BAC-9000 Series

BACnet VAV Controller-Actuators (B-AAC)

DESCRIPTION

KMC Conquest™ BAC-9000 series controller-actuators are designed to operate VAV (Variable Air Volume) terminal units. The integrated alarming, scheduling, and trending enable these BACnet Advanced Application Controllers to be powerful edge devices for the modern smart building ecosystem.

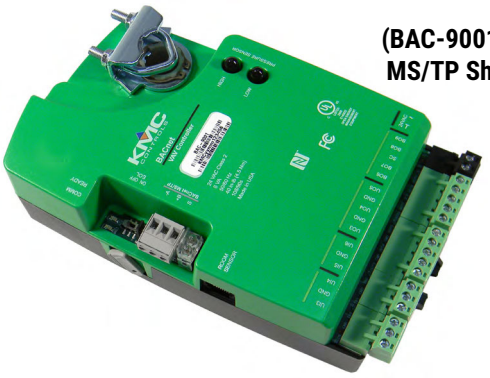
With integrated actuators, internal air pressure sensors, and other powerful features, they are ideal for new installations and upgrades of less-efficient equipment. They easily mount to terminal boxes by securing a "V" clamp on the shaft and securing a single-screw anti-rotation bracket.

The factory-supplied programming covers common VAV applications. The controllers feature simple, menu-driven setup choices using an STE-9000 series digital sensor, which can be installed permanently as the room sensor or used temporarily as a technician's service tool.

Alternately, quick configuration of controller properties can be done using NFC (Near Field Communication) from a smart phone, tablet, or computer (using KMC Connect Lite™ app) while the controller is unpowered. The Ethernet-enabled BAC-9001C**E** can also be configured by connecting an HTML5-compatible web browser to the built-in configuration web pages.

For demanding building automation custom requirements, these controllers are also fully programmable. Custom configuration and programming, with wizards for application programming selection/configuration, are enabled by KMC Connect™ software and the KMC Converge™ module for Niagara Workbench.

KMC Converge and TotalControl™ software additionally provide the capability of creating custom graphical web pages (hosted on a remote web server) to use as a custom user-interface for the controllers.



(BAC-9001 with MS/TP Shown)

MADE IN USA

KMC Conquest™ Automation Hardware

APPLICATIONS

Application options include:

- Pressure independent or dependent VAV
- Cooling only and with changeover
- Staged, modulated, floating, or time-proportional reheat
- Series or parallel fan control
- Dual duct (with TSP-8003 actuators)
- Supply/exhaust tracking (with TSP-8003 actuators)
- CAV (Constant Air Volume)

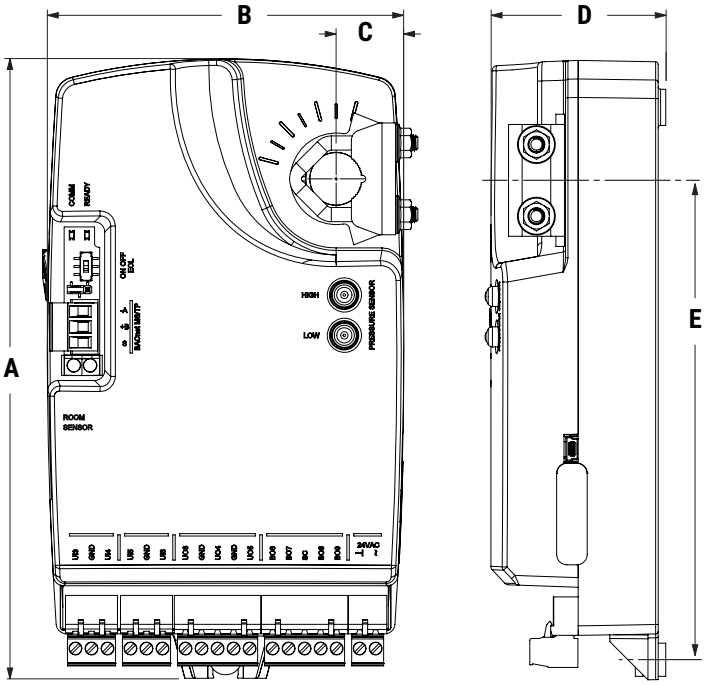
For installations with a BACnet building automation system, these easily integrated controllers signal demands for higher static duct pressure, cooler or warmer supply air, and other diagnostics for AHU optimization.

