Installation Guide (3/6 Outputs)

Quick Start

⚠ 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 outputs).* **If replacing an older 3-input FlexStat, replace the backplate as well. See other installation guides for other models.**

NOTE: BAC-14xx36 series FlexStats were discontinued in August 2021.

To select and use a FlexStat in an application:

1. **Select the appropriate model** for the intended application and options (see the **BAC-12xxxx/13xxxx Series 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)		
	A	B	C
BAC-12xxxx (shown)	1.125 (29)	5.551 (141)	4.192 (106)
BAC-13xxxx/14xxxx	1.437 (36.5)		5.192 (132)

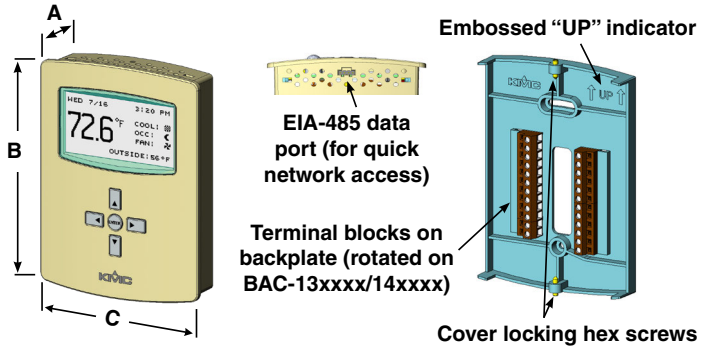


Illustration 1—Dimensions and Installation

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.

⚠ 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.

2. 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 *Connections and Wiring on page 2*.)
6. 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.

⚠ 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).

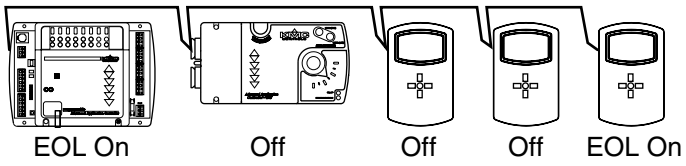


Illustration 2—MS/TP Network End-Of-Line Termination

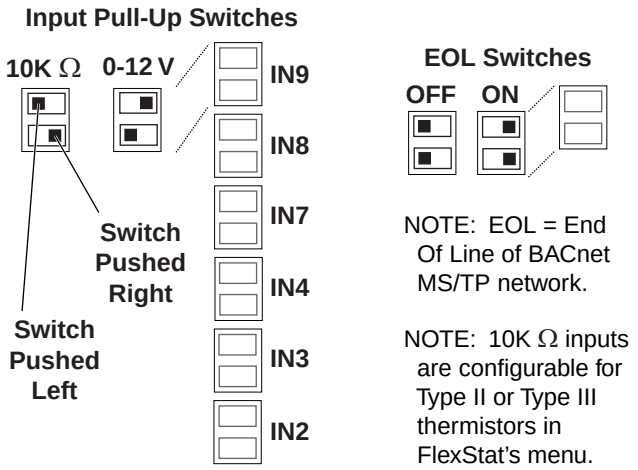


Illustration 3—BAC-12xxxx EOL/Pull-Up Switch Positions

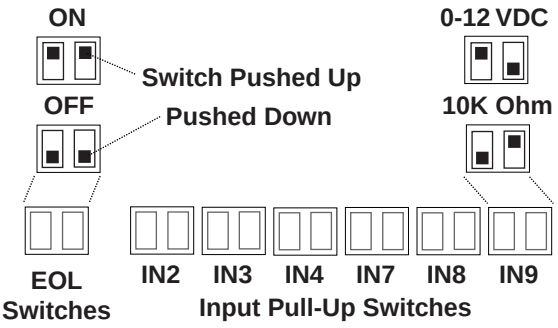


Illustration 4—BAC-13xxxx/14xxxx Switch Positions

⚠ 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 outputs).* **If replacing an older 3-input FlexStat, replace the backplate as well. See other installation guides for other models.**

NOTE: BAC-14xx36 series FlexStats were discontinued in August 2021.

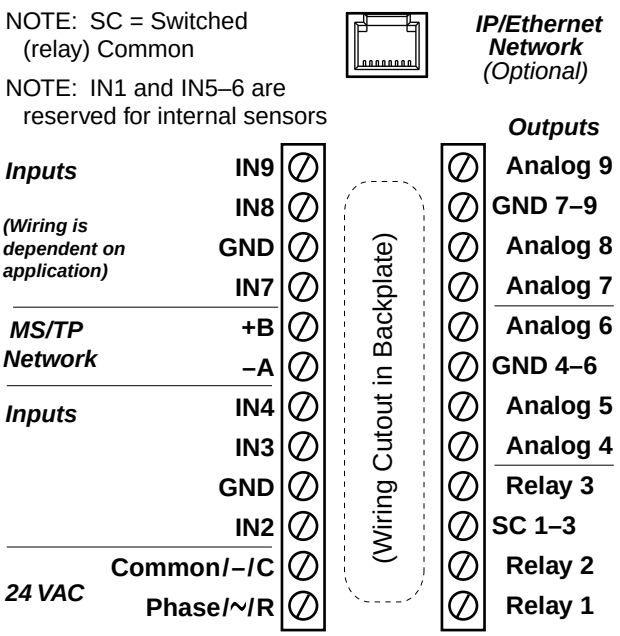


Illustration 5—(BAC-12xx36) Terminals and Connections

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 *Configuration on page 4*). 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** *Applications 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**.

⚠ CAUTION

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

⚠ 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.**

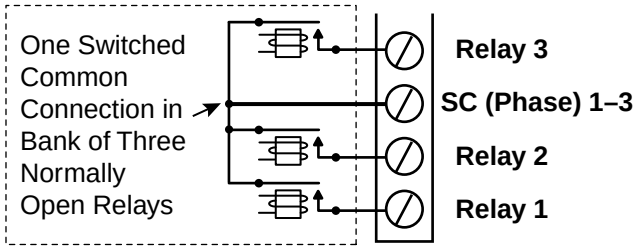


Illustration 6—Switched (Relay) Common and Relays

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

- **Maximum output current** for individual **ANALOG** 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.

