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# CONNECTING A NETSENSOR

**NOTE:** A digital **STE-9000 Series NetSensor** can be used for configuring the controller.



Plug an **Ethernet patch cable 1** connected to an **STE-9000 Series NetSensor** into the (yellow) **ROOM SENSOR port 2** of the controller.

## **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.



# SELECTING AN APPLICATION

## List of Applications

KMC Conquest Airflow Measurement System controllers come with the following applications.

### **BAC-9311C(E)-AFMS:**

- AFMS-E (standard AFMS application with English units—the default)
- AFMS-M (standard AFMS application with metric units)

### **BAC-5901-C(E)-AFMS:**

- AFMS-E (standard AFMS application with English units—the default)
- AFMS-M (standard AFMS application with metric units)
- AFMPA-E (pressure assist AFMS application with English units)
- AFMPA-M (pressure assist AFMS application with metric units)

**NOTE:** See the next section, [About the Pressure Assist Application on page 3](#), for guidance about when it should be selected and how it works.

**NOTE:** Select the desired application before configuring other settings. Changing the application later would reset most settings back to their defaults.

## About the Pressure Assist Application

**NOTE:** If using the standard application (AFMS-E or AFMS-M) skip this section and continue to [How to Select an Application on page 4](#).

## When to Select the Pressure Assist Application

The pressure assist application (AFMPA-E or AFMPA-M) on a BAC-5901C(E)-AFMS should be selected if pressure flow pickup tubes and a transducer were installed for pressure assist (in addition to the supply air pressure flow pickup tubes and transducer). This should be done if the RTU/AHU/UV has any of the following non-standard features:




- a relief fan that is not constant speed, or is not commanded to operate via mixed air damper position
- a return fan that is not controlled by a supply fan / return fan offset
- a bypass damper utilized to bypass a heat recovery system
- return VAV boxes
- a supply to return bypass (typically found in zone damper applications, or where a bypass damper is used in place of a VFD)

If any of these non-standard features are present, the pressure of the unit's mixed and/or return air sections may change, which will affect airflow. The pressure assist application measures and accounts for these pressure changes in the airflow measurement calculations.

## How the Pressure Assist Application Works


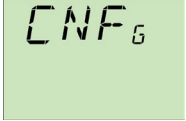


During its learn mode, the standard application records the percentage of outside versus return airflow in the mixed air chamber at each position of the unit's damper. The pressure assist application's learn mode records this as well as the differential pressure and airflow rate across the outside air damper. Thereafter, when a change in pressure is detected, the pressure assist application can adjust the outside versus return airflow calculation accordingly using the additional measurements.

## How to Select an Application



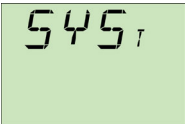


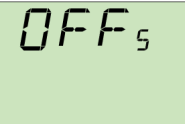
PROCEDURES AND STEPS	DISPLAY
<p>1. From the home display, press the Up and Down buttons together for at least 6 seconds.</p> <p>2. Enter the level 2 password. The display changes to <math>\text{CNF}_2</math> after Password 2 is correctly entered.</p> <p>NOTE: For the default level 2 password, see the <b>Conquest Controllers Default Password Technical Bulletin (TB150716)</b> by logging into the <b>KMC website</b> and looking at the downloadable documents for any of the KMC Conquest controllers or STE-9000 series NetSensors.</p>	
<p>3. At the <math>\text{CNF}_2</math> display, press the Enter button to enter the Configuration menu.</p>	
<p>4. From the <math>\text{STRT}</math> display, press the Up or Down buttons to cycle to the <math>\text{RSTR}</math> display.</p> <p>5. At <math>\text{RSTR}</math>, press the Enter button to access the <b>restore application</b> options.</p> <p>NOTE: <math>\text{RSTR}</math> will stop flashing and an application option will flash in the lower display.</p> <p>6. Press the Up or Down buttons to cycle to the desired application.</p> <p>7. Press the Enter button to make the choice.</p> <p>NOTE: The controller will restart for the change to take effect.</p>	






