BAScontrol-E36 – 36-point Edge Controller

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

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

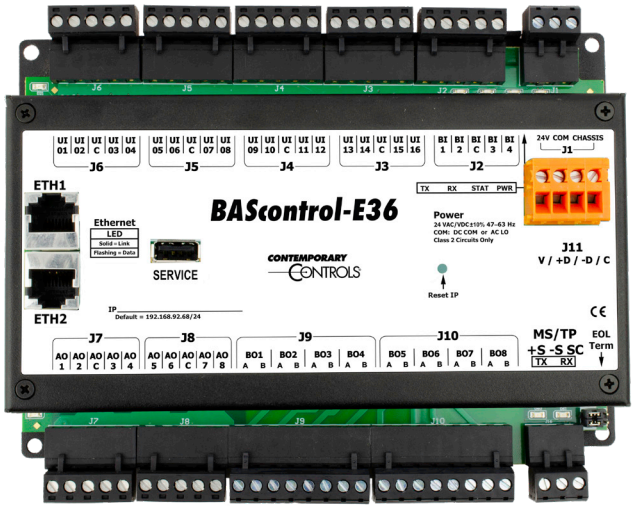
The device is fully webpage configurable and freely programmable using Sedona's drag-and-drop programming methodology of assembling components onto a wiresheet to create applications. The unit can be programmed using the Sedona Application Editor (SAE) in Contemporary Controls' free BAScontrol Toolset.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

Versatile Control Device

- BACnet/IP and BACnet MS/TP client/server
- BACnet B-ASC device profile
- Resident Sedona Virtual Machine (SVM)
- Programmable with free BAScontrol Toolset
- Programmable with N4 Workbench
- Configurable with a common web browser
- Built-in 10/100 Mbps Ethernet two-port switch
- NTP or manually settable real-time clock
- COV subscriptions – a mix of 230 binary or analog
- Azure IoT Central connector
- JSON-node dashboard
- Email alarms and notifications
- Built-in API to openweathermap.org
- Multiple 7-day schedules
- 16 non-volatile counters using FRAM
- Service port with support for USB Wi-Fi device for easy configuration
- Wall setter port for connection to optional wall setter device
- Outdoor temperature operation -40°C to +75°C

Flexible Input/Output — 36-points of physical I/O

- Sixteen configurable universal inputs: Thermistor, resistance, analog voltage, binary input, retentive pulse inputs
- Four voltage-free binary inputs
- Eight 0-10 VDC analog outputs
- Eight relay outputs



BASautomation® Sedona OPEN CONTROL

BAScontrolE36 – Overview

The BAScontrol-E36 utilizes a powerful TI AM3352 Sitara processor with 512MB of RAM memory plus 5 GB of pseudo-single layer eMMC memory, a 2 KB FRAM memory for high-speed non-volatile data storage and an Atmel Xmega I/O processor. For speed and programming convenience, the application program executes out of RAM. Retentive data such as pulse counts, and runtimes are held in FRAM memory. A status LED lights upon boot-up.

By operating at the BACnet/IP level, the BAScontrol-E36 can share the same Ethernet network with supervisory controllers, operator workstations or IP routers. The two 10/100 Mbps Ethernet ports with built-in switch support protocols, including HTTP, MQTT, SSH, UDP, TCP, BACnet/IP, NTP, DNS, DHCP, and Sedona SOX. The unit can be configured for a fixed IP address or can operate as a DHCP client receiving its IP address from a DHCP server. LED indicators identify a link condition with flashing indicated data transfer. Pressing a hidden IP Reset switch returns the controller to default IP address settings and authentication settings.

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

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

A real-time clock uses a super-cap for 7-day backup retention (at room temperature). Time Sync via a NTP server or from BACnet's TimeSync service is supported.

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

Flexible Input and Output

Configuration of the 16 universal inputs (UIs) is accomplished using webpages. Universal inputs can be configured for voltage, temperature, resistance, pulse, and voltage-free contact closure. Type II and Type III 10 kΩ thermistor curves, and 20 kΩ and 100 kΩ curves are resident in the unit. The 100 kΩ follows the Tasserson (PSB) curve. BACnet configuration is via webpages.