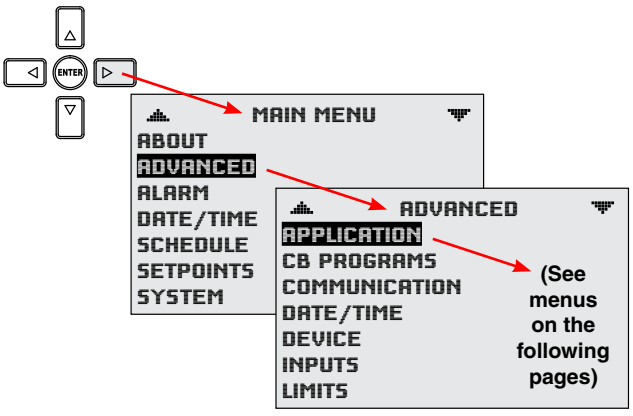


Illustration 7—Configuration Screens

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_2 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

⚠ 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-**12**xx**36**/13xx**36**/14xx**36** series only. See other installation guides for other models.

NOTE: CO_2, 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: Since 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

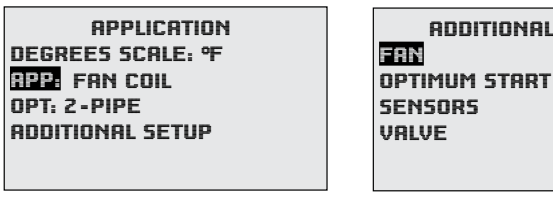
Remove dust as necessary from the holes in the top and bottom. Clean the display with a soft, damp cloth and mild soap.

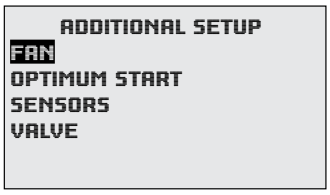
To maintain maximum sensitivity of the built-in motion sensor, occasionally wipe dust or dirt off the lens—but do not use any fluid on the sensor.

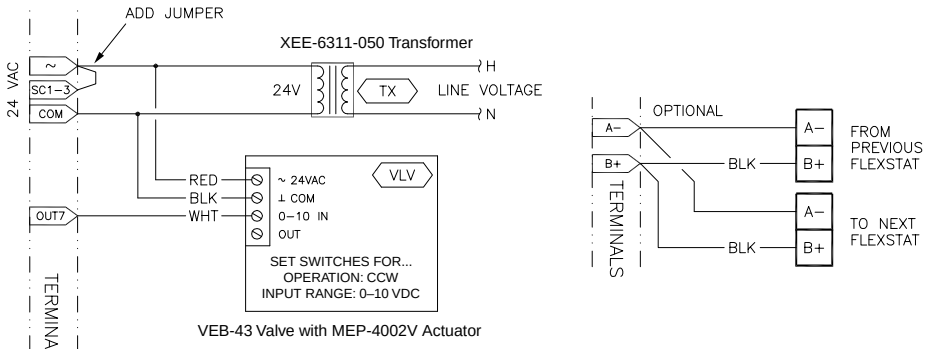
Applications

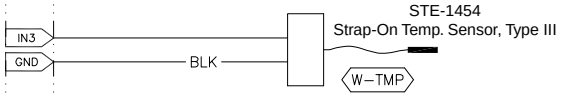
FCU (Fan Coil Unit)—2 Pipe, Modulating

Output Terminals	FCU Output Connections	BACnet Objects
Analog 9		*AO9*
GND	Ground (for analog output terminals 7–9)	
Analog 8		*AO8*
Analog 7	Valve (VLV)	AO7
Analog 6		*AO6*
GND		
Analog 5		*AO5*
Analog 4		*AO4*
Relay 3	Fan 3	BO3
SC 1–3	24 VAC (for relay terminals 1–3)	
Relay 2	Fan 2	BO2
Relay 1	Fan 1	BO1





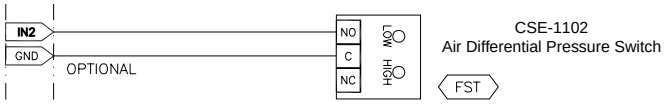




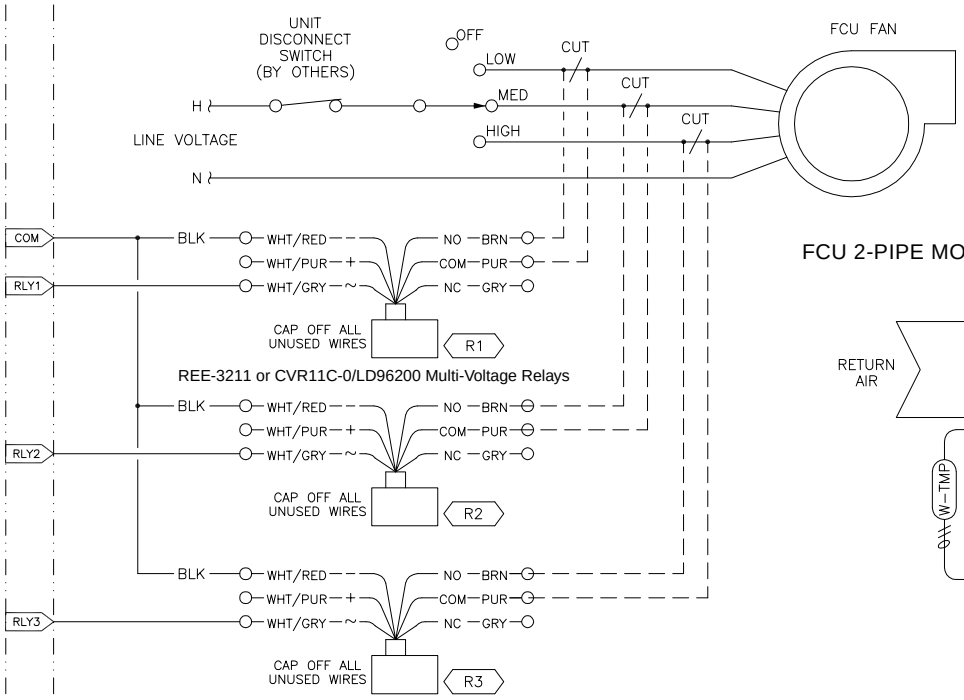
Input Terminals	FCU Input Connections	BACnet Objects
IN9	Opt. Remote CO_2 Sensor*	AI9
IN8		AI8
IN7	Opt. Remote Temp. Sensor*	AI7
IN4		AI4
IN3	Supply Water Temp. (W-TMP)**	AI3
GND	Ground	
IN2	Optional FST*	AI2