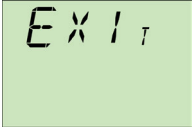
# SETTING PARAMETERS

## Setting Communication Parameters

PROCEDURES AND STEPS	DISPLAY
<p>1. From the home display, press the Up and Down buttons together for at least 6 seconds.</p> <p>2. Enter the level 2 password. The display changes to <math>\text{CNF}_6</math> after Password 2 is correctly entered.</p> <p>NOTE: For the default level 2 password, see the <b>Conquest Controllers Default Password Technical Bulletin (TB150716)</b> by logging into the <a href="#">KMC website</a> and looking at the downloadable documents for any of the KMC Conquest controllers or STE-9000 series NetSensors.</p>	
<p>3. At the <math>\text{CNF}_6</math> display, press the Up or Down buttons to cycle to the <math>\text{COMM}</math> display.</p>	
<p>4. At the COMM display, press the Enter button to select the <b>Communication parameters</b> menu.</p> <p>5. Use the Up, Down, and Enter buttons as needed to set the device instance, MAC address, and/or baud rate.</p> <p>NOTE: When all communication parameters have been configured, the screen will automatically return to the flashing <math>\text{CNF}_6</math> display.</p>	
<p>6. Continue to step 3 of the next section of this application guide to configure the system parameters.</p>	

## Setting System Parameters



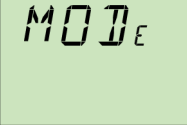
PROCEDURES AND STEPS	DISPLAY
<ol style="list-style-type: none"> <li>From the home display, press the Up and Down buttons together for at least 6 seconds.</li> <li>Enter the level 2 password. The display changes to <math>\text{CNF}_2</math> after Password 2 is correctly entered.</li> </ol> <p>NOTE: For the default level 2 password, see the <b>Conquest Controllers Default Password Technical Bulletin (TB150716)</b> by logging into the <a href="#">KMC website</a> and looking at the downloadable documents for any of the KMC Conquest controllers or STE-9000 series NetSensors.</p>	
<ol style="list-style-type: none"> <li>From the <math>\text{CNF}_2</math> display, press the Enter button to enter the Configuration menu.</li> </ol>	
<ol style="list-style-type: none"> <li>From the <math>\text{STPT}</math> display, press the Up or Down buttons to cycle to the <math>\text{SYST}</math> display.</li> <li>At <math>\text{SYST}</math>, press the Enter button to enter the <b>System parameters</b> sub-menu.</li> </ol>	
<ol style="list-style-type: none"> <li>At the <math>\text{SQFT}</math> display, press the Up or Down buttons to enter the supply air area (<b>the square foot measurement of the supply air duct</b> at the point where the pressure flow pickup tubes were installed).</li> <li>Press the Enter button to save the value and advance to the <math>\text{CAL}_1</math> display.</li> </ol>	
<ol style="list-style-type: none"> <li>Press the Up or Down buttons to input the <b>calibration multiplier</b> (obtained from a balancer).</li> <li>Press the Enter button to save the value and advance to the <math>\text{OFF}_5</math> display.</li> </ol>	
<ol style="list-style-type: none"> <li>Press the Up or Down buttons to input the <b>calibration offset</b> (obtained from a balancer).</li> <li>Press the Enter button to save the value and advance to the <math>\text{STRK}</math> display.</li> </ol>	

PROCEDURES AND STEPS	DISPLAY
<p>12. Press the Up or Down buttons to enter the <b>time in seconds that it takes for the damper to go from open to closed.</b></p> <p>13. Press the Enter button to save the value and advance to the <i>REV</i> display.</p>	
<p>14. Press the Up or Down buttons to toggle choices for the <b>direction that the damper moves:</b> <i>NORMAL</i> (normal) or <i>REVERSE</i> (reverse-action).</p> <p>15. Press the Enter button to save the choice and advance to the <i>VOLT</i> display.</p>	
<p>16. Press the Up or Down buttons to toggle choices for the <b>voltage of the actuator:</b> 2-10 volts or 0-10 volts.</p> <p>17. Press the Enter button to save the choice and advance to the <i>ENLL</i> display.</p>	
<p>18. Low limit is <i>ON</i> by default. If not needed, press the Up or Down buttons to toggle it to <i>OFF</i>.</p> <p><b>⚠ CAUTION</b></p> <p><b>Low limit is recommended to prevent freezing of the equipment.</b></p> <p>NOTE: The default low limit is 37 degrees Fahrenheit. The low temperature limit value can be changed later in the (System) Setpoints menu. See <b>Changing (System) Setpoints on page 13.</b></p> <p>19. Press the Enter button to save the choice and return to the flashing <i>STPT</i> display.</p>	
<p>20. Press the Up or Down buttons several times to cycle to the <i>EXIT</i> option.</p>	
<p>21. Press the Enter button to return to the home screen.</p>	

# LEARN DAMPER STROKE

## Accessing the Command Menu

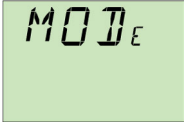

Before the KMC Conquest Airflow Measurement System can run Learn Mode, it must first learn the minimum and maximum angles of the damper stroke using the inclinometer. The menu option to start **Learn Damper Stroke** is accessed from the Level 1 **Command menu**. Follow the steps below to access the Command menu.