- The four binary inputs (BIs) are intended for voltage-free contact closure monitoring.
- The eight 0-10 VDC analog outputs (AOs) are capable of driving up to 4 mA.
- The eight SPST relay outputs (BOs) are capable of switching 2 A at 30 V (NEC class 2 wiring) are BACnet configurable via a webpage.
- The 192 virtual components (VTs) are webpage configurable for either an AV or BV read-from wiresheet or write-to wiresheet by a BACnet client.
- The 48 web components (WCs) are webpage configurable for either a read-from wiresheet or write-to wiresheet by a web browser.

The BAScontrol-E36 is powered from either a 24 VAC or 24 V DC power source. Its half-wave rectified power supply can share the same power source with other half-wave rectified equipment. An LED indicates power is applied.

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

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

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

Multiple email messages can be triggered by wiresheet alarm or notification events and sent to specified email addresses. Messages are secured using SSL/TLS encryption.

BAScontrol-E36 – Overview

Sedona Open Control

Sedona function block graphical programming is used to develop control sequences for the BAScontrol-E36 series of controllers. Using the Sedona Application Editor (SAE) running on a Windows PC, components are assembled onto a wiresheet, configured, and then interconnected with other components to create applications. Programming can be accomplished live on the target controller or emulated using the BASemulator. Once the program is finalized, it can be saved along with BACnet configurations using BASbackup and restored as needed. The use of Sedona and the BAScontrol Toolset is license-free.

Multiple independent schedules with configurable events (holidays/exceptions) can be created via webpage configuration and bound to corresponding Sedona schedule components.

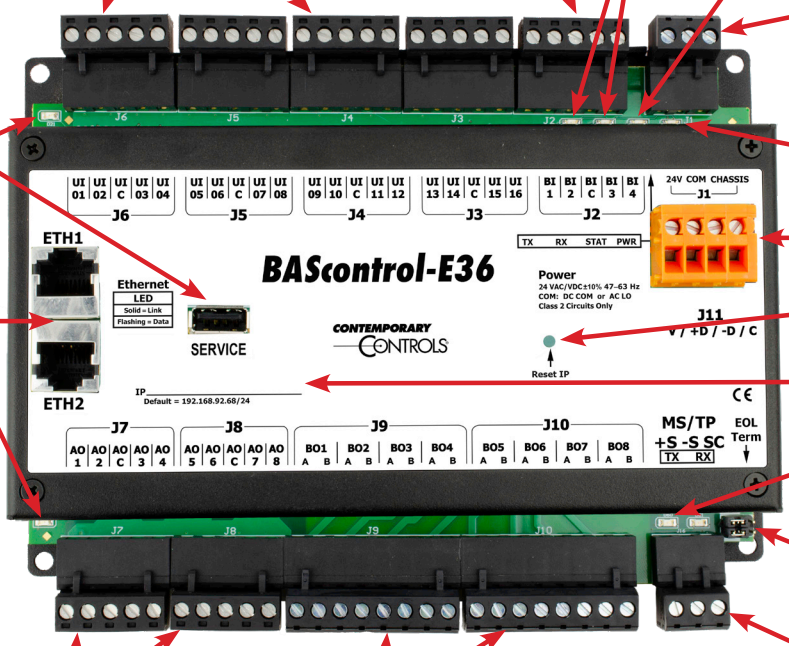
BAScontrol Toolset – Essential Tools for Programming Edge Controllers

The BAScontrol Toolset includes the SAE, BASbackup—the BAScontrol Project Utility, and BASemulator—BAScontrol emulation on a PC. Provided free of charge, these tools simplify controller programming, program testing, and project archiving. All three programs are available as a single install on a Window PC sharing a common Sedona bundle of kits and components. Along with a common web browser, the toolset is all that is needed to commission a BASautomation Edge controller.

Universal Inputs

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

- Analog inputs: 0–10 VDC, 10-bit resolution, 0–20 mA (with external resistor)
- Temperature inputs: Type II or Type III 10 kΩ thermistors, 20 kΩ thermistor, 100 kΩ thermistor
- Resistance inputs: 1 kΩ to 100 kΩ
- Contact closure input: Excitation curent 0.5 mA, Open circuit voltage 12 VDC
- Configure as binary inputs
- Pulse input accumulators: accommodates active or passive sources (40 Hz max)



Binary Inputs
Four points of voltage-free contact closure

TX/RX LEDs
Flash wall setter transmit and receive

Status LED
Lights upon start up

Power Input
24 VAC/VDC 22 VA/15 W half-wave rectified allows power sharing with other half-wave devices.

