

3 Relays, 6 Analog Outputs, 6 External Inputs

# Installation Guide (3/6 Outputs)

### Quick Start

### **A** CAUTION

This document is for 3-relay, 6-analog-output, 6-external-input BAC-12xx36/13xx36/14xx36 series only. THESE MODELS ARE NOT COMPATIBLE WITH THE BACKPLATES OF OLDER BAC-10000 SERIES FLEXSTATS (WITH ONLY 3 EXTERNAL INPUTS)! If replacing an older 3-input FlexStat, replace the backplate as well. See other installation guides for other models.

To select and use a FlexStat in an application:

- **1. Select the appropriate model** for the intended application and options (see the FlexStat Data Sheet).
- 2. Mount and wire the unit (see this Installation Guide).
- **3. Configure/program the unit** (see the FlexStat Operation and Application Guides).
- **4. If necessary, troubleshoot any issues** (see the FlexStat Operation Guide).
- **5. Operate the unit** (see the FlexStat Operation Guide).
- NOTE: This document gives basic mounting, wiring, and setup information only. For configuration, programming, operation, and other information, see the KMC Controls web site for the latest documents.

	Models	Dimensions in Inches (mm)			
	woders	Α	В	С	
	BAC-12xxxx (shown)	1.125 (29)	5.551	4.192 (106)	
	BAC-13xxxx/14xxxx	1.437 (36.5)	(141)	5.192 (132)	
A			Embos	sed "UP" ind	icator
₿ ₽	net	IA-485 data ort (for quick work access) ninal blocks o blate (rotated 13xxxx/14xxx	n on x)	Hocking hex s	crews
	Illustration 1—Dimensions and Installation				

### Mounting

For optimum temperature sensor performance, the FlexStat must be mounted on an interior wall and away from heat sources, sunlight, windows, air vents, and air circulation obstructions (e.g., curtains, furniture). Additionally, for a model with an occupancy sensor option, install it where it will have unobstructed view of the most typical traffic area. (See the FlexStat Application Guide for more information.)

If replacing an existing thermostat, label wires as needed for reference when removing the existing thermostat.

1. Complete rough-in wiring at each location prior to thermostat installation. Cable insulation must meet local building codes.

### **A** CAUTION

To prevent mounting screw heads from touching the circuit board in the thermostat, use only the mounting screws supplied by KMC Controls. Using other screws may damage the FlexStat. Do not turn screws in farther than necessary to remove the cover.

- If the cover is locked on the backplate, turn the hex screws in the bottom and top of the FlexStat CLOCKWISE until they (just) clear the cover. (See Illustration 1.) Pull the cover away from the backplate (mounting base).
- 3. Route the wiring through the backplate.
- 4. With the embossed "UP" and arrows toward the ceiling, fasten the backplate to a wall handy-box. BAC-12xxxx models mount directly on vertical 2 x 4 inch boxes, but they require an HMO-10000/ HMO-10000W wall mounting plate for horizontal or 4 x 4 boxes. BAC-13xxxx/14xxxx models mount directly on any of those types of boxes.
- 5. Make the appropriate connections to the terminal blocks. (See the Connections and Wiring section.)
- Place the FlexStat cover over the backplate while being careful not to pinch or dislodge any wiring. Back the hex screws (counterclockwise) out of the brackets until they engage the FlexStat cover and hold it in place.

## **Connections and Wiring**

### Wiring Considerations

- Because of the many connections (power, network, inputs, outputs, and their respective grounds or switched commons), be sure wiring is well planned before installation of conduit!
- Make sure that conduit for all wiring has adequate diameter for all necessary wiring. Using 1-inch conduit and junction boxes is recommended! Use external junction boxes above the ceiling or in another convenient location as needed to make connections that run to the FlexStat's junction box.
- To prevent excessive voltage drop, use a conductor size that is adequate for the wiring length! Allow plenty of "cushion" to allow for transient peaks during startup.
- Using multiple conductor wires for all inputs (e.g., 8 conductor) and outputs (e.g., 12 conductor) is recommended. Grounds for all the inputs can be combined on one wire.

