KMC BAC-9300 Series Controller Installation Guide

Contents

KMC BAC-9300 Series Controller

Product Information

Specifications

- Product Name: BAC-9300 Series Controller
- Manufacturer: KMC Controls
- Model Number: BAC-9300

Introduction
The KMC ConquestTM BAC-9300 Series Unitary Controller is a versatile controller used for various applications. Please follow the installation guide below for proper installation.

Mount Controller

On a DIN Rail

1. Position the DIN rail so that the color-coded terminal blocks are easily accessible for wiring.
2. Pull out the DIN Latch until it clicks once.
3. Position the controller so that the top four tabs of the back channel rest on the DIN rail.

On a Flat Surface

1. Position the controller so that the color-coded terminal blocks are easy to access for wiring.
2. Lower the controller against the DIN rail.
3. Push in the DIN Latch to engage the DIN rail.

Controller Connections

Connecting Room Sensor

1. Plug an Ethernet patch cable connected to an STE-9000 Series or STE-6010/6014/6017 sensor into the (yellow) ROOM SENSOR port of the controller. The Ethernet patch cable should not exceed 150 feet (45 meters) in length.
2. **CAUTION:** Do not plug an Ethernet communications cable into the Room Sensor port on Conquest E models, as it may damage the Ethernet switch or router. The Room Sensor port powers a NetSensor.

Wiring Sensors
Wire any additional sensors to the green (input) terminal block. Please refer to the Sample (BAC9311) Wiring on page 7 for guidance. Ensure that no more than two 16 AWG wires are joined at a common point.

Wiring Additional Equipment
Wire additional equipment such as fans, heaters, dampers, and valves to the green (output) terminal block. Refer to the Sample (BAC-9311) Wiring on page 7 for detailed instructions.

Connecting (Optional) Pressure Flow Sensor
Follow the steps below to connect an air flow sensor to the BAC9311/9311C/9311CE controller:

1. Remove the black shipping plugs from the PRESSURE SENSOR ports.
2. Connect the high-pressure tube from the pressure flow sensor to the HIGH port on the controller.
3. Connect the low-pressure tube from the pressure flow sensor to the LOW port on the controller.

Connecting (Optional) Ethernet Network
To connect an Ethernet network:
Plug an Ethernet patch cable into the Ethernet port on the controller.

FAQ

- **Q: Can I use an Ethernet cable meant for communications with the Room Sensor port?**
  A: No, on Conquest E models, do not plug a cable meant for Ethernet communications into the Room Sensor port. The Room Sensor port powers a NetSensor, and the supplied voltage may damage an Ethernet switch or router.
- **Q: What is the maximum length for an Ethernet patch cable?**
  A: The Ethernet patch cable should not exceed 150 feet (45 meters) in length.
- **Q: Can I join more than two 16 AWG wires at a common point on the green terminal block?**
  A: No, do not join more than two 16 AWG wires at a common point.

BAC-9300 Series Controller
Installation Guide

INTRODUCTION
Complete the following steps to install a KMC Conquest™ BAC-9300 Series Unitary Controller. For controller specifications, see the data sheet at **kmccontrols.com**. For additional information, see the KMC Conquest Controller Application Guide.