PROCEDURES AND STEPS	DISPLAY
<p>1. From the home screen, press the Enter button to access the Level 1 menus. (If a Level 1 password was set up, enter it.)</p> <p><b>NOTE:</b> If Level 1 is already on the Command menu, the display will now show <code>MODE</code>. In that case, skip to <a href="#">Starting Learn Damper Stroke on page 9</a></p>	
<p>2. Press the Enter button several times until <code>MENU</code> shows on the screen.</p> <p>3. Press the Up or Down buttons to select <code>COMMAND</code>, then press the Enter button to make the choice and return to the home screen.</p>	
<p>4. Wait about 5 seconds, then press the Enter button to access the Command menu.</p> <p><b>NOTE:</b> If Level 1 switched to the Command menu, <code>MODE</code> will now show on the screen.</p> <p><b>NOTE:</b> If you accessed Level 1 again too quickly, it will not have completed switching to the Command menu. It will still be on whatever menu it was before. In that case, repeat steps 2 to 4.</p>	



## Starting Learn Damper Stroke

To make the controller learn the minimum and maximum angles of the damper stroke, follow these steps:

PROCEDURES AND STEPS	DISPLAY
1. From <code>MODE</code> (under the Command menu in Level 1), press Enter once to advance to the <code>LSTR</code> menu item.	 A green rectangular box containing the text "MODE" in a monospaced font.
2. Press the Up or Down button to toggle <b>Learn Damper Stroke</b> to <code>ON</code> . 3. Press the Enter button to make the choice and start Learn Damper Stroke. <b>NOTE:</b> The controller will begin to drive the damper with the actuator.	 A green rectangular box containing the text "LSTR" on the top line and "ON" on the bottom line, both in a monospaced font.

# LEARN MODE

## Before Starting Learn Mode

For valid Learn Mode results, ensure that:



- The square foot measurement of the supply air duct has been entered. See [Setting System Parameters on page 6](#).
- The controller has learned the minimum and maximum angles of the damper stroke. See [Learn Damper Stroke on page 8](#).
- The supply air fan is running at a normal, steady rate (i.e. without hunting or sporadic spikes)
- If the unit has a heat recovery wheel, it is turned off.
- If the unit has bypass damper, it is set to 100% open.



**NOTE:** The heating and cooling functions may be left on, as long as the MAT sensor is located before any heating and cooling sources.

## Checking Learn Ready Status

Complete the procedures below to check whether the system is ready to run Learn Mode now or should be set to run it later.

### Accessing Learn Ready Status from the Status Menu

PROCEDURES AND STEPS	DISPLAY
<p>1. From the home screen, press the Enter button to access the Level 1 menus. (If a Level 1 password was set up, enter it.)</p> <p><b>NOTE:</b> If Level 1 is already on the Status menu, the display will now show <code>FEIY</code>. In that case, skip to step 5.</p>	
<p>2. Press the Enter button several times until <code>MENU</code> shows on the screen.</p> <p>3. Press the Up or Down buttons to select <code>STATUS</code>, then press the Enter button to make the choice and return to the home screen.</p>	

PROCEDURES AND STEPS	DISPLAY
<p>4. Wait about 5 seconds, then press the Enter button to access the Status menu.</p> <p><b>NOTE:</b> If Level 1 switched to the Status menu, <i>RE D Y</i> will now show on the screen.</p> <p><b>NOTE:</b> If you accessed Level 1 again too quickly, it will not have completed switching to the Status menu. It will still be on whatever menu it was before. In that case, repeat steps 2 to 4.</p> <p>5. Take note of the <b>learn ready status</b> - <i>NOT</i> <i>RE R</i> (not ready) or <i>RE R D Y</i> (ready).</p>	
<p>6. Press the Enter button 3 times to advance to the <i>SEN F</i> (sensor fault) display.</p> <p>7. Take note of whether a sensor fault is indicated at the bottom half of the display - <i>FAULT</i> (fault) or <i>NORMAL</i> (normal).</p>	

### Interpreting Learn Ready Status

If the lower half of the *RE D Y* display shows *RE R D Y* (ready), you may start Learn Mode now. In that case, go to [Manually Starting Learn Mode on page 12](#).

