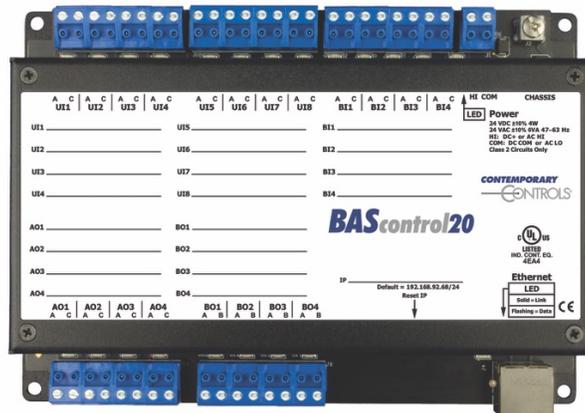


BASC20

20-point BACnet/IP Sedona Unitary Controller

BAScontrol20



User Manual

Firmware Version 3.1.2

UM-BASC2000-AA1

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Disclaimer

Contemporary Control Systems, Inc. reserves the right to make changes in the specifications of the product described within this manual at any time without notice and without obligation of Contemporary Control Systems, Inc. to notify any person of such revision or change.

**WARNING — This is a Class A product as defined in EN55022.
In a domestic environment this product may cause radio interference
in which case the user may be required to take adequate measures.**

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1 Introduction

The BAScontrol20 is a 20-point unitary controller which supports BACnet/IP and Sedona Framework using an Ethernet connection. The controller complies with the B-ASC device profile having a convenient mix of 8 universal inputs, 4 binary inputs, 4 analog outputs and 4 relay (20R) or triac (20T) outputs. Unique to the unit are 48 web components which link Sedona wire sheet readable/writeable data to web pages, and 24 virtual points which link Sedona wire sheet readable/writeable data to a BACnet client. The device is fully web page-configurable, and freely programmable using Sedona's drag-and-drop programming methodology of assembling components onto a wire sheet to create applications. The unit can be programmed using Niagara Workbench AX or a third-party Sedona programming tool such as Sedona Application Editor (SAE). Rugged design, low profile, and wide temperature operation make it suitable for indoor or outdoor use. To download the free Sedona Application Editor, visit: www.ccontrols.com/sae. For more information about Sedona, SAE, kits, components, and programming download the Sedona Reference Manual at: www.ccontrols.com/sedona

The BASC20 utilizes a powerful 32-bit ARM7 processor with 512 kB of flash memory plus a 16 Mbit serial flash file system for storing configuration data and an application program. By operating at the BACnet/IP level, the BASC20 can share the same Ethernet network with supervisory controllers and operator workstations. 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. A real-time clock with a super-cap backup allows for creating local schedules.

A 10/100 Mbps Ethernet port supports protocols such as BACnet/IP, Sedona Sox, HTTP and FTP. Configuration of universal inputs and virtual points can be accomplished using web pages. Type II and type III 10 k Ω thermistors curves and a 20 k Ω curve are resident in the unit. Current inputs can be measured using external resistors. Contact closures require a voltage-free source. Binary inputs and outputs as well as analog outputs require no configuration. The unit is powered from either a 24VAC/VDC source.

1.1 Features and Benefits

Versatile Control Device — field controller or remote Ethernet I/O

- BACnet/IP compliant
- B-ASC device profile
- Configurable by Workbench or third-party Sedona tool
- Direct connection to an Ethernet network
- Powered by a Sedona Virtual Machine

Flexible Input/Output — 20-points of I/O

- Eight configurable universal inputs:
- Thermistor, resistance, analog voltage, binary input, resistance, contact closure, pulse inputs (4 max)
- Four contact closure inputs
- Four analog voltage outputs
- Four relay or triac output (model specific)

1.2 Product Image and Main Features

Universal Inputs

Eight input points can be configured — all discoverable as BACnet objects.

- Analog inputs: 0–10 VDC, 12-bit resolution, 0–20 mA (with external resistor)
- Temperature inputs: Type II or Type III 10 kΩ thermistors; 20 kΩ thermistor
- Resistance inputs: 1 kΩ to 100 kΩ
- Contact closure, voltage-free
- Pulse input accumulators (UI1–UI4): accommodates active or passive sources (40 Hz max)

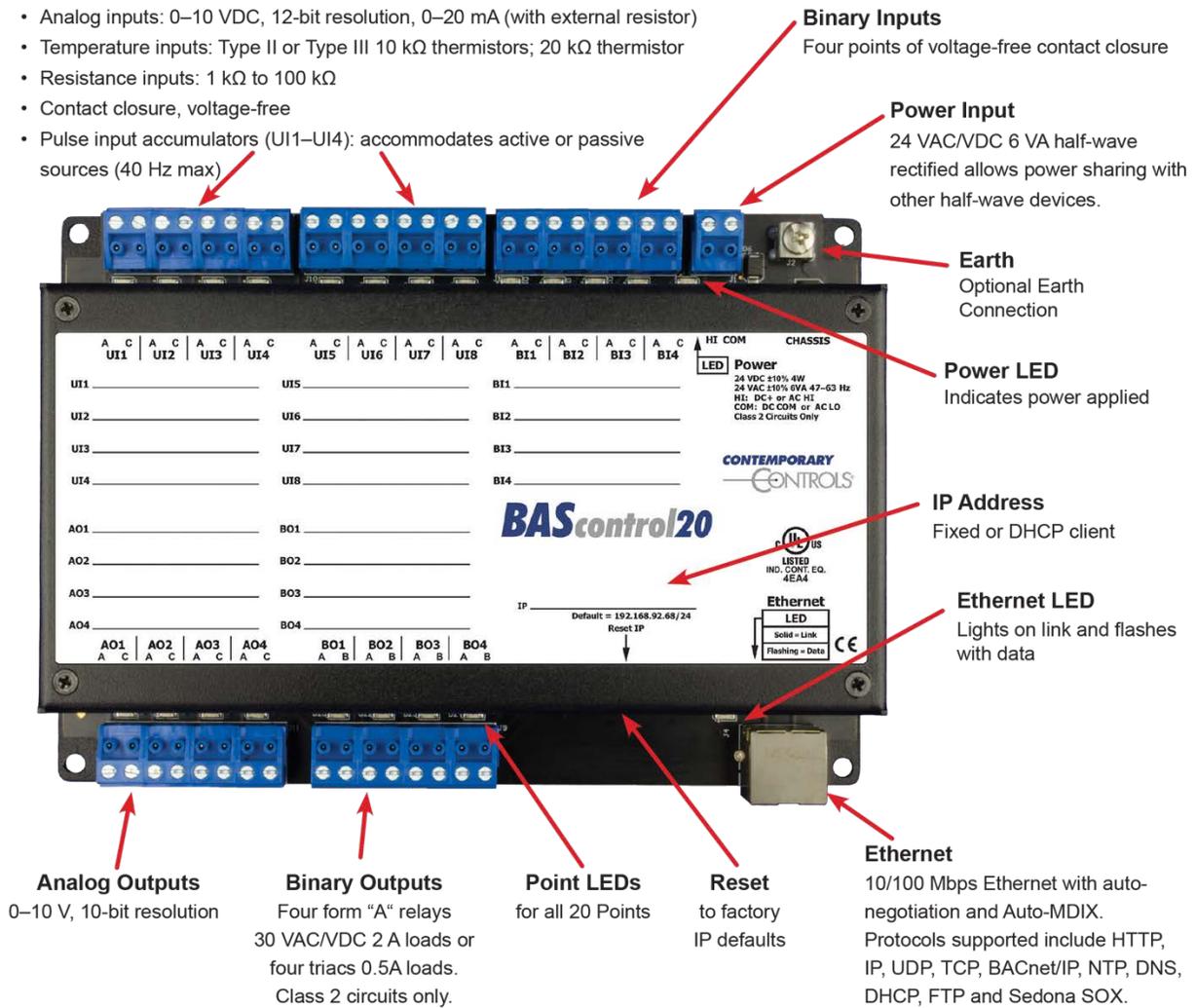


Figure 1 — BASC20 Main Features

2 Specifications

2.1 Universal Input (Channels UI1–UI8)

Configured As	Limits
Analog Input	0–10 VDC or 0–20 mA (with external resistor). 12-bit resolution. Input impedance 1 M Ω on voltage.
Temperature Input	Type II 10 k Ω thermistor –10° to +190 °F (–23.3° to +87.8°C) Type III 10 k Ω thermistor –15° to +200 °F (–26.1° to +93.3°C) Type 20 k Ω thermistor 15° to 215° F (–9° to +101° C)
Contact Closure Input	Excitation current 0.5 mA. Open circuit voltage 12 VDC. Sensing threshold 3 VDC (logic "1") and 7 VDC (logic "0"). Response time 20 ms.
Pulse Input (points UI1–UI4)	0–10 VDC for active output devices. 0–12 VDC for passive devices (configured for internal pull-up resistor). 40 Hz maximum input frequency with 50% duty cycle. Adjustable high and low thresholds.
Resistance	1 k Ω -100 k Ω range

2.2 Binary Inputs (Channels BI1–BI4)

Type	Limits
Contact Closure	Excitation current 1.2 mA. Open circuit voltage 12 VDC. Sensing threshold 3 VDC (logic "1") and 7 VDC (logic "0"). Response time 20 ms.

2.3 Analog Outputs (Channels AO1–AO4)

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

2.4 Binary Outputs (Channels BO1–BO4)

(Class 2 circuits only - requires external power source)

Type	Limits
Model BASC-20R	Normally open relay contacts. 30 VAC/VDC 2 A.
Model BASC-20T	Isolated triacs. 30 VAC 0.5 A.

2.5 Communications

Protocol	Data Link and Physical Layers
Ethernet	ANSI/IEEE 802.3 10/100 Mbps Ethernet. 10BASE-T, 100BASE-TX, auto-negotiation of speed and duplex. Auto-MDIX. 100 m maximum segment length. Default IP address is 192.168.92.68/24.