MOUNT CONTROLLER

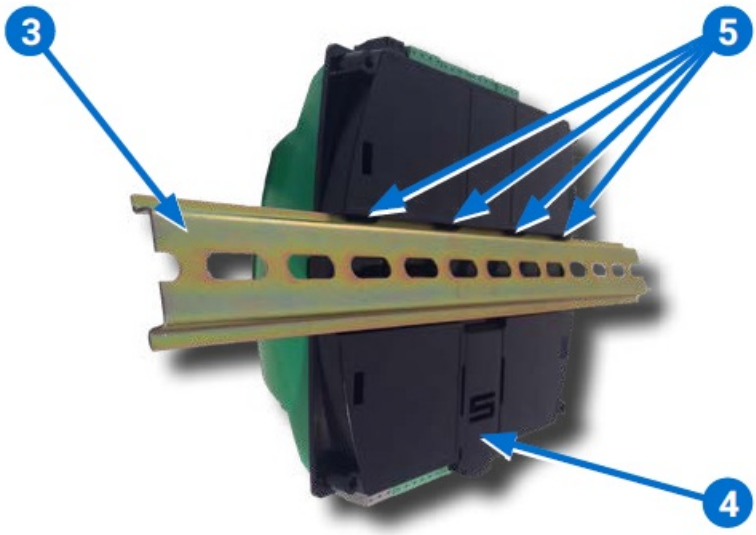
- **NOTE:** Mount the controller inside a metal enclosure for RF shielding and physical protection.
- **NOTE**: To mount the controller with screws on a flat surface, complete the steps in On a Flat Surface on page 1. Or to mount the controller on a 35 mm DIN rail (such as integrated in an HCO-1103 enclosure), complete the steps in On a DIN Rail on page 1.

On a Flat Surface

1. Position the controller so the color-coded terminal blocks 1 are easy to access for wiring.
   NOTE: The black terminals are for power. The green terminals are for inputs and outputs. The gray terminals are for communication.
2. Screw a #6 sheet metal screw through each corner of the controller 2 .

On a DIN Rail

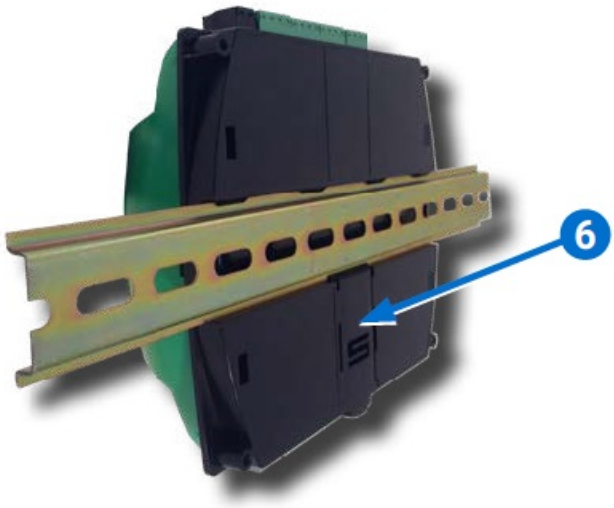
1. Position the DIN rail 3 so that when the controller is installed the color-coded terminal blocks are easy to access for wiring.
2. Pull out the DIN Latch 4 until it clicks once.
3. Position the controller so that the top four tabs 5 of the back channel rest on the DIN rail.



4. Lower the controller against the DIN rail.

5. Push in the DIN Latch 6 to engage the DIN rail.

   NOTE: To remove the controller, pull the DIN Latch until it clicks once and lift the controller off the DIN rail.



CONNECT SENSORS AND EQUIPMENT

- **NOTE:** See Sample (BAC-9311) Wiring on page 7 and Input/Output Objects/Connections on page 8 for more information. See also the BAC-9300 series videos in the KMC Conquest Controller Wiring playlist.
- **NOTE:** A digital STE-9000 Series NetSensor can be used for configuring the controller (see Configure/Program the Controller on page 6). After the controller has been configured, an STE-6010, STE-6014, or STE-6017 analog sensor can be connected to the controller in place of the NetSensor. See the relevant installation guide for additional details.

1. Plug an Ethernet patch cable 7 connected to an STE-9000 Series or STE-6010/6014/6017 sensor into the (yellow) ROOM SENSOR port 8 of the controller.
    1. **NOTE:** The Ethernet patch cable should be a maximum of 150 feet (45 meters).
    2. **CAUTION** On C Conquest “E” models, do NOT plug a cable meant for Ethernet communications into the Room Sensor port! The Room Sensor port powers a NetSensor, and the supplied voltage may damage an Ethernet switch or router.