(See also **Sample Installation on page 6**.)

MODELS

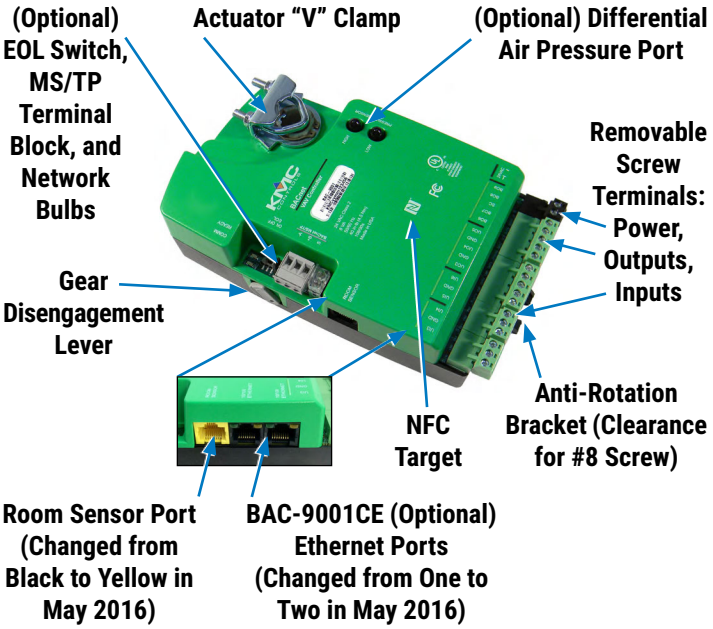
APPLICATIONS	INPUTS	OUTPUTS	FEATURES				MODEL
			Air Pressure Sensor	Real Time Clock	MS/TP	Ethernet	
Pressure-**independent** VAV, cooling/heating with fan and reheat; CAV	8 total: • 1 internal actuator position feedback • 1 integrated air pressure sensor (except BAC-9021) • 2 analog (temperature sensor port) • 4 software-configurable universal inputs (terminals)	9 total: • 2 internal triacs (actuator motor control) • 4 external triacs (terminals) • 3 universal outputs (0–12 VDC on terminals)	✔		✔		BAC-9001
				✔		✔	BAC-9001CE
Pressure-**dependent** VAV					✔		BAC-9021

SPECIFICATIONS



DIMENSIONS		
A	7.605 inches	193 mm
B	4.374 inches	111 mm
C	0.830 inches	21 mm
D	2.150 inches	55 mm
E	5.891 inches	150 mm

TERMINAL COLOR CODE	
Black	24 VAC Power
Gray	MS/TP Communications
Green	Inputs and Outputs



Inputs and Outputs

Inputs, Universal (4 on Terminal Blocks)

Universal inputs	Configurable as analog, binary, or accumulator objects
Termination	1K and 10K ohm sensors, 0–12 VDC, or 0–20 mA (without need for an external resistor)
Resolution	16-bit analog-to-digital conversion
Protection	Overvoltage protection (24 VAC, continuous)
Wire size	12–24 AWG, copper, in removable screw terminal blocks

Input, Dedicated Room Sensor Port

Connector	Modular connector for STE-9xx1 series digital wall sensors or STE-6010/6014/6017 analog temperature sensors
Cable	Uses standard Ethernet patch cable up to 150 feet (45 meters)

