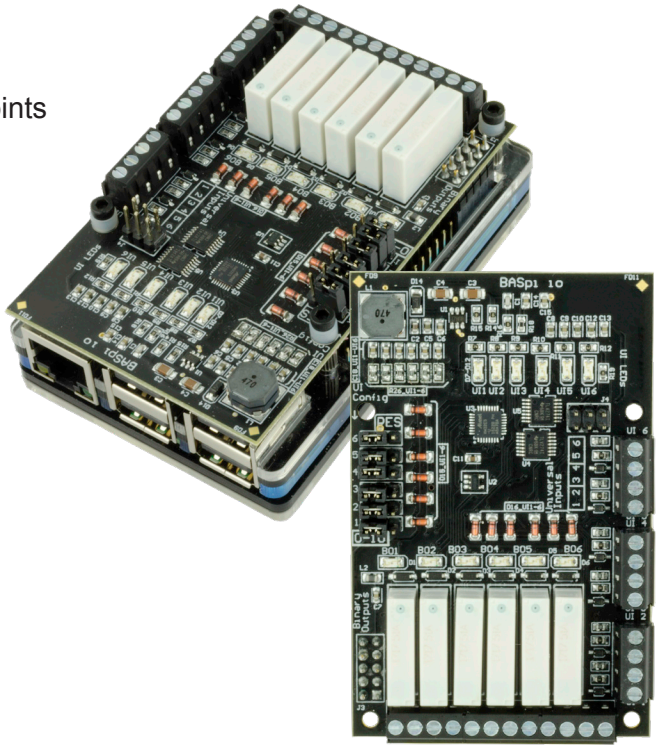
BASpi – 12-point BACnet/IP Sedona Expansion Board

The BASpi I/O board is a 12-point BAS expansion board for Raspberry Pi. The I/O board, plus the firmware files provided by Contemporary Controls turn your Raspberry Pi into a BACnet-networked, Sedona-programmable controller with 6 Universal Inputs and 6 Relay Outputs. All 12 physical I/O points, in addition to 24 Virtual Points are served up over BACnet/IP using Ethernet or Wi-Fi. BASpi is web page configurable over Ethernet or Wi-Fi connections. The Sedona Application Editor (SAE) is offered as part of the free BAScontrol Toolset. This programming tool is used to create control applications by linking graphical components on a wiresheet. In addition to SAE, BASemulator gives you BASpi software emulation for PC and BASbackup allows you to backup and restore your entire BASpi project to a zip file.

The BASpi I/O board is available stand-alone, as well as a complete system – the BASpi-SYS, which is packaged with RaspberryPi 3 board + BASpi I/O board for immediate control right out of the box.

Versatile Control Device

- BACnet/IP Server - 12 physical points and 24 virtual points
- BACnet/IP over Ethernet or Wi-Fi
- Resident Sedona Virtual Machine (SVM)
- Graphically programmable with free Sedona Application Editor
- Free project backup and restore utility - BASbackup and free software emulator for PC - BASemulator
- Web page configurable with a common web browser over Ethernet or Wi-Fi (2.4GHz 802.11n)
- NTP server or manually-settable clock



Flexible Input/Output — 12-points of physical I/O

- Six configurable Universal Inputs:Analog Input (0-10V), Binary Input, Resistance, Thermistor (10KT2, 10KT3, 20K), Pulse Input max (40Hz)
- Six Relay Outputs (2A max current)
- 24 Virtual Points used to read or write data to/from wiresheet by a BACnet client/supervisor station
- 48 Web Components allow live monitoring and forcing of wiresheet points from the BASpi's web page

ASHRAE BACnet™

Built on the Sedona FRAMEWORK™

BASpi I/O board is compatible with Raspberry Pi 3 and requires a Raspbian Stretch with Desktop installation, as well as firmware files provided by Contemporary Controls. The firmware will only run if the BASpi-IO board hardware is installed on the Raspberry Pi3. There are two installation options for the BASpi I/O board firmware:

- The entire Raspbian image (Raspbian with Desktop + BASpi firmware files) provided by Contemporary Controls as a download. All you would need to do is download it from www.baspi.io, write it to an 8GB or larger SD card, and power it up.
- The BASpi stand-alone firmware files can be downloaded and copied to a USB drive, transferred, and installed onto your existing Raspbian system.
- BASpi System (BASpi-SYS) is also available from Contemporary Controls to those who want to take control right out of the box!

The BASpi-SYS includes all elements required to use the controller:

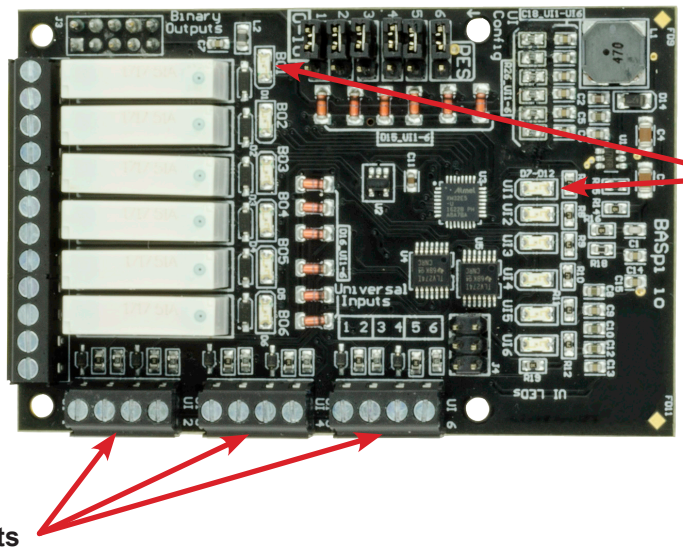
- Raspberry Pi 3 board
- BASpi I/O board
- 8GB pSLC industrial grade µSD card with pre-written Raspbian Stretch with Desktop and BASpi firmware files image
- Enclosure case
- 100-240V AC input, 5.1VDC, 2.5A output, international wall power supply
- Free BAScontrol Toolset with graphical programming tool - Sedona Application Editor, backup/restore project utility - BASbackup, software emulation for PC - BASemulator
- Quick Start Guide for beginners