### **A** CAUTION

To avoid damage from ground loops and other communication issues in networked FlexStats, correct phasing on MS/TP network and power connections on ALL the networked controllers is critically important.

### **Network Wiring**

For **Ethernet or IP** communications, plug an Ethernet cable into the RJ-45 jack on the back of the FlexStat.

For **MS/TP** communications, connect the -A terminals in parallel with all other -A terminals on the network and the +B terminals in parallel with all other +B terminals. (See Illustrations 2 and 5.) Connect the shields of the cable (Belden cable #82760 or equivalent) together at each device. Use a wire nut or the *S* terminal in KMC BACnet controllers. (FlexStats, however, do not have an *S* terminal.) Connect the cable shield to a good earth ground **at one end only**.

NOTE: The *S* terminal in KMC controllers is provided as a connecting point for the shield. The terminal is not connected to the ground of the controller. When connecting to controllers from other manufacturers, verify the shield connection is not connected to the controller's ground.

For more information on principles and good practices when connecting an MS/TP network, see Planning BACnet Networks (Application Note AN0404A).

### MS/TP EOL (End-Of-Line) Termination

The controllers/thermostats on the physical ends of an EIA-485 wiring segment must have end-of-line termination installed for proper network operation. (See Illustrations 2 through 4.) If a FlexStat is at the physical **end** of the MS/TP network line, set **both** the EOL termination switches to **On** (to the **right/up**) on the back of the circuit board. If not on the end, ensure that both switches are Off (left/down).

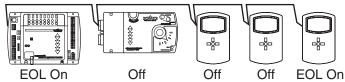


Illustration 2-MS/TP Network End-Of-Line Termination

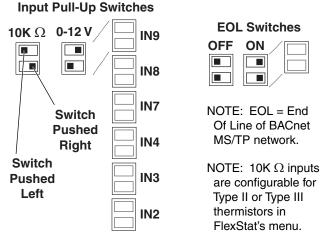


Illustration 3—BAC-12xxxx EOL/Pull-Up Switch Positions

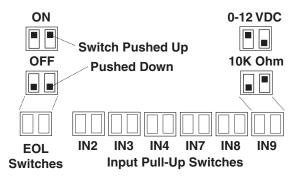
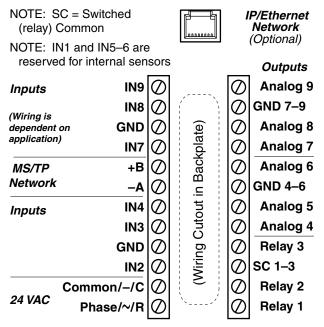


Illustration 4—BAC-13xxxx/14xxxx Switch Positions

### **A** CAUTION

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## NOTE: On BAC-13xxxx/14xxxx models, terminals are rotated 90° CCW.

#### **Input Connections**

Passive input devices require pull-up resistors in the circuit. For **passive** input devices (e.g., switch contacts and 10K ohm thermistors) on IN2 through IN4 and IN7 through IN9, set the pull-up switches on the back of the circuit board to the **10K** position. For **active** voltage devices, set the switches to the **0–12 VDC** position. (See Illustrations 3 through 5.)

- NOTE: Unlike the EOL switch pairs, the INPUT switch pairs must NOT have both switches set to the same direction—if one of the pair's switches is set to the left, for example, the other must be set to the right (or vice versa). ALL the input pull-up resistor switch pairs must be fully latched in either 10K Ohm or 0–12 VDC position even if a switch pair has no input connected! A single incorrect switch position may cause errors in multiple inputs.
- NOTE: **Type II or III 10K ohm thermistors can be selected by changing the menu setting** in Advanced > Inputs > Input # > Sensor (see the Configuration section). If a **remote space temperature sensor** is connected to AI7, space temperature can be configured for onboard, remote, averaging of the two, the lowest reading, or the highest reading.
- NOTE: FlexStat inputs do not support 1K ohm RTDs.

