



## 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.

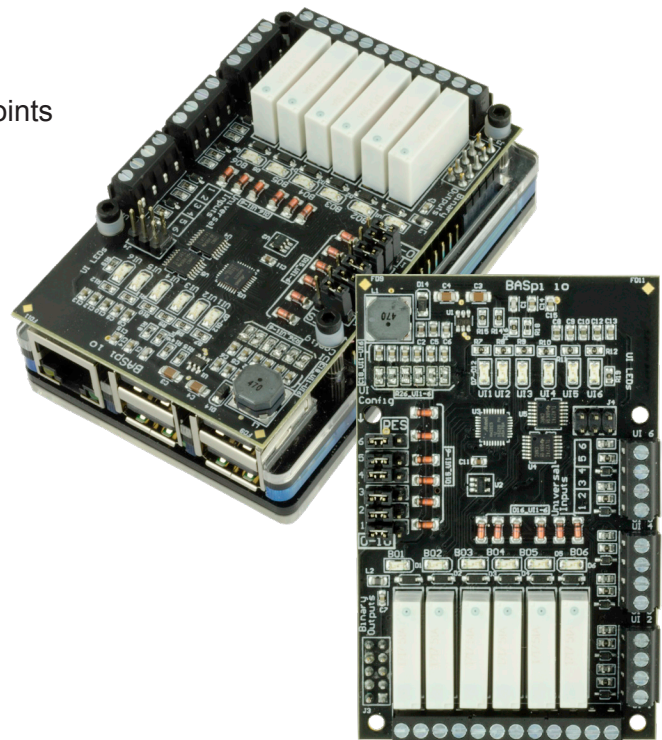
The BASpi I/O board is available stand-alone, as well as a complete system – the BASpi-SYS, which is packaged with RaspberryPi 3 board + BASpi I/O board for immediate control right out of the box.

### 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



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-I/O 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](http://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-I/O 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-I/O 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](http://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

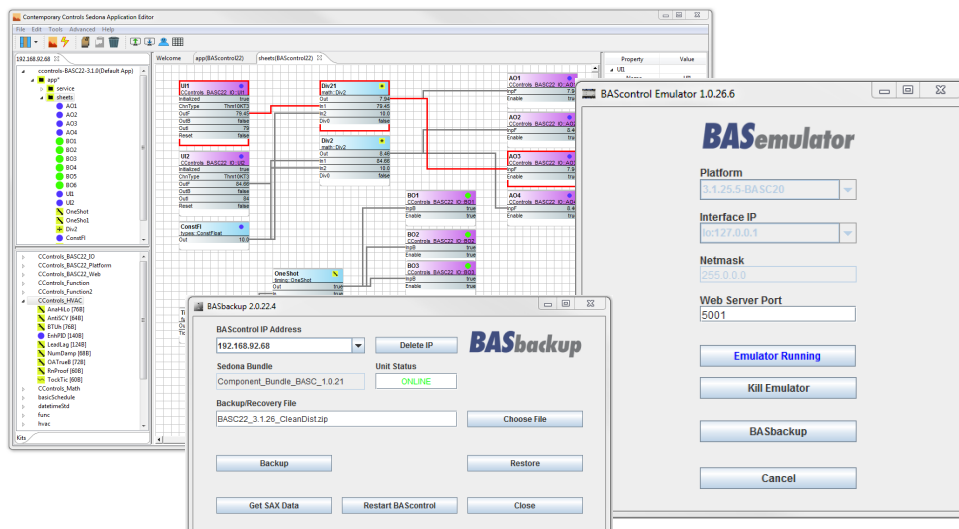
The BAScontrol Toolset is offered as a free download and supports both the BASpi-IO and BASpi-SYS. A link to obtain the free toolset is available at [www.baspi.io](http://www.baspi.io). Refer to the Quick Start Guide for more information on getting started with the toolset. For complete details on Sedona 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 set-

tings, 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”

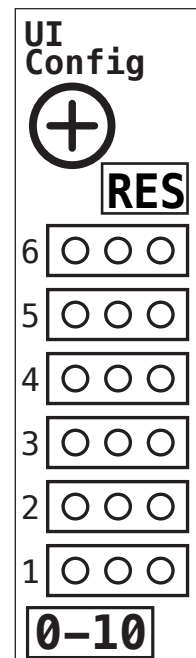
After configuring the jumper, select an appropriate channel type from the web page:

- 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”