The BASpi-SYS is everything you need, all pre-configured and ready of the box. It includes a Raspberry Pi3, an enclosure, and our BASpi-IO board already mounted and secured on the Pi using 4 screws. We have also installed an industrial grade pSLC micro SD card for increased system stability. The card is pre-written with the latest Raspbian Stretch with Desktop OS as well as the necessary BASpi firmware files pre-installed for you. Also included in BASpi-SYS is the official Raspberry Pi international wall wart power supply which provides plenty of power for any project, anywhere around the world. All of this has been packaged together for you and will work right out of the box, all you would need to do is apply power and connect.

Both BASpi-IO and BASpi-SYS come with the free BAScontrol Toolset including Sedona Application Editor, BASbackup, and BASemulator as software support. All BASpi downloads can be freely accessed at www.baspi.io

BASpi – Overview

The BASpi IO board utilizes the powerful 64-bit CPU in the Raspberry Pi3 as well as its Ethernet and Wi-Fi adapters for network connectivity. The board is powered through the 10-pin header which mates with the Raspberry Pi GPIO Header pins 1 through 10. By operating at the BACnet/IP level, the BASpi can share the same Ethernet or Wi-Fi network with BACnet supervisory controllers and operator workstations. The BASpi's Sedona Virtual Machine can be accessed over wired Ethernet IP connection, or wirelessly over Wi-Fi. The BACnet server can be operational on one physical layer at a time only, ether wired over Ethernet, or wireless over Wi-Fi. You can select which layer you want BACnet /IP to be served on from System Configuration page. 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. An NTP or manually-configurable clock allows for creating local schedules. Universal input channels are set for 0-10V input by default. Channel configuration is accomplished using the web page and setting the channel type using a 3-pin jumper. Type II and type III 10 kΩ thermistor curves and a 20 kΩ thermistor curve are resident in the unit. Pulse inputs with or without pull up are supported at up to 40Hz. Contact closure inputs require a voltage-free source.



Binary Outputs
Six form "A" relays for 30 VAC/VDC 2 A loads. Class 2 circuits only.

Point LEDs
for all 12 points

Universal Inputs

Six input channels can be configured — all discoverable as BACnet objects.

- Analog inputs: 0–10 VDC, (+/- 1% precision)
- Temperature inputs: Type II or Type III 10 kΩ thermistors; 20 kΩ thermistor
- Resistance inputs range of: 1 kΩ to 100 kΩ
- Pulse input: accommodates active or passive sources (40 Hz max)
- Binary Input: voltage-free contact closure

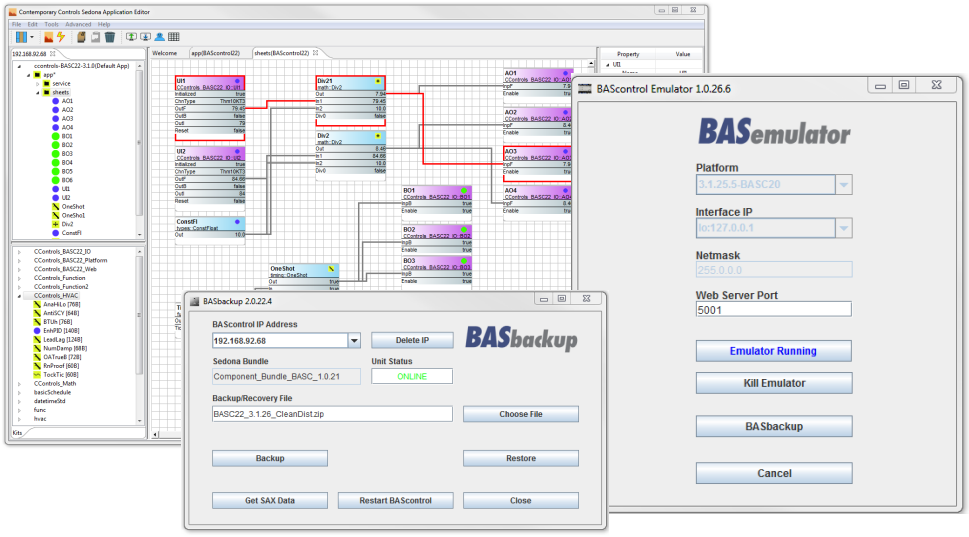
BASpi Software Tools

The BAScontrol Toolset is offered as a free download and supports both the BASpi-IO and BASpi-SYS. A link to obtain the free toolset is available at www.baspi.io. Refer to the Quick Start Guide for more information on getting started with the toolset. For complete details on Sedona operation and components see the Sedona Open Control Reference Manual at: https://www.ccontrols.com/tech/sedona.htm

The BAScontrol Toolset consists of:

Sedona Application Editor (SAE) – used to connect to Sedona devices, write/edit graphical Sedona wiresheet control applications and making local wiresheet application (SAX file) copies to a Windows PC/laptop.

BASemulator – is a software emulator for the BAScontrol series which runs on Windows. This controller emulator allows you to write your Sedona wiresheet application and fully configure all parameters such as I/O Channel configuration, BACnet settings, and Network settings before deploying onto real controllers. **BASbackup** – allows you to backup and restore Sedona wiresheet applications and/or complete device configuration between real controllers or emulated controllers (using BASemulator). In addition, it allows you to create a transferrable backup file which can be used to clone controllers or reproduce controllers with slightly altered settings.