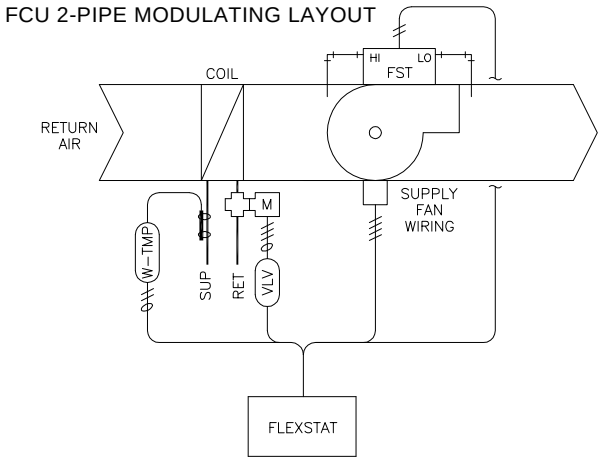
*Fan Status (FST) and (not shown on the diagram) remote temp./CO_2 sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input Connections section).
**Input for Supply Water Temp is typically a 10K,Type III thermistor.

NOTE: In firmware earlier than R2.1.0.18, an option for a DAT on IN2 was available for a built-in trend log. For later firmware, use KMC Connect or TotalControl to create a custom trend if this is desired.



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





FCU—4 Pipe, Modulating

APPLICATION
DEGREES SCALE: °F
APP: FAN COIL
OPT: 4-PIPE
ADDITIONAL SETUP

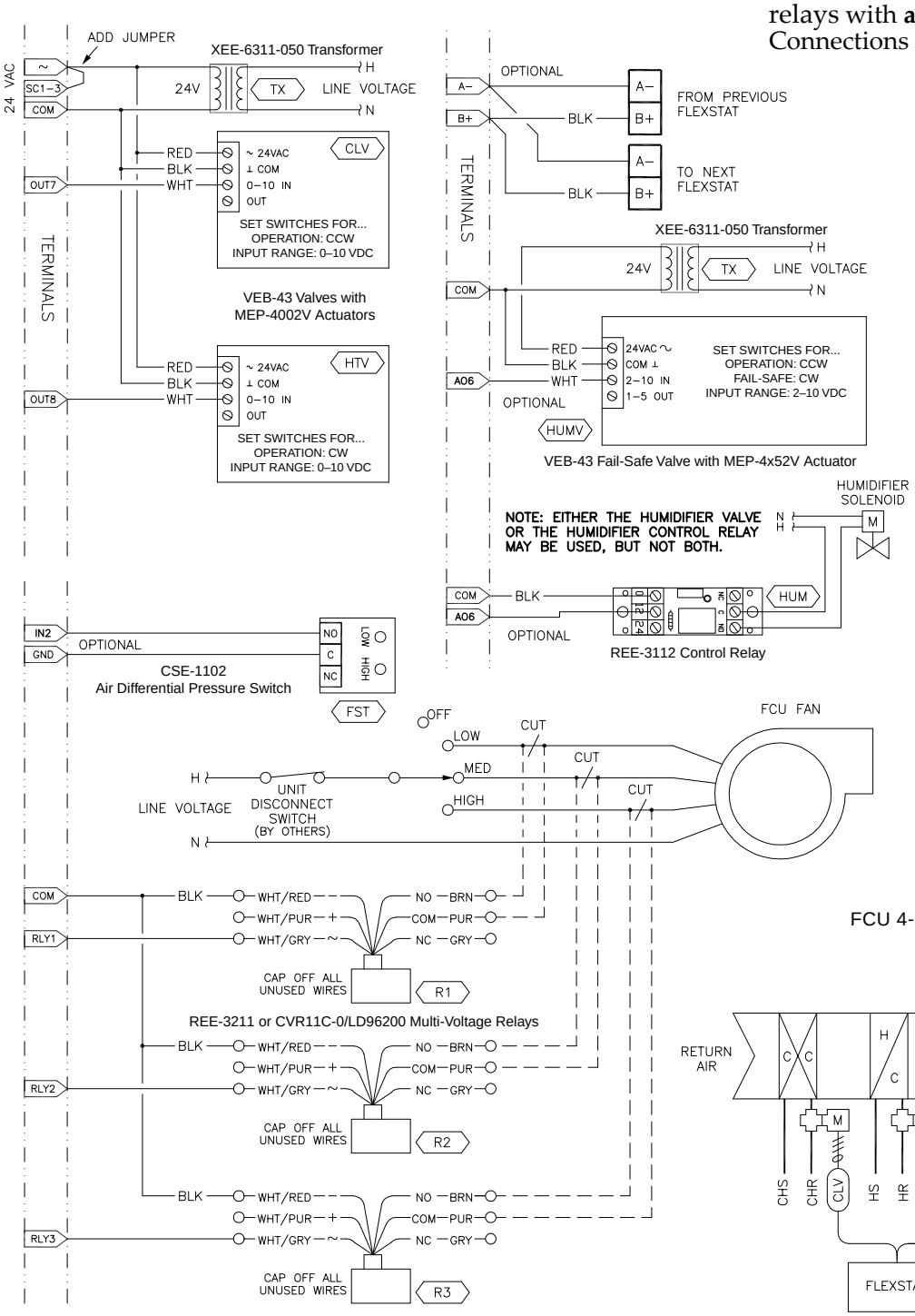
ADDITIONAL SETUP
FAN
HUMIDITY
OPTIMUM START
SENSORS
VALVE