2. Wire any additional sensors to the green (input) terminal block 10 . See Sample (BAC-9311) Wiring on page 7.
    1. **NOTE:** Wire sizes 12–24 AWG can be clamped in each terminal.
    2. **NOTE:** No more than two 16 AWG wires can be joined at a common point.

Wire additional equipment (such as fans, heaters, dampers, and valves) to the green (output) terminal block 11 . See Sample (BAC-9311) Wiring on page 7.

CAUTION
Do NOT connect 24 VAC to the analog outputs (UO7–UO10 and GNDs)!

NOTE: Use 24 VAC (only) with triac outputs (BO1–BO6 with SCs).

CONNECT (OPT.) PRESSURE FLOW SENSOR

- **NOTE:** Complete the steps in this section to connect an air flow sensor to the BAC-9311/9311C/9311CE controller.
- **NOTE:** BAC-9301/9301C/9301CE controllers do not have PRESSURE SENSOR ports.
- **NOTE:** Use 1/4 inch (6.35 mm) FR tubing.

Tubing should not be longer than 6 feet (20 meters).

1. Remove the black shipping plugs 9 from the PRESSURE SENSOR ports.
2. Connect the high pressure tube from the pressure flow sensor to the HIGH 12 port on the controller.
3. Connect the low pressure tube from the pressure flow sensor to the LOW 13 port on the controller.

CONNECT (OPT.) ETHERNET NETWORK

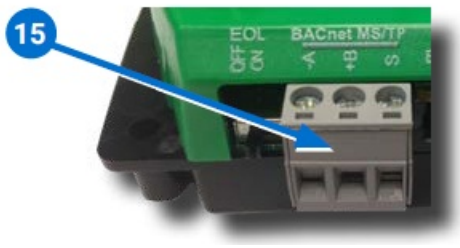
For BAC-93x1CE models (only), connect an Ethernet patch cable 14 to the 10/100 ETHERNET port (“E” models only).

CAUTION
On C Conquest “E” models, do NOT plug a cable meant for Ethernet communications into the Room Sensor port! The Room Sensor port powers a NetSensor, and the supplied voltage may damage an Ethernet switch or router.

- **NOTE:** The Ethernet patch cable should be T568B Category 5 or better and a maximum of 328 feet (100 meters) between devices.
- **NOTE:** Before May 2016, BAC-xxxxCE models had a single Ethernet port. They now have dual Ethernet ports, enabling daisy-chaining of controllers 14 . See the Daisy-Chaining Conquest Ethernet Controllers Technical Bulletin for more information.
- **NOTE:** On newer models, the Room Sensor port is yellow 8 instead of black to help differentiate it from the black Ethernet ports.
- **NOTE:** For more information, see Sample (BAC-9311) Wiring on page 7 and the BAC-9300 series videos in the KMC Conquest Controller Wiring playlist.

CONNECT (OPTIONAL) MS/TP NETWORK

1. For BAC-93×1/93x1C models (only), connect the BACnet network to the gray BACnet MS/TP terminal block 15 .

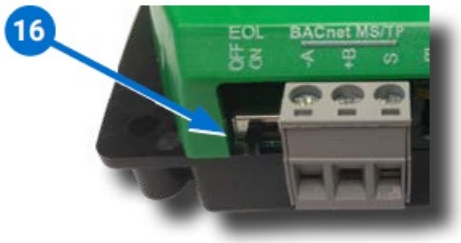


NOTE: Use 18 gauge AWG shielded twisted pair cable with maximum capacitance of 51 picofarads per foot (0.3 meters) for all network wiring (Belden cable #82760 or equivalent).

1. A. Connect the –A terminals in parallel with all other –A terminals on the network.
2. B. Connect the +B terminals in parallel with all other +B terminals on the network.
3. C. Connect the shields of the cable together at each device using a wire nut or the S terminal in KMC BACnet controllers.

