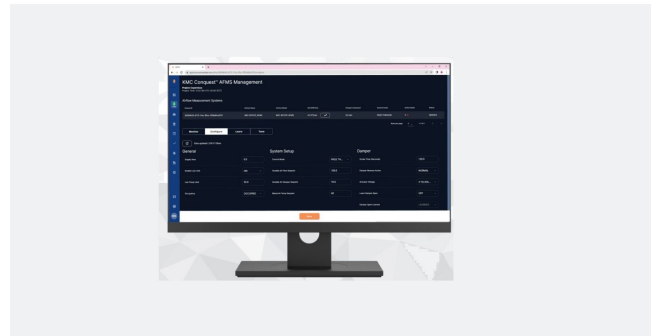
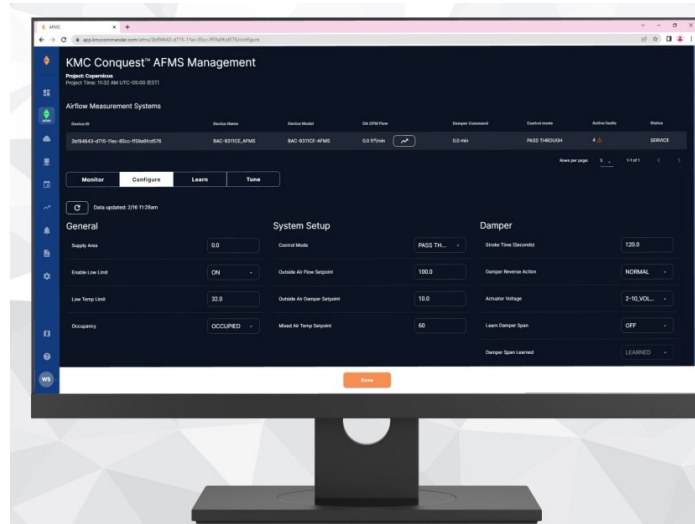




# KMC CONTROLS AG230215A AFMS Commander Installation Guide

[Home](#) » [KMC CONTROLS](#) » KMC CONTROLS AG230215A AFMS Commander Installation Guide 

## KMC CONTROLS AG230215A AFMS Commander Installation Guide



### Contents

- 1 Managing a KMC Conquest AFMS
- 2 Setting AFMS Parameters
- 3 Calibrating the AFMS's Sensors
- 4 Running AFMS Learning Mode
- 5 Controlling Airflow with an AFMS
- 6 Monitoring with an AFMS
- 7 Accessing the Damper Characterization Table
- 8 Important Notices
- 9 Documents / Resources
  - 9.1 References
- 10 Related Posts

## Managing a KMC Conquest AFMS

## About the AFMS Module

The KMC Commander AFMS module allows you to configure, control, tune, and monitor the operation of a KMC Conquest Airflow Measurement System (AFMS). The icon appears in KMC Commander's side navigation bar after an AFMS controller is discovered and saved in Networks Explorer.

### Prerequisites

1. Install a KMC Conquest AFMS (the controller and all system components).

**Note:** See the Airflow Measurement System Installation Guide, found on any AFMS controller's product page.

2. Select the application (on the AFMS controller) needed for the equipment.



**Caution:** Select the application before configuring other settings. Changing applications after configuration will restore most parameters to their defaults. See "Selecting an Application" in the KMC Conquest AFMS NetSensor Application Guide, found on any AFMS controller's product page.

**Note:** Complete basic configuration using a Conquest NetSensor, KMC Connect software, TotalControl software, and/or the KMC Converge module for Niagara WorkBench.

3. Set the AFMS controller's communication parameters.

**Note:** See the above note on the basic configuration methods.

4. In Networks Explorer, discover, save, and assign a profile (with trended points) to the AFMS controller.

**Note:** For details, see the Discovering Devices and Assigning Device Profiles topics on KMC Commander Help.

### Setting Up an AFMS

To set up an AFMS using the KMC Commander AFMS module, complete the following processes in this order:

1. Setting AFMS Parameters.
2. Calibrating the AFMS's Sensors.
3. Running AFMS Learning Mode.

**Note:** In environmental conditions where you can't run Learning Mode, see Manually Entering Damper Characterization Data.