Power LED
Indicates power applied

Wall Setter
BASWS interface

Reset IP and Authentication
To factory IP defaults

IP Address
Fixed or DHCP client

MS/TP LEDs
Flash for TX and RX

Bias/Termination jumpers

MS/TP
Communication

Service
USB connector

Ethernet LEDs
Light on link and flashes with data

Ethernet Ports
10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX. Protocols supported include HTTP, UDP, MQTT, SSH, TCP, BACnet/IP, NTP, DNS, DHCP, and Sedona SOX.

Analog Outputs
0–10 V, 10-bit resolution

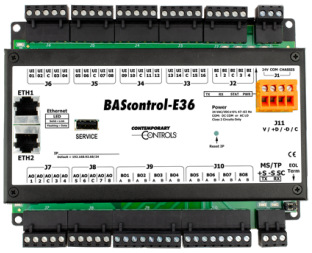
Binary Outputs
Eight form "A" relays for 30 VAC/VDC 2 A loads. Class 2 circuits only.

BACnet Protocol Implementation Conformance (PIC) Statement

CONTEMPORARY CONTROLS®

BAScontrol-E36

36-point Edge Controller



BACnet Protocol Implementation Conformance Statement (Annex A)

Date: **March** 26, 2024
Vendor Name: Contemporary Controls
Product Name: BAScontrol-E36
Product Model Number: BASC-E36
Applications Software Version: **1.0.0** **Firmware Revision:** 1.0.0 **BACnet Protocol Revision:** 15
Product Description: BACnet client and server 36-point RTU controller with Ethernet and MS/TP ports.

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 – A, B
- DS-WP-B Data Sharing — WriteProperty – A, 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): 9.6,19.2, 38.4, 57.6, 76.8, 115.2 kbps
- ☐ 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

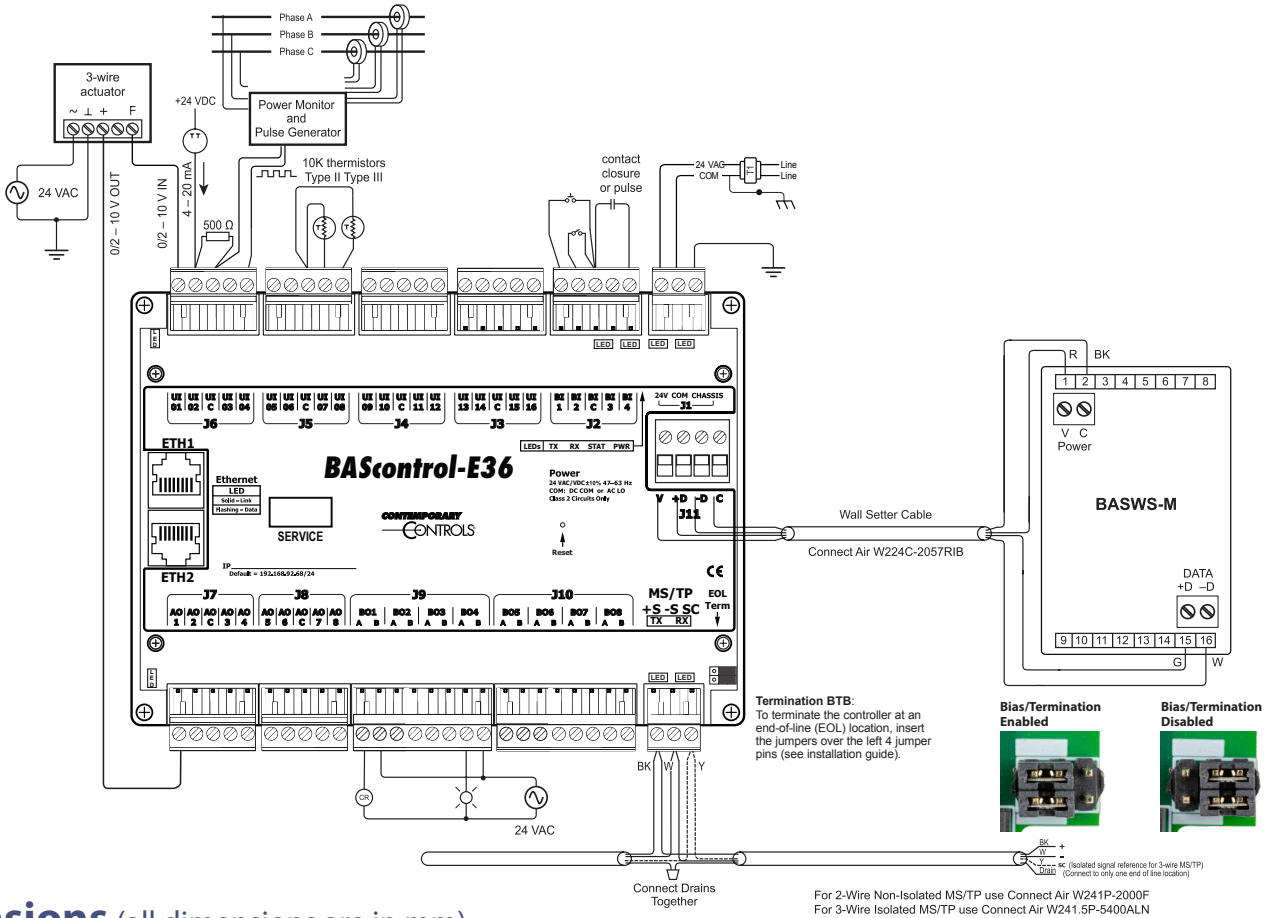
Networking Options:
- ☐ Router, Clause 6 – List all routing configurations, e.g., ARCNET-Ethernet-MS/TP, etc.
- ☐ Annex H, BACnet Tunnelling Router over IP
- ☐ BACnet/IP Broadcast Management Device (BBMD)
  Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No