NOTE: In firmware earlier than R2.1.0.18, an option for a DAT on IN2 was available for a built-in trend log. For later firmware, use KMC Connect or TotalControl to create a custom trend if this is desired.

Input Terminals	FCU Input Connections	BACnet Objects
IN9	Opt. Remote CO_2 Sensor*	AI9
IN8		AI8
IN7	Opt. Remote Temp. Sensor*	AI7
IN4		AI4
IN3		AI3
GND	Ground	
IN2	Optional Fan Status (FST)*	AI2

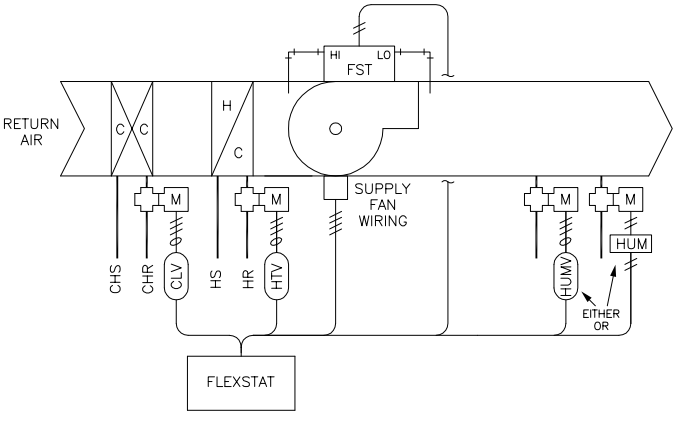
*Fan Status (FST) and (not shown on the diagram) remote temp./CO_2 sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input Connections section).

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



Output Terminals	FCU Output Connections	BACnet Objects
Analog 9		*AO9*
GND	Ground (for analog output terminals 7–9)	
Analog 8	Heat Valve (HTV)	AO8
Analog 7	Cool Valve (CLV)	AO7
Analog 6	Optional Humidification Valve (HUM or HUMV)	AO6
GND	Ground (for analog output terminals 4–6)	
Analog 5		*AO5*
Analog 4		*AO4*
Relay 3	Fan 3	BO3
SC 1–3	24 VAC (for relay terminals 1–3)	
Relay 2	Fan 2	BO2
Relay 1	Fan 1	BO1

FCU 4-PIPE MODULATING LAYOUT



AHU (Air Handler Unit)—1 Heat and 1 Cool

APPLICATION
DEGREES SCALE: °F
APP: AIR HANDLER
OPT: 1H/1C
ADDITIONAL SETUP

ADDITIONAL SETUP
DAMPER
FAN
HUMIDITY
OPTIMUM START
SENSORS

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

NOTE: For MAT sensor use with firmware earlier than R2.1.0.18, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

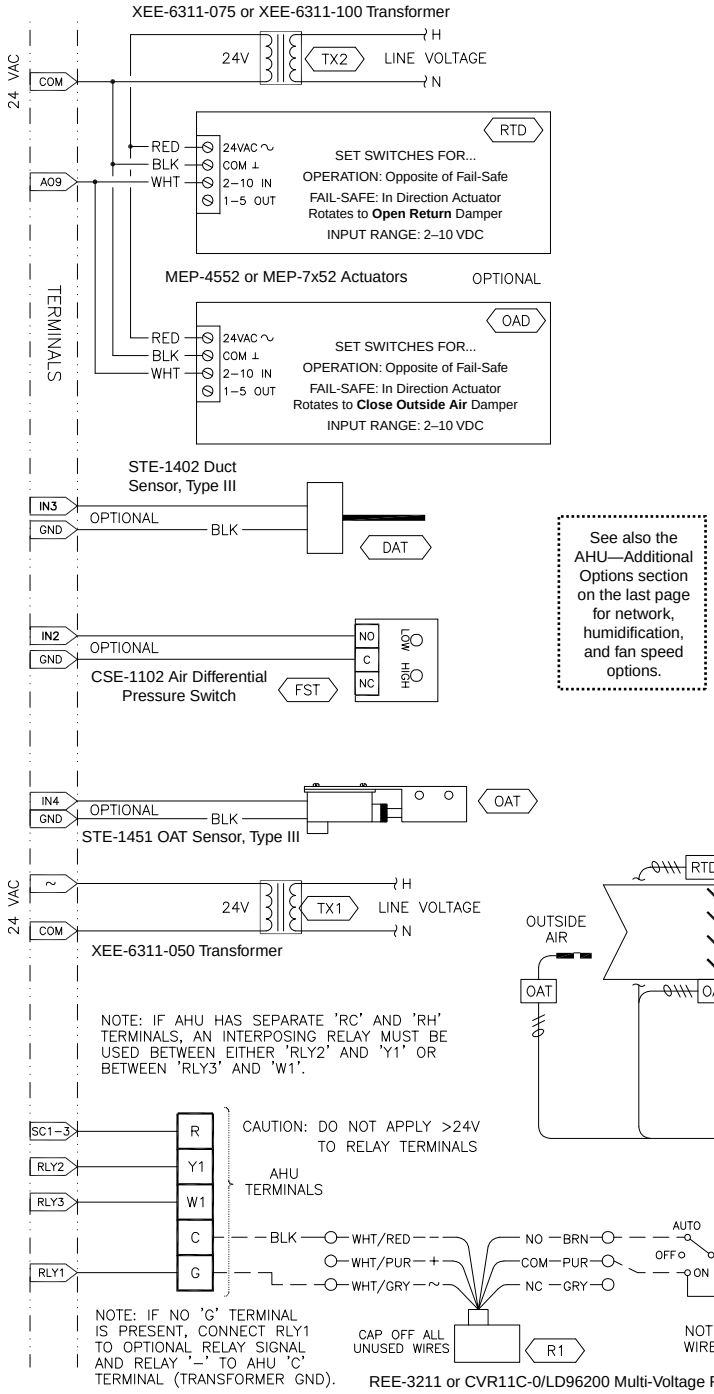
Input Terminals	AHU Input Connections	BACnet Objects
IN9	Opt. Remote CO_2 Sensor*	AI9
IN8		AI8
IN7	Opt. Remote Temp. Sensor*	AI7
IN4	Opt. Outside Air Temp. (OAT)**	AI4
IN3	Opt. Discharge Air Temp. (DAT)**	AI3
GND	Ground	
IN2	Optional Fan Status (FST)*	AI2