### Setting AFMS Parameters

#### Before Beginning

Before setting a KMC Conquest Airflow Measurement System's parameters in AFMS, ensure that the Prerequisites on page 3 have been met.



**Caution:** Select the appropriate application on the AFMS controller before configuring other settings. Changing applications after configuration will restore most parameters to their defaults. See "Selecting an Application" in the KMC Conquest AFMS NetSensor Application Guide, found on any AFMS controller's product page.

#### Setting the Parameters

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. Select the Configure tab.
3. For Supply Area, enter the measurement (in square feet) of the cross section where the supply airflow pickup tubes were installed.

**Note:** For guidance about the location of the pickup tubes, see “Mounting the Supply Airflow Pickup Tubes” in the Airflow Measurement System Installation Guide, found on any AFMS controller’s product page.

4. Choose to either leave Enable Low Limit set to ON (the default), or to turn it OFF.



**Warning:** ON is recommended to prevent freezing of equipment. If not needed (due to your equipment’s particular nature), you might choose to turn it OFF.

5. Either leave Low Temp Limit set to the default (37°F), or adjust the value.

**Note:** If the mixed air temperature reaches the Low Temp Limit set here (and Enable Low Limit is set to ON) the outside air damper will modulate toward closed to prevent freezing of the equipment.

6. For Stroke Time (Seconds), enter the time (in seconds) that it takes for the damper to go from 100% open to 100% closed.
7. For Damper Reverse Action:
  - Select NORMAL if the greater the output signal to the damper actuator is, the more the damper opens (if 10 volts = 100% open).
  - Select REVERSE if the greater the output signal to the damper actuator is, the more the damper closes (if 10 volts = 100% closed).
8. For Actuator Voltage, select the voltage range of the damper actuator (2 to 10 volts or 0 to 10 volts).
9. Select ON for Learn Damper Span.

**Note:** Before the AFMS controller can run Learning Mode, it must learn the minimum and maximum incline of the damper using the inclinometer.
10. Select Save.

**Note:** “The process of updating points is successfully started” appears briefly. When the damper has stroked the opening, Damper Span Learned will report LEARNED.

## Calibrating the AFMS’s Sensors

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. Select the Tune tab.
3. Under Offset for Supply Air Flow, enter the CFM offset (determined by a TAB technician) for the supply air pressure transducer.
4. Under Multiplier for Supply Air Flow, enter the multiplier (determined by a TAB technician) for the supply air pressure transducer.
5. Under Offset for Outside Air Temp, Return Air Temp, and Mixed Air Temp, enter the °F offsets (determined by a TAB technician) for the outside, return, and mixed air temperature sensors.
6. Select Save.

**Note:** For more information on the AFMS’s sensors, see the Airflow Measurement System Selection Guide, found on any AFMS controller’s product page.

## Running AFMS Learning Mode

## Before Starting Learning Mode

For valid results, first ensure that:

- The parameters are set correctly.
- The sensors are calibrated.
- The supply air fan is running at a normal, steady rate (without hunting or sporadic spikes).
- If the unit has a heat recovery wheel, it is turned off.
- If any heating or cooling sources are located upstream of the MAT sensor, they are turned off.
- If the unit has a bypass damper, it is set to 100% open.

## Checking Learn Ready Status

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. Select the Learn tab.
3. Take note whether Learn Ready reports READY or NOT READY.

## Interpreting Learn Ready Status

If READY is reported, you may manually start Learning Mode.

If NOT READY is reported:

- Check Sensor Fault. If FAULT is reported, fix any faults found.  
**Note:** Go to Monitor to find more detailed information on faults.
- Ensure that Learn Damper Span has completed.  
**Note:** (Under Configure,) Learn Damper Span must currently be OFF, and Damper Span Learned must report LEARNED.
- Mixed Air Temp Low Limit Control may be ACTIVE. If that is the case, continue to Enabling Learning Mode to Auto Start.  
**Note:** Go to Monitor to find Mixed Air Temp Low Limit Control. Go to Configure to find Enable Low Limit and Low Temp Limit. (See Setting AFMS Parameters on page 4 for important guidance on Low Limit.)
- Check Min Delta Temp. If the current  $\Delta T$  (the absolute difference between the outside and return air temperatures) is less than the minimum difference allowed, then continue to.  
**Note:** Go to Monitor to find Outside Air Temp and Return Air Temp. Calculate the absolute difference, then compare to Min Delta Temp.