Configuring the Universal Inputs

The BASpi is web page configurable over wired Ethernet IP connection, or wirelessly over Wi-Fi. The web page allows for easy configuration, live monitoring, and forcing of physical points, virtual points, and web components. All points are accessible from the BASpi web page, BACnet /IP clients, and the Sedona wiresheet.

The BASpi universal inputs can be configured for several different channel types. There are two circuits on the six Universal Inputs which are jumper-selectable (UI config diagram). **RES** circuit utilizes a pull-up and the **0-10** does not. Depending on your input type, select pull up or no pull up for each channel by moving the jumpers accordingly.

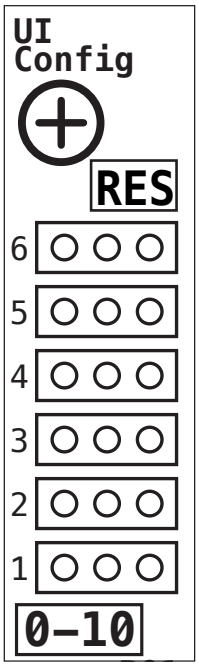
First configure the jumper on the board:

1. For resistance or thermistor inputs and binary or pulse inputs with pull up, set the config jumper to “RES”

   After configuring the jumper, select an appropriate channel type from the web page:
   - Therm 10KT2
   - Therm 10KT3
   - Therm 20K
   - Resistance
   - Binary Input
   - Pulse Input

2. For analog, pulse, and binary input (without pull up), set the config jumper to “0-10”

   After configuring the jumper, select an appropriate channel type from the web page:
   - Analog Input
   - Binary Input
   - Pulse Input



(see next section - Web page configuration for more web page detail).

BASpi Wiring Diagram

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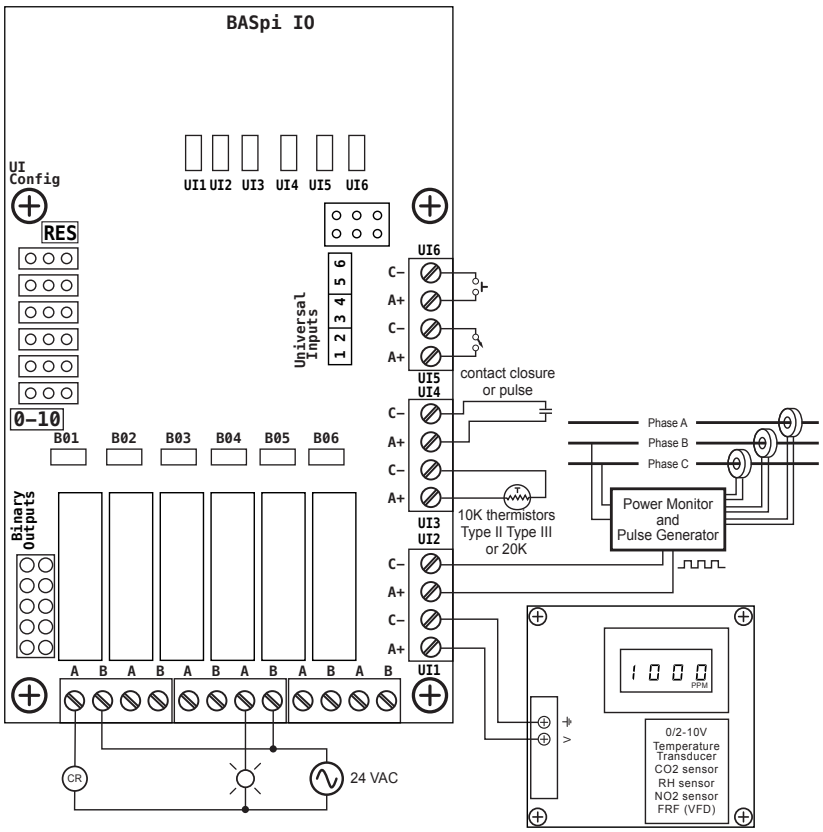
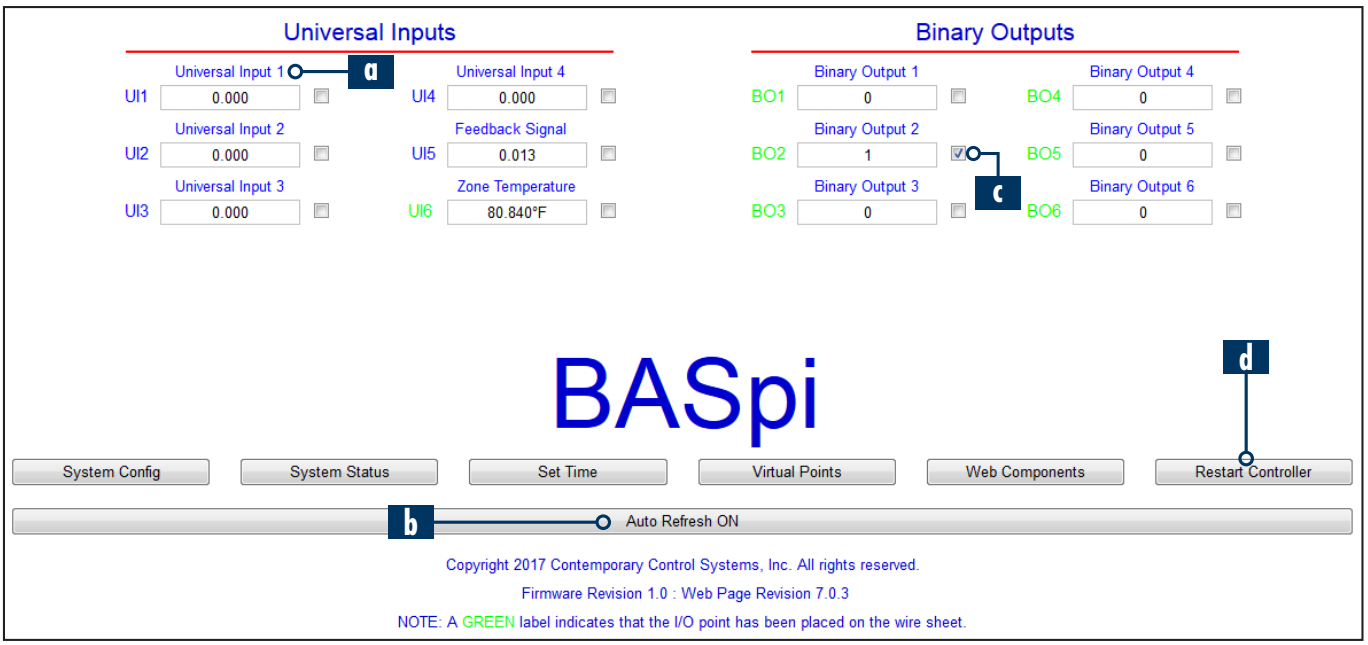