2.6 Protocol Compliance

Protocol	Compliance
BACnet/IP	ASHRAE 135-2008 annex J. Application specific controller device profile B-ASC.

2.7 Power Requirements

Item	Limits
Input power	24 VAC/VDC \pm 10%, 47–63 Hz, 6 VA

2.8 General Specifications

Item	Description
Protection	All inputs and outputs (except for relay outputs and communications ports) are over-voltage protected up to 24 VAC and short-circuit protected.
Environmental	Operating temperature 0° to +60°C. Storage temperature –40°C to +85°C. Relative humidity 10–95%, non-condensing.
Weight	0.6 lbs. (0.27 kg).

2.9 LED Indicators

LED Indicator	Indication
UI1–UI8 Configured as Analog Input	Green: > 1% of range, otherwise off
UI1–UI8 Configured as Temperature Input	Green: sensor detected
UI1–UI8 Configured as Contact Input	Green: contact closed, otherwise off
UI1–UI8 Configured as Pulse Input	Green: pulse sensed, otherwise off
UI1–UI8 Configured for Resistance	Green: resistance sensed
BI1–BI4 Contact Closure	Green: contact closed, otherwise off
AO1–AO4 Analog Output	Green: commanded output
BO1–BO4 Binary Output	Green: commanded output
Ethernet	Green: Link established; flashes with activity

2.10 Electromagnetic Compatibility

Standard	Test Method	Description	Test Levels
EN 55024	EN 61000-4-2	Electrostatic Discharge	6 kV contact
EN 55024	EN 61000-4-3	Radiated Immunity	10 V/m, 80 MHz to 1 GHz
EN 55024	EN 61000-4-4	Fast Transient Burst	1 kV clamp & 2 kV direct
EN 55024	EN 61000-4-5	Voltage Surge	1 kV L-L & 2 kV L-Earth
EN 55024	EN 61000-4-6	Conducted Immunity	10 V (rms)
EN 55024	EN 61000-4-11	Voltage Dips & Interruptions	1 Line cycle, 1–5 s @100% dip
EN 55022	CISPR 22	Radiated Emissions	Class A
EN 55022	CISPR 22	Conducted Emissions	Class B
CFR 47, Part	ANSI C63.4	Radiated Emissions	Class A

2.11 Field Connections

Terminal	Universal Inputs 1–8
UI1 A	Universal Input Point 1 High
UI1 C	Universal Input Point 1 Common
UI2 A	Universal Input Point 2 High
UI2 C	Universal Input Point 2 Common
UI3 A	Universal Input Point 3 High
UI3 C	Universal Input Point 3 Common
UI4 A	Universal Input Point 4 High
UI4 C	Universal Input Point 4 Common
UI5 A	Universal Input Point 5 High
UI5 C	Universal Input Point 5 Common
UI6 A	Universal Input Point 6 High
UI6 C	Universal Input Point 6 Common
UI7 A	Universal Input Point 7 High
UI7 C	Universal Input Point 7 Common
UI8 A	Universal Input Point 8 High
UI8 C	Universal Input Point 8 Common

Terminal	Relay Outputs (BASC-20R)
BO1 A	Output 1 normally-open contact
BO1 B	Output 1 common contact
BO2 A	Output 2 normally-open contact
BO2 B	Output 2 common contact
BO3 A	Output 3 normally-open contact
BO3 B	Output 3 common contact
BO4 A	Output 4 normally-open contact
BO4 B	Output 4 common contact

Terminal	Analog Outputs 1–4
AO1 A	Output Point 1 High
AO1 C	Output Point 1 Common
AO2 A	Output Point 2 High
AO2 C	Output Point 2 Common
AO3 A	Output Point 3 High
AO3 C	Output Point 3 Common
AO4 A	Output Point 4 High
AO4 C	Output Point 4 Common

Terminal	Binary Inputs 1–4
B11 A	Input Point 1 High
B11 C	Input Point 1 Common
B12 A	Input Point 2 High
B12 C	Input Point 2 Common
B13 A	Input Point 3 High
B13 C	Input Point 3 Common
B14 A	Input Point 4 High
B14 C	Input Point 4 Common

Terminal	Triac Outputs (BASC-20T)
BO1 A	Output 1 Isolated Triac
BO1 B	Output 1 Isolated return
BO2 A	Output 2 Isolated Triac
BO2 B	Output 2 Isolated return
BO3 A	Output 3 Isolated Triac
BO3 B	Output 3 Isolated return
BO4 A	Output 4 Isolated Triac
BO4 B	Output 4 Isolated return

2.12 Power Connection

Terminal	Power
HI	High AC or DC +
COM	AC or DC common

2.13 Ordering Information

Model	Description
BASC-20R	BAScontrol with 20 I/O points, includes 4 relay outputs
BASC-20T	BAScontrol with 20 I/O points, includes 4 triac outputs

2.14 Dimensional Drawing

All units are in mm.

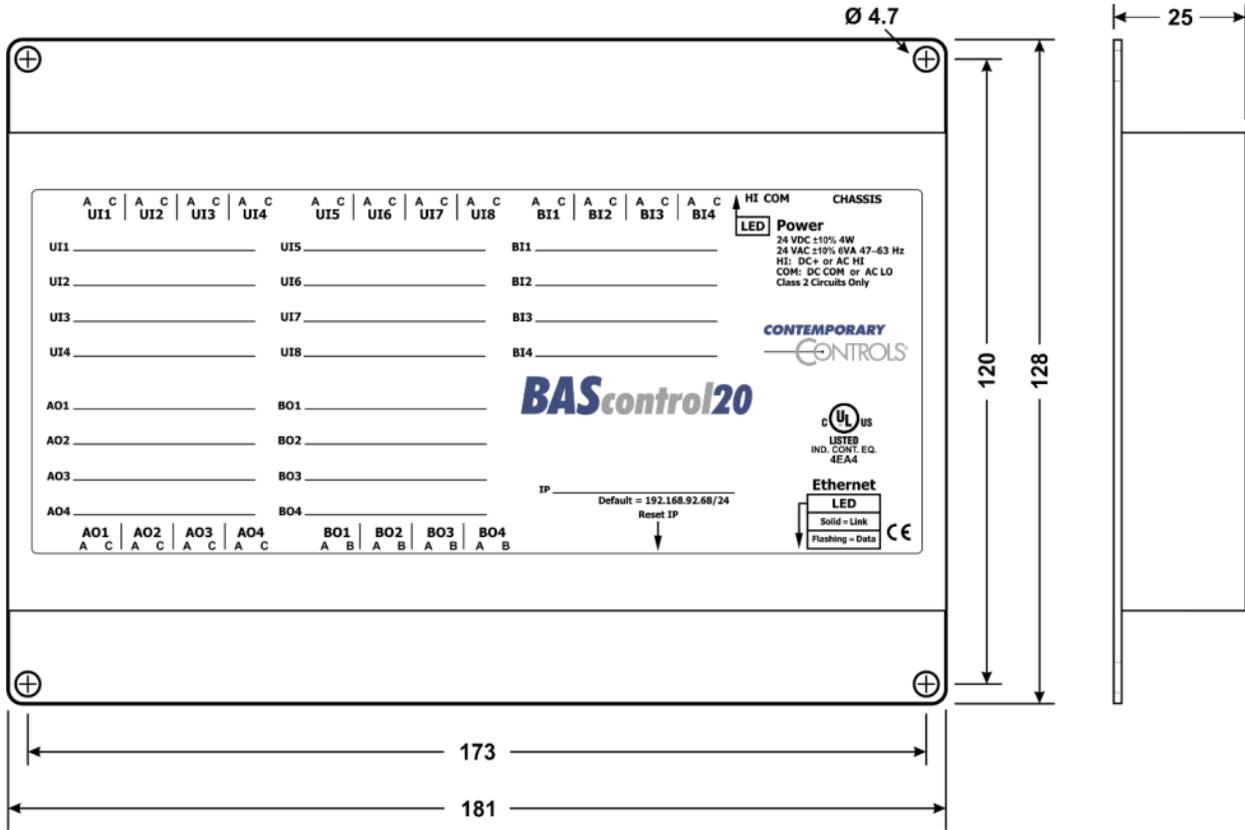


Figure 2 — BASC20 Dimensions

2.15 PICS Statement



BAScontrol20

BACnet/IP Sedona Field Controller



BACnet Protocol Implementation Conformance Statement (Annex A)

Date: August 29, 2016
Vendor Name: Contemporary Controls
Product Name: BAScontrol20
Product Model Number: BASC-20R and BASC-20T
Applications Software Version: 1.2.28 **Firmware Revision:** 3.1.2 **BACnet Protocol Revision:** 3
Product Description: BACnet/IP compliant 20-point field controller or remote I/O that allows a direct connection to Ethernet 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 Output	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.

3 Installation

The BASC20 is intended to panel-mounted with screws (not provided). The BAScontrol20 is outdoor temperature rated for temperature range between -40°C and 75°C.

3.1 Power Supply

The power source for the internal supply is applied via the two terminals labelled HI and COM. COM is for the power source return and also serves as the common ground connection. Primary 24 VAC/VDC ($\pm 10\%$) power is applied to HI and COM. HI connects to a diode accomplishes half-wave rectified power — while providing reverse input voltage protection. The recommended power conductor size is 16–18 AWG (solid or stranded). Ground is directly connected to zero volts. Input connections are reverse-polarity protected.

WARNING: Powering devices can present hazards. Read the next two sections carefully.

3.1.1 Power Supply Precautions

Internally, the BASC20 utilizes a half-wave rectifier and therefore can share the same AC power source with other half-wave rectified devices. Sharing a common DC power source is also possible. Sharing AC power with full-wave rectified devices is NOT recommended. Full-wave rectified devices usually require a dedicated AC power source that has a secondary elevated above ground. Both secondary connections are considered HOT. AC power sources that power several half-wave devices have a common secondary connection called COMMON, LO, or GROUND. This connection might be tied to earth. The other side of the secondary is considered the HOT or HI side of the connection. Connect the HOT side of the secondary to the HI input on the BASC20 and the LO side to COM on the BASC20. All other half-wave devices sharing the same AC power source need to follow the same convention. When using a DC power source, connect its positive terminal to the HI input on the BASC20 and the negative terminal to COM on the BASC20. Reversing polarity to the BASC20 will not damage the BASC20.

