## b3865/866 VAV Controllers with Built-in Actuator

The *Continuum* b3865 and b3866 are native BACnet Advanced Application Controllers (B-AAC) that communicate on an RS-485 field bus as Master devices using the MS/TP BACnet protocol. The b3865 and b3866 are unique, low-cost VAV box controllers that come equipped with a built-in actuator to streamline hardware installation and save commissioning time. Four universal inputs; an airflow sensor; three Form A triac-based outputs; and an integrated damper actuator, make these controllers perfect for VAV applications requiring reheat control. Both models feature a room sensor input, which supports Andover's *Smart Sensor*, or any standard room temperature sensor.

The b3866 model is identical to the b3865, with the exception that it also offers two analog outputs to control reheat valves, lighting ballast control, etc.
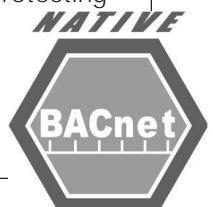
The b3865/866 features Flash memory, increased user memory, and a fast (32-bit) processor for faster scan times, with plenty of additional memory available for data logging of your critical data.

As native BACnet controllers, the b3865/866 can communicate with other BACnet devices on the MS/TP network, in strict accordance with **ANSI/ASHRAE standard 135-2001**. By connection to the Andover b4920 device the b3865/866 and other MS/TP devices can share and gather data from the wider Ethernet/IP network of controllers. Among those Ethernet controllers can be *Continuum* controllers (Bacnet or Infinet) or third-party BACnet IP devices. All Andover devices, both BACnet and Infinet, are fully compatible with the *Continuum* CyberStation front-end software, a fully native BACnet Operator Workstation (B-OWS) application.

### INCREASED RELIABILITY WITH FLASH MEMORY

The b3865/866's non-volatile Flash memory stores your operating system *and* application programs, so that in the event of a power loss, your application will be restored when power is returned. In additon, the Flash memory allows for easy upgrades of your operating system via software downloads, eliminating the need to swap out proms. The b3865/866 includes an on-board battery to safeguard your runtime data — protecting all point data and log data from being lost if power is removed.

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- Native BACnet MS/TP Communications for Interoperability to Third-Party Systems

- Compact Terminal Controllers Provide Low-cost VAV Control

- Built-in Damper Actuator Simplifies Hardware Installation

- Universal Inputs with Form A, Form K, and Analog Outputs for Flexible Control Options

- Non-Volatile Flash Memory Provides Utmost Reliability — Stores Both Application Program and Operating System

- Flash Memory Allows Easy On-Line Software Updates

- Local Extended Storage of Log Data

- On-Board Airflow Sensor

- View and Modify Information with Optional Andover *Smart Sensor* Display

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## INPUTS

The input configuration on the b3865/866 consists of four full range Universal inputs that accept voltage (0-5VDC), digital (on/off), counter signals (up to 4Hz), or temperature signals, plus an on-board air flow sensor. Both models also offer an additional input to support the Andover *Smart Sensor*, or any standard room temperature sensor.

## OUTPUTS

The b3865/866 contains three Form A Triac-based outputs. Each Triac is ground referenced. These outputs can be used separately for on/off or pulsed control of lighting, heat, and fan units or for bi-directional control of dampers and valves; or configured into one Form K Tri-state output and one Form A output. (Note: Any two consecutive Triac outputs can be configured as a Form K output.) Outputs are rated for AC loads only. The b3866 also offers two (0-10V) analog outputs.
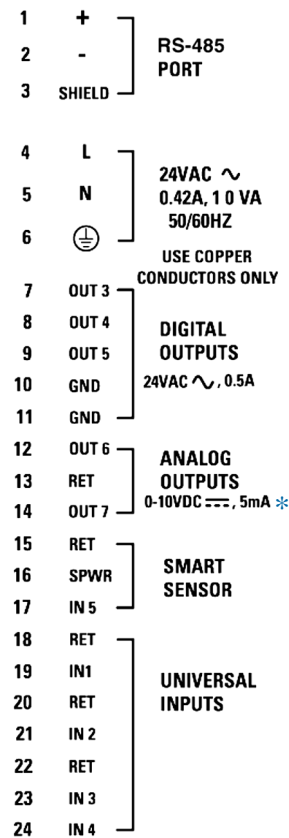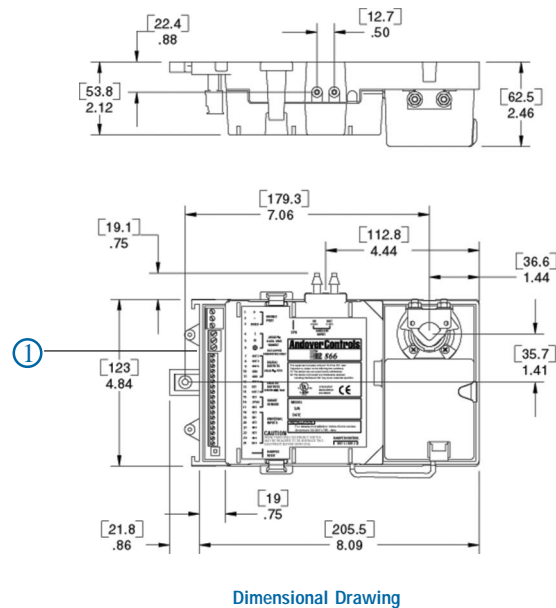
## DAMPER ACTUATOR

