section mainly provides versioning for the SAM controllers critical operations. It is also the place to reboot the SAM if required.



Web Interface cont'd:

Control Parameter Settings

This section is used to view/monitor/adjust the control parameters that exist in both Bacnet and Sedona. As previously stated, these control parameters are very similar to M2 virtual points and can be changed/adjusted via the web page as well. To change a value, click in the Value field and change to the desired value. Then click the Save button at the bottom of the page to save that new value. Multiple values can be changed and saved at the same time.



Control Parameters

Name	Value
Occupied Cooling Setpoint	74.0
UnOccupied Cooling Setpoint	85.0
Occupied Heating Setpoint	72.0
UnOccupied Heating Setpoint	55.0
CP Numeric 5	0.0
CP Numeric 6	0.0
CP Numeric 7	0.0
CP Numeric 8	0.0
CP Numeric 9	0.0
CP Numeric 10	0.0
CP Numeric 11	0.0
CP Numeric 12	0.0
CP Numeric 13	0.0
CP Numeric 14	0.0
CP Numeric 15	0.0
CP Numeric 16	0.0

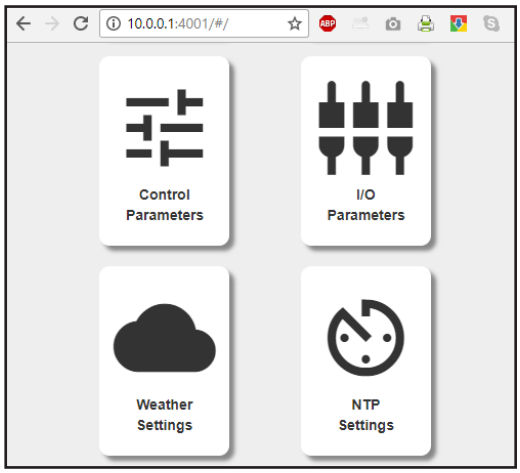
Name	Value
From Fire Panel	false
CP Boolean 2	false
CP Boolean 3	false
CP Boolean 4	false
CP Boolean 5	false
CP Boolean 6	false
CP Boolean 7	false
CP Boolean 8	false
CP Boolean 9	true
CP Boolean 10	true
CP Boolean 11	true
CP Boolean 12	true
CP Boolean 13	true
CP Boolean 14	true
CP Boolean 15	true
CP Boolean 16	false