WARNING: Devices powered from a common AC source could be damaged if a mix of half-wave and full-wave rectified devices exist. If you are not sure of the type of rectifier used by another device, do not share the AC source with it.

3.1.2 Limited Power Sources

The BASC20 should be powered by a limited power source complying with the requirements of the National Electric Code (NEC) article 725 or other international codes meeting the same intent of limiting the amount of power of the source. Under NEC article 725, a Class 2 circuit is that portion of the wiring system between the load side of a Class 2 power source and the connected equipment. For AC or DC voltages up to 30 volts, the power rating of a Class 2 power source is limited to 100 VA. The transformer or power supply complying with the Class 2 rating must carry a corresponding listing from a regulatory agency such as Underwriters Laboratories (UL).

3.2 Cabling Considerations

Function	Signalling and Data Rate	Minimum Required Cable	Maximum Segment Distance
Ethernet	10BASE-T 10 Mbps	Category 3 UTP	100 m (328 ft)
Ethernet	100BASE-TX 100 Mbps	Category 5 UTP	100 m (328 ft)
I/O	Unspecified	Solid: 16–22 AWG Stranded: 16–18 AWG	Unspecified

Table 1 — Cabling Considerations

* If using shielded cable, connect to chassis at only one point.

NOTE: Wire size may be dictated by electrical codes for the area where the equipment is being installed. Consult local regulations.

Observe in Table 1 that 10BASE-T segments can successfully use Category 3, 4 or 5 cable — but 100BASE-TX segments must use Category 5 cable. Category 5e cable is highly recommended as the minimum for new installations.

The Ethernet port of the BASC20 employs Auto-MDIX technology so that either straight-through or crossover cables can be used to connect to the network.

4 Field Connections

4.1 Sample BASC20 Wiring Diagram

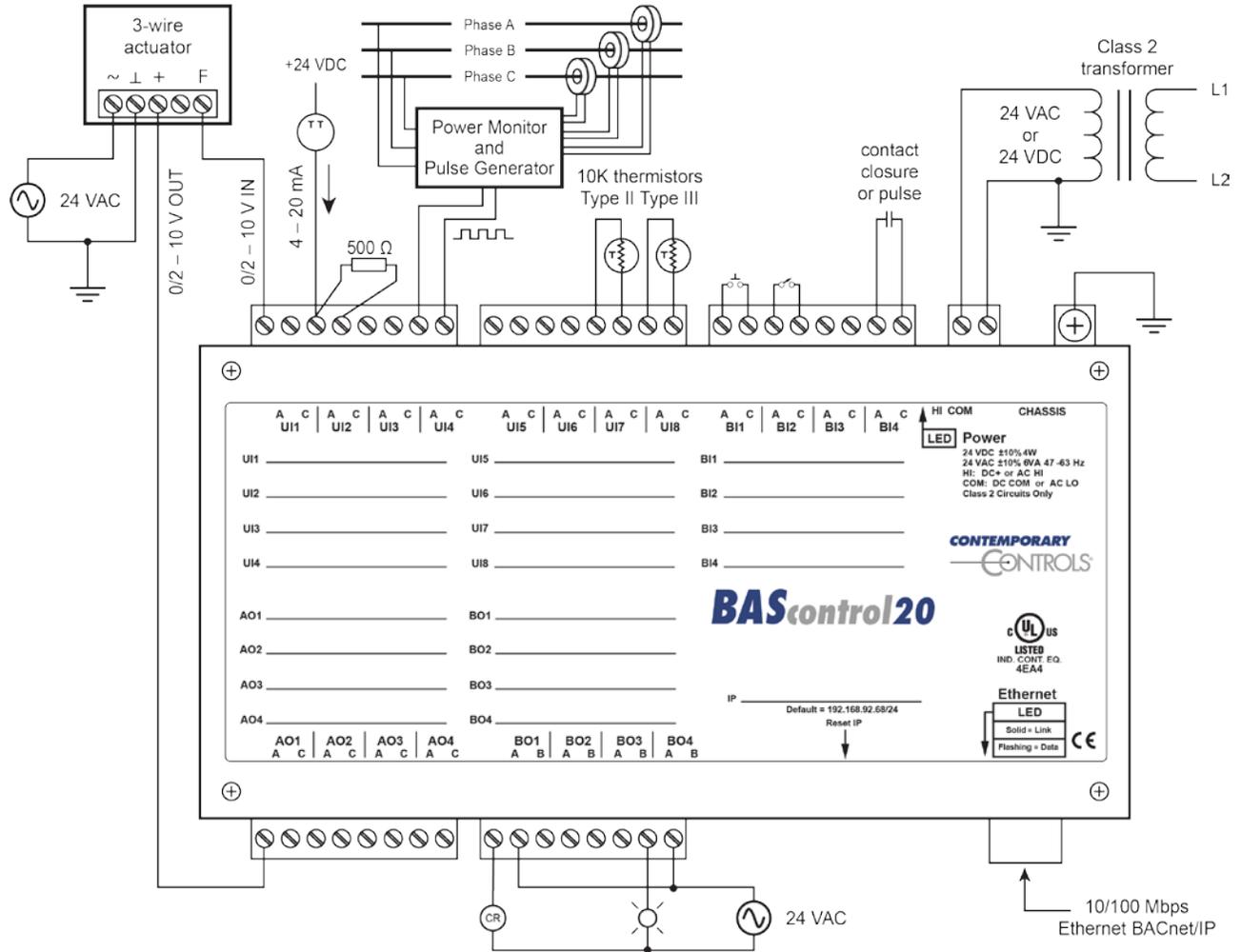


Figure 3 — Sample BASC20 Wiring Diagram

4.2 Universal Input — Configured as 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. Transmitters that produce an elevated “zero” such as 2–10 VDC or 4–20 mA can be measured as well. Using the web page, configure the input for voltage. When set as a voltage input, the input impedance is 1 M Ω .

With voltage measurement, connect the more positive voltage to point **A** and the less positive to common **C** as shown in (Figure 4). 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 BASC20 common. Notice the connections in the diagram in the case of a separately powered actuator. In this situation it is necessary to attach the transmitter output to point **A** on the BASC20 input and a ground reference to B.

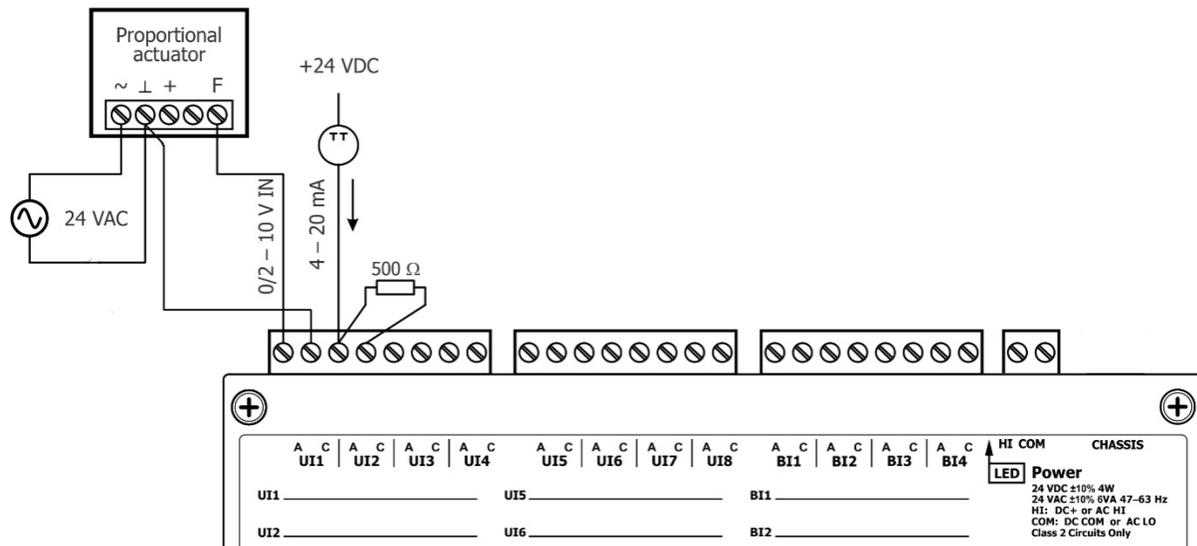


Figure 4 — Analog Input Connections

When measuring current from two-wire transmitters, remember the BASC20 sinks current to ground. A 500 Ω resistor is applied between points A and C on the input. To measure current, it must be driven into point A with respect to point C.

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 BASC20 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.

4.3 Universal Input — Configured as Temperature or Resistance Input

The BASC20 has built-in calibration curves for 10 kΩ Type II or Type III thermistors and 20 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. With a web browser, configure an input Channel Type for either Type II or Type III thermistor or 20 kΩ. As shown in (Figure 5), connect the two-wire thermistor to points **A** and **C**. Polarity is not an issue. If averaging of temperature is desired, connect multiple thermistors in a series-parallel combination so that the nominal resistance remains at 10 kΩ or 20 kΩ as shown. Make sure that all devices are of the same type. The effective range of measurement varies by type. Type II 10 kΩ thermistors range from -10° to +190 °F (-23.3° to +87.8°C). Type III 10 kΩ thermistors range from -15° to +200 °F (-26.1° to +93.3°C). 20 kΩ thermistors range from 15° to 215° F (-9° to +101° C). An open input results in a fault condition and no LED indication for that point.

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 1kΩ to 100kΩ. 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 component in the Sedona component family.