- NOTE: To use a 4–20 current loop input or map analog inputs as binary values, see the FlexStat Application Guide.
- NOTE: To use a remote SAE-10xx  $CO_2$  sensor, see the FlexStat Operation Guide.
- NOTE: For more information on wiring specific applications (AHU and FCU), see the Applications section starting on page 5. (These applications are the packaged programs selectable from the Advanced > Application menu in the BAC-1xxx36 models.) See also the FlexStat Application Guide.

#### **A** CAUTION

Relays are for Class-2 voltages (24 VAC) only. Do not connect line voltage to the relays!

### **A** CAUTION

Do not mistakenly connect 24 VAC to an analog output ground. This is not the same as a relay's switched common. See the backplate's terminal label for the correct terminal.

### **Output Connections**

Connect the device under control between the desired output terminal and the related **SC (Switched Common for relays) or GND (Ground for analog outputs)** terminal. (See Illustration 5). For the bank of three relays, there is one Switched (relay) Common connection (in place of the GND terminal used with analog outputs). (See Illustration 6.) **For the relay circuit, the phase side of the AC should be connected to the SC terminal.** 

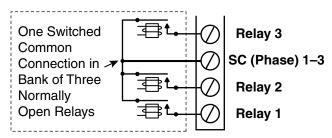


Illustration 6-Switched (Relay) Common and Relays

Do not attach a device that draws current exceeding the FlexStat's output capacity:

- Maximum output current for individual ANA-LOG outputs (4–9) is 20 mA @ 12 VDC (each).
- Max. output current is 1 A for individual RELAYS @ 24 VAC/VDC or a total of 1.5 A for relays 1–3.

For example, (discontinued) KMC REE-3211 relays would exceed the FlexStat's analog output capacity, but they can be used with the FlexStat's internal relays 1–3 as shown in the following applications pages. (Use a Core Components CVR11C-0/LD96200 in the REE-3211's place in those applications.)

FlexStat relays 1–3 are **NO**, **SPST (Form "A")**. (To emulate binary outputs with the analog outputs, set the output voltage to be either 0 or 12 VDC in Control Basic.)

#### **Power Connection**

The FlexStat requires an external, 24 volt, AC power source. Use a KMC Controls Class-2 transformer to supply power. Connect the transformer's **neutral** lead to the 24 VAC **Common/–/C** terminal and the AC **phase** lead to the 24 VAC **Phase/~/R** terminal. (See Illustration 5.) Power is applied to the FlexStat when the transformer is powered.

KMC Controls recommends powering only one controller/thermostat from each transformer. If installing a FlexStat in a system with other controllers/thermostats powered from a single transformer, however, phasing must be correct and the total power drawn from the transformer must not exceed its rating.

## Configuration

To configure the FlexStat, navigate the menus and change settings by pressing a combination of buttons. Press the **Right** (Menu) button and then the:

- Enter button to select and/or exit value editing.
- Up/Down button to move among entries (up/ down lines).
- Left/Right button to move among value fields (left/right spaces).
- Left button to return to the Home screen.

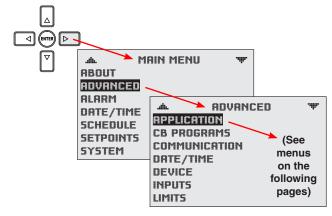


Illustration 7—Configuration Screens

- NOTE: Applications on pages 5–11 are the packaged programs selectable from the Advanced > Application menu in the BAC-1xxx36 (only) models. Other FlexStat models have other applications.
- NOTE: Humidity, motion, and CO<sub>2</sub> sensor options in menus are dependent on the FlexStat model and selected application.

For detailed **configuration**, **operation**, **troubleshooting**, **and other information**, see the FlexStat Operation Guide.

For **additional wiring**, **customization**, **programming**, **and application information**, see the FlexStat Application Guide.

### Applications Notes and Cautions

#### **A** CAUTION

Relays are for Class-2 voltages (24 VAC) only. Do not connect line voltage to the relays!