Web Page Configuration – Main Page and System Configuration

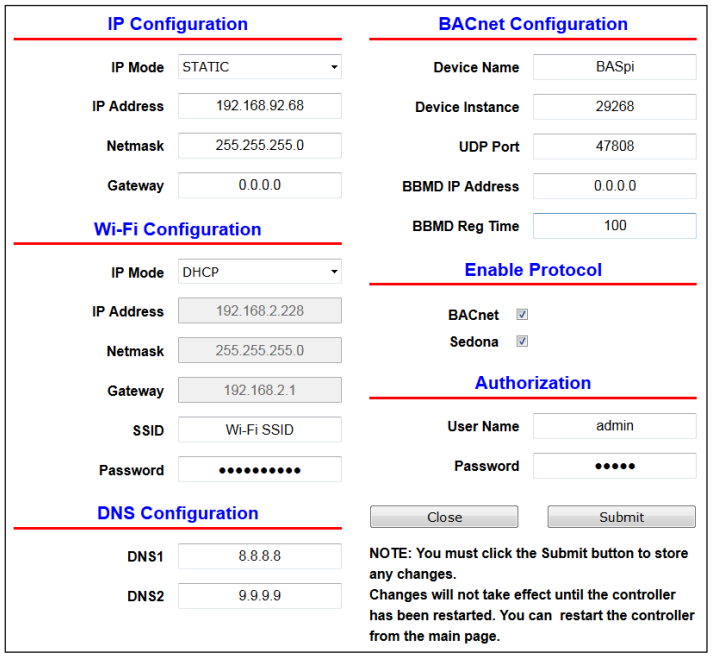
The BASpi is web page configurable over wired 10/100Mbps IP Ethernet connection, or wirelessly over Wi-Fi (2.4GHz 802.11n). The web page allows for easy system and channel configuration, live monitoring, and forcing of physical points, virtual points, and web components. Initially, the BASpi can be accessed over Ehternet cable at its default IP address of 192.168.92.68 with a subnet mask of 255.255.255.0 or it can be accessed internally (from the Raspberry Pi3 web browser itself) at its local host address of 127.0.0.1.

The web page requires login authentication:
user name: admin
password: admin



The main web page provides an overview of all real points plus access to other web pages. To configure a point, click on the point name (a) and a configuration page will appear. To observe the updated data for each point, click Auto Refresh button to ON (b). Point values can be temporarily forced by checking the box adjacent to the point (c), entering a value into the point's text box and clicking outside the box. The value will remain forced until the box is unchecked or the unit power cycled. Care must be exercised when forcing values into points. The BASpi unit can be restarted using the Restart Controller button (d).

System Configuration page allows you to easily set up the Ethernet and Wi-Fi network adapters, BACnet server configuration, and credentials authorization. Changes to this page will not take effect until the device has been rebooted. The BASpi can operate on both network adapters concurrently with the exception of the BACnet server which will only operate on the selected adapter. The IP settings can be changed to the desired values. Either DHCP or a static IP address can be selected. If a static address is desired, enter the value along with the network mask and gateway address. If domain address is required, enter in the Primary and Secondary DNS addresses. BACnet device data must be entered when using BACnet. Make sure the Device Instance (0-65536) is unique over the complete BACnet Internetwork. Device Object Name is the name which BACnet clients will see when the BASpi is discovered and/or trended into the BACnet client database. The BACnet UDP port is set to 47808 as a decimal value, also equivalent to BAC0 in hexadecimal by default. This UDP port number is used by BACnet clients when doing a discovery of the BACnet network. This port number can be changed as long as it is the same in both the client and server BACnet devices. BBMD feature requires a BACnet router with BBMD capability.



Either BACnet or Sedona protocols or both can be selected. BACnet checkmark enables the BACnet /IP server and the Sedona checkmark enables the Sedona Virtual Machine. Once satisfied with System Configuration, click Submit, then Close, and Restart Controller for changes to be applied on next bootup of BASpi.