10 kΩ Type II or Type III Thermistors or 20 kΩ Thermistors

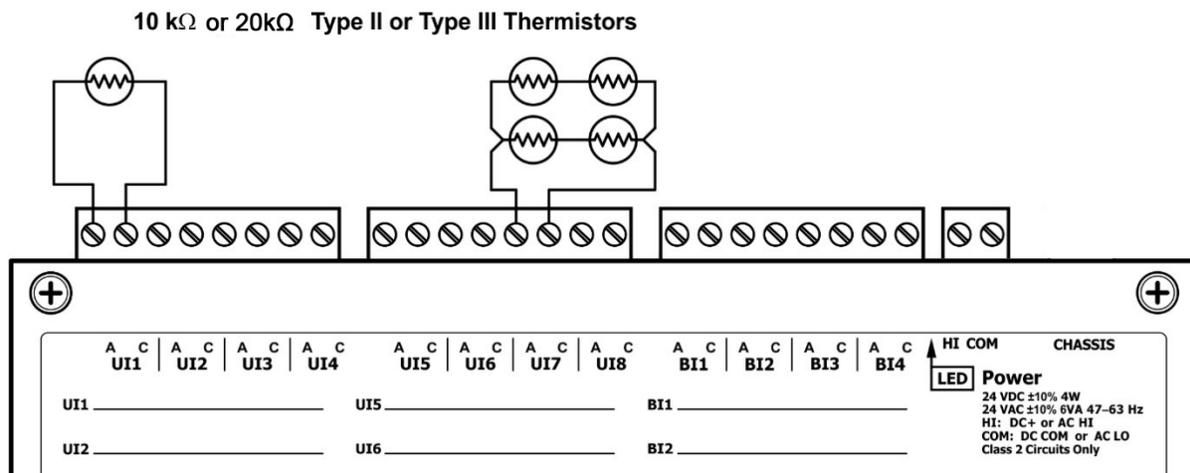


Figure 5 — Thermistor and Resistor Connections

4.4 Universal Input — Configured as a 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 BASC20 provides the energy to be sensed. With a web browser, access the Main Screen, click the title link of any channel UI1–UI8. Set the Channel Type to Binary Input and the Units to NO_UNITS. As shown in (Figure 6), connect the contacts between points A and C. For common mechanical contacts, polarity is not an issue. The open-circuit voltage is 12 VDC and the short-circuit current is 0.5 mA.

For solid-state switch sensing, we recommend that an attached solid-state device have an opto-isolated open-collector NPN transistor output stage with a collector-emitter output voltage (V_{ce}) 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 A (the more positive point). The BASC20 sets the low-threshold to 3 V and the high-threshold to 6 V. When a contact is made or the solid-state switch is on (resulting in a saturated output), the voltage at point A is close to zero volts. The corresponding LED for that channel will be on. 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 6 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.

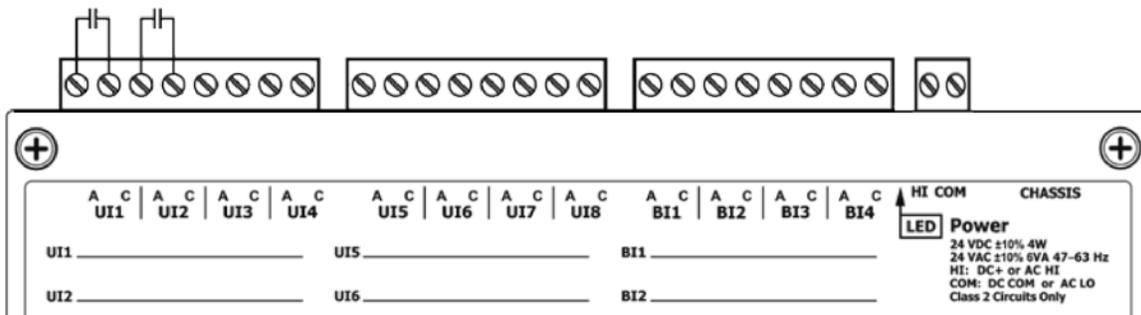


Figure 6 — Binary Input Connections

4.5 Universal Input — Configured as Pulse Input

When an input (UI1 – UI4) is configured for Pulse Input, a 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 k Ω when using active sensors. Connect the output of the pulse device to point A and the common to point C as shown in (Figure 7).

If the pulse device has a passive output requiring a pull-up resistor, the BASC20 can provide a 10 k Ω resistor to +12 VDC by checking a box on the configuration page. The two threshold values can still be set as needed.

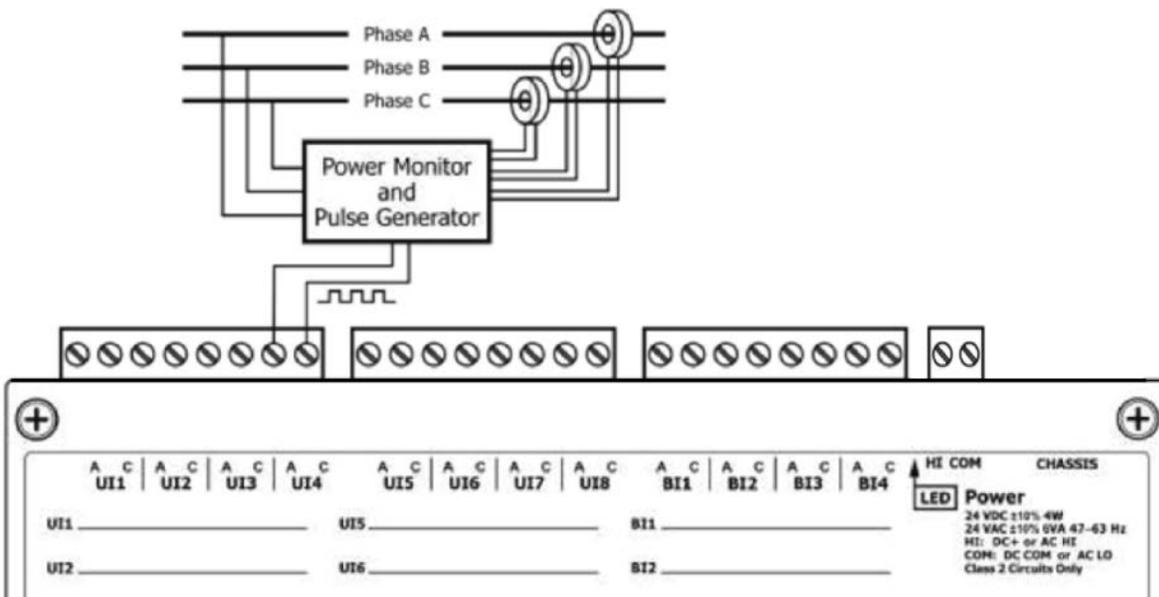


Figure 7 — Pulse Input Connections

4.6 Analog Outputs

Voltage in the range of 0–10 VDC can be outputted by assigning analog outputs (AO1–AO4). For analog output DC voltage, the output voltage is applied to point **A** with respect to **C** (common). There is no configuration necessary for analog outputs.

(Figure 8) illustrates connections to a proportional damper actuator but with a separate power supply. The damper requires a 0–10 V command signal which can easily be accomplished by the BASC20. If position feedback is to be measured, connect the actuator output signal to UI1 and configure the universal input for analog input.