2. Connect the cable shield to a good earth ground at one end only.
    1. **NOTE:** For principles and good practices when connecting an MS/TP network, see Planning BACnet Networks (Application Note AN0404A).
    2. **NOTE**: The EOL switch is shipped from the factory in the OFF position.
3. If the controller is at either end of a BACnet MS/TP network (only one wire under the terminals), turn the EOL switch 16 to ON.

    NOTE: For more information, see Sample (BAC-9311) Wiring on page 7 and the BAC-9300 series videos in the KMC Conquest Controller Wiring playlist.



CONNECT POWER
NOTE: Follow all local regulations and wiring codes.

1. Connect a 24 VAC, Class-2 transformer to the black power terminal block of the controller.
    1. A. Connect the neutral side of the transformer to the controllers common terminal ⊥ ⊥ 17 .
    2. B. Connect the AC phase side of the transformer to the controllers phase terminal ~ ~ 18 .

    3. **NOTE**: Connect only one controller to each transformer with 12—24 AWG copper wire.
    4. **NOTE:** Use either shielded connecting cables or enclose all cables in conduit to maintain RF emissions specifications.
    5. **NOTE:** For more information, see Sample (BAC-9311) Wiring on page 7 and the BAC-9300 series videos

in the KMC Conquest Controller Wiring playlist.

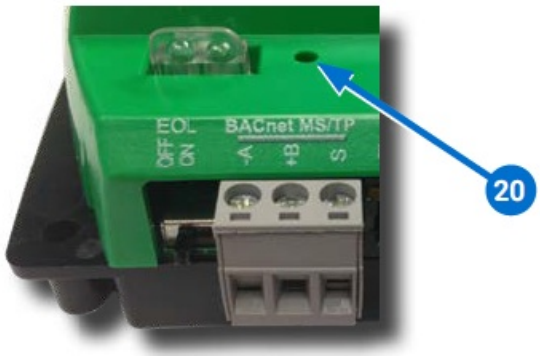
POWER AND COMMUNICATION STATUS

The status LEDs indicate power connection and network communication. The descriptions below describe their activity during normal operation (at least 5 to 20 seconds after power-up/initialization or restart).
NOTE: If both the green READY LED and the amber COMM LED remain OFF, check the power and cable connections to the controller.

Green READY LED 19
After controller power-up or restart is complete, the READY LED flashes steadily about once per second, indicating normal operation.

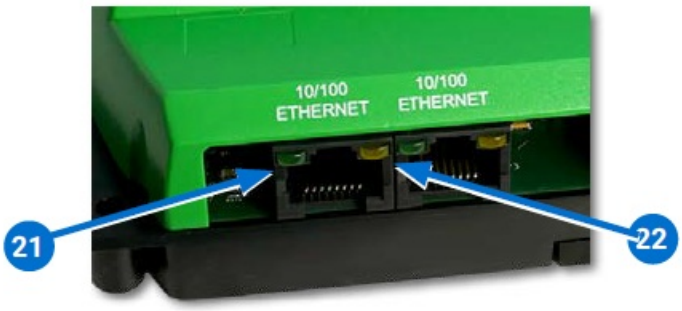
Amber (BACnet MS/TP) COMM LED 20

- During normal operation, the COMM LED flickers as the controller receives and passes the token over the BACnet MS/TP network.
- When the network is not connected or communicating properly, the COMM LED flashes more slowly (about once a second).



Green ETHERNET LED 21
NOTE: The Ethernet status LEDs indicate network connection and communication speed.

- The green Ethernet LED stays ON when the controller is communicating with the network.
- The green Ethernet LED is OFF when the (powered) controller is not communicating with the network.