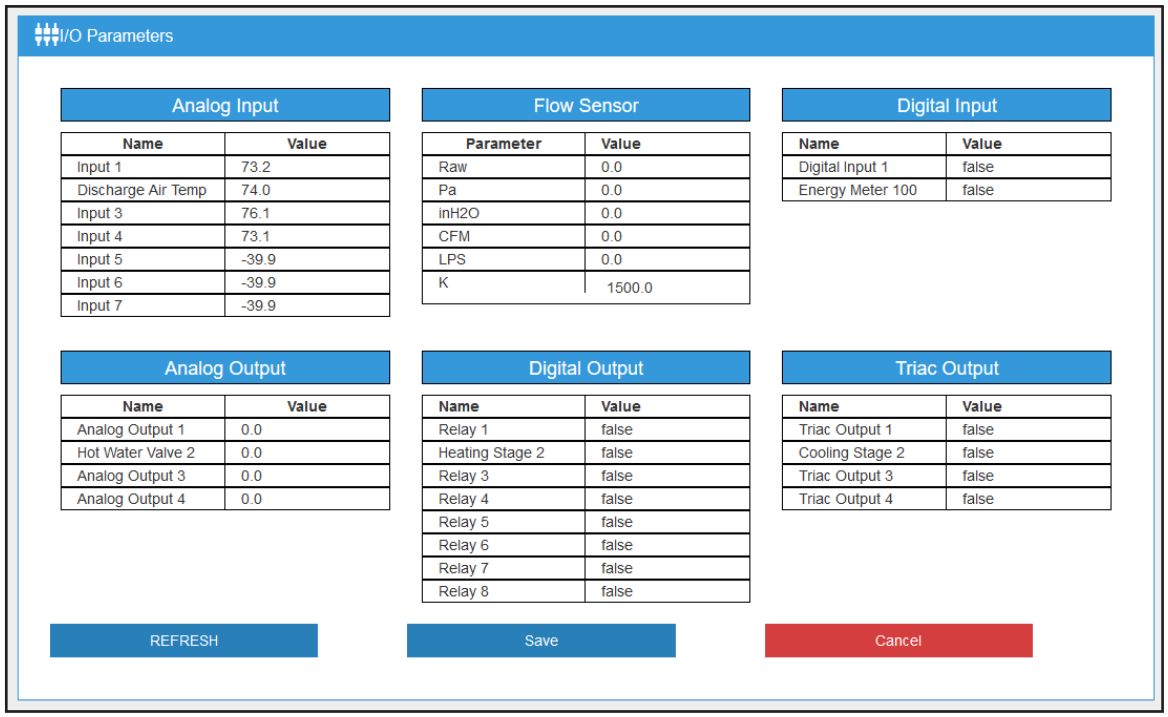
REFRESH Save Cancel

Web Interface cont'd:

IO Paramters

This section is used to view/monitor all the hardware points on the SAM controllers. The only point in this page that you can change/write to is the Flow Sensor K field. This K field is used to calibrate the SAM's differential pressure transducer. To change the K value, click in the value field to change it to the desired value and click the Save button at the bottom.





Analog Input

Name	Value
Input 1	73.2
Discharge Air Temp	74.0
Input 3	76.1
Input 4	73.1
Input 5	-39.9
Input 6	-39.9
Input 7	-39.9

Flow Sensor

Parameter	Value
Raw	0.0
Pa	0.0
inH2O	0.0
CFM	0.0
LPS	0.0
K	1500.0

Digital Input

Name	Value
Digital Input 1	false
Energy Meter 100	false

Analog Output

Name	Value
Analog Output 1	0.0
Hot Water Valve 2	0.0
Analog Output 3	0.0
Analog Output 4	0.0

Digital Output

Name	Value
Relay 1	false
Heating Stage 2	false
Relay 3	false
Relay 4	false
Relay 5	false
Relay 6	false
Relay 7	false
Relay 8	false

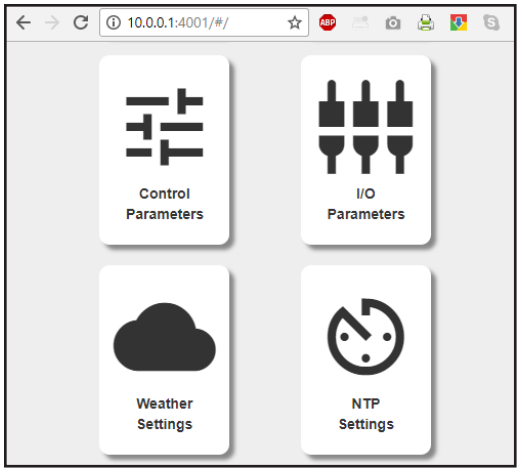
Triac Output

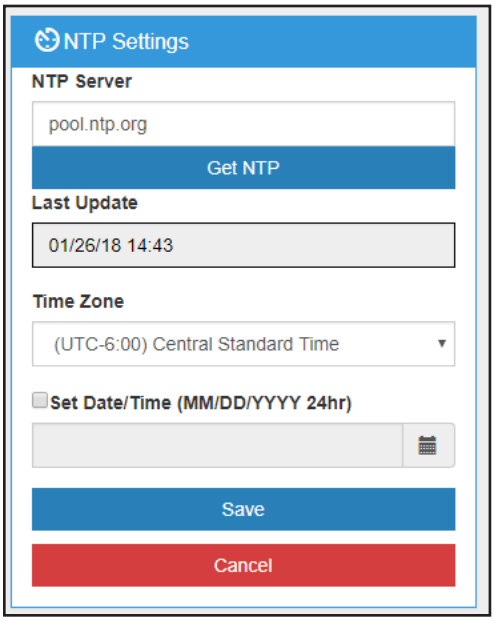
Name	Value
Triac Output 1	false
Cooling Stage 2	false
Triac Output 3	false
Triac Output 4	false