Do not mistakenly connect 24 VAC to an analog output ground.

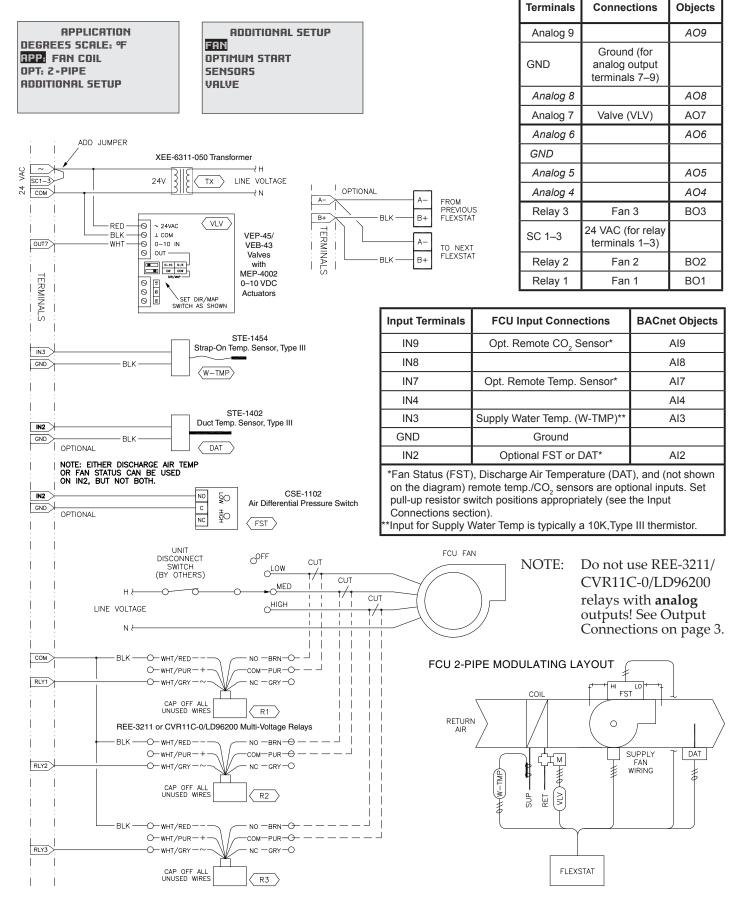
- NOTE: Although typical terminal code letters are shown, check the schematics of your unit for wiring details!
- NOTE: These applications are for **3 relay** and **6 analog** output BAC-12xx36/13xx36/14xx36 series only. See other installation guides for other models.
- NOTE: CO<sub>2</sub>, humidity, and motion sensor options are dependent on FlexStat model.
- NOTE: For Bill of Materials listings of the various accessories shown in the sample diagrams, see the FlexStat Application Guide.
- NOTE: The **KMC REE-3211 is discontinued. Use Core Components CVR11C-0/LD96200 in its place.** Do not use either with **analog** outputs! See Output Connections on page 3.

### Maintenance

Remove dust as necessary from the holes in the top and bottom. Clean the display with a soft, damp cloth and mild soap.

To maintain maximum sensitivity of the built-in motion sensor, occasionally wipe dust or dirt off the lens—but do not use any fluid on the sensor.