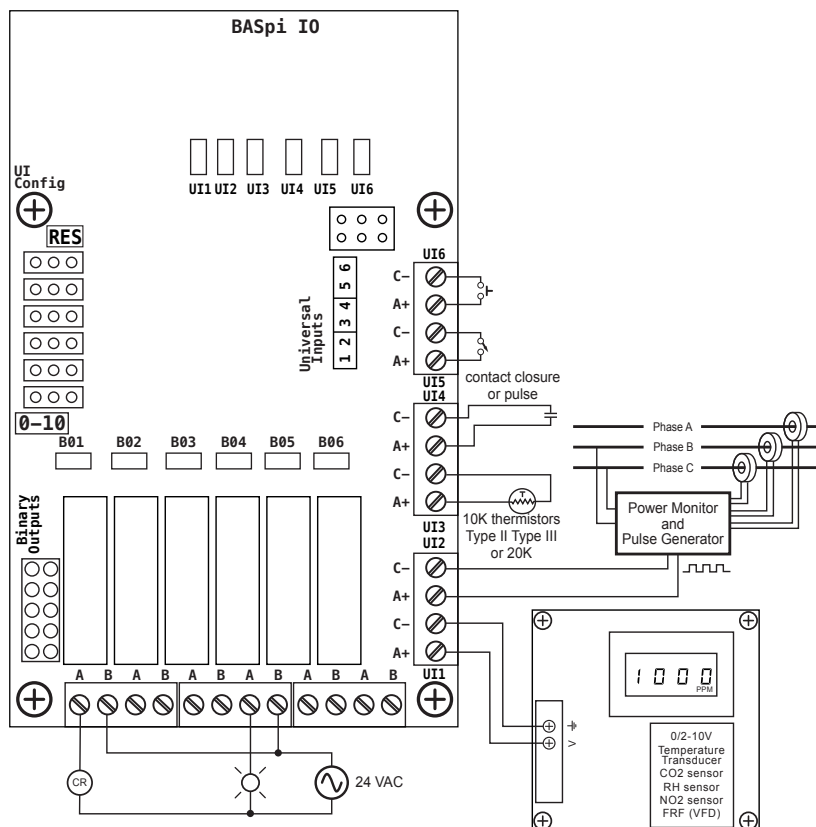
After configuring the jumper, select an appropriate channel type from the web page:

- Analog Input
- Binary Input
- Pulse Input



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

## BASpi Wiring Diagram



## 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 Ethernet 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.

IP Configuration		BACnet Configuration	
IP Mode	STATIC	Device Name	BASpi
IP Address	192.168.92.68	Device Instance	29268
Netmask	255.255.255.0	UDP Port	47808
Gateway	0.0.0.0	BBMD IP Address	0.0.0.0
		BBMD Reg Time	100
Wi-Fi Configuration		Enable Protocol	
IP Mode	DHCP	BACnet	<input checked="" type="checkbox"/>
IP Address	192.168.2.228	Sedona	<input checked="" type="checkbox"/>
Netmask	255.255.255.0		
Gateway	192.168.2.1	Authorization	
SSID	Wi-Fi SSID	User Name	admin
Password	*****	Password	*****
DNS Configuration		<input type="button" value="Close"/> <input type="button" value="Submit"/>	
DNS1	8.8.8.8	NOTE: You must click the Submit button to store any changes. Changes will not take effect until the controller has been restarted. You can restart the controller from the main page.	
DNS2	9.9.9.9		

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”

BAS Channel Configuration		UI6
Channel Type	Therm 10KT3	
Temperature Offset	0	
Temperature Units	Fahrenheit	Out of Bounds Value 77
BACnet Object Configuration		
Object Instance	6	
Object Name	Zone Temperature	
Object Type	Analog Input	
Object Description	Zone Temperature	
Units	VOLTS	
COV Increment	0	<input type="button" value="Close"/> <input type="button" value="Submit"/>

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

**BAS Channel Configuration**

Channel Type: Resistance

Open Circuit Value: 100000

UI1

## 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.

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.

**BAS Channel Configuration**

Channel Type: Pulse Input

Maximum Value: 16777215

Pull Up Resistor: Enabled

High Threshold: 7.5

Low Threshold: 2.5

UI3

**System Time**

Year: 2018

Month: February

Day: 20

Hour: 3 PM

Minute: 24

Manual Time Set

**NTP Configuration**

☒ NTP Enabled

NTP Server: pool.ntp.org

Time Zone: Central:UTC-6

NTP Refresh (Days): 1

NTP Success

**DST Configuration**

☐ DST Enabled

DST ON: March

DST OFF: November

Day of Month: 2nd SUN

Hour: 2 AM

Close Submit

## 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.

**Web Components**

<PREV NEXT>

Description	Value	Wire Sheet	Min	Max
WC01 Switch Status	0.000000	Output		
WC02 Default Web Component 2	0.000000	Input	0.000000	100.000000
WC03 Default Web Component 3	0.000000	Input	0.000000	100.000000
WC04 Default Web Component 4	0.000000	Input	0.000000	100.000000
WC05 Default Web Component 5	0.000000	Input	0.000000	100.000000
WC06 Default Web Component 6	0.000000	Input	0.000000	100.000000
WC07 Default Web Component 7	0.000000	Input	0.000000	100.000000
WC08 Default Web Component 8	0.000000	Input	0.000000	100.000000

Auto Refresh ON NOTE: A GREEN label indicates that the component has been placed on the wire sheet.