*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown on the diagram) remote temp./CO_2 sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input Connections section).

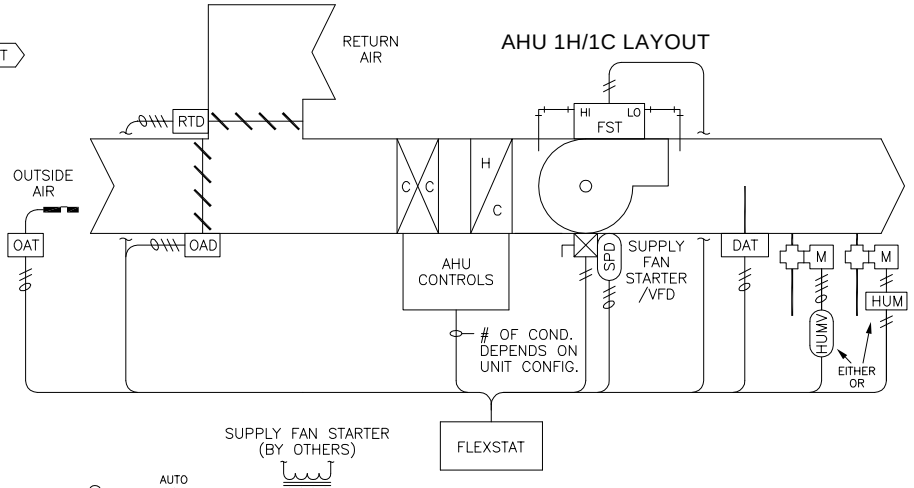
**When using the optional Outside Air Damper, DAT/OAT inputs must also be connected.

Output Terminals	AHU Output Connections	BACnet Objects
Analog 9	Optional Outside Air Damper (OAD/RTD)*	AO9
GND	Ground (for analog output terminals 7–9)	
Analog 8		*AO8*
Analog 7		*AO7*
Analog 6	Optional Humidification Valve (HUM or HUMV)	AO6
GND	Ground (for analog output terminals 4–6)	
Analog 5		*AO5*
Analog 4	Optional Fan Speed	AO4
Relay 3	Heat 1 (W1)	BO3
SC 1–3	24 VAC (for relay terminals 1–3)	
Relay 2	Cool 1 (Y1)	BO2
Relay 1	Fan 1 (G)	BO1

*If optional Outside Air Damper is used, must also have DAT/OAT inputs.



See also the AHU—Additional Options section on the last page for network, humidification, and fan speed options.



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
STAGING

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

NOTE: For MAT sensor use with firmware earlier than R2.1.0.18, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

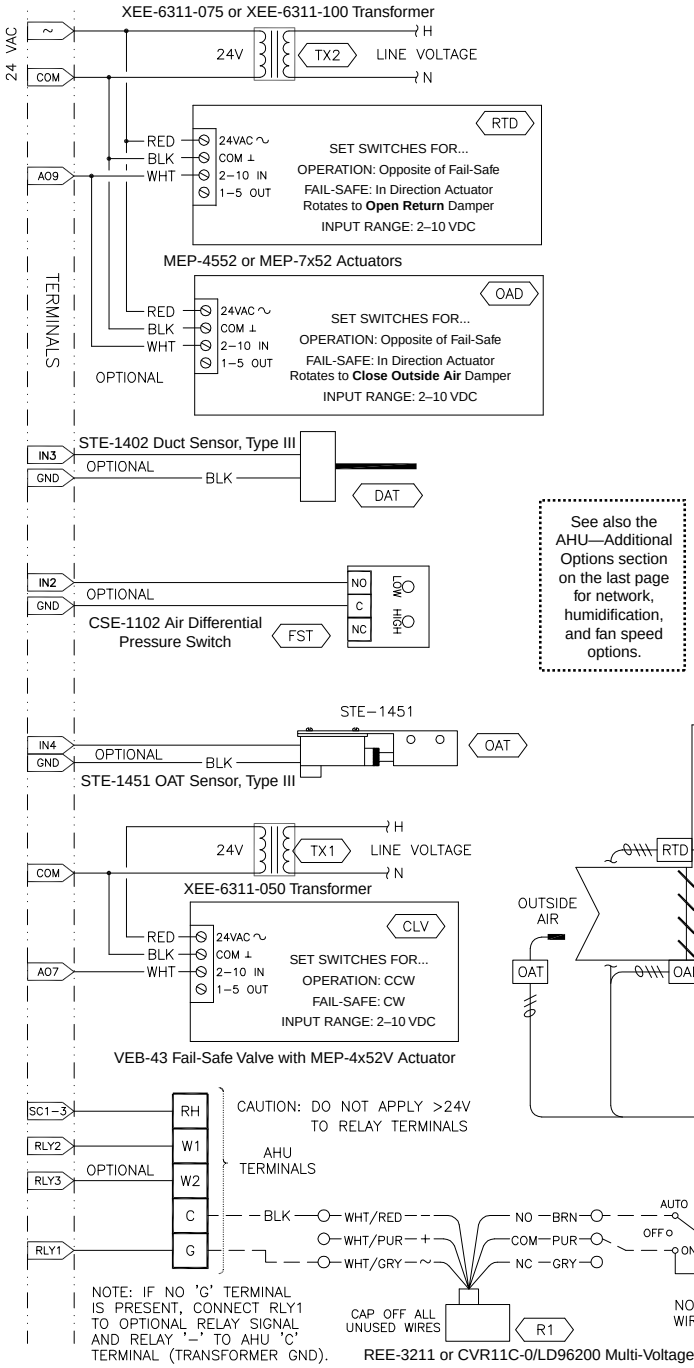
Input Terminals	AHU Input Connections	BACnet Objects
IN9	Opt. Remote CO_2 Sensor*	AI9
IN8		AI8
IN7	Opt. Remote Temp. Sensor*	AI7
IN4	Opt. Outside Air Temp. (OAT)**	AI4
IN3	Opt. Discharge Air Temp. (DAT)**	AI3
GND	Ground	
IN2	Optional FST*	AI2