The integrated Belimo® damper actuator allows simple direct mounting of the b3865/866 directly over the existing damper shaft. This eliminates the need for separate mounting, wiring, and positioning of the damper motor. All b3865/866 controllers have built-in software over-drive protection which senses repeated motor limit stall conditions and helps to prevent motor damage. Also, the actuator has a built-in clutch button to temporarily disengage the direct-drive gears during commissioning. The b3865/866 actuator may be preset for a limited range of motion using the mechanical "stops" provided.

## SOFTWARE CAPABILITIES

The dynamic memory of the b3865/866 can be allocated for any combination of programs, scheduling, alarming, and data logging using the powerful Andover Controls *Plain English*® programming language. Our object-oriented *Plain English* language with intuitive keywords provides an easy method to tailor the controller to meet your exact requirements. Programs are entered into the b3865/866 using the *Continuum* CyberStation. Programs are then stored and executed by the b3865/866.

**Dimensional Drawing**



| | | |
|---|---|---|
| 1 | + | RS-485 PORT |
| 2 | - | |
| 3 | SHIELD | |
| 4 | L | 24VAC ∿ 0.42A, 1 0 VA 50/60HZ |
| 5 | N | |
| 6 | ⏚ | USE COPPER CONDUCTORS ONLY |
| 7 | OUT 3 | DIGITAL OUTPUTS 24VAC ∿, 0.5A |
| 8 | OUT 4 | |
| 9 | OUT 5 | |
| 10 | GND | |
| 11 | GND | |
| 12 | OUT 6 | ANALOG OUTPUTS 0-10VDC ⎓, 5mA * |
| 13 | RET | |
| 14 | OUT 7 | |
| 15 | RET | SMART SENSOR |
| 16 | SPWR | |
| 17 | IN 5 | |
| 18 | RET | UNIVERSAL INPUTS |
| 19 | IN1 | |
| 20 | RET | |
| 21 | IN 2 | |
| 22 | RET | |
| 23 | IN 3 | |
| 24 | IN 4 | |

① **Wiring Drawing**

**\*Analog Outputs not used on b3865**

## ELECTRICAL

| | |
|---|---|
| **Power:** | 24 VAC, +10% -15%, 50/60 Hz |
| **Power Consumption:** | 10 VA |
| **Overload Protection:** | Fused with 2 amp fuse. MOV protected. |
| **Software Real-Time Clock:** | Synchronized through MS/TP via BACnet |

## MECHANICAL

| | |
|---|---|
| **Operating Environment:** | 32°–120°F (0–49°C), 10–95% RH (non-condensing) |
| **Size:** | 5.59"H x 8.95"W x 2.46"D (142H x 227W x 62) mm |
| **Weight:** | 1.86 lbs. (.85 kg) |
| **Enclosure Type:** | UL Open class, IP 10. Flammability rating of UL94-5V |

## BATTERY

| | |
|---|---|
| **Battery Backup:** | Replaceable, non-rechargeable, lithium battery. Provides 5 years typical accumulated power failure backup of RAM memory. |

## COMMUNICATIONS

| | |
|---|---|
| **Communications Interface:** | RS-485 BACnet, MS/TP. 127 devices maximum |
| **Communications Speed:** | 9600, 19.2K, 38.4K, 76.8K baud* |
| **BACnet Device Profile:** | B-AAC, BACnet Advanced Application Controller |
| **Bus Length:** | 4,000 ft. (1,220m) standard; BACnet repeater allows extension to longer distances. |
| **Bus Media:** | Twisted, shielded pair, low capacitance cable |

