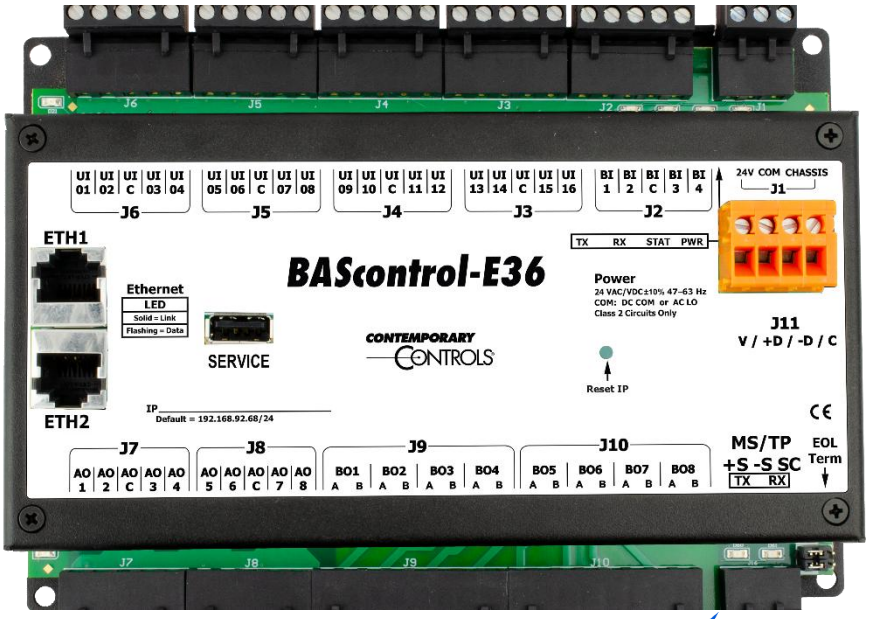
BASC-E36

36-point Edge Controller

BAScontrol-E36



ASHRAE BACnet™ Sedona Microsoft Azure

User Manual

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Contents

1 Introduction

The BAScontrol-E36 is a 36-point edge controller which supports BACnet/IP client/server operation over its built-in 2-port Ethernet switch connection or BACnet MS/TP over its EIA-485 port. The controller complies with the B-ASC device profile having a convenient mix of sixteen universal inputs, four binary inputs, eight analog outputs, and eight binary outputs. It is designed for the requirements of ASHRAE Guideline 36-2018 High-Performance Sequences of Operation for HVAC Systems (GL-36).

The BAScontrol-E36 has the necessary computing power and input/output (I/O) points to execute recommended advanced sequences published in GL-36. The BAScontrol-E36 utilizes BACnet for communication protocol, and Sedona for control running on a Linux platform. It also has edge-connected features, such as a cloud connector to Azure IoT Central, a simple-to-use graphical dashboard, email alarming and notifications, and access to an online weather service.

The BAScontrol-E36 is powered from either a 24 VAC or 24 V DC power source. Its half-wave rectified power supply can share the same power source with other half-wave rectified equipment. It utilizes a powerful TI AM3352 Sitara processor with 512 MB of RAM memory plus 5 GB of pseudo-single layer eMMC memory, a 2 KB FRAM memory for high-speed non-volatile data storage and an Atmel Xmega I/O processor.

10/100 Mbps Ethernet ports support protocols, such as BACnet/IP, HTTP, MQTT, SSH, UDP, TCP, NTP, DNS, DHCP, and Sedona SOX. Configuration of universal inputs and virtual points can be completed using web pages. Type II and Type III 10 kΩ thermistors curves, and 20 kΩ and100 kΩ curves are resident in the unit. The 100 kΩ follows the Tasseron (PSB) curve.

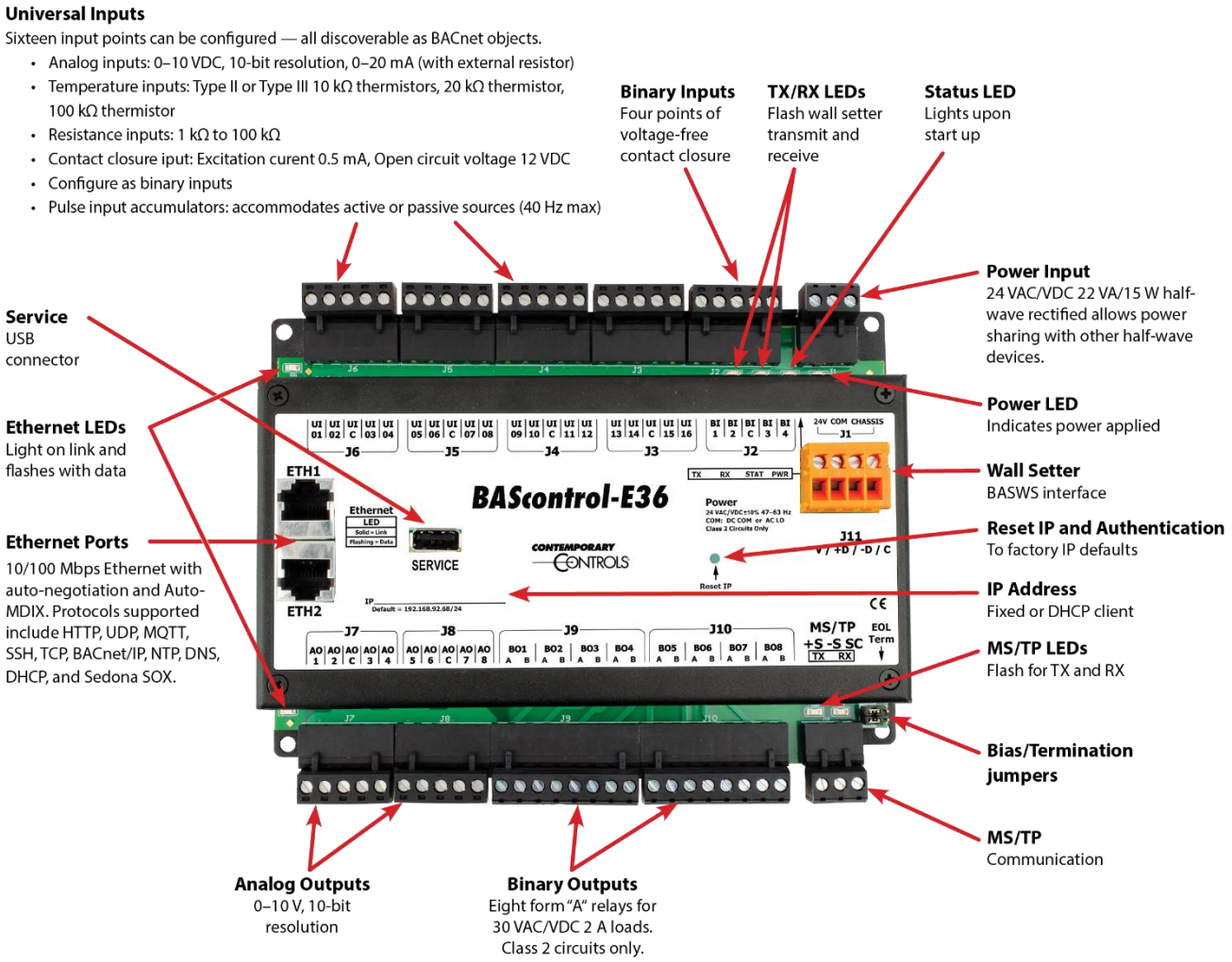
The device is fully webpage configurable and freely programmable using Sedona's drag-and-drop programming methodology of assembling components onto a wiresheet to create applications. The unit can be programmed using the Sedona Application Editor (SAE) in Contemporary Controls' free BAScontrol Toolset. A Sedona N4 driver is available for programming via N4 Workbench. Rugged design, low profile, and wide temperature operation make it suitable for indoor or outdoor use.

1.1. Features and Benefits

- BACnet/IP and BACnet MS/TP client/server
- BACnet B-ASC device profile
- Resident Sedona Virtual Machine (SVM)
- Programmable with free BAScontrol Toolset
    - Sedona Applications Editor (SAE) – function block programming editor
    - BASbackup – project backup/restore utility
    - BASemulator – controller emulation on PC for offline or remote programming
- Programmable with N4 Workbench
- Configurable with a common web browser
- Built-in 10/100 Mbps Ethernet two-port switch
- NTP or manually settable real-time clock
- COV subscriptions – a mix of 230 binary or analog
- Azure IoT Central connector
- JSON-node dashboard

- Email alarms and notifications
- Built-in API to openweathermap.org
- Multiple 7-day schedules
- 16 non-volatile counters using FRAM
- Service port supports USB Wi-Fi device for easy configuration
- Wall setter port for connection to optional wall setter device
- Isolated 485 port
- Outdoor temperature operation -40°C to +75°C
- Sixteen configurable universal inputs: can be configured for voltage, temperature, resistance, pulse, and voltage-free contact closure. Type II and Type III 10 kΩ thermistor curves, and 20 kΩ and 100 kΩ thermistor curve are resident in the unit. The 100 kΩ follows the Tasserson (PSB) curve.
- Four binary inputs (BIs) are intended for voltage-free contact closure monitoring.
- Eight 0-10 VDC analog outputs (AOs) can drive up to 4 mA.
- Eight SPST relay outputs (BOs) can switch 2 A at 30 V (NEC class 2 wiring) are BACnet configurable via a webpage.
- 192 virtual components (VTs) are webpage configurable for either an AV or BV read-from wiresheet
- or write-to wiresheet by a BACnet client.
- 48 web components (WCs) are webpage configurable for either a read-from wiresheet or write-to wiresheet by a web browser.

1.2. Product Image and Main Features



2 Specifications

The BAScontrol-E36 is powered from either a 24 VAC or 24 V DC power source. Its half-wave rectified power supply can share the same power source with other half-wave rectified equipment. It utilizes a powerful TI AM3352 Sitara processor with 512MB of RAM memory plus 5 GB of pseudo-single layer eMMC memory, a 2 KB FRAM memory for high-speed non-volatile data storage and an Atmel Xmega I/O processor. For speed and programming convenience, the application program executes out of RAM. Retentive data such as pulse counts, and runtimes are held in FRAM memory. A status LED lights upon boot-up.

By operating over BACnet/IP, the BAScontrol-E36 can share the same Ethernet network with supervisory controllers, operator workstations, or IP routers. Two 10/100 Mbps Ethernet ports with built-in switch support protocols, such as BACnet/IP, HTTP, MQTT, SSH, UDP, TCP, NTP, DNS, DHCP, and Sedona SOX.

The unit can be configured for a fixed IP address or can operate as a DHCP client receiving its IP address from a DHCP server. LED indicators identify a link condition with flashing indicated data transfer. Pressing a hidden IP Reset switch returns the controller to default IP address and authentication (user ID/password) settings.

Additionally, the BAScontrol-E36 can operate over an isolated BACnet MS/TP serial port at baud rates up to 115.2 kbps. A six-pin header block can invoke bias and termination for end-of-line (EOL) installations. Serial port configuration is via a web page over Ethernet. Transmit and receive LEDs flash on MS/TP traffic.

For single-zone applications, the BAScontrol-E36 has provisions to support Contemporary Controls' BASWS digital wall setter. A four-pin connector provides power and data to the wall setter having a large LCD display with programmable numeric characters and icons to show mode of operation, setpoint, and measured variable. A five-button pad provides mode control and navigation. Custom Sedona components interface the wall setter to wiresheet logic.

As a BACnet service device, the BAScontrol-E36 will respond to a BACnet client request by default over either the IP port or MS/TP port. This means that the BAScontrol-E36 can function as remote I/O to BACnet clients over IP or MS/TP without needing a Sedona program. Through webpage configuration of connected BACnet servers, the BAScontrol-E36 can function as a BACnet client to these devices over IP or MS/TP. This requires the use of Sedona Network Variables (NetVs) found in the NetV kit. This capability allows the BAScontrol-E36 to initiate messages over IP or MS/TP to other BACnet devices without the need for BACnet headend intervention.

A USB connector labeled "SERVICE" can be used to attach an optional Wi-Fi stick allowing service personnel access to the controller web pages. It can also be used to connect to Wi-Fi access points. USB current draw is limited to just this purpose.

Azure IoT Central connector configuration requires settings from your IoT Central account and the selected points to be delivered to the cloud or to be received from the cloud.

The BAScontrol-E36 has a built-in, user-friendly graphical HTML5 dashboard which can be edited and viewed from a web browser. It provides live status of any BAScontrol-E36 point or virtual point. The graphical dashboard can be created, customized, and accessed over an IP connection using any standard web browser.

2.1. Computing

CPU	TI AM3352 Sitara processor with 512MB of RAM memory plus 5 GB of pseudo-single layer eMMC memory, a 2 KB FRAM memory for high-speed non-volatile data storage and an Atmel Xmega I/O processor
RAM	512 MB
Storage	At least 5GB eMMC industrial grade micro-SD card for maximum system stability. Pseudo SLC NAND flash

2.2. Networking

Ethernet	IEEE 802.3 10/100 Mbps data rate 10BASE-T, 100BASE-TX physical layer 100 m (max) CAT5 cable length. Auto-negotiation of speed and duplex. Auto-MDIX. LED lights on link and flashes with data. Protocols supported include BACnet/IP, HTTP, MQTT, SSH, UDP, TCP, NTP, DNS, DHCP, and Sedona SOX.
MS/TP	ANSI/ASHRAE 135 (ISO 16484-5) optically isolated 9.6, 19.2, 38.4, 57.6, 76.8, 115.2 kbps data rate. EIA-485 physical layer 1200 m (max) cable length (1000 m max for 115.2 kbps). Jumper selectable bias and termination. Protocol Supported: BACnet MS/TP
Wi-Fi	A USB connector labeled “SERVICE” can be used to attach an optional Wi-Fi stick allowing service personnel access to the controller web pages. It can also be used to connect to Wi-Fi access points.
SERVICE port	USB 2.0 Type A jack. Intended for connecting USB Wi-Fi adapter for viewing controller web pages.
Wall setter port	EIA-485 physical layer 100m (max) cable length

2.3. Protocol Compliance

BACnet/IP	ASHRAE 135-2020 revision 15. Application specific controller device profile B-ASC.
BACnet MS/TP	BACnet standard protocol SSPC-135 Clause 9. Release 15.
Sedona	SOX Sedona 1.2.28

2.4. Power

Input Power	24 VAC/VDC ± 10%, 47-63 Hz, 22 VA/15 W

2.5. Universal Inputs (Channels UI1-UI16)

Analog Input	0–10 VDC or 0–20 mA (with 500 Ω/0.5 W resistor). 10-bit resolution. Input impedance 1 MΩ on voltage. **NOTE**: External resistors not provided.
Temperature Input	Type II 10 kΩ thermistor: –10° to +190 °F (–23.3° to +87.8°C) Type III 10 kΩ thermistor: –15° to +200 °F (–26.1° to +93.3°C) Type 20 kΩ thermistor: 15º to 215º F (-9º to +101º C) Type 100 kΩ Tasseron (PSB) thermistor: 68º to 338º F (20º to 170º C)
Contact Closure Input	Excitation current 0.5 mA. Open circuit voltage 12 VDC. Sensing threshold 3 VDC and below (logic TRUE) and 7 VDC and above (logic FALSE). Response time 20 ms.
Pulse Input (UI1–UI4)	1 MΩ input impedance for 0-10 VDC active output devices. Current sinking passive output devices will be pulled up internally to 12 VDC and must be capable of sinking 1.2 mA. 40 Hz maximum input frequency with 50% duty cycle. Adjustable high and low thresholds.
Resistance	1 kΩ -100 kΩ range.

2.6. Binary Inputs (Channels BI1 - BI4)

Binary Input: voltage-free contact closure input	Excitation current 1.2 mA. Open circuit voltage 12 VDC. Sensing threshold 3 VDC and below (logic TRUE) and 7 VDC and above (logic FALSE). Response time 20 ms.

2.7. Analog Outputs (Channels AO1 – AO8)

Analog Output	0–10 VDC. 10-bit resolution, 4 mA maximum.

2.8. Relay Outputs (Points BO1-BO8) (Class 2 Circuits Only — requires external power source)

Binary Output	Form “A” relay (NO contact). 30 AC/VDC 2 A. Class 2 circuits only. Both poles available.

2.9. Serial Interface

USB	A USB connector labeled “SERVICE” can be used to attach an optional Wi-Fi stick allowing service personnel access to the controller web pages. It can also be used to connect to Wi-Fi access points.

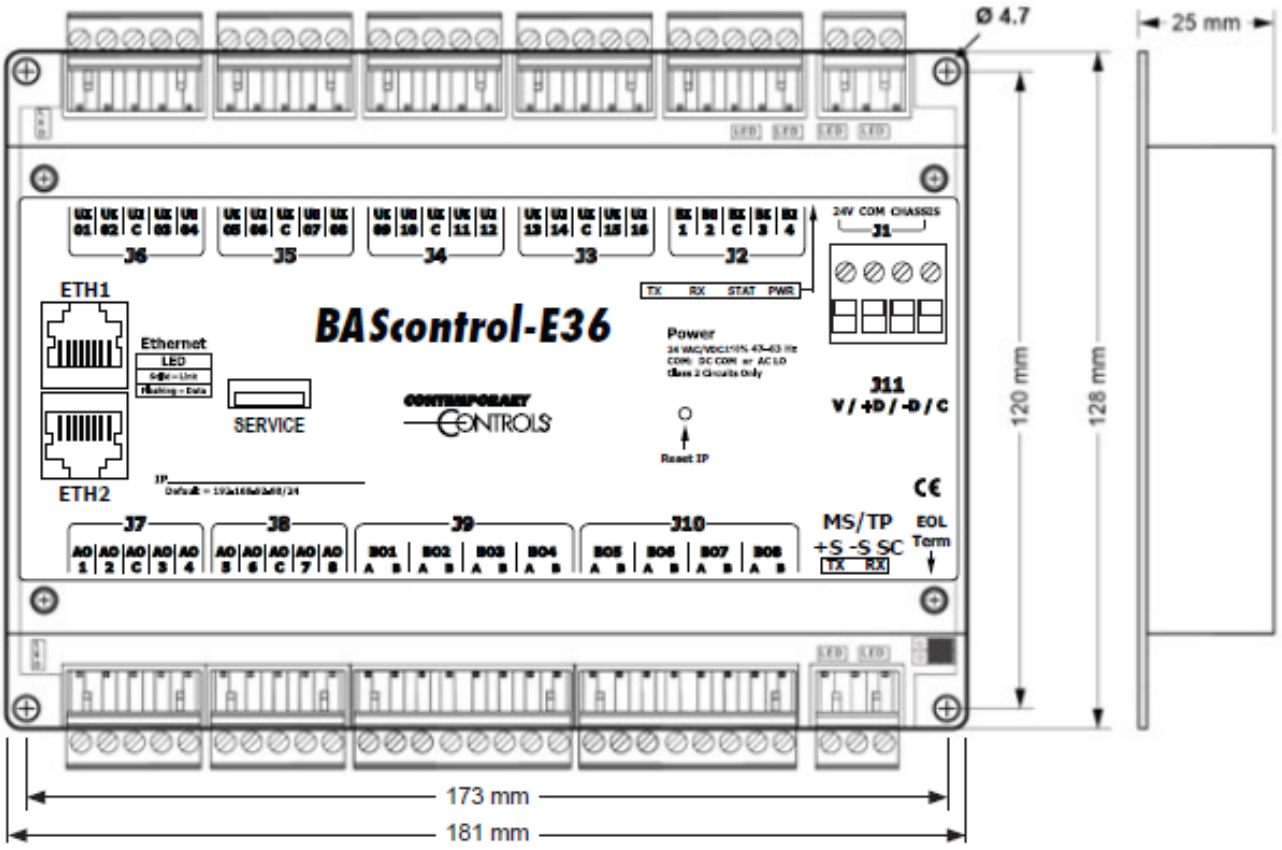
2.10. Wall Setter Port

EIA-485	Four-pin serial connector: EIA-485 physical layer 100 m (max) cable length.

3 Mechanical Dimensions, Mounting, and Power

3.1. Dimensions (all dimensions are in mm)

The BASC-E36 is intended to be panel-mounted within the control panel using four screws. The dimensions are in millimeters.

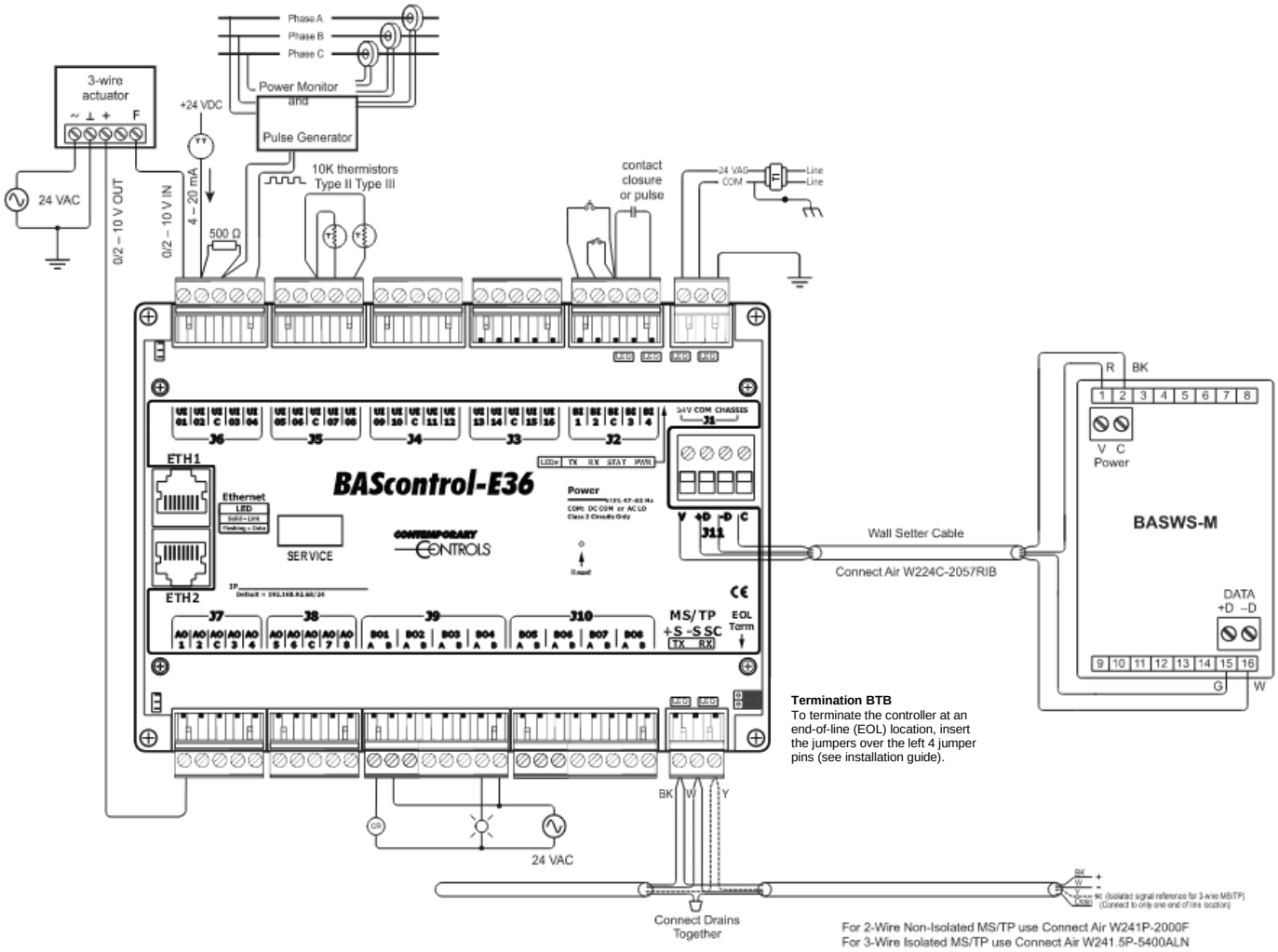


3.2. Power

The BAScontrol-E36 is powered from either a 24 VAC or 24 V DC ± 10%, 47-63 Hz, 22 VA/15 W power source. Its half-wave rectified power supply can share the same power source with other half-wave rectified equipment. An LED indicates power is applied.

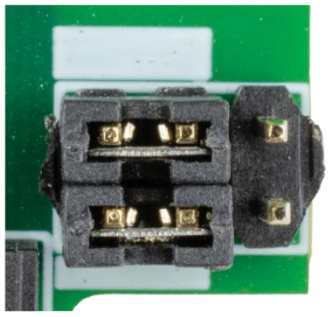
WARNING: Internally, this device utilizes a half-wave rectifier and therefore can only share the same AC power source with other half-wave rectified devices. Sharing AC power with full wave rectified devices is NOT recommended. Devices powered from a common AC source could be damaged if a mix of half-wave and full-wave rectified devices exists.

4 Typical Wiring Diagram

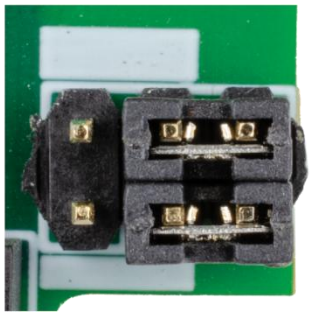


BAScontrol-E36 connected to a BASWS-M Wallsetter

To enable or disable bias/termination, install jumpers as shown.



Bias/Termination Enabled



Bias/Termination Disabled

5 BAScontrol-E36 Configuration – Initial Setup

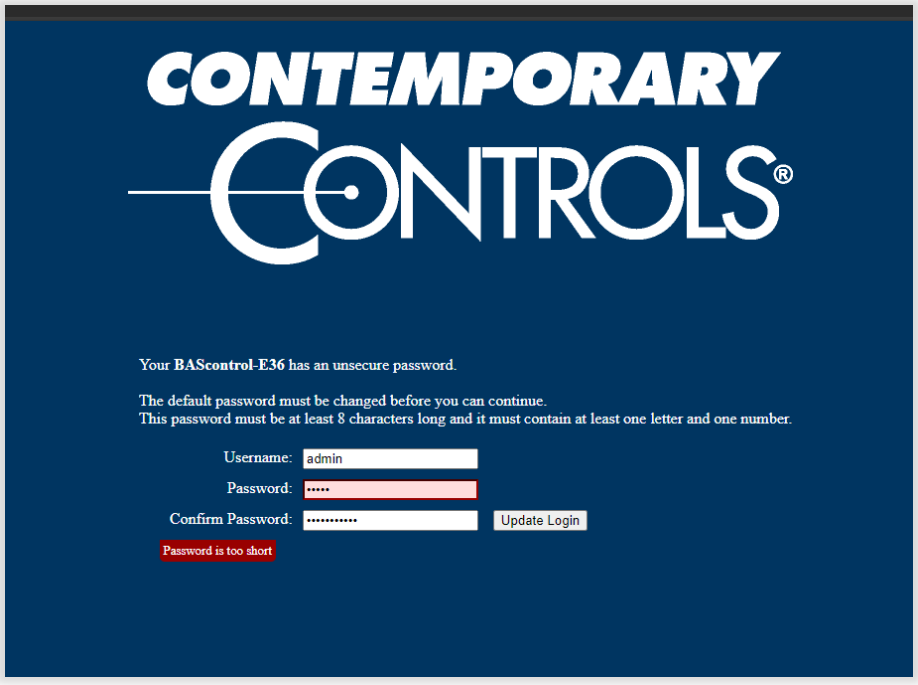
The BAScontrol-E36 is webpage configurable and accessible from any PC with recent versions of most standard web browsers installed. Initially, the BAScontrol-E36 must be accessed over Ethernet at its default IP address because its Wi-Fi is disabled in its factory default condition. To configure, connect it to your PC using an Ethernet cable and set the PC's IP address and subnet mask to the same subnet as the BAScontrol-E36.

Factory programmed:

IP Address: **192.168.92.68** Web server (HTTP) port: **80** (does not need to be typed in the browser)
Netmask: **255.255.255.0** Username: **admin**
Gateway: **192.168.92.1** Password: **admin**

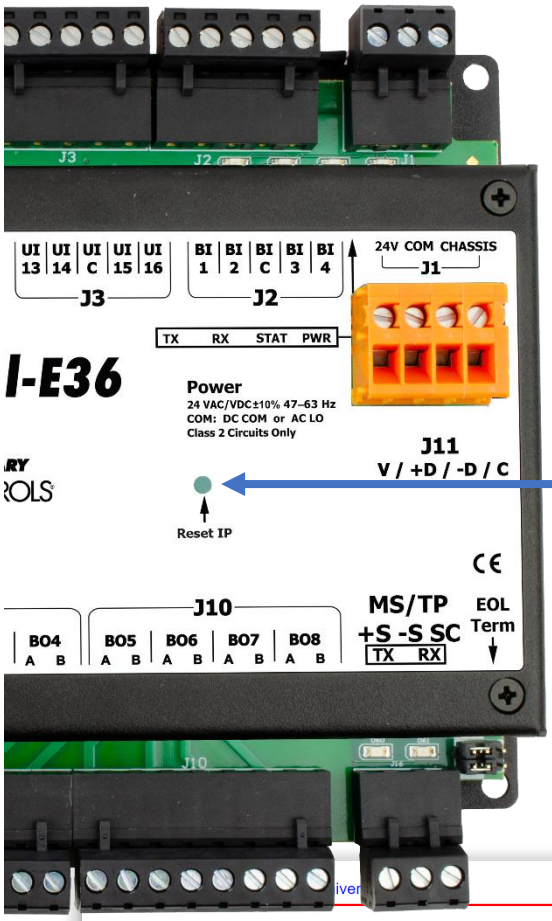
ATTENTION: The default login password must be changed before the BAScontrol-E36 can be used or its system configuration altered. The password must be at least 8 characters long and it must contain at least one letter and one number. This ensures authorized access to the BAScontrol-E36 only.

To ensure secure access only, you must change the default password on first login. The default login credentials can only be used to login for the very first time and must be changed immediately after logging in. You will be presented with the Update Login web page shown below which will require you to set a new secure password. The password must be at least 8 characters long and must contain at least one letter and one number. Changing the username is optional, but highly recommended for enhanced security. Enter in the new credentials and click **Update Login** to continue.



Once secure credentials are set, you will be asked to log in again using the new credentials. The BAScontrol-E36 is now ready to configure and use.

5.1. Restore Defaults: Reset of IP Address, Authentication, and Login Credentials



You can reset the controller to its default values. Use a paperclip or similar tool to press and hold the Reset IP switch for 10 seconds – the Ethernet port LEDs will go off after holding it for 10 seconds. Release the Reset IP switch. Do not remove power from the unit. Wait 30 seconds for the unit to reboot on its own. The unit will be in recovery mode and accessible at its default IP address (192.168.92.68 /24) and login credentials (admin/admin).

Reset Switch: Used to restore to default IP address and login credentials

NOTE: The controller will not execute Sedona logic or communicate BACnet while in recovery mode. No configuration will be lost by performing the RESET procedure.

Login to the unit and open the System Configuration page. Your previously configured IP address and login credentials will still be shown in the page and will be used upon reboot if not changed. You can modify the configuration or leave it as is and take note of it. Once done, click the Restart Controller button on the main web page to reboot into normal operation using the configuration shown in the System Configuration web

5.2. BAScontrol-E36 Main Web Page Overview

The BAScontrol-E36 is web page configurable over wired 10/100 Mbps Ethernet connection, or over Wi-Fi via an optional USB Wi-Fi stick. Initially, the BAScontrol-E36 must be accessed over the Ethernet connection at its default IP address because its Wi-Fi is disabled in its factory default condition.

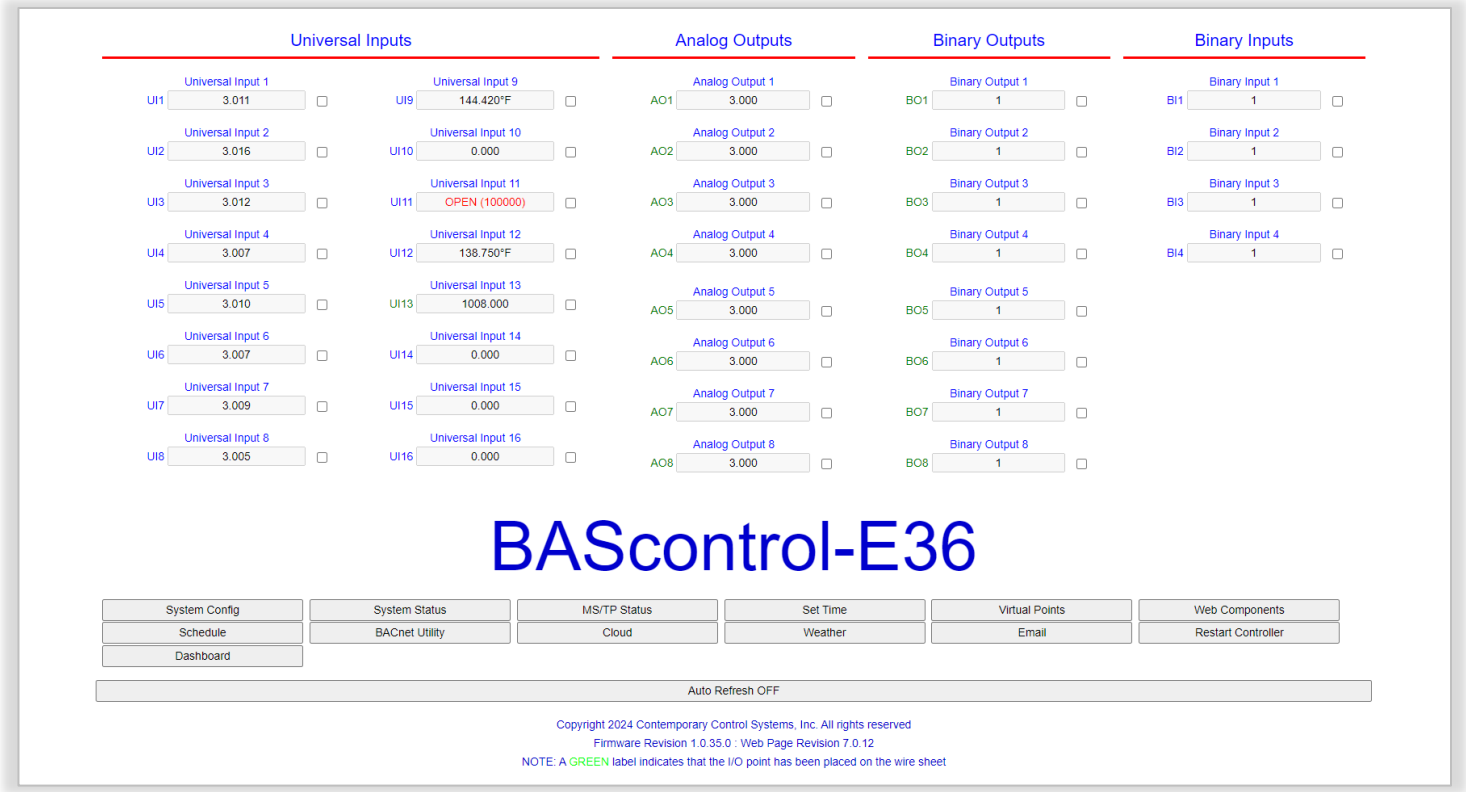
Once you successfully log in to the controller, the main page appears. The main web page allows for easy system and channel type configuration, live monitoring, and forcing physical I/O channels, virtual points, and web components. The main web page provides an overview of all physical I/O channels in addition to access buttons to all other configuration web pages.

The top of the page displays channel data for the 36 BACnet hardware input/output points:

- Universal Inputs (Channels UI1–UI16)
- Binary Inputs (Channels BI1–BI4)
- Analog Outputs (Channels AO1–AO8)
- Binary Outputs (Channels BO1–BO8)

Fourteen buttons occupy the bottom of the main page. One button provides access to the 192 BACnet input/output points, called virtual points (VTs), while another button provides access to the 48 web components. The button functions are as follows:

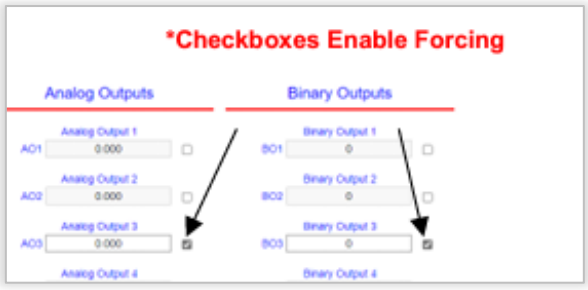
- System Configuration
- System Status
- MS/TP Status
- Set Time
- Virtual Points (Channels VT01-VT192)
- Web Components (Channels WC01-WC48)
- Schedule
- BACnet Utility
- Cloud
- Weather
- Email
- Restart Controller
- Dashboard
- Auto Refresh (On/Off)



Each of the channel types have three features:

- Title link — If clicked, it displays a configuration screen.
- Data field* — You can read a value or enter one if forced.
- Checkbox* — If checked, you can force the channel value.

To observe live updated data for all I/O channels, click **Auto Refresh ON**. Its default state is **Auto Refresh OFF**.



Input and/or output channel values can be temporarily or permanently forced by checking the box adjacent to the channel(s) of interest, entering a value into the text box and clicking outside the box. The value will remain forced on the channel until the box is unchecked, or the unit is power cycled prior to saving.

To retain forces on channels through reboot or power loss, click the **Restart Controller** button or right-click and choose **Save Configurations** to save the forced channel values into memory – this will cause the forced channels to remain forced even if the unit is power cycled or rebooted.

Caution: Care must be exercised when forcing values into I/O channels because the value will be applied to the physical channel immediately after clicking away from the value box. These web page I/O overrides take the highest priority and will override physical inputs, Sedona logic, and BACnet commanded values for a given channel.

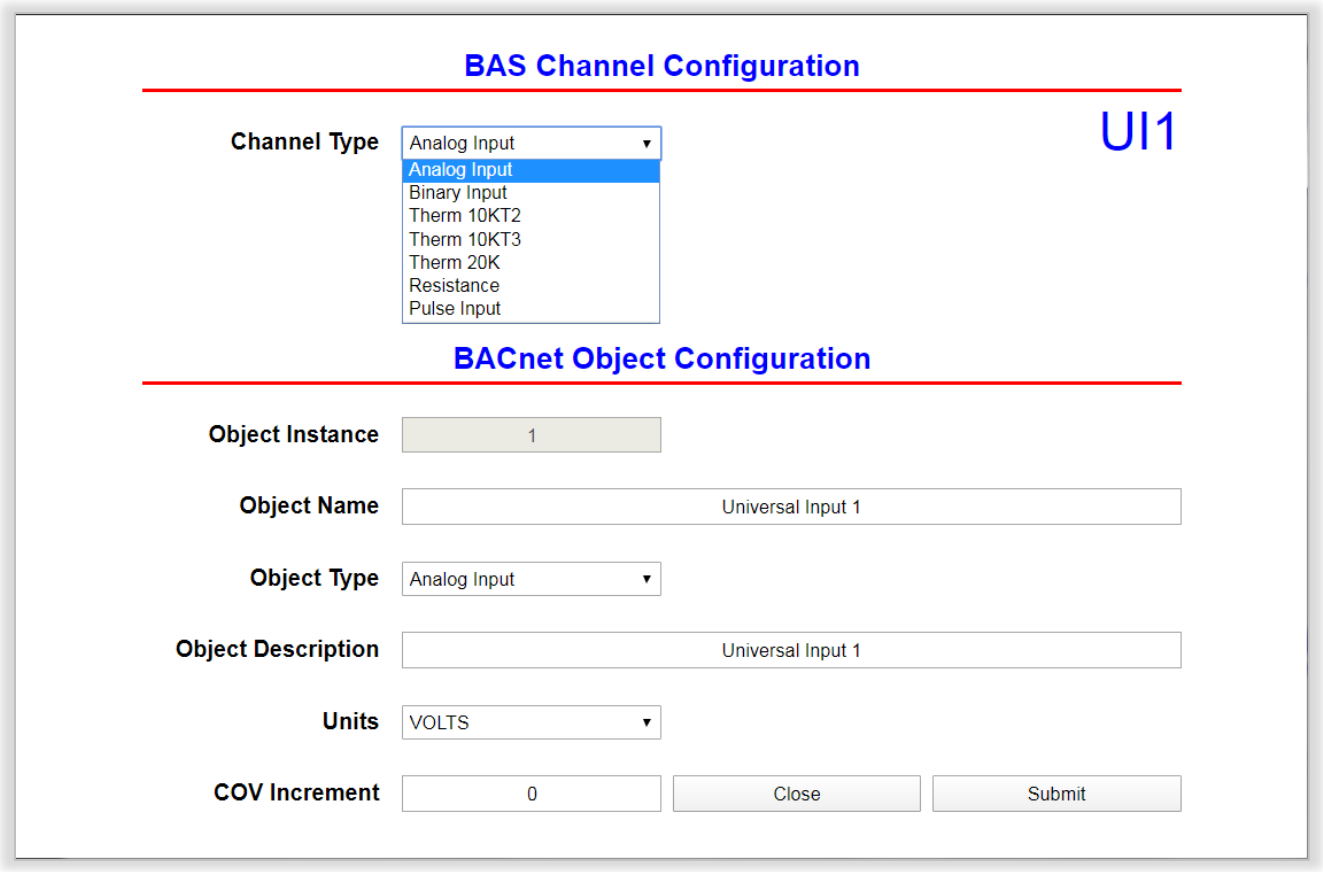
Points displayed in blue (default) on the web page are not being utilized in the Sedona wiresheet. Once a point is utilized in the Sedona wiresheet, its label is displayed in green to indicate the channel is used in Sedona wiresheet logic.

6 BAScontrol-E36 Channel Type Configuration

To configure an I/O channel, click the title link of the desired channel from the main webpage to access its configuration page. Examples of each channel type - Universal Input, Analog Output, and Binary Input and Output are shown below.

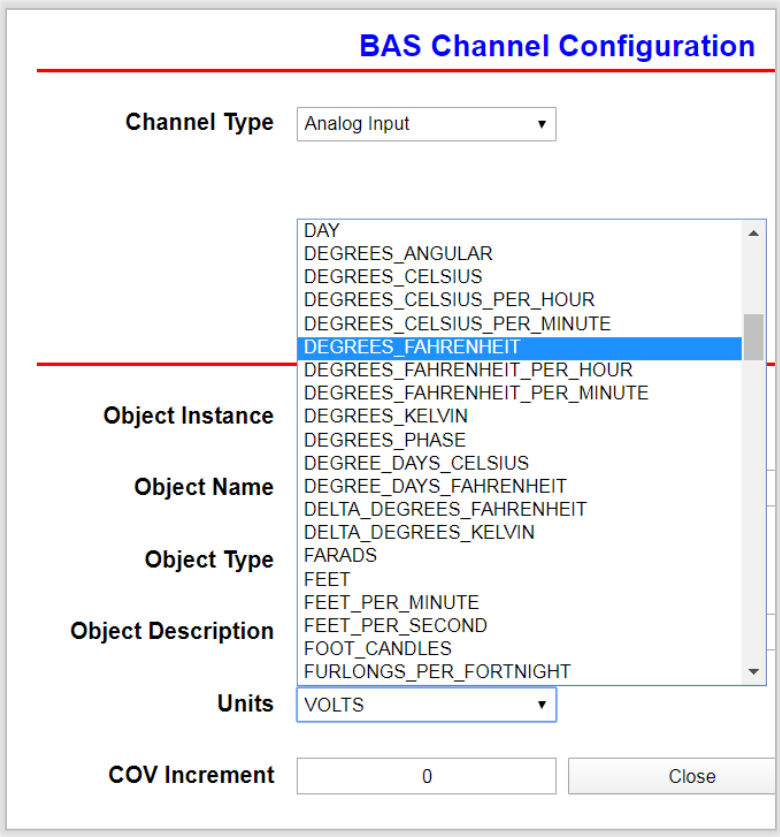
6.1. Universal Inputs

- Choose **Channel Type**. For Universal Input channels, the Channel Type can be configured for:
  - Analog input (0–10 V)
  - Binary input
  - Thermistor input (10 KT2, 10 KT3, 20 k or 100 k)
  - Resistance (1 kΩ -100 kΩ).
  - Pulse input (40 Hz max)



Object Instance is the BACnet object instance which is not configurable – it is automatically assigned.

Configure the following parameters:



- **Object Name**
- **Object Description**
- **Units** - allows you to specify the units for the channel value.

NOTE: The values for Object Name, Object Description, and Units are served over BACnet to clients and supervisors and used in the Azure IoT Central cloud setup.