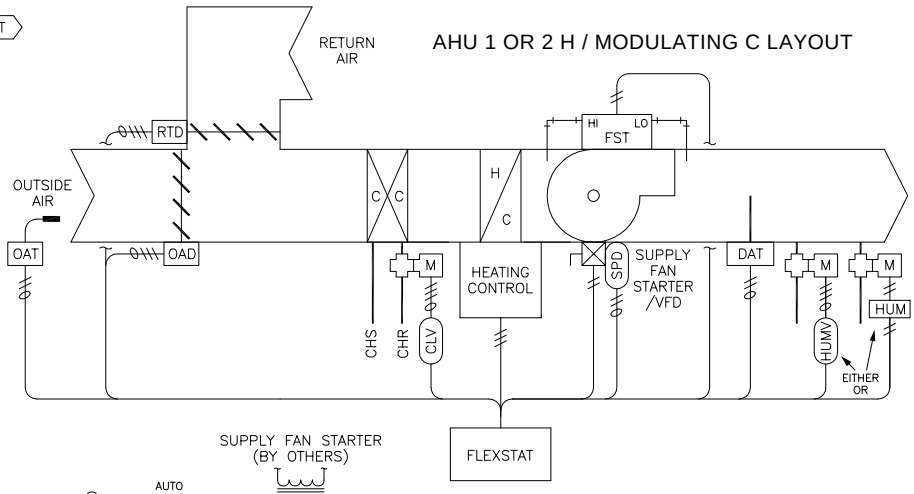
*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown on the diagram) remote temp./CO_2 sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input Connections section).

**When using the optional Outside Air Damper, DAT/OAT inputs must also be connected.

Output Terminals	AHU Output Connections	BACnet Objects
Analog 9	Optional Outside Air Damper (OAD/RTD)*	AO9
GND	Ground (for analog output terminals 7–9)	
Analog 8		*AO8*
Analog 7	Cooling Valve (CLV)	AO7
Analog 6	Optional Humidifier Valve (HUM or HUMV)	AO6
GND	Ground (for analog output terminals 4–6)	
Analog 5		*AO5*
Analog 4	Optional Fan Speed	AO4
Relay 3	Optional Heat 2 (W2)	BO3
SC 1–3	24 VAC (for relay terminals 1–3)	
Relay 2	Heat 1 (W1)	BO2
Relay 1	Fan 1 (G)	BO1

*If optional Outside Air Damper is used, must also have DAT/OAT inputs.





AHU—Modulating Heat and 1 or 2 Cool

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

ADDITIONAL SETUP
DAMPER
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.

NOTE: For MAT sensor use with firmware earlier than R2.1.0.18, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