## Manually Starting Learning Mode

If Learn Ready reports READY (see Checking Learn Ready Status on page 7), you may start Learning Mode manually.

1. Leave Min Delta Temp set to the default, or adjust it if needed.

**Note:** If the  $\Delta T$  becomes less than the Min Delta Temp, the AFMS controller will abort Learning Mode.

This is to insure that the controller does not receive unusable learning samples. Setting the Min Delta Temp at a 10°F or larger difference is recommended.

2. Leave Time Between Samples (Seconds) set to the default, or adjust it if needed.

**Note:** Most often, Time Between Samples (Seconds) can be left on the default (60 seconds). You might increase the value if the damper Stroke Time is longer than that of a typical unit, or if the damper actuator requires extra time to respond. You might decrease it if a large  $\Delta T$  is present and time at the site is limited. However, too little time between samples could result in inaccurate measurements.

3. For Learning Mode, select ON.

4. Select Save.

5. Wait for Learning Mode to complete

**Note:** To calculate the total time (in minutes) that Learning Mode should take to complete, multiply Time Between Samples (Seconds) by 91, then divide by 60.

**Note:** Learn Timer shows the elapsed time since Learning Mode started.

### Enabling Learning Mode to Auto Start

If Learn Ready reports NOT READY because of currently unfavorable temperatures you may enable the AFMS controller to automatically start Learning Mode when it detects favorable temperatures at a later time.

1. Leave Min Delta Temp set to the default, or adjust it if needed.

**Note:** If the  $\Delta T$  becomes less than the Min Delta Temp, the AFMS controller will abort Learning Mode.

This is to insure that the controller does not receive unusable learning samples. 10°F or more Min Delta Temp is recommended.

2. Leave Auto Start Delta Temp set to the default, or adjust it if needed.

**Note:** When the  $\Delta T$  reaches the Auto Start Delta Temp, Learning Mode will start. Learning Mode will complete if the  $\Delta T$  remains greater than the Min Delta Temp for the entire duration. An Auto Start Delta Temp that is at least 10°F more than Min Delta Temp is recommended.

3. Leave Time Between Samples (Seconds) set to the default, or adjust it if needed.

**Note:** Most often, Time Between Samples (Seconds) can be left on the default (60 seconds). You might increase the value if the damper Stroke Time (Seconds) (found under Configure > Damper) is longer than that of a typical unit, or if the damper actuator requires extra time to respond.

4. For Auto Learn Enable, select ON.

5. Select Save.

**Note:** See the Date of Last Learn and the OAT When Learned once Learning Mode has run automatically.

### Alternative to Running Learning Mode

While not ideal, the damper characterization data can be calculated and entered manually. This should only be done if — in the allotted time for setting up the AFMS — the  $\Delta T$  is unlikely to remain greater than the Min Delta Temp for the duration of Learning Mode.

### Controlling Airflow with an AFMS

#### About

After Setting Up an AFMS on page 3, you can control outside air flow, or control mixed air temperature. Also, for setup or maintenance purposes, you can command a damper position.

Alternatively, you can pass through control of the damper actuator to an external controller, using the AFMS for measurement and monitoring only.

### Controlling Out side AirFlow

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. Select the Configure tab.
3. From the Control Mode dropdown menu, select OA FLOW CTRL.
4. Enter an Outside Air Flow Setpoint (as CFM).
5. Select Save.

**Note:** The outside air damper will modulate to maintain the Outside Air Flow Setpoint. If Enable Low Limit is ON and the mixed air temperature reaches the Low Temp Limit, the damper will modulate toward closed to prevent freezing of the equipment. If an occupancy sensor is used, this Control Mode will only be active when the served space is occupied.

### Controlling Mixed Air Temperature

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. From the tabs that appear, select Configure.
3. From the Control Mode dropdown menu, select MAT CTRL.
4. Enter a Mixed Air Temp Setpoint.
5. Select Save

**Note:** The outside air damper will modulate to maintain the Mixed Air Temp Setpoint. If Enable Low Limit is ON and the mixed air temperature reaches the Low Temp Limit, the damper will modulate toward closed to prevent freezing of the equipment. If an occupancy sensor is used, this Control Mode will only be active when the served space is occupied.