- **COV Increment** (Change of Value)

COV Increment is the change in value required before the BASC-E36 sends this value to the subscribing BACnet COV client. COV only reports changes in value instead of continuously serving the point value (polled). COV can be useful to mitigate traffic on the network or conserve point trend database space in BACnet supervisory devices. All 36 BASC-E36 physical I/O channels and 192 Virtual Points support COV. For analog points, “0” COV increment means that an analog point will be transmitting its value for any change in its value. COV increment does not apply to binary points and is therefore greyed out on those channels. COV increment is only used when the BACnet client performs a COV subscription with the BASC-E36.

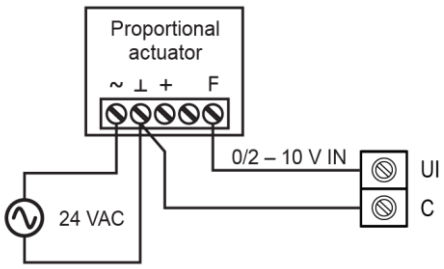
- Click **Submit**.
- Click **Close**.

Restart is not required when altering Channel Configuration.

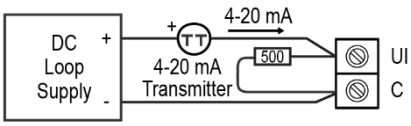
6.1.1. Analog Input

An analog input can measure voltage in the range of 0–10 VDC or it can measure current in the range of 0–20 mA with a 500 Ω external resistor installed. Transmitters that produce an elevated “zero” such as 2–10 VDC or 4–20 mA can be measured as well.

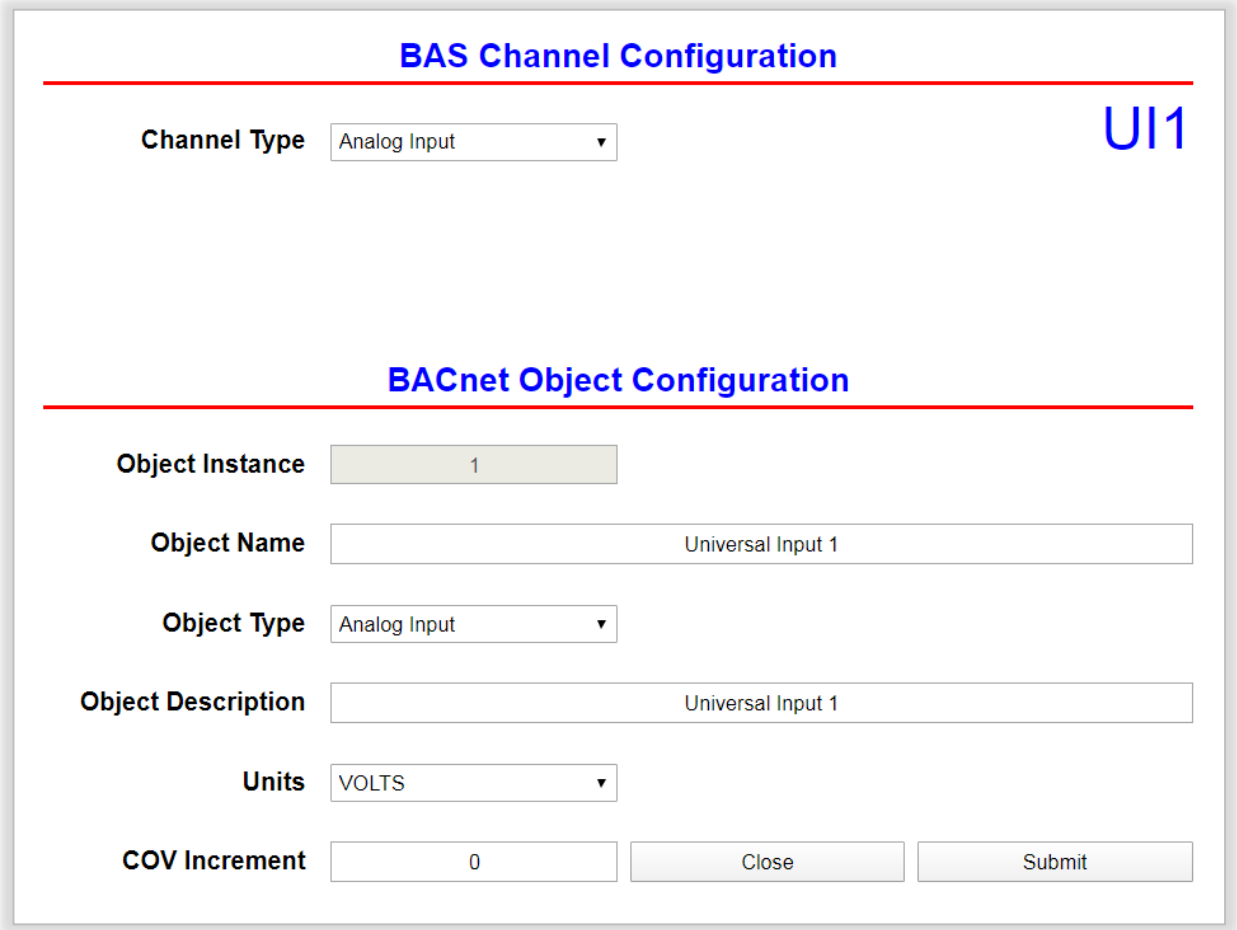
Set the **Channel Type** to Analog Input to configure the input for voltage by selecting Analog Input. When set as a voltage input, the input impedance is 1 MΩ. With voltage measurement, connect the more positive voltage to point UIX (any UI channel) and the less positive to common C. On proportional damper actuators, the output signal is referenced to the damper’s power supply common. That common must be at the same reference as the BAScontrol-E36 common.



When measuring current from two-wire transmitters, remember the BAScontrol-E36 sinks current to ground. A 500 Ω external resistor can be applied between points UIX and C on the input to convert 0-20 mA to 0-10 V. A smaller resistor can be used by the two-wire device if required, however, the voltage produced will be less (V = external resistor current).

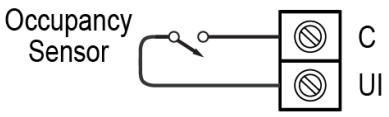


Care should be exercised when connecting to a three-wire current transmitter. These are usually non-isolated devices between the power source and signal output. The BAScontrol-E36 will sink current from its input to ground so the transmitter must source current from a positive potential to ground. If the three-wire transmitter works in this manner, it can be accommodated. Four-wire transmitters usually have isolation between power supply and signal output so their output stage can usually be treated as a two-wire transmitter.

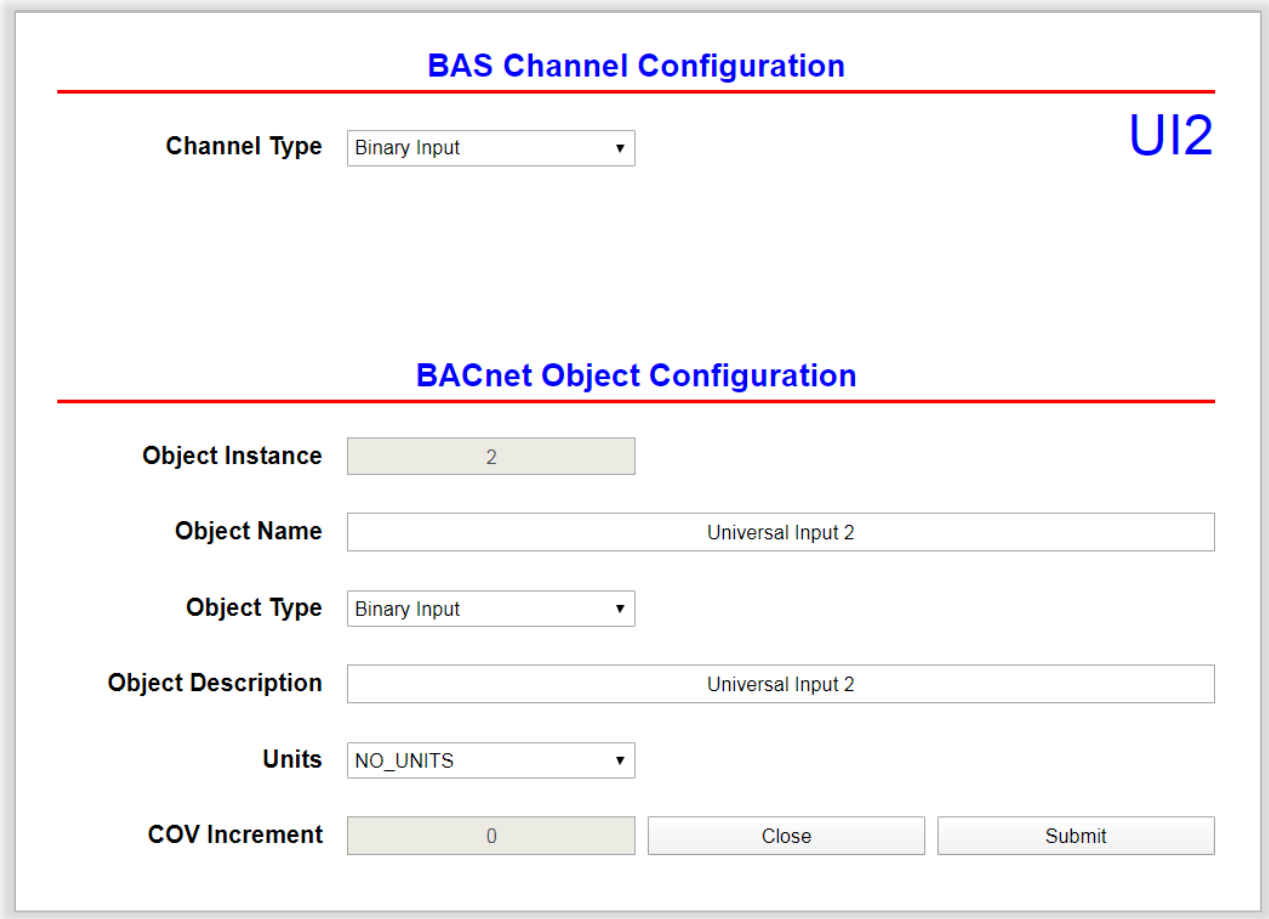


6.1.2. Binary Input

To sense the action of a push-button or relay, the contacts must have no applied energy, and be rated for low-voltage, low-current switching. The BAScontrol-E36 provides the energy to be sensed. Set the **Channel Type** to Binary Input and the **Units** to NO_UNITS. Connect the contacts between points UIX and C. For common mechanical contacts, polarity is not an issue.



The open-circuit voltage is 12 VDC and the short-circuit current is 1.2 mA. For solid-state switch sensing, it is recommended that an attached solid-state device have an optically isolated open-collector NPN transistor output stage with a collector-emitter output voltage (Vce) of at least 30 V. Output sinking current should be greater than 5 mA. The collector-emitter saturation voltage should be less than 0.2 V when sinking 2 mA. The emitter must be connected to point C and the collector to point UIX (the more positive point). The BAScontrol-E36 sets the low threshold to 3 V and the high threshold to 7 V. When a contact is made or the solid-state switch is on (resulting in a saturated output), the voltage at point UIX is close to zero volts. If the contact is opened or the solid-state switch is turned off, the voltage at point C quickly rises towards 12 V. Once the voltage passes the 7 V high threshold, the “off” state is sensed. To return to the “on” state, this voltage must fall below 3 V. The three-volt difference is called hysteresis. There is no need to add an external pull-up resistor when using a contact closure input. Contact closure inputs are sampled every 10 ms and for a change of state to be recognized, the input state must be stable for two consecutive samples. Therefore, contact closure response is 20 ms.



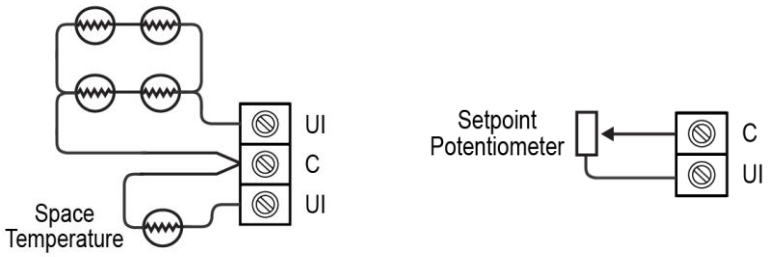
6.1.3. Temperature or Resistance Input

The BAScontrol-E36 has built-in calibration curves for 10 kΩ Type II or Type III thermistors, and 20 kΩ and 100 kΩ thermistors. These devices have a non-linear negative coefficient of resistance to temperature and provide a nominal resistance of 10 kΩ or 20 kΩ at 25° C. Configure the **Channel Type** for either Type II or Type III thermistor, or 20 kΩ or 100 kΩ thermistor. Connect the two-wire thermistor to points UIX and C. Polarity is not an issue. If average temperature is desired, connect multiple thermistors in a series-parallel combination (as shown below) so that the nominal resistance remains at 10 kΩ or 20 kΩ. Make sure that all devices are of the same type. The effective range of measurements varies by type.

- Type II 10 kΩ thermistor: –10° to +190 °F (–23.3° to +87.8°C)
- Type III 10 kΩ thermistor: –15° to +200 °F (–26.1° to +93.3°C)
- Type 20 kΩ thermistor: 15º to 215º F (-9º to +101º C)
- Type 100 kΩ Tasseron (PSB) thermistor: 68º to 338º F (20º to 170º C)

An open input results in a fault condition for that point; however, an Out of Bounds value can be set up.

Two-wire potentiometers used as setpoint stations can be read by the universal input by selecting resistance on the drop-down menu. The resistance range is from 1 kΩ to 100 kΩ. Connections are made just like thermistors, but no non-linear curves are used during resistance measurement. If unique curve-fitting is required, this could be accomplished using the Linearize Sedona component on the wiresheet. For example, a 3 kΩ thermistor can be used to sense a wider range of temperatures (such as outdoor temperature) and its curve can be fitted to the Linearize Sedona component on the wiresheet.

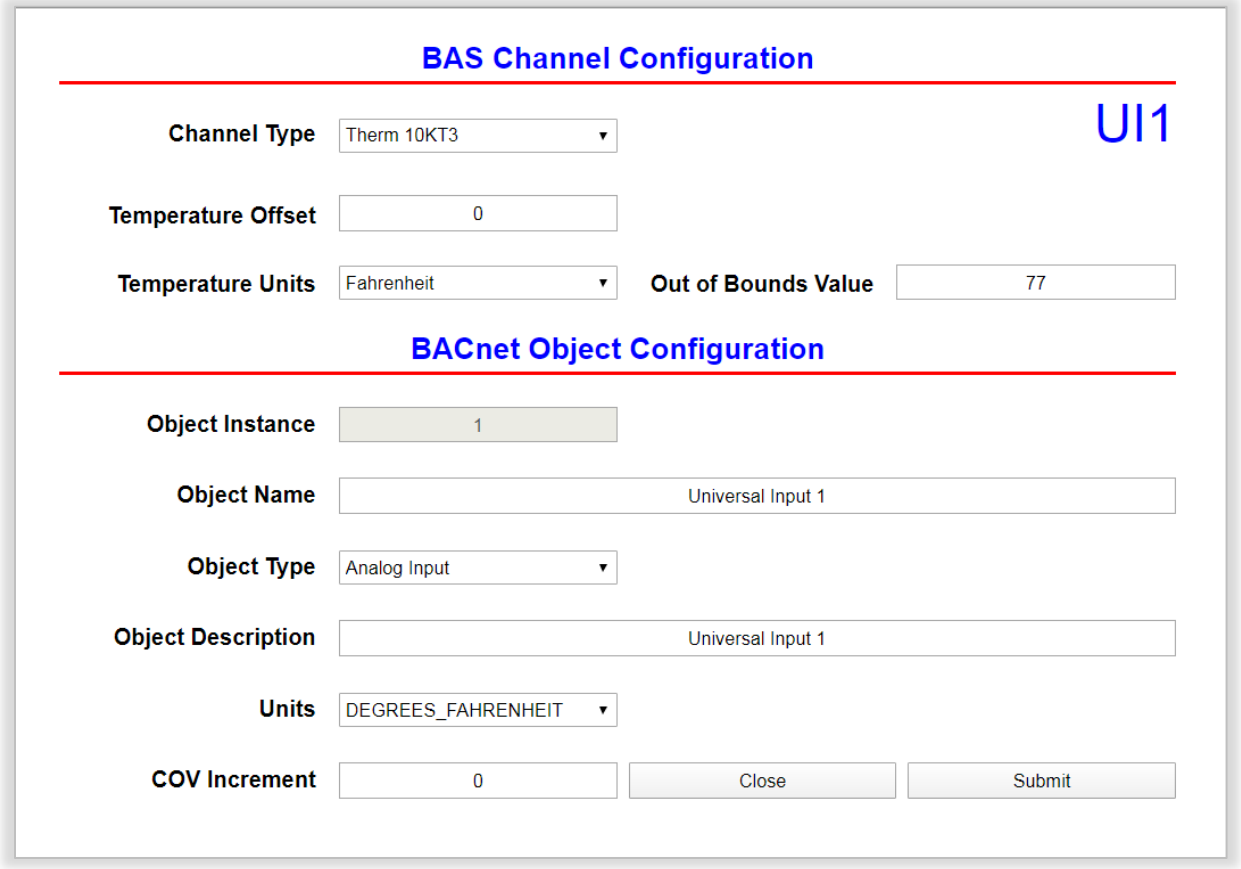


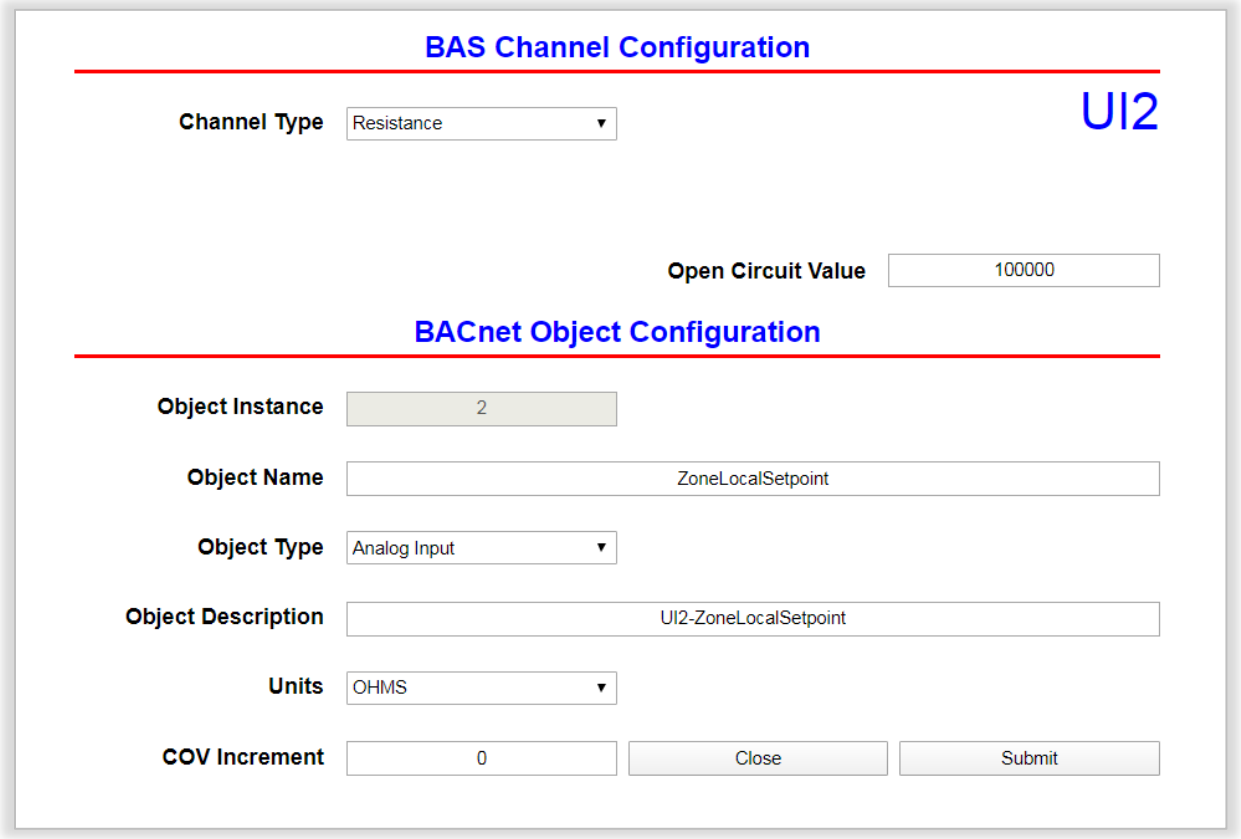
When a Universal Input channel is configured for one of the available thermistor curves (10 kT2, 10 kT3, 20 k, or 100 k), additional parameters are revealed.

- **Temperature Offset**: can be configured to offset/adjust the actual sensor reading by entering a positive or negative offset value in the box.
    - Temperature Units can be set for Fahrenheit or Celsius curves.

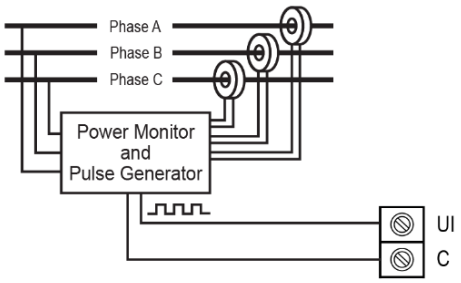
Out of Bounds Value: is the value which will be used for the channel by Sedona wiresheet logic, BACnet server, graphical dashboards and Azure Cloud in case the attached thermistor provides an out-of-bounds value, such as in sensor failure or open circuit condition. The **Out of Bounds Value** can be very useful to maintain stable control logic operation until a repair can be performed. Or this value could be set to a value that would never be attained by a properly working sensor and act as a signal to your Sedona logic that a sensor failure has occurred. and the logic should work in the appropriate manner and could signal an alarm. The **Out of Bounds Value** can be used in your Sedona application to detect sensor failure or open circuit condition and

to trigger an alarm and put the mechanical equipment into a safe state until the sensor can be repaired.

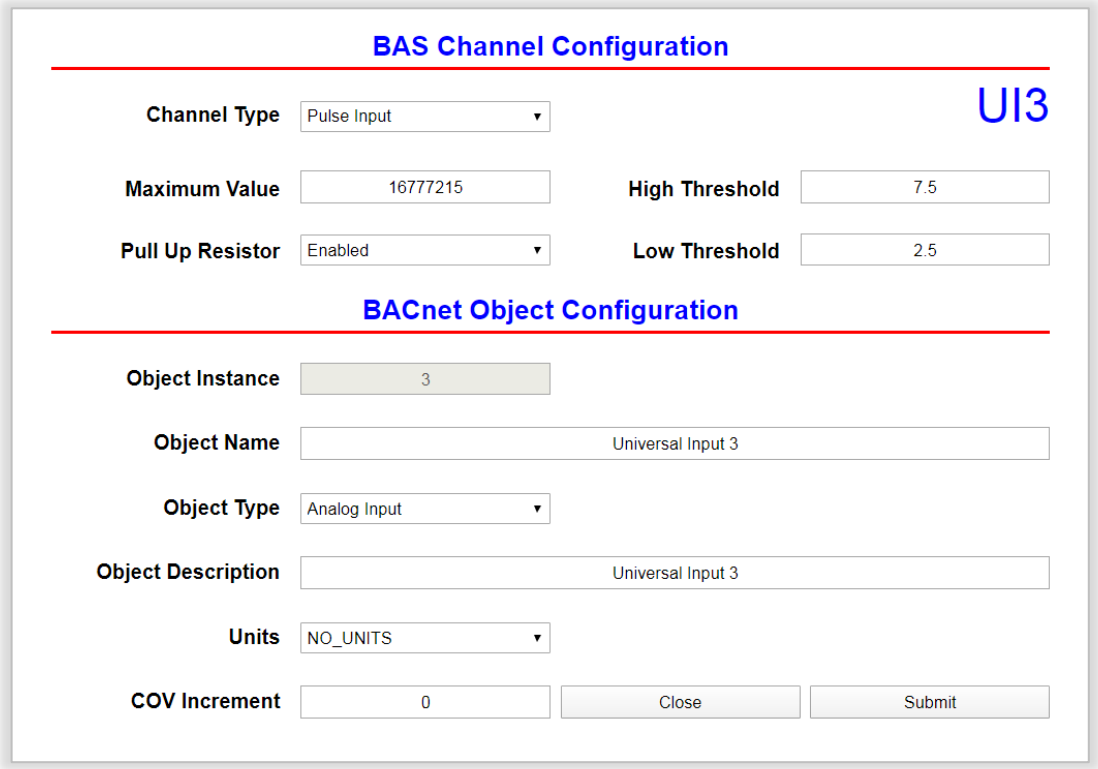




6.1.4. Pulse Input



When the **Channel Type** is configured for Pulse Input, pulse rate up to 40 Hz can be measured, assuming a 50% duty cycle. The pulse device could have an active output or a passive output requiring a pull-up resistor. Both situations can be accommodated. The input voltage range is 0–10 VDC and the installer can set both the low-threshold and high threshold on the Pulse Input web page. The difference in the two thresholds is the hysteresis. You can detect a sinusoidal input by setting the high threshold below the positive peak and the low threshold above the negative peak. Setting both thresholds well away from the sinusoidal waveform peaks offers some noise immunity. It is not necessary for the input to swing from zero to 10 V. Any substantial swing within this range can be detected. The input impedance using Pulse Input is 100 kΩ when using active sensors. Connect the output of the pulse device to point UIX and the common to point C. If the pulse device has a passive output requiring a pull-up resistor, the BAScontrol-E36 can provide a 10 kΩ pull up resistor to +12 VDC by selecting Pull Up Resistor from the dropdown on the configuration page. Current sinking passive output devices will be pulled up internally to 12 VDC and must be capable of sinking 1.2 mA. The two threshold values can still be set as needed.



When a Universal Input channel is configured for Pulse Input, additional configuration parameters are revealed.

- **High** and **Low Thresholds** - are configurable in the respective fields.
- **Maximum Value** - (16777215 set by default) is the value at which the pulse count will roll over. A Universal Counter (UC) component in the Sedona wiresheet can be used to store roll over counts. 16777215 is the largest whole number that can be accurately contained in a 32-bit floating point value. It is recommended that you roll over the counter at this point (or a lower value) to retain accurate counts.
- **Pull Up Resistor** - enable/disable using the drop-down.

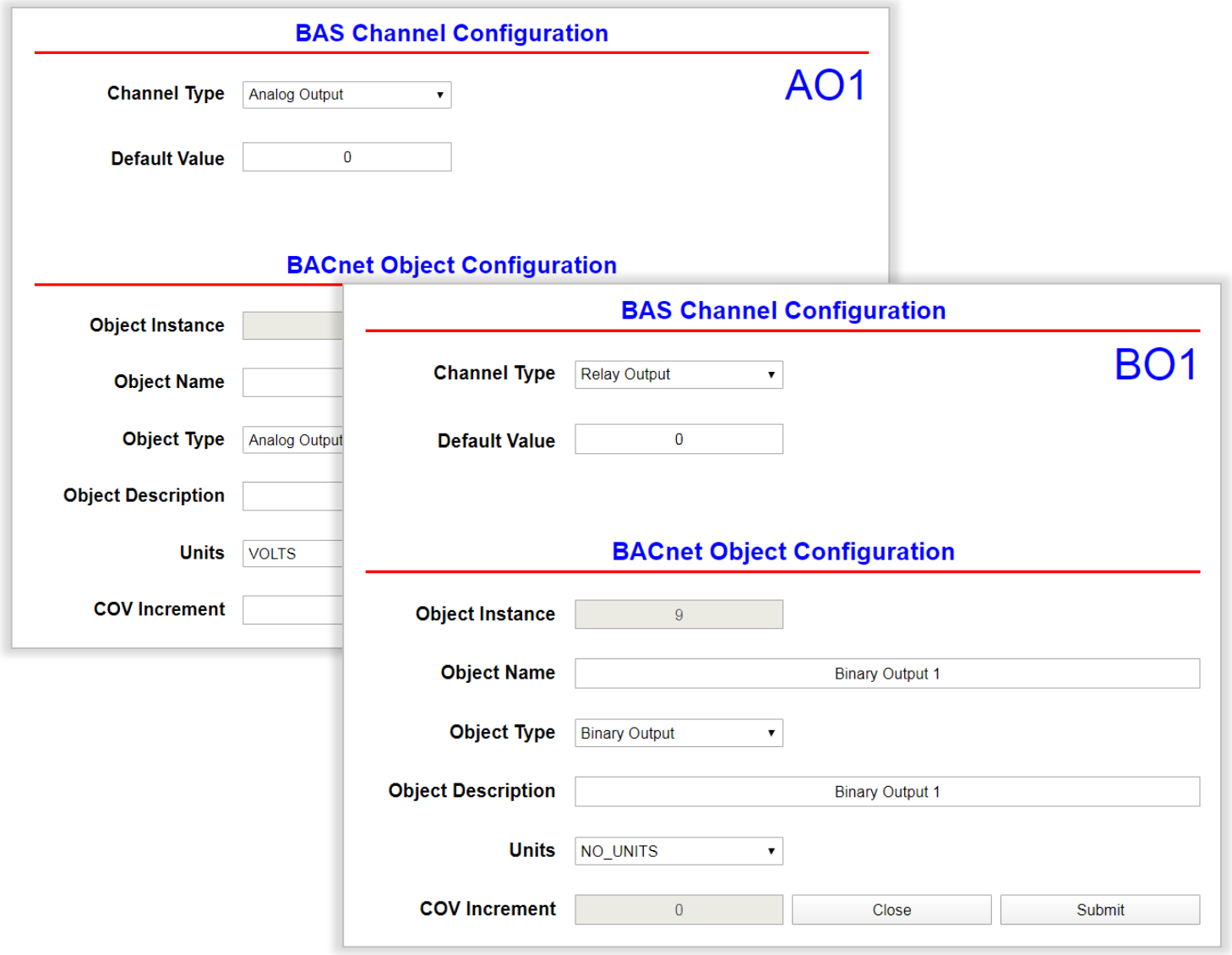
6.2. Analog and Binary Output Configuration

From the main web page, select a point name and configure it as described below.

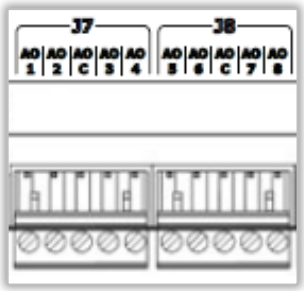
- **Channel Type** is not configurable – it is set to analog or binary, respectively.
- Configure the following parameters:
    - **Object Name**
    - **Object Description**
    - **Units** - allows you to specify the units for the channel value.

NOTE: These values are served over BACnet to clients and supervisors, graphical dashboards, and used in the Azure IoT Central cloud.

    - **Default Value** - This is the output value the controller will use as a starting control value in the case of power loss before a BACnet client has written to the channel or Sedona logic had been triggered. This Default Value is also the Relinquish Default value outside of the BACnet priority array used when no other higher priority (1 – 16) writes are present. As soon as Sedona logic or a BACnet client write to the point, Default Value is no longer used by the output.
    - **COV Increment** - COV Increment is the change of value increment used by BACnet clients/supervisors which support this service. COV is typically used to reports changes in value to a BACnet client in place of the client continuously requesting the point value. COV can be useful to mitigate traffic on the network. All 36 physical I/O channels and 192 Virtual Points support COV. For analog points, “0” COV increment means that an analog point will be transmitting its value for any change in its value. COV increment does not apply to binary points and is therefore greyed out on those channels. You do not need to set up COV unless the BACnet client you are using supports this BACnet service.



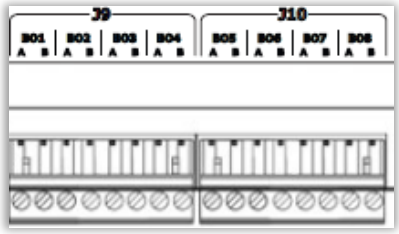
6.2.1. Analog Output



For 0–10 VDC output voltage, apply the voltage to points AO1-AO8 with respect to the C (common) terminals. The C terminals must be used as the common point. Both C terminals are connected together internally. No configuration is necessary for analog outputs. C2 must be used as the common point for all AO1-AO8 outputs.

6.2.2. Binary Output

Eight binary outputs are available. Each output requires an external power source. Two types of binary devices can be controlled. The BAScontrol-E36 provides normally open form “A” relay contacts that are rated at 30 VAC/VDC and 2 A max current. When the binary output is engaged, it will short the A terminal to its B terminal. Each binary output has its own isolated A & B terminals. Binary outputs are intended for Class 2 circuits only.



7 BAScontrol-E36 System Configuration

The controller I/O can be configured using the main web page as outlined in the previous section. Located near the bottom of the main web page are a series of 13 access buttons to all other configuration web pages.

7.1. System Config

The System Configuration page allows you to easily set up the Ethernet and MS/TP network adapters, enable/disable supported protocols, BACnet client/server configuration, optional Wi-Fi USB stick configuration, and Admin login credentials. **The Submit button must be clicked to apply any changes. Changes to this page will not take effect until the unit has been restarted.** BAScontrol-E36 firmware can be restarted using the Restart Controller button on the main web page.

NOTE: The BAScontrol-E36 can operate on both IP (Ethernet & Wi-Fi) and MS/TP networks concurrently. The BACnet/IP client/server will only operate on the selected IP network adapter in the Interface drop-down under the BACnet tab. Only one of the two adapters (Ethernet or Wi-Fi) should have a gateway address to the Internet.

7.1.1. Admin Tab

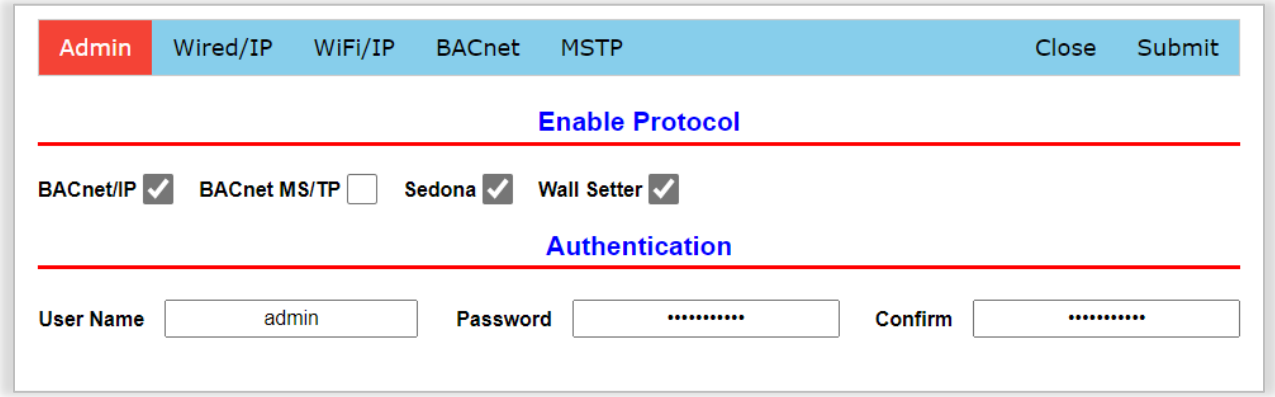
The Admin tab allows you to enable/disable supported protocols and change your authorization credentials. Changes will not take effect until the unit is restarted.

7.1.1.1. Enable Protocol

The followings checkmarks appear under Enable Protocol:

- **BACnet/IP** - enables BACnet /IP communications (enabled by default).
- **BACnet MS/TP** - enables BACnet MS/TP communications.
- **Sedona** - enables the Sedona Virtual Machine which executes wiresheet logic (enabled by default).
- **Wall Setter** - enables communication with an optional wall setter (enabled by default).

Disabling unused protocols offers potential savings in CPU usage or memory space. However, it is not necessary to disable them.



7.1.1.2. Authentication

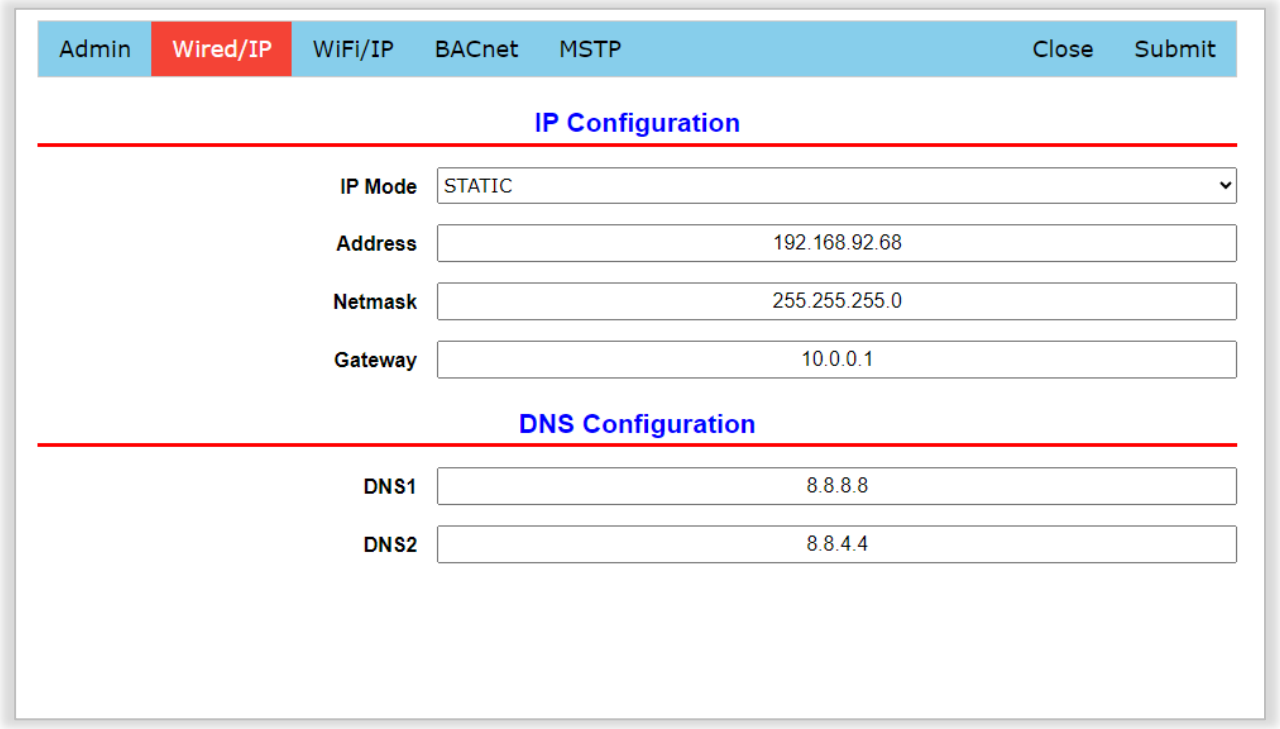
We strongly advise you to change the default Username and Password (admin/admin). Username and Password:

- Can be up to 32 characters
- Can use alphanumeric and the following characters:
  ~ ! @ # $ % ^ & * ( ) _ + - | } { `[] \ ' ; , . / * ? > <
- Cannot include emojis, UTF-8 hex pre translation values [0x], and non-U.S. characters.

Click **Submit** and restart unit to apply changes.

7.1.2. Wired/IP Tab

The Wired/IP tab is where the Ethernet network adapter configuration can be accessed.

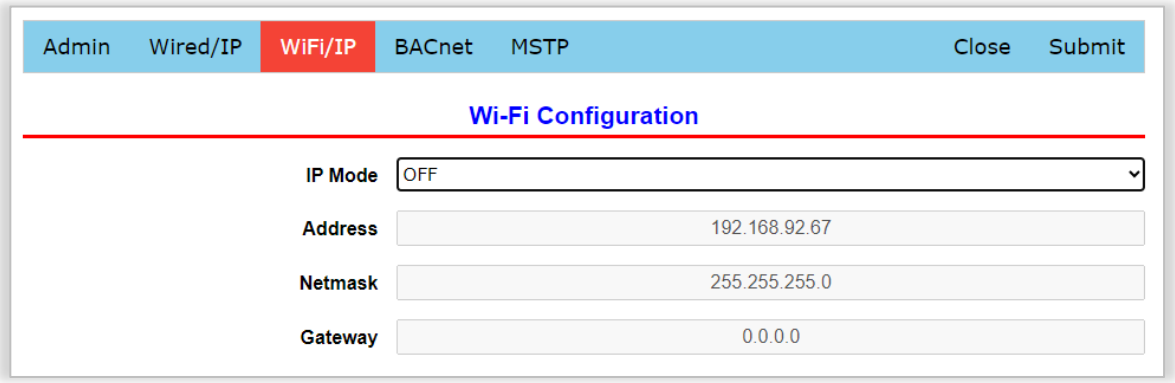


- Configure the following parameters:
  - **IP Mode**, select either a **DHCP** or a **Static IP** address.
    - For a static address, enter:
      - **Address** - The unique IP address for the unit, for example, 192.168.92.68.
      - **Netmask**: The netmask used by all devices on the network, for example 255.255.255.0.
      - **Gateway** - The IP address of the IP router used to reach other networks, such as the Internet, for example 192.168.92.1. Only one gateway address should be set up on either Ethernet or Wi-Fi adapters.
      - **DNS1** and **DNS2** - If a Domain Name Server (DNS) address is required for Internet services, such as NTP time service, weather service, cloud service, or email alarms/notifications, enter in the Primary and Secondary DNS addresses. You can use 8.8.8.8 or 8.8.4.4 if you have not been assigned DNS servers.

- Click **Submit** and restart unit to apply changes.

7.1.3. Wi-Fi/IP Tab

A USB connector labeled “SERVICE” can be used to attach an optional Wi-Fi stick for webpage access and connection to Wi-Fi access points. The Wi-Fi/IP tab is where the Wi-Fi adapter configuration can be accessed.



- Configure the following parameters:
  - **IP Mode** - OFF, STATIC, DHCP, and AP. OFF is the default value and indicates that Wi-Fi is disabled.
  - **IP address** -The Wi-Fi network’s IP address range should not overlap the Ethernet network range.
  - **Netmask** and **Gateway** – the addresses used on the network.
- Click **Submit** and restart unit to apply changes.