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.

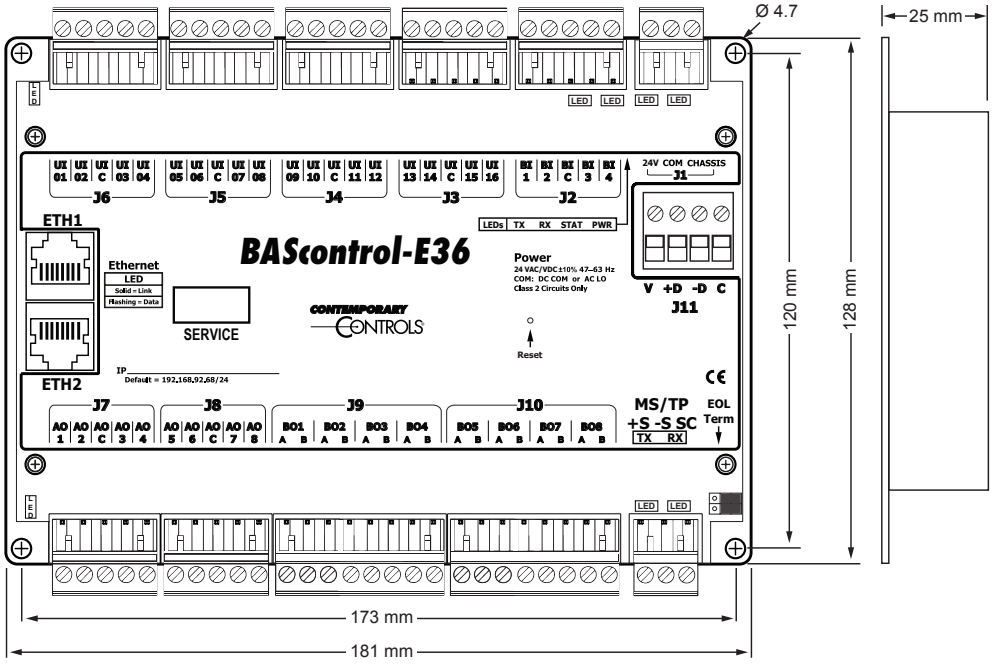
26 March 2024 PI-BASE360-AA0

Wiring Diagram



Dimensions (all dimensions are in mm)

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



Specifications

Power – Input Power (Class 2 Circuits Only)

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

Universal Inputs (UI-UI6)

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

Binary Inputs (BI1-BI4)

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

Analog Outputs (AO1- AO8)

	Limits
Analog output	0-10 VDC. 10-bit resolution. 4 mA maximum.