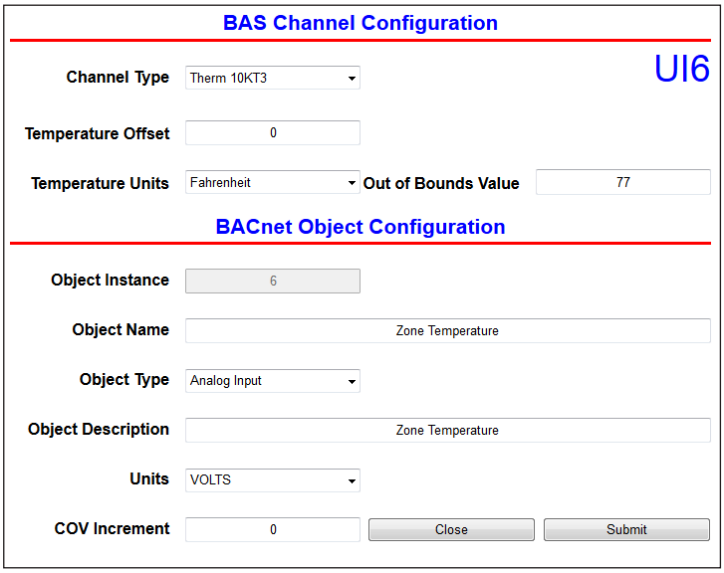
Web Page Configuration – Channel, Time and Web Components

Channel Configuration

After you have configured the 3-position jumper on the BASpi board, you can select the channel type for each of the six channels from the web page. For resistance or thermistor inputs and binary or pulse inputs with pull up, set the config jumper to “RES”. After configuring the jumper, select an appropriate channel type from the web page:

- Therm 10KT2
- Therm 10KT3
- Therm 20K
- Resistance
- Binary Input
- Pulse Input

For analog, pulse, and binary input (without pull up), set the config jumper to “0-10”



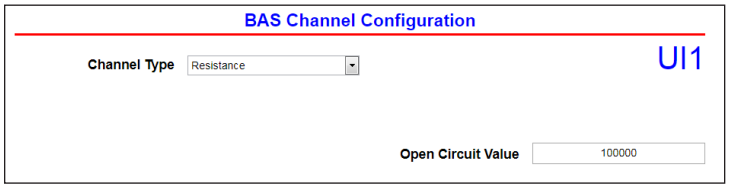
After configuring the jumper, select an appropriate channel type from the web page:

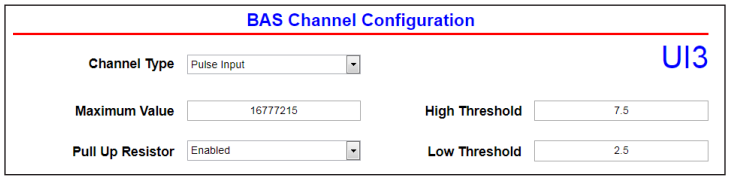
- Analog Input
- Binary Input
- Pulse Input

BACnet channel configuration allows you to specify how the point is served to BACnet clients. Object Name is the name the channel will appear as when discovered by a BACnet client. Object Description allows you to give more information about the point. Units parameter allows you to specify the units for the channel value. COV Increment is the change-of-value increment used by BACnet clients which support this service. COV only reports changes in value instead of continuously serving the point. You do not need to set up COV unless the BACnet client you are using supports this service.

Some channel configuration options allow for additional settings.

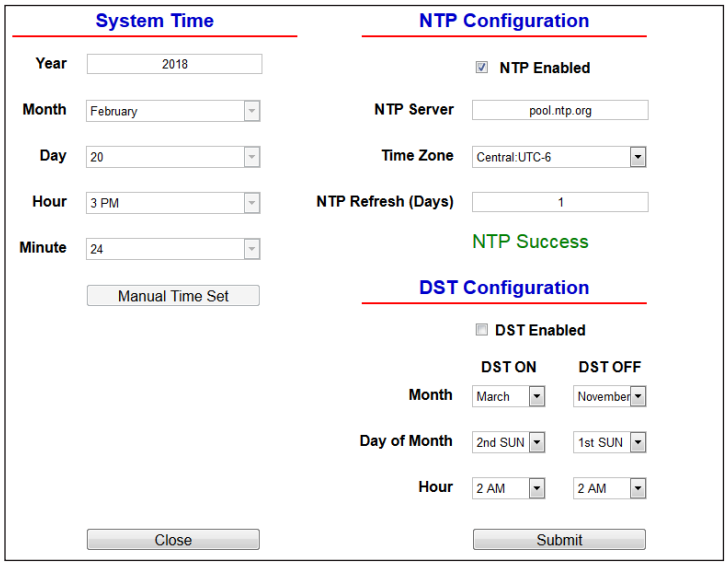
- The Thermistor curves allow for positive or negative offset adjustment.
- Resistance channel types allow to specify an open circuit value.
- Pulse input channel types allow for Maximum Value of pulses counted (max setting by default), as well as High and Low thresholds for active inputs.





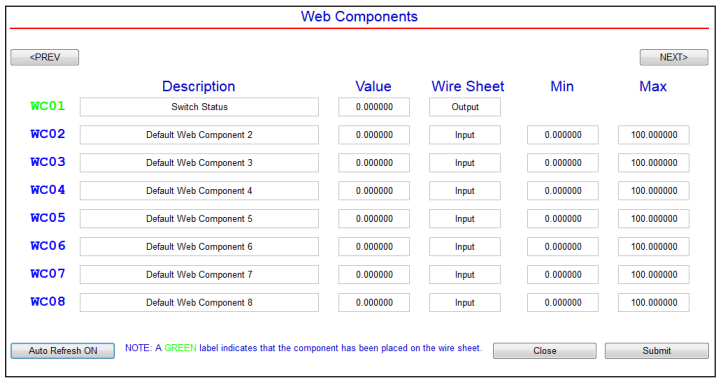
Time Configuration

Time and date can be set manually or automatically with the help of an NTP server if access to the Internet is possible over Ethernet or Wi-Fi. Daylight Savings Time can be enabled and configured accordingly. If accessing an NTP server using domain names, make sure the DNS servers are specified in the System Configuration screen.