### Commanding a Damper Position

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. From the tabs that appear, select Configure.
3. From the Control Mode drop-down menu, select DMPR POSITION CTRL.
4. Enter an Outside Air Damper Setpoint (0–100% open).
5. Select Save.

**Note:** The AFMS controller will command the damper to the Outside Air Damper Setpoint. If Enable Low Limit is ON and the mixed air temperature reaches the Low Temp Limit, the damper will modulate toward closed to prevent freezing of the equipment. If an occupancy sensor is used, this Control Mode will only be active when the served space is occupied.

### Enabling Pass Through

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. From the tabs that appear, select Configure.
3. From the Control Mode drop-down menu, select PASS THROUGH.

#### 4. Select Save.

**Note:** The external controller (if the AFMS controller is wired to one) will be allowed to control the damper actuator. (For wiring details, see the Airflow Measurement System Installation Guide, found on any AFMS controller's product page.) This Control Mode will only be active when Learn Damper Span and Learning Mode (under the Learn tab) are OFF.



**Warning:** The Enable Low Limit and Low Temp Limit do not apply when in PASS THROUGH. Ensure the external controller has its own low limit and other safeties configured to prevent equipment damage.

## Monitoring with an AFMS

### Accessing Monitoring

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. Select the Monitor tab.

### Monitoring Operation

| Label            | Description                                                                                                                                        |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Outside Air Flow | The AFMS controller's current outside air CFM calculation displays here.                                                                           |
| AFMS Status      | NORMAL = No faults are detected. LEARN MODE = Learning Mode is ON. SPAN MODE = Learn Damper Span is ON. SERVICE = One or more faults are detected. |
| Control Mode     | The saved Control Mode (OA FLOW CTRL, MAT CTRL, DMPR POSITION CTRL or PASS THROUGH) displays here.                                                 |
| Damper Position  | The damper's percentage open displays here.                                                                                                        |
| Occupancy        | The default is OCCUPIED. If an occupancy sensor is used and the served space is vacant, UNOCCUPIED will display.                                   |
| Outside Air Temp | The outside air temperature sensor's measurement displays here.                                                                                    |
| Return Air Temp  | The return air temperature sensor's measurement displays here.                                                                                     |
| Mixed Air Temp   | The mixed air temperature sensor's measurement displays here.                                                                                      |

### Monitoring Faults

| Label | Description |
|-------|-------------|
|-------|-------------|

|                           |                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outside Air Sensor Fault  | FAULT = The outside air temperature sensor is missing or shorted.                                                                                                                                                                                                                                                                                                                                        |
| Return Air Sensor Fault   | FAULT = The return air temperature sensor is missing or shorted.                                                                                                                                                                                                                                                                                                                                         |
| Mixed Air Sensor Fault    | FAULT = The mixed air temperature sensor is missing or shorted.                                                                                                                                                                                                                                                                                                                                          |
| Sensor Fault              | FAULT = One or more of the three temperature sensors is missing or shorted.                                                                                                                                                                                                                                                                                                                              |
| Damper Control Fault      | If the saved Control Mode is DMPR POSITION CTRL FAULT will display if the damper position is more than 15% off from the Outside Air Damper Setpoint for longer than the Stroke Time (Seconds) (found under Configure > Damper). This indicates that the damper is not moving properly.                                                                                                                   |
| Outside Air Control Fault | If the saved Control Mode is OA FLOW CTRL FAULT will display if Outside Air Flow is more than 15% off from the Outside Air Flow Setpoint for longer than the Stroke Time (Seconds) (found under Configure > Damper). This indicates that the damper is not moving properly.                                                                                                                              |
| Mixed Air Flow Fault      | If the saved Control Mode is MAT CTRL FAULT will display if Mixed Air Temp is more than 15°F off from the Mixed Air Temp Setpoint for longer than the Stroke Time (Seconds) (found under Configure > Damper). This indicates that the damper is not moving properly.                                                                                                                                     |
| Outside Air Flow Fault    | FAULT = The calculation of the airflow based on the damper characterization data has differed from the calculation using the current temperatures by more than the tolerance (20% difference default) for longer than 10 minutes. Ensure that the equipment is in the same physical condition as it was when Learning Mode was run. Learning Mode may need to be run again and/or sensors re-calibrated. |

|                                  |                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mixed Air Temp Low Limit Control | <p>ACTIVE = The damper is modulating toward closed to prevent freezing of the equipment because the Mixed Air Temp is lower than the Low Temp Limit (found under Configure &gt; General).</p> <p>INACTIVE = Either the Mixed Air Temp is higher than the Low Temp Limit, or Enable Low Limit is set to OFF.</p> <p>See the related low limit information in.</p> |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Accessing the Damper Characterization Table