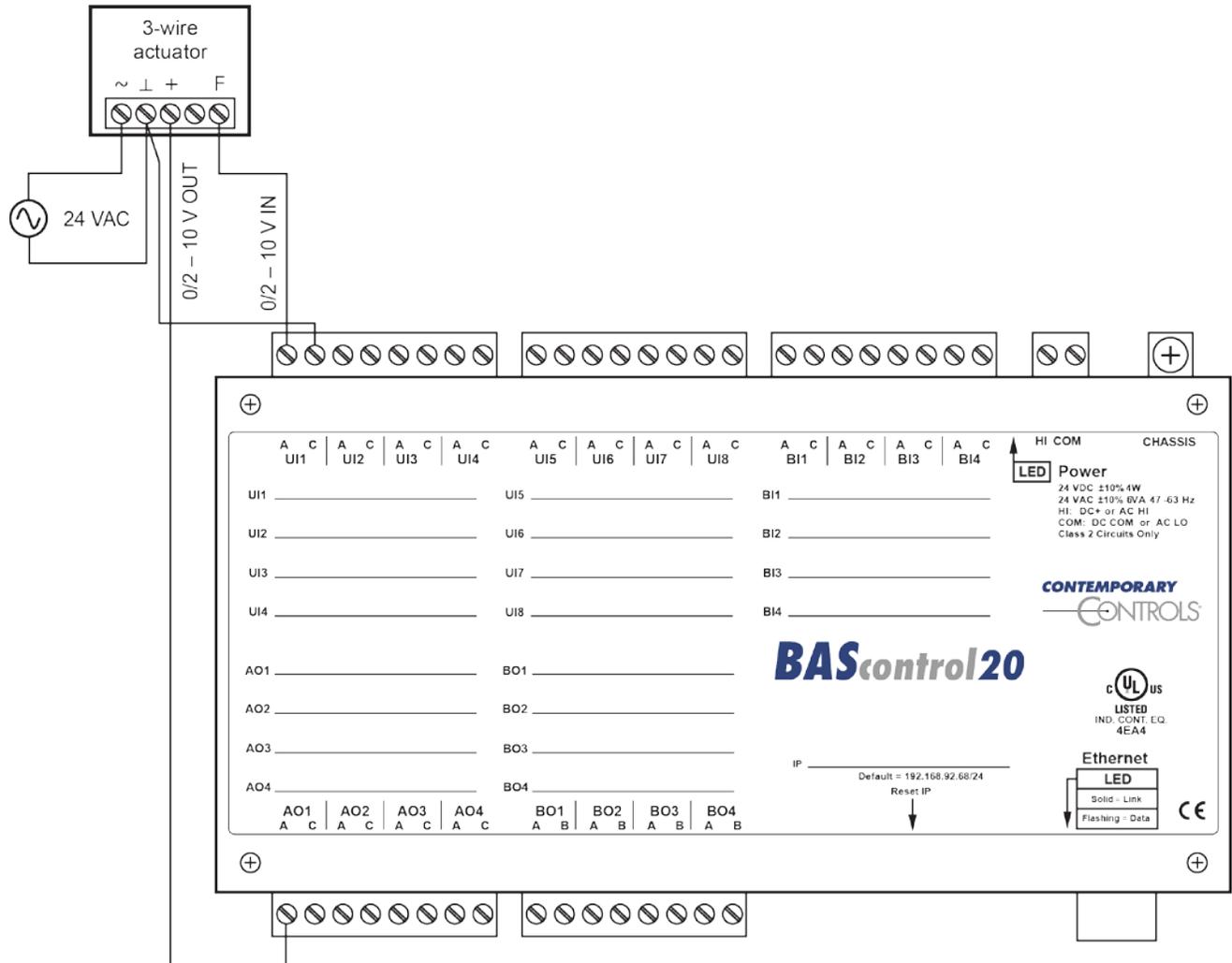


Figure 8 — Analog Output Connections

4.7 Binary Outputs

As shown in (Figure 9), four binary outputs (BO1 – BO4) are available. Each output requires an external power source. Two types of binary devices can be controlled. The BASC-20R provides four normally-open form “A” relay contacts that are rated at 30 VAC/VDC and 2 A. The BASC-20T provides isolated triac outputs that can drive loads up to 30 VAC and 0.5 A.

Each output voltage is applied to point **A** with respect to point **B** and is intended for Class 2 circuits only.

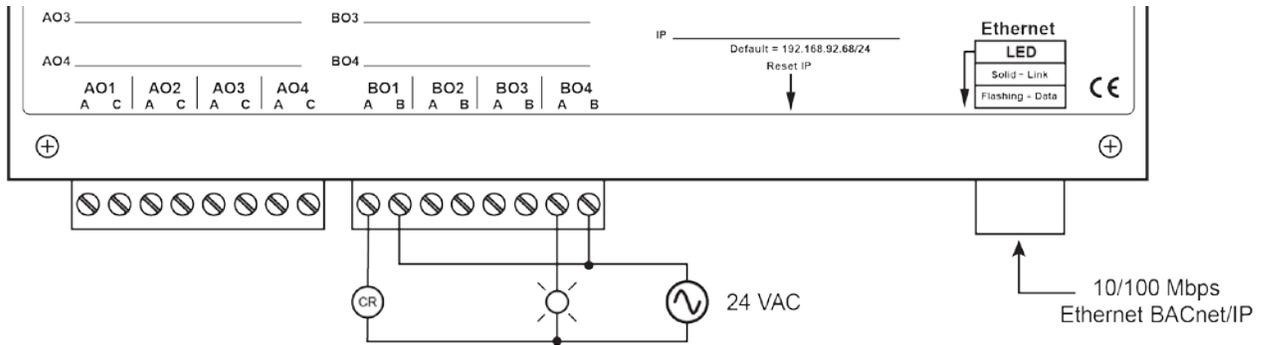


Figure 9 — Binary Output Connections

4.8 Binary Inputs

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 BASC20 provides the energy to be sensed. With a web browser, access the Main Screen, click the title link of any channel UI1–UI8. Set the Channel Type to Binary Input and the Units to NO_UNITS. As shown in (Figure 10), connect the contacts between points **A** and **C**. For common mechanical contacts, polarity is not an issue. The open-circuit voltage is 12 VDC and the short-circuit current is 0.5 mA.

For solid-state switch sensing, we recommend that an attached solid-state device have an opto-isolated open-collector NPN transistor output stage with a collector-emitter output voltage (V_{ce}) 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 **A** (the more positive point). The BASC20 sets the low-threshold to 3 V and the high-threshold to 6 V. When a contact is made or the solid-state switch is on (resulting in a saturated output), the voltage at point **A** is close to zero volts. The corresponding LED for that channel will be on. 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 6 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.

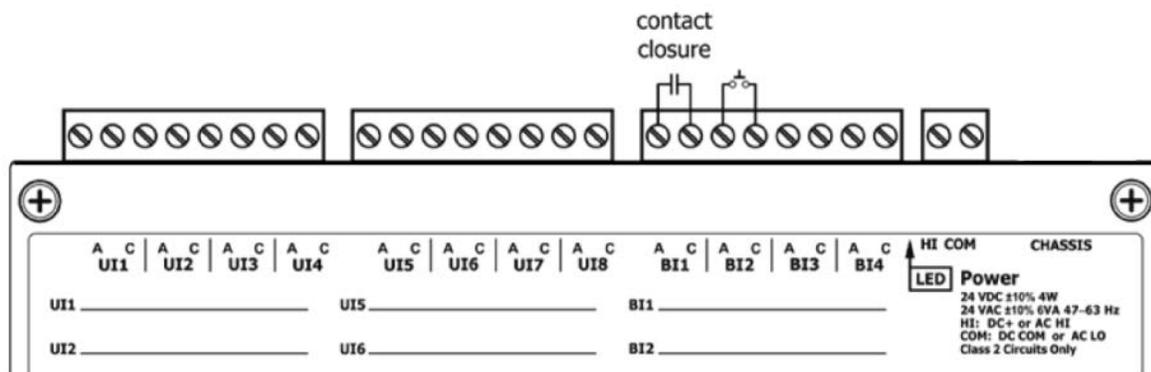


Figure 10 — Binary Input Connection

4.9 LEDs

To aid in troubleshooting, several LEDs have been provided.

The BASC20 has an Ethernet LED that glows green when properly linked to equipment operating at 10/100 Mbps and indicates activity by flashing.

LEDs to indicate I/O status follow the behaviour described in Table 2 below:

If the I/O channel is ...	Green indicates ...
a Relay output	the coil or triac is energized.
an Analog output	the command is greater than zero.
a Contact input	the contact is made.
a Pulse input	the input state changed.
a Thermistor	thermistor is connected.
a Resistor	resistor is connected.
an Analog input	the signal is greater than 1% of span.

Table 2 — LED Behaviour

5 Configuration via a Web Browser

5.1 General Considerations

Some configuration of the BASC20 is required. This is accomplished while the unit is connected to a computer running a web browser (Javascript-enabled) that accesses the unit's built-in web server.

5.1.1 Ethernet Port Auto-Negotiation

The Ethernet port on the BASC20 offers full auto-negotiation. A single cable links two Ethernet devices. When these devices auto-negotiate, the data rate will be 100 Mbps only if both are capable of that speed. Likewise, full-duplex will only be selected if both can support it. If only one device supports auto-negotiation, then it will default to half-duplex mode and match the data rate of the non-auto-negotiating device.

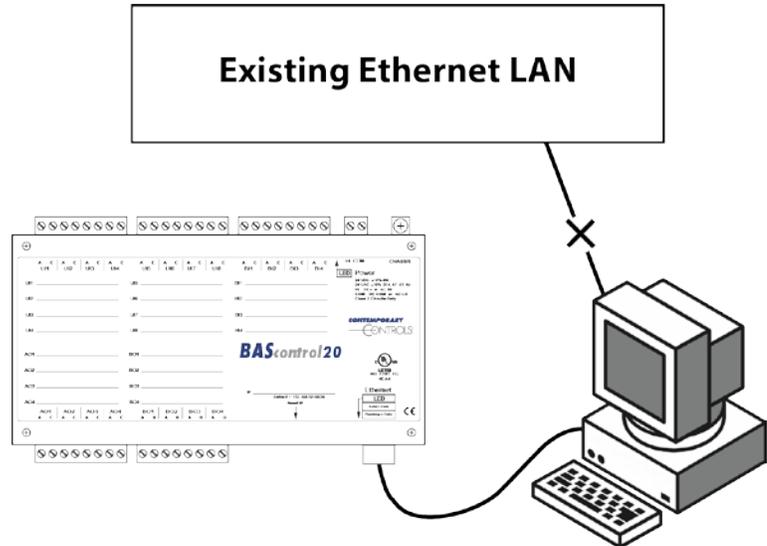


Figure 11 — Setup for Initial IP Address Configuration by Web Browser

Auto-MDIX (Auto-Crossover)

When interconnecting two Ethernet devices, a straight-through cable or crossover cable can be used — but if one device uses Auto-MDIX, the cable wiring does not matter; Auto-MDIX adjusts for either type.

Reset Switch

To reset the BASC20 to its default values of the IP address (192.168.92.68) and netmask (/24 or 255.255.255.0), press the reset switch (see Figure 11 for location) while the unit is powered. Follow the instructions under the section 5.1.2.

5.1.2 Secure Login and Reset (Recovery Mode)

To reset the unit to its default IP values and login credentials, press the reset switch for over 4 seconds. (See Figure 1 for the switch location.) This forces the **recovery mode** — confirmed by alternate flashing of UI1 -UI4 and AO1 -AO4 channel LEDs. This action restores the default settings for the user ID (admin), password (admin), IP address (192.168.92.68) and subnet mask (255.255.255.0). Access the main web page and make changes to the IP configuration and login credentials, and then click **Restart Controller** to exit recovery mode.

5.1.3 Web Server Initial Access

5.1.3.1 Web Server

The BASC20 contains an interactive web server, accessible from any Internet-compatible PC on the local network. It is compatible with all recent browsers. It is factory programmed with a default IP address of 192.168.92.68 and a Class C subnet mask of 255.255.255.0. Once configured, changing its IP address is strongly encouraged.

5.1.3.2 Initial Access

The hardware arrangement for initially setting the BASC20 IP address appears in (Figure 11). The PC should be temporarily disconnected from the Ethernet LAN in case the BASC20's default address matches that of a device on the existing LAN. The procedure for altering the IP address creates a temporary LAN composed of nothing but the BASC20, the PC used to configure it and a CAT5 cable connecting the two. Since the BASC20 supports Auto-MDIX, either straight-through or crossover cable can be used.