FCU Output

Output

BACnet

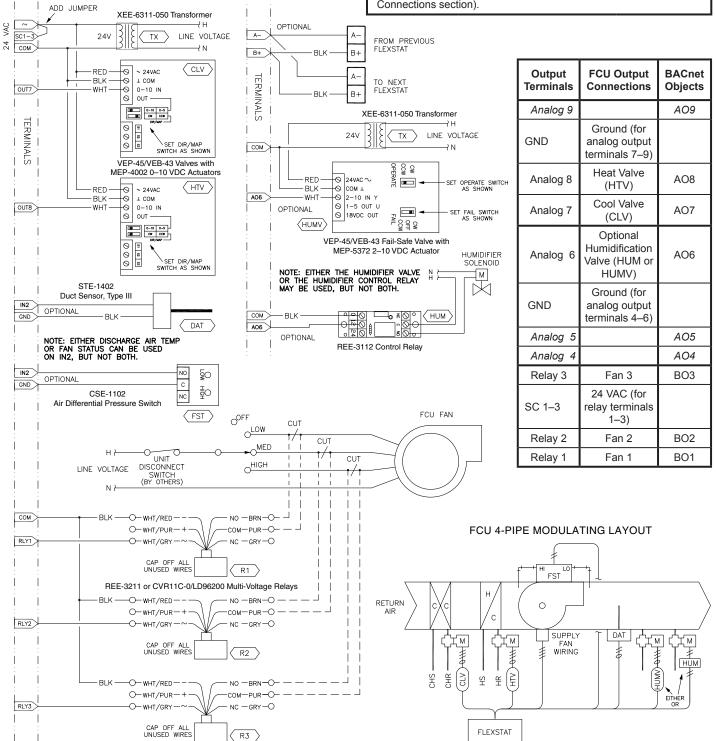
#### FCU—4 Pipe, Modulating

APPLICATION DEGREES SCALE: °F APP: FAN COIL OPT: 4-PIPE ADDITIONAL SETUP ADDITIONAL SETUP FAN HUMIDITY OPTIMUM START SENSORS VALVE

NOTE: Do not use REE-3211/CVR11C-0/LD96200 relays with **analog** outputs! See Output Connections on page 3.

Input Terminals FCU Input Connections		BACnet Objects
IN9	Opt. Remote CO <sub>2</sub> Sensor*	AI9
IN8		AI8
IN7	Opt. Remote Temp. Sensor*	AI7
IN4		Al4
IN3		AI3
GND	Ground	
IN2	Optional FST or DAT*	AI2

\*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown on the diagram) remote temp./CO<sub>2</sub> sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input Connections section).



#### AHU (Air Handler Unit)-1 Heat and 1 Cool

APPLICATION DEGREES SCALE: °F IPP: AIR HANDLER OPT: 1H/1C ADDITIONAL SETUP ADDITIONAL SETUP IAMPER FAN HUMIDITY OPTIMUM START SENSORS

NOTE: Do not use REE-3211/CVR11C-0/LD96200 relays with **analog** outputs! See Output Connections on page 3.

XEE-6311-075 or XEE-6311-100 Transformer	Connections section).	itaida Air Dombor MAT(OAT in	
Z4V	also be connected.	itside Air Damper, MAT/OAT in	puts must
RED 24VAC ~ RED RET OPERATE SWITCH BLK COM 1 SET OPPOSITE DIRECTION		ntput AHU Output ninals Connections	BACnet Objects
A09 WHT O 2-10 IN Y 0 1-5 OUT U 0 18VDC OUT	An	alog 9 Optional Outside Air Damper (OAD/RTD)*	AO9
MEP-5372, MEP-7252, MEP-7552, or MEP-7852 Actuators	GNE	Ground (for analog output terminals 7–9)	
	An	alog 8	AO8
RED 24VAC ∿ PR QAD   A BLK COM ⊥ SET OPERATE SWITCH   BLK COM ⊥ AS FAIL SWITCH	An	alog 7	A07
Set Fall SWITCH TO Set Fall SWITCH TO DIRECTION ACTUATOR ROTATES TO CLOSE OA DAMPER	An	alog 6 Optional Humidificatio Valve (HUM or HUMV	
STE-1402 Duct Sensor, Type III	GNE	Ground (for analog output terminals 4–6)	
GND GN HOLD BLK DAT See also the AHU—Additional	An	alog 5	AO5
NOTE: EITHER DISCHARGE AIR TEMP Options section	An	alog 4 Optional Fan Speed	AO4
ON IN2, BUT NOT BOTH. for network,	Re	lay 3 Heat 1 (W1)	BO3
IN2 OPTIONAL NO SQ   CND CSE-1102 Air Differential FST NC TO   Pressure Switch FST NC TO	SC	1–3 24 VAC (for relay terminals 1–3)	
	Re	lay 2 Cool 1 (Y1)	BO2
	Re	lay 1 Fan 1 (G)	BO1
OPTIONAL BLK   STE-1416 Duct Averaging   Sensor, Type III		otional Outside Air Damper is u t also have MAT/OAT inputs.	sed,
	RETURN	AHU 1H/1C LAYOUT	
STE-1451 OAT Sensor, Type III		±	
		FST FST	
24V Example 1 LINE VOLTAGE   N AIR   XEE-6311-050 Transformer			$\rangle$
NOTE: IF AHU HAS SEPARATE 'RC' AND 'RH' TERMINALS, AN INTERPOSING RELAY MUST BE USED BETWEEN EITHER 'RLY2' AND 'Y1' OR BETWEEN 'RLY3' AND 'W1'. CAUTION: DO NOT APPLY >24V TO RELAY TERMINALS	AHU CONTROLS	OF COND. PENDS ON IIT CONFIG.	
RLYZ Y1 AHU RLYZ W1 TERMINALS	SUPPLY FAN STARTER (BY OTHERS) FLEXS	STAT	
RLYT G WHT/PUR - + ON NOTE: IF NO 'G' TERMINAL			
IS PRESENT, CONNECT RLY1 CAP OFF ALL NOTE	IF VFD IS USED, OMIT STARTER WIR R1 RELAY CONTACTS TO VFD 'RUN' ( Iays		
PAC 12xx26/12xx26/14xx26 Series ElevStat		Installatio	n Cuida Pov C