*Note: Baud rates REQUIRE Continuum V1.62 version (or later) of software*

## INPUTS/OUTPUTS

| | |
|---|---|
| **Inputs:** | 4 Universal inputs: Voltage (0-5.115 VDC); Temperature -30°F to 230°F (-34°C to 110°C), Digital (on/off), Counter (up to 4Hz at 50% duty cycle, 125 ms min. pulse width). Current input (0 - 20 mA) using external 250 ohm resistor<br>1 airflow sensor (0 to 2" W.C.)<br>1 *Smart Sensor* Temperature Input (32°F to 105°F) (0°C to 41°C) |
| **Input Voltage Range:** | 0-5.115 volts DC |
| **Input Impedance:** | 10K ohm to 5.120V or 5M ohm with pull-up resistor disabled |
| **Input Protection:** | 24 VAC or 24 VDC temporarily on any single channel, ±1000V transients (Tested according to EN61000-4-4) |
| **Input Resolution:** | 5.0 mV |
| **Input Accuracy:** | ±15mV (±0.56°C from -23°C to +66°C or ±1°F from -10°F to +150°F) |
| **Airflow Input:** | |
| Range: | 0 to 2" W.C. (0-500 Pa) |
| Resolution: | 0.005" W.C. (1.25 Pa) @ 23° C (73° F) |
| Accuracy: | ±0.05" W.C. (12.50 Pa) @23°C (73°F) |

## INPUTS/OUTPUTS (CONTINUED)

| | |
|---|---|
| **Outputs:** | 3 single pole single throw (SPST) Form A Triacs (any two consecutive outputs can be configured as one Tri-state Form K); 1 integrated damper actuator; 2 analog outputs (0-10V) (b3866 only) |
| **Output Rating:** | |
| For SPST: | Maximum 0.5A, 24VAC, ±2000V transients (Tested according to EN61000-4-4)<br>Minimum: 20 mA AC<br>Each Triac is ground referenced, DC loads not permitted. |
| For 0-10V: | 5 mA maximum, 2K ohm minimum impedance, ±1000V transients (Tested according to EN61000-4-4) |
| **Output Accuracy:** | |
| For SPST: | 0.1 sec. for pulse width modulation |
| For 0-10V: | 50 mV resolution/100mV accuracy |

## DAMPER ACTUATOR

| | |
|---|---|
| **Rated Torque:** | 35 in-lb. (3.95 Nm) |
| **Range of Travel:** | 0-95 degrees, with adjustable mechanical stops |
| **Rotation Speed:** | 1.0 degree/sec nominal |
| **Position Resolution:** | 0.1 degrees with a 1.0 degree min. positioner movement |
| **Actuator Output:** | 1.0 sec minimum pulse duration |
| **Shaft Accommodations:** | Accepts shafts 1/4" - 5/8" diameter (6.35mm - 15.9mm) |

## CONNECTIONS

| | |
|---|---|
| **Power:** | 3-position fixed screw terminal connector |
| **Communications:** | 3-position removeable screw terminal connector |
| **Inputs/Outputs/Smart Sensor:** | |
| | 18-position fixed screw terminal connector |
| **Damper Shaft:** | 1/4" - 5/8" diameter (6.35mm - 15.9mm) |
| **Service Port:** | 4-position shrouded connector |

## USER LEDS/SWITCHES

**Status Indicator LEDS:**

| | |
|---|---|
| CPU | CPU Active |
| TD | Transmit Data |
| RD | Receive Data |

**Switches:**
- DAMPER LEARN
- RESET
- Input Pull-up Resistor Switch (per input)
- Motor Direction Switch

## GENERAL

| | |
|---|---|
| **Memory:** | 128K SRAM, 1MB FLASH |
| **Processor:** | Motorola 32-bit Coldfire |

**Note: b3865/866 REQUIRES *Continuum* V1.6 version (or later) of software**

## AGENCY LISTINGS

UL/CUL 916, FCC CFR 47 Part 15, ICES-003, EN55022, AS/NZS 3548, and VCCI Class A, CE

CE    c(UL)us LISTED 58B2 OPEN ENERGY MANAGEMENT EQUIPMENT

## OPTIONS

UL864, Smoke Control System Equipment, UUKL (b3865-S, b3866-S)

## SOFTWARE CAPABILITIES (CONTINUED)

Programming multiple b3865/866s is inherently easy with *Plain English.* A complete copy of one b3865/866's programs can be loaded directly into other b3865/866s without changing any point names or programs.

## SMART SENSOR INTERFACE

The b3865/866 provides a built-in connection for Andover's *Smart Sensor.* The *Smart Sensor* provides a 2-character LED display and a 6-button programmable keypad that enables operators and occupants to change setpoints, balance VAV boxes, monitor occupancy status, and turn equipment on and off. An enhanced version of the *Smart Sensor* is also available with a 4-digit custom LCD that provides the following icons: PM, %, °, Setpoint, Cool, Heat, CFM, Fan, OA, and SP.

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