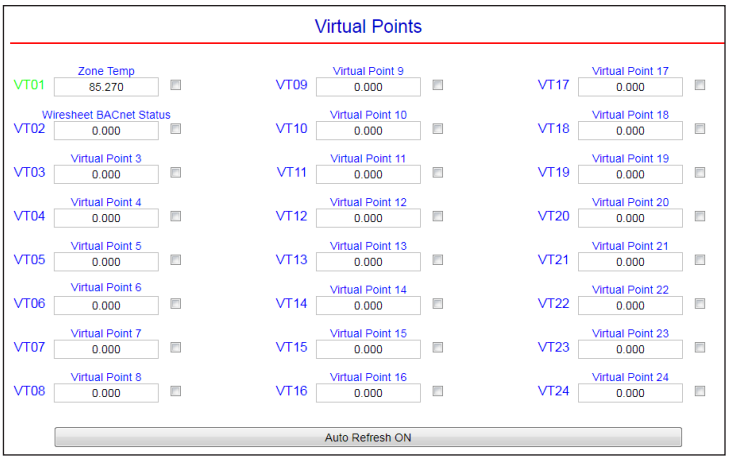
Web Components Configuration

Web Components allow you to read/write Sedona logic data from the BASpi web page. These points are served up to the BASpi's web page. You can configure up to 48 web components. These components provide a means to write and read data to and from Sedona wire sheets without the need of a Sedona Editor tool. A web component configured as a wire sheet input can have its input range restricted to minimum and maximum values eliminating the need to add limit detection within the wire sheet logic. Web components are ideal for simplified control logic configuration. Web Components are not served up over BACnet.



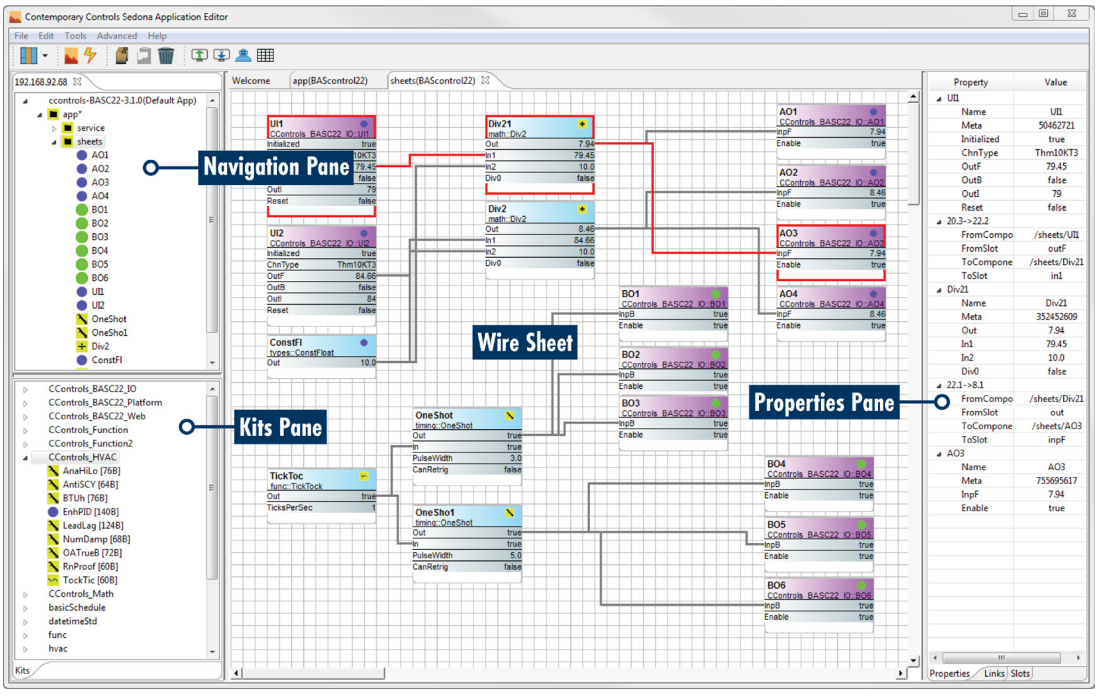
Virtual Points Configuration

Virtual Points allow you to read/write Sedona logic data from a BACnet client. These points are served up over BACnet. You may use a tool such as the free BDT (BACnet Discovery Tool) from Contemporary Controls to discover, read and write points on the BASpi. The Virtual points web page is accessible from the main page by clicking the “Virtual Points” button. Virtual Points can be configured and forced in the same manner as the physical IO channels. All 24 Virtual Points are served up over BACnet.



Powered by a Sedona Virtual Machine — for Implementing Control

The BASpi incorporates Sedona Virtual Machine (SVM) open source technology, originally developed by Tridium. Using tools such as the free Sedona Application Editor, or Tridium established tools such as Niagara Workbench AX, the user can develop a control application using powerful dragand-drop visual programming methodology. Once developed, the program remains stored in the BASpi and executes by way of the SVM. The application can run standalone in the BASpi, or it can interact with a program in a supervisory BACnet controller over Ethernet or Wi-Fi. The number of potential applications is unlimited. The BASpi includes Tridium’s Sedona 1.2 kits of components — and Contemporary Controls’ enhanced product-specific and non-product-specific kits. The BASpi IO Kit components provide 12 physical points, 24 BACnet Virtual Points, and 4 Universal Counters. BASpi Web Kit has 48 components which share data with web pages. Input web components receive data from hosted web pages. Output web components send data to hosted web pages. The Contemporary Controls’ Function, Function2, HVAC, and Math kits provide additional components for increased flexibility. A set of kits is pre-installed on the BASpi. In order to install additional compatible kits, use the Kit Manager in Sedona Application Editor (SAE). For complete details on Sedona Framework, SAE, and Sedona component functionality refer to the Sedona Open Control Reference Manual.