Relay Outputs (Points BO1-BO6) (Class 2 Circuits Only — requires external power source)

	Limits
Binary output	Form "A" relay (NO contact). 30 VAC/VDC 2 A. Class 2 circuits only. Both poles available.

Specifications (continued)

Data Link/Physical Layer Communication

Protocol	Compliance
Ethernet	IEEE 802.3 10/100 Mbps data rate 10BASE-T, 100BASE-TX physical layer 100 m (max) CAT5 cable length. Auto-negotiation of speed and duplex. Auto-MDIX.
MS/TP	ANSI/ASHRAE 135 (ISO 16484-5) optically isolated 9.6, 19.2, 38.4, 57.6, 76.8, 115.2 kbps data rate. EIA-485 physical layer 1200 m (max) cable length (1000 m max for 115.2 kbps). Jumper selectable bias and termination.
Service port	USB 2.0 Type A jack. Intended for connecting USB Wi-Fi adapter (CCSI P/N ACC-WIFISTK-1) for viewing controller web pages.
Wall Setter Port	EIA-485 physical layer 100 m (max) cable length.

Protocol Compliance

Data Link	Compliance
BACnet/IP	ASHRAE 135-2016 annex J. Release 15. Application specific controller device profile B-ASC.
BACnet MS/TP	BACnet standard protocol SSPC-135 Clause 9. Release 15.
Sedona	SOX Sedona 1.2.28

General Specifications

Item	Description
Protection	All inputs are over-voltage protected.
Environmental	Operating temperature -40°C to +75°C Storage temperature -40°C to +85° Relative humidity 10 to 95%, non-condensing
Weight	0.8 lbs. (0.36 kg)
Regulatory	CE Mark; CFR47, Part 15 Class A; RoHS; C22.2 #142-M1987

Electromagnetic Compatibility

Test Method	Description
EN 61000-4-2	Electrostatic Discharge
EN 61000-4-3	Radiated Immunity
EN 61000-4-4	Fast Transient Burst
EN 61000-4-5	Voltage Surge
EN 61000-4-6	Conducted Immunity
EN 61000-4-11	Voltage Dips & Interruptions
CISPR 22	Radiated Emissions
CISPR 22	Conducted Emissions
ANSI C63.4	Radiated Emissions

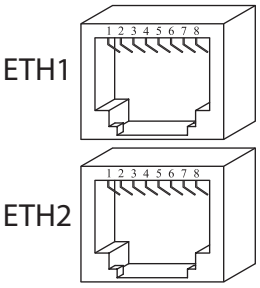
Specifications (continued)

Ethernet and MS/TP Connector Pin Assignments

Ethernet

RJ-45 Pin Assignments

10BASE-T/100BASE-TX



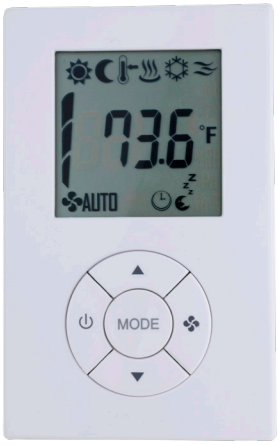
Terminal	Usage
1	TD +
2	TD –
3	RD +
6	RD –
Other pins	Not Used

MS/TP

MS/TP	
Terminal	**Description**
+S	Data +
–S	Data –
SC	Signal Common

Applications

Wall Setter Option



The BAScontrol-E36 supports a wall setter option. This four-wire powered serial port connection can accommodate one Contemporary Controls' BASWS-M wall setter. The wall setter has a large LCD display with programmable numeric characters and icons to show mode of operation, setpoint, and measured variable. A five-button pad provides mode control and navigation. A custom Sedona component interfaces the wall setter to wiresheet logic.

All icons can be programmed to be disabled, enabled or to flash. The significance of the icon action is determined by the programmer. The unit has a built-in space temperature sensor. Either the setpoint or the measured variable can be displayed in units of Celsius or Fahrenheit. An engineering mode exists where configuration settings can be entered manually. Buttons can be locked out if desired.

Ordering Information

Model	***Description***
BASC-E36	36-point Edge Controller
BASWS-M	Modbus wall setter

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