

# Installation Guide (6/3 Outputs)

## Quick Start

The KMC FlexStat series of intelligent temperature/humidity-sensing, wall-mounted, thermostat/controllers are native BACnet Advanced Application Controllers (B-AAC) for use in a BACnet system. The FlexStat simplifies networked zone control for common packaged HVAC equipment by including an on-board library of programs that permits rapid configuration of a wide range of HVAC control applications.

### To use the FlexStat:

1. Mount and wire the unit (see this Installation 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 ([www.kmccontrols.com](http://www.kmccontrols.com)) for the latest documents and firmware. For installation instructions of FlexStats with output configurations other than 6 relays and 3 analog outputs, see that model's respective installation guide.

2. Configure/program the unit (see the FlexStat Operation and Application Guides).
3. If necessary, troubleshoot any issues (see the FlexStat Operation Guide).
4. Operate the unit (see the FlexStat Operation Guide).

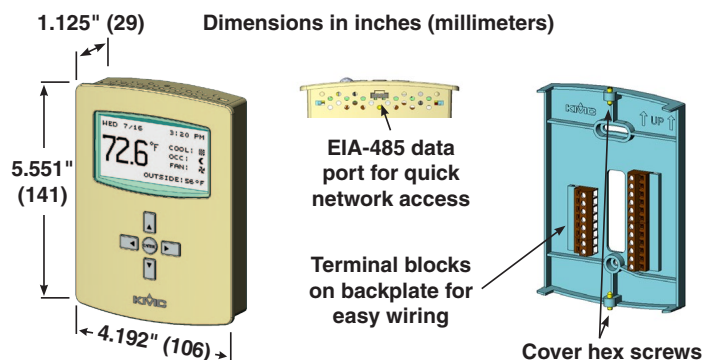


Illustration 1—Dimensions and Connections

## 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).** (See the Application Guide for more information.)

**Additionally, for a model with an occupancy sensor option, be sure to install it where it will have unobstructed view of the most typical traffic area** (see the 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.
2. Turn the hex screws in the bottom and top of the FlexStat **clockwise** until they 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 toward the ceiling, fasten the backplate directly to a **vertical** 2 x 4 inch wall handy-box. (For horizontal or 4 x 4 applications, use the HMO-10000 wall mounting plate.)
5. Make the appropriate connections to the terminal blocks. (See the Connections and Wiring section.)
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.

### ⚠ CAUTION

To prevent mounting screw heads from touching the circuit board in the thermostat, use only the mounting screws supplied by KMC Controls. Using screws other than the type supplied may damage the FlexStat.

**NOTE:** This document is for 6 relay and 3 analog output BAC-1xx63 series only. See other installation guides for the proper FlexStat series.

# 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!
- 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.
- 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.
- Using multiple conductor wires for all inputs (e.g., six 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.

## MS/TP Wiring

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 4.) 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 the EIA-485 wiring segment must have end-of-line termination installed for proper network operation. (See Illustrations 2 and 3.) If a FlexStat is at the physical **end** of the MS/TP network line, set **both** the EOL termination switches (**1 and 2**) to **On** (to the **right**) on the back of the circuit board. If not on the end, ensure that both switches are Off (left).