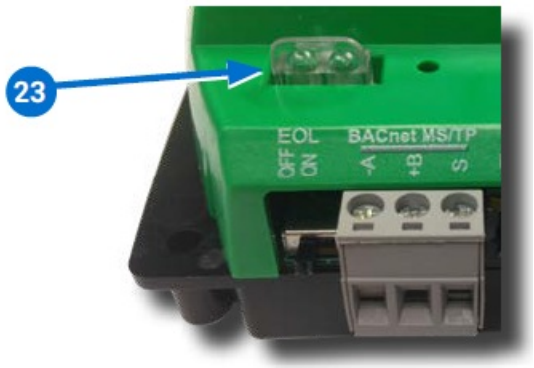
Amber ETHERNET LED 22

- The amber Ethernet LED flashes when the controller is communicating with a 100BaseT Ethernet network.
- The amber Ethernet LED remains OFF when the (powered) controller is communicating with the network at only 10 Mbps (instead of 100 Mbps).
  NOTE: If both the green and amber Ethernet LEDs remain OFF, check the power and network cable connections.

MS/TP NETWORK ISOLATION BULBS

The two network isolation bulbs 23 serve three functions:

- Removing the (HPO-0055) bulb assembly opens the MS/TP circuit and isolates the controller from the network.
- If one or both bulbs are ON, the network is improperly phased. This means the ground potential of the controller is not the same as other controllers on the network. If this happens, fix the wiring. See Connect (Optional) MS/TP Network on page 4.
- If the voltage or current on the network exceeds safe levels, the bulbs blow, opening the circuit. If this happens, fix the problem and replace the bulb assembly.



CONFIGURE/PROGRAM THE CONTROLLER

- See the table for the most relevant KMC Controls tool for configuring, programming, and/or creating graphics for the controller. See the documents or Help systems for the respective KMC tool for more information.
- See the table (on the next page) for the most relevant KMC Controls tools for configuring, programming, and/or creating graphics for the controller. See the tools' documents or Help systems for more information.
- **NOTE:** After the controller has been configured, an STE-6010/6014/6017 series analog sensor can be connected to the controller in place of an STE-9000 series digital NetSensor.
- **NOTE:** A BAC-9301CE can be configured by connecting an HTML5-compatible web browser to the controller's

default IP address (192.168.1.251). See
the Conquest Ethernet Controller Configuration Web Pages Application Guide for more information about the built-in configuration web pages.

- **NOTE**: To configure a VAV controller, enter the correct K factor for the VAV box. Typically, this is supplied by the manufacturer of the VAV unit. If this information is unavailable, use an approximate K factor from the chart in the Appendix: K Factors for VAV section in the KMC Conquest Controller Application Guide.