For initial configuration, the PC chosen for the procedure should temporarily have its IP address modified as shown in (Figure 12) — which employs a Windows® 7 example.

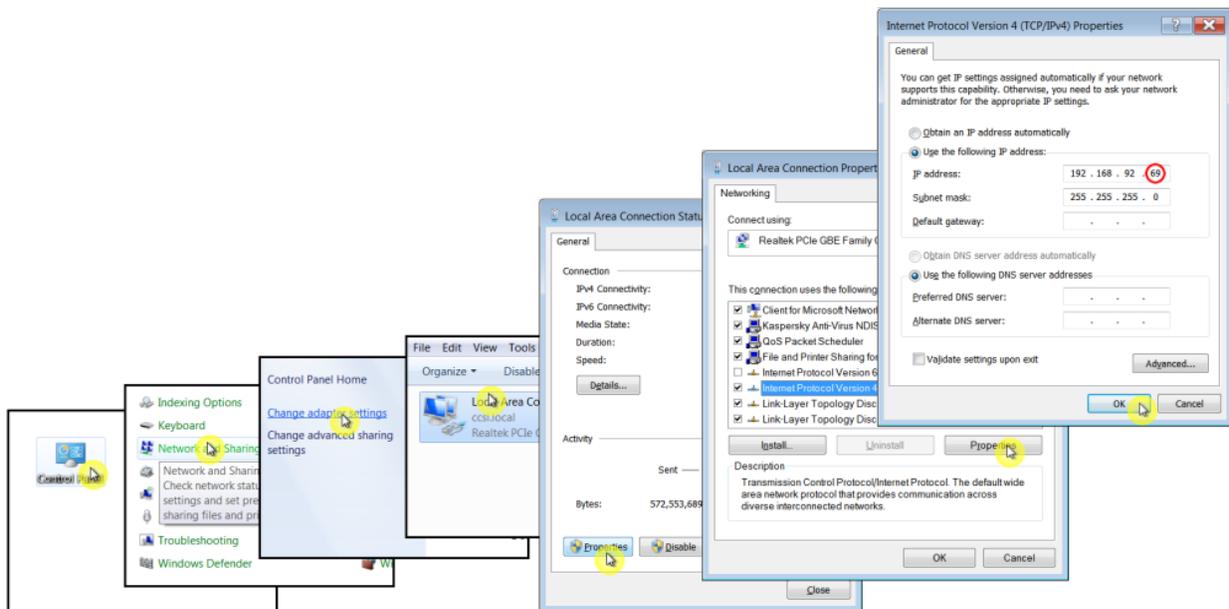


Figure 12 — Steps for Changing the IP Address of the PC Used for Setup

(Figure 12) uses an IP address for the PC of 192.168.92.69, but the final quad of the address could be any value 1–254 except for 68 which is used by the BASC20. After setting the IP address of the PC to the same LAN as the BASC20, a browser can access the BASC20 default IP address.

When first accessing the BASC20, you must provide the default login credentials. We strongly advise you to change these values as discussed in Section 5.1.4.4.

(Figure 13) displays the Main Page that appears after you first login to the BASC20. This page displays channel data in five columns:

- Universal Inputs (Channels UI1–UI8)
- Binary Inputs (Channels BI1–BI4)
- Analog Outputs (Channels AO1–AO4)
- Binary Outputs (Channels BO1–BO4)

Each of the 20 channels has three features:

- title link — If clicked, it displays a configuration screen (see Figure 18).
- data field* — You can read a value or enter one if forced (see Section 5.1.10).
- checkbox* — If checked, you can force the channel value (see Section 5.1.10).

* You need to check the box before making a change.

Checkboxes Enable Forcing

Universal Inputs		Binary Inputs		Analog Outputs		Binary Outputs			
U11	Space Temperature 74.838°F	UI5	Universal Input 5 0.008	BI1	Temporary Occupancy Switch 0	AO1	Analog Output 1 0.000	BO1	Heat 1 0
U12	Universal Input 2 0.009	UI6	Universal Input 6 0.007	BI2	Binary Input 2 0	AO2	Analog Output 2 0.000	BO2	Fan 1
U13	Universal Input 3 0.001	UI7	Universal Input 7 0.003	BI3	Binary Input 3 0	AO3	Analog Output 3 0.000	BO3	Cool 1 0
U14	Universal Input 4 0.001	UI8	Universal Input 8 0.003	BI4	Binary Input 4 0	AO4	Analog Output 4 0.000	BO4	Binary Output 4 0

BAScontrol20

System Configuration System Status Set Time Virtual Points Web Components Restart Controller

Auto Refresh ON

Figure 13— Main Page

Six buttons occupy the bottom of the Main Page. They function as follows:

- **System Configuration** described in Section 5.1.4
- **System Status** described in Section 5.1.5
- **Set Time** described in Section 5.1.6
- **Virtual Points** described in Section 5.1.10
- **Web Components** described in Section 5.1.7
- **Restart Controller** described in Section 5.1.8
- **Auto Refresh (On/Off)** described in Section 5.1.9

5.1.4 System Configuration

Clicking the *System Configuration* button shown in the lower-left area of (Figure 13) opens the window depicted in (Figure 14) — where you can configure the settings discussed in the next four sections.

The screenshot shows a web-based configuration window with four main sections and two buttons at the bottom.

- IP Configuration:** Includes fields for IP Mode (Static IP), IP Address (10.0.0.204), Netmask (255.255.255.0), Gateway (10.0.0.1), Primary DNS (8.8.8.8), and Secondary DNS (8.8.4.4).
- BACnet Device Configuration:** Includes fields for Device Object Name (Heat Cool Box), Device Instance (2749204), UDP Port (47808), BBMD IP Address (0.0.0.0), and BBMD Reg Time (100).
- Enable Protocol:** Includes checkboxes for BACnet (checked), Sedona (checked), and FTP (unchecked).
- Authentication:** Includes fields for User Name (admin) and Password (masked with dots).

At the bottom, there are two buttons: "Close" and "Submit".

A note box contains the following text: "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."

Figure 14 — System Configuration Window

Four sections and two special buttons exist on the System Configuration screen:

- IP Configuration is discussed in Section 5.1.4.1.
- BACnet Device Configuration is discussed in Section 5.1.4.2.
- Enable Protocol is discussed in Section 5.1.4.3.
- Authentication is discussed in Section 5.1.4.4.

5.1.4.1 IP Configuration

As shown in (Figure 14) the following parameters can be adjusted, followed by a **Submit**.

- **IP Mode** Choose either **Static IP** (the default) or **DHCP**.
- **IP Address** Changing the default value of 192.168.92.68 is recommended.
- **Netmask** The default value of 255.255.255.0 is adequate for most users.
- **Gateway** If your Ethernet LAN has a gateway (router) enter its IP address here.
- **Primary DNS** Enter your primary domain name service address
- **Secondary DNS** Enter your secondary domain name service address

After the BASC20 has been given its initial configuration, it will be ready for use in the full original Ethernet network. The temporary network constructed in (Figure 11) should be dismantled and the PC re-configured to restore its original IP address.

5.1.4.2 BACnet Configuration

As shown on the right side of (Figure 14), the following parameters can be adjusted, followed by a **Submit**.

- **Device Object Name** You must change the default name (BAScontrol System) to be **unique** throughout the **entire BACnet internetwork**.
- **Device Instance** This 22-bit value (0–4,194,303) **must be unique** throughout the **entire BACnet internetwork**. It defaults to **2749**.
- **UDP Port** The default of 47808 should usually not be changed.
- **BBMD IP Address** Enter the address of the BBMD with which the BASC20 will perform Foreign Device Registration (FDR) — if the BBMD is not in the same subnet as the BASC20.
- **BBMD Reg Time** Specify the seconds between successive FDR registrations. Default is 100.

5.1.4.3 Enable Protocol

On the right side of (Figure 14), three functions can be adjusted, followed by a **Submit**.

- **BACnet** Disabling BACnet (on by default) will free more memory for Sedona.
- **Sedona** Disabling Sedona (on by default) will free more memory for BACnet.
- **FTP** If needed, enable FTP (which by default is unchecked). If you select FTP, BACnet and Sedona are automatically de-selected.

5.1.4.4 Authentication

On the right side of (Figure 14), you can use up to 63 characters to specify **User Name** and **Password**, followed by **Submit**.

- **User Name** You can change the default *admin* to any *User Name* you wish.
- **Password** You can change the default *admin* to any *Password* you wish.

Note: After checking the submit button after any change you must restart the controller from the main web page.

5.1.5 System Status

This read-only screen is displayed in (Figure 15) and reports the three items:

- **Firmware Revision** Your firmware version is listed in the upper-left corner.
- **MAC ID** The Ethernet MAC address in the middle.
- **Available Memory** This value in the upper-right corner will vary often.
- **System Message Log** is discussed in Section 5.1.5.1.

System Status

The screenshot displays the 'System Status' window. At the top, there are three data boxes: 'Firmware Revision' with the value '3.1.2', 'MAC Address' with the value '00:50:DB:00:D3:01', and 'Available Memory' with the value '27800'. Below these is a 'System Message Log' section containing a text area with the following log output:

```
BAScontrol : 3.1.2 : Jun 26 2015 : 09:05:34
Free memory: 99504
Watchdog timer enabled
Refreshing chn_data.xml...done
Low memory limit= 8192
SVM starting; 50168 bytes free
Running SVM in platform mode
Sedona VM 1.2.28
buildDate: Jun 25 2015 09:23:49
endian: little
blockSize: 4
refSize: 4
IP Addr: 10.0.15.2
IP Mask: 255.255.240.0
IP Gate: 10.0.0.1
Start Responder...OK
Network initialized
RTC Time: Sun Jul 10 14:39:10 2016
bacnet-ip : 3.1.2 : Jun 25 2015 : 09:23:31
```

At the bottom of the window, there are three buttons: 'Clear Message Log', 'Close', and 'Refresh'.