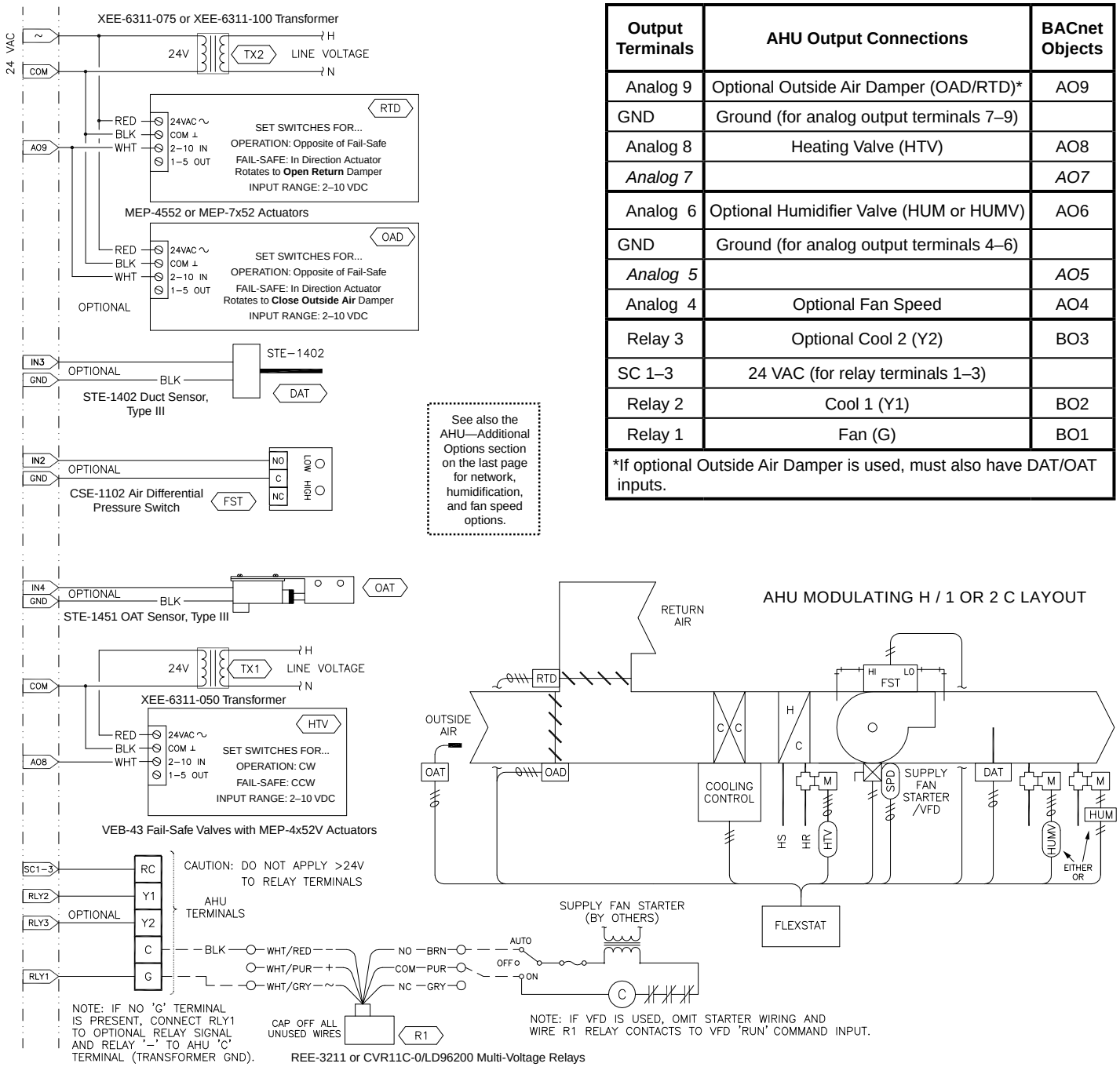
Input Terminals	AHU Input Connections	BACnet Objects
IN9	Opt. Remote CO_2 Sensor*	AI9
IN8		AI8
IN7	Opt. Remote Temp. Sensor*	AI7
IN4	Opt. Outside Air Temp. (OAT)**	AI4
IN3	Opt. Discharge Air Temp. (DAT)**	AI3
GND	Ground	
IN2	Optional FST*	AI2

*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown on the diagram) remote temp./CO_2 sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input Connections section).

**When using the optional Outside Air Damper, DAT/OAT inputs must also be connected.

Output Terminals	AHU Output Connections	BACnet Objects
Analog 9	Optional Outside Air Damper (OAD/RTD)*	AO9
GND	Ground (for analog output terminals 7–9)	
Analog 8	Heating Valve (HTV)	AO8
Analog 7		*AO7*
Analog 6	Optional Humidifier Valve (HUM or HUMV)	AO6
GND	Ground (for analog output terminals 4–6)	
Analog 5		*AO5*
Analog 4	Optional Fan Speed	AO4
Relay 3	Optional Cool 2 (Y2)	BO3
SC 1–3	24 VAC (for relay terminals 1–3)	
Relay 2	Cool 1 (Y1)	BO2
Relay 1	Fan (G)	BO1

*If optional Outside Air Damper is used, must also have DAT/OAT inputs.



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*.

NOTE: For MAT sensor use with firmware earlier than R2.1.0.18, see the **FlexStat Economizer Change of MAT to DAT Service Bulletin** available on the KMC Partners web site.

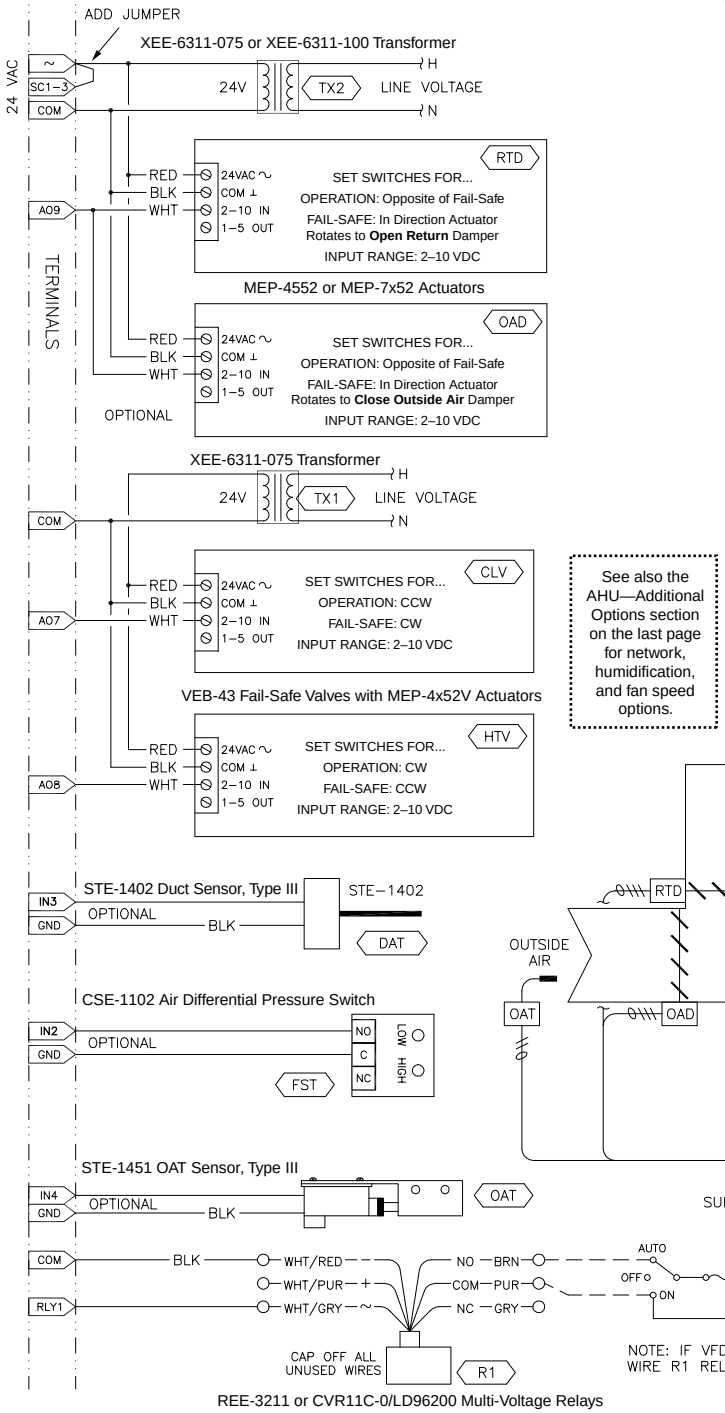
Input Terminals	AHU Input Connections	BACnet Objects
IN9	Opt. Remote CO_2 Sensor*	AI9
IN8		AI8
IN7	Opt. Remote Temp. Sensor*	AI7
IN4	Opt. Outside Air Temp. (OAT)**	AI4
IN3	Opt. Discharge Air Temp. (DAT)**	AI3
GND	Ground	
IN2	Optional FST or DAT*	AI2