Input Terminals

IN9

IN8

IN7

IN4

IN3

GND

IN2

**AHU Input Connections** 

Opt. Remote CO<sub>2</sub> Sensor\*

Opt. Remote Temp. Sensor\*

Opt. Outside Air Temp. (OAT)\*\*

Opt. Mixed Air Temp. (MAT)\*\*

Ground

**Optional FST or DAT\*** 

\*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown

on the diagram) remote temp./CO $_{\rm 2}$  sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input

**BACnet Objects** 

AI9

AI8

AI7

Al4

AI3

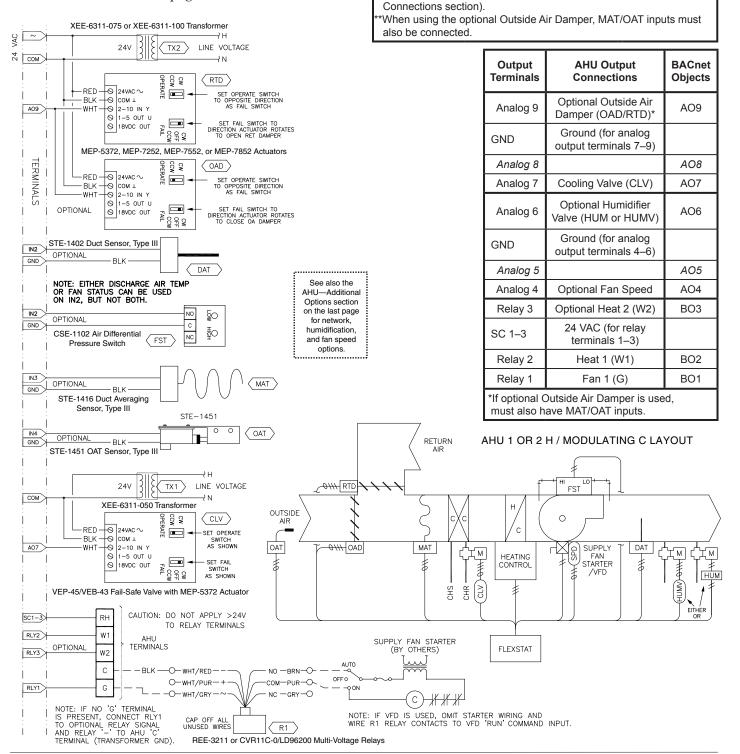
Al2

#### AHU—1 or 2 Heat and Modulating Cool

APPLICATION DEGREES SCALE: °F APP: AIR HANDLER OPT: 2H/MOD C ADDITIONAL SETUP ADDITIONAL SETUP DAMPER FAN HUMIDITY OPTIMUM START SENSORS

STRGING

NOTE: Do not use REE-3211/CVR11C-0/LD96200 relays with **analog** outputs! See Output Connections on page 3.