Figure 15 — System Status Window

5.1.5.1 System Message Log

Various items are reported in Figure 15 after a power up cycle. Information is used by technical support at Contemporary Controls. The information can be cleared by checking the Clear Message log button. To refresh the page, click on Refresh.

5.1.7 Web Components (WC01–WC48)

Web components provide a means of interacting with the Sedona wire sheet via a web browser versus using a Sedona tool. These are custom components developed by Contemporary Controls which are provided in the CControls_BASC20_Web kit. Configuring web components is accomplished using a Sedona tool by first setting the target component as an input or output (integer, float or Boolean). In addition, high and low limits can be entered for wire sheet inputs. Returning to the web pages, for every web component (WC), a description and value can be entered. The description field is only used as an aid to the systems integrator in understanding the function of the component. If the component is configured as a wire sheet input, the assigned limits will restrict the range of the variable's entry. This eliminates the need to add limit logic on the wire sheet. For wire sheet outputs, limits are ignored and not displayed. A green tag means that the web component has been placed on the wire sheet.

[Web Components](#)

	Description	Value	Wire Sheet	Min	Max
WC09	Temporary Occupancy Time (TmpOcc)	2.000000	Input	0.000000	100.000000
WC10	Outside Air Heating Lockout (HLock)	120.000000	Input	0.000000	160.000000
WC11	Outside Air Cooling Lockout (CLock)	40.000000	Input	0.000000	100.000000
WC12	Fan Mode (0=Auto, 1=ON, 2=Smart)	2.000000	Input	0.000000	2.000000
WC13	Alarm Frost (0=GRN, 1=YEL, 2=RED)	0.000000	Input	0.000000	100.000000
WC14	Alarm Filter (0=GRN, 1=YEL, 2=RED)	0.000000	Input	0.000000	100.000000
WC15	Alarm Service (0=GRN, 1=YEL, 2=RED)	0.000000	Input	0.000000	100.000000
WC16	Monday Occupied	390.000000	Input	0.000000	1439.000000

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

Figure 17 — Web Components Screen Showing Example Data

5.1.8 Restart Controller

Click this button to restart the BASC20 that is currently targeted by your browser. Extreme care should be exercised when resetting a commissioned controller.

5.1.9 Auto Refresh (On/Off)

Click this button to update the BASC20 values currently displayed by your browser. With **Auto Refresh** ON, values periodically update. If OFF, there is no updating.

5.1.10 Virtual Points (VT01-VT24)

The 24 virtual points have their own web page. Virtual points allow communication to and from a BACnet client to the BASC20 wire sheet. Virtual points are usually setpoints, calculated data or status points that do not impact the real input/output points that exist on the controller. The first eight virtual points (VT01-VT08) reside in persistent memory for up to seven days when power is removed. The remaining points are not retentive. A GREEN tag means that the virtual point has been placed on the wire sheet.

Detailed information on configuring virtual components can be found in 5.2.8.

5.1.11 Forcing I/O Points from the Main Web Page

There is one feature available on the main web page that could be useful for checkout but must be done with great care. Both input and output points can be forced to states and values different from program generated values. Looking at the main web page, it is possible to both read and write values for the 20 real I/O points and 24 virtual points. There is no issue with reading points — only writing points. Just to the right of the value field is a checkbox. If you **hover your cursor** over this checkbox, this tool tip will display: **Click to Force Channel**. To change an input or output value, check this box before making a value change. This override value will remain until the checkbox is unchecked. The same can be done to outputs.

Caution: Use great care when forcing an input or output on a commissioned system to avoid damage to equipment or process or injury to personnel.

5.2 Channel Configuration

To configure a real input/output channel, access the Main Page (Figure 13), click on the title link for the channel of interest and make adjustments in the new screen that appears (Figure 18). The upper section of the new screen displays BAS Channel Configuration options; the lower section displays BACnet Object Configuration options. Only the universal inputs must be configured in the upper portion of the screen. The channel identity is confirmed by the large channel tag near in the upper-right corner of the new screen. Clicking the **Submit** button registers your changes which become effective immediately. If you close the configuration screen without clicking the **Submit** button, **your changes will be lost**.

The **BAS Channel Configuration** (upper) section of each configuration screen displays:

- **Channel Type**—If more than one option is available, choose the desired type.
- **Channel Number**—This *read-only* value confirms the selected channel.

The **BACnet Object Configuration** (lower) section of the screen displays:

- **Object Instance**—This is the **read-only** value automatically assigned for this channel.
- **Object Name**—Assign the channel a **unique** name, using up to 63 characters.
- **Object Type**— This will match the selected **Channel Type** (see above) except for Virtual Points which must be either Analog Value or Binary Value.
- **Object Description**—Describe the device as you wish, using up to 63 characters.
- **Units**—Choose the appropriate unit from the list of standard BACnet units.

- **COV Increment**—Enter the amount of change (**0** for **any** change) at which a COV message will be sent to subscribers. (Ignored for binary objects.) You can subscribe to 14 binary and 2 analog channels. Additional subscription requests will be denied.
- **Submit** button—This will immediately apply your configuration.
- **Close** button—The window closes whether or not the configuration is saved.

BAS Channel Configuration

Channel Type UI1

Temperature Offset

Temperature Units Out of Bounds Value

BACnet Object Configuration

Object Instance

Object Name

Object Type

Object Description

Units

COV Increment

Figure 18 — Sample Configuration Screen

5.2.1 Universal Input — Configured as Analog Input (Channels UI1–UI8)

You can measure 0–10 V with UI1–UI8 as follows:

- Access the Main Page (Figure 13) and click a title link from among UI1–UI8.
- Under **BAS Channel Configuration** in the new page that appears, set the **Channel Type** to *Analog Input*. An example appears in (Figure 19).
- Under **BACnet Object Configuration**, the **Units** value defaults to *VOLTS*. Change if necessary.
- Attach your device to the pair of BASC20 pins for the chosen channel — so that the more positive connection is to pin **A** and the more negative to pin **C**.

The screenshot shows a web interface for configuring a channel. It is divided into two main sections: "BAS Channel Configuration" and "BACnet Object Configuration".

BAS Channel Configuration:

- Channel Type:** A dropdown menu set to "Analog Input".
- UI1:** A large blue text label on the right side of the section.

BACnet Object Configuration:

- Object Instance:** A text input field containing the number "1".
- Object Name:** A text input field containing "Universal Input 1".
- Object Type:** A dropdown menu set to "Analog Input".
- Object Description:** A text input field containing "Default Bacnet Description".
- Units:** A dropdown menu set to "VOLTS".
- COV Increment:** A text input field containing "0".
- Buttons:** "Close" and "Submit" buttons are located at the bottom right of the form.

Figure 19 — Universal Input Configured as Analog Input

5.2.2 Universal Input — Configured as Binary Input (Channels UI1–UI8)

You can accept a binary input with any channel UI1–UI8 as follows:

- On the Main Page (Figure 13), click a title link from among UI1–UI8.
- Under **BAS Channel Configuration** in the new page that appears (Figure 20), set the **Channel Type** to *Binary Input*.
- In the **BACnet Object Configuration** (lower) section of the screen, all items are as described in Section 5.2 above — but **Units** defaults to *NO_UNITS*.
- Attach your device to the pair of BASC20 pins for the chosen channel — so that the more positive connection is to pin **A** and the more negative to pin **C**.

The screenshot shows a web interface with two main sections. The top section, titled "BAS Channel Configuration", has a "Channel Type" dropdown menu set to "Binary Input" and a "UI1" label on the right. The bottom section, titled "BACnet Object Configuration", contains several input fields: "Object Instance" with the value "1", "Object Name" with "Universal Input 1", "Object Type" dropdown set to "Binary Input", "Object Description" with "Default Bacnet Description", "Units" dropdown set to "NO_UNITS", and "COV Increment" with the value "0". At the bottom right of this section are "Close" and "Submit" buttons.

Figure 20 — Universal Input Configured as Binary Input

5.2.3 Universal Input — Configured as Pulse Input (Channels UI1–UI4)

Any channel UI1–UI14 can be a **Pulse Input** for pulse trains in the range of 0–40 Hz. You can accept a pulse input with any channel UI1–UI4 as follows:

- On the Main Page (Figure 13), click a title link from among UI1–UI4.
- Under **BAS Channel Configuration** in the new page that appears (Figure 21), set the **Channel Type** to *Pulse Input*. Additional fields will appear ...
- In the **Maximum Value** field, set the desired limit for the accumulated pulse count. It defaults to the absolute maximum of 16,777,215. To **reset** the accumulator value to zero, momentarily set Reset = true in the universal input Sedona component using a Sedona Tool.
- Set the **Pull Up Resistor** parameter to *Enabled*, if used with a passive device otherwise have it disabled.

Note: In order The **BAS Channel Type** is *Pulse Input*, but the **BACnet Object Type** is *Analog Input*. This is because the BACnet object is an accumulator. **Units** can be changed from the default *NO_UNITS*.

The screenshot shows a web interface for configuring a channel. It is divided into two main sections: 'BAS Channel Configuration' and 'BACnet Object Configuration'. The 'BAS Channel Configuration' section includes fields for 'Channel Type' (set to 'Pulse Input'), 'Maximum Value' (16777215), 'Pull Up Resistor' (set to 'Enabled'), 'High Threshold' (7.5), and 'Low Threshold' (2.5). The 'BACnet Object Configuration' section includes fields for 'Object Instance' (1), 'Object Name' (Universal Input 1), 'Object Type' (set to 'Analog Input'), 'Object Description' (Default Bacnet Description), 'Units' (set to 'NO_UNITS'), and 'COV Increment' (0). There are 'Close' and 'Submit' buttons at the bottom right.