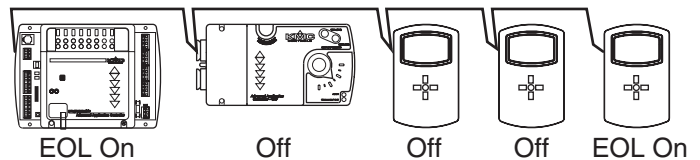


Illustration 2—MS/TP Network End-Of-Line Termination

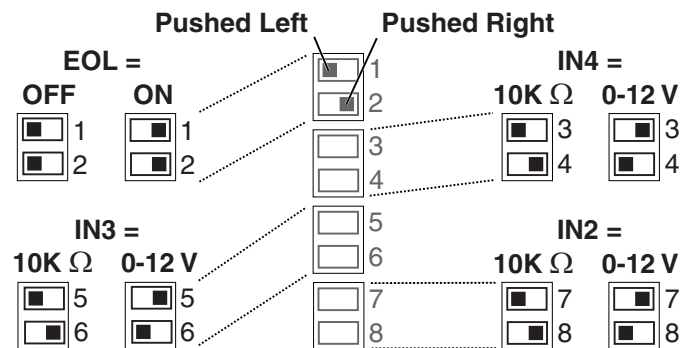


Illustration 3—EOL and Pull-Up Switch Resistor Positions

**NOTE:** IN1 is the room temp. sensor AI1

**NOTE:** SC = Switched (Relay) Common

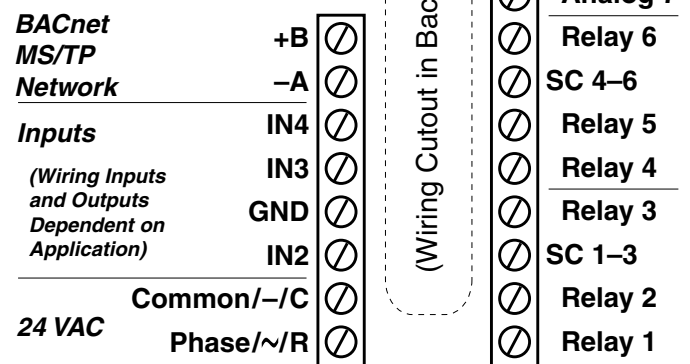


Illustration 4—(BAC-1xx63C) Terminals and Connections

## Input Connections

Passive input devices require pull-up resistors in the circuit. For **passive** input devices (e.g., switch contacts and Type III 10K ohm thermistors) on IN2 through IN4, 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 and 4.)

**NOTE:** Unlike the EOL switch pairs (1-2), the **INPUT switch pairs (3-4, 5-6, and 7-8) must NOT have both switches set to the left or both set to the right**—if switch 3 is set to the left, for example, switch 4 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 positions even if a switch pair has no input connected!** A single incorrect switch position may cause errors in multiple inputs.

**NOTE:** For more information on wiring specific applications (AHU, FCU, HPU, RTU), see the **Applications** section starting on page 4. (These applications are the packaged programs selectable from the Advanced > Application menu in the BAC-1xx63C models.) See also the FlexStat Application Guide on [www.kmccontrols.com](http://www.kmccontrols.com).

**NOTE:** FlexStat inputs do not support 1K ohm RTDs. To use a 4–20 current loop input or map analog inputs as binary values, see the FlexStat Application Guide.

## 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 4). 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 5).

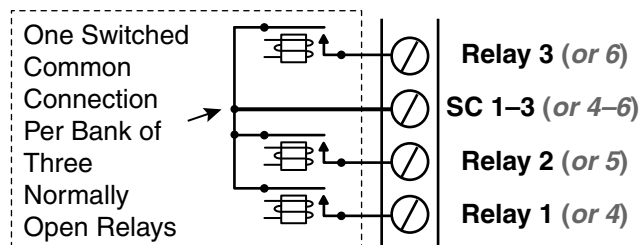


Illustration 5—Switched (Relay) Common and Relays

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

- **Maximum output current** for individual ANALOG outputs (7–9) 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 per bank of 3 relays** (relays 1–3 and 4–6).

For example, KMC REE-3111/3112 relays could be connected to the analog outputs, but **REE-3211/3221/3213 relays would exceed the FlexStat’s analog output capacity** (although the REE-3211 can be used with the FlexStat’s internal relays 1–6 as shown in the following applications pages).

FlexStat relays 1–6 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.)

### ⚠ 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.

## 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 4.) Power is applied to the FlexStat when the transformer is plugged in.

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.

## Accessories

HMO-10000	Horizontal or 4 x 4 handy box wall mounting plate, light almond
HMO-10000W	HMO-10000 in white
HPO-0044	Replacement cover hex screw
HTO-1103	FlexStat firmware flash upgrade kit
KMD-5567	Network surge suppressor
KMD-5575	Network repeater/isolator
KMD-5576	EIA-485 to USB Communicator
KMD-5624	PC data port (EIA-485) cable (FlexStat to USB Communicator)—included with the KMD-5576 (buy for third-party EIA-232 interfaces)
SP-001	Flat blade and hex end screwdriver (with KMC logo) for cover hex screws
XEE-6111-040	Transformer, 120-to-24 VAC, 40 VA, <b>single</b> -hub
XEE-6112-040	Transformer, 120-to-24 VAC, 40 VA, <b>dual</b> -hub

## 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.

**Humidity and motion sensor options are dependent on the FlexStat model. For operation, configuration, troubleshooting, and other information, see the FlexStat Operation Guide.**