7.1.3.1. IP Mode

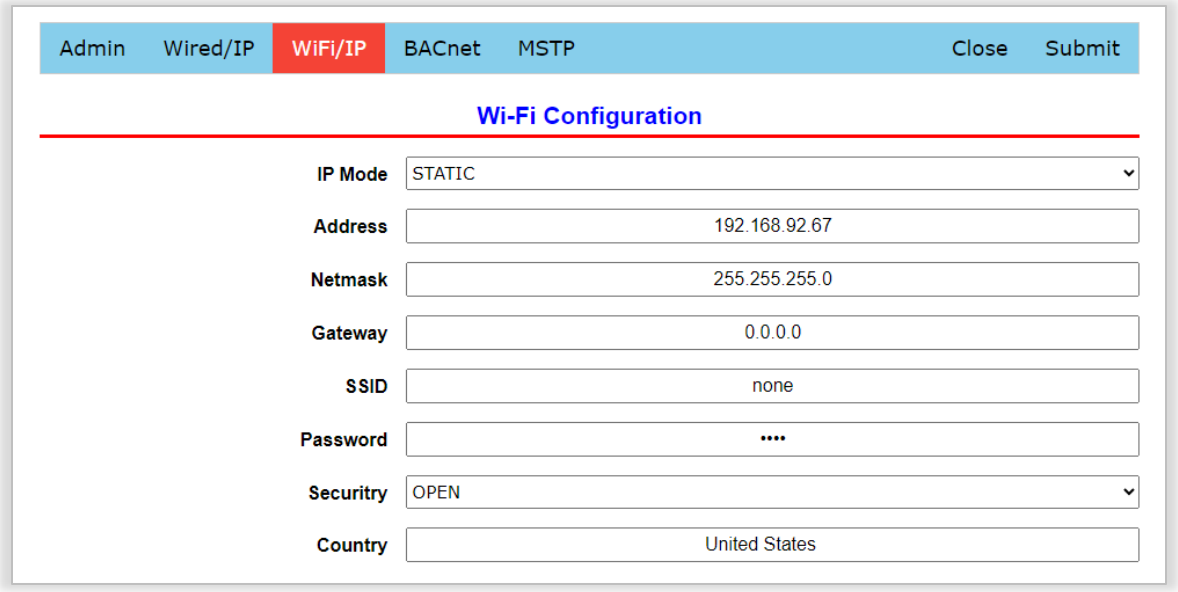
IP Mode – Static

Static IP addresses are fixed and do not change unless you change them manually. In STATIC IP mode, the BAScontrol-E36 will work in end-device mode which is how your PC or smart phone works when it communicates Wi-Fi. To set the IP mode to static, enter the BAScontrol-E36’s IP address. The address must be:

- Supported by the connected Wi-Fi access point (AP)
- Outside the range of the IP addresses assigned via DHCP by the Wi-Fi access point

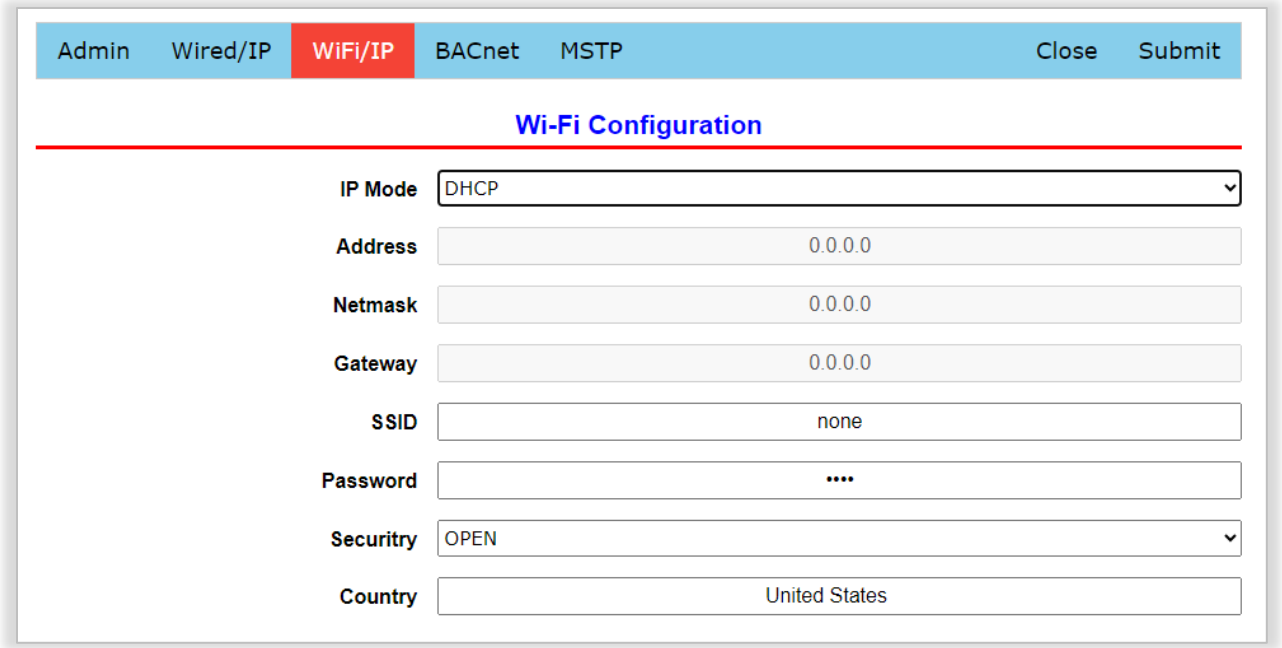
To ensure stable communication, it is advisable to use Static IP addressing when the BAScontrol-E36 is operating as a BACnet server on the network.

- Configure the following parameters:
  - **SSID/Password** - The SSID of your access point and its associated password. In this mode, the BAScontrol-E36 will connect with the access point indicated by the SSID which allows the controller to communicate with other devices on the Wi-Fi network.
  - **Security** - setting that is used by the access point.
  - **Country** - indicates the frequency range of the BAScontrol-E36.
- Click **Submit** and restart unit to apply changes.



IP Mode – DHCP

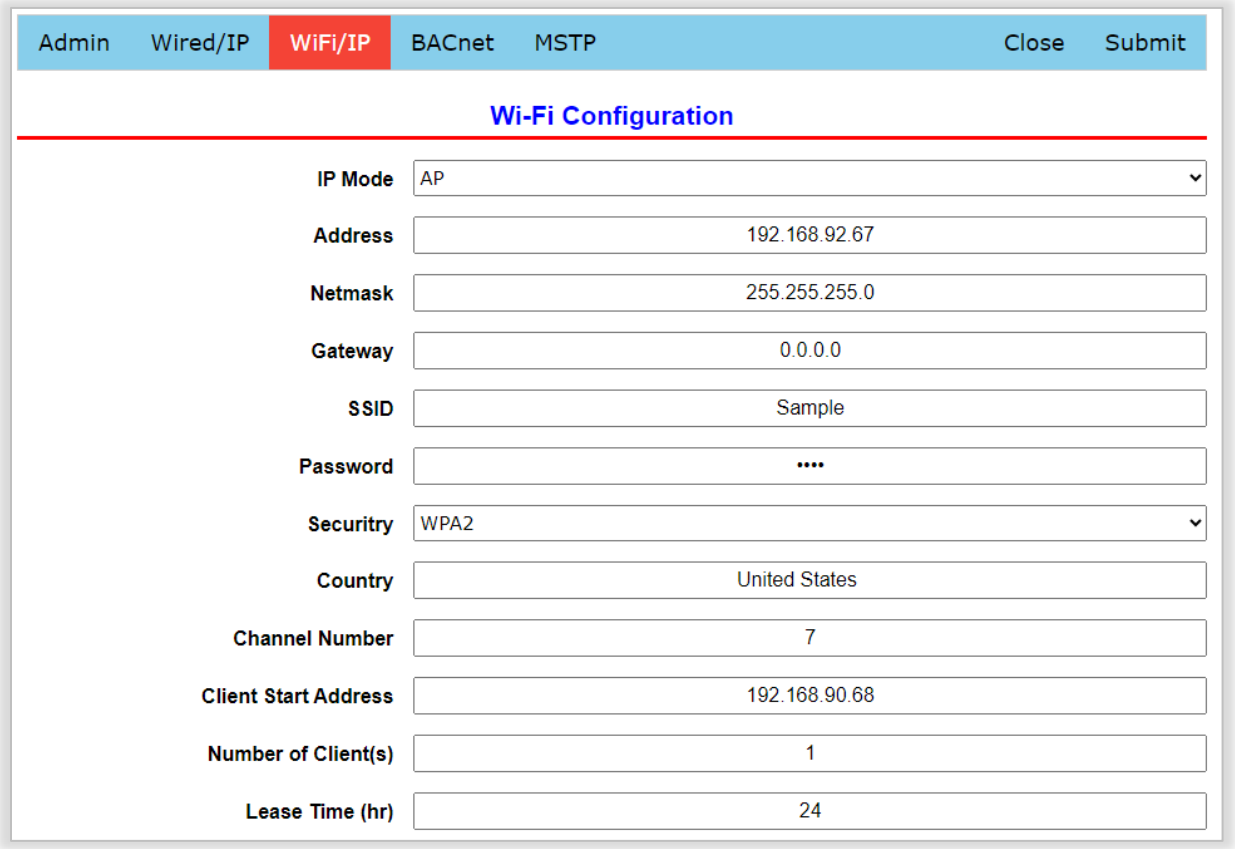
Dynamic Host Configuration Protocol (DHCP) is a service running on devices, such as IP routers or servers, on the local IP network. DHCP is similar to STATIC but doesn't require an IP address, netmask or gateway. These are provided by the access point. DHCP is a service running on devices, such as IP routers or servers on the local IP network. Dynamic IP addresses are issued to network devices using a periodic leasing system, and the leased IP address is only active for a limited time. If the lease time expires, the BAScontrol-E36 will automatically request a new lease from the DHCP server. Sometimes, this means the BAScontrol-E36 could receive a new IP address if the controller was disconnected/ unplugged from the IP network or had lost power between leases.



IP Mode – AP

In Access Point (AP) mode. The BAScontrol-E36 becomes the access point for the network. This is meant for connecting a Wi-Fi end device, such as a smart phone, to the BAScontrol-E36. A maximum of five end devices can be connected. AP mode can also be used for quick configuration changes or viewing the unit's status.

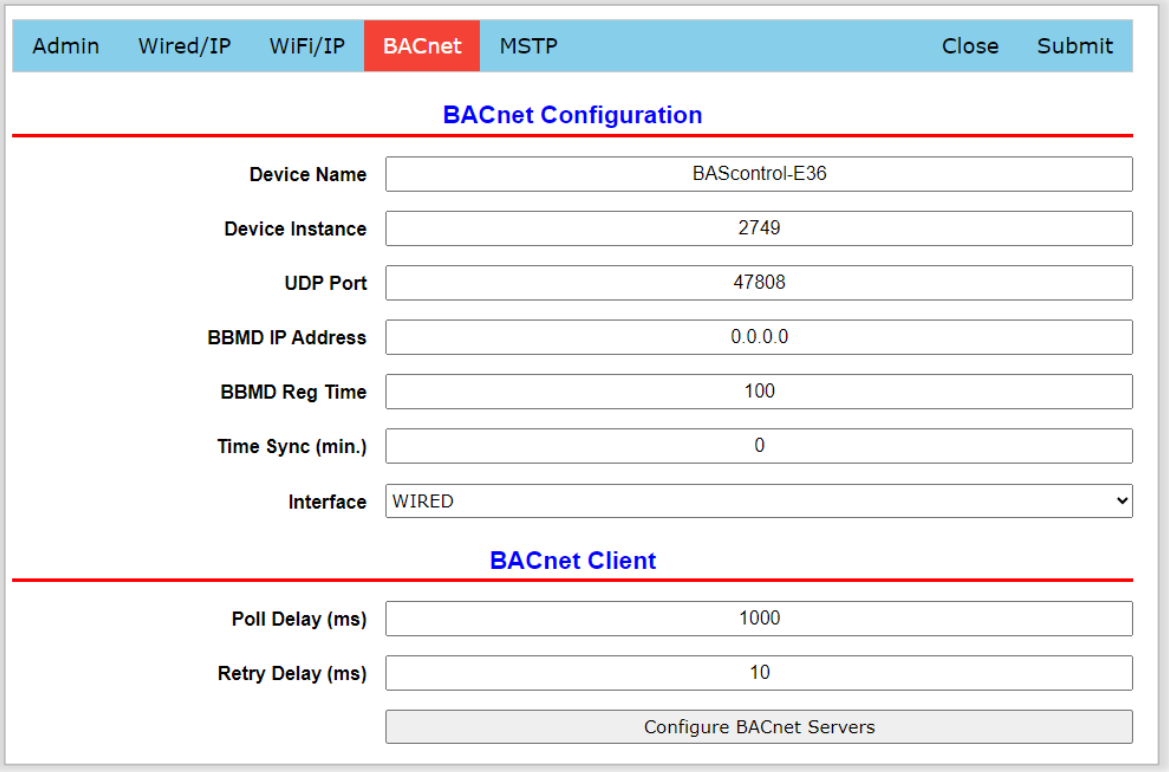
- Configure the following parameters:
  - **IP Address, Netmask,** and **Gateway** settings - These should not overlap with the Ethernet settings.
  - **SSID** - The SSID should be unique and will require a password. The Wi-Fi end devices must enter the assigned SSID and password to connect to the BAScontrol-E36.
  - **Security** - We recommend using WPA2 as the security setting.
  - **Country** - Channel number is used to select which of the Wi-Fi channels to be used by the BAScontrol-E36. If you have multiple Wi-Fi networks in close proximity, you can move the unit to an unused or less used channel.
  - **Client Start Address** - This indicates the first address it will serve to the connected Wi-Fi devices.
  - **Channel Number** - The Wi-Fi channel that the BAScontrol-E36 will use for its Wi-Fi communications. We recommend channel seven. If channel seven is crowded with other traffic, you can select a different channel.
  - **Number of Clients** - Controls how many devices can connect, with a maximum of five devices.
  - **Lease Time** - indicates how often the connected Wi-Fi devices must renew their DHCP lease.
- Click **Submit** and restart unit to apply changes.



7.1.4. BACnet Tab

7.1.4.1. BACnet Configuration

The BAScontrol-E36 is BACnet/IP connected over Ethernet or BACnet MS/TP connections as well as an optional Wi-Fi connection by using a USB stick (sold separately). BACnet device settings must be configured when using BACnet.



Configure the following parameters:

- **Device Name** - The BACnet Device Object Name which BACnet clients/supervisors will see when the BAScontrol-E36 is discovered and/or trended into a database.
- **Device Instance** - A 22-bit value (0–4,194,302) and must be unique throughout the entire BACnet internetwork. Its default value is set to 2749.
- **UDP Port** - is set to 47808 as a decimal value, equivalent to BAC0 in hexadecimal by default. This UDP port number is used by BACnet clients when doing a discovery and communication on the BACnet network. This port number can be changed but must be the same with both the client and server BACnet devices for successful communication.
- **Broadcast Management Device (BBMD) IP Address** - the address of the BBMD device on the network. Enter the address of the BBMD with which the BAScontrol-E36 will perform Foreign Device Registration (FDR).

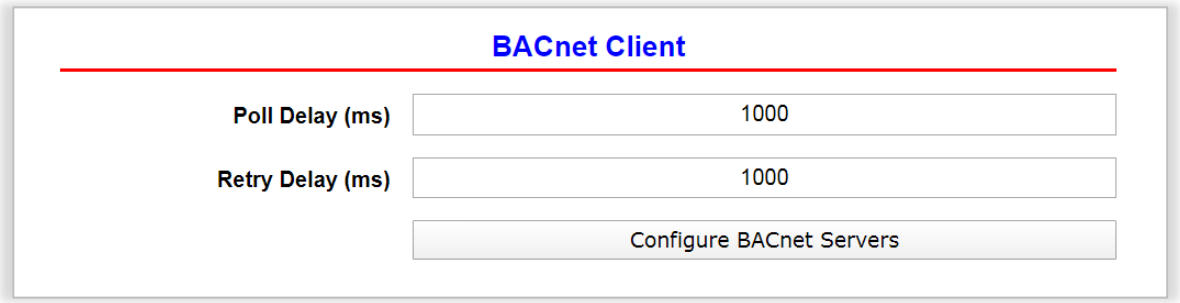
  NOTE - A BBMD feature requires a BACnet device with BBMD capability, such as a BACnet router, be installed and configured on the network – BASrouter, or BASrouterSX can be used as a BBMD.
- **BBMD Reg Time** - the BBMD registration time. Specify the seconds between successive FDR registrations. Default is 100.

- **Time Sync. (min.)** - the BACnet client TimeSync service time transmission interval setting. This can be used to synchronize the time on all BACnet devices on the network.
- **Interface** - Select **Wired** for Ethernet or **Wi-Fi** from the Interface dropdown selection – this is the network adapter the BACnet/IP client/server will operate on.

  NOTE: The BAScontrol-E36 can operate on both Ethernet and Wi-Fi network adapters concurrently, except for the BACnet/IP client/server which will only operate on the selected adapter.

7.1.4.2. BACnet Client Configuration

BACnet devices can act as clients, servers, or both. When a BACnet device is only a server, it only replies to a request from BACnet clients, such as your system head-end, supervisor, etc. When the BACnet device acts as a client, it can read or write BACnet objects in BACnet servers. The BAScontrol-E36 can be both a BACnet server and a BACnet client. BACnet Client parameters allow you to tune the poll delay and poll retry delay (in ms) for BACnet communication between the BAScontro-lE36 client and BACnet server devices on the network.



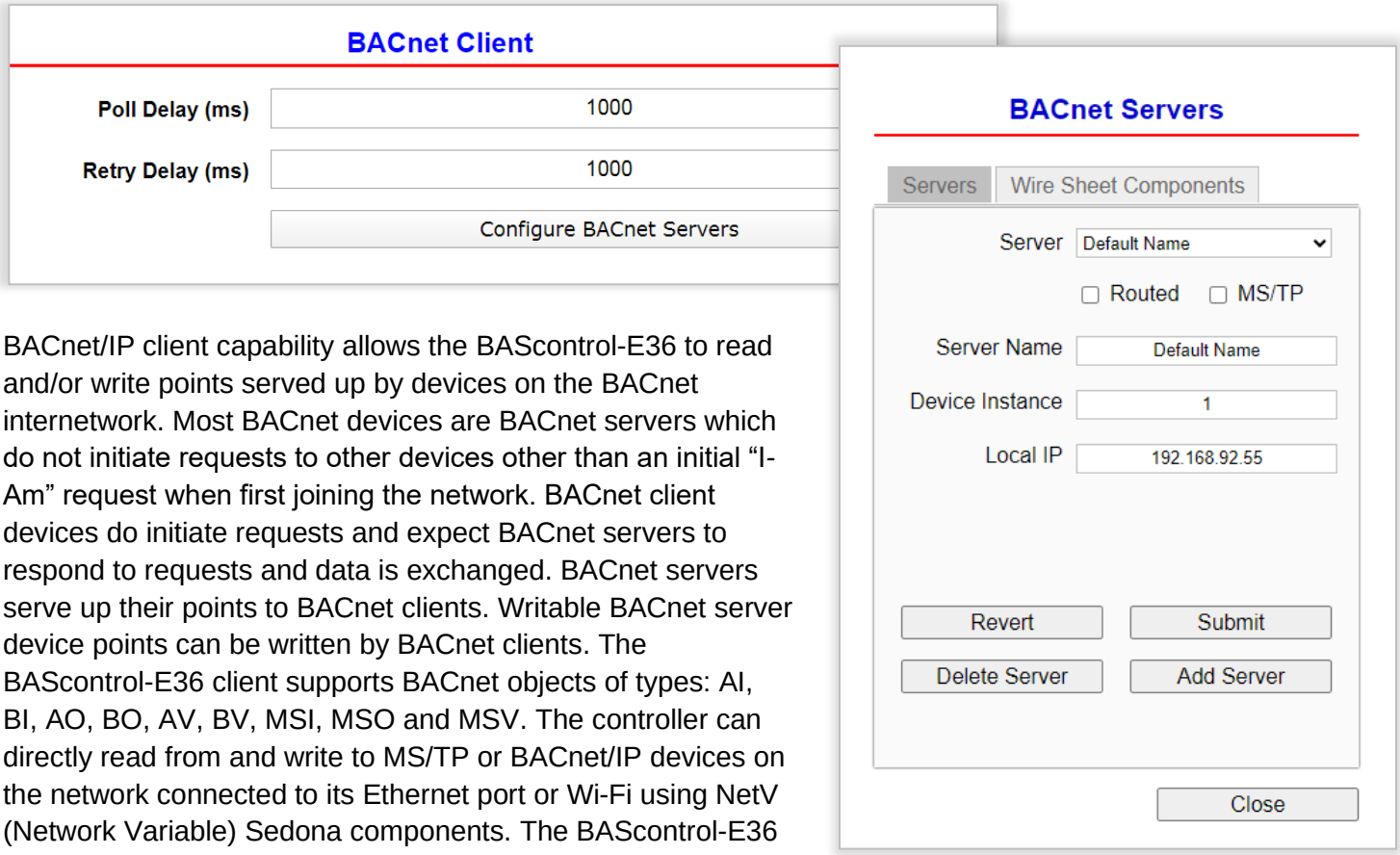
Configure the following parameters:

- **Poll Delay** - The default BACnet client Poll Delay is set to 1000 ms which is a very appropriate setting for delay between data point polls for most applications. Depending on your application and limitations of your network, this parameter should be set to a reasonable value. Lower values provide higher performance, higher values introduce less stress on the network.
- **Retry Delay** - If the BACnet client in the BAScontrol-E36 fails to read or write a BACnet point value for whatever reason (such as high network traffic or interrupted connection), it will retry every 1000 ms by default. Depending on your application and limitations of you network, this parameter should be set to a reasonable value. Lower values provide higher performance, higher values introduce less stress on the network.

  NOTE: Caution must be used when setting the Retry Delay value because if this parameter is set to an extreme value, such as 25 ms, and a point is continuously not available causing the BACnet client to fail reading/writing the point, the BACnet client will retry to read/write this point at the specified Retry Delay rate which could potentially flood the network with retry messages sent at a high frequency.

7.1.4.3. BACnet Servers Configuration

To set up a connection between the BAScontrol-E36 client and BACnet server device(s), you need to integrate the BAScontrol-E36 into your network by configuring its IP or MS/TP and BACnet device settings in accordance with your existing IP and BACnet network settings. Then, the BACnet Server device(s) parameters can be configured utilizing the **Configure BACnet Servers** button.



BACnet/IP client capability allows the BAScontrol-E36 to read and/or write points served up by devices on the BACnet internetwork. Most BACnet devices are BACnet servers which do not initiate requests to other devices other than an initial "I-Am" request when first joining the network. BACnet client devices do initiate requests and expect BACnet servers to respond to requests and data is exchanged. BACnet servers serve up their points to BACnet clients. Writable BACnet server device points can be written by BACnet clients. The BAScontrol-E36 client supports BACnet objects of types: AI, BI, AO, BO, AV, BV, MSI, MSO and MSV. The controller can directly read from and write to MS/TP or BACnet/IP devices on the network connected to its Ethernet port or Wi-Fi using NetV (Network Variable) Sedona components. The BAScontrol-E36 can also communicate through BACnet routers to BACnet servers.

Points obtained over the BACnet network can be used in the BAScontrol-E36 Sedona wiresheet control logic, become scaled, calculated, and/or converted to different data types, written to other BACnet devices, served up to BACnet supervisory controllers and operator workstations by using Virtual Components, as well as be monitored, displayed, or pushed to the Azure IoT Central cloud, exposed for configuration on the BAScontrol-E36 web page by the use of Web Components or Graphical Dashboard by use of Virtual Components.

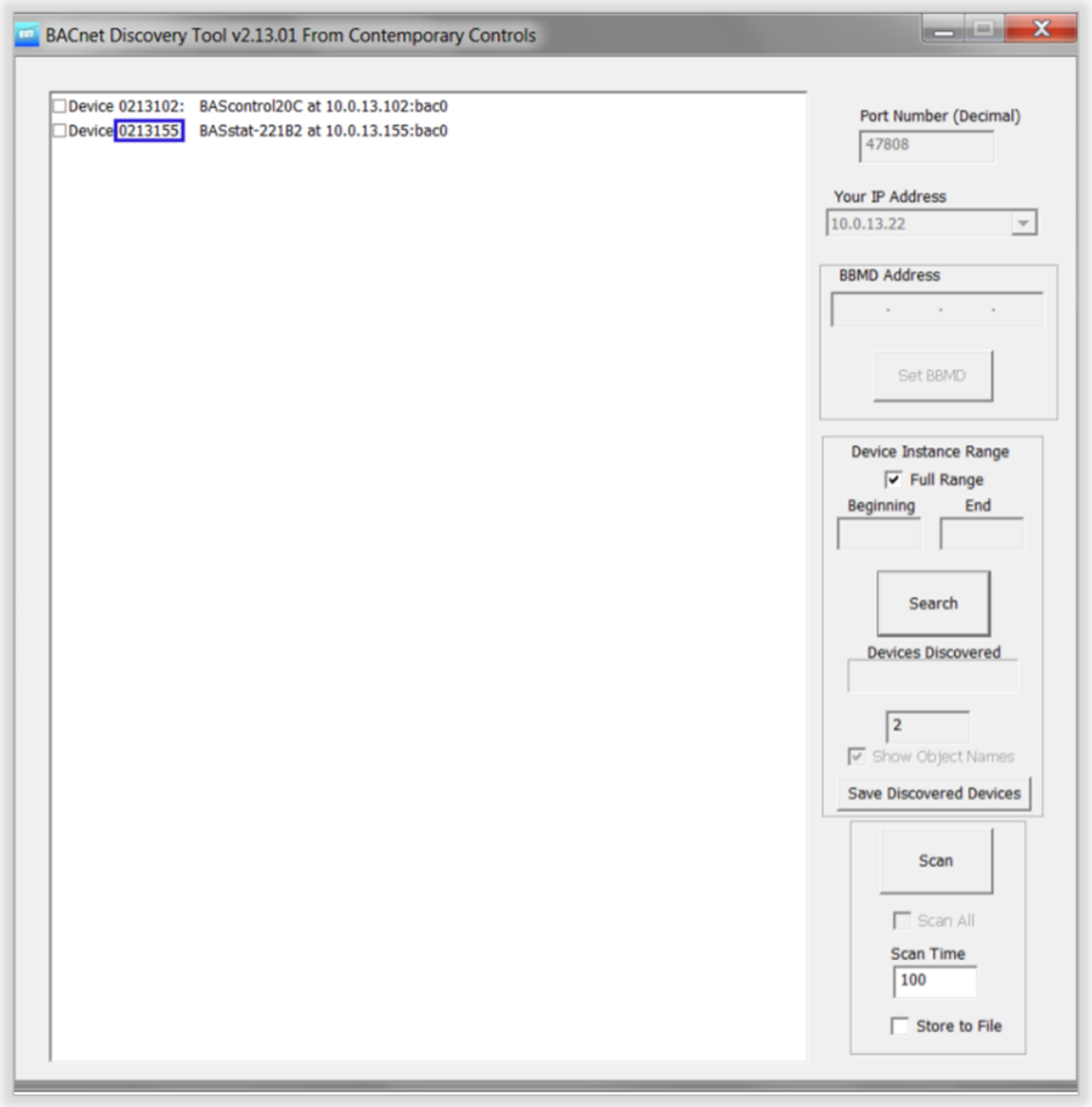
Reading points over BACnet networks can be useful in applications, such as averaging zone temperatures, reading an outside air temperature from a BACnet networked sensor device, reading zone temperatures, humidity, CO_2 PPM, and other comfort parameters from a BACnet networked wall setter/thermostat comfort device, or exchanging control values/points with another BACnet controller or supervisory controller/workstation. In applications which do not require a complete BMS/head end, the BAScontrol-E36 can be used to read and write points among BACnet devices. In remote access applications, by employing Remote Access VPN IP routers (such as EIPR-V, EIGR-V, or EIGR-C), the BAScontrol-E36 client can obtain and write BACnet points from devices on a remote BACnet network. Once you have configured the BAScontrol-E36 BACnet system settings, you are ready to set up the BACnet server devices to which the BAScontrol-E36 will communicate.

BACnet Discovery Tool for IP Devices

The BACnet Discovery Tool (BDT) can be very helpful when setting up BACnet Server Devices. All BACnet server configuration parameters such as Server Name, Device Instance, Local IP, etc. can be obtained by using the free BACnet Discovery Tool - BDT.

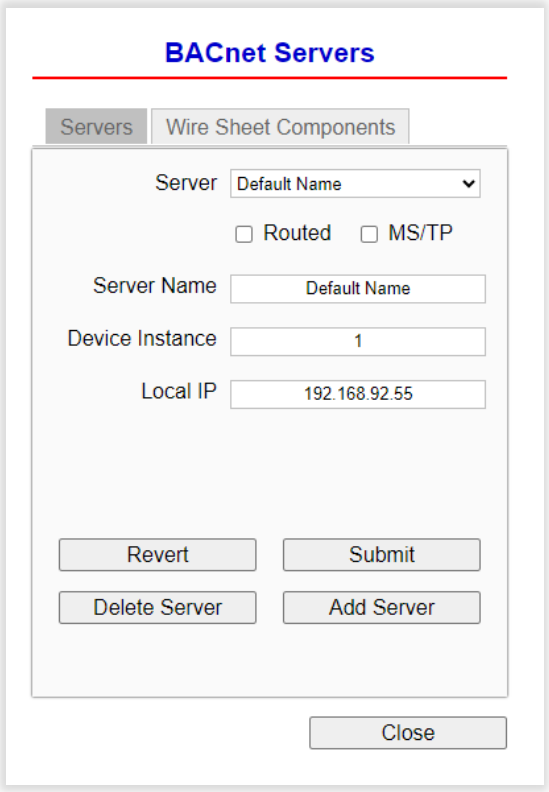
BDT can be used to assist you in BACnet Server device configuration if the server device(s) is already online and available on the BACnet network. The tool is simple and easy to use. It discovers BACnet devices on the network available at the specified UDP port number (usually 47808). BDT will list the discovered BACnet server device's Device Instance number, Device Name, IP address, or MAC address (if the device is routed from BACnet MS/TP to BACnet/IP). If you know the BACnet server device parameters, or they are not yet online and discoverable on the BACnet network, you can enter their configuration parameters without the use of a BACnet discovery tool.

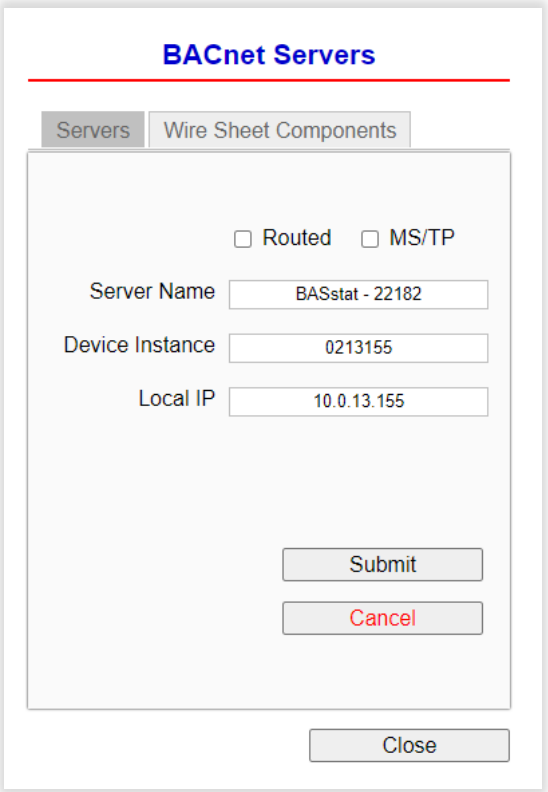
The BDT can also be used to commission BACnet devices and/or verify proper BACnet network operation by discovering devices and points and reading and/or writing points. More of the BDT features are outlined in the BDT Instruction Sheet provided with the tool download.



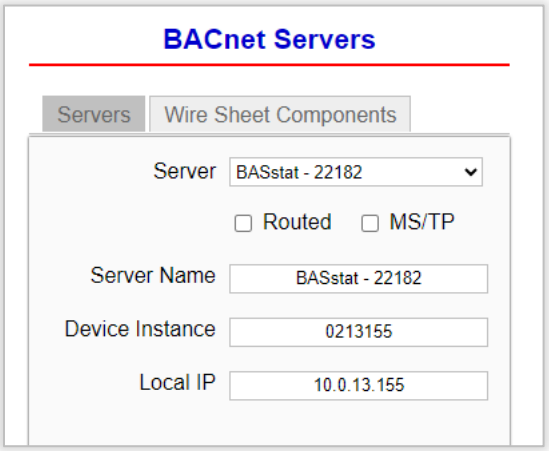
Configure BACnet/IP Server Device

Configure a BACnet sever to BAScontrol-E36 client communication:





- Click the **Add Server** button.
- If the server device is BACnet/IP networked and is not routed (through a BACnet router), you do not need to check the **Routed** or **MS/TP** checkboxes.
- Enter a unique **Server Name**. The name can be anything which helps you identify the device, or it can be the actual Device Object Name of the BACnet server device as seen by other BACnet clients or in BACnet discovery tools.
- Enter the unique **Device Instance** number of the BACnet server device. This can be seen in the BDT (outlined in blue in the BDT image above), or it can be obtained from the BACnet server device's settings web page or hardware configuration, if available. The Device Instance number will also be entered in the NetV (Network Variable) component(s) in the Sedona wiresheet for points applicable to this BACnet server device. Enter **Local IP** which is the IP address of the BACnet server device. This can also be seen in the BDT, or it can be obtained from the device's settings web page or network administrator.
- Click **Submit** to save the server device configuration.



The server device configuration will be listed in the Servers drop-down on the BACnet Servers page. Repeat the process for adding more server devices. There is no limit on devices imposed, however it is not recommended to add more than 10 devices.

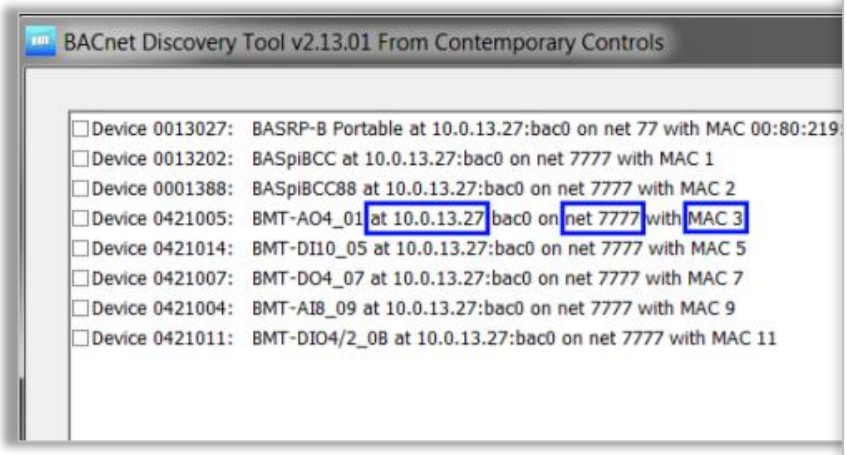
You must restart the BAScontrol-E36 to activate BACnet server device communication: Close the BACnet Servers and System Configuration pages and click **Restart Controller** from the main web page.

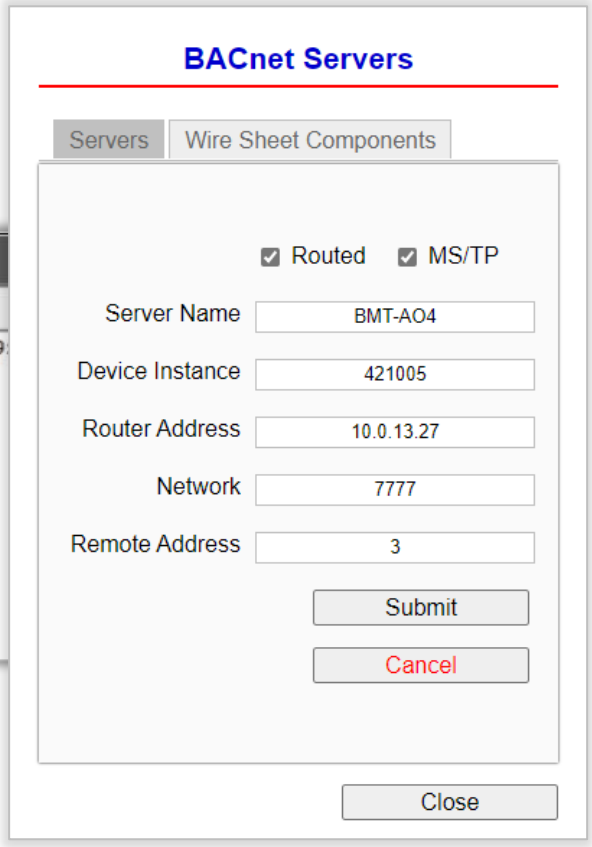
After this process, the NetV components which use the BACnet Server Configuration can be utilized on the Sedona wiresheet.

Configure Routed BACnet MS/TP Server Device

MS/TP server devices reached through the BAScontrol-E36 can also be used. Configuring a routed BACnet MS/TP device is done in a similar fashion. A BACnet router (such as BASrouter or BASrouterSX) is needed to route the BACnet MS/TP device to BACnet/IP, so the BAScontrol-E36 can communicate with it on the BACnet/IP network.

- Click the **Add Server** button.
- Check **Routed** and **MS/TP**.
- Use the BDT to perform a discovery to obtain all configuration parameters or simply enter them in if they are known. Enter server values shown in the BDT example below:
  - **Server Name**
  - **Device Instance**
  - **Router Address** and **Network** (net) for BACnet MS/TP device routed to BACnet/IP
  - **MAC (Remote) Address**
- Click **Submit**





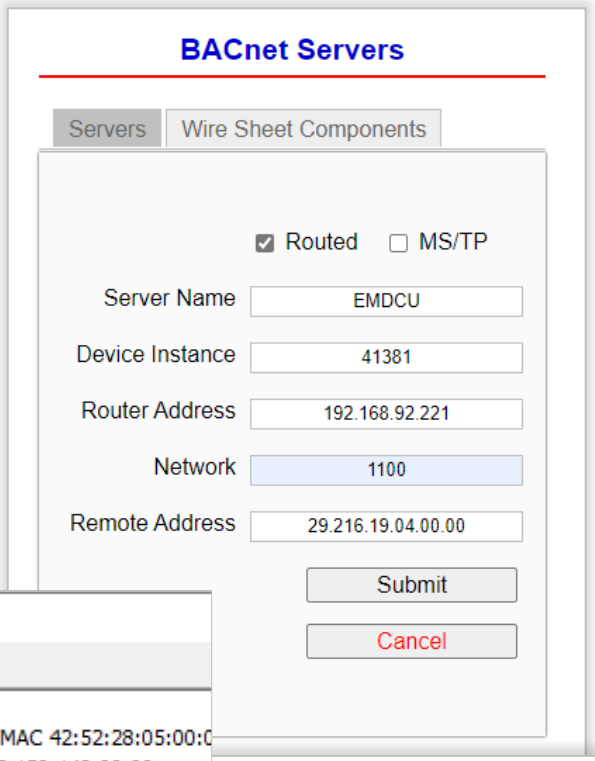
The server device configuration will now be listed in the Server drop-down. Repeat the process for adding more server devices. There is no limit on devices imposed, however it is not recommended to add more than 10 devices.

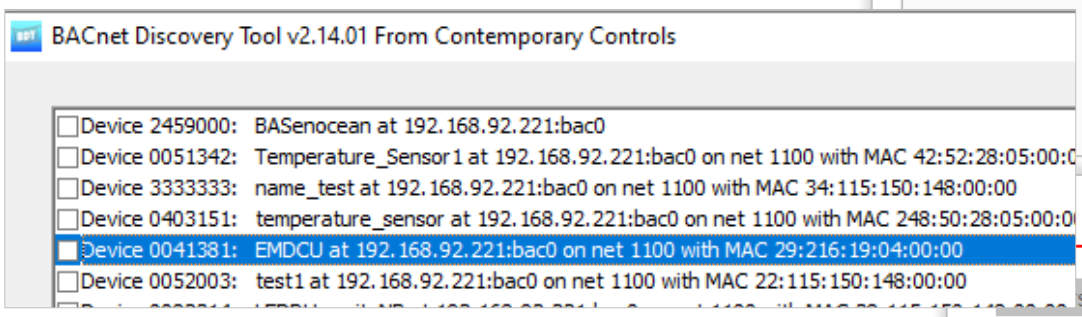
Restart the BAScontrol-E36 to activate the configuration.

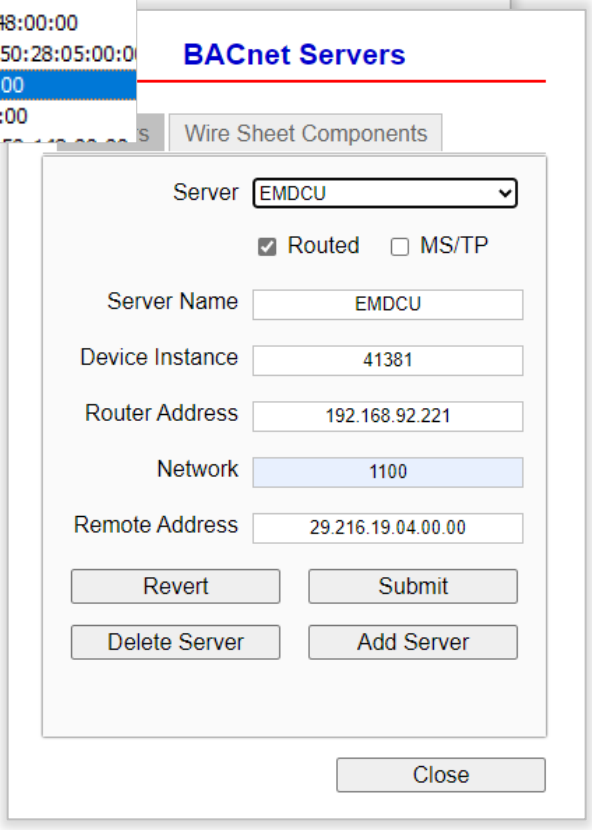
Configure Routed BACnet non-MS/TP Server Device

BACnet servers may have more complex MAC addresses when being routed. For example, the Modbus devices routed through our BASgatewayLX will have 6-byte MAC addresses. Also, our EnOcean gateway will use 6-byte MAC addresses for EnOcean devices which appear on the BACnet network.

- Click the **Add Server** button.
- Select the **Routed** checkbox.
- Enter server values shown in the BDT example below:
    - **Server Name**
    - **Device Instance**
    - **Router Address**
    - **Network**
    - **MAC (Remote) Address** enter the bytes of the unit's MAC address in the Remote Address box with "." between each byte, for example, "29.216.19.04.00.00." Devices with 4-byte addresses can also be supported in a similar manner.
- Click **Submit**





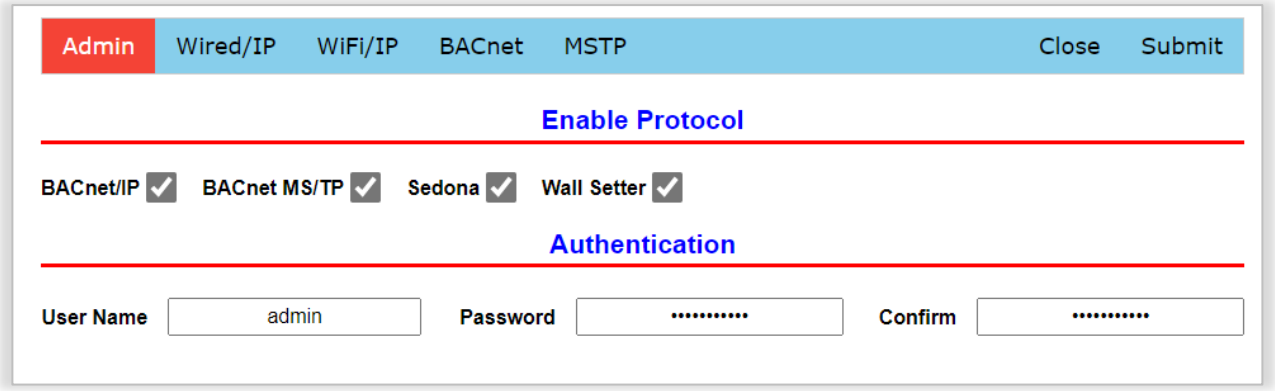


The server device configuration will now be listed in the Server drop-down. Repeat the process for adding more server devices. There is no limit on devices imposed, however it is not recommended to add more than 10 devices.

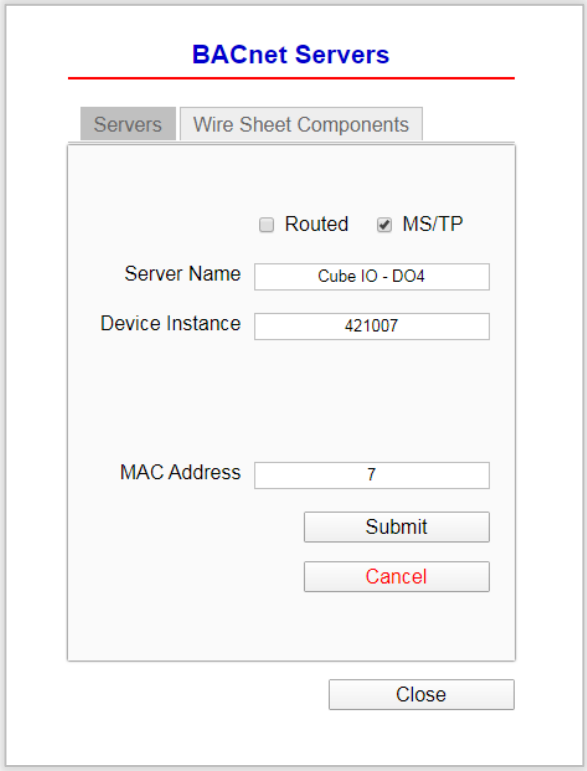
Restart the BAScontrol-E36 to activate the configuration.

Configure BACnet MS/TP Devices

BAScontrol-E36 can be discovered as an MS/TP server device. In addition, it can directly read and/or write BACnet MS/TP device points on the connected bus.