### Manually Entering Damper Characterization Data

While not ideal, the damper characterization data can be calculated and entered manually in the AFMS Table. This should only be done if — in the allotted time for Setting Up an AFMS on page 3 — the  $\Delta T$  is unlikely to be greater than the Min Delta Temp for the duration of Learning Mode. In that case, for reliability, running Learning Mode at a later available time is still recommended.

### Accessing the AFMS Table

1. Go to AFMS, then select the Device Name of the AFMS controller.
2. Select the Tune tab.

### Interpreting the AFMS Table

| Label              | Description                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------|
| OA Fraction        | Percentage (expressed as a decimal) of the supply airflow that is outside airflow at the given outside air damper position |
| Outside Air Closed | Outside air damper at closed position                                                                                      |
| Outside Air 5      | Outside air damper at 0–5% open                                                                                            |
| Outside Air 10     | Outside air damper at 5–10% open                                                                                           |
| Outside Air 15     | Outside air damper at 10–15% open                                                                                          |
| Outside Air 20     | Outside air damper at 10–20% open                                                                                          |
| Outside Air 30     | Outside air damper at 20–30% open                                                                                          |
| Outside Air 40     | Outside air damper at 30–40% open                                                                                          |
| Outside Air 50     | Outside air damper at 40–50% open                                                                                          |
| Outside Air 60     | Outside air damper at 50–60% open                                                                                          |
| Outside Air 70     | Outside air damper at 60–70% open                                                                                          |
| Outside Air 80     | Outside air damper at 70–80% open                                                                                          |
| Outside Air 90     | Outside air damper at 80–90% open                                                                                          |
| Outside Air 100    | Outside air damper at 90–100% open                                                                                         |

### Calculating the damper characterization data

Use the %OA equation found in ASHRAE Standard 111, section 7.6.3.3: “Flow Rate Approximation by Temperature Ratio”.

**Note:** Find ASHRAE Standard 111 on this page of read-only versions of ASHRAE standards.

**Note:** See Controlling Airflow with an AFMS on page 10 for how to set the outside air damper to the required positions for the measurements.

**Note:** See Monitoring with an AFMS on page 12 for where to find the sensor readings.

### Verifying the Damper Characterization Data

Should the damper characterization data require verification, measurements should only be made using NISTtraceable instruments and the method described in ASHRAE Standard 111.

## Important Notices

### Trademarks

KMC Commander®, KMC Conquest™, KMC Controls®, and the KMC logo are registered trademarks of KMC Controls, Inc. All other products or name brands mentioned are trademarks of their respective companies or organizations. All rights reserved.

### Patents

Pat. <https://www.kmccontrols.com/patents/>

## Terms of Use

<https://www.kmccontrols.com/terms/>

## EULA (End User License Agreement)

<https://www.kmccontrols.com/eula/>

## Copyright

No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form by any means without the written permission of KMC Controls, Inc.

## Disclaimers

The material in this document is for information purposes only. The contents and the product it describes are subject to change without notice. KMC Controls, Inc. makes no representations or warranties with respect to this document. In no event shall KMC Controls, Inc. be liable for any damages, direct or incidental, arising out of or related to the use of this document.

## Documents / Resources



**[KMC CONTROLS AG230215A AFMS Commander](#)** [pdf] Installation Guide  
AG230215A AFMS Commander, AG230215A, AFMS Commander, Commander

## References

- [KMC Controls | Building Automation and Control Solutions](#)
- [Assigning Device Profiles](#)
- [Discovering Devices](#)
- [Read-Only Versions of ASHRAE Standards](#)
- [End User License Agreement \(“EULA”\)](#)
- [Patents](#)
- [Controller: Airflow Measurement System, BACnet AAC, Clock, MSTP | KMC Controls](#)
- [Airflow Measurement System | KMC Controls](#)
- [Website Terms of Use | KMC Controls](#)