Close Submit

## 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.

Virtual Points

VT01

Zone Temp

85.270

VT02

Wiresheet BACnet Status

0.000

VT03

Virtual Point 3

0.000

VT04

Virtual Point 4

0.000

VT05

Virtual Point 5

0.000

VT06

Virtual Point 6

0.000

VT07

Virtual Point 7

0.000

VT08

Virtual Point 8

0.000

VT09

Virtual Point 9

0.000

VT10

Virtual Point 10

0.000

VT11

Virtual Point 11

0.000

VT12

Virtual Point 12

0.000

VT13

Virtual Point 13

0.000

VT14

Virtual Point 14

0.000

VT15

Virtual Point 15

0.000

VT16

Virtual Point 16

0.000

VT17

Virtual Point 17

0.000

VT18

Virtual Point 18

0.000

VT19

Virtual Point 19

0.000

VT20

Virtual Point 20

0.000

VT21

Virtual Point 21

0.000

VT22

Virtual Point 22

0.000

VT23

Virtual Point 23

0.000

VT24

Virtual Point 24

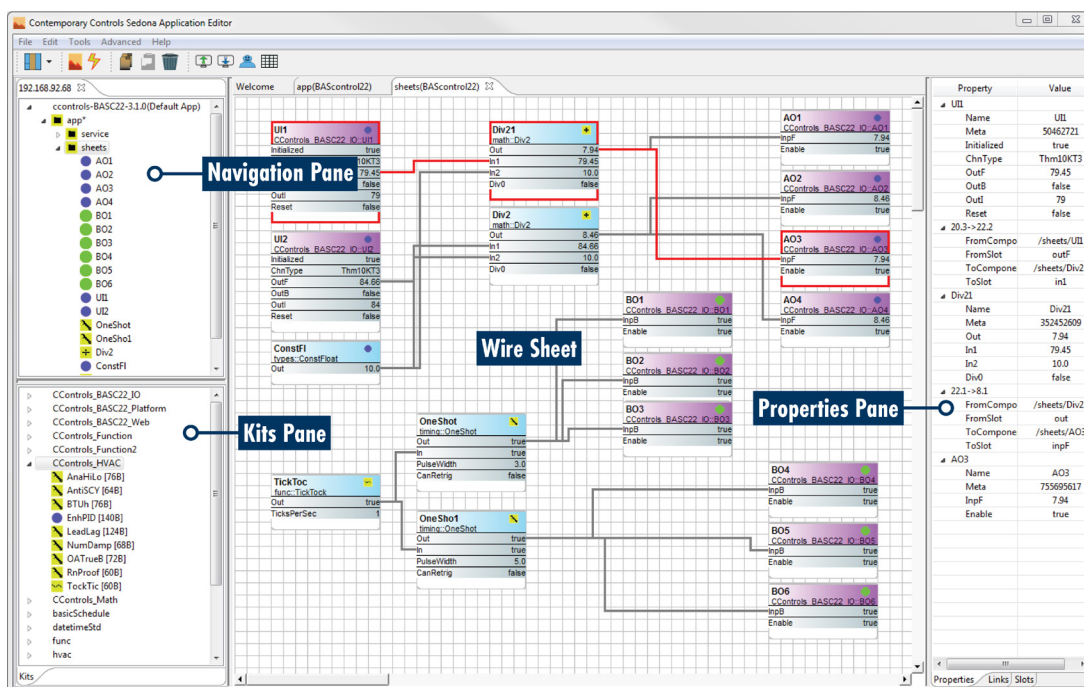
0.000

Auto Refresh ON

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

## Specifications

### Universal Inputs

#### Configured As

Analog input

Temperature input

Contact closure input

Pulse input

Resistance

#### Characteristics

0–10 VDC (+/- 1% precision)

Input impedance 1 MΩ on voltage

Type II 10 kΩ thermistors: -10° to +190 °F (-23.3° to +87.8°C)

Type III 10 kΩ thermistors: -15° to +200 °F (-26.1° to +93.3°C)

20 kΩ thermistors: 15° to 215° F (-9° to +101° C)

Excitation current 0.5 mA. Open circuit voltage 10 VDC.

Sensing threshold 3 VDC (low) and 7 VDC (high). Response time 20 ms.

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.

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

Protocols supported

#### Ethernet/Wi-Fi

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

### Electrical

Input

Voltage

Power

5 VDC

4 W (with all IO, BASpi firmware, and both networks adapters engaged)

## Ordering Information

### Model

BASPI-IO6U6R

BASPI-SYS6U6R

### Description

Raspberry Pi 3 Daughterboard 6UI/6 Relay

Raspberry Pi 3 with BASpi 6UI/6 Relay

#### United States

Contemporary Control  
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