- To activate BACnet MS/TP server functionality, return to the Admin tab and check **BACnet MS/TP**.
- Return to BACnet tab->Configure BACnet Servers
- Click the **Add Server** button
- Check **MS/TP**
- Enter:
  - **Device Name**
  - **Device Instance**
  - **MAC address**.
- Click **Submit**



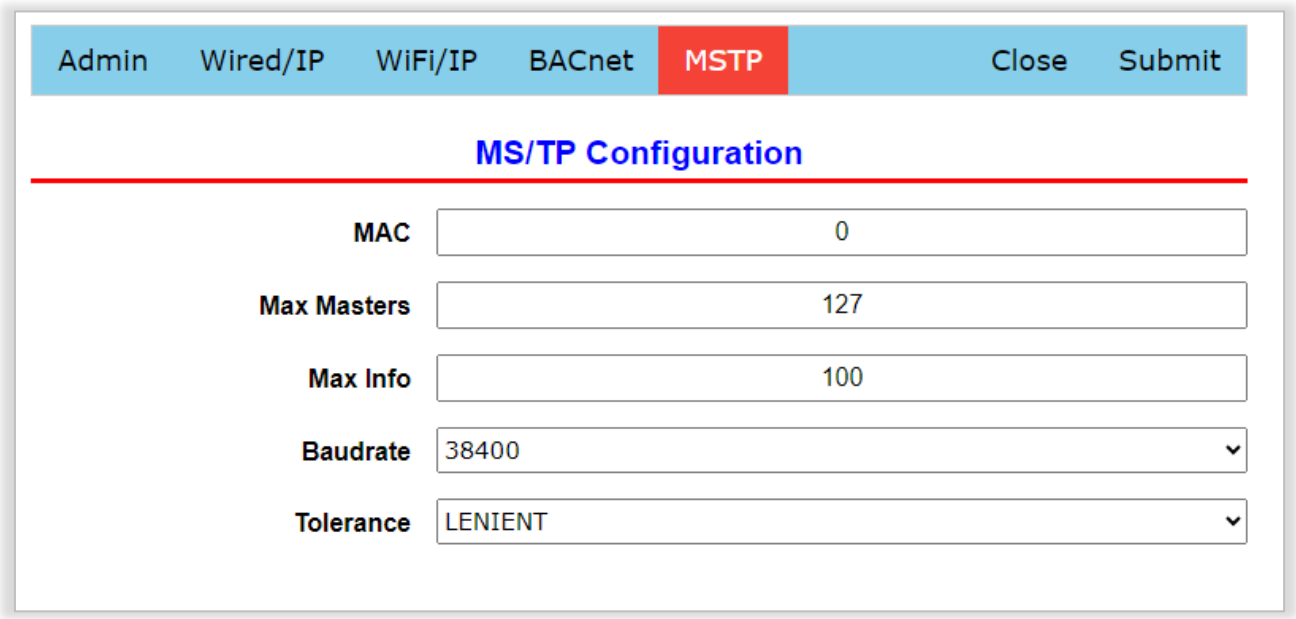
The server device configuration will now be listed in the Server drop-down. Repeat the process for adding more server devices. There is no limit on devices imposed, however it is not recommended to add more than 10 devices.

Restart the BAScontrol-E36 to activate the configuration.

After the reboot, the BAScontrol-E36 is ready to poll points from or write points to the configured BACnet server devices configured. BACnet server device points are configured from the Sedona wiresheet in the BAScontrol-E36 using NetV (Network Variable) components. To open the Sedona wiresheet of the BAScontrol-E36, you can use our free Sedona Application Editor (SAE). The Sedona Application editor is available for free as part of the BAScontrol Toolset.

7.1.5. MSTP Tab

To activate BACnet MS/TP client/server functionality, return to the Admin tab and check **BACnet MS/TP**.



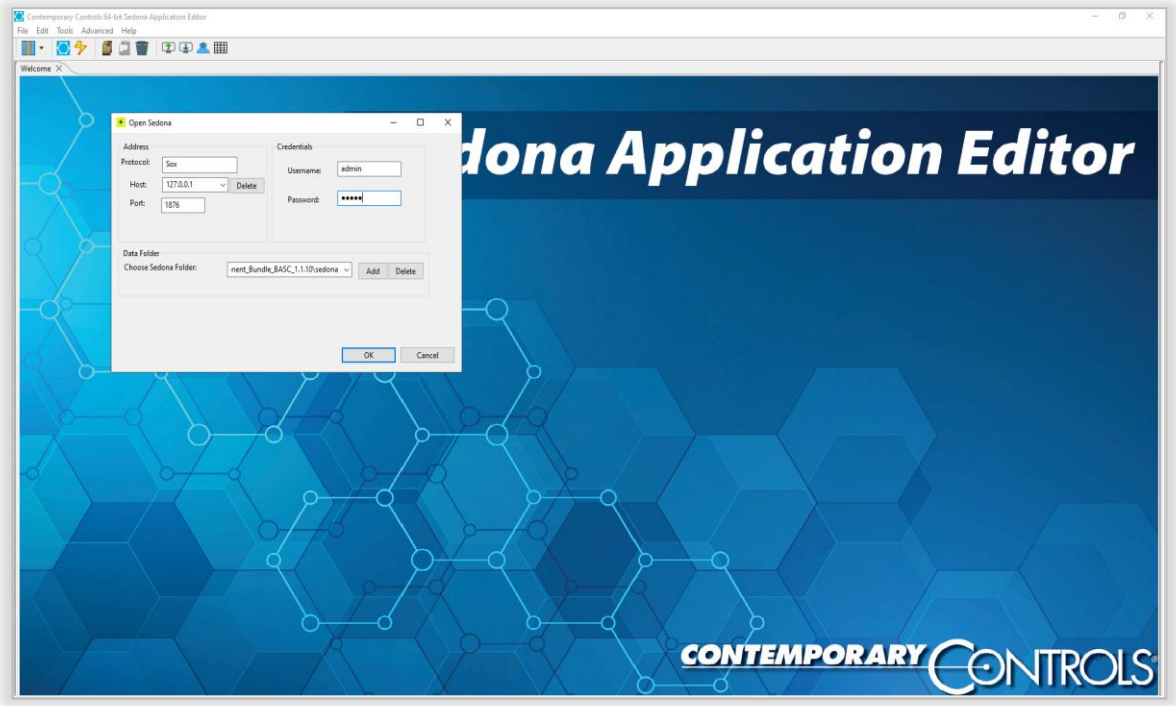
Configure the following parameters:

- **MAC Address** – BAScontrol-E36 MAC address must be a unique 8-bit (0–127) value in decimal. Lower MAC address numbers are preferred. To optimize token passing and data exchange, all other BACnet devices attached to the same MS/TP network should be assigned consecutive MAC addresses beginning with 1, without allowing any gaps in addressing
- **Max Masters** - Only master nodes participate in the MS/TP token-passing process. BAScontrol-E36 does not support BACnet MS/TP slave device communication. The highest master MAC address (in decimal) in the MS/TP network is 127, and you should use 127 if you are unsure of other MS/TP device addresses. Each MS/TP device should use this same value. For a value in this field to be proper, it must equal or exceed the highest MAC address for any master present on the network. Optimum performance occurs when this value: equals the highest MAC address of any master, and all masters use sequential MAC addresses starting with 1. Since many BACnet devices do not allow this parameter to be changed, Max Master value of 127 is universal and will ensure a working network.
- **Max Info** - Max Info is the maximum number of messages that can be exchanged onto the MS/TP network by the BAScontrol-E36 per token pass. Its range is 1–100, and the typical value is 100. The default value provides good performance especially if the BAScontrol-E36 BACnet client is reading/writing values directly from the BACnet MS/TP network.
- **Baud Rate** - The baud rate of the MS/TP network can be 9600, 19200, 38400, 57600, 76800, or 115200 bps. All MS/TP devices on the same MS/TP network must use the same baud rate for successful communication.
- **Tolerance** - This setting determines the degree to which interoperability with devices is successful. The Lenient option is less efficient for traffic flow but optimizes interoperability and therefore is chosen as default.
    - When using **Lenient**, the BAScontrol-E36 will wait longer for devices to respond to a poll for a master request.

- A slight improvement in performance will be realized by selecting the **Strict** setting given that the network is optimized, and other devices are able to respond fast enough.

7.1.6. Configure BACnet Server Device Points Using Sedona

The points of the previously configured BACnet server devices are configured from the BAScontrol-E36 Sedona wiresheet. In order to configure server device points, open a Sedona connection to the BAScontrol-E36. The example below uses Contemporary Controls' free Sedona Application Editor (SAE).



7.1.6.1. Connect to the SAE

- Click the **Open Connection** button on the SAE toolbar and type the BAScontrol-E36's IP address in the Host field.
- Enter the default credentials of **admin** for Username and Password.
- Click **OK** to connect.

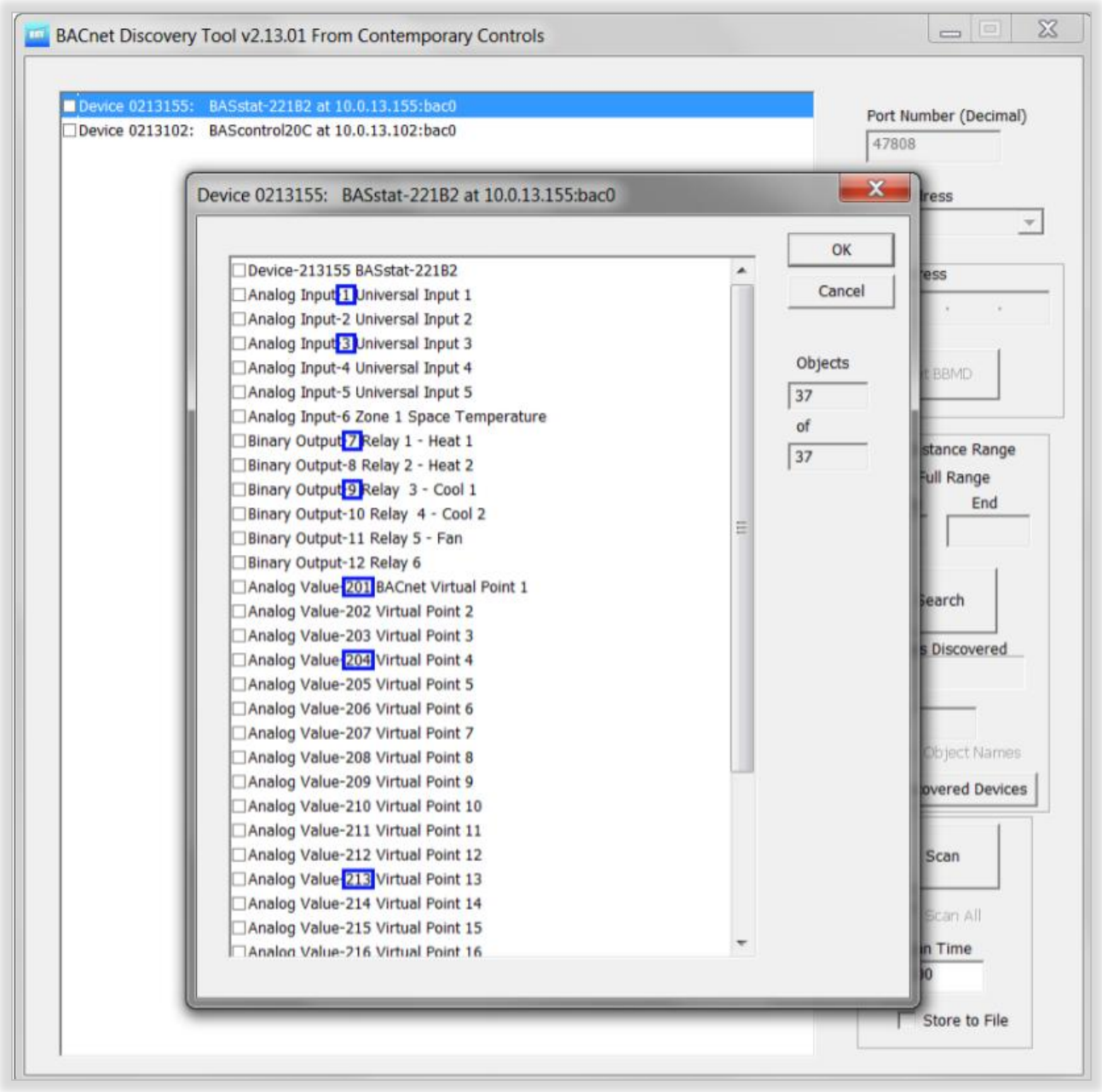
The BAScontrol-E36 wiresheet will open, and you are ready to write wiresheet logic as well as configure BACnet server points.

7.1.6.2. Create and Configure NetV Components

Network Variable (NetV) components are available in the CControls_BASCE36_NETV kit. To create a NetV component, drag-and-drop it onto the wiresheet. Then, the NetV component must be configured to communicate with one of the BACnet server devices configured in the previous section.

To configure a NetV component, the NetV component must have the **Device Instance** and **Object Instance** configured, and they must be the same as previously configured on the System Configuration-> BACnet tab-> Configure BACnet Servers page.

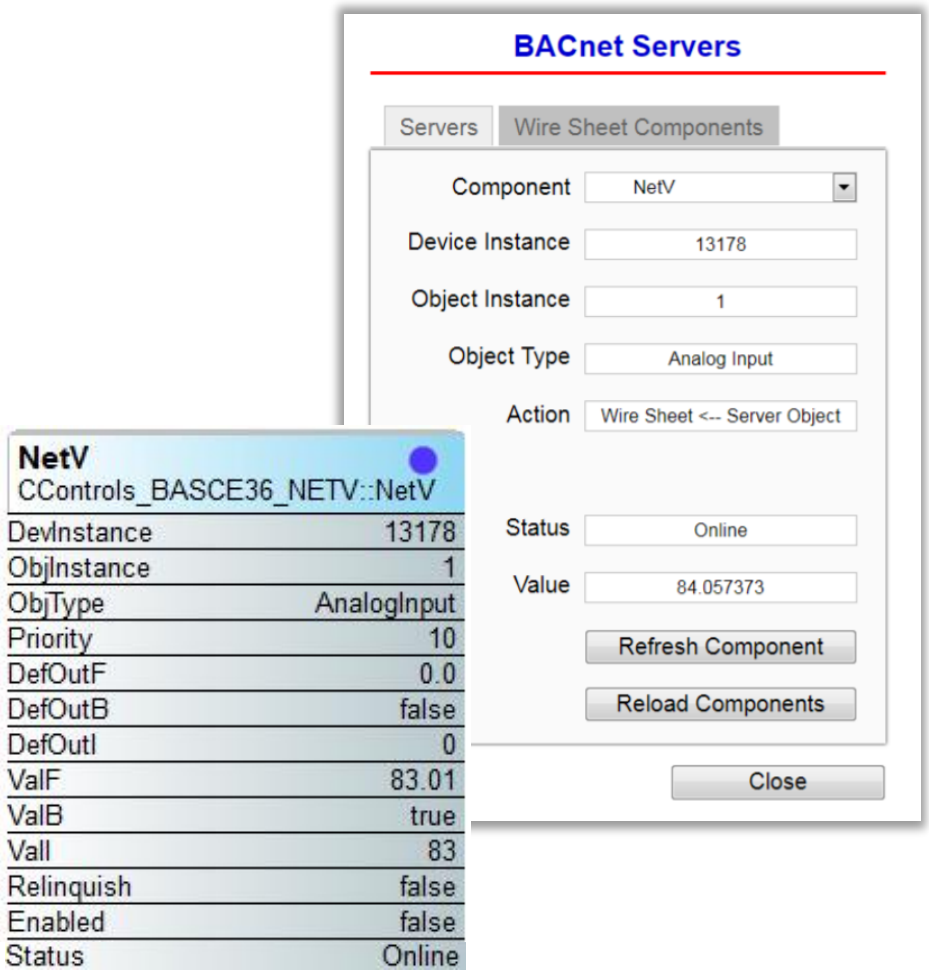
With BDT, you can discover the object types and object instances required to configure the NetV components. For example, we are looking at the objects in a BASstat. We can see the object types and object instances that could be used in a NetV which would be used to communicate with the BASstat that has already been configured as a BACnet server in the BAScontrol-E36. The **Object Instance** can be seen in the BDT, as shown outlined in blue in the image below.



The **OutUse** slots must be configured as Input or Output before the NetV can get to Online state. (Refer to the next sections NetV Component Types and Example for details.)

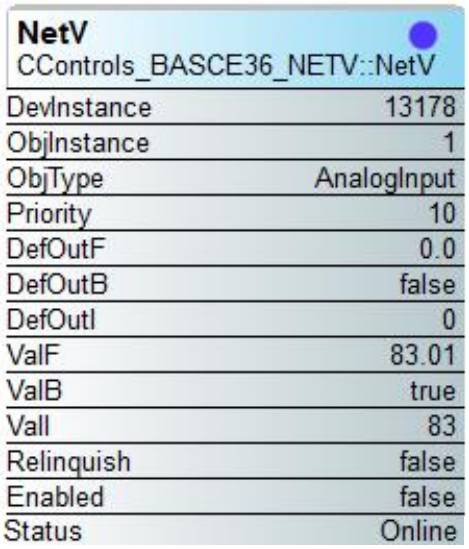
Once you have configured the NetV objects and they have come to Online state, you can observe the NetV components state for each configured BACnet server device on the Configure BACnet Servers web page.

- Click the **Wiresheet Components** Tab.
- Select the **Components** drop-down menu and choose the desired NetV component.
- Click **Refresh Component** to refresh its data.
- Select **Reload Components** to reload the component in the case of loss of communication with the BACnet server.



NetV Component Types

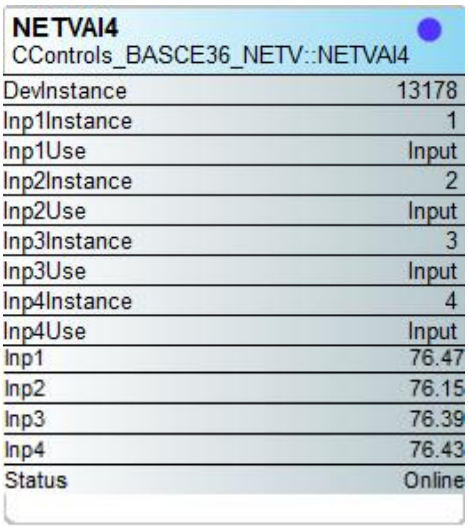
NetV Component



NetV is a read/write component. It is the most universal component in the client kits which can be configured to read or write a single point (object) on the target BACnet server device.

- **DevInstance** - must have the correct target device instance configured which must be the same as the device instance of the target device configured on the System Configuration-> BACnet tab-> Configure BACnet Servers page.
- **ObjInstance** - must be configured with the correct target device object instance to be read/written.
- **ObjType** - can be of any of the following BACnet object types and configured as Analog Input (AI), Analog Output (AO), Analog Value (AV), Binary Input (BI), Binary Output (BO), or Binary Value (BV),
    - If the point configured in the NetV is a writable point, such as AO, AV, BO, or BV, and you need to write to the point, **Enabled** must be set to true.
    - If enabled is false, then these objects are read-only.
    - If the object is read only, such as AI or BI, set **Enabled** to false.
- **Priority** - lets you configure the BACnet write priority for writable objects with range of 1 through 16 and default value of 10.
- **DefOutF, DefOutB,** and **DefOutI** - are used to set a safe default value for an output or input in Float, Bool, and Integer data types. If the NetV object is offline (server device not reachable), you need to be able to put the system Sedona logic in a safe state using these slots.
- **ValF, ValB,** and **ValI** -
    - Read the target object present value property when Enabled slot is set to false
    - Command (write) the target object present value property when Enabled slot is set to true.
- **Relinquish** -
    - Triggered to true: it releases the writable target object by removing the write and setting the specified write priority of the configured target object to NULL.
    - Toggled back to false: the write to the target object at the specified priority is applied again.
- **Enabled** - is used to set the point (object) as writable when set to true or read only when set to false.
- **Status** - indicates the Online, Offline, or Not Configured states for the target object.

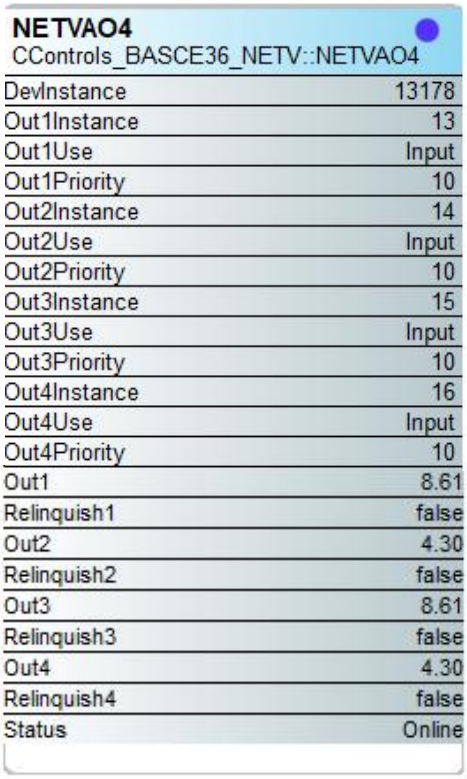
NETVAI4 Component



NETVAI4 is a read only component that allows the reading of up to four BACnet objects on the remote BACnet server device of type Analog Input (AI).

- **DevInstance** - must have the correct target device instance configured which must be the same as the device instance of the target device configured on the System Configuration-> BACnet tab-> Configure BACnet Servers page.
- **Inp1Instance, Inp2Instance, Inp3Instance,** and **Inp4Instance** - must be configured with the correct target device object instances to be read.
- **Inp1Use, Inp2Use, Inp3Use,** and **Inp4Use** - allow you to set the use for each of the four objects. Since the NETVAI4 is a read-only component, the two options are Input and Not Used.
- **Inp1, Inp2, Inp3, Inp4** - display the target object present value property read from the target BACnet server device.
- **Status**: indicates the Online, Offline, or Not Configured states for the target object.

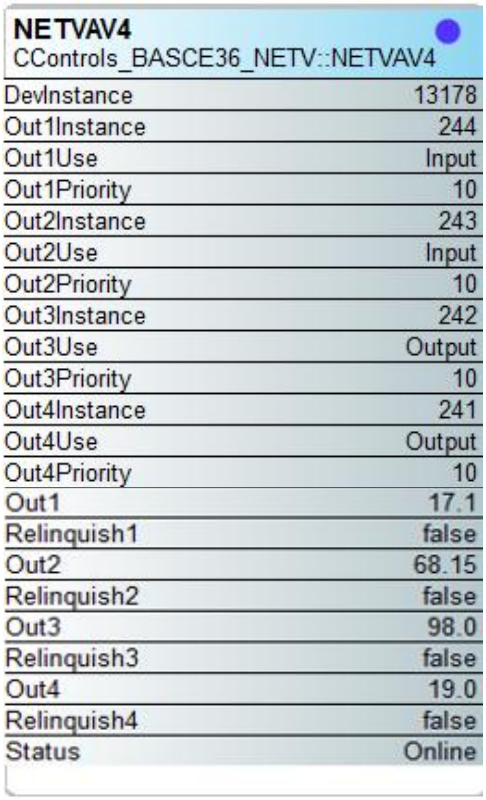
NETVAO4 Component



NETVAO4 is a read/write component that allows the reading or writing of up to four BACnet objects of type Analog Output (AO).

- **DevInstance** - must have the correct target device instance configured which must be the same as the device instance of the target device configured on the System Configuration-> BACnet tab-> Configure BACnet Servers page.
- **Out1Instance, Out2Instance, Out3Instance,** and **Out4Instance** - must be configured with the correct target device object instances to be read.
- **OutUse,** when configured for -
  - Input: the component reads the target device AO object present value property.
  - Output: the component writes to the target device AO object present value property.
  - NotUsed: the slot is not in use.
- **Out1Priority, Out2Priority, Out3Priority,** and **Out4Priority** - let you configure the BACnet write priority for writable target objects with range 1 through 16 and default value of 10.
- **Out1, Out2, Out3,** and **Out4** -
  - Read the target object present value property when OutUse slot is set to Input.
  - Command (write) to the target object present value property when OutUse slot is set to Output.
- **Relinquish1, Relinquish2, Relinquish3,** and **Relinquish4** -
  - Triggered to true – releases the writable target objects by removing the write and setting the specified write priority of the configured target objects to NULL.
  - Toggled back to false - the write to the target object at the specified priority is applied again.
- **Status** - indicates the Online, Offline, or Not Configured states for the target object.

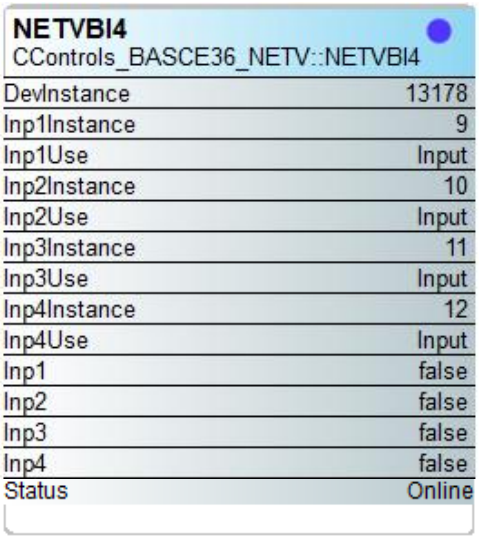
NETVAV4 Component



NETVAV4 component allows reading or writing of up to 4 BACnet objects of type Analog Value (AV).

- **OutUse**, when configured for -
  - Input: the component reads the target device AV object present value property.
  - Output: the component writes to the target device AV object present value property.
  - NotUsed: the slot is not in use. Slots configured as NotUsed: will not consume RAM memory.
- **OutPriority** - let you configure the BACnet write priority for writable target objects with range 1 through 16 and default value of 10.
- **Out1, Out2, Out3,** and **Out4** -
  - Read the target object present value property when **OutUse** slot is set to Input.
  - Command (write) to the target object present value property when **OutUse** slot is set to Output.
- **Relinquish** -
  - Trigged to True – it releases the writable target object by removing the write and setting the specified write priority of the configured target object to NULL.
  - Toggled back to False - the write to the target object at the specified priority is applied again.
- **Status** - indicates the Online or Offline state for the target object.

NETVBI4 Component

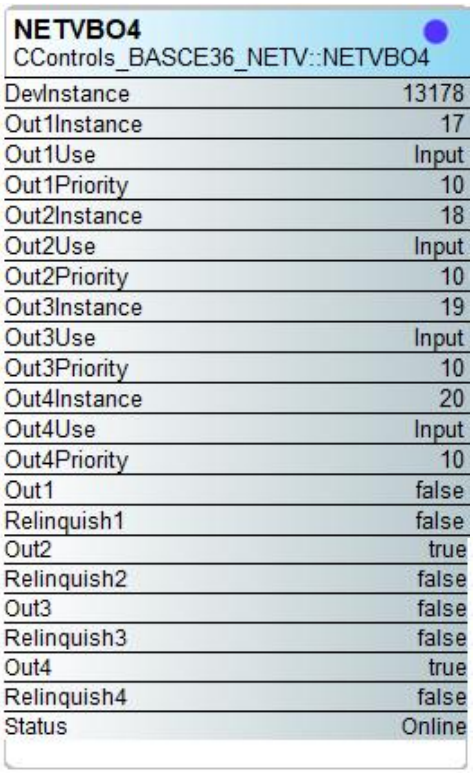


NETVBI4 is a read only component that can read up to four BACnet objects of type Binary Input (BI).

- **DevInstance** - must have the correct target device instance configured which must be the same as the device instance of the target device configured on the System Configuration-> BACnet tab-> Configure BACnet Servers page.
- **Inp1Instance, Inp2Instance, Inp3Instance, Inp4Instance** - must be configured with the correct target object instances to be read.
- **Inp1Use, Inp2Use, Inp3Use, and Inp4Use** - allow you to set the use for each of the four objects. Since the NETVBI4 is a read only component, the two options are Input and Not Used.
- **Inp1, Inp2, Inp3, and Inp4** - display the target object present value property read from the target BACnet server device.
- **Status** - indicates the Online, Offline, or Not Configured states for the target object.

NETVBO4 Component

NETVBO4 is a read/write component that reads or writes up to four BACnet objects of type Binary Output (BO).

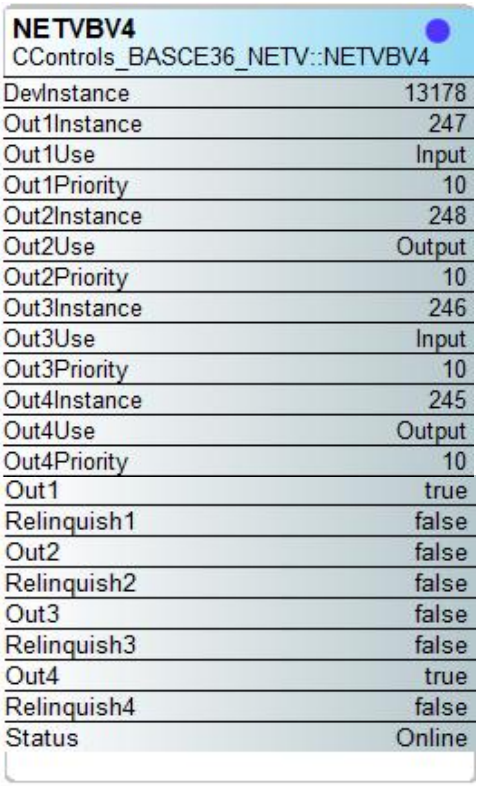


- **DevInstance** - must have the correct target device instance configured which must be the same as the device instance of the target device configured on the System Configuration-> BACnet tab-> Configure BACnet Servers page.
- **Out1Instance, Out2Instance, Out3Instance, Out4Instance** - must be configured with the correct target device object instances to be read.
- **OutUse**, when configured for -
    - Input: the component will read the target device BO object present value property
    - Output: the component will write to the target device BO object present value property.
    - NotUsed: the slot is not in use.
- **Out1Priority, Out2Priority, Out3Priority, Out4Priority** - let you configure the BACnet write priority for writable target objects with range 1 through 16 and default value of 10.
- **Out1, Out2, Out3,** and **Out4** -
    - Read the target object present value property when OutUse slot is set to Input.
    - Command (write) to the target object present value property when OutUse slot is set to Output.
- **Relinquish1, Relinquish2, Relinquish3,** and **Relinquish4** -
    - Triggered to true: are used to release the writable target objects by removing the write and setting the specified write priority of the configured target objects to NULL
    - Toggled back to false: the write to the target object at the specified priority is applied again.
- **Status** - indicates the Online, Offline, or Not Configured states for the target object.

NOTE: Any BACnet object (Object Instance) from the same BACnet device (Device Instance) can only be used in the BAScontrol-E36 Sedona wiresheet once. If a second instance of the same BACnet Object Instance with the same Device Instance is created/configured, one of the two instances will be Offline.

NETVBV4 Component

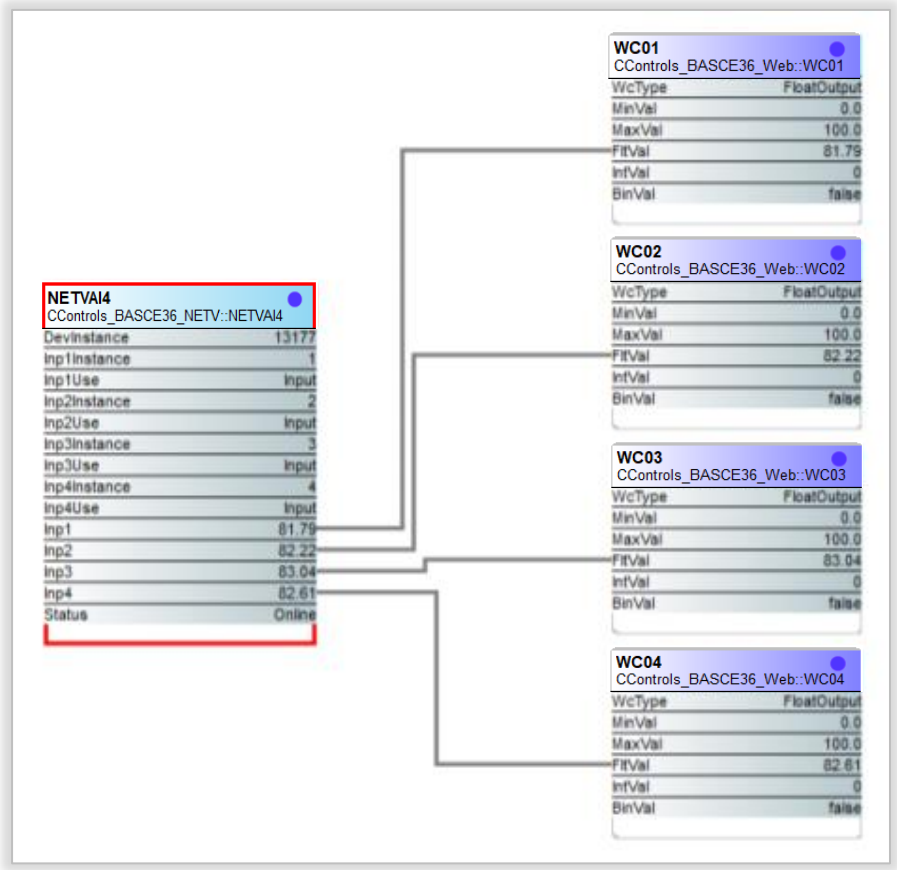
NETVBV4 component allows reading or writing of up to four BACnet objects of type Binary Value (BV).



- **OutUse**, when configured for -
    - Input: the component will read the target device BV object present value property.
    - Output: the component will write to the target device BV object present value property.
    - NotUsed: the slot is not in use. Slots configured as NotUsed: will not consume RAM memory.
- **OutPriority** - let you configure the BACnet write priority for writable objects with range 1 through 16 and default value of 10.
- **Out1, Out2, Out3, and Out4** -
    - Read the target object present value property when **OutUse** slot is set to Input.
    - Command (write) to the target object present value property when **OutUse** slot is set to Output.
- **Relinquish** -
    - Triggered to true: is used to release the writable target object by removing the write and setting the specified write priority of the configured target object to NULL.
    - Toggled back to false: the write to the target object at the specified priority is applied again.
- **Status** - indicates the Online or Offline state for the target object.

Examples

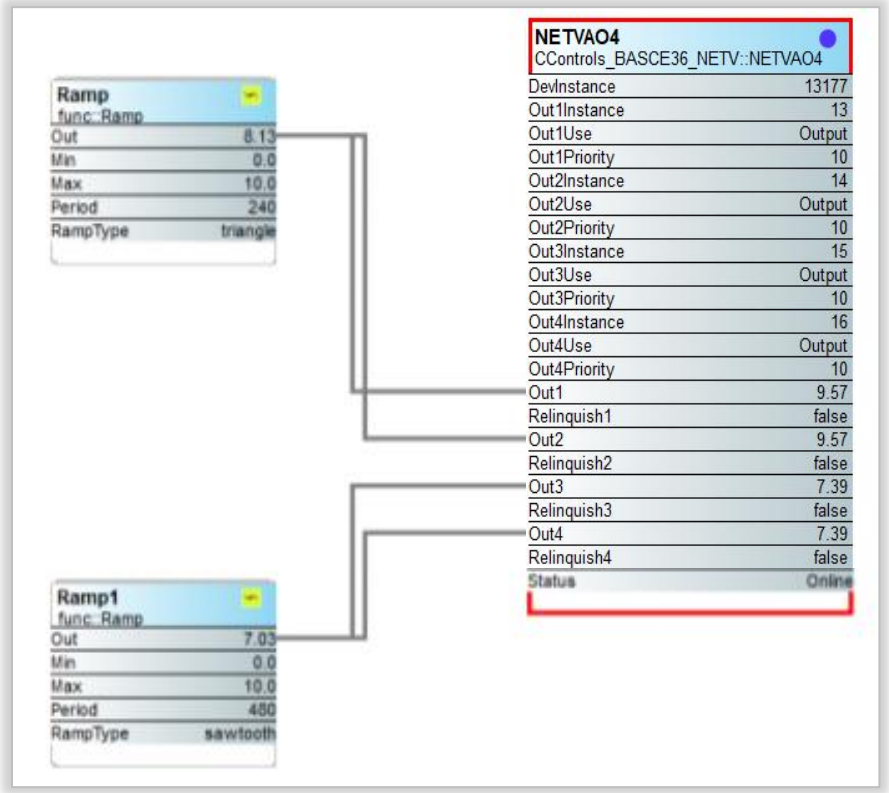
Example 1: A NETVAI4 configured to read four Analog Inputs from a BACnet server on the network.



Property	Value
NETVAI4	
Name	NETVAI4
Meta	236322817
DevInstance	13177
Inp1Instance	1
Inp1Use	Input
Inp2Instance	2
Inp2Use	Input
Inp3Instance	3
Inp3Use	Input
Inp4Instance	4
Inp4Use	Input
Inp1	81.62
Inp2	82.67
Inp3	83.71
Inp4	83.36
Status	Online

NETVAI4 Property Pane Configuration:

Example 2: A NETVAO4 configures to write to four Analog Outputs from a BACnet server on the network.



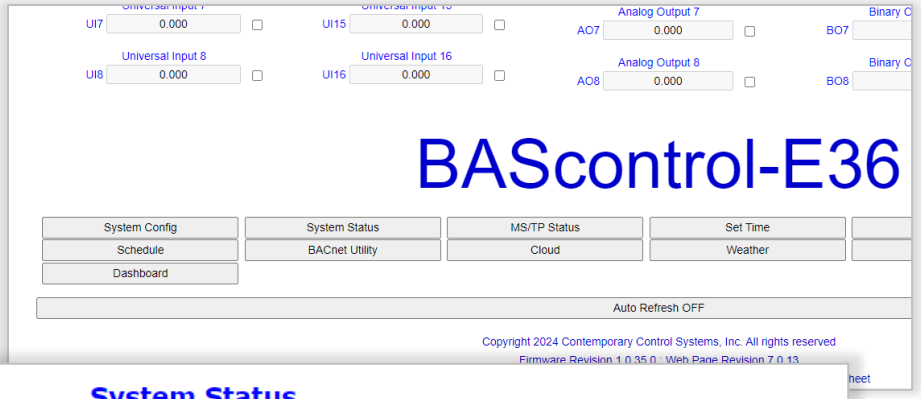
Property	Value
NETVAO4	
Name	NETVAO4
Meta	504299521
DevInstance	13177
Out1Instance	13
Out1Use	Output
Out1Priority	10
Out2Instance	14
Out2Use	Output
Out2Priority	10
Out3Instance	15
Out3Use	Output
Out3Priority	10
Out4Instance	16
Out4Use	Output
Out4Priority	10
Out1	9.57
Relinquish1	false
Out2	9.57
Relinquish2	false
Out3	7.39
Relinquish3	false
Out4	7.39
Relinquish4	false
Status	Online

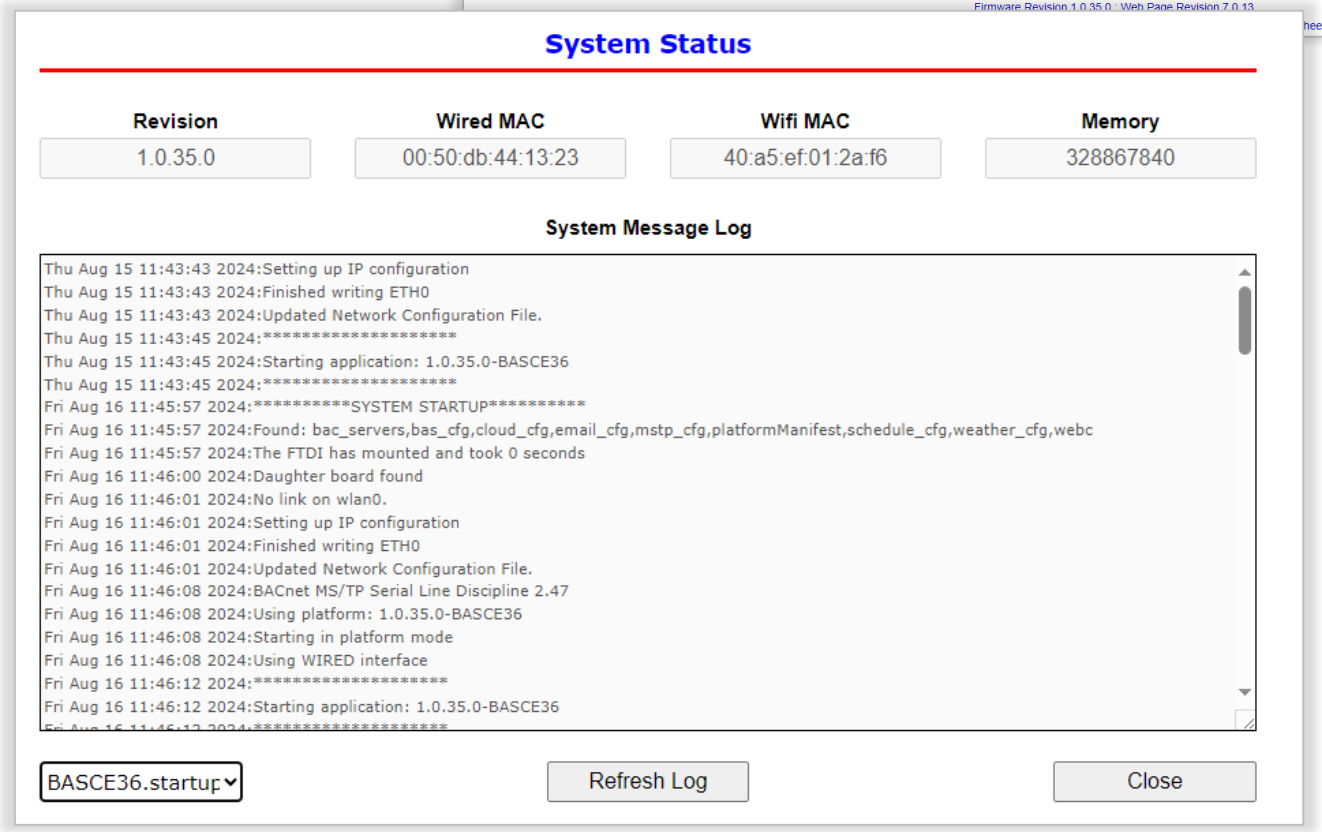
NETVAO4 Property Pane Configuration

7.2. System Status

From the BAScontrol-E36 main web page, click the **System Status** button.

The System Status page provides useful information for tech support and troubleshooting the BAScontrol-E36.

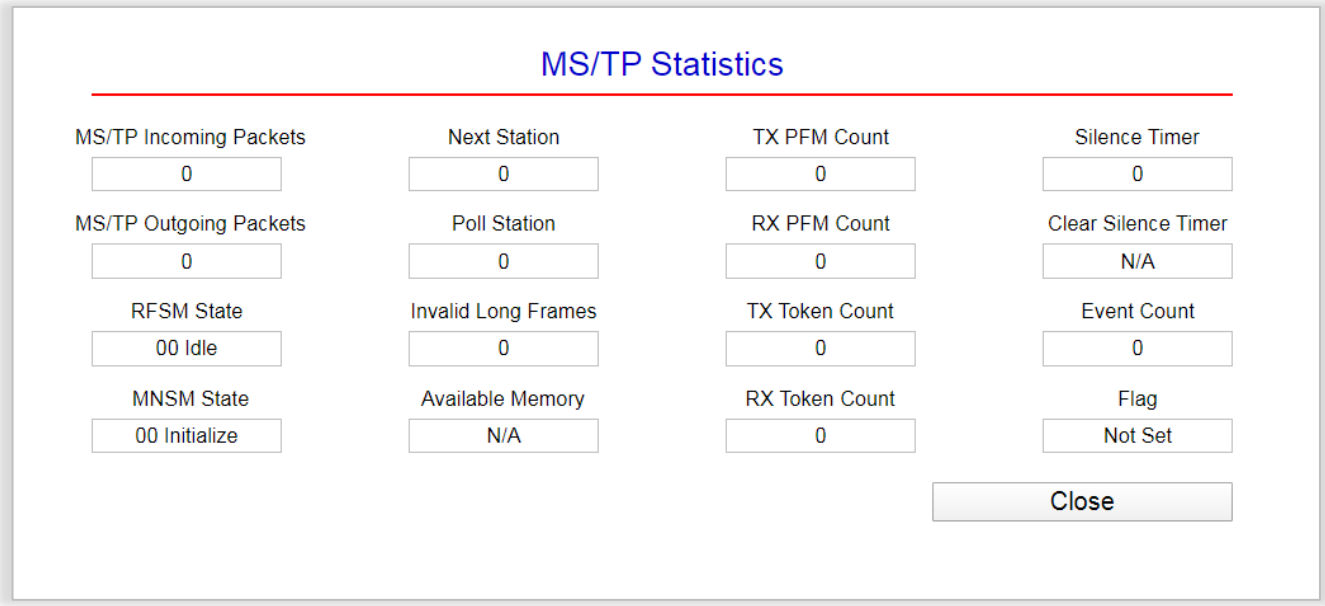




- **Revision** - displays installed firmware revision number
- **Wired MAC** - displays the Ethernet address
- **Wi-Fi MAC** - displays the Wi-Fi MAC address.
- **Memory** - displays available RAM memory in bytes.
- **System Message Log** - logs system events and statements about several different aspects of the BAScontrol-E36 firmware, such as cloud, email, weather, or main platform engine selectable from the drop-down at the bottom. Logs can be copied and pasted and sent to tech support for analysis.
- **Refresh Log** - refreshes the data.