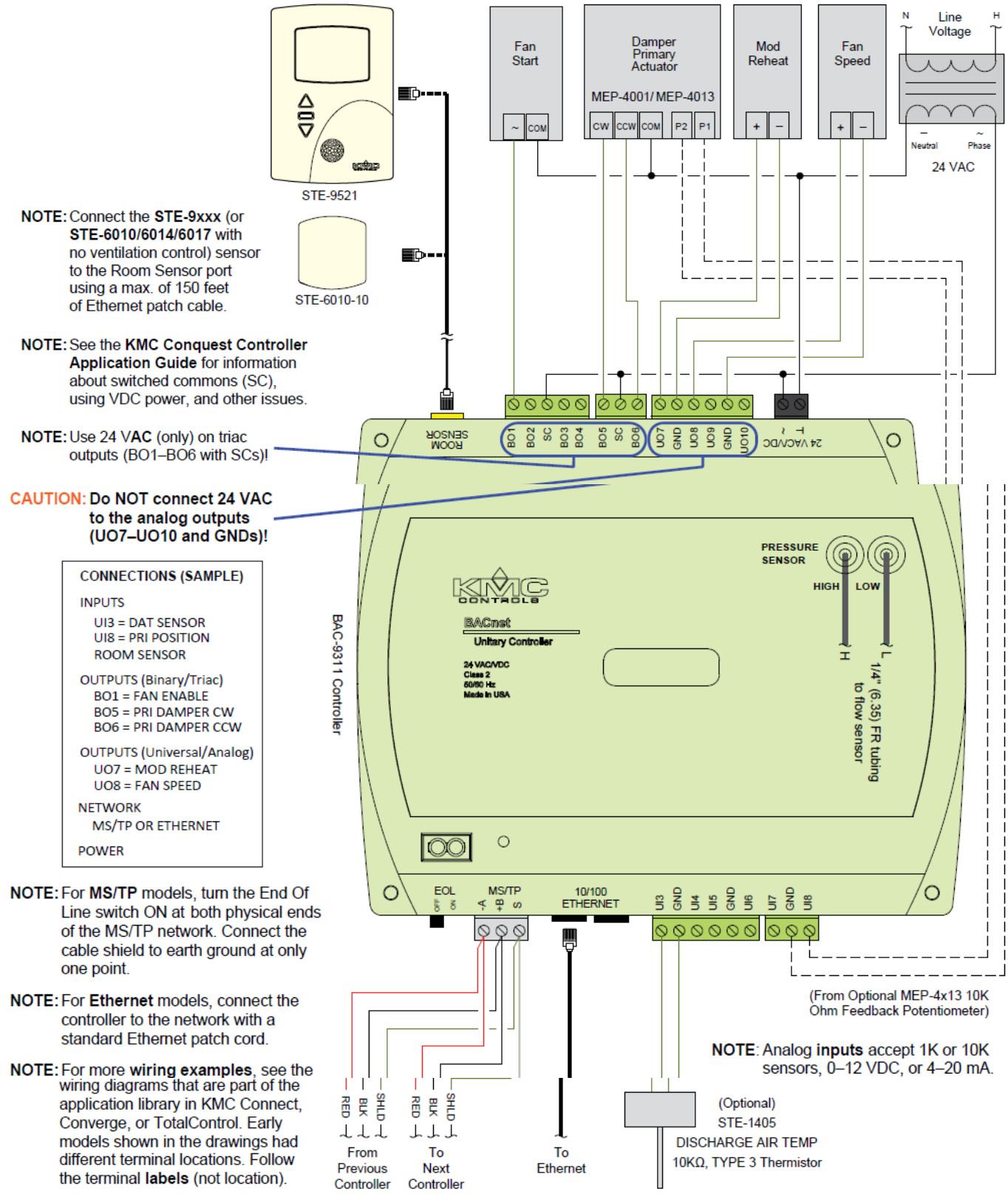
For instructions on VAV balancing:

- With an STE-9000 series NetSensor, see the VAV Airflow Balancing with an STE-9xx1 section of the KMC Conquest Controller Application Guide.
- With a BAC-5051E Router, see its application and installation guide.
- With KMC Connect or TotalControl, see the Help system for the software.

SETUP PROCESS			**KMC CONTROLS TOOL**
Config- uration	**Programming (Control Basic)**	**Web Page Graphics***	
✓			Conquest NetSensor
✓			Internal con- figuration web pa ges in Con- quest Ethernet “E” models**
✓			KMC Connect Lite™ (NFC) ap p***
✓	✓		KMC Connect™ software
✓	✓	✓	TotalControl™ software
✓	✓		KMC Con- verge™ module for Niagara W orkbench
		✓	KMC Converge **GFX** module f or Niagara Work- bench

- *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 Et hernet 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 v er. 4.0.

SAMPLE (BAC-9311) WIRING



INPUT/OUTPUT OBJECTS/CONNECTIONS

BAC-9301 FCU (2-PIPE)	
Inputs	
AI1	Space Sensor *(on Room Sensor port)*
AI2	Space Setpoint Offset *(on port)*
AI3/UI3	Discharge Air Temperature
AI4/UI4	Outdoor Air Temp
AI5/UI5	Space Humidity
AI6/UI6	Supply Water Temperature
AI8/UI8	Analog Input #8
BI7/UI7	Fan
Outputs	
AO7/UO7	Analog Heat/Cool Valve (Proportional)*
AO8/UO8	Auxiliary Heat (Proportional)**
AO9/UO9	Analog Output #9
AO10/UO10	Fan Speed Control
BO1	Fan Low Speed
BO2	Fan Medium Speed
BO3	Fan High Speed
BO4	Binary Heat/Cool Valve (On/Off)*
BO5	Auxiliary Heat (On/Off)**
BO6	Binary Output #6
*AO7 and BO4 are controlled simultaneously. **AO8 and BO5 are controlled simultaneously.	

