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 are easy to access for wiring.

2. Screw a #6 sheet metal screw through each corner of the controller.

3. Position the controller so that the top four tabs of the back channel rest on the DIN rail.

4. Lower the controller against the DIN rail.

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

NOTE: The black terminals are for power. The green terminals are for inputs and outputs. The gray terminals are for communication.
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 YouTube video KMC Conquest Wiring: BAC-9300 Series Unitary Controllers.

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.

NOTE: The Ethernet patch cable should be a maximum of 150 feet (45 meters).

CAUTION

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.

NOTE: Auxiliary VAV equipment such as fans, heaters, reheat valves, and discharge air temperature sensors can be connected to the controller.

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.

2. Wire additional sensors to the green (input) terminal block 10.

NOTE: Wire sizes 12–24 AWG can be clamped in each terminal.

NOTE: No more than two 16 AWG wires can be joined at a common point.

3. Wire additional equipment to the green (output) terminal block 11.
**CAUTION**

Do NOT connect 24 VAC to the analog outputs (U07–U010 and GNDs)!

**NOTE:** Use 24 VAC (only) with triac outputs (B01–B06 with SCs).

**CONNECT (OPT.) ETHERNET NETWORK**

1. For BAC-93x1C models (only), connect an Ethernet patch cable to the 10/100 ETHERNET port (“E” models only).

**CAUTION**

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.

**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. See the Daisy-Chaining Conquest Ethernet Controllers Technical Bulletin on the KMC Partner web site for more information.

**NOTE:** On newer models, the Room Sensor port is yellow 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 YouTube video KMC Conquest Wiring: BAC-9300 Series Unitary Controllers.

**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 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.
**CONNECT (OPTIONAL) MS/TP NETWORK**

1. For BAC-93x1/93x1C models (only), connect the BACnet network to the gray BACnet MS/TP terminal block.  

   ![Gray BACnet MS/TP terminal block](image)

   **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).

   A. Connect the –A terminals in parallel with all other –A terminals on the network.

   B. Connect the +B terminals in parallel with all other +B terminals on the network.

   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.

   **NOTE:** For principles and good practices when connecting an MS/TP network, see Planning BACnet Networks (Application Note AN0404A).

   **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 to ON.

   **NOTE:** For more information, see Sample (BAC-9311) Wiring on page 7 and the YouTube video KMC Conquest Wiring: BAC-9300 Series Unitary Controllers.

**CONNECT POWER**

1. Connect a 24 VAC, Class-2 transformer to the black power terminal block of the controller.

   ![Black power terminal block](image)

   **NOTE:** Follow all local regulations and wiring codes.

   A. Connect the neutral side of the transformer to the controllers common terminal.  

   B. Connect the AC phase side of the transformer to the controllers phase terminal.

   **NOTE:** Connect only one controller to each transformer with 12—24 AWG copper wire.

   **NOTE:** Use either shielded connecting cables or enclose all cables in conduit to maintain RF emissions specifications.

   **NOTE:** For more information, see Sample (BAC-9311) Wiring on page 7 and the YouTube video KMC Conquest Wiring: BAC-9300 Series Unitary Controllers.

**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

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

- 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

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

- 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 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.

<table>
<thead>
<tr>
<th>SETUP PROCESS TOOL</th>
<th>KMC CONTROLS TOOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Conquest NetSensor</td>
</tr>
<tr>
<td>Programming</td>
<td>Internal configuration web pages in Conquest Ethernet “E” models**</td>
</tr>
<tr>
<td>Web Page</td>
<td>KMC Connect Lite” (NFC) app***</td>
</tr>
<tr>
<td>Graphics</td>
<td>KMC Connect™ software</td>
</tr>
<tr>
<td></td>
<td>TotalControl™ software</td>
</tr>
<tr>
<td></td>
<td>KMC Converge™ module for Niagara WorkBench</td>
</tr>
<tr>
<td></td>
<td>KMC Converge GFX module for Niagara WorkBench</td>
</tr>
</tbody>
</table>

*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.
SAMPLE (BAC-9311) WIRING

(Single Duct VAV, Series Fan Powered with Modulating Reheat and Vent Control)

NOTE: Connect the STE-9xxx (or STE-6010/6014/6017 with no ventilation control) sensor to the Room Sensor port using a max. of 150 feet of Ethernet patch cable.

NOTE: See the KMC Conquest Controller Application Guide for information about switched commons (SC), using VDC power, and other issues.

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

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

NOTE: For MS/TP models, turn the End Of Line switch ON at both physical ends of the MS/TP network. Connect the cable shield to earth ground at only one point.

NOTE: For Ethernet models, connect the controller to the network with a standard Ethernet patch cord.