*Fan Status (FST), Discharge Air Temperature (DAT), and (not shown on the diagram) remote temp./CO_2 sensors are optional inputs. Set pull-up resistor switch positions appropriately (see the Input Connections section).

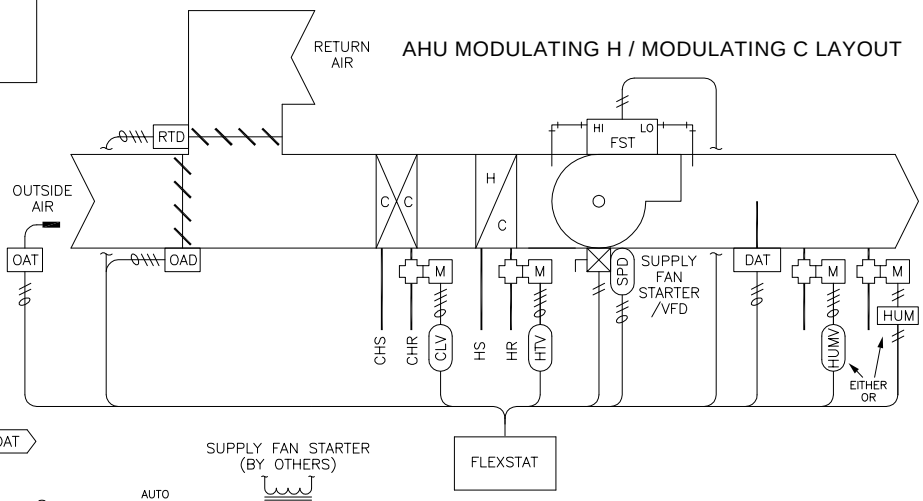
**When using the optional Outside Air Damper, DAT/OAT inputs must also be connected.

Output Terminals	AHU Output Connections	BACnet Objects
Analog 9	Optional Outside Air Damper (OAD/RTD)*	AO9
GND	Ground (for analog output terminals 7–9)	
Analog 8	Heating Valve (HTV)	AO8
Analog 7	Cooling Valve (CLV)	AO7
Analog 6	Optional Humidifier Valve (HUM or HUMV)	AO6
GND	Ground (for analog output terminals 4–6)	
Analog 5		*AO5*
Analog 4	Optional Fan Speed	AO4
Relay 3		*BO3*
SC 1–3	24 VAC (for relay terminals 1–3)	
Relay 2		*BO2*
Relay 1	Fan	BO1

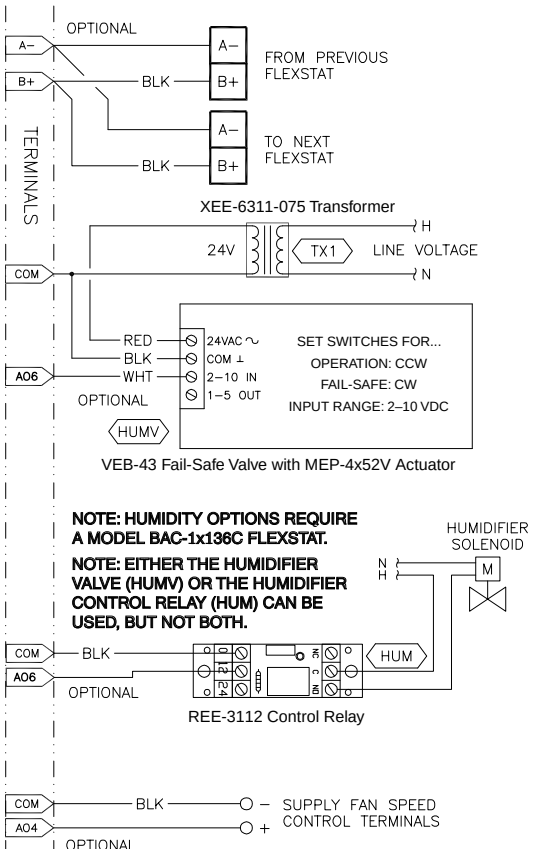
*If optional Outside Air Damper is used, must also have DAT/OAT inputs.



REE-3211 or CVR11C-0/LD96200 Multi-Voltage Relays



AHU—Additional Options



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

Important Notices

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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.

⚠ 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 of the new FlexStat will be damaged.

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 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 KMC Connect, TotalControl, or KMC Converge.

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