BAC-9301 HPU	
Inputs	
AI1	Space Sensor *(on Room Sensor port)*
AI2	Space Setpoint Offset *(on port)*
AI3/UI3	Discharge Air Temperature
AI4/UI4	Outdoor Air Temp
AI5/UI5	Space Humidity
AI7/UI7	Analog Input #7
AI8/UI8	Analog Input #8
BI6/UI6	Fan
Outputs	
AO7/UO7	Analog Output #7
AO8/UO8	Analog Output #8
AO9/UO9	Economizer Output
AO10/UO10	Analog Output #10
BO1	Fan Start – Stop
BO2	Stage 1 Compressor
BO3	Stage 2 Compressor
BO4	Reversing Valve
BO5	Auxiliary Heat
BO6	Binary Output #6

BAC-9301 FCU (4-PIPE)	
Inputs	
AI1	Space Sensor *(on Room Sensor port)*
AI2	Space Setpoint Offset *(on port)*
AI3/UI3	Discharge Air Temperature
AI4/UI4	Outdoor Air Temp
AI5/UI5	Space Humidity
AI7/UI7	Analog Input #7
AI8/UI8	Analog Input #8
BI6/UI6	Fan
Outputs	
AO7/UO7	Analog Cooling Valve (Proportional)*
AO8/UO8	Analog Heating Valve (Proportional)**
AO9/UO9	Analog Output #9
AO10/UO10	Fan Speed Control
BO1	Fan Low Speed
BO2	Fan Medium Speed
BO3	Fan High Speed
BO4	Binary Cooling Valve (On/Off)*
BO5	Binary Heating Valve (On/Off)**
BO6	Binary Output #6
*AO7 and BO4 are controlled simultaneously. **AO8 and BO5 are controlled simultaneously.	

BAC-9311 HPU	
Inputs	
AI1	Space Sensor *(on Room Sensor port)*
AI2	Space Setpoint Offset *(on port)*
AI3/UI3	Discharge Air Temperature
AI4/UI4	Outdoor Air Temp
AI5/UI5	Space Humidity
AI7/UI7	Analog Input #7
AI8/UI8	Analog Input #8
AI9	Duct Pressure *(internal sensor)*
BI6/UI6	Fan
Outputs	
AO7/UO7	Analog Output #7
AO8/UO8	Analog Output #8
AO9/UO9	Economizer Output
AO10/UO10	Analog Output #10
BO1	Fan Start – Stop
BO2	Stage 1 Compressor
BO3	Stage 2 Compressor
BO4	Reversing Valve
BO5	Auxiliary Heat
BO6	Binary Output #6

BAC-9301 RTU	
Inputs	
AI1	Space Sensor *(on Room Sensor port)*
AI2	Space Setpoint Offset *(on port)*
AI3/UI3	Discharge Air Temperature
AI4/UI4	Outdoor Air Temp
AI5/UI5	Space Humidity
AI7/UI7	Analog Input #7
AI8/UI8	Analog Input #8
BI6/UI6	Fan
Outputs	
AO7/UO7	Analog Cooling Output
AO8/UO8	Analog Heating Output
AO9/UO9	Economizer Output
AO10/UO10	Analog Output #10
BO1	Fan Start – Stop
BO2	Cool Stage 1
BO3	Cool Stage 2
BO4	Binary Output #4
BO5	Heating Stage 1
BO6	Heating Stage 2