7.3. MS/TP Status

The MS/TP Statistics web page reports the traffic of the BACnet MS/TP driver. This can be very useful to confirm proper BACnet MS/TP bus and server node operation as well as troubleshoot it in case of BACnet MS/TP communication issues or failure. Several parameters are reported such as incoming and outgoing packets, state machine state, poll station, next station, transmit and receive PFM (poll for master) counts as well as transmit and receive token counts. After the packet counts, the instantaneous state of some BAScontrol-E36 MS/TP state machine values are displayed. These are documented in the MS/TP portion of the BACnet standard.



The following parameters are noteworthy:

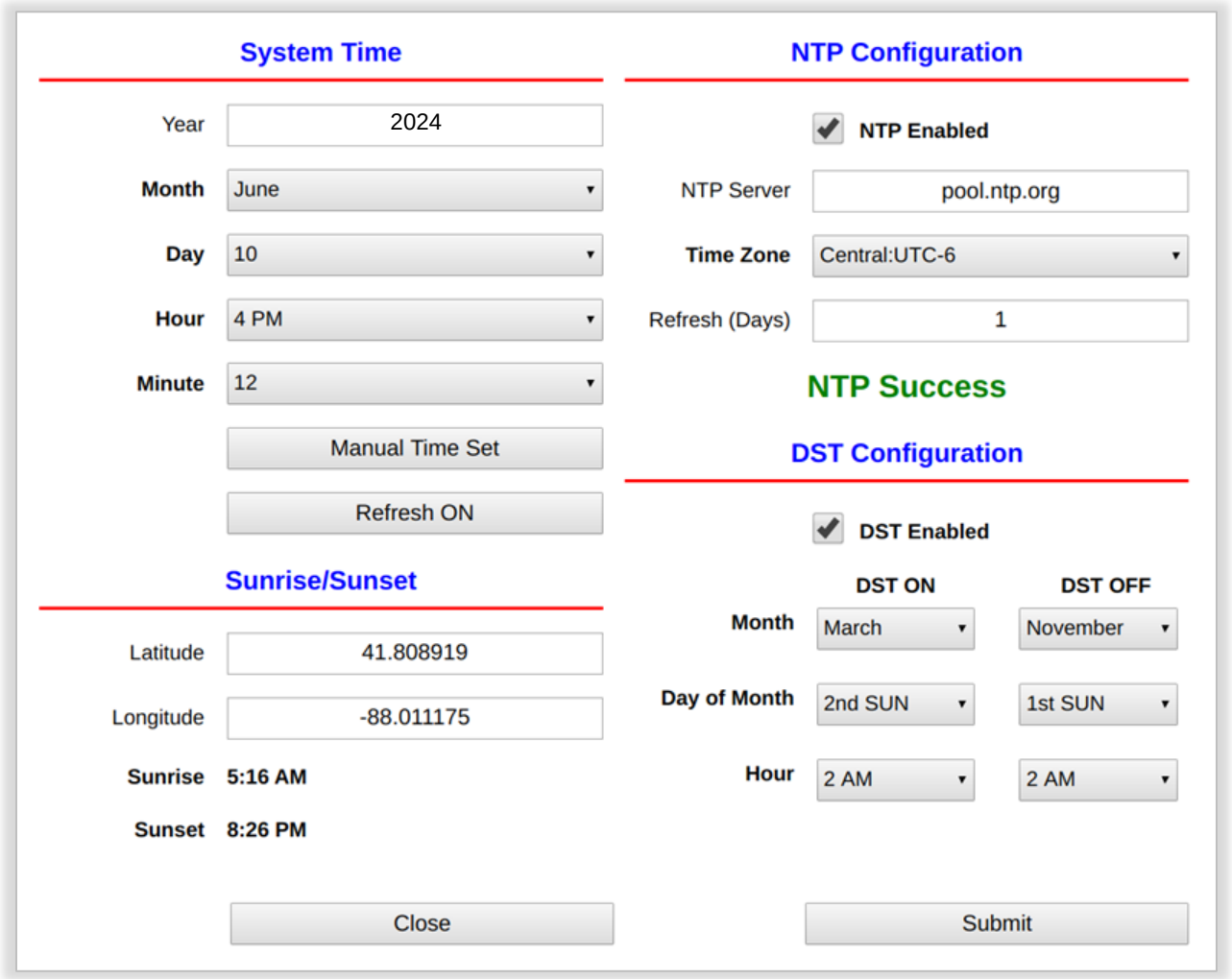
- **RFSM State** - the current Receive Frame State Machine state.
- **MNSM Sate** - the current Master Node State Machine state.
- **Next Station** - the MS/TP MAC address of the device to which the BAScontrol-E36 will pass the token next. This value may change if devices leave or enter the network, and when the BAScontrol-E36 searches for devices on the network.

  NOTE: If this value does not change from the BAScontrol-E36's own MS/TP MAC address while connected to the MS/TP bus, the BAScontrol-E36 does not find any other MS/TP devices on the bus.
- **Invalid Long Frames** - the number of frames received which are longer than allowed.
- **TX PFM Count** - the number of Polls for Master messages transmitted.
- **RX PFM Count** - the number of Poll for Master messages received.
- **TX Token Count** - the number of tokens transmitted.
- **RX Token Count** - the number of tokens received.
- **Clear Silence Timer** - the number of times the silence resets because its value is too large.

The Statistics page refreshes automatically, so you can watch the MS/TP state change and gain insight into the condition of the MS/TP network. For example, if **MNSM State** always reports SoleMaster or PollForMaster, for a prolonged period after repeated refreshes, then the router cannot communicate with any MS/TP devices.

7.4. Set Time

The Set Time webpage provides all time and date related settings. Time and date can be set manually or automatically with the help of an NTP server with Internet access. Daylight Savings Time (DST) can be enabled and configured accordingly. If you access an NTP server using domain names, make sure proper DNS servers are specified in the System Configuration screen.



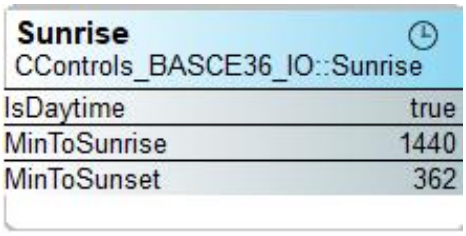
System Time

To manually set the time:

- Enter the desired parameters -
  - **Year**
  - **Month**
  - **Day**
  - **Hour**
  - **Minute**
- Click **Manual Time Set**.
- To observe time changes in real time, click **Auto Refresh ON**.

Sunrise/Sunset

Sunrise/Sunset can be used to determine sunrise and sunset times based on geolocation. Enter in your location's **Latitude** and **Longitude** to provide input data for the component. The calculation will be performed automatically, and Sunrise/Sunset times will be displayed on the page.



The **Sunrise** Sedona component can also be used to determine sunrise and sunset times based on geolocation.

- **IsDaytime** - provides a true/false binary output.
  - true = daytime
  - false = night-time
- **MinToSunrise** - provides minutes to sunrise. It is accurate when **IsDayTime** is false (night-time)
- **MinToSunse**t - provides minutes to sunset. It is accurate when **IsDayTime** is true (daytime).

NTP Configuration

NTP is a protocol which synchronizes clocks to UTC (Coordinated Universal Time). Proper time is important when creating schedules or using the BAScontrol-E36's BACnet Time Sync to synchronize time on BACnet server devices on the network.

- Check the **NTP Enabled** checkmark to enable NTP server obtained time. Uncheck NTP Enabled to disable.
- Alter the **NTP Server.** The Default NTP server domain name is "pool.ntp.org" and can be altered if needed. Internet connection is required for NTP server communication.
  - When NTP is enabled, the NTP server will be queried and the BAScontrol-E36 time will be synchronized at start-up and at midnight during each refresh period.
- Set the **Time Zone** to match that of your location.
- Set **Refresh** (in Days). Is the refresh interval with default value of 1 day.
- NTP Status -
  - NTP Success is shown in green.
  - NTP Failure status is shown in red.

DST configuration

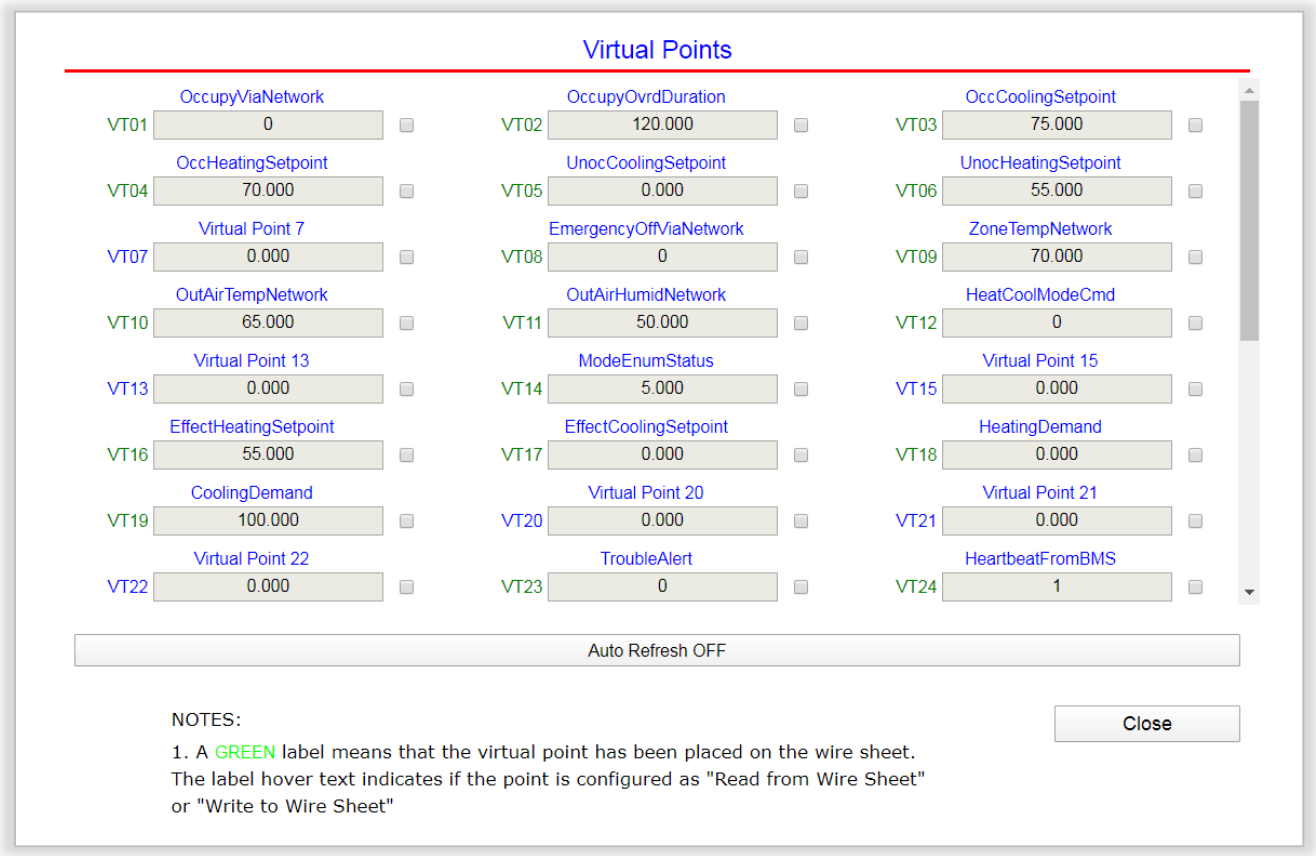
Daylight Saving Time (DST) configuration is provided because NTP cannot adjust for them.

- Check **DST Enabled** to enable DST.
- Set the **date** and the **time**, enabling and disabling and DST.
  - Date can be set to a month or day of the month.
  - Set the time after midnight.
- Click **Submit**.
- Click **Close**.

NOTE: If Internet connectivity is not available, then NTP cannot be used to set the controller's time. However, as the BAScontrol-E36 has a built-in RTC with supercap backup, it will retain the time through short power cycles, such as less than seven days at room temperature. If you disable NTP and set the time manually, the built-in RTC will control the controller's time.

7.5. Virtual Points

Virtual Points can be configured to be analog (AV) or binary (BV) and allow communication to and from a BACnet client to the BAScontrol-E36 Sedona wiresheet. Virtual Points are usually setpoints, calculated data, occupancy commands, filter flags, or other status points that do not directly impact the physical input/output points that exist on the controller. A GREEN tag means that the virtual point has been placed on the wiresheet. Virtual Points support full BACnet Priority Array whether configured for Binary Value or Analog Value.



There are 192 virtual components (VTs) in the CControls_BASCE36_IO kit. VTs are used to link Sedona wiresheet readable/writeable data to a BACnet client. BACnet clients can discover, read and command these Virtual Points which can be linked as an input to the wiresheet or an output from the wiresheet (Write to wiresheet/Read from wiresheet).

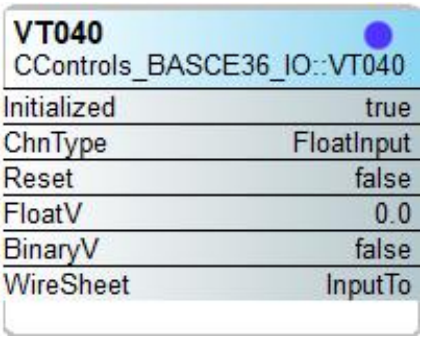
Virtual Points could be used for setpoint, or reset data intended for the wiresheet or calculations, or status information generated by the wiresheet. When Virtual Points are set for outputs, they can be given a Default Value in their BAS Channel Configuration. Default Value is a value used by the output, immediately after boot-up of the controller when Sedona logic or BACnet client have yet to command the output point. As soon as Sedona logic or a BACnet client write to the point, Default Value is no longer used by the output. When BACnet priorities 1 through 16 are all nullified, the output point will use Default Value set in the channel configuration web page of the output point. This value is also reported to BACnet as Relinquish Default, but cannot be written to by BACnet clients, it can only be set from the channel's web page in the BAScontrol-E36.

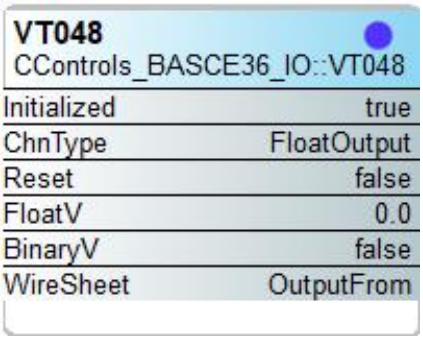
Although BACnet allows for the reading of the BAScontrol-E36 physical input and output points — and under certain conditions the writing of real output points — virtual points have no reading or writing restrictions.

Virtual points are treated by BACnet as either a binary variable (BV) or analog variable (AV) while real points appear as binary inputs (BI), analog inputs (AI), binary outputs (BO) or analog outputs (AO).

The BAScontrol-E36 logic engine reads the state of its inputs (AI and BI) and outputs (AO and BO), executes logic, and then sets outputs (AO and BO) accordingly. In a similar manner, a BACnet client can read the BAScontrol-E36 physical inputs and write to the BAScontrol-E36 physical outputs.

AVs and BVs are a bit different in that they can be configured to be either an input to the BACnet client or an output from the BACnet client. If a BACnet client is to write to the Sedona wiresheet such as a command, a VT can be assigned to input this data to the wiresheet so using the Sedona tool we would configure the VT's Wiresheet slot to Input to Wiresheet. This will result in a channel type (**Chn Type**) of float input or binary input, depending upon the AV or BV selection on the VT's channel configuration. If a BACnet client is to read data from the Sedona wiresheet such as status, assign a VT to output this data from the wiresheet. Using the Sedona tool, configure the VT's Wiresheet slot to Output from Wiresheet. This will result in a channel type (**Chn Type**) of float output or binary output depending upon the AV or BV selection on the VT's channel configuration.



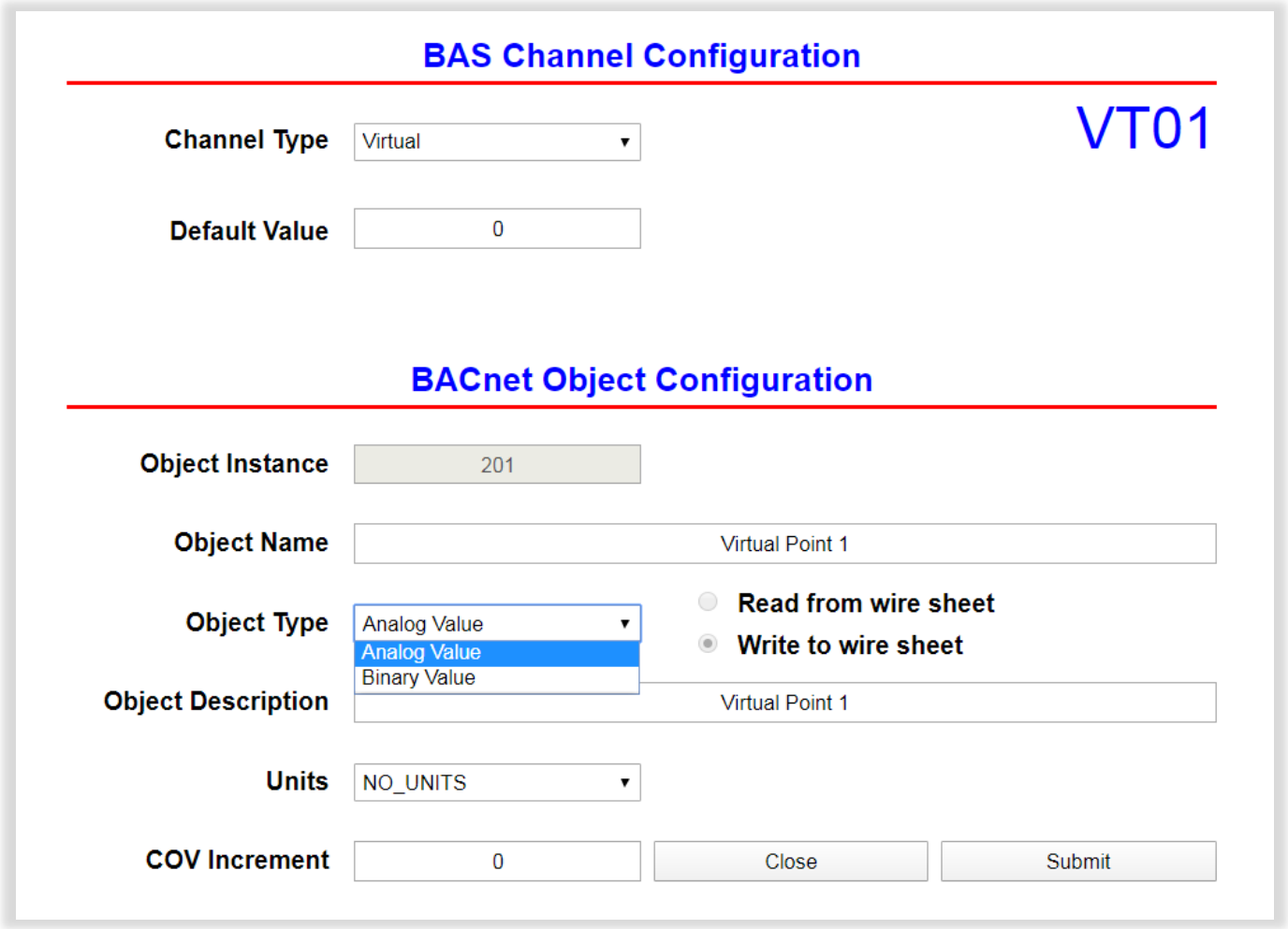


Virtual Points are multifunctional and used for Weather service data, utilized in Dashboards and pushed to the Cloud if configured. Weather service data parameters are assigned to individual Virtual Points. A Virtual Point is used for each Weather service parameter, such as Temperature. If another Weather service parameter is needed, such as Pressure, a second Virtual Point is assigned to that parameter, and so on. Since Virtual Points are served over BACnet, this means that weather data could be served or written to other BACnet devices on the network.

Virtual Points can also be pushed to the Cloud and utilized in Dashboards. Any Sedona wiresheet value can be pushed to the cloud or written to from the Cloud by using a Virtual Point. A value obtained over the local network by using a NetV component can also be pushed to the Cloud or used in a Dashboard if tied to a Virtual Point. It is advisable to use Virtual Points in Dashboards especially in HMI (Human-Machine-Interface) applications where outputs can be engaged by users, because this gives the integrator the opportunity to create additional safety logic between the Virtual Point displayed on the HMI and the physical output being engaged/disengaged.

7.6. Virtual Points Configuration

From the Virtual Points webpage, click the **title link** of the desired Virtual Point to access its configuration page.



Under BACnet Object Configuration, enter the values for the following parameters:

- **Object Instance** – is the BACnet object instance which is automatically assigned and is not configurable.
- **Object Type** – set to Analog Value or Binary Value.
  Notice that the radio buttons **Read from wiresheet** or **Write to wiresheet** reflect the BACnet client's point of view. This can only be changed by the Sedona tool for each Virtual Point component once placed on the wiresheet.
- **Object Name** – enter a unique name, up to 63 characters
- **Object Description**
- **Units** – allows you to specify the units for the channel value.
- **COV Increment** – is the change of value increment used by BACnet clients/supervisors which support this service and can be set for each Virtual Point at the respective configuration page.
    - COV transmits the value to subscribing clients when the value exceeds the COV increment. This saves the client from continuously requesting the point value.

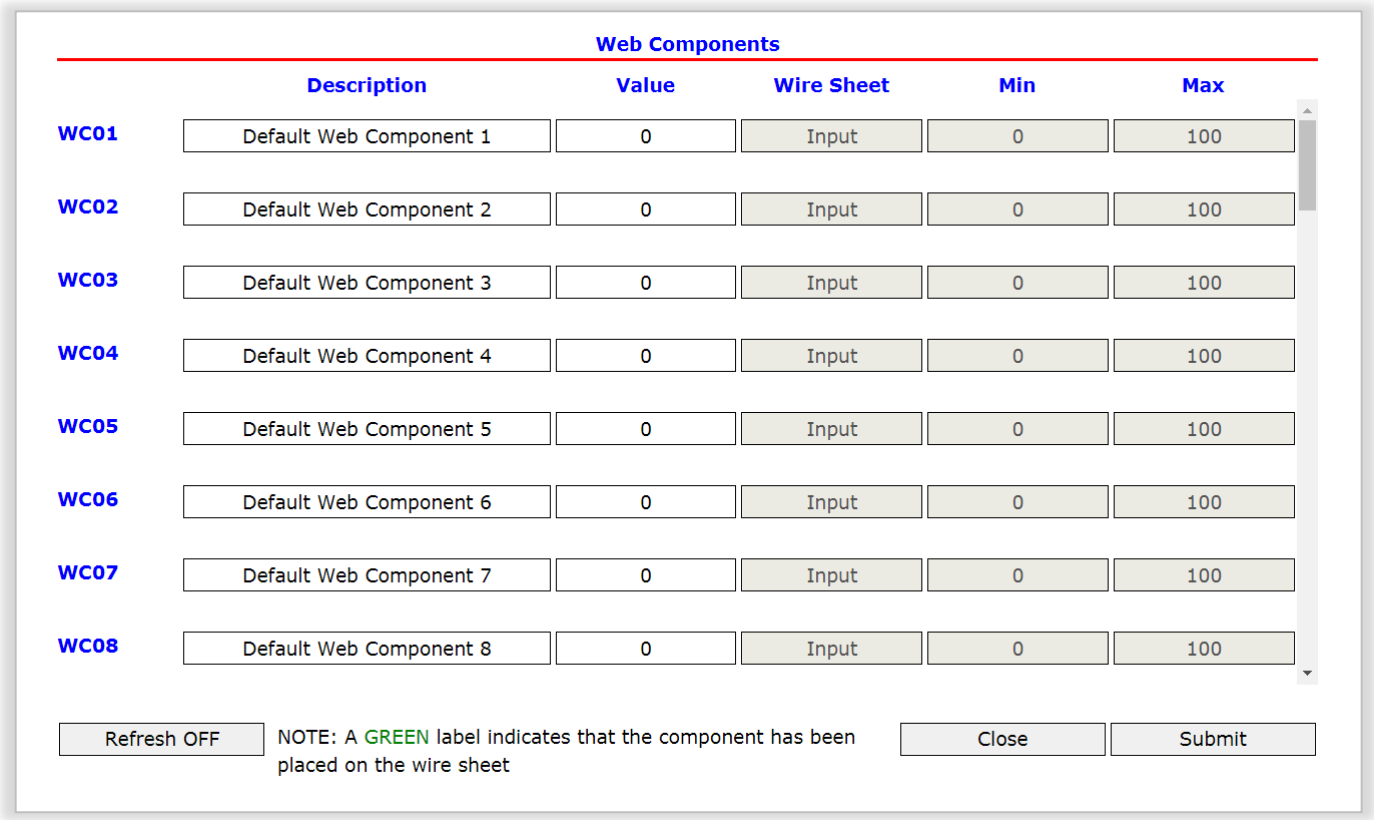
- COV can be useful to mitigate traffic on the IP.
- All 36 BAScontrol-E36 physical I/O channels and 192 VTs support COV.
- You do not need to set up COV unless the BACnet client you are using supports this service.

Under BAS Channel Configuration:

- **Default Value** - can be set for each output channel.
  - It is the normal output value the controller will use as a starting control value in the case of power loss before a BACnet client has written to the channel or Sedona logic had been triggered.
  - It is also the Relinquish Default value outside of the BACnet priority array used when no other higher priority (1 – 16) writes are present. Relinquish Default is used when all other priorities are null value.

7.7. Web Components

The Web Components allow you to use and configure up to 48 Web Components. Web Components are not served over BACnet or used in graphical dashboards or the Cloud, but they provide a means to write or read data to and from the Sedona wiresheet directly from the BAScontrol-E36 web page.

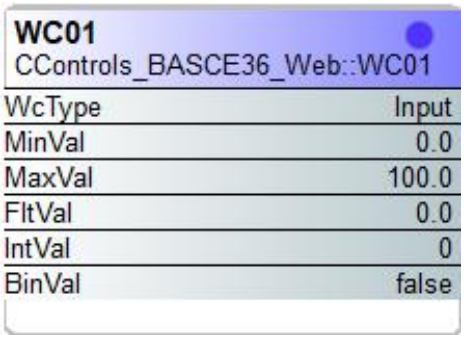


These components can be used to alter Sedona wiresheet control parameters, such as setpoints, monitor wiresheet logic states, or adjust logic sequence for variation in control applications. Web components are ideal for simplified control logic configuration.

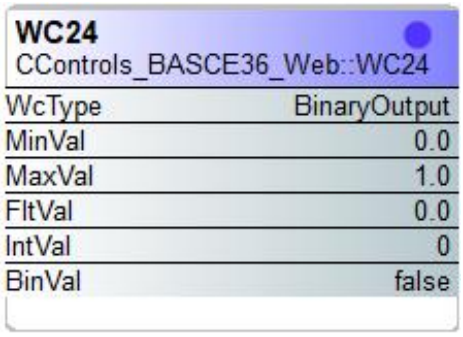
A Web component configured as a wiresheet input can have its input range restricted to minimum and maximum values, eliminating the need to add limit detection within the wiresheet logic. The limits are configured in the Sedona web components.

To observe Web Component value changes in real time, click **Auto Refresh OFF** to the **ON** state.

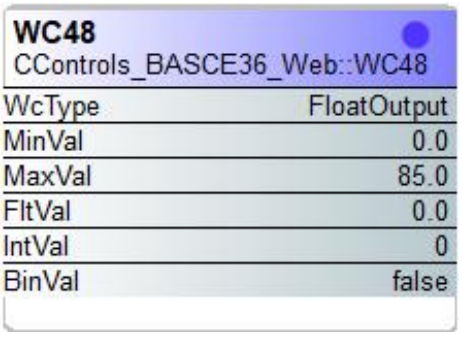
Wiresheet input:



Wiresheet binary output:



Wiresheet float output:



7.8. Schedule

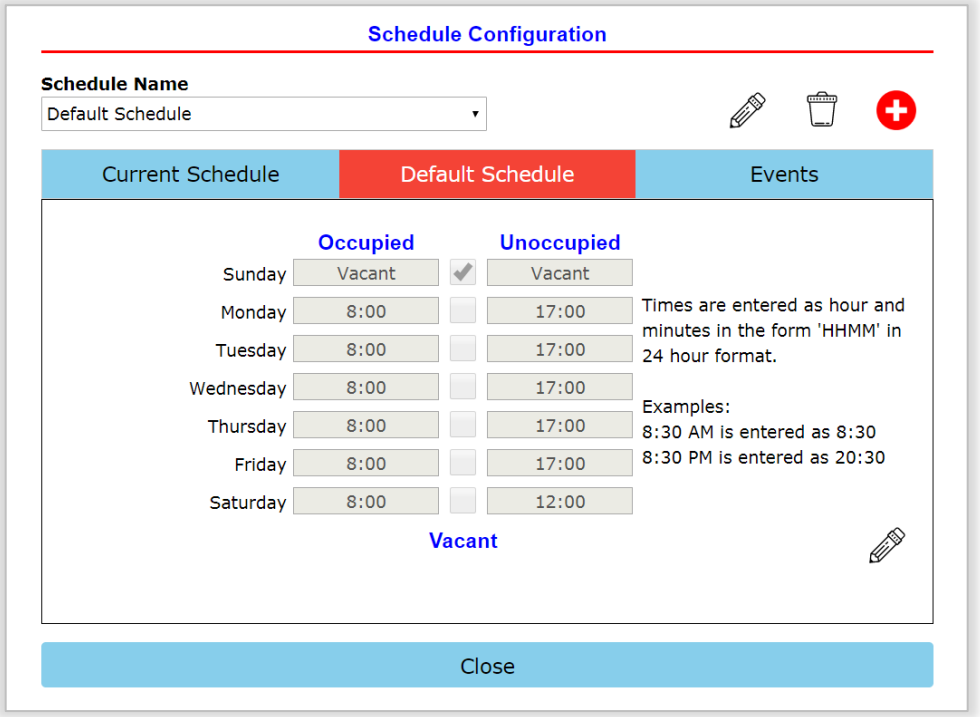
The BAScontrol-E36 supports multiple advanced schedules with configurable events (holidays/exceptions). Multiple independent schedules can be created. Schedules are web page configurable and are bound to Sedona schedule components, one per schedule (CControls_BASCE36_Schedule kit and Sched component), are used to trigger Sedona wiresheet control logic. The name of the schedule created in the web page is also entered into the Sedona schedule component to bind them. Schedules depend on proper time setting in the BAScontrol-E36 which can be set manually or obtained over an Internet connection from an NTP time server.

The **Schedule Name** dropdown is used to select a given schedule when multiple schedules are present. Default Schedule is the only option in this dropdown by default. Once more schedules are created and stored, they will appear in this dropdown menu where they can be selected and viewed, edited, or deleted.

- To edit a selected schedule's name, use the pencil icon button at the top.
- To delete a selected schedule entirely, use the trash can icon button at the top.
- To create a new schedule, use the plus icon button at the top.

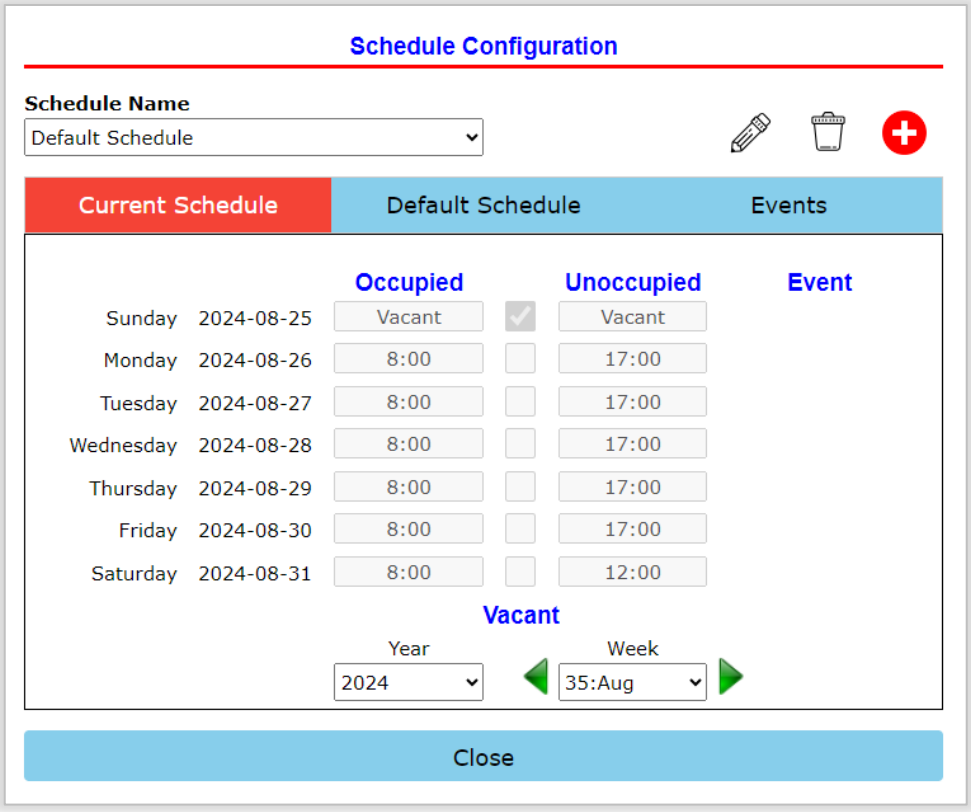
7.9. Default Schedule

The **Default Schedule** tab for a selected **Schedule Name** shows the default (regular week) schedule which is the schedule for weeks with no events (holidays/exceptions). The **pencil icon** button at the lower right corner can be used to edit the Default Schedule for the selected Schedule. Occupied/Unoccupied times are entered in a 24hr format (HH:MM).



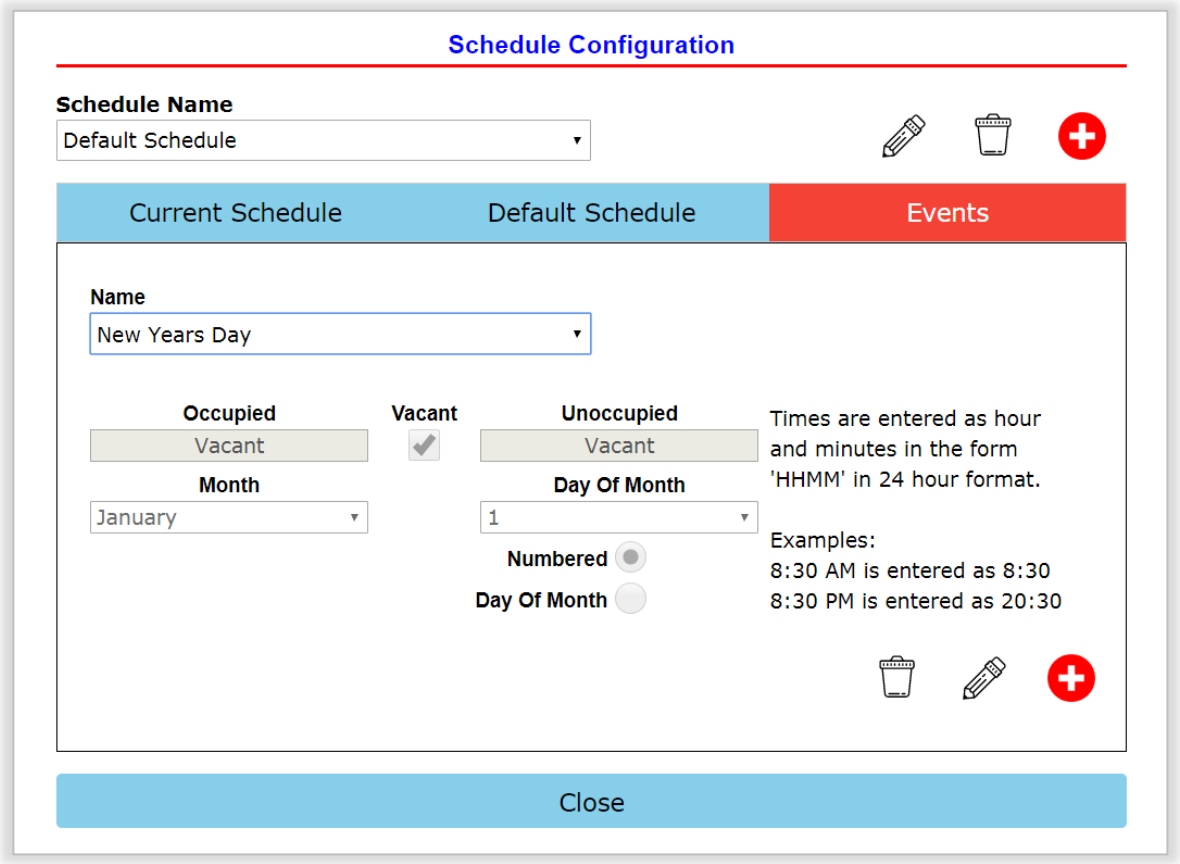
7.10. Current Schedule

The **Current Schedule** tab for a selected **Schedule Name** shows the current week's schedule with any events (holidays/exceptions) present that week which are listed under the **Events** column for each applicable day. To browse through current weekly schedules for the selected Schedule, use the **Year** and **Week** drop-downs or green arrows at the bottom of the page. Events (holidays/exceptions) that are set up for any given week will be shown under the **Events** column for each applicable day (New Year's Day in the example in the next section).

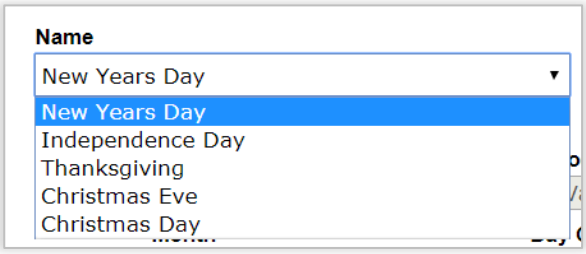


7.11. Events

The **Events** tab is where special events with custom **Occupied** and **Unoccupied** times, or **Vacancy** (unoccupied for entire day) can be created. **Occupied/Unoccupied** times are entered in a 24hr format (HH:MM).



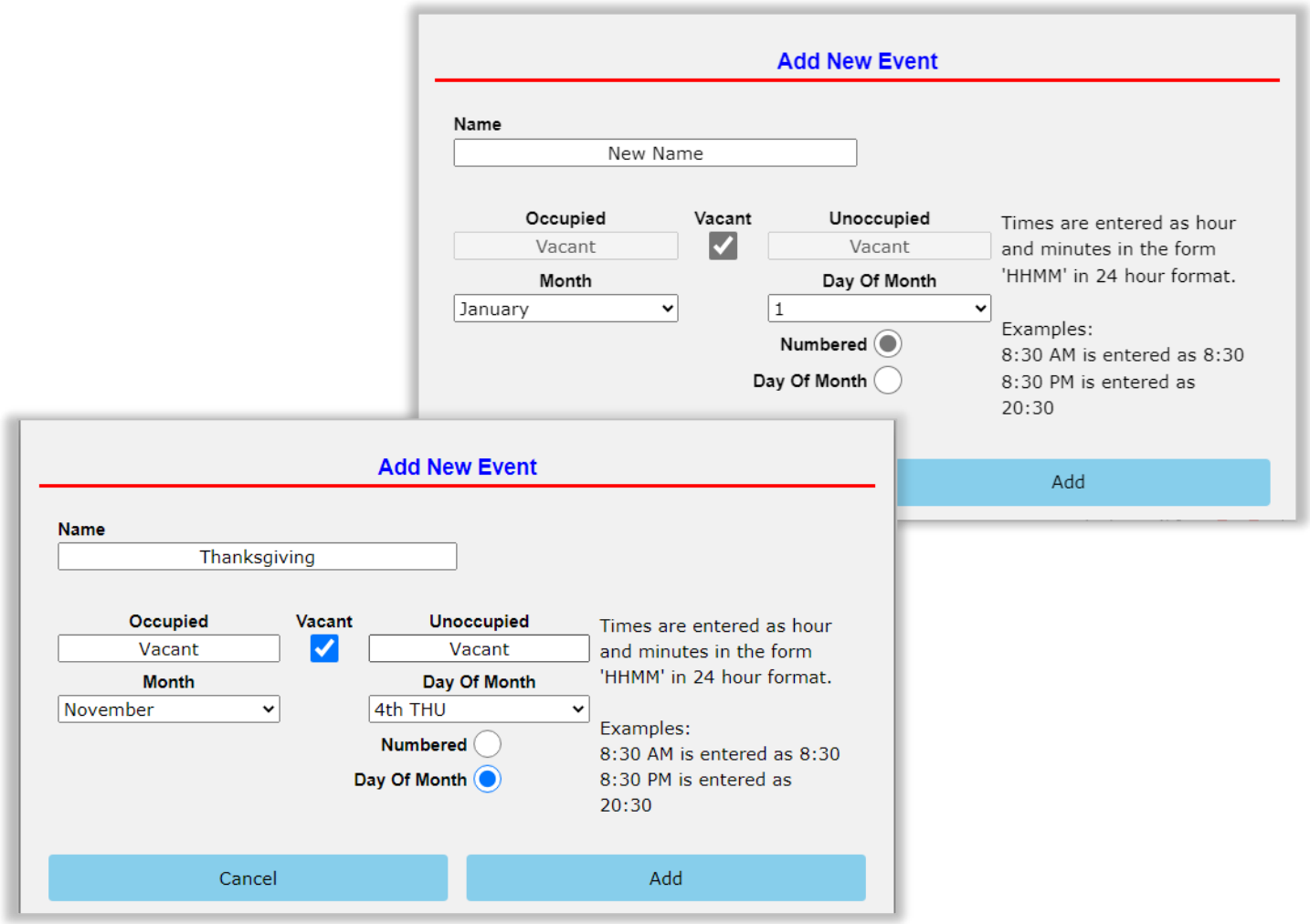
Some standard holidays (New Year's Day, Independence Day, Thanksgiving, Christmas Eve, Christmas Day) have been pre-entered for the Default Schedule Name.



- Select a configured event from the **Name** drop-down.
- Use the **pencil icon** button at the lower right corner to edit a selected event.
- Use the **trash can** icon button at the lower right corner to delete a selected event entirely.

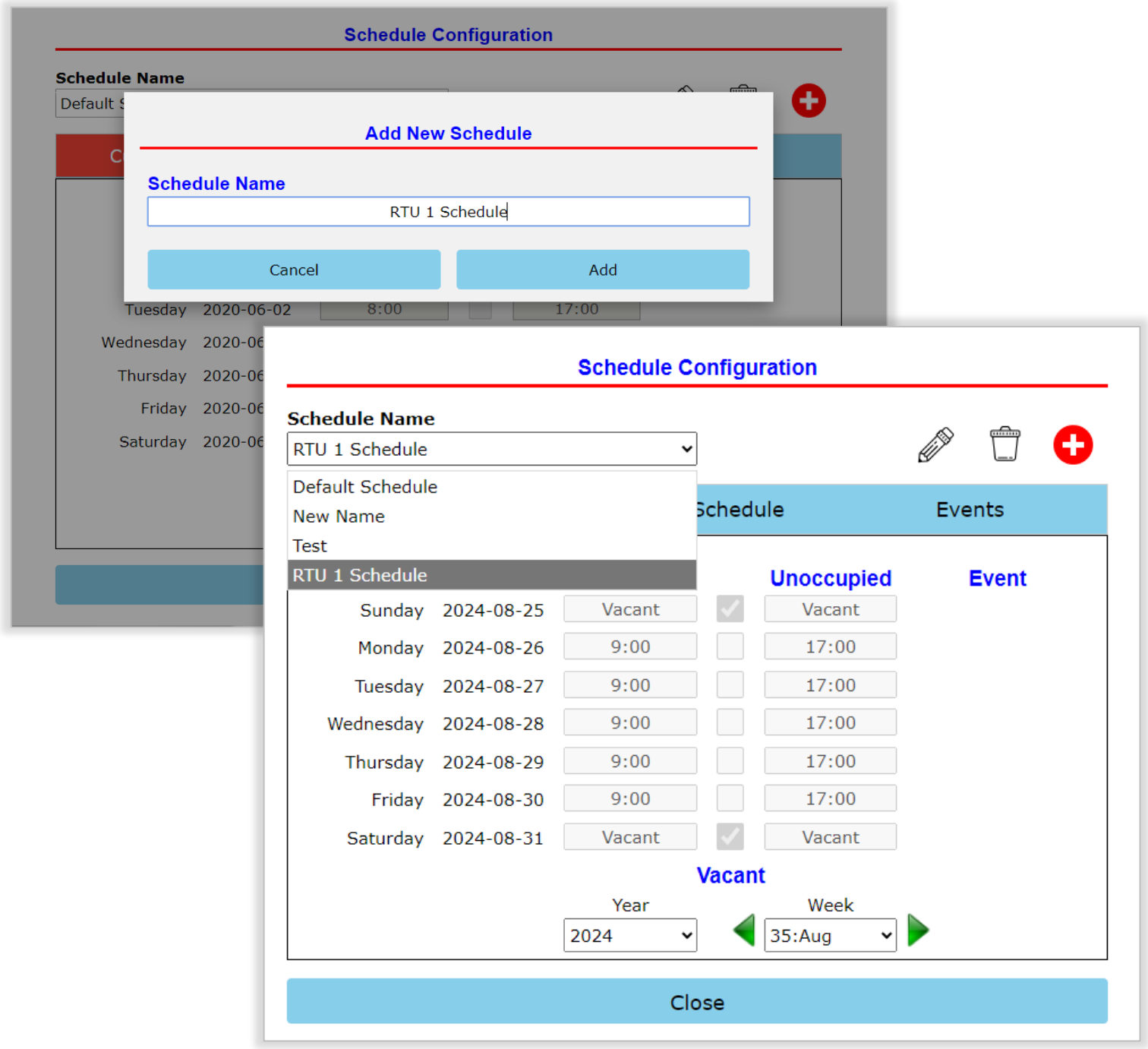
7.12. New Event

- Use the **plus icon** button at the lower right corner to create a new event.
- Enter a **Name** for the event.
- Using the **Numbered** or **Day of Month** radio button option, choose
    - **Month**
    - **Day of Month**
        - The Day of Month option allows you to keep the event without having to change its exact date as it changes to a different date every year, such as 4th Thursday in November for Thanksgiving.
    - **Occupied/Unoccupied** times or check the **Vacant** checkbox for vacancy (unoccupied for entire day).