The lower half of the *RE D Y* display shows *NOT RE R* (not ready) if any of the following are true:



- A sensor fault is detected (a sensor is missing or shorted)
- The controller is in the process of running Learn Damper Stroke
- Low Limit is enabled and the outside air temperature is less than the low temperature limit setpoint (37 degrees Fahrenheit default).
- The current delta-T is less than the minimum delta-T setpoint (10 degrees default difference).

**NOTE:** To change the low temperature limit and minimum delta-T setpoints, see [Changing \(System\) Setpoints on page 13](#).



**NOTE:** The delta-T is the difference between the outside and return air temperatures.

If no sensor fault was detected and the controller is not in the process of learning the damper stroke, you may choose to enable the controller to auto-start Learn Mode when it detects favorable temperatures at a later time. In that case, go to [Enabling Learn Mode to Auto-Start on page 12](#).

## Manually Starting Learn Mode

PROCEDURES AND STEPS	DISPLAY
1. Access the Command Menu. See <a href="#">Accessing the Command Menu on page 8</a> for details. <b>NOTE:</b> <code>MODE</code> will display on the screen.	
2. Press the Enter button twice to advance to the <code>LMO</code> menu item.	
3. Press the Up or Down button to toggle Learn Mode to <code>ON</code> .	
4. Press the Enter button to make the choice and start Learn Mode.	

## Enabling Learn Mode to Auto-Start

PROCEDURES AND STEPS	DISPLAY
1. Access the Command Menu. See <a href="#">Accessing the Command Menu on page 8</a> for details. <b>NOTE:</b> <code>MODE</code> will display on the screen.	
2. Press the Enter button three times to advance to the <code>AUTO</code> menu item.	
3. Press the Up or Down button to toggle Learn Mode to <code>ON</code> .	
4. Press the Enter button to save the choice.	

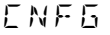


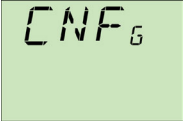


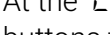




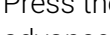
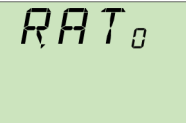

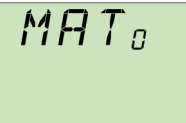
The controller will automatically start Learn Mode when the delta-T becomes greater than the delta-T needed to autostart Learn Mode setpoint (20 degrees default difference.)



**NOTE:** To change the setpoint, see [Changing \(System\) Setpoints on page 13](#).

If low limit is enabled (recommended) the controller will only run Learn Mode if the outside air temperature also remains above the low temperature limit setpoint.

**NOTE:** To change the low limit setpoint, see [Changing \(System\) Setpoints on page 13](#).

# CHANGING (SYSTEM) SETPOINTS

PROCEDURES AND STEPS	DISPLAY
<p>1. From the home display, press the Up and Down buttons together for at least 6 seconds.</p> <p>2. Enter the level 2 password. The display changes to  after Password 2 is correctly entered.</p> <p>NOTE: For the default level 2 password, see the <b>Conquest Controllers Default Password Technical Bulletin (TB150716)</b> by logging into the <a href="#">KMC website</a> and looking at the downloadable documents for any of the KMC Conquest controllers or STE-9000 series NetSensors.</p>	
<p>3. From the  display, press the Enter button to enter the Configuration menu.</p>	
<p>4. From the  display, press the Enter button to enter the <b>Setpoints</b> sub-menu.</p>	
<p>5. At the  display, press the Up or Down buttons to input the <b>low temperature limit</b> value.</p> <p>6. Press the Enter button to save the value and advance to the  display.</p>	
<p>7. Press the Up or Down buttons to input the <b>outdoor air temperature offset</b>.</p> <p>8. Press the Enter button to save the value and advance to the  display.</p>	
<p>9. Press the Up or Down buttons to input the <b>return air temperature offset</b>.</p> <p>10. Press the Enter button to save the value and advance to the  display.</p>	
<p>11. Press the Up or Down buttons to input the <b>mixed air temperature offset</b>.</p> <p>12. Press the Enter button to save the value and advance to the  display.</p>	