BAC-9311 VAV	
Inputs	
AI1	Space Sensor *(on Room Sensor port)*
AI2	Space Setpoint Offset *(on port)*
AI3/UI3	Discharge Air Temperature
AI4/UI4	Analog Input #4
AI5/UI5	Analog Input #5
AI6/UI6	Analog Input #6
AI7/UI7	Analog Input #7
AI8/UI8	Primary Damper Position
AI9	Primary Duct Pressure *(internal sensor)*
Outputs	
AO7/UO7	Analog Heat
AO8/UO8	Fan Speed
AO9/UO9	Analog Output #9
AO10/UO10	Analog Output #10
BO1	Fan
BO2	Heating Stage 1
BO3	Heating Stage 2
BO4	Heating Stage3
BO5	Primary Damper CW
BO6	Primary Damper CCW

BAC-9311 RTU	
Inputs	
AI1	Space Sensor *(on Room Sensor port)*
AI2	Space Setpoint Offset *(on port)*
AI3/UI3	Discharge Air Temperature
AI4/UI4	Outdoor Air Temp
AI5/UI5	Space Humidity
AI7/UI7	Economizer Feedback
AI8/UI8	Analog Input #8
AI9	Duct Pressure *(internal sensor)*
BI6/UI6	Fan
Outputs	
AO7/UO7	Analog Cooling Output
AO8/UO8	Analog Heating Output
AO9/UO9	Economizer Output
AO10/UO10	Analog Output #10
BO1	Fan Start – Stop
BO2	Cool Stage 1
BO3	Cool Stage 2
BO4	Binary Output #4
BO5	Heating Stage 1
BO6	Heating Stage 2

- **NOTE:** See Sample (BAC-9311) Wiring on page 7 for more information.
- **NOTE**: Universal Input (UIx) terminal = Analog Input (AIx) object or Binary Input (BIx). Universal Output (UOx) terminal = Analog Output (AOx) object.
- **NOTE:** Universal (analog) inputs and outputs can be configured to emulate binary (on/off or voltage/no-voltage) objects. They are used with GND terminals.
- **NOTE:** Binary Output (BOx) terminals are triacs and are used with SC terminals instead of GND terminals.

REPLACEMENT PARTS

- **HPO-0055** Replacement Network Bulb Module for Conquest Controllers, Pack of 5
- **HPO-9901** Conquest Hardware Replacement Parts Kit

NOTE: HPO-9901 includes the following:

Terminal Blocks

- (1) Black 2 Position
- (2) Grey 3 Position
- (2) Green 3 Position
- (4) Green 4 Position
- (2) Green 5 Position
- (2) Green 6 Position

DIN Clips

(2) Small
(1) Large

NOTE: See the Conquest Selection Guide for more information about replacement parts and accessories.

IMPORTANT NOTICES

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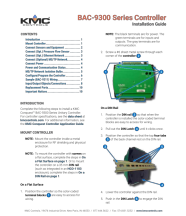
Documents / Resources

	KMC BAC-9300 Series Controller [pdf] Installation Guide BAC-9311, BAC-9300 Series Controller, BAC-9300 Series, Controller

References

- KMC Controls | Building Automation and Control Solutions

- KMC Controls | Building Automation and Control Solutions
- Manual-Hub.com - Free PDF manuals!
- KMC Controls | Building Automation and Control Solutions
- Router: BACnet, IP/Enet/Single MSTP | KMC Controls
- Controller: VAV, PI, BACnet AAC, 40 in-lbs, 90 sec, Clock
- KMC Conquest Unitary Controllers | KMC Controls
- Controller: Unitary, BACnet AAC, MSTP | KMC Controls
- Controller: Unitary, BACnet AAC, Clock, Ethernet | KMC Controls
- NetSensor: Temperature, Almond | KMC Controls
- NetSensor: Temperature, Humidity, Occupancy, CO2, White | KMC Controls
- User Manual