7.13. New Schedule with Events

Use the **plus icon** button at the top right corner to create an entirely new Schedule with its own **Events** and **Default Schedule**. You will be asked to enter in a **Schedule Name**. Then, you can configure its **Default Schedule** and **Events**.



7.2.4. Adding Schedules to Sedona

Once you have configured your schedule(s), you can configure a **Sched** component on the Sedona wiresheet. Multiple **Sched** components can be configured for multiple schedules.

Schedule component in default state

Sched CControls_BASCE36_Schedule::Sched	
SchedName	
IsOccupied	false
MinToOccupied	0
HeadActive	false
HeadOccupied	false
Status	InvalidName

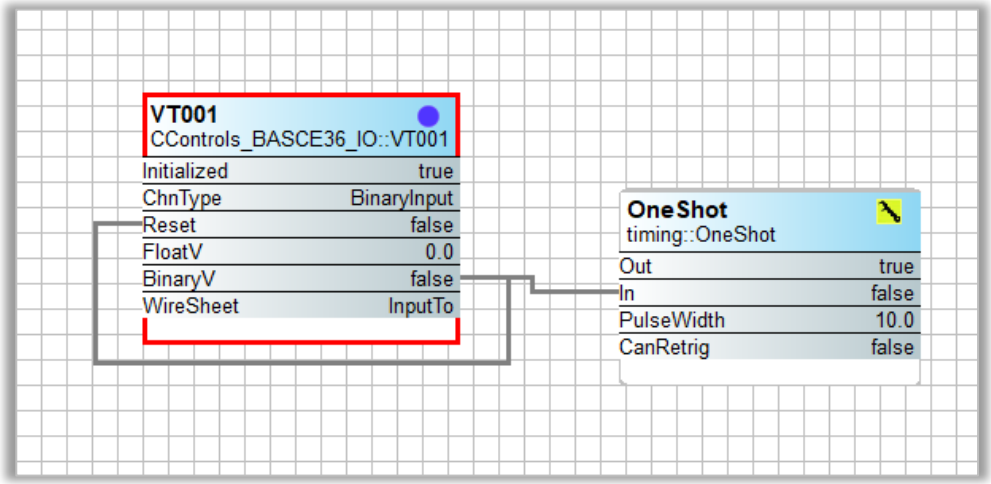
Schedule component configured

Sched CControls_BASCE36_Schedule::Sched	
SchedName	RTU1 Schedule
IsOccupied	false
MinToOccupied	0
HeadActive	false
HeadOccupied	false
Status	Configured

- **SchedName** - Enter the **Schedule Name** (as configured in web page) you would like to bind to the component in the **SchedName** slot. The configuration from the web page for the given **Schedule Name** will be bound to that component.
  NOTE: When configured successfully, the **Status** slot will change state from InvalidName to Configured.
- **IsOccupied** - indicates current state. False indicates unoccupied and true indicates occupied state.
- **MinToOccupied** - indicates minutes to occupied state.
- **HeadActive** and **HeadOccupied** - allow for BACnet supervisory commands to be accommodated into the schedule by use of Virtual Point components outputs tied to those slots.

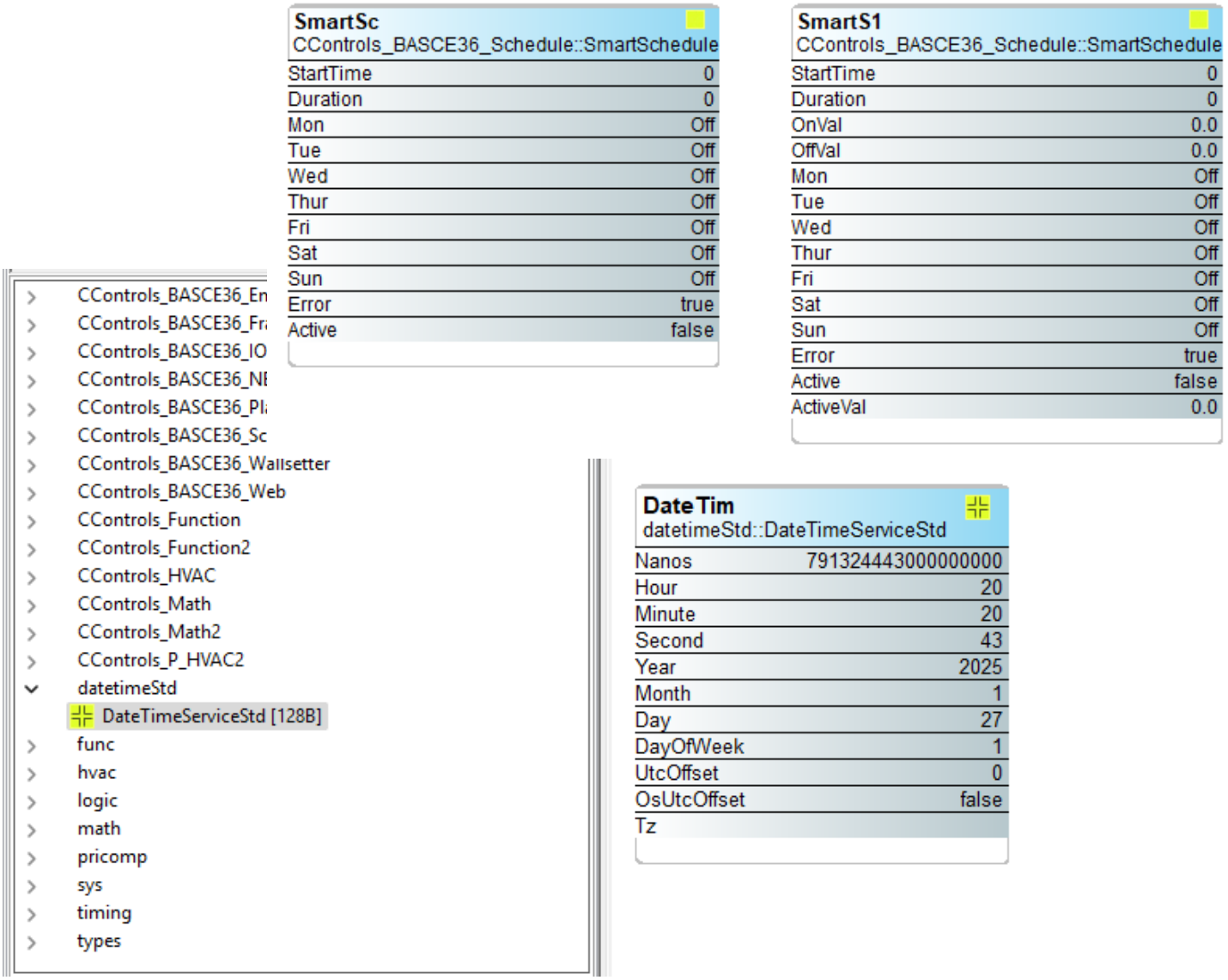
A BACnet supervisor (head-end) can control the schedule and the BAScontrol-E36 could act as a backup to the supervisor if it becomes disconnected from the controller or unavailable.

To accomplish this logic, set up a Virtual Point that will reset itself. The supervisor will need to periodically write a true to the virtual point more often than the set pulse width. The output of this Virtual Point will go to a one-shot component. The output of the one-shot component will go to the **HeadActive** (supervisor occupied command input). Another Virtual Point in standard mode will control the **HeadActive** (head-end active signal). If the head-end stops sending a continuously pulsing signal to the head-end active Virtual Point, then the **Sched** component takes over. Don't use these input slots if you don't want a head-end to control the schedule, and the BAScontrol-E36 can handle schedules stand-alone. The **HeadActive** signal goes to the False state and the schedule component will be fully in charge of its output. When the head-end is in control of the schedule component, the **MinToOccupied** slot is not accurate and should not be used.



7.2.4.1. Smart Schedules

The BAScontrol-E36 also supports Smart Schedules—one for Boolean outputs and the other for Float outputs. **StartTime** is military time format [HHMM].



The components use the datetimeStd::DateTimeServiceStd component found in the service folder as their time reference.

During each scan period, **Error** is true if:

- Duration variable is set to zero or less.
- Duration is set to greater than 1441 (allowing for 24hours).
- Duration [in minutes] is greater than the available minutes since StartTime.
- If Mon, Tue, Wed, Thur, Fri, Sat, Sun Variables are all off.
- If OffVal variable equals OnVal variable.

7.14. BACnet Utility

The built-in BACnet Utility allows the BAScontolE36 to read and write BACnet points throughout the BACnet internetwork. This can be very useful to test point reads/writes when integrating BACnet device points into the BAScontrol-E36 Sedona wiresheet.

When Custom is chosen in the **Server** drop-down menu, the Server Data and Object Data parameters are entered in manually for:

Server Data -

- **Device Instance**
- **Local IP address**

Object Data -

- **Object Type**
- **Object Instance**
- **Object Property**

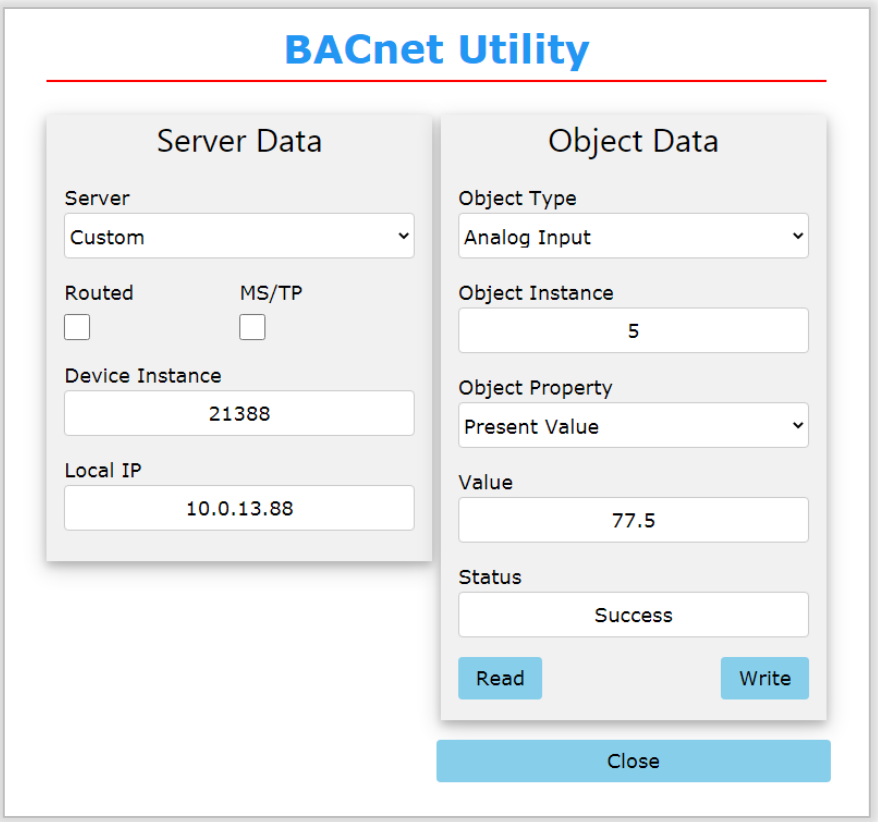
Value shows the Polled value.

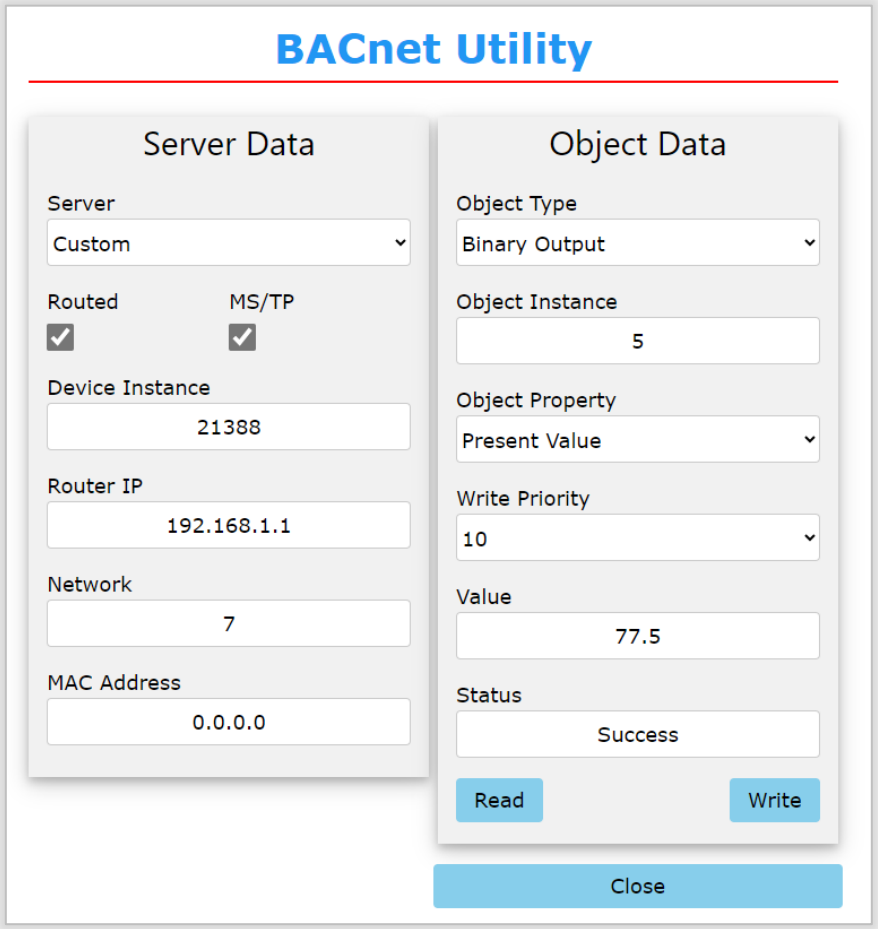
Status field shows the status Success or Fail.

Click the **Read** or **Write** buttons to execute the respective command.

For **MS/TP routed devices**, the manually entered Server Data parameters are -

- **Device Instance**
- **Router IP**
- **Network**
- **MAC Address**

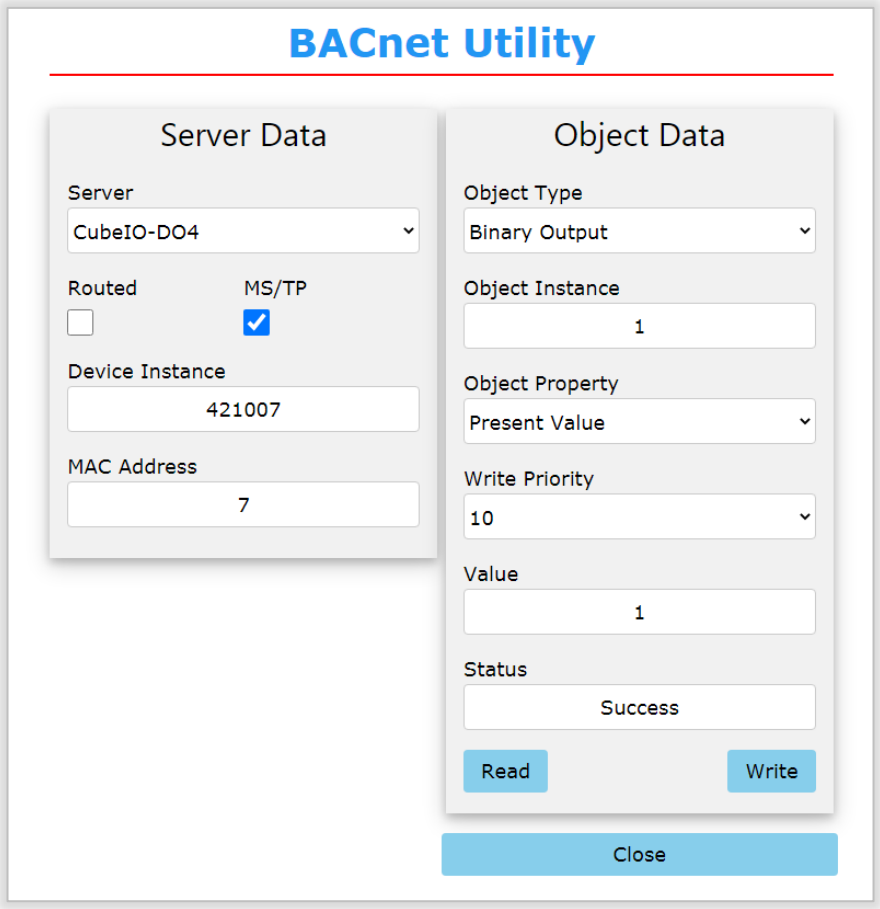




If BACnet Server devices have been previously configured on System Configuration->BACnet tab->Configure BACnet Servers, the devices will appear in the **Server** drop-down menu, and their Server Data parameters will populate automatically.

Object Data parameters for can be selected -

- **Object Type**
- **Object Instance**
- **Object Property**
- **Write Property**



For routed BACnet MS/TP devices to BACnet/IP, enter -

- **Router IP**
- **Network**
- **MAC Address**

to access BACnet server objects.

For routed BACnet/IP devices which are not MS/TP devices, enter -

- Router IP
- Network
- Multibyte MAC (for example, “29.216.19.04.00.00”).

Make sure the MS/TP box is unchecked.

For MS/TP devices which are not routed, enter -

- **Device Instance**
- **MAC Address**

Make sure the Router box is unchecked.

7.15. Cloud

7.4.1. Azure IoT Central

7.4.1.1. Overview

By leveraging open IoT protocols, such as MQTT, proven security mechanisms, such as Transport Layer Security (TLS), and the robust software as a service (SaaS) cloud solution, Azure IoT Central, BAScontrol-E36 controllers can easily and securely connect to the cloud, providing the option to make any attached equipment a cloud-connected asset. As the BAScontrol-E36 can also read BACnet objects from other devices, these values can also be sent to the cloud

BAScontrol-E36 has a webpage configuration that provides quick and easy cloud connectivity to the Azure IoT Central.

Cloud Connection Benefits

Cloud connectivity on the BAScontrol-E36 is optional, but it provides excellent global asset management and globally accessible centralized monitoring and supervision of distributed BAScontrol-E36 devices. This IoT solution is suitable for multi-site building automation applications, or multi-branch store or retail chain applications. The cloud connection allows the user to upload select, processed, triggered, or all BAScontrol-E36 point data to the cloud securely where it can be trended, visualized, analyzed, alarmed, and accessed from anywhere.

The Azure IoT Central web UI lets you monitor device conditions, create rules, and manage devices and their data throughout their life cycle. Furthermore, it enables you to act on device insights by extending IoT intelligence into line-of-business applications.

- Make any attached equipment a cloud connected asset
- Central point of worldwide secure data access in 140 countries and regions
- Streamlined global data monitoring, analysis, and visualization of distributed applications
- Improved mobility/accessibility
- Asset management and supervision
- Predictive/proactive maintenance
- Scalability of operations

Establish an Account

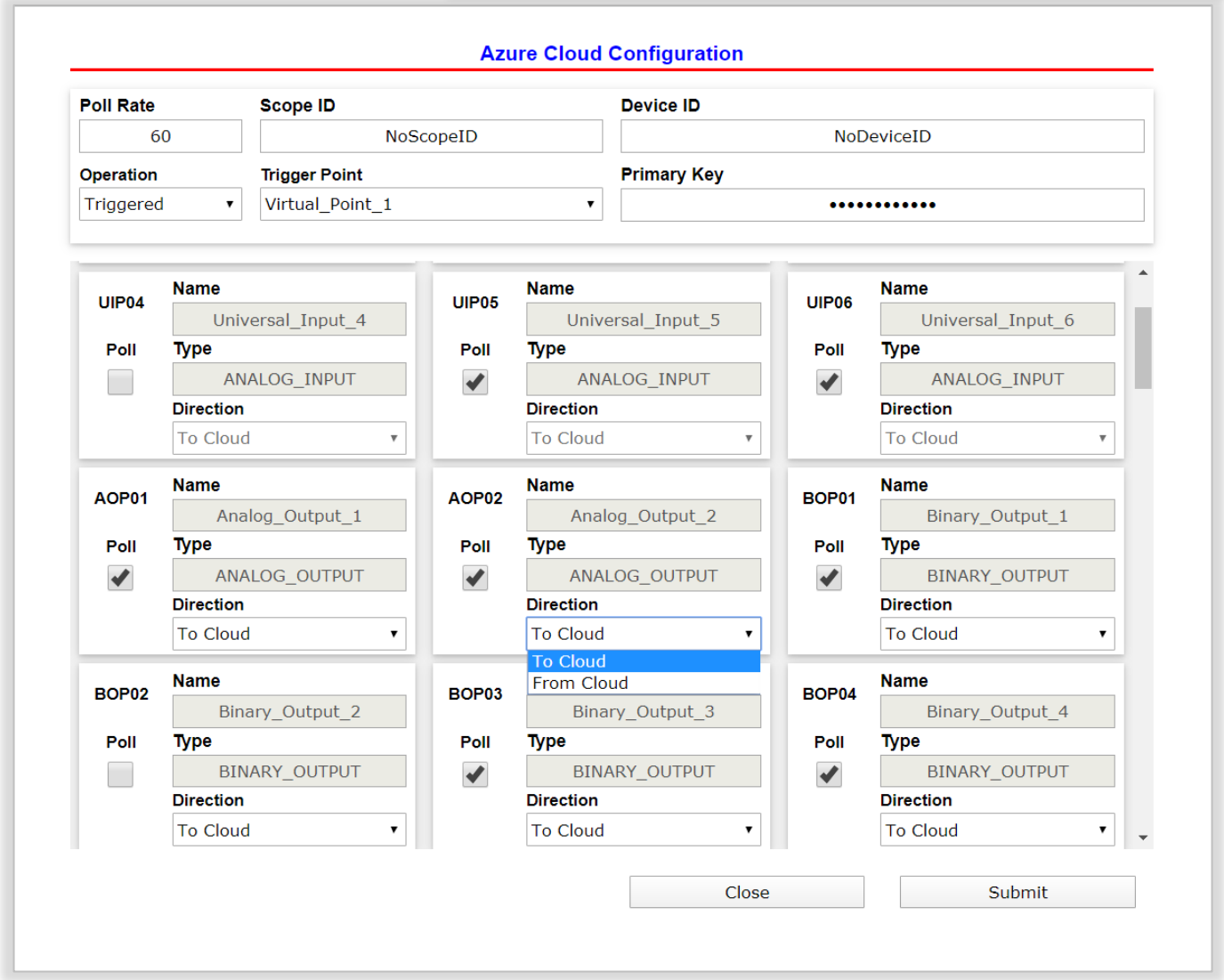
To connect your BAScontrol-E36 to the Azure IoT Central hosted IoT application platform, you must have a Microsoft Azure IoT Central account which you can try for free at Azure IoT Central.

7.4.1.2. Establish Cloud Connection

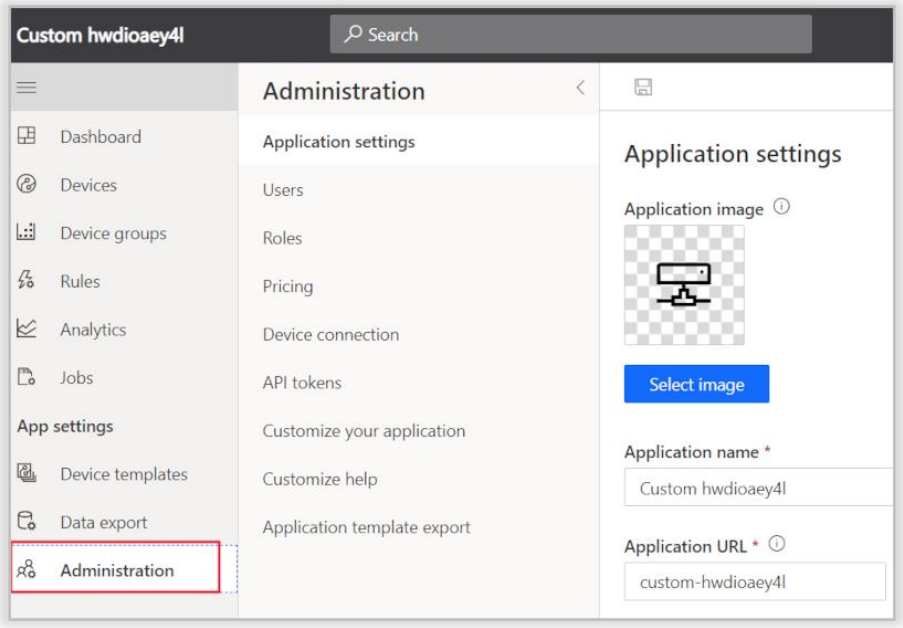
Once the Azure IoT Central account has been created, select **Connect Your Device**. You will be presented with the following set of parameters:

- Scope ID
- Device ID
- Primary Key
- Secondary Key (not used in BAScontrol-E36).

To connect a BAScontrol-E36, click the **Cloud** button on the Bascontrol36 main webpage.



Then, copy and paste the **Scope ID**, **Device ID**, and **Primary Key** parameters and into the respective fields in the Azure Cloud Configuration page.



Enter values in the following fields:

- **Pole Rate** - Select a reasonable Poll Rate for your application. 60 seconds is the default.

  NOTE: A faster Poll Rate could cost more in cloud fees.

- **Operation** - Select **Poll** or **Triggered**.
  - Poll operation will push all data from the selected points to the cloud at the specified Poll Rate.
  - Triggered operation will only push data from the selected points when the selected Trigger Point is true drop=down. The Trigger Point is evaluated every poll period.
- **Trigger Point** - enables pushing data to the cloud. It can be controlled using Sedona logic, or a binary input channel.
- **Poll checkmarks** - Selects which physical/virtual points will be pushed to the cloud,
  - **Direction** drop-down: Select **To Cloud** and **From Cloud** to determine whether a point's present value will be pushed to the cloud or written from the cloud.
    - Input channel points and read-only input virtual points can only be pushed to the cloud.
    - Writeable points can be written to/from the cloud.

7.4.1.3. Cloud Personas

The IoT Central documentation refers to four personas who interact with an IoT Central application:

- *Solution builder* - is responsible for defining the types of devices that connect to the application and customizing the application for the operator.
- *Operator* manages the devices connected to the application.
- *Administrator* - is responsible for administrative tasks such as managing user roles and permissions within the application.
- *Device developer* - creates the code that runs on a device or IoT Edge module connected to your application – the BAScontrol-E36 built-in cloud connector has taken care of this part for you.

IoT Central applications are fully hosted by Microsoft, which reduces the administration overhead of managing your applications. Administrators manage access to your application with user roles and permissions. To utilize the Administration section, you must be in the Administrator role for the Azure IoT Central application. If you create an Azure IoT Central application, you're automatically assigned to the Administrator role for that application.

In the Application Settings page, you can change the name and URL of your application, then select **Save**.

7.4.1.4. Create your IoT Central Application

As a solution builder, you can use IoT Central to create a custom, cloud-hosted IoT solution for your organization. A custom IoT solution typically consists of:

- A cloud-based application that receives telemetry from your devices and enables you to manage those devices.
- Multiple distributed devices connected to your cloud-based application.

You can quickly deploy a new IoT Central application and then customize it to your specific requirements in your browser. You can start with a generic application template or with one of the industry-focused application templates for Retail, Energy, Government, or Healthcare.

Use the web-based tools to create a device template for the devices that connect to your application. This device template includes:

- A device capability model that describes the capabilities a device should implement such as the telemetry it sends and the properties it reports.
- Cloud properties that aren't stored on the device.
- Customizations, dashboards, and forms that are part of your IoT Central application.

7.4.1.5. Customize the UI

As a solution builder, you can also customize the IoT Central application UI+ for the operators who are responsible for the day-to-day use of the application. Customizations include:

- Defining the layout of properties and settings on a device template.
- Configuring custom dashboards to help operators discover insights and resolve issues faster.
- Configuring custom analytics to explore time series data from your connected devices.

7.4.1.6. Manage your Devices

As an operator, you use the IoT Central application to manage the devices in your IoT Central solution. Operators perform tasks such as:

- Monitoring the devices connected to the application.
- Troubleshooting and remediating issues with devices.
- Provisioning new devices.

As a solution builder, you can define custom rules and actions that operate over data streaming from connected devices. An operator can enable or disable these rules at the device level to control and automate tasks within the application.

With any IoT solution designed to operate at scale, a structured approach to device management is important. It's not enough just to connect your devices to the cloud, you need to keep your devices connected and fully functional. An operator can use the following IoT Central capabilities to manage your devices throughout the application life cycle.

Dashboards

Built-in dashboards provide a customizable UI to monitor device health and telemetry. Start with a pre-built dashboard in an application template or create your own dashboards tailored to the needs of your operators. You can share dashboards with all users in your application or keep them private.

Rules and Actions

Build custom rules based on device state and telemetry to identify devices in need of attention. Configure actions to notify the appropriate personnel and ensure timely corrective measures are taken.

Jobs

Jobs let you apply single or bulk updates to devices by setting properties or calling commands.

Integrate with Other Services

As an application platform, IoT Central lets you transform your IoT data into the business insights that drive actionable outcomes. Rules, data export, and the public REST API are examples of how you can integrate IoT Central with line-of-business applications.

You can generate business insights, such as determining machine efficiency trends or predicting future energy usage on a factory floor, by building custom analytics pipelines to process telemetry from your devices and store the results. Configure data exports in your IoT Central application to export telemetry, device property changes, and device template changes to other services where you can analyze, store, and visualize the data with your preferred tools.

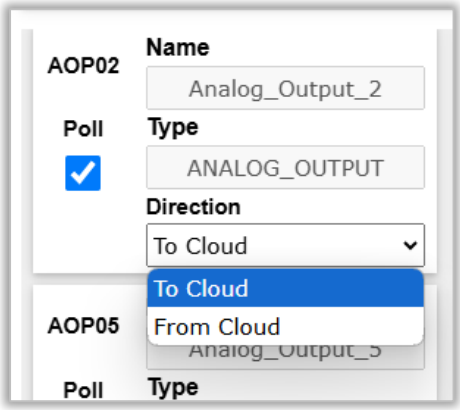
Build Custom IoT solutions and integrations with the REST APIs

You can Build IoT solutions such as:

- Mobile companion apps that can remotely set up and control devices.
- Custom integrations that enable existing line-of-business applications to interact with your IoT devices and data.
- Device management applications for device modeling, onboarding, management, and data access.

7.4.1.7. Write data from IoT Central to BAScontrol-E36

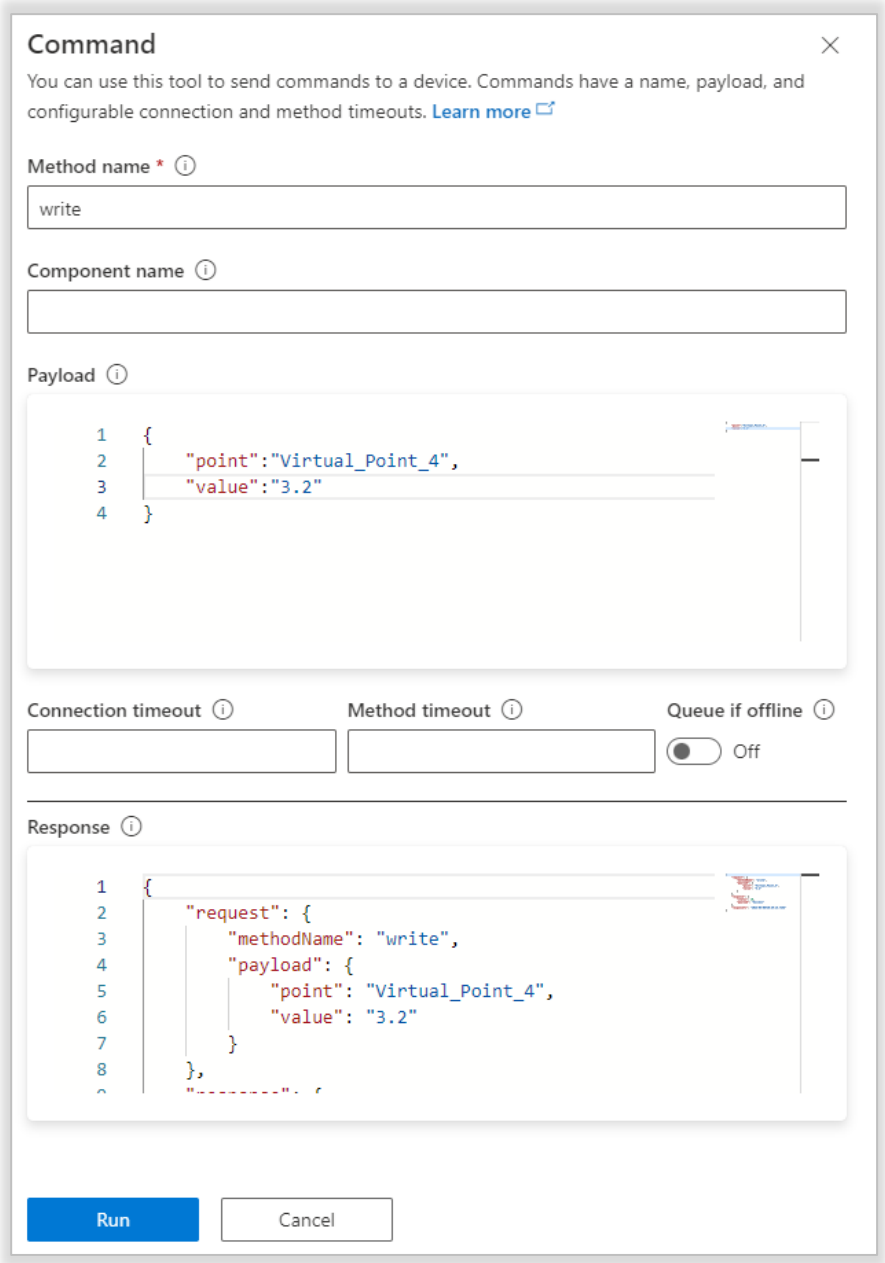
The BAScontrol-E36 can receive data from IoT Central when it is connected to the cloud. This data can go to one of the BAScontrol-E36's virtual points. As described in an upcoming section**,** **Establish Cloud Connection**, mark your virtual point's Direction as being **From Cloud**.



To write data from IoT Central, select **Devices**, and click **Manage Device**.

Then, select **Command** and fill out the command options as shown below:

- **Method name**: must be "**write**."
- **Payload**: the virtual point name must match the point you wish to control in the BAScontrol-E36.
- **Response**: You should see a similar response as shown in the image.
- **Run:** After clicking **Run,** status should appear as **Success**.



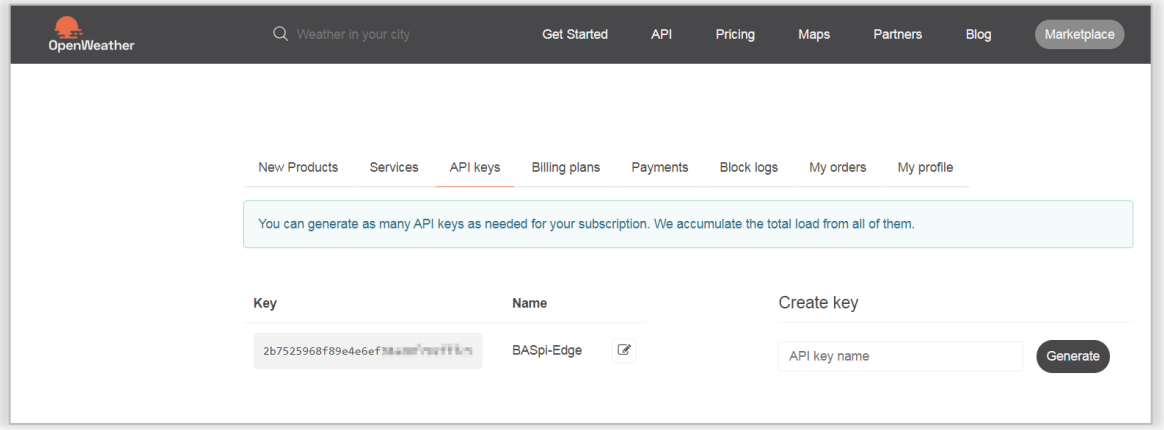
NOTE: Data sent to the cloud will use the assigned channel names, for example, Virtual_Point_1. These names are very long and if you send a lot of data to the cloud, these longer names could provide an added expense. You can shorten the names of the channels going to the cloud to save money. In your Azure configuration you need to utilize the channel names, so it might be advisable to keep some aspect of the channel's use in the name to help keep in your Azure configuration. For example, Virtual_Point_1 could be abbreviated to VP1

If you have any issues sending data to the cloud, go to the System Status webpage and look at the status for the cloud functions in the BAScontrol-E36

7.16. Weather

The BAScontrol-E36 supports current weather forecast data obtained from the free weather web service: openweathermap.org. Enter a valid email address to create a free account. Once verified, log in to your openweathermap.org account and click the **API keys** tab. Enter a name in the **Create Key field** and click **Generate.**

You can create multiple API keys. Names can also be edited after the keys have been created. Different API keys can be used in different BAScontrol-E36 controllers installed at different sites.



7.5.1. Establish Weather Server Connection

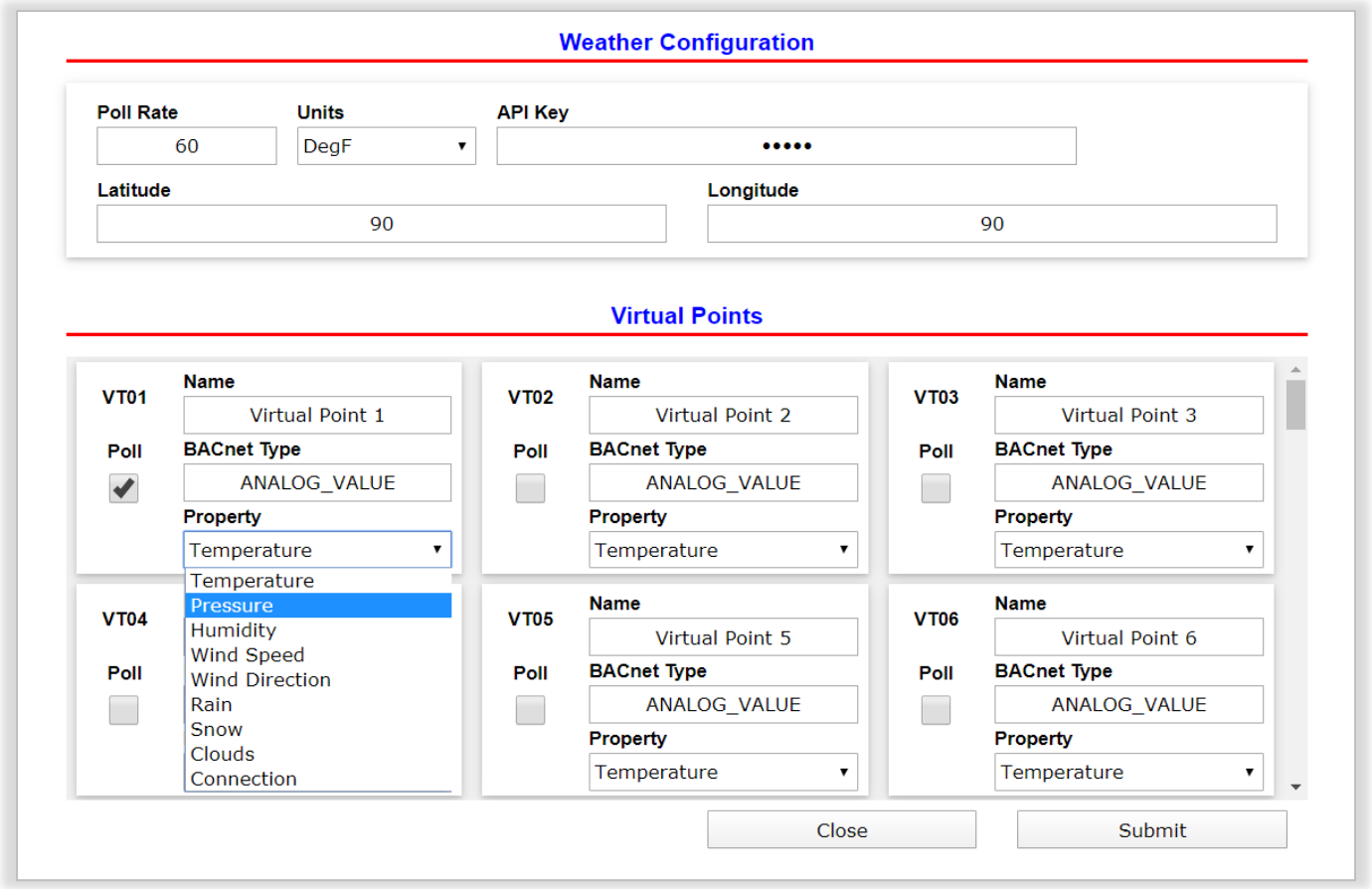
Click the **Weather** button to access the BAScontrol-E36 Weather Configuration page. Copy the API key provided from your openweathermap.org account and paste it into the **API Key** field. Make sure you have a proper gateway address set up for either the Ethernet or Wi-Fi adapter as well as a proper DNS address. An Internet connection **over Ethernet or Wi-Fi is required for BAScontrol-E36 to query the weather server.**

- **Poll Rate** - The default Poll Rate of 60 seconds is recommended to maintain the free aspect of the openweathermap.org weather service. Slower poll rates can be used and will not affect your account. Faster poll rates may require payment.
- **Units** - Choose **DegF** or **DegC** from the dropdown for degrees Fahrenheit or degrees Celsius, respectively.
- **Latitude and Longitude** - Allows the weather web service to provide timely weather data for the specific location. Use the same geolocation configuration as the **Set Time** web page.

7.5.2. Assign Virtual Points

Once the API key and Internet connection are configured, weather forecast parameters are bound to Virtual Points and can be used in the Sedona wiresheet control logic, served on BACnet, and used in graphical Dashboards or Cloud dashboards. A total of 192 VTs are available.

- **Properties** - Choose a Virtual Point which is not in use and assign a weather parameter. Temperature, pressure, humidity, wind speed, wind direction, rainy condition, snow condition, and cloudy condition weather parameters are supported. Each weather condition must be bound to a Virtual Point.
- **Virtual Point** - can be assigned the Connection weather server data point which indicates the binary state of the weather service connection as **1** for Connected and **0** for Disconnected - this can be used to ignore the weather server data in case of connection loss.
- **Poll** - Click the **Poll** checkmark to enable polling the weather web server. Optionally, a name can be entered in for each Virtual Point.



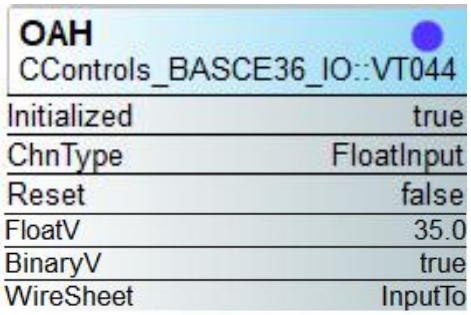
Repeat the process for each weather condition you wanted supported.