Input, Integrated Air Pressure Sensor (optional)

Δ pressure range	0 to 2" wc (0 to 500 Pa)
Sensor accuracy	±4.5% of the reading or (when near zero) 0.0008" wc (0.2 Pa), whichever is greater (@ 25° C); internally linearized and temperature compensated
Connections	Barbed for 1/4 inch FR (Flame Retardant) tubing

Outputs, Universal (3 on Terminal Blocks)

Universal outputs	Configurable as an analog (0 *to* 12 VDC) or binary object (0 *or* 12 VDC, on/off)
Power/protection	Each short-circuit protected universal output capable of driving up to 100 mA (at 0–12 VDC) or 100 mA total for all outputs
Resolution	12-bit digital-to-analog conversion
Wire size	12–24 AWG, copper, in removable screw terminal blocks

Outputs, Triac (4 Binary)

Triac outputs	Optically isolated zero-crossing triac output configured as a binary object
Power	Maximum switching 24 VAC at 1.0 A for each output; maximum total for controller is 3.0 A
Wire size	12–24 AWG, copper, in removable screw terminal blocks

Output, Integrated Actuator

Torque	40 in-lb. (4.5 N•m)
Angular rotation	0 to 95°; adjustable end stops at 45 and 60° rotation
Motor timing	90 sec. for 90° at 60 Hz; 108 sec. for 90° at 50 Hz
Shaft type/size	Mounts on round or square damper shafts—see **Enclosure and Mounting on page 4**
Noise level	<35 db(A) @ 1 meter (3.3 feet)

Communication Ports

MS/TP (optional)	One EIA-485 port (removable terminal block) for BACnet MS/TP, operating at 9.6, 19.2, 38.4, 57.6, 76.8, or 115.2 kilobaud; max. length of up to 4,000 feet (1,200 meters) of 18 AWG shielded twisted-pair, no more than 51 pf/ft (167 pf/m); use repeaters for longer distances
Ethernet (optional)	On "E" model only, two 10/100BaseT Ethernet connectors for BACnet IP, Foreign Device, and Ethernet 802.3 (ISO 8802-3); segmentation supported; up to 328 ft (100 m) between controllers (using T568B Category 5 or better cable)
NFC	NFC (Near Field Communication) up to 1 inch (2.54 cm) from the top of the enclosure
Room sensor	Modular STE connection jack for STE-9000 series digital sensors and STE-6010/6014/6017 analog sensors
Auxiliary	One serial port with mini Type B connector (reserved for future use)

Configurability

OBJECTS*	MAXIMUM #
Inputs and Outputs	
Analog, binary, or accumulator input	8
Analog or binary output	9
Values	
Analog value	120
Binary value	80
Multi-state value	40
Program and Control	
Program (Control Basic)	10
PID loop	10
Schedules	
Schedule	2
Calendar	1
Logs	
Trend log	20
Trend log multiple (must be created)	4 (default 0)
Alarms and Events	
Notification class	5
Event enrollment	40

*Configuration allows creation and deletion of objects (maximum number of objects shown). The number and configuration of default objects depends on the selected application. For lists of default objects, see the **KMC Conquest Controller Application Guide**. See also the PIC statement for all supported BACnet objects.

Configuring, Programming, and Designing

SETUP PROCESS			KMC CONTROLS TOOL
Configuration	**Programming (Control Basic)**	**Web Page Graphics***	
✔			Conquest NetSensor
✔			Internal configuration web pages in Conquest Ethernet "E" models**
✔			KMC Connect Lite™ (NFC) app***
✔	✔		KMC Connect™ software
✔****	✔****	✔	TotalControl™ software
✔	✔		KMC Converge™ module for Niagara WorkBench
		✔	KMC Converge **GFX** module for Niagara WorkBench

*Custom graphical user-interface web pages can be hosted on a remote web server, but not in the controller.