Contemporary Controls' Developed Sedona Components

BASpi I/O Kit BASpi platform specific components	**UI1 – UI6**	Universal input – binary, analog voltage, thermistor, resistance or pulse input
	BO1 – BO6	Binary output – binary output point
	ScanTim	Scan time monitor – records the min, max and average scan times
	UC1 – UC4	Universal counters – up/down counters
	VT01 – VT24	Virtual points – share wire sheet data with BACnet/IP clients
BASpi Web Kit BASpi platform specific components	**WC01 – WC48**	Web components – share wire sheet data with the BASpi web pages
Contemporary Controls Function Kit Common to Sedona 1.2 compliant controllers	**Cand2**	Two-input Boolean product – two-input AND/NAND gate with complementary outputs
	Cand4	Four-input Boolean product – four-input AND/NAND gate with complementary outputs
	Cand6	Six-input Boolean product – six-input AND/NAND gate with complementary outputs
	Cand8	Eight-input Boolean product – eight-input AND/NAND gate with complementary outputs
	Cmt	Comment – comment field up to 64 characters
	Cor2	Two-input Boolean sum – two-input OR/NOR gate with complementary outputs
	Cor4	Four-input Boolean sum – four-input OR/NOR gate with complementary outputs
	Cor6	Six-input Boolean sum – six-input OR/NOR gate with complementary outputs
	Cor8	Eight-input Boolean sum – eight-input OR/NOR gate with complementary outputs
	CtoF	°C to °F – Celsius to Fahrenheit Temperature Conversion
	Dff	"D" Flip-Flop – D-style Edge-triggered Single-bit Storage
	FtoC	°F to °C – Fahrenheit to Celsius Temperature Conversion
	HLpre	High – Low Preset – defined logical true and false states
	PsychrE	Psychrometric Calculator – English Units
	PsychrS	Psychrometric Calculator – SI Units
	SCLatch	Set/Clear Latch – single-bit level-triggered single-bit data storage

Tridium's Sedona 1.2 Components

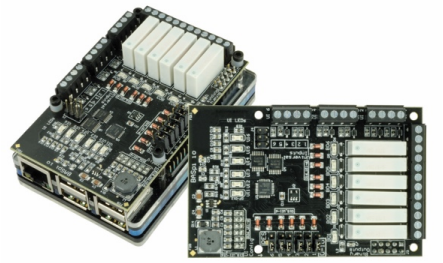
The HVAC Group operations that facilitate control	**LSeq**	Linear Sequencer — bar graph representation of input value
	ReheatSeq	Reheat sequence — linear sequence up to four outputs
	Reset	Reset — output scales an input range between two limits
	Tstat	Thermostat — on/off temperature controller
The Scheduling Group scheduling operations based upon time of day	**DailySc**	Daily Schedule Boolean — two-period Boolean scheduler
	DailyS1	Daily Schedule Float — two-period float scheduler
	DateTime	Time of Day — time, day, month, year
The Function Group convenient functions for developing control schemes	**Cmpr**	Comparison math — comparison (<=>) of two floats
	Count	Integer counter — up/down counter with integer output
	Freq	Pulse frequency — calculates the input pulse frequency
	Hysteresis	Hysteresis — setting on/off trip points to an input variable
	IRamp	IRamp — generates a repeating triangular wave with an integer output
	Limiter	Limiter — Restricts output within upper and lower bounds
	Linearize	Linearize — piecewise linearization of a float
	LP	LP — proportional, integral, derivative (PID) loop controller
	Ramp	Ramp — generates a repeating triangular or sawtooth wave with a float output
	SRLatch	Set/Reset Latch — single-bit data storage
	TickTock	Ticking clock — an astable oscillator used as a time base
	UpDn	Float counter — up/down counter with float output
The Priority Group prioritizing actions of Boolean, Float and Integer variables	**PrioritizedBool**	Prioritized boolean output — highest of sixteen inputs
	PrioritizedFloat	Prioritized float output — highest of sixteen inputs
	PrioritizedInt	Prioritized integer output — highest of sixteen inputs
The Types Group variable types and conversion between types	**B2F**	Binary to float encoder — 16-bit binary to float conversion
	ConstBool	Boolean constant — a predefined Boolean value
	ConstFloat	Float constant — a predefined float variable
	ConstInt	Integer constant — a predefined integer variable
	F2B	Float to binary decoder — float to 16-bit binary conversion
	F2I	Float to integer — float to integer conversion
	I2F	Integer to float — integer to float conversion
	L2F	Long to float — long integer to float conversion
	WriteBool	Write Boolean — setting a writable Boolean value
	WriteFloat	Write Float — setting a writable float value
	WriteInt	Write integer — setting an integer value
The Logic Group logical operations using Boolean variables	**ADemux2**	Analog Demux — Single-input, two-output analog de-multiplexer
	And2	Two-input Boolean product — two-input AND gate
	And4	Four-input Boolean product — four-input AND gate
	ASW	Analog switch — selection between two float variables
	ASW4	Analog switch — selection between four floats
	B2P	Binary to pulse — simple mono-stable oscillator (single-shot)
	BSW	Boolean switch — selection between two Boolean variables
	DemuxI2B4	Four-output Demux — integer to Boolean de-multiplexer
	ISW	Integer switch — selection between two integer variables
	Not	Not — inverts the state of a Boolean
	Or2	Two-input Boolean sum — two-input OR gate
	Or4	Four-input Boolean sum — four-input OR gate
	Xor	Two-input exclusive Boolean sum — two-input XOR gate
The Timing Group time-based components	**DlyOff**	Off delay timer — time delay from a "true" to "false" transition of the input
	DlyOn	On delay timer — time delay from an "false" to "true" transition of the input
	OneShot	Single Shot — provides an adjustable pulse width to an input transition
	Timer	Timer — countdown timer
The Math Group math-based components	**Add2**	Two-input addition — results in the addition of two floats
	Add4	Four-input addition — results in the addition of four floats
	Avg10	Average of 10 — sums the last ten floats while dividing by ten thereby providing a running average
	AvgN	Average of N — sums the last N floats while dividing by N thereby providing a running average
	Div2	Divide two — results in the division of two float variables
	FloatOffset	Float offset — float shifted by a fixed amount
	Max	Maximum selector — selects the greater of two inputs
	Min	Minimum selector — selects the lesser of two inputs
	MinMax	Min/Max detector — records both the maximum and minimum values of a float
	Mul2	Multiply two — results in the multiplication of two floats
	Mul4	Multiply four — results in the multiplication of four floats
	Neg	Negate — changes the sign of a float
	Round	Round — rounds a float to the nearest N places
	Sub2	Subtract two — results in the subtraction of two floats
	Sub4	Subtract four — results in the subtraction of four floats
	TimeAvg	Time average — average value of float over time