Web Interface cont'd:

NTP Settings

This section is used to configure the date/time of the SAM controllers. The SAM controllers utilize the Network Time Protocol to maintain a very accurate clock. Typically, the only setting you would need to change in this screen is the time zone. If the SAM does not have access to the internet or a local NTP server, you can manually set the date/time via this web page.

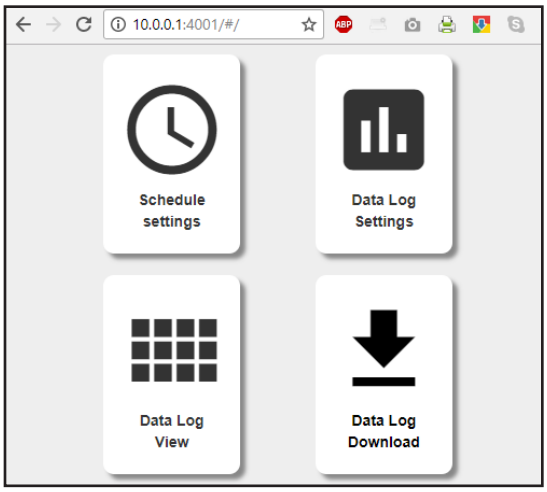


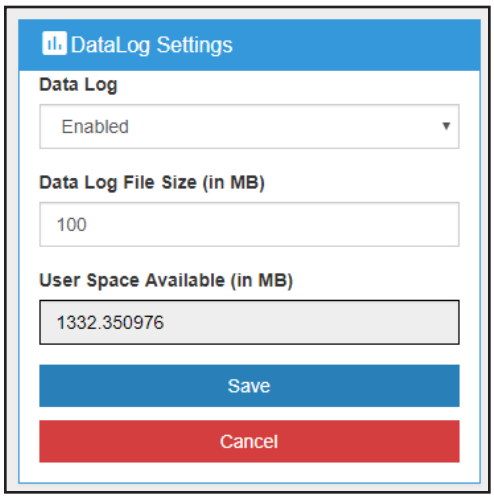


Datalog Settings

The internal data logging of the SAM controllers is very similar to all previous Solidyne controllers, where the data logging does not require any setup. The moment a SAM controller is powered up, it automatically starts to log all of the points inside of it. This includes all analog and digital inputs and outputs, along with all of the control parameters...both numeric and boolean.

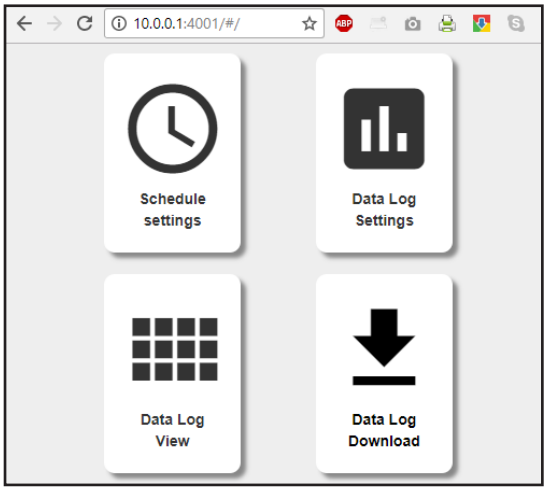
In the Datalog Settings page, there are 3 fields, 2 of which can be altered. The first is the the datalogging system enable/disable. It is enabled by default. If there is a need to disable the datalogging system, you can select this value to disabled and click the save button. The other item is the Data Log File Size. This is the amount of megabytes of memory that will be dedicated for the datalogging system (not each point). The default is 500MB which will hold well over 1 year of point history. All points are logged in 5 minute increments. The last item in this page is the User Space Available which will display the amount of total free memory in the system.