BAS Channel Configuration	
Channel Type	Pulse Input
Maximum Value	16777215
Pull Up Resistor	Enabled
High Threshold	7.5
Low Threshold	2.5

BACnet Object Configuration	
Object Instance	1
Object Name	Universal Input 1
Object Type	Analog Input
Object Description	Default Bacnet Description
Units	NO_UNITS
COV Increment	0

Figure 21 — Universal Input Configured as Pulse Input

5.2.4 Universal Input — Configured as Thermistor or Resistance Input (Channels UI1–UI8)

Channels UI1–UI8 can be used as Type II or Type III 10 k Ω **Thermistor** Inputs or a 20 k Ω **Thermistor** input or a **Resistance**. The BACnet object type will be **Analog Input**.

You can accept a thermistor input with any channel UI1–UI8 as follows:

- On the Main Page (Figure 13), click a title link from among UI1–UI8.
- Under **BAS Channel Configuration** in the new page that appears (Figure 22 is an example of a Type III screen), set the **Channel Type** to *Therm 10kT2* or *Therm 10kT3* or *Therm 20k*. Additional fields then appear ...
- The **Temperature Offset** parameter is only used as needed. If you determine that your thermistor yields an inaccurate result, enter a positive or negative offset value here to correct your thermistor reading.
- **Temperature Units** — the *Fahrenheit* default can be changed to *Celsius*. Note that the **Units** parameter under **BACnet Object Configuration** near the bottom of the screen automatically replicates your setting of the **Temperature Units** parameter.
- **Out of Bounds Value** — this is the temperature value you want assumed if an open thermistor condition occurs. A fault condition will be indicated in the universal input Sedona component.

You can accept a resistance input with any channel UI1–UI8 as follows:

- On the Main Page (Figure 13), click a title link from among UI1–UI8.
- Under **BAS Channel Configuration** in the new page that appears, set the **Channel Type** to *Resistance*. The **Units** field automatically selects *OHMS*.
- Open Circuit Value – This will be the value display under open circuit conditions

The screenshot shows a web interface with two main sections: "BAS Channel Configuration" and "BACnet Object Configuration".

BAS Channel Configuration:

- Channel Type: Therm 10kT3 (dropdown menu)
- Temperature Offset: 0 (text input)
- Temperature Units: Fahrenheit (dropdown menu)

BACnet Object Configuration:

- Object Instance: 1 (text input)
- Object Name: Universal Input 1 (text input)
- Object Type: Analog Input (dropdown menu)
- Object Description: Default Bacnet Description (text input)
- Units: DEGREES_FAHRENHEIT (dropdown menu)
- COV Increment: 0 (text input)

At the bottom right, there are "Close" and "Submit" buttons. A "UI1" label is visible in the top right corner of the form area.

Figure 22 — Thermistor Input Configuration

5.2.5 Binary Inputs (Channels BI1–BI4)

You can accept a binary input with any channel BI1—BI4 as follows:

- On the Main Page (Figure 13), click a title link from among BI1-BI4.
- Under **BAS Channel Configuration** in the new page that appears (Figure 23), the **Channel Type** should be *Binary Input* by default.
- In the **BACnet Object Configuration** (lower) section of the screen, all items are as described in Section 5.2 above – but **Units** defaults to *NO_UNITS*.
- Attach your device to the pair of BASC20 pins for the chosen channel – so that the more positive connection is to pin **A** and the more negative to pin **C**.

The screenshot shows a web interface for configuring a binary input. It is divided into two main sections: "BAS Channel Configuration" and "BACnet Object Configuration".

BAS Channel Configuration:

- Channel Type:** A dropdown menu set to "Binary Input".
- Channel ID:** "B11" is displayed in large blue text on the right.
- Buttons:** "Submit" and "Close" buttons are located on the right side.

BACnet Object Configuration:

- Object Instance:** A text input field containing the number "9".
- Object Name:** A text input field containing "Binary Input 1".
- Object Type:** A dropdown menu set to "Binary Input".
- Object Description:** A text input field containing "Default Bacnet Description".
- Units:** A dropdown menu set to "NO_UNITS".
- COV Increment:** A text input field containing the number "0".

Figure 23 — Binary Input Configuration

5.2.6 Analog Outputs (Channels AO1–AO4)

Voltage in the range of 0–10 VDC (with up to 4 mA of current) can be outputted by assigning analog outputs. Configure an output using a web browser. For DC voltage, the output voltage is applied to point **A** with respect to **C** (common).

Any channel AO1–AO4 can be used to provide an analog voltage output. The BACnet type will be *Analog Output*. To configure an analog output:

- On the Main Page (Figure 13), click a title link from among AO1–AO4.
- Under **BAS Channel Configuration** (lower) section of the new screen that appears (Figure 24), the **Channel Type** will be *Analog Output* (read-only).
- In the **BACnet Object Configuration** (lower) section of the screen, all items are as described in Section 5.2 above — but **Units** defaults to *VOLTS*.
- Attach your device to the pair of BASC20 pins for the chosen channel — so that the more positive connection is to pin **A** and the more negative to pin **C**.

The screenshot shows a web interface for configuring an analog output. The title is "BAS Channel Configuration" and the channel is identified as "AO1". The "Channel Type" is set to "Analog Output". Below this is the "BACnet Object Configuration" section. It includes fields for "Object Instance" (13), "Object Name" (Analog Output 1), "Object Type" (Analog Output), "Object Description" (Default Bacnet Description), "Units" (VOLTS), and "COV Increment" (0). There are two radio buttons: "Read from Wire Sheet" and "Write to Wire Sheet", with "Write to Wire Sheet" selected. At the bottom right, there are "Close" and "Submit" buttons.

Figure 24 — Analog Output Configuration

5.2.7 Binary Outputs (Channels BO1–BO4)

The BASC20 can provide four binary relay outputs (BASC-20R) or four triac outputs (BASC-20T). The voltage and current limits for relay units are 30 VAC/VDC and 2 A. For triac units the limits are 30 VAC and 0.5 A. Violating these limits could damage the BASC20 and void the warranty.

Relay channels can be used as contact closures for other devices, but triac channels can only be used to enable or restrict the flow of AC current. It is common for the BASC20 binary outputs to enable the coil of interposing relays which can carry larger currents and support switching higher voltages.

Any channel BO1–BO4 can be used to provide a binary output. The BACnet type will be *Binary Output*. To configure an binary output:

- On the Main Page (Figure 13), click a title link from among BO1–BO4.
- Under **BAS Channel Configuration** (lower) section of the new screen that appears (Figure 25), the **Channel Type** will be *Binary Output* (read-only).
- In the **BACnet Object Configuration** (lower) section of the screen, all items are as described in Section 5.2 above. **Units** will default to *NO_UNITS*.
- Attach your device to the pair of BASC20 pins for the chosen channel — so that the more positive connection is to pin **A** and the more negative to pin **B**.

The screenshot shows two configuration screens for a Binary Output channel. The top screen, titled "BAS Channel Configuration", has a "Channel Type" dropdown menu set to "Binary Output" and a channel identifier "BO1" in the top right corner. The bottom screen, titled "BACnet Object Configuration", contains the following fields and options: "Object Instance" (text input with "17"), "Object Name" (text input with "Binary Output 1"), "Object Type" (dropdown menu set to "Binary Output"), "Object Description" (text input with "Default Bacnet Description"), "Units" (dropdown menu set to "NO_UNITS"), and "COV Increment" (text input with "0"). There are two radio buttons for "Read from Wire Sheet" and "Write to Wire Sheet", with "Write to Wire Sheet" selected. At the bottom right of the second screen are "Close" and "Submit" buttons.

Figure 25 — Binary Output Configuration

5.2.8 Virtual Points (Channels VT01–VT24)

In the **CControls_BASC20_IO** kit are 24 virtual point components (VT01–VT24) that are used by a BACnet client to send and receive intermediate data to and from the BASC20. By intermediate data we mean that the data is neither real input data nor real output data but something in between real inputs and real outputs. It could be setpoint or reset data intended for the wire sheet or calculations or status information generated by the wire sheet. Although BACnet allows for the reading of the BASC20 real 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 BASC20 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 BASC20’s real inputs and will attempt to “write” to the BASC20’s real 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. Therefore, we need to establish rules for the use of AVs and BVs.

The screenshot shows a web-based configuration interface for a virtual point. It is titled "BAS Channel Configuration" and "BACnet Object Configuration". The "Channel Type" is set to "Virtual" and the point is identified as "VT01". Under "BACnet Object Configuration", the "Object Instance" is 201, "Object Name" is "Virtual Point 1", "Object Type" is "Analog Value", "Object Description" is "Virtual Point", and "Units" are "NO_UNITS". The "COV Increment" is set to 0. Two radio buttons are present: "Read from Wire Sheet" (unselected) and "Write to Wire Sheet" (selected). "Close" and "Submit" buttons are located at the bottom right of the configuration area.

Figure 26 — Virtual Configuration Screen

If a BACnet client is to write intermediate data to the Sedona wire sheet such as a command, we would assign a VT to input this data from the wire sheet so using our Sedona tool we would configure the VT’s WireSheet slot to Input to Wire Sheet. This will result in a channel type (Chn Type) of “float in” or “binary in” depending upon the AV or BV selection on the VT’s channel configuration.

If a BACnet client is to read intermediate data from the Sedona wire sheet such as status, we would assign a VT to output this data to the wire sheet so using our Sedona tool configure the VT’s WireSheet slot to *Output from Wire Sheet*. 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.

Next we access the Virtual Points web page and click on the title link of a particular virtual point of interest to gain access to its configuration page. From the **Object Type** parameter under **BACnet Object Configuration**, select either *Analog Variable* or *Binary Variable*. Enter a unique **Object Name** and if desired enter an **Object Description** or even change the **Units**. Notice that the radio button *Read from Wire Sheet* or *Write to Wire Sheet* reflects the point of view of the BACnet client. This can only be changed by the Sedona tool.

Upon power loss, the first eight virtual components are retentive up to seven days. This allows a BACnet client command to be retained even if power is lost to the controller. Backup is accomplished using a super-cap.

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December, 2017