BACnet Protocol Implementation Conformance (PIC) Statement

CONTEMPORARY CONTROLS

BASpi-IO and BASpi-SYS

BACnet/IP Sedona Field Controller



BACnet Protocol Implementation Conformance Statement (Annex A)

Date: **May** 2, 2018
Vendor Name: Contemporary Controls
Product Name: BASpi-IO and BASpi-SYS
Product Model Number: BASPI-IO6U6R and BASPI-SYS6U6R
Applications Software Version: **1.2.28** **Firmware Revision:** 1.0.29 **BACnet Protocol Revision:** 3
Product Description: BACnet/IP compliant 12-point field controller or remote I/O that allows a direct connection to Ethernet or WiFi without the need of a BACnet router.

BACnet Standardized Device Profile (Annex L):

- ☐ **BACnet Operator Workstation (B-OWS)**
- ☐ **BACnet Building Controller (B-BC)**
- ☐ **BACnet Advanced Application Controller (B-AAC)**
- ☒ **BACnet Application Specific Controller (B-ASC)**
- ☐ **BACnet Smart Sensor (B-SS)**
- ☐ **BACnet Smart Actuator (B-SA)**

List all BACnet Interoperability Building Block Supported (Annex K):

DS-RP-B Data Sharing — ReadProperty – B
DS-WP-B Data Sharing — WriteProperty – B
DS-RPM-B Data Sharing — ReadPropertyMultiple – B
DS-COV-B Data Sharing — ChangeOfValue – B
DM-DDB-B Device Management — Dynamic Device Binding – B
DM-DOB-B Device Management — Dynamic Object Binding – B
DM-DCC-B Device Management — Device Communication Control – B
DM-TS-B Device Management — Time Synchronization – B

Segmentation Capability:

- ☐ Able to transmit segmented messages Window Size:
- ☐ Able to receive segmented messages Window Size:

Standard Object Types Supported:

Object Type Supported	Can Be Created Dynamically	Can Be Deleted Dynamically
Analog Input	No	No
Analog Value	No	No
Binary Input	No	No
Binary Output	No	No
Binary Value	No	No
Device	No	No

No optional properties are supported.

Data Link Layer Options:

- ☒ BACnet IP, (Annex J)
- ☒ BACnet IP, (Annex J), Foreign Device
- ☐ ISO 8802-3, Ethernet (Clause 7)
- ☐ ANSI/ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s):
- ☐ MS/TP master (Clause 9), baud rate(s):
- ☐ MS/TP slave (Clause 9), baud rate(s):
- ☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):
- ☐ Point-To-Point, modem, (Clause 10), baud rate(s):
- ☐ LonTalk, (Clause 11), medium:
- ☐ Other:

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐ Yes ☒ No

Networking Options:

- ☐ Router, Clause 6 – List all routing configurations, e.g., ARCNET-Ethernet-MS/TP, etc.
- ☐ Annex H, BACnet Tunnelling Router over IP
- ☐ BACnet/IP Broadcast Management Device (BBMD)
  Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

- ☒ ANSI X3.4
- ☐ IBM™/Microsoft™ DBCS
- ☐ ISO 8859-1
- ☐ ISO 10646 (UCS-2)
- ☐ ISO 10646 (UCS-4)
- ☐ JIS C 6226

If this product is a communication gateway, describe the types of non-BACnet equipment/network(s) that the gateway supports:
No gateway support.

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Specifications

Universal Inputs

Configured As	*Characteristics*
Analog input	0–10 VDC (+/− 1% precision) Input impedance 1 MΩ on voltage
Temperature input	Type II 10 kΩ thermistors: −10º to +190 ºF (−23.3º to +87.8ºC) Type III 10 kΩ thermistors: −15º to +200 ºF (−26.1º to +93.3ºC) 20 kΩ thermistors: 15º to 215º F (−9º to +101º C)
Contact closure input	Excitation current 0.5 mA. Open circuit voltage 10 VDC. Sensing threshold 3 VDC (low) and 7 VDC (high). Response time 20 ms.
Pulse input	0–10 VDC for active output devices 0–10 VDC for passive devices (configured for internal pull-up resistor) 40 Hz maximum input frequency with 50% duty cycle. Web page adjustable high and low thresholds.
Resistance	1 kΩ -100 kΩ range

Binary Outputs

Binary output	Normally open relay contacts. 30VAC/VDC 2A max

Storage

micro SD card (pSLC industrial grade cards recommended for maximum system stability - 8GB pSLC card is available with BASpi-SYS)

Functional

Ethernet/Wi-Fi

Protocols supported	BACnet/IP, Sedona SOX, HTTP (BASpi firmware)

Electrical

Input

Voltage	5 VDC
Power	4 W (with all IO, BASpi firmware, and both networks adapters engaged)

Ordering Information

Model	*Description*
BASPI-IO6U6R	Raspberry Pi 3 Daughterboard 6UI/6 Relay
BASPI-SYS6U6R	Raspberry Pi 3 with BASpi 6UI/6 Relay

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