Input Terminals

IN9

IN8

IN7

IN4

IN3

GND

IN2

**AHU Input Connections** 

Opt. Remote CO, Sensor\*

Opt. Remote Temp. Sensor\*

Opt. Outside Air Temp. (OAT)\*\*

Opt. Mixed Air Temp. (MAT)\*\*

Ground

Optional FST or DAT\*

\*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown

on the diagram) remote temp./CO2 sensors are optional inputs. Set

pull-up resistor switch positions appropriately (see the Input

**BACnet Objects** 

AI9

AI8

AI7

Al4

AI3

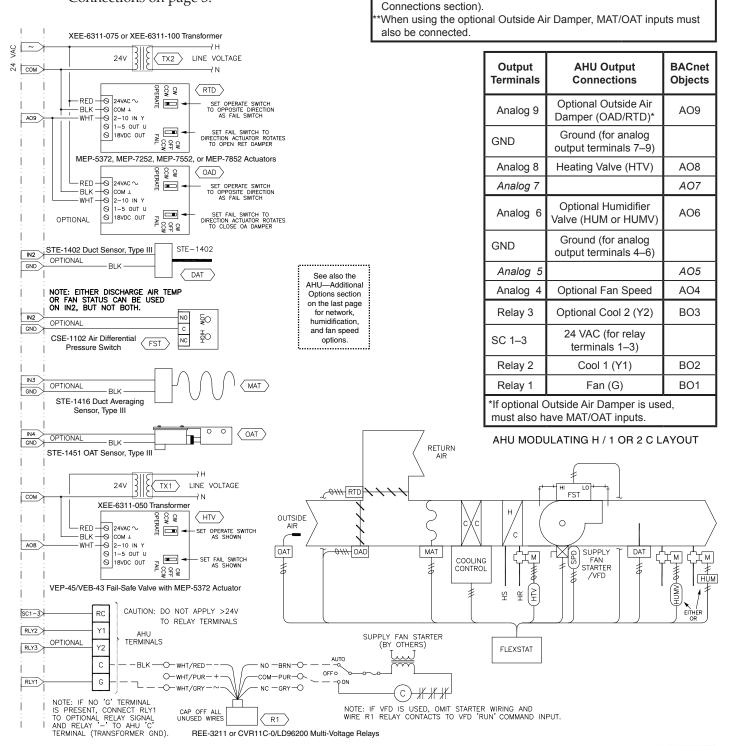
Al2

#### AHU—Modulating Heat and 1 or 2 Cool

APPLICATION DEGREES SCALE: °F APP: AIR HANDLER OPT: MOD H/2 C ADDITIONAL SETUP

#### ADDITIONAL SETUP DIMPER FAN HUMIDITY OPTIMUM START SENSORS STAGING

NOTE: Do not use REE-3211/CVR11C-0/LD96200 relays with **analog** outputs! See Output Connections on page 3.



Input Terminals

IN9

IN8

IN7

IN4

IN3

GND

IN2

**AHU Input Connections** 

Opt. Remote CO, Sensor\*

Opt. Remote Temp. Sensor\*

Opt. Outside Air Temp. (OAT)\*\*

Opt. Mixed Air Temp. (MAT)\*\*

Ground

**Optional FST or DAT\*** 

\*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown on the diagram) remote temp./CO, sensors are optional inputs. Set