PROCEDURES AND STEPS	DISPLAY
<p>13. Press the Up or Down buttons to input the <b>minimum delta T</b>.</p> <p>NOTE: The minimum delta T is the temperature difference below which Learn mode will halt. If the difference between the outdoor and return air falls below this value during the Learn mode process, Learn mode will not complete.</p> <p>14. Press the Enter button to save the value and advance to the <b>MINDEL</b> display.</p>	
<p>15. Press the Up or Down buttons to input <b>the delta T needed to auto-start learn mode</b>.</p> <p>NOTE: The default is 20 degrees Fahrenheit difference, which is the recommended minimum. It cannot be decreased to less than 15 degrees Fahrenheit difference.</p> <p>16. Press the Enter button to save the value and automatically go back to the flashing <b>STPT</b> display.</p>	

# CONTROL MODES

## Selecting a Control Mode from the Command Menu

1. Access the Command Menu. See [Accessing the Command Menu on page 8](#) for details.

**NOTE:** The display will then show `MDE`.

2. Press the Up and Down buttons to toggle to the desired control mode:
  - `CFM ETR` (Outside Air CFM control mode)
  - `IMPR PQ` (Damper Position control mode)
  - `PASS TR` (Pass Through control mode)
  - `MIXE T` (Mixed Air Temperature control mode)
3. Press the Enter button to save the choice.

## Outside Air CFM Control Mode

When Outside Air CFM control mode is selected, the air damper position is modulated to maintain the outside air CFM setpoint.

If the mixed air temperature reaches the low limit, the outside air damper will modulate toward closed to prevent freezing of the equipment.

If an occupancy sensor is used, the control mode will only run when the served space is occupied.

## Damper Position Control Mode

When Damper Position control mode is selected, the air damper is maintained at the damper position setpoint (0-100% open).

If the mixed air temperature reaches the low limit, the outside air damper will modulate toward closed to prevent freezing of the equipment.

If an occupancy sensor is used, the control mode will only run when the served space is occupied.

## Pass Through Control Mode

Pass Through control mode allows an external controller to control the actuator. This is done by passing the voltage signal from the external controller through the AI3/UI3 terminal (on the KMC Conquest AFMS controller) to the damper command analog value (AV7/A07 on a BAC-5901-AFMS, or AV9/U09 on a BAC-9311-AFMS).

Pass through will only occur when the KMC Conquest AFMS controller is not

in Learn Mode. If Learn mode starts, Pass Through mode will stop until the Learn mode sequence completes.

**⚠ CAUTION**

**The external controller must have low limit and other safeties configured to prevent damage to the equipment!**

## Mixed Air Temperature Control Mode

When Mixed Air Position control mode is selected, the air damper is modulated to maintain the mixed air temperature setpoint.

If the mixed air temperature reaches the low limit, the outside air damper will modulate toward closed to prevent freezing of the equipment.

If an occupancy sensor is used, the control mode will only run when the served space is occupied.



# SYSTEM DIAGNOSTICS

## Object Types Monitored

The controller programming includes four system diagnostic indicators in the form of BACnet binary value objects:

- Missing or shorted temperature sensors
- Damper fault
- Outdoor airflow out of control range
- Mixed air temperature out of control range

## Missing or Shorted Temperature Sensors (BV18)

BV18 is set to Active (Sensor Issue) for any or the following conditions:

- The OAT, MAT, or RAT sensor is missing (powered off or not connected).
- The OAT, MAT, or RAT sensor is shorted.

## Damper Fault (BV19)

BV19 is set to Active (On) when all the following conditions are true:

- Damper Position control mode is selected.
- The system is not running Learn mode.
- The system is not learning the damper stroke.
- The damper position is more than 15% off (in either direction) of the damper setpoint for longer (in seconds) than the damper should take to stroke the opening.

## Excess Outdoor Air CFM (BV20)

BV20 is set to Active (Fault) when all the following conditions are true:

- CFM control mode is selected.
- The system is not running Learn mode.
- The system is not learning the damper stroke.
- The outdoor air CFM (as calculated by the KMC Conquest Airflow Monitoring System) is more than 15% off of the Outside Air CFM setpoint, for longer (in seconds) than the damper should take to stroke the opening.

## Mixed Air Temperature Out of Control Range (BV21)

BV21 is set to Active (On) when all the following conditions are true:

- Mixed Air control mode is selected.
- The system is not running Learn mode.
- The system is not learning the damper stroke.
- The MAT is more than 5 degrees Fahrenheit off of the MAT setpoint, for longer (in seconds) than the damper should take to stroke the opening.