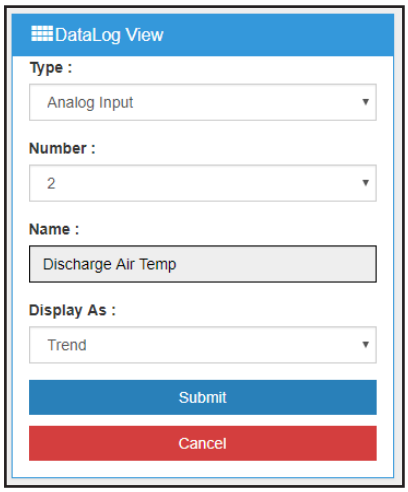




Datalog View

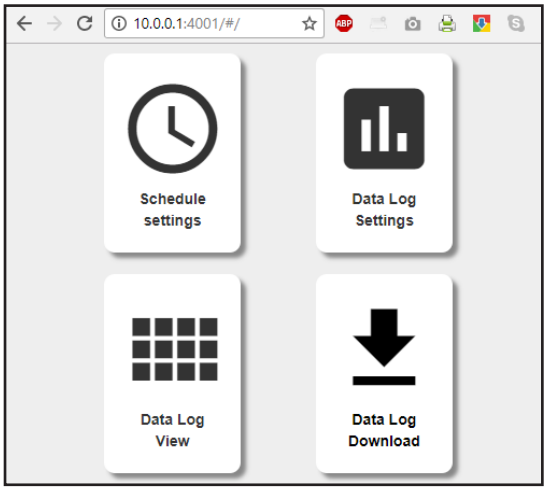
This section is used to view any of the points 5 minute history. A Datalog can be viewed either as a Trend or a Table. Just select the point you would like to view and select if you want to view the datalog at a graphical trend or a tabled history chart.

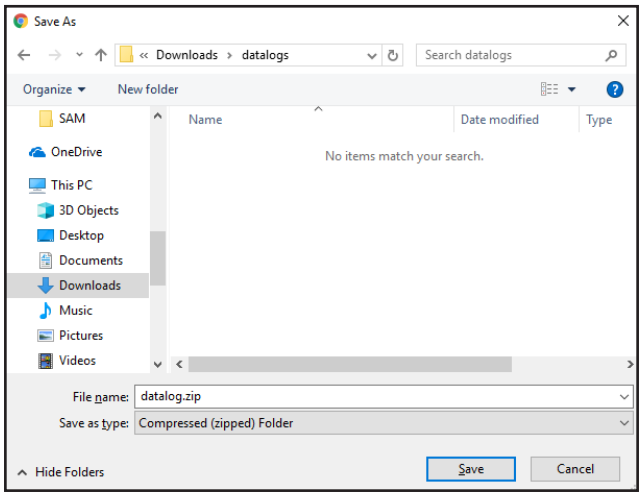




Datalog Download

This section is used to download ALL of the datalog history from the SAM controller. It will be downloaded as a .zip file and inside the zip file will be the history for all of the points in XML format.