Conquest Ethernet-enabled "E" models with the latest firmware can be configured with an HTML5 compatible web browser from pages served from within the controller. For information, see the **Conquest Ethernet Controller Configuration Web Pages Application Guide.

***Near Field Communication via enabled smart phone or tablet running the KMC Connect Lite app.

****Full configuration and programming of KMC Conquest controllers is supported starting with TotalControl ver. 4.0.

Hardware Features

Processor, Memory, and Clock

Processor	32-bit ARM® Cortex-M4
Memory	Programs and configuration parameters are stored in nonvolatile memory; auto restart on power failure
RTC	Real time clock with (capacitor) power backup for 72 hours ("C" model only) for network time synchronization or full stand-alone operation

Indicators and Isolation

LED indicators	Power/status, MS/TP communication, and Ethernet status
MS/TP protection	One network bulb assembly indicates reversed polarity and isolates circuit
Switch	EOL (end of line) for MS/TP

Installation

Power

Supply voltage	24 VAC (–15%, +20%), 50/60 Hz, Class 2 only; non-supervised (all circuits, including supply voltage, are power limited circuits)
Required power	8 VA, plus external loads
Wire size	12–24 AWG, copper, in a removable screw terminal block

Enclosure and Mounting

Weight	1.17 lb. (0.53 kg)
Case material	Green and black flame retardant plastic
Mounting	Directly mounts on 3/8 to 5/8 inch (9.5 to 16 mm) round or 3/8 to 7/16 inch (9.5 to 11 mm) square damper shafts with 2 inch (51 mm) minimum shaft length

Environmental Limits

Operating	32 to 120° F (0 to 49° C)
Shipping	–40 to 160° F (–40 to 71° C)
Humidity	0 to 95% relative humidity (non-condensing)

Warranty, Protocol, and Approvals

Warranty

KMC Limited Warranty	5 years (from mfg. date code)

BACnet Protocol

Standard	Meets or exceeds the specifications in ANSI/ASHRAE BACnet Standard 135-2010 for Advanced Application Controllers
Type	BTL-certified as a B-AAC controller type

Regulatory

UL	UL 916 Energy Management Equipment listed
BTL	BACnet Testing Laboratory listed as Advanced Application Controller (B-AAC)
CE	CE compliant
RoHS 2	RoHS 2 compliant (pending)
FCC	FCC Class A, Part 15, Subpart B and complies with Canadian ICES-003 Class A*

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. (NFC operation meets FCC compliance while the controller is in an unpowered state.)

ACCESSORIES

NOTE: For accessory details, see the respective product data sheets and installation guides.

DAT Sensor and Dual Duct Actuator

STE-1405	Discharge air temperature sensor with 10-foot plenum-rated cable
TSP-8003	Tri-state actuator with pressure sensor for dual-duct applications

Differential Air Pressure Sensors

SSS-1012	Sensor, 3-5/32 inches (80 mm) length
SSS-1013	Sensor, 5-13/32 in. (137 mm) length
SSS-1014	Sensor, 7-21/32 in. (194 mm) length
SSS-1015	Sensor, 9-29/32 in. (252 mm) length

Miscellaneous Hardware

HPO-9901	Controller replacement parts kit with terminal blocks and DIN clips
SP-001	Screwdriver (KMC branded) with hex end (for NetSensor cover screws) and flat blade end (for controller terminals)

Network Communications

BAC-5051E	Single port router
HPO-0055	Replacement network bulb assembly (pack of 5)
HPO-5551	Router technician cable kit
HPO-9003	NFC Bluetooth/USB module (fob)
HSO-9001	Ethernet patch cable, 50 feet
HSO-9011	Ethernet patch cable, 50 feet, plenum rated
HSO-9012	Ethernet patch cable, 75 feet, plenum rated
KMD-5567	Network surge suppressor

Room Sensors, Analog

STE-6010W10	Temperature sensor, white
STE-6014W10	Sensor with rotary setpoint dial, white
STE-6017W10	Sensor with rotary setpoint dial and override button, white

NOTE: Other STE-6000 series sensors are not fully compatible with the dedicated sensor port. However, various other models can be used with the screw terminals. See the STE-6000 series data sheet for more information. For digital sensor information, see the STE-9000 series data sheet.