pull-up resistor switch positions appropriately (see the Input

BAC-12xx36/13xx36/14xx36 Series FlexStat

**BACnet Objects** 

AI9

AI8

AI7

Al4

AI3

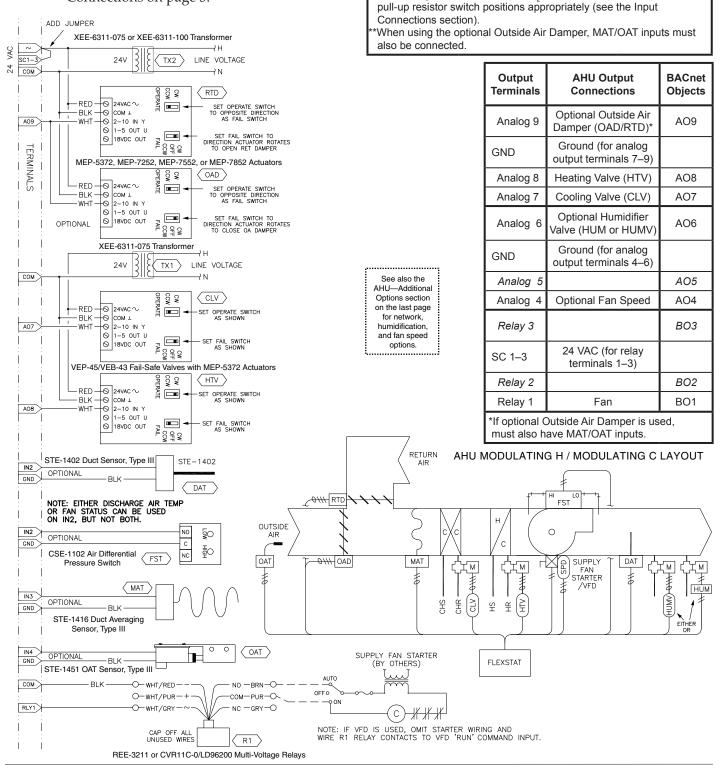
AI2

#### AHU—Modulating Heat and Modulating Cool

APPLICATION
DEGREES SCALE: °F
APP: AIR HANDLER
OPT: MOD H/MOD C
ADDITIONAL SETUP

ADDITIONAL SETUP DAMPER FAN HUMIDITY OPTIMUM START SENSORS VALVE

NOTE: Do not use REE-3211/CVR11C-0/LD96200 relays with **analog** outputs! See Output Connections on page 3.



**Input Terminals** 

IN9

IN8

IN7

IN4

IN3

GND

IN2

**AHU Input Connections** 

Opt. Remote CO, Sensor\*

Opt. Remote Temp. Sensor\*

Opt. Outside Air Temp. (OAT)\*\*

Opt. Mixed Air Temp. (MAT)\*\*

Ground Optional FST or DAT\*

\*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown on the diagram) remote temp./CO, sensors are optional inputs. Set

**BACnet Objects** 

AI9

AI8

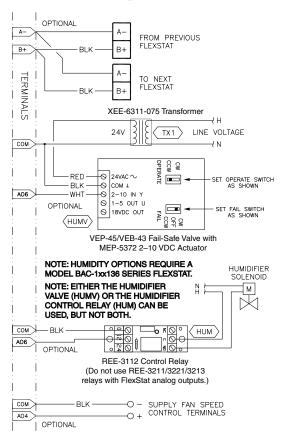
AI7

Al4

AI3

AI2

#### **AHU**—Additional Options



NOTE: Do not use REE-3211/CVR11C-0/LD96200 relays with **analog** outputs! See Output Connections on page 3.

### **Important Notices**

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.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. A BAC-12xxxx Class B digital apparatus complies with Canadian ICES-003. A BAC-13xxxx/14xxxx Class A digital apparatus complies with Canadian ICES-003 Class A.

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### **Additional Resources**

The **latest support files** are always available on the KMC Controls web site (**www.kmccontrols. com**). To see all available files, you will need to log-in to the Partners site



For specifications and accessories, see the BAC-12xxxx/13xxxx/14xxxx Series FlexStat Data Sheet.

For operation, configuration, troubleshooting, and other information, see the **FlexStat Operation Guide**.

For additional wiring, application, and programming information, see the **FlexStat Application Guide**.

For additional instructions on programming, see the Help system for BACstage or TotalControl.







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