NOTE: For more wiring examples, see the wiring diagrams that are part of the application library in KMC Connect, Converge, or TotalControl. Early models shown in the drawings had different terminal locations. Follow the terminal labels (not location).

NOTE: Analog inputs accept 1K or 10K sensors, 0–12 VDC, or 4–20 mA.
## 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)**
- 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 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-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: Analog Output #9
- AO10/UO10: Economizer Output
- BO1: Fan Start - Stop
- BO2: Stage 1 Compressor
- BO3: Stage 2 Compressor
- BO4: Reversing Valve
- BO5: Auxiliary Heat
- BO6: Binary Output #6

### 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-9300 Series Controller

#### BAC-9301 RTU

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI1</td>
<td>Fan</td>
</tr>
<tr>
<td>AI2</td>
<td>AI7/UI7 Economizer Output</td>
</tr>
<tr>
<td>AI3/UI3</td>
<td>AI8/UI8 Analog Input #8</td>
</tr>
<tr>
<td>AI4/UI4</td>
<td>B01 Fan Start - Stop</td>
</tr>
<tr>
<td>AI5/UI5</td>
<td>B02 Cool Stage 1</td>
</tr>
<tr>
<td>AI7/UI7</td>
<td>B03 Cool Stage 2</td>
</tr>
<tr>
<td>AI8/UI8</td>
<td>B04 Binary Output #4</td>
</tr>
<tr>
<td>BI6/UI6</td>
<td>B05 Heating Stage 1</td>
</tr>
<tr>
<td></td>
<td>B06 Heating Stage 2</td>
</tr>
</tbody>
</table>

#### BAC-9311 RTU

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI1</td>
<td>AO7/UO7 Analog Cooling Output</td>
</tr>
<tr>
<td>AI2</td>
<td>AO8/UO8 Analog Heating Output</td>
</tr>
<tr>
<td>AI3/UI3</td>
<td>AO9/UO9 Economizer Output</td>
</tr>
<tr>
<td>AI4/UI4</td>
<td>AO10/UO10 Analog Output #10</td>
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<tr>
<td>AI5/UI5</td>
<td>BO1 Fan Start - Stop</td>
</tr>
<tr>
<td>AI6/UI6</td>
<td>BO2 Cool Stage 1</td>
</tr>
<tr>
<td>AI7/UI7</td>
<td>BO3 Cool Stage 2</td>
</tr>
<tr>
<td>AI8/UI8</td>
<td>BO4 Binary Output #4</td>
</tr>
<tr>
<td>AI9</td>
<td>BO5 Heating Stage 1</td>
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<tr>
<td>BI6/UI6</td>
<td>BO6 Heating Stage 2</td>
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</table>

#### BAC-9311 VAV

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI1</td>
<td>AI7/UI7 Economizer Output</td>
</tr>
<tr>
<td>AI2</td>
<td>AI8/UI8 Primary Damper Position</td>
</tr>
<tr>
<td>AI3/UI3</td>
<td>AI9 Primary Duct Pressure (internal sensor)</td>
</tr>
<tr>
<td>AI4/UI4</td>
<td>AO7/UO7 Analog Heat</td>
</tr>
<tr>
<td>AI5/UI5</td>
<td>AO8/UO8 Fan Speed</td>
</tr>
<tr>
<td>AI6/UI6</td>
<td>AO9/UO9 Analog Output #9</td>
</tr>
<tr>
<td>AI7/UI7</td>
<td>AO10/UO10 Analog Output #10</td>
</tr>
<tr>
<td>AI8/UI8</td>
<td>BO1 Fan</td>
</tr>
<tr>
<td>AI9</td>
<td>BO2 Heating Stage 1</td>
</tr>
<tr>
<td>BI6/UI6</td>
<td>BO3 Heating Stage 2</td>
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<td>BO4 Heating Stage3</td>
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<td></td>
<td>BO5 Primary Damper CW</td>
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<tr>
<td></td>
<td>BO6 Primary Damper CCW</td>
</tr>
</tbody>
</table>

**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:

<table>
<thead>
<tr>
<th>Terminal Blocks</th>
<th>DIN Clips</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Black 2 Position</td>
<td>(2) Small</td>
</tr>
<tr>
<td>(2) Grey 3 Position</td>
<td>(1) Large</td>
</tr>
<tr>
<td>(2) Green 3 Position</td>
<td></td>
</tr>
<tr>
<td>(4) Green 4 Position</td>
<td></td>
</tr>
<tr>
<td>(2) Green 5 Position</td>
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</tr>
<tr>
<td>(2) Green 6 Position</td>
<td></td>
</tr>
</tbody>
</table>

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