NOTE: To order the STE-601x sensor with light almond color instead of white, drop the W on the end of the model number (e.g., STE-6010W is white and STE-6010 is light almond).

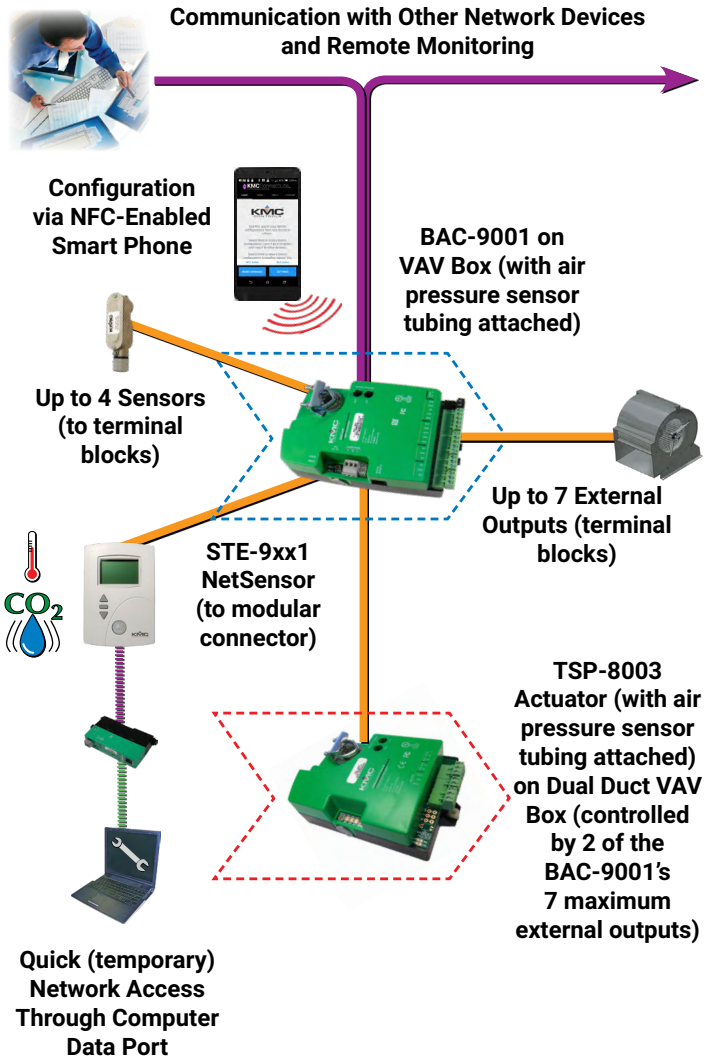
Room Sensors, Digital (LCD Display)

STE-9000 Series	KMC Conquest NetSensor digital room temp. sensors for viewing and configuration and optional humidity, occupancy, and CO_2 sensing (see STE-9000 series data sheet for options)
HPO-9001	NetSensor distribution module

Transformers, 120 to 24 VAC

XEE-6111-050	50 VA, single-hub
XEE-6112-050	50 VA, dual-hub

SAMPLE INSTALLATION



For more information about installation and operation, see:

- **BAC-9000 Series VAV Controller Installation Guide**
- **KMC Conquest Controller Application Guide**
- **KMC Conquest Wiring: BAC-9000 Series Controllers (Video)**

SUPPORT

Additional resources for installation, configuration, application, operation, programming, upgrading, and much more are available on the web at **www.kmccontrols.com**. To see all available files, log-in to the KMC Partners site.

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