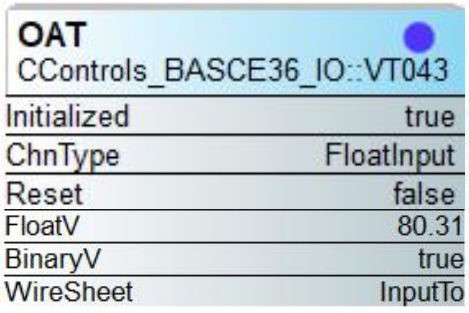
Click **Submit** to save all configuration changes, then click **Close** to close the Weather Configuration web page.

Restart the controller to activate the weather API configuration.

Once configured, the Virtual Points web page will show the weather values obtained from the weather server and the corresponding Virtual Point Sedona components will carry these values into the Sedona wiresheet.

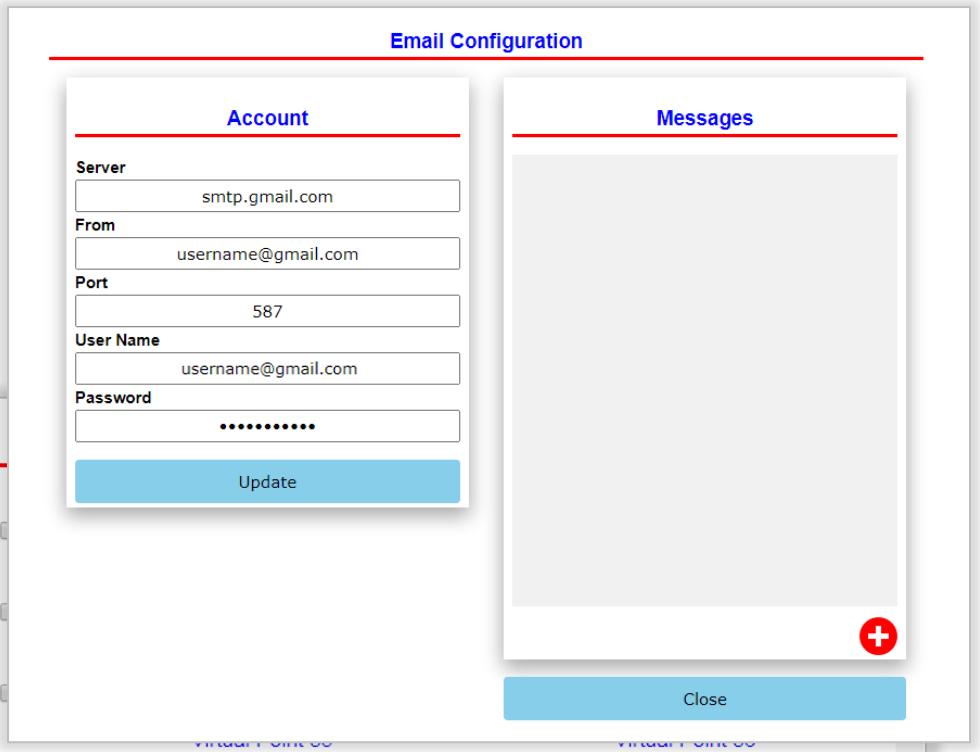
These weather parameters can then be dropped on the Sedona wiresheet and utilized in control logic. Virtual Points are automatically served over BACnet and can also be utilized in graphical Dashboards or Cloud dashboards.

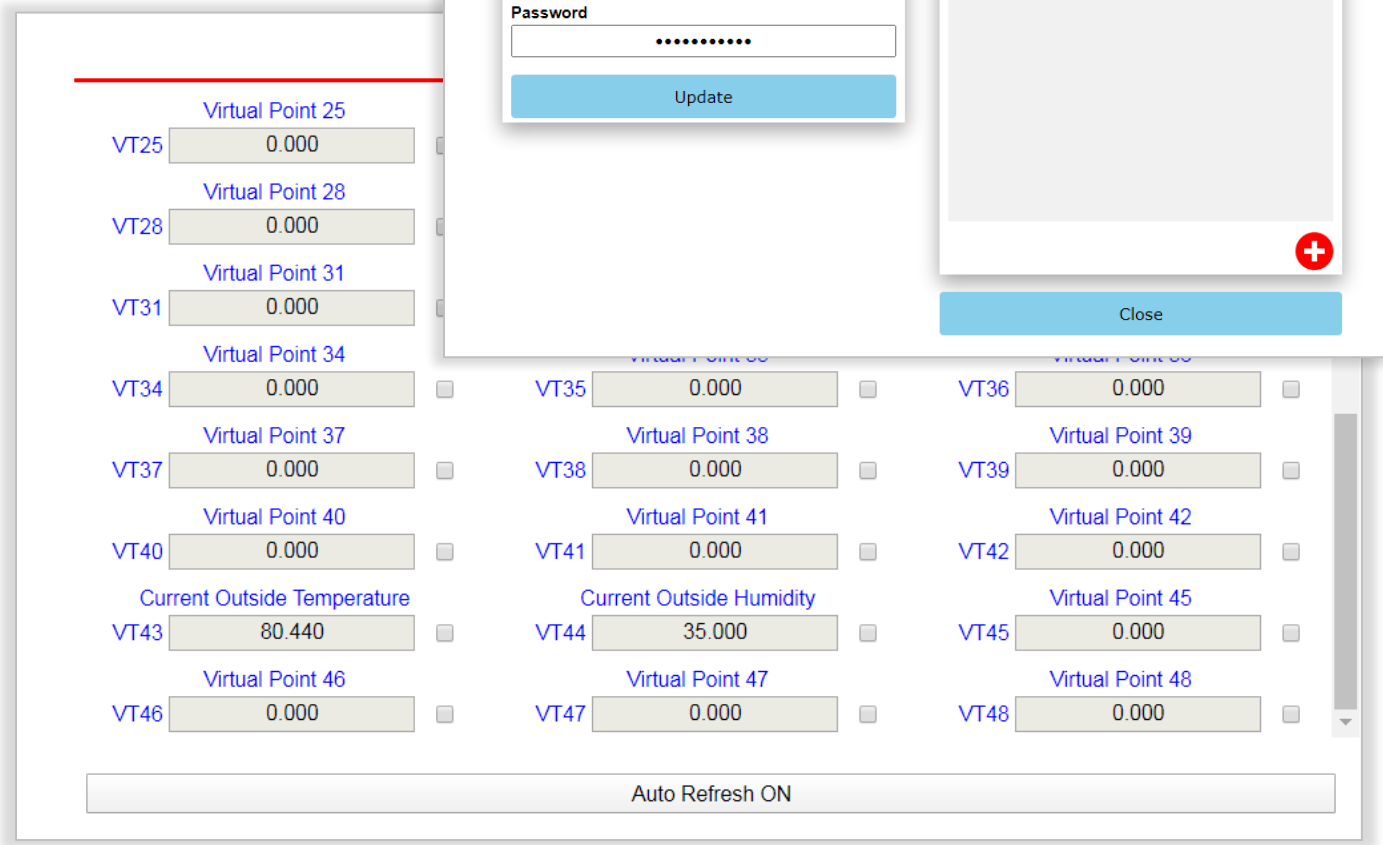




7.17. Email Configuration

BAScontrol-E36 supports multiple email alarms/notifications. The Email service uses a Simple Mail Transfer Protocol (SMTP) server to send email messages. A routing email address is required. Multiple emails can be configured to be sent to different email addresses (different individuals).





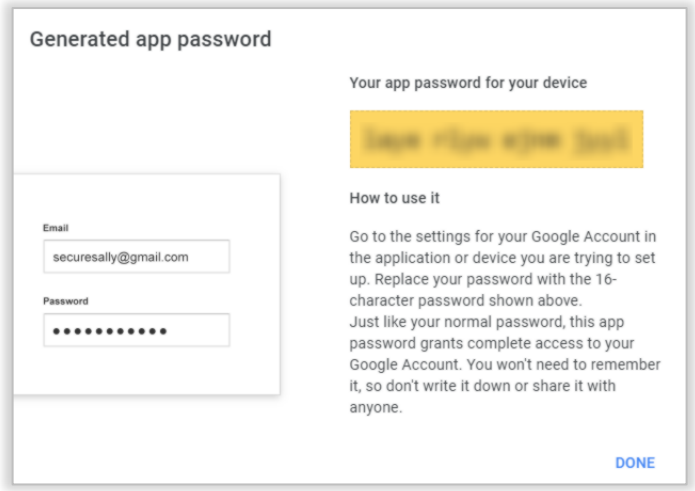
Emails are secure using SSL/TLS encryption on port 587 by default and support most common email servers with security. Unsecure servers are currently not supported.

Email alarms/notifications body and subject are customizable and can be triggered by Sedona wiresheet email components. The email body can include the present values of any or all the BAScontrol-E36 physical and/or virtual points, and up to three Sv wiresheet values provided as slots in the Sedona Email component. To set up email alarms/notifications, open the Email Configuration page.

7.6.1. Establish an Account

First, the Account information must be set up. This includes the SMTP routing and account configuration needed to send emails. You could create a free or paid email account with most standard email providers. Configure the email in the Account fields as follows:

- **Server:** Identifies the SMTP server.
  For example, smtp.gmail.com or any other free or paid SMTP server provider. Currently, only secure servers are supported.
  - On some email servers, such as Gmail, an app password must be created before emails can be sent.
    - Sign into the Gmail account using a web browser at https://mail.google.com.
    - Go to Account > Security > How you sign in to Google > 2-Step Verification > App passwords.
    - Under App passwords, provide a unique name, and click the **Create** button. This will give you a popup with a Generated app password. For security, please use this password for the email login password on the BAScontrol-E36 unit.

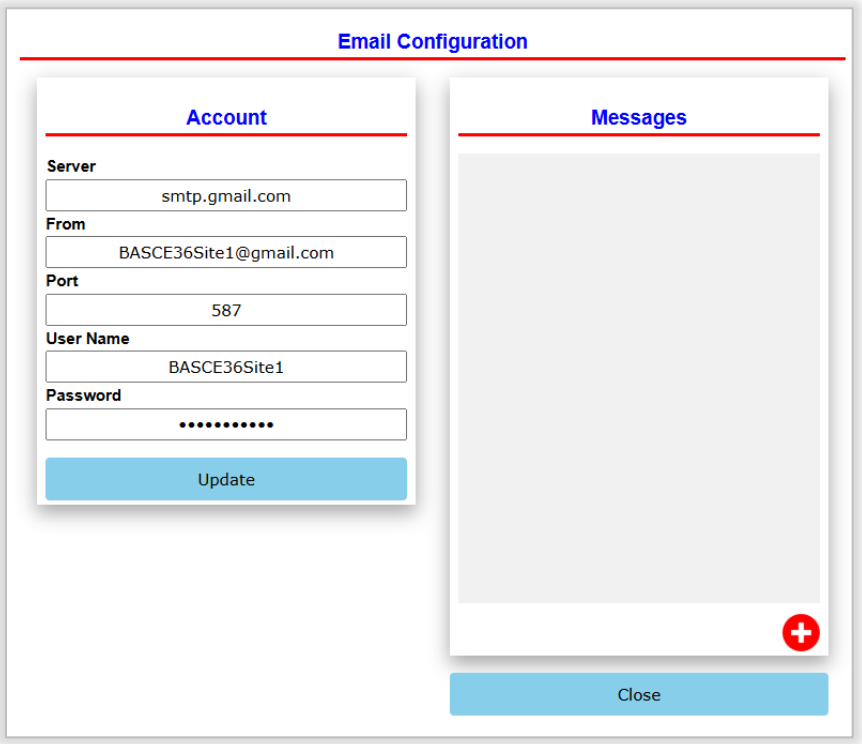


- **From** - Identifies the originator email address.
  This must be a valid email address. It is the email address the BAScontrol-E36 email notifications will originate from, and recipients will see.
- **Port** - The default port is 587.
  Only change Port if needed. When an email client or outgoing server submits an email to be routed by a proper email server, it should always use SMTP port 587 as the default. This port, coupled with TLS encryption, will ensure that emails from BAScontrol-E36 are submitted securely and following the guidelines set out by the IETF.
- **User Name** - Identifies the username for the originator email address account. This is the same username normally used when logging into that account. You could create different accounts for different job sites if preferred.
- **Password** - Identifies the password for the originator email address. This is the same password normally used when logging into that account. For security purposes, the password field is obscured so that it cannot be read.

Configuration Example:

In the example below, recipients of this BAScontrol-E36 email alarms/notifications will receive emails from: BASCE36Site1@gmail.com. The corresponding username and password for that Gmail account were entered in the Username and Password fields. The default secure port of 587 is used and third party less secure apps access was enabled in the Gmail account settings for that account as described above.

Restart the controller for Account settings to take effect and to send messages from the configured account.

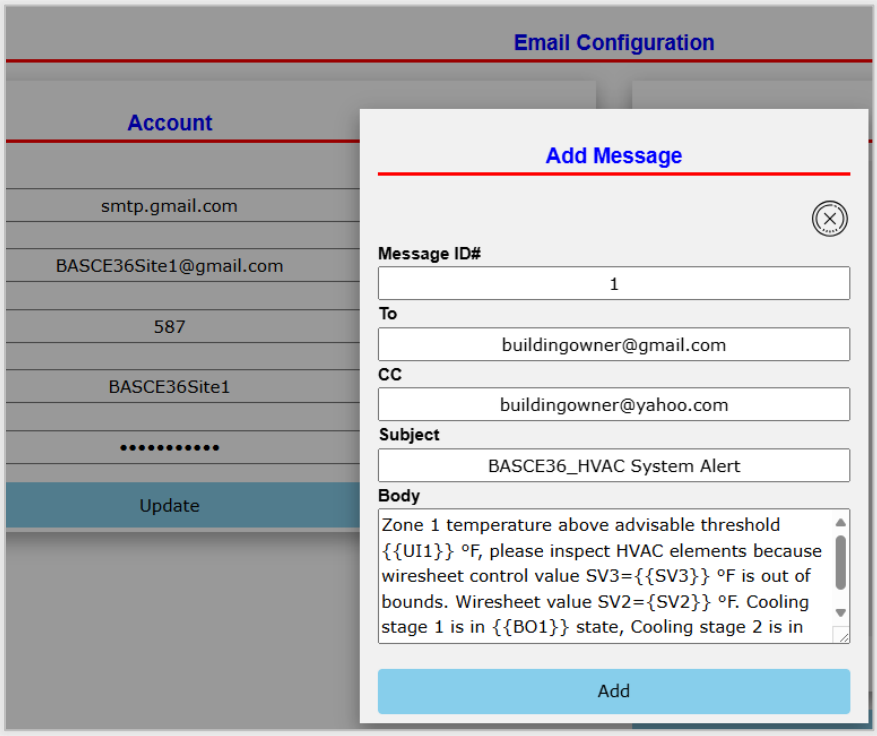


7.6.2. Create Messages

Once the Account information is set up, you can create email alarms/notifications.

- To create a new message, click the **red plus** icon at the lower right corner.
- Enter a **Message ID#,** this can be any numeric value.

  It will also be used in the Sedona Email component which will be bound to this message. When the Sedona component configured with this Message ID# is triggered, the message will be sent. This allows for the use of multiple Sedona Email components to send different alarms/notifications to different recipients.



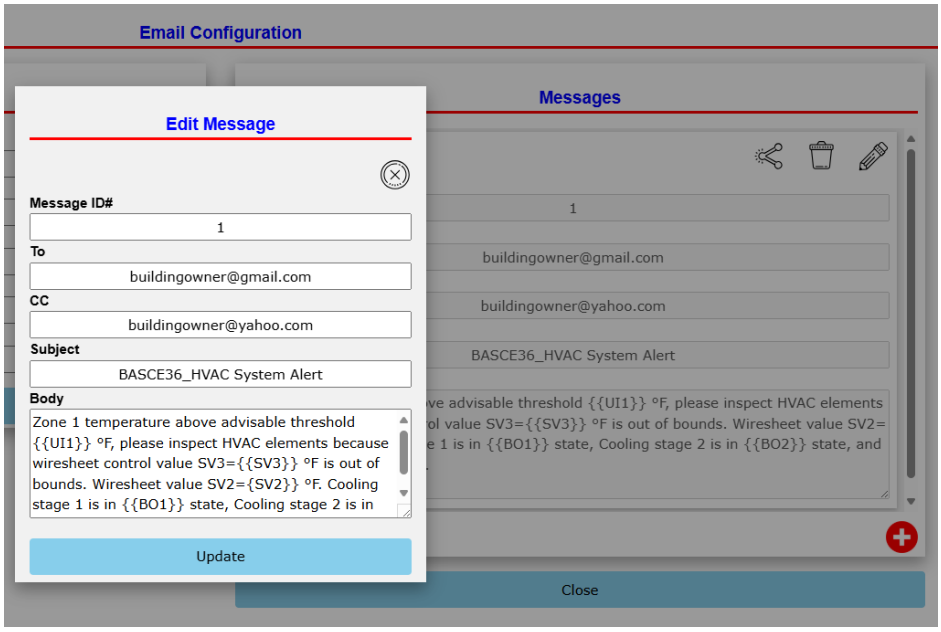
- Enter the recipient's email address in the **To** field. Multiple recipients' email addresses can be entered by separating the addresses with a comma (,).
- Enter secondary recipient's addresses in the he **CC** (carbon copy) field. Multiple recipients' email addresses can be entered by separating the addresses with a comma (,).

- Enter the message's subject line in the **Subject** field
- Enter the message content in the **Body** field.
  Actual point values sampled at the time of triggered sent email can also be included in the email text body. Using curly braces **{}** around a point name and instance, real, virtual, or up to three wiresheet point present values can be included. For example:

  Zone 1 temperature above advisable threshold {{UI1}} °F, please inspect HVAC elements because wiresheet control value SV3={{SV3}} °F is out of bounds. Wiresheet value SV2={SV2}} °F. Cooling stage 1 is in {{BO1}} state, Cooling stage 2 is in {{BO2}} state, and Fan is in {{BO3}} state.

  - {{UI1}} will send the present value of Universal Input 3, regardless of what channel type it is configured for. Units or description are not included with the value so they must be added in the text body if needed, such as "{{UI1}} °F" for a temperature value or "{{UI1}} V" for a voltage value.
  - {{AO1}} will send the present value of Analog Output 1.
  - {{BO2}} will send the present value of Binary Output 2.
  - {{VT44}} will send the present value of Virtual Point 44.
  - There are also three Sv float value slots per email component – Sv1, Sv2, and Sv3. These slots can be tied directly to wiresheet data and used to send values in the body which are not physical I/O points or Virtual Points, but values sampled directly from wiresheet logic. All three Sv values can be included in one email. In the example below Sv1 is not used, Sv2 has a value of 75.5 and Sv3 has a value of 213.
    - {{SV1}} will send the present value of the Sv1 slot of the configured email component ID.
    - {{SV2}} will send the present value of the Sv2 slot of the configured email component ID.
    - {{SV3}} will send the present value of the Sv3 slot of the configured email component MessageID.

If you need to edit a message, click the **pencil** icon at the top right, and click **Update**. To delete a configured message entirely, click the **trash can** icon, and confirm.



To force a send to test a message alert, click the **triple node** (share) icon. A small pop-up window will be displayed with Status: IDLE.

Click **Send** to force an email. Status will change to PENDING and upon a successful send, it will change to SUCCESS. If it fails, it will change to FAIL. On Status: SUCCESS, the message will be forcefully sent (not automatically triggered by Sedona Email component) to the configured recipients.

NOTE: Sv wiresheet values {{SV1}}, {{SV2}} and {{SV3}} included in Body are only sent when the Sedona Email component is triggered to true state. These values will not be sent when the message is forced from the web page using the **triple node** (share) icon.

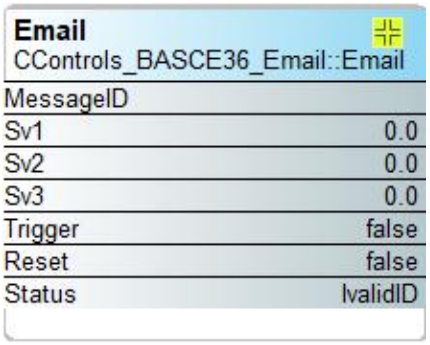
To create another message with a different MessageID#, click the **red plus** icon at the bottom. MessageID# numbers must be unique for each configured message bound to a Sedona Email component.

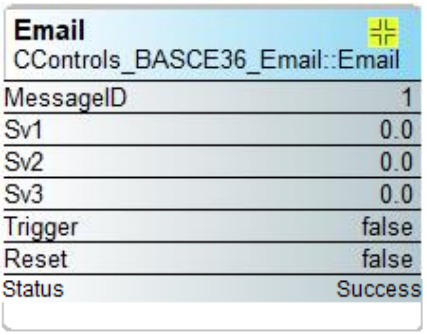
If you have any issues sending the email, go to the System Status webpage and look at the status for the email functions in the BAScontrol-E36

7.6.3. Email Component Configuration

Once the message is configured, you are ready to bind a Sedona Email component to the configured message using the Message ID#.

The Email component is available in the CControls_BASCE36_Email kit. Drag and drop the Email component on the wiresheet to begin configuration.



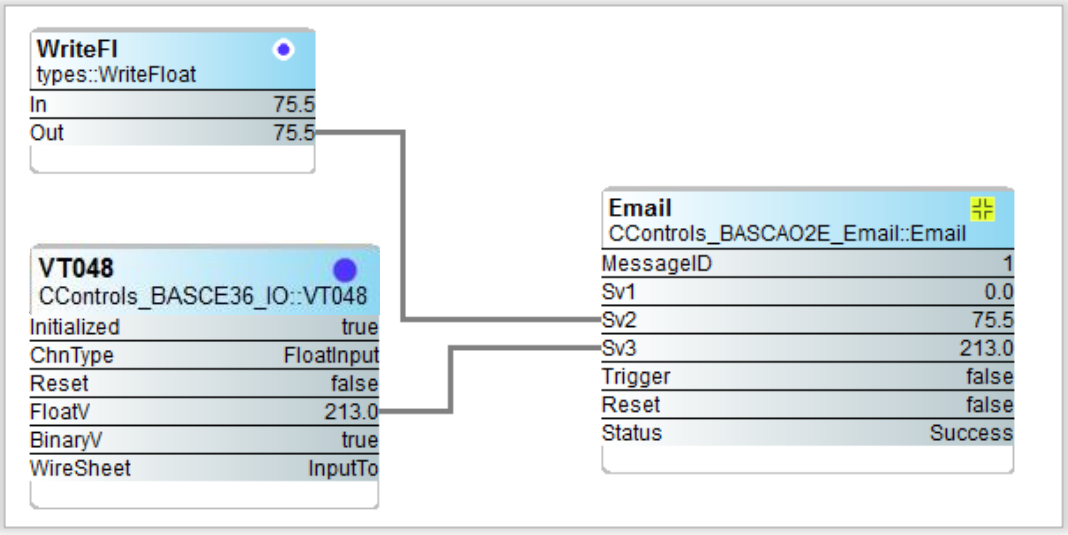


- **MessageID** - Is the MessageID for the desired message created on the web page.
- **Trigger** - is a binary value which when triggered to a true state will initiate the email send. The next email alarm/notification will not be sent until this slot returns to a false condition and then true again to initiate the next send (sends on rising edge).
- **Status** - Once MessageID# is entered in the **MessageID** slot, **Status** will change state:
    - From InvalidID to Pending while the email service is in the process of sending a message.
    - To Success once the message has been sent successfully.
    - To Failure if the message fails. The email component will not retry to send email alerts in the case of **Status** slot = Failure until the Email component has been reset by toggling the **Reset** slot to true.

The **Status** slot has an Integer (Int) data type output which allows you to create additional logic to drive the **Reset** slot to true in case of Failure Status.

- 0 for Success
- 1 for Failure
- 2 for Pending

- **Sv1**, **Sv2**, and **Sv3** - are float values that can tie wiresheet values to the message body. These values can be included in the email by using curly braces around each slot name such as, {{SV1}}, {{SV2}}, or {{SV3}}. All three values can be included in the email message body.



Successfully received email alert example:

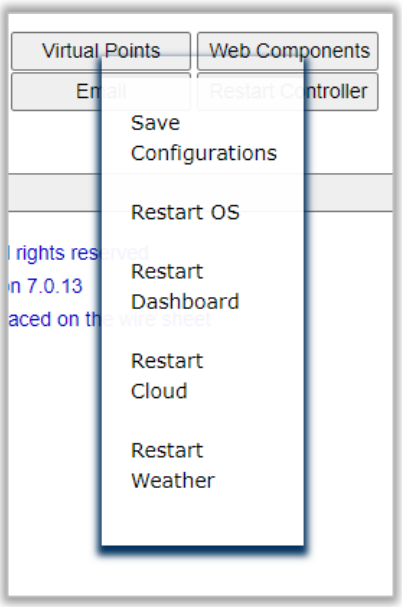
Zone 1 temperature above advisable threshold 79.600°F, please inspect HVAC elements because wiresheets control values Sv3 –213.000°F is out of bounds. Wiresheet value Sv2 –75.500°F.

7.18. Restart Controller

BAScontrol-E36 firmware can be restarted using the **Restart Controller** button on the main web page.

The **Restart Controller** button only restarts selective services after configuration changes have been made to those services.

To restart a specific service such as cloud or weather, or to restart the Linux operating system: right-click **Restart Controller** or any of the web page buttons at the bottom and select one of the Reset options:



- **Restart OS** - restarts the Linux operating system with all associated services–complete system restart:
- **Restart Cloud** - restarts cloud service only.
- **Restart Weather** - restarts weather service only.
- **Save Configurations** - saves your current BAScontrol-E36 configuration.
- **Restart Dashboard** - restarts only the dashboard on the BAScontrol-E36.

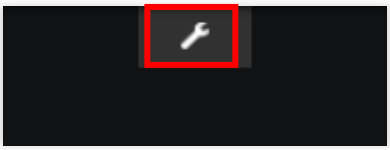
NOTE: Sedona logic is paused during Restart. Physical inputs/outputs will remain in the last known state before the Restart while the system is rebooting. Once the system is restarted, Sedona logic resumes normal operation.

7.19. Dashboard

Graphical dashboards allow you to easily visualize your automation application and/or provide a human-machine interface. BAScontrol-E36 graphical dashboards can be configured and customized using a web page and accessed over Ethernet or Wi-Fi. A built-in library of graphical widgets such as gauges, charts, sliders, or buttons is used to display and/or control BAScontrol-E36 point values.

7.20. Dashboard Configuration

To design a graphical dashboard, click the **Dashboard** button on the main web page. You will be taken to a black screen with a small wrench icon at the top. The wrench icon is only shown when the dashboard is accessed over an IP connection.

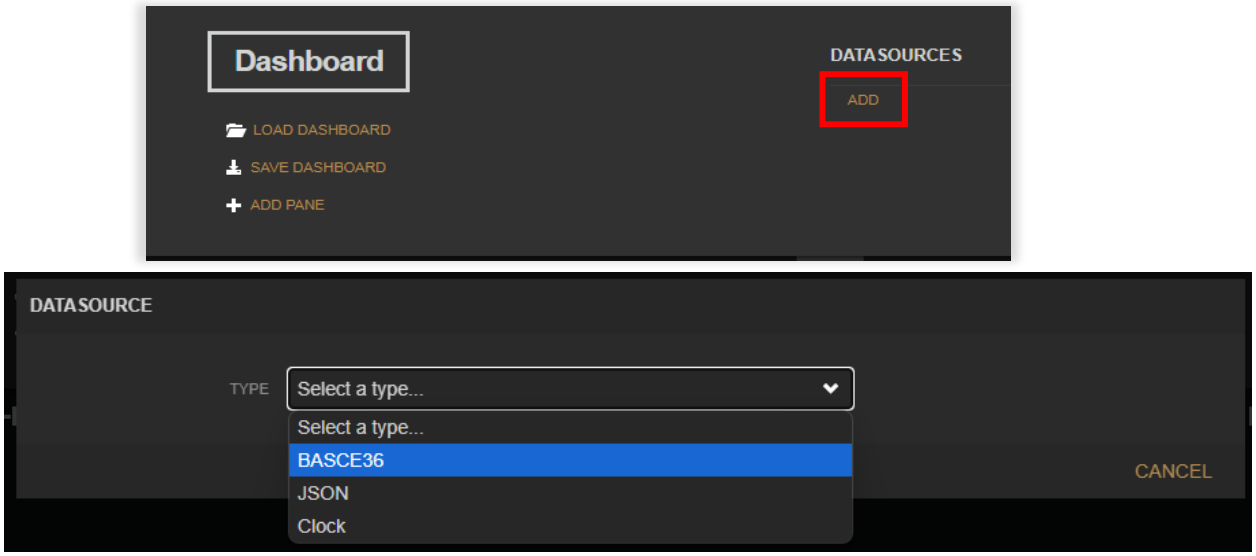


Click the small **wrench** icon at the top to begin dashboard configuration.

NOTE: BAScontrol-E36 IP address and Channel Configuration, specifically channel names (point names), must be configured prior to designing a Dashboard. The Dashboard uses this configuration to create, obtain, and update data used in the Dashboard.

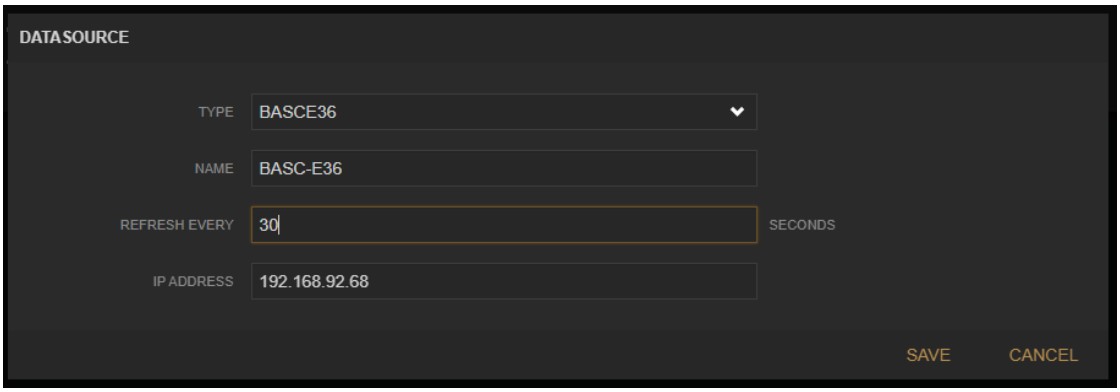
7.8.1.1. Add Data Source

Click **Add** under Data Sources and choose **BASCE36** from the Type dropdown menu.



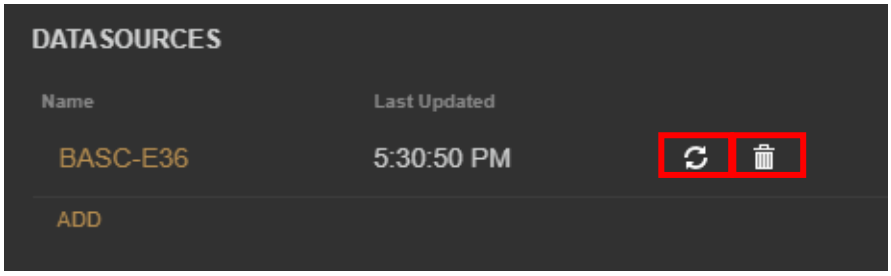
7.8.1.2. Name Data Source

Once selected, give the BAScontrol-E36 data source a name. The refresh rate is set to five seconds by default, but it can be configured to a minimum value of one second if faster response for graphical widgets is required. The IP address is the same as BAScontrol-E36 configured IP address and will be populated automatically.



NOTE: If BAScontrol-E36 IP address changes, it will have to be manually changed in the Dashboard Data Source configuration. Use of static IP addressing is recommended.

Click **Save** to save Data Source configuration. On successful Data Source configuration, the Last Updated time printed next to the BAScontrol-E36 data source will update to the current local time. This indicates the dashboard has successful communication with the data source.

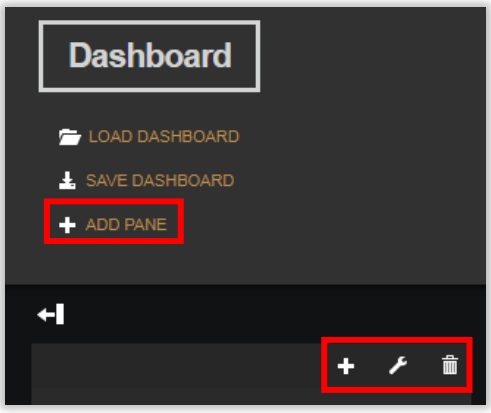


The **circular arrow** icon can be used to refresh data source, and the **trashcan** icon can be used to delete it.

7.8.2. Dashboard Design

7.8.2.1. Add Pane

To begin designing your dashboard, click **Add Pane**, and a new pane (widgets container) will appear on the dashboard. Panes are used to organize graphical widgets and function as widget containers. Panes can be freely positioned on the screen by clicking at the top area and dragging with the mouse.

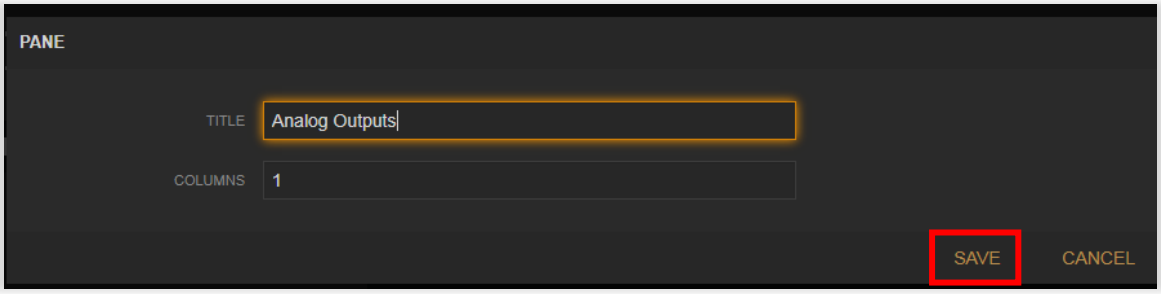


Each Pane has three icons:

- **Plus**: Adds graphical widgets to the given pane.
- **Wrench**: Configures some pane settings, such as its name and number of columns.
- **Trash can**: deletes a pane.

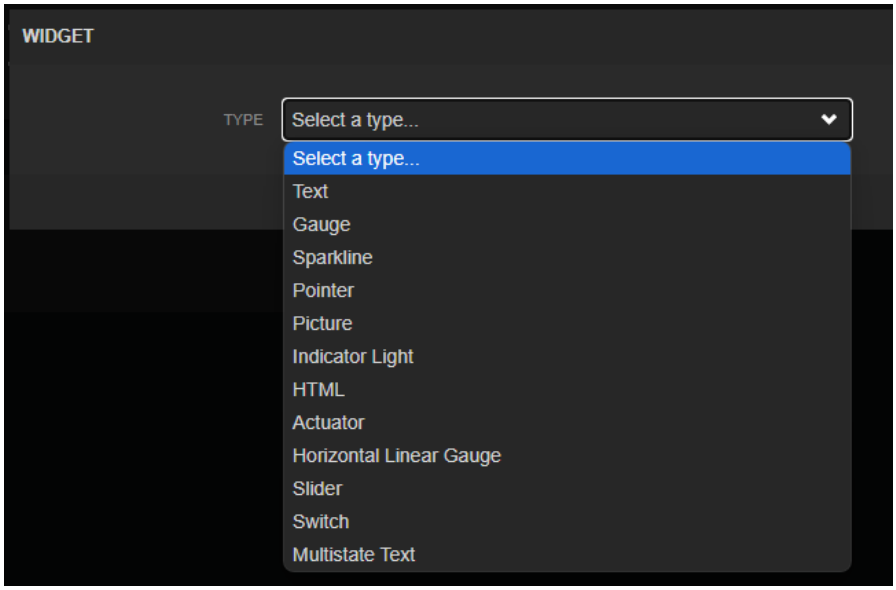
The in this example pane is named “Analog Outputs,” and it will display gauges indicating BAScontrol-E36 analog outputs states.

Click **Save** to save any pane setting changes and close the pane settings window.

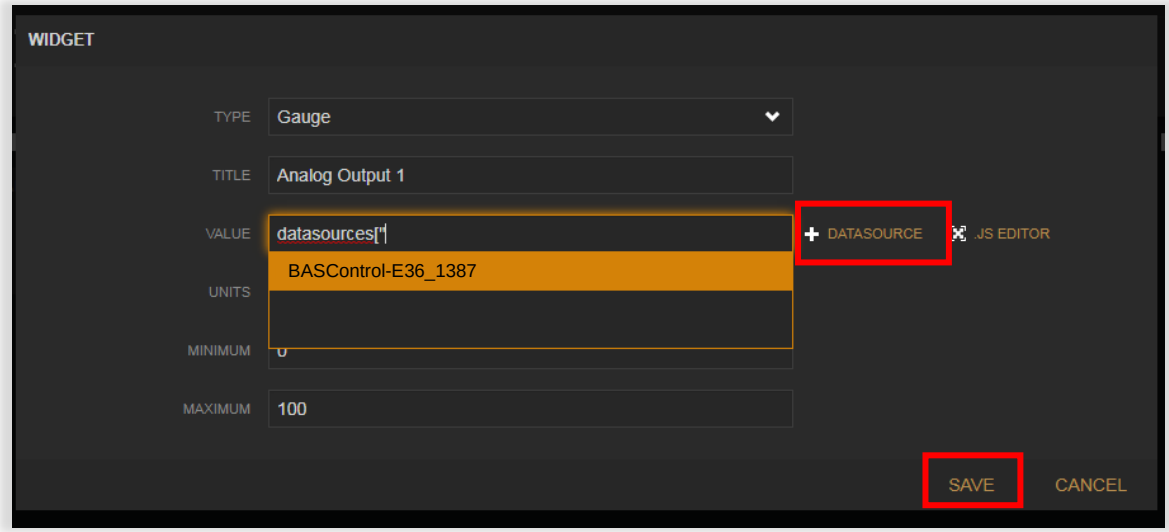


To add graphical widgets, Click the **plus** icon and choose a graphical widget from the dropdown selection.

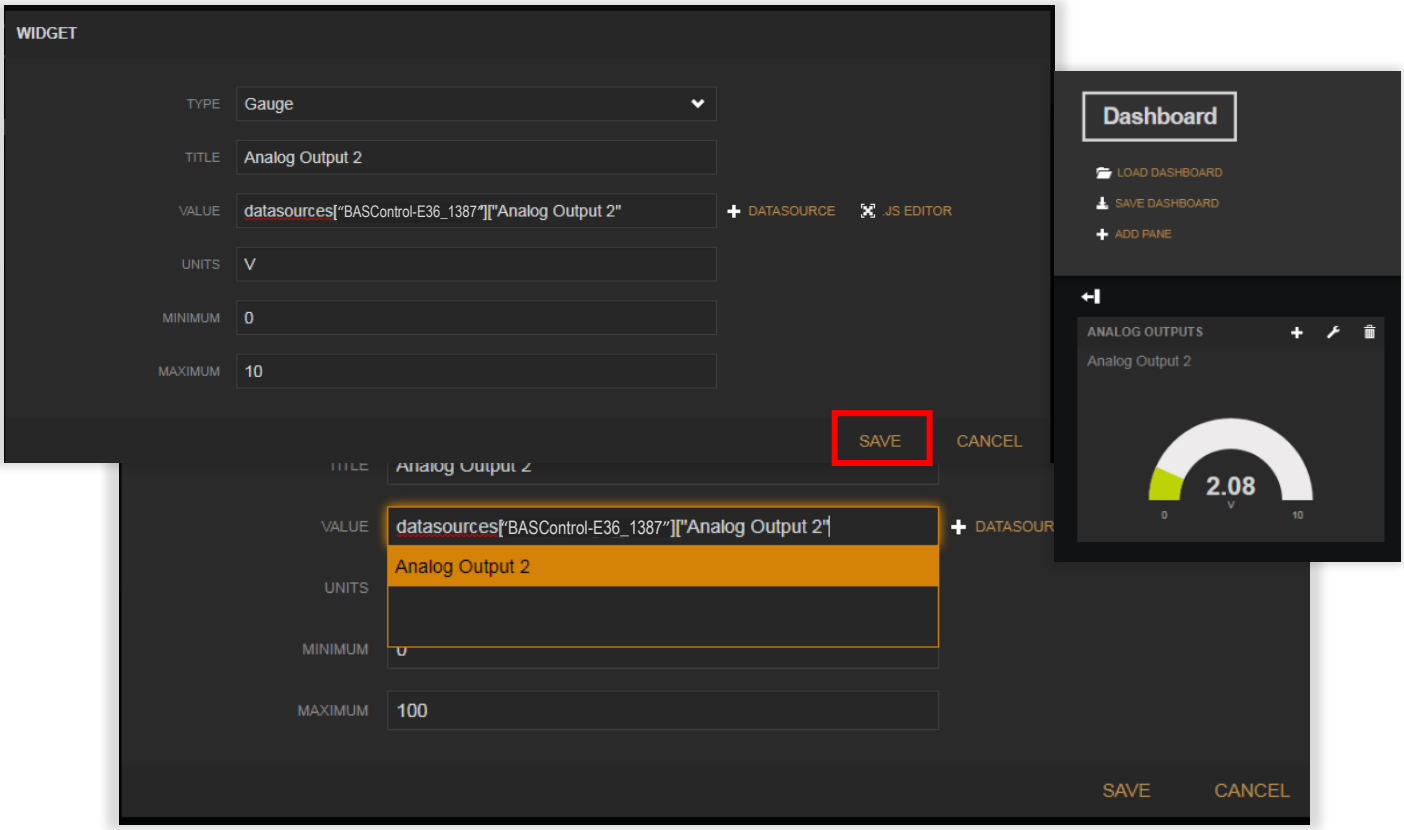
Once a widget is selected, it must be configured for one of the available BAScontrol-E36 points. All 36 physical I/O points as well as all 192 VTs can be utilized in Dashboards. Web Components cannot be utilized in Dashboards.



Name the selected widget and then click **+ Data Source**. Select the previously configured data source (BAScontrol-E36_1387 in example).



7.8.2.2. Choose Data Sources



Once you click on the configured data source, the **Value** field will begin to populate, and the data source available points will be shown in the drop-down menu. Points are listed in the same order as shown on BAScontrol-E36 main web page.

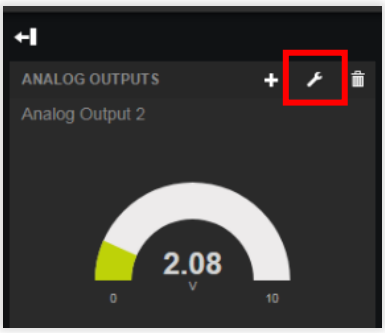
Select the point to be bound to the widget (Analog Output 2, in this example). Point names can also be manually edited using the keyboard input. In addition, if a point name exists in the data source, it will automatically be displayed in the drop-down menu once you begin typing a point name.

7.8.2.3. Create a Widget Pane

Assign **Units**, **Minimum**, and **Maximum** values to create a widget pane. In this example, analog outputs can be driven from 0 V to 10 V, therefore we enter the following values:

- Units: V
- Minimum: 0
- Maximum: 10

Click **Save**, and the Widget will be created in the pane and its value will be updated in the specified interval.