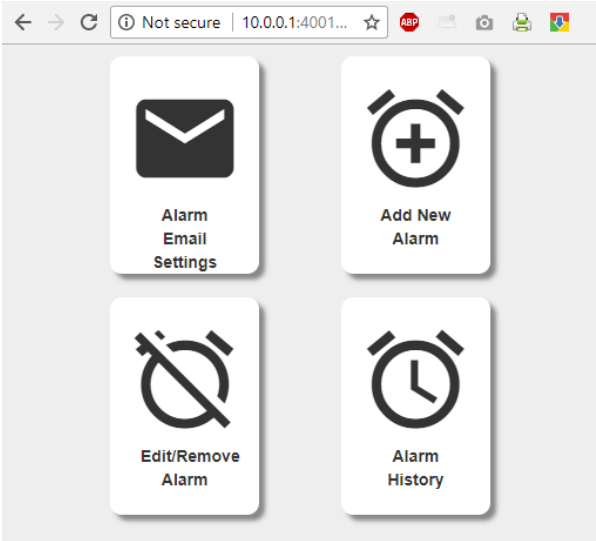


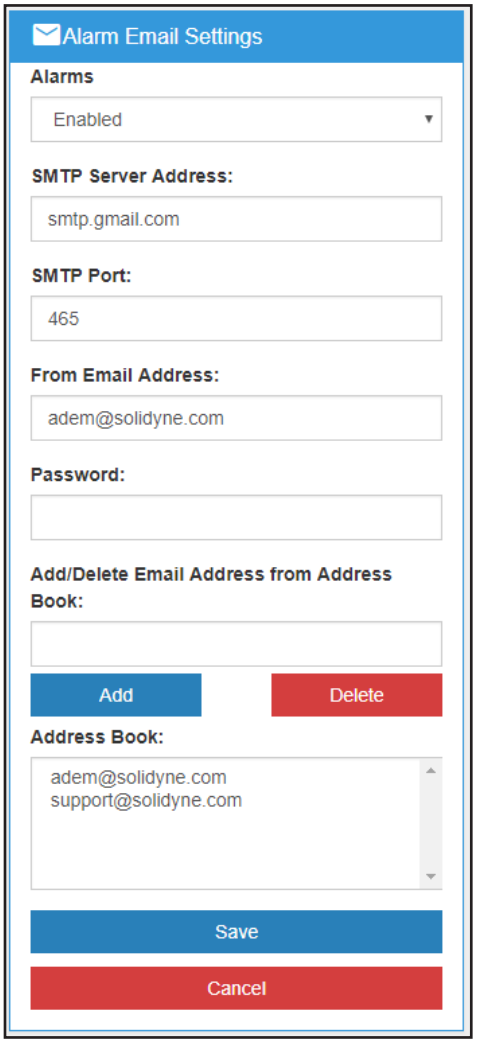


Web Interface cont'd:

Email Alarm Settings

This section is used to setup the email alarms. The alarming system can be disabled from this page by selecting Disabled from the drop down and clicking on the Save button. The SAM controller can only deliver emails to an SMTP server, it is not an SMTP server itself. The SAM is compatible with Gmail and other popular email service providers. Further, you can add/delete email addresses from the address book.

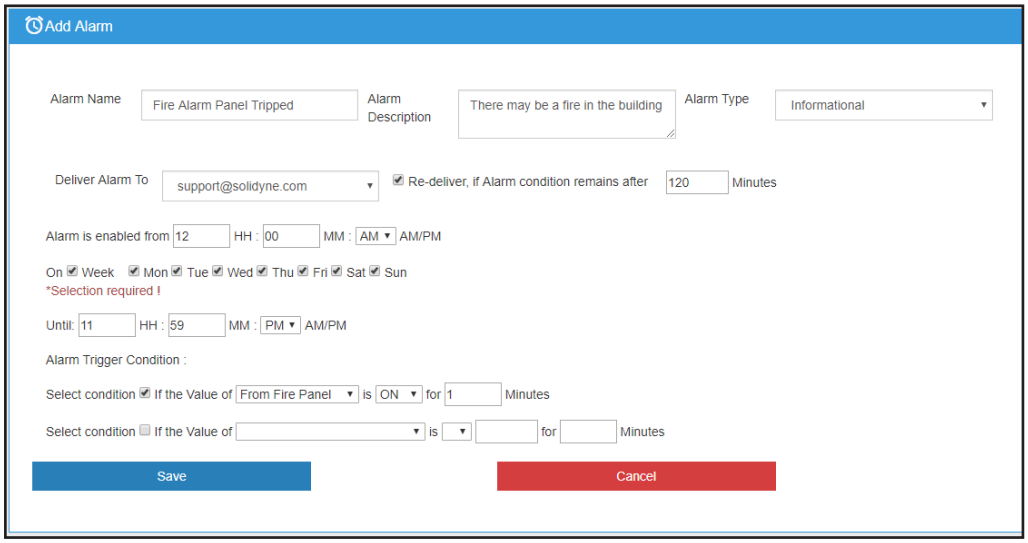




Web Interface cont'd:

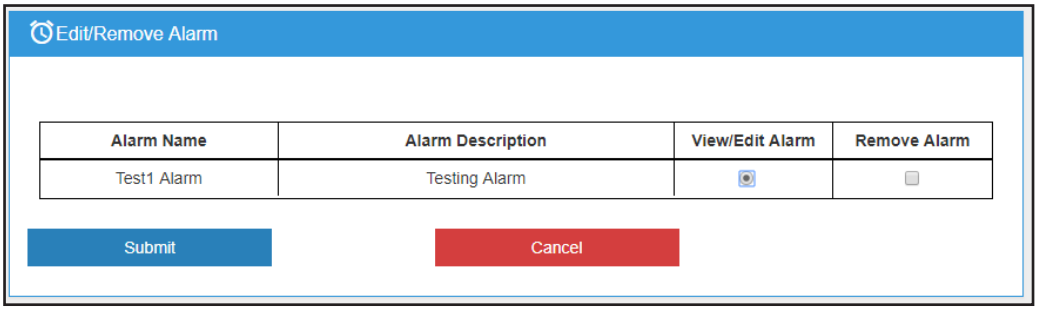
Add Alarm

This section is used to add alarms that will eventually be delivered via email to someone in the address book. See example below.



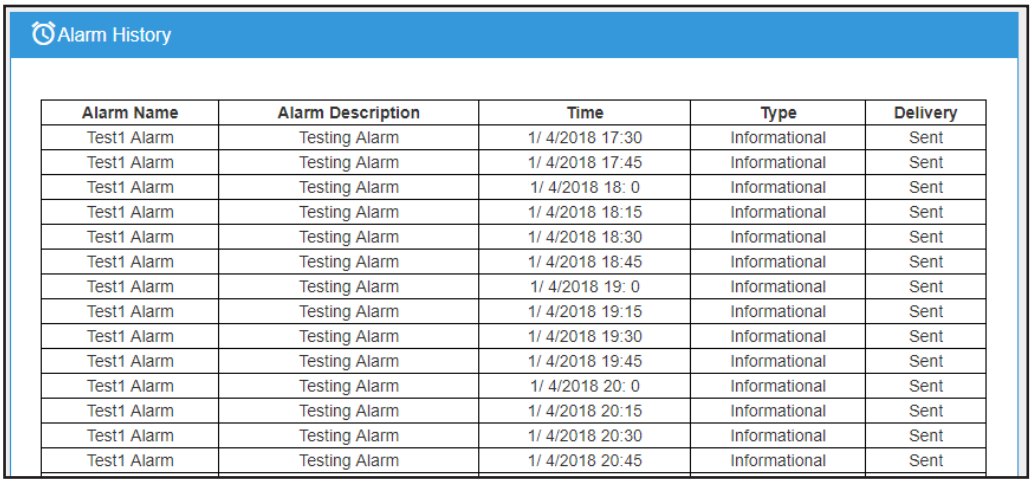
Edit/Remove Alarm

This section is used to edit or remove existing alarm configurations. To edit an alarm, select the dot next to the alarm you'd like to edit and click the Submit button. To remove an alarm, select the checkbox next to the alarm and click the Submit button.



Alarm History

A log of all of the alarms is stored and viewed in the Alarm History page.



Alarm Name	Alarm Description	Time	Type	Delivery
Test1 Alarm	Testing Alarm	1/ 4/2018 17:30	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 17:45	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 18: 0	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 18:15	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 18:30	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 18:45	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 19: 0	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 19:15	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 19:30	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 19:45	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 20: 0	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 20:15	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 20:30	Informational	Sent
Test1 Alarm	Testing Alarm	1/ 4/2018 20:45	Informational	Sent