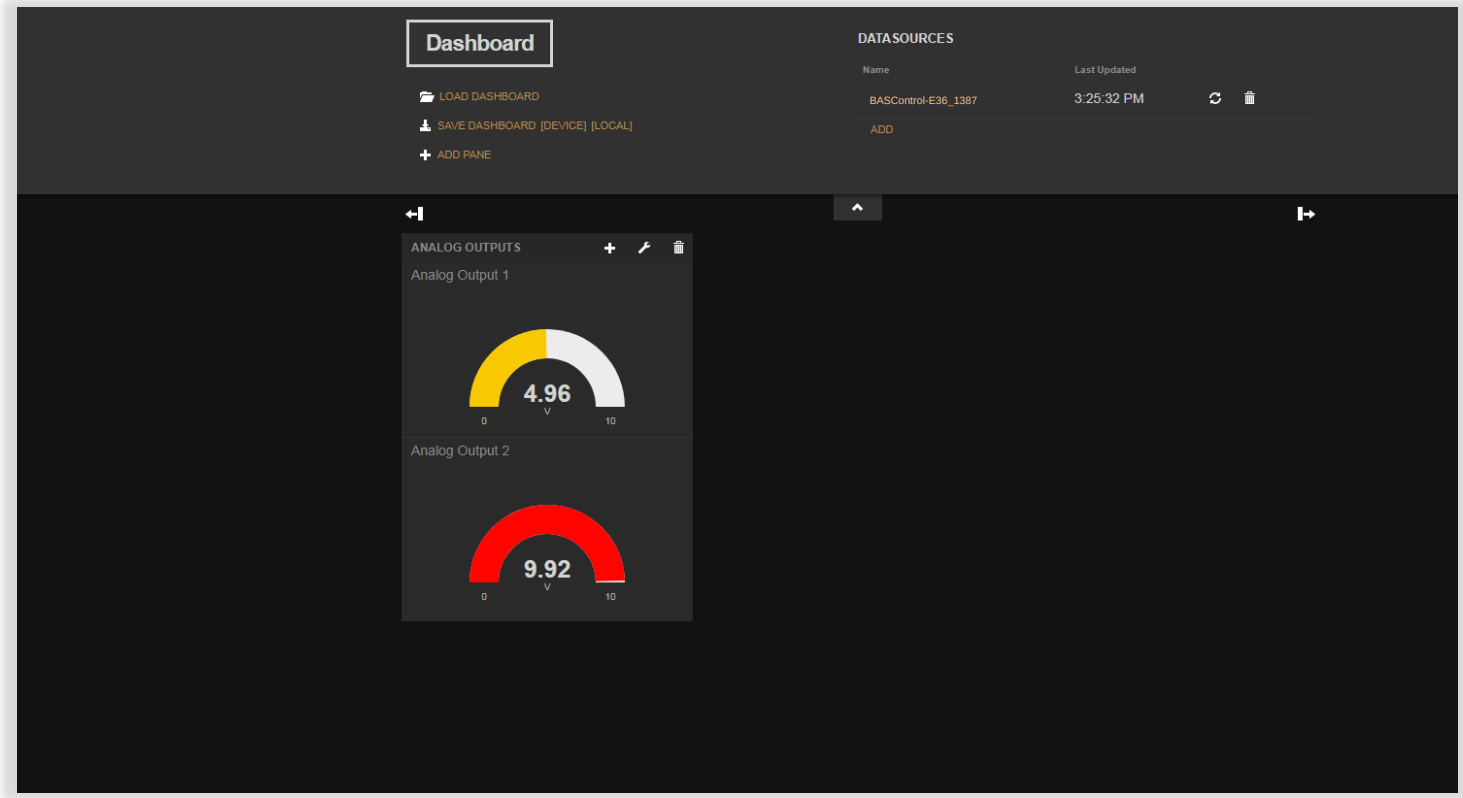


Widget properties can be edited by clicking the **wrench** icon in the Widget's upper right corner.

Pane properties can be edited by clicking the **wrench** icon in the Pane's upper right corner. Repeat the process to add a second widget to the same pane.

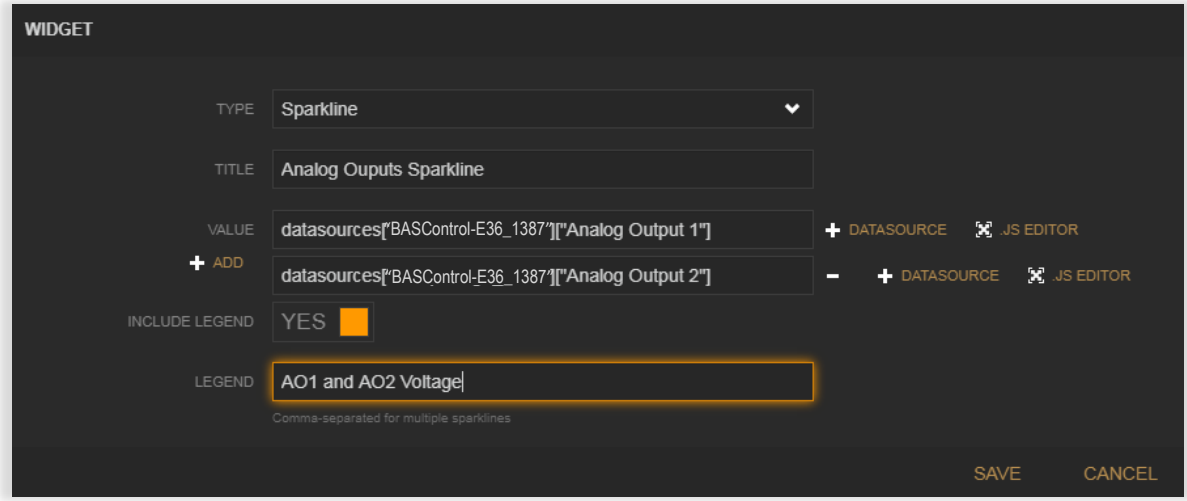
To create a new pane, click the **wrench** icon in the Pane's upper right corner.

The image below shows BAScontrol-E36 analog outputs added to the first pane. Widget order of appearance within the same pane can be changed as needed by clicking the **small arrow** on a given widget in a given pane.

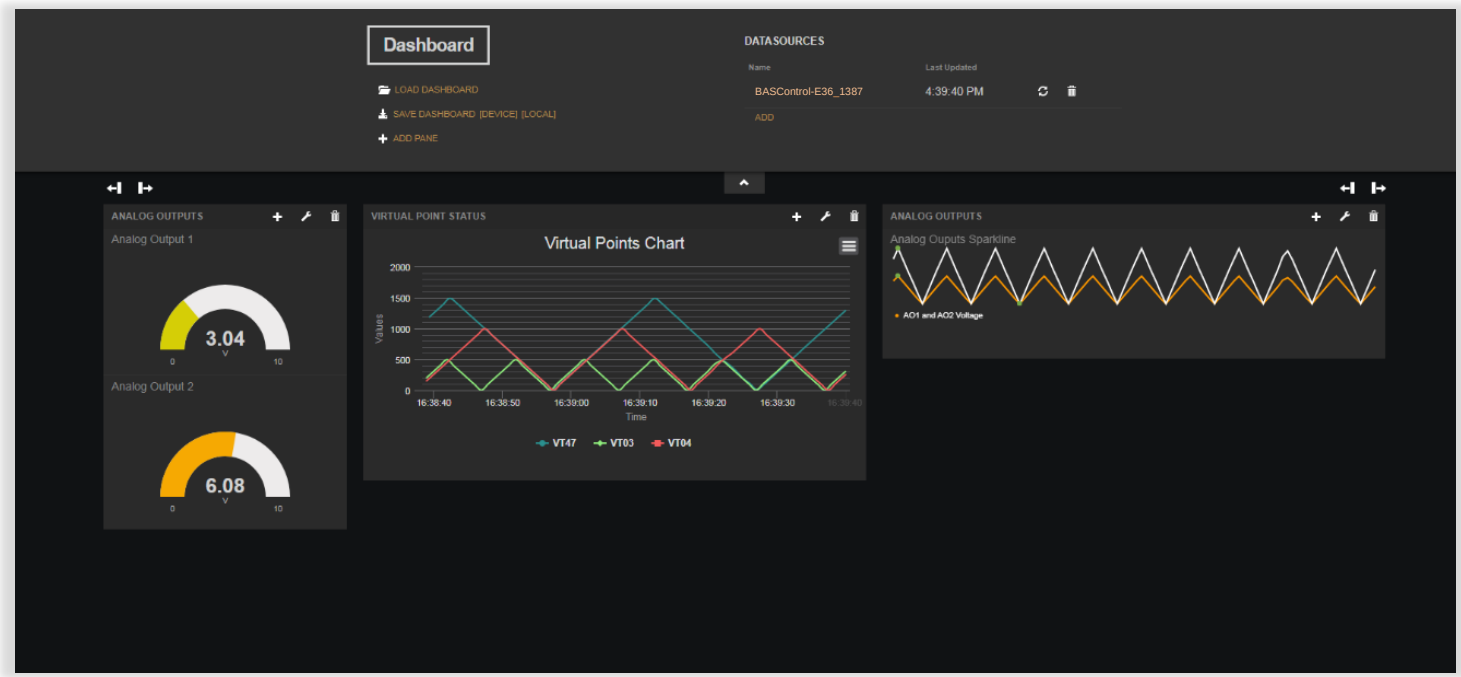


Sparkline Widget

The Sparkline widget allows you to graph point values without a time axis. The difference with this chart is that no time frame is configured or shown, and more than 3 points can be added to the same chart, useful for comparison of multiple point values. A new pane with 2 columns was created and the Sparkline widget configured to graph Analog Output 1 and Analog Output 2 values.



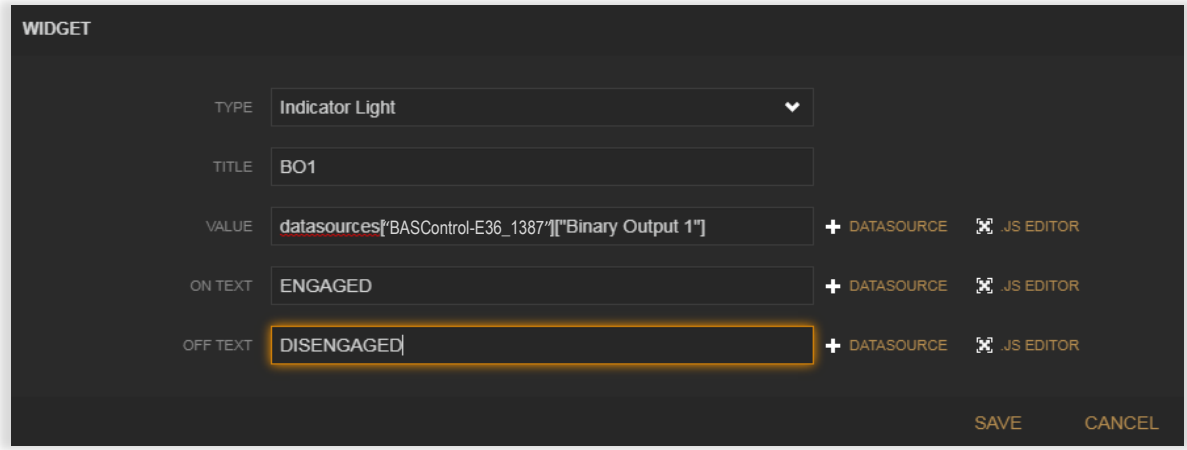
In this Sparkline chart, we can observe that one of the point values peaks above the other.

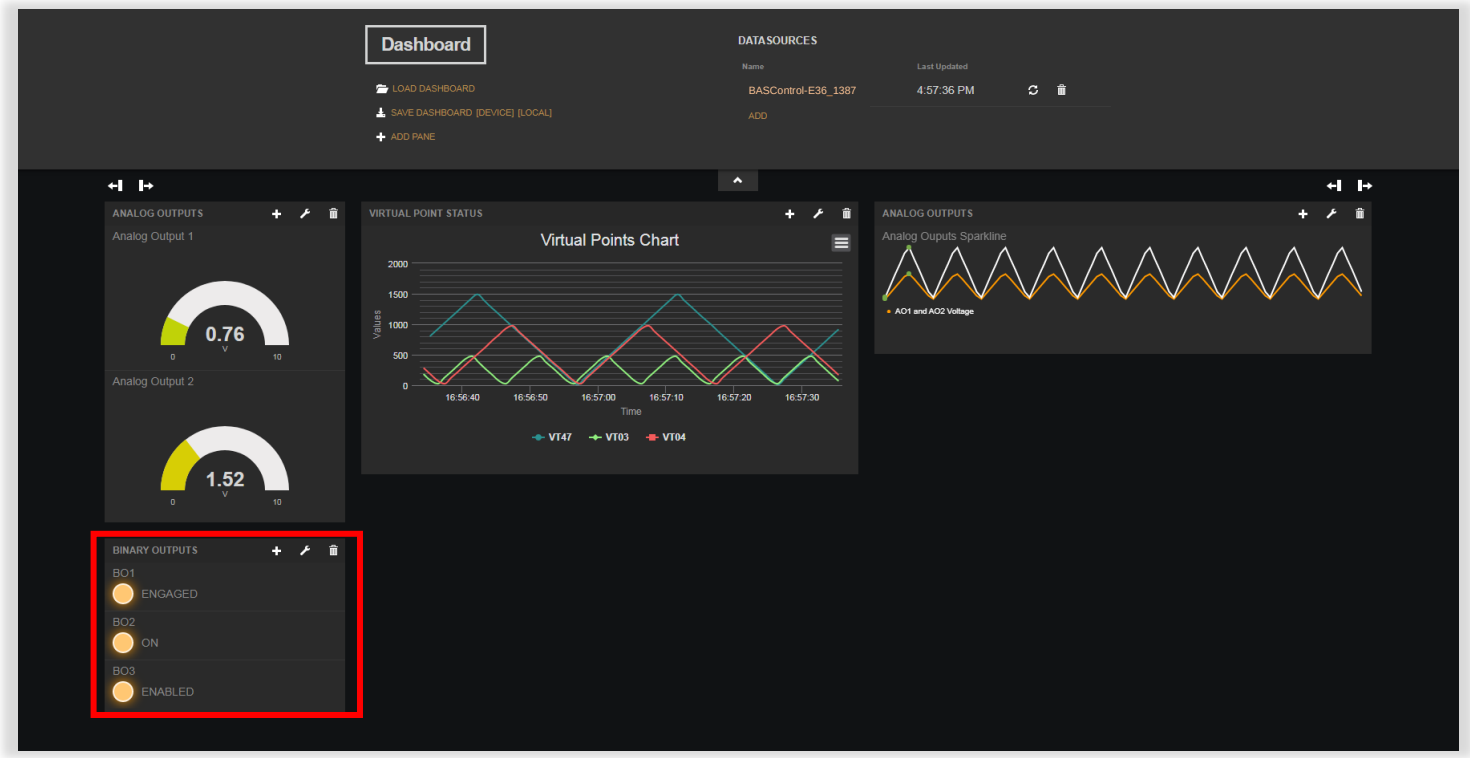


Indicator Light Widget

The Indicator Light widget defines ON text and OFF text in an application. In this example, the Indicator Light widget indicates Binary Output states. **ENGAGED** was defined for ON text and **DISENGAGED** for OFF text for BO1, ON and OFF for BO2, and **ENABLED** and **DISABLED** for BO3.

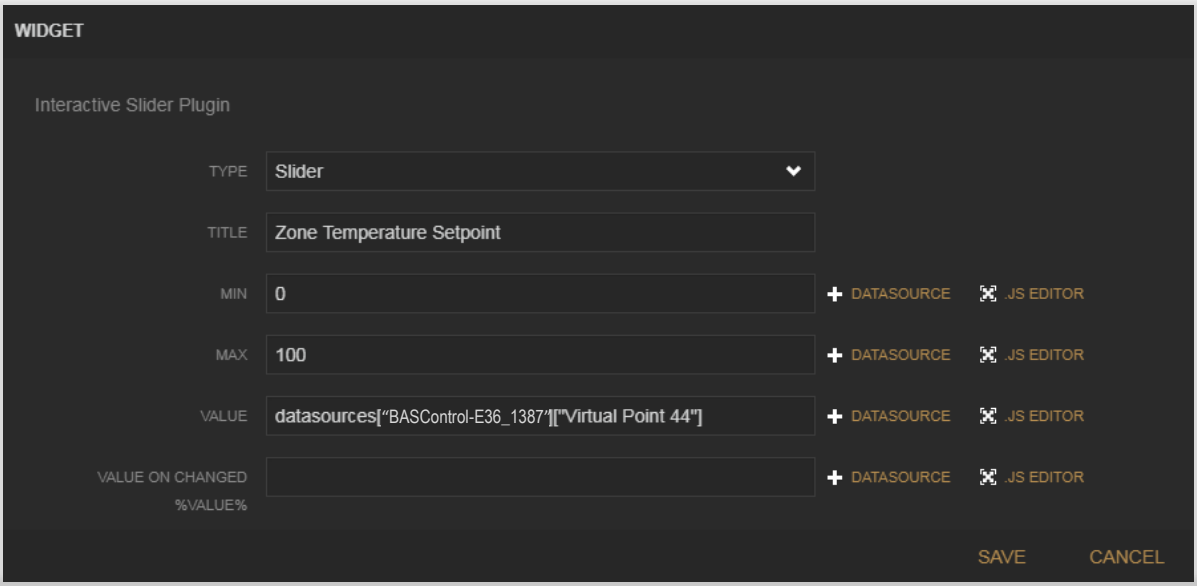
.

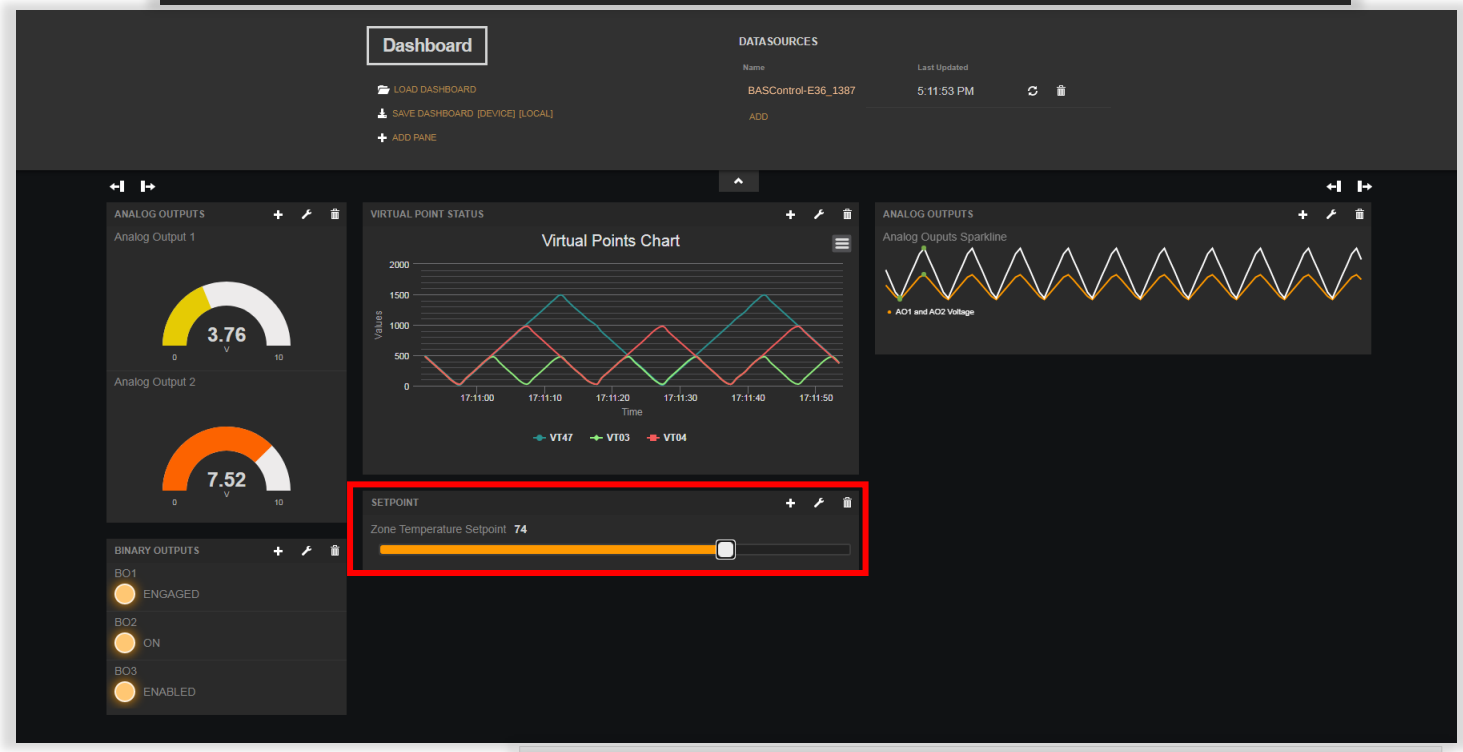




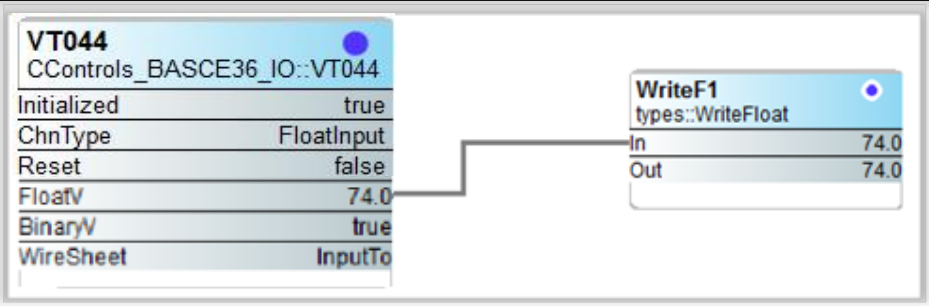
Slider Widget

The Slider widget allows you to define desirable value which will then be written into the Sedona wiresheet logic. You can set slider value using your mouse on PC/laptop or your finger on touchscreens/tablets. In this example, Virtual Point 44 to is configured as Temperature Setpoint input to the wiresheet.



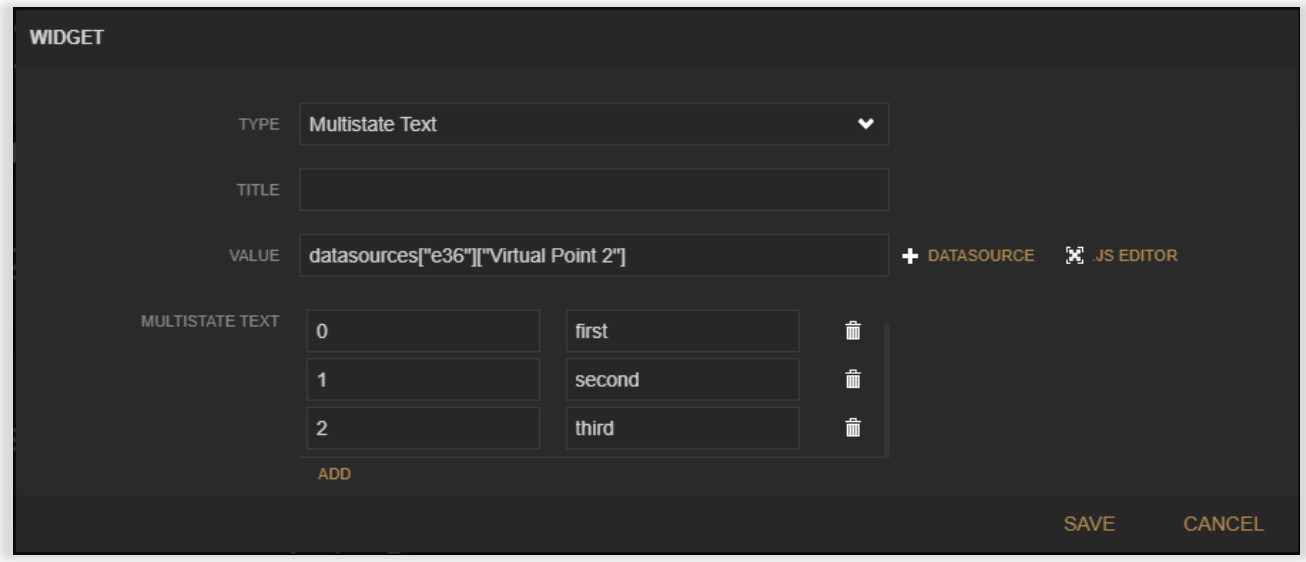


In the Dashboard example above, the Slider Widget was configured as Temperature Setpoint with a desired value of 74, which VT44 configured as input to the wiresheet.



Multistate Text Widget

The Multistate widget adds states to the widget to cover the possible states of the value. The text entered for each state will be displayed by this widget in the dashboard. Below we have “first” being displayed when the value is 0, “second” when the value is 1, and “third” when the value is 2. Analog values can be used, and any value after the decimal point will be ignored. For example, “second” will be displayed when the value is 1.00 to 1.99.



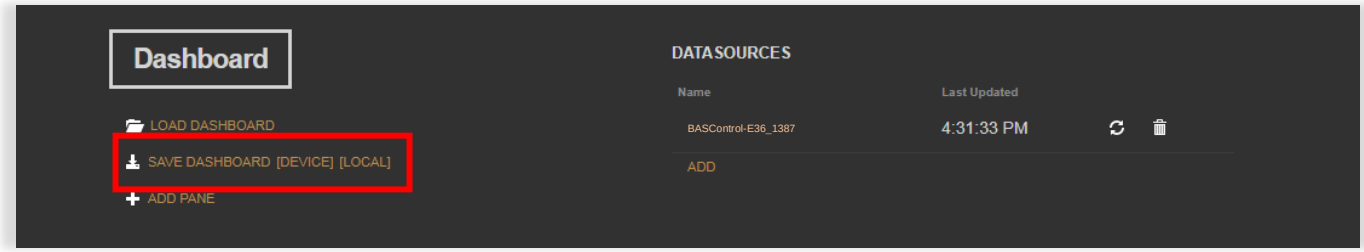
7.8.2.4. Generate Dashboard

7.8.2.5. The dashboard created using the web interface can be saved to LOCAL or DEVICE as a dashboard.json file.

A dashboard.json file saved to **LOCAL** is saved directly to the Downloads folder on the PC/laptop/tablet used to configure the dashboard.

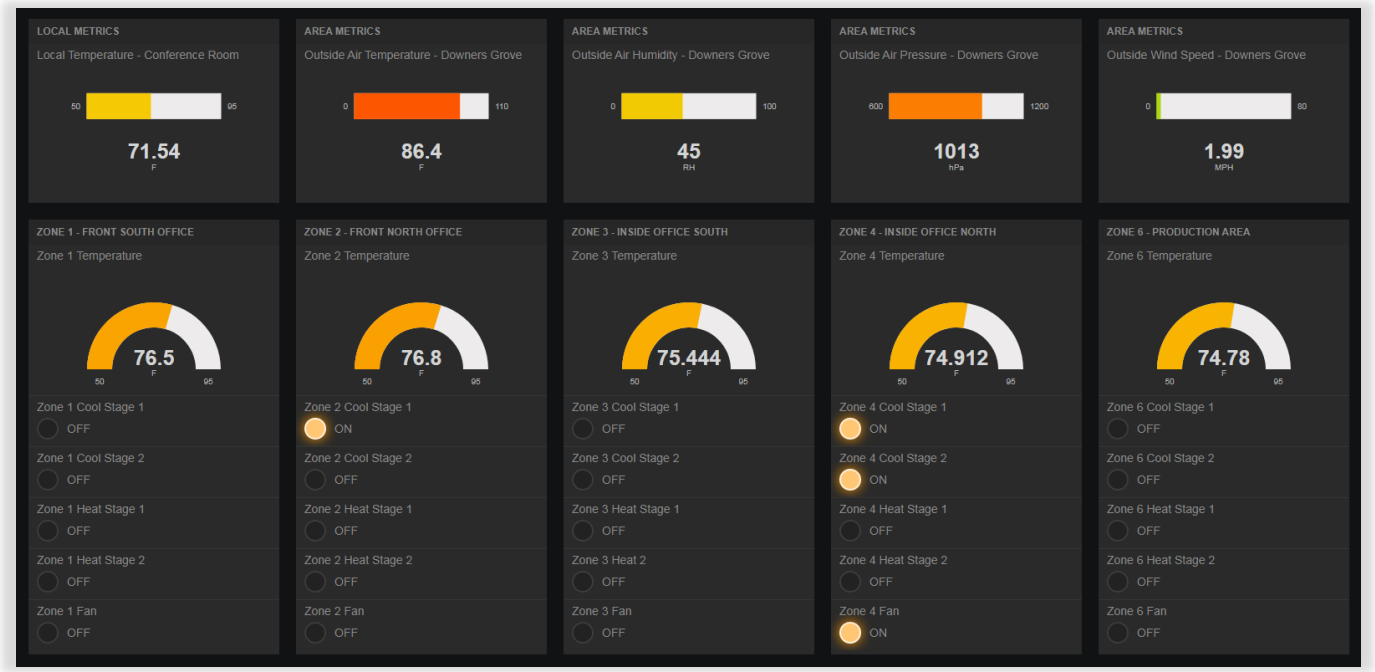
The dashboard.json file can be transferred to other PC/laptop/tablet devices on the IP network, however BAScontrol-E36 can only serve one dashboard instance at a time.

When finished with setup and the dashboard has been saved, click the **wrench** icon to hide configuration.



7.8.2.6. Dashboard Examples

Only one Dashboard instance is supported by a single BAScontrol-E36. This Dashboard can be served over one source only whether it is Ethernet or Wi-Fi output.



8 Sedona Programming

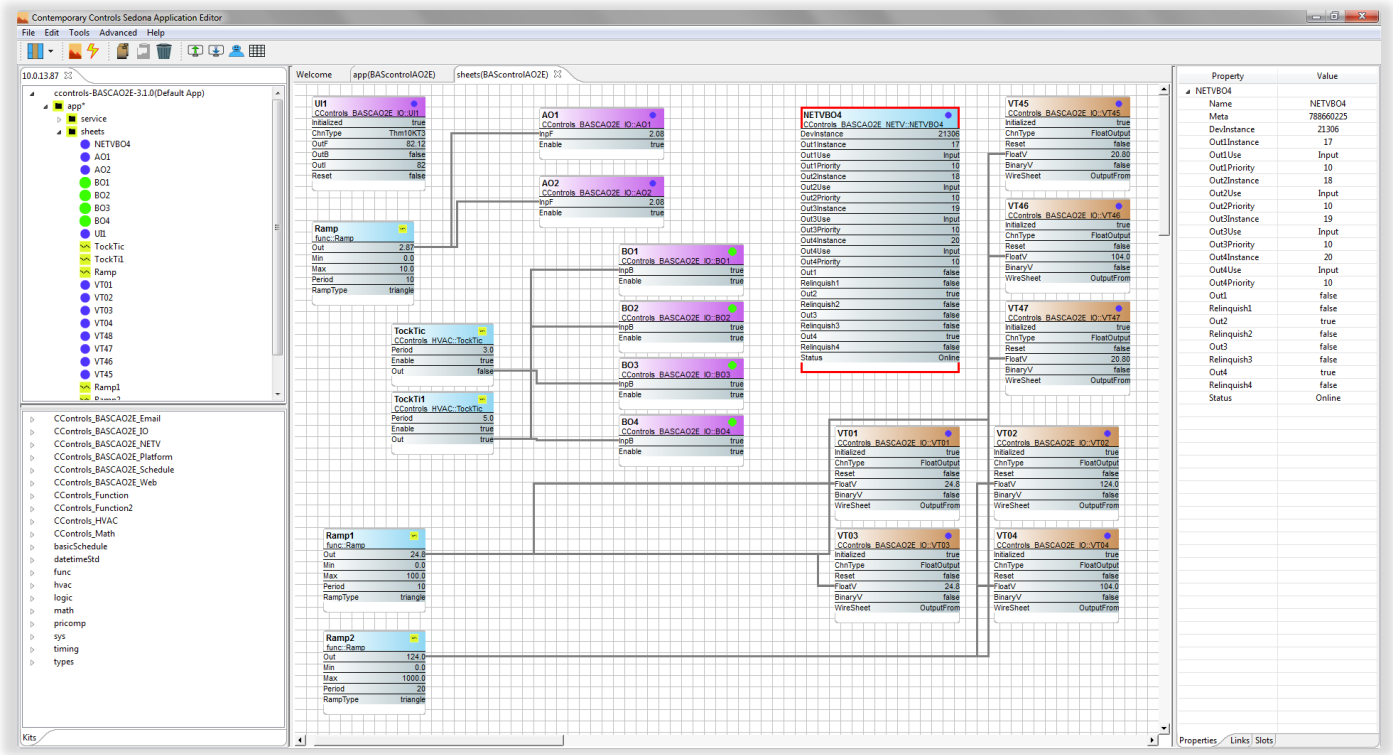
Sedona is an open-source software environment designed to build smart, networked, embedded devices which are well suited for implementing control applications.

As a Sedona developer, Contemporary Controls has produced several product lines based on Sedona, the BAScontrol Toolset for unrestricted use in program development and archiving, and pre-built applications with sophisticated macro components. The required kits and manifests for the connected BAScontrol-E36 Sedona device are provided in the Component_Bundle_BASCE36 as part of the tool installation. The BAScontrol Toolset is available for free download from the Contemporary Controls' website.

The BAScontrol Toolset includes:

- Sedona Applications Editor (SAE)—an editing tool used to create function block (component) wiresheet applications in the Sedona environment.
- BASemulator—a utility used to emulate controller operation on a Windows PC. Each of BAScontrollers and Micro Edge controllers can be emulated.
- BASbackup—a project utility which provides a convenient way of storing/restoring and replicating real or emulated controller settings and configurations as well as Sedona wiresheet applications.

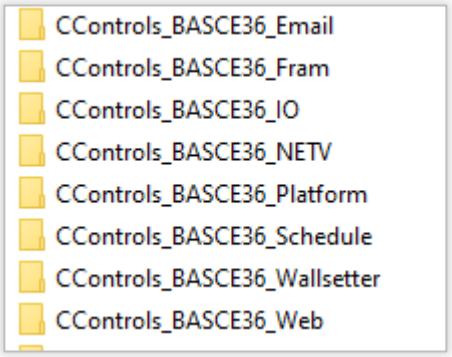
The BAScontrol-E36 incorporates the Sedona Virtual Machine (SVM). Once developed, the Sedona wiresheet program remains stored in the BAScontrol-E36 and executes in the SVM. The application can run standalone in the BAScontrol-E36, or it can interact with a program in a supervisory BACnet controller over Ethernet, Wi-Fi, or MS/TP. The number of applications is unlimited.



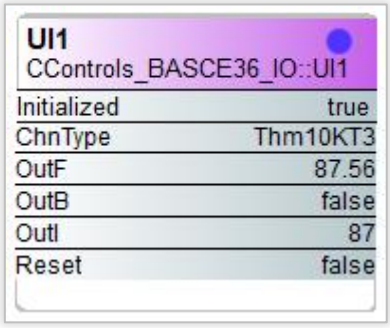
It uses the provided Component Bundle of standard Sedona 1.2 release kits along with Contemporary Controls' custom platform-dependent and platform-independent Sedona kits. Kits can be updated, or new custom kits can be added to the data folder at any time without impacting the toolset.

8.1. BAScontrol-E36 IO Kit

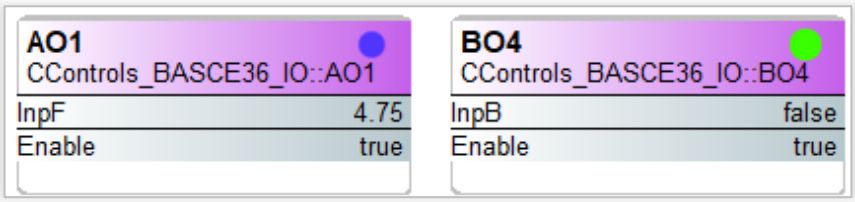
The BAScontrol-E36 (BASCE36) IO kit provides 36 physical points, 192 BACnet Virtual Points, and 6 Universal Counters. In addition, **ScanTime** and **Sunrise** components are also included in the BAScontrol-E36 IO kit.



16 Universal Input components can be configured for different input types from the web page. These components are only retentive to flash memory when configured for Pulse Input and the pulse counts are stored in non-volatile memory.

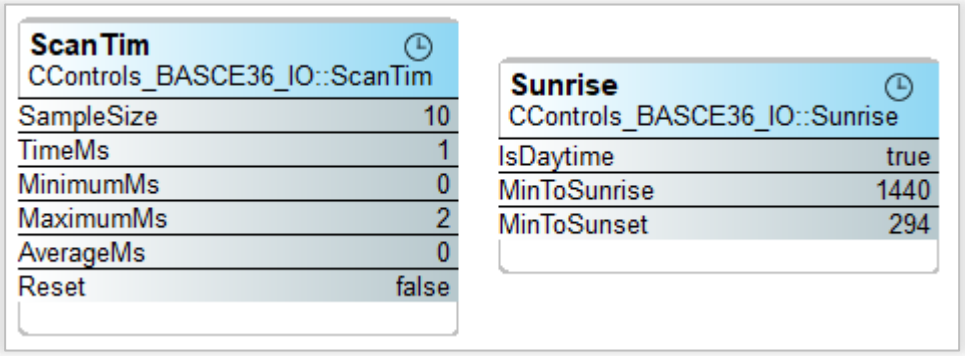


Eight output components are available to all eight binary outputs,



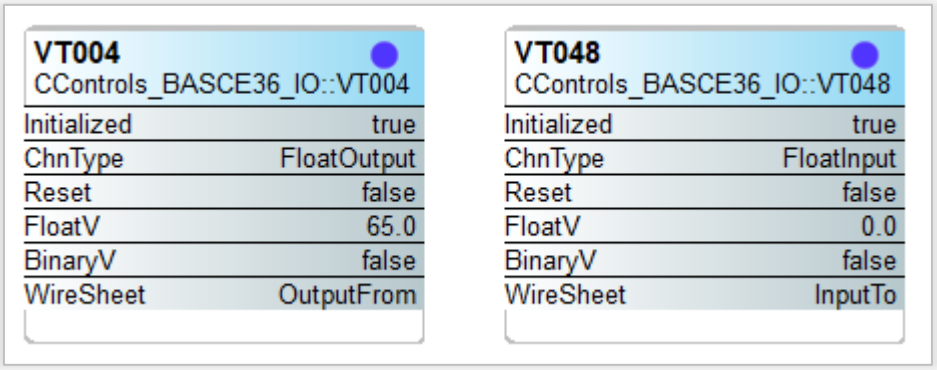
The **ScanTime** component reports the execution time parameters of the app.

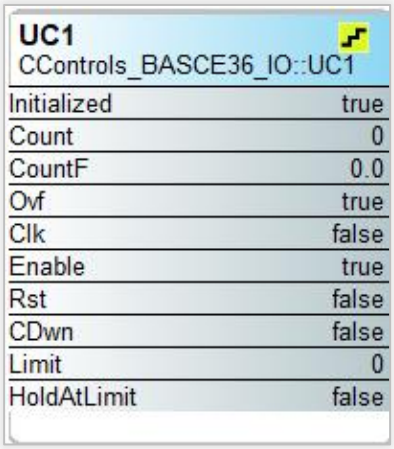
The **Sunrise** component is used in conjunction with time and geolocation settings and provides sunrise and sunset information.



UC (Universal Counter) components are used to store wiresheet data to non-volatile memory. These could be used to store rollover counts for Universal Input components set for Pulse Input.

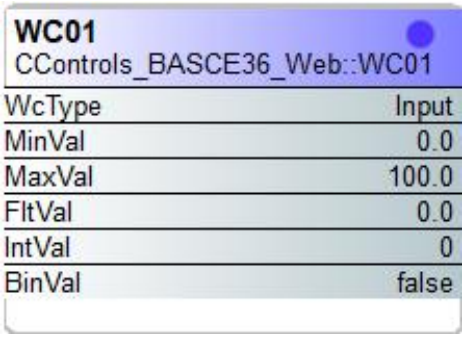
Virtual Points are BACnet server points which are also utilized in Weather and Cloud configuration.

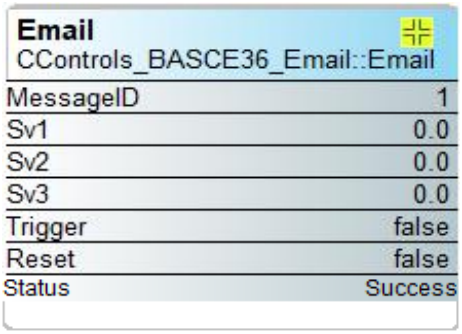




8.2. BAScontrol-E36 Web Kit

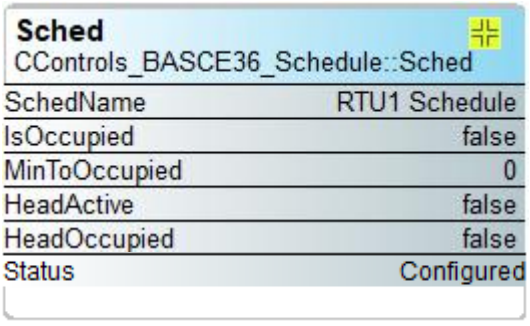
BAScontrol-E36 Web Kit has 48 components which share data with its web page and can be used for configuration points. Input web components receive data from the web page. Output web components send data to the web page.





BAScontrol-E36 Email component allows for emails to be triggered.

BAScontrol-E36 Schedule component allows for schedules to be triggered.



The BAScontrol-E36 NetV components allow for BACnet points to be obtained over the network and utilized in the BAScontrol-E36 wiresheet and other services, such as Cloud and Dashboard.

NetV CControls_BASCE36_NETV::NetV	
DevInstance	13178
ObjInstance	1
ObjType	AnalogInput
Priority	10
DefOutF	0.0
DefOutB	false
DefOutI	0
ValF	83.01
ValB	true
ValI	83
Relinquish	false
Enabled	false
Status	Online

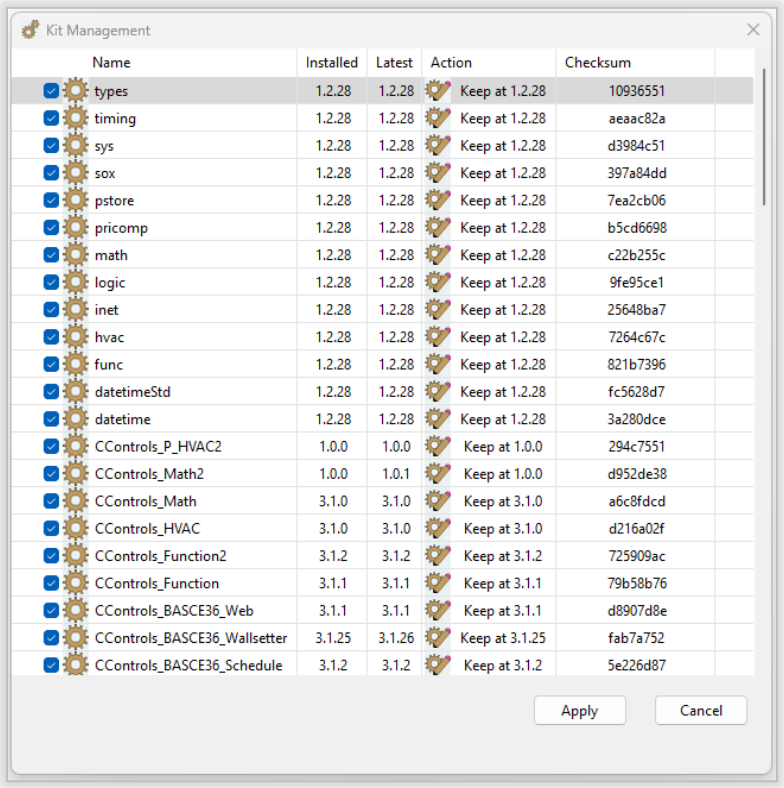
NETVBO4 CControls_BASCE36_NETV::NETVBO4	
DevInstance	13178
Out1Instance	17
Out1Use	Input
Out1Priority	10
Out2Instance	18
Out2Use	Input
Out2Priority	10
Out3Instance	19
Out3Use	Input
Out3Priority	10
Out4Instance	20
Out4Use	Input
Out4Priority	10
Out1	false
Relinquish1	false
Out2	true
Relinquish2	false
Out3	false
Relinquish3	false
Out4	true
Relinquish4	false
Status	Online

8.3. Function, Function2, HVAC, and Math Kits

Function, Function2, HVAC, and Math kits provide enhanced logic functionality.

The complete set of compatible kits is pre-installed on the BAScontrol-E36 from the factory. To install additional compatible kits, such as custom kits developed or obtained through third parties, use the Kit Manager in SAE. However, there is no need to use the Kit Manager unless you have compatible kits from third parties which need to be installed on BAScontrol-E36.

For complete details on Sedona Framework, SAE, and Sedona component functionality refer to the Sedona Open Control Reference Manual.



9 Warranty

Contemporary Controls (CC) warrants this product to the original purchaser for two years from the shipping date. Products returned to CC for repair are warranted for one year from the date the repaired product is shipped back to the purchaser or for the remainder of the original warranty period, whichever is longer. If the product fails to operate in compliance with its specification during the warranty period, CC will, at its option, repair or replace the product at no charge. The customer is, however, responsible for shipping the product; CC assumes no responsibility for the product until it is received. CC's limited warranty covers products only as delivered and does not cover repair of products that have been damaged by abuse, accident, disaster, misuse, or incorrect installation. User modification may void the warranty if the product is damaged by the modification, in which case this warranty does not cover repair or replacement. This warranty in no way warrants the suitability of the product for any specific application. IN NO EVENT WILL CC BE LIABLE FOR ANY DAMAGES INCLUDING LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT EVEN IF CC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY PARTY OTHER THAN THE PURCHASER. THE ABOVE WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR USE, TITLE AND NONINFRINGEMENT.

10 Returning Products for Repair

Return the product to the location where it was purchased by following the instructions at the URL below: www.ccontrols.com/rma.htm

11 Declaration of Conformity

Additional compliance documentation can be found on our website: www.ccontrols.com

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