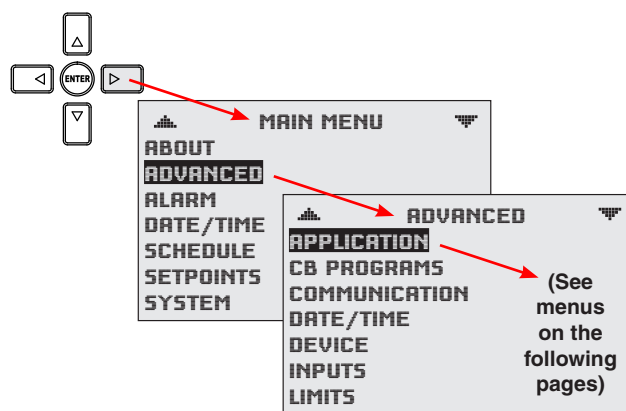


Illustration 6—Configuration Screens

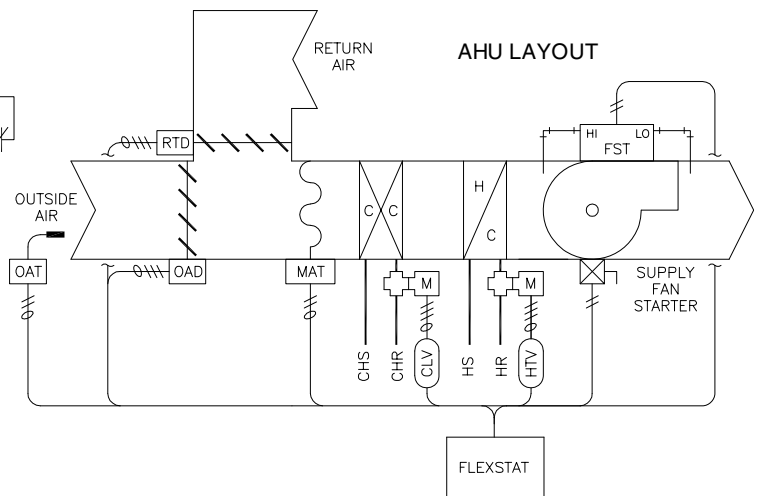
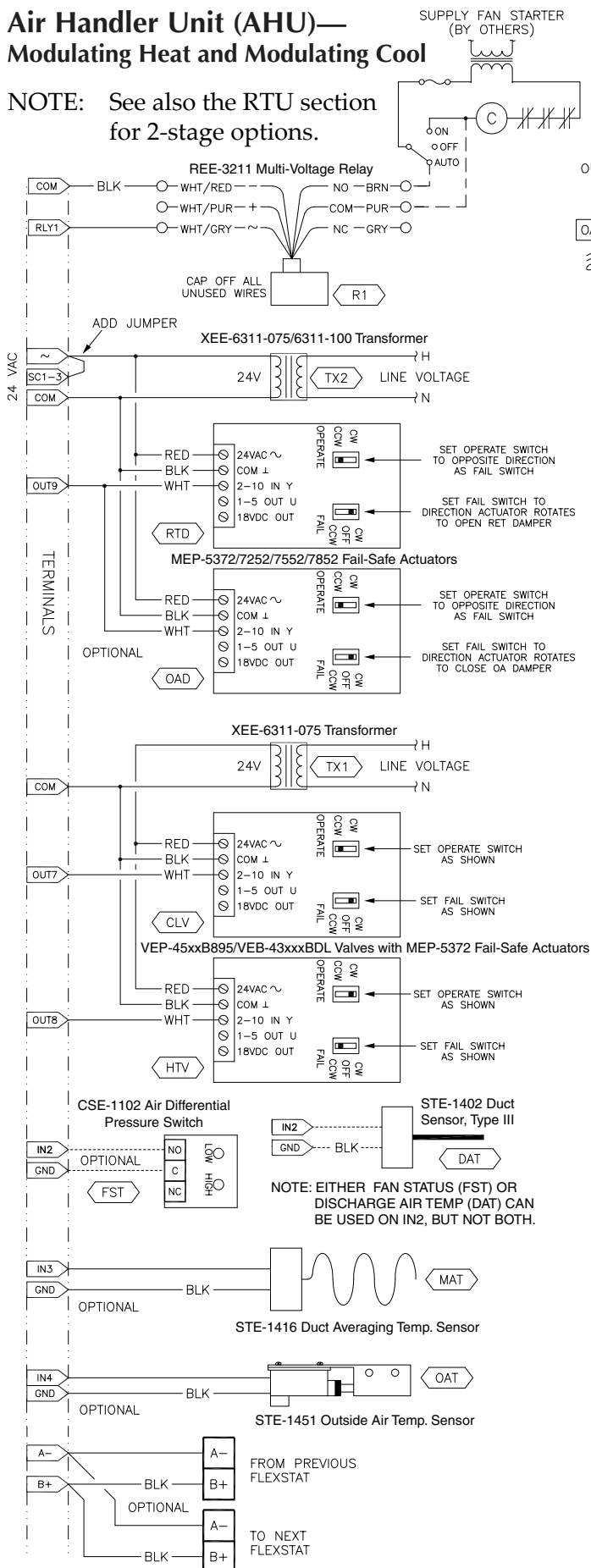
**NOTE:** Applications on pages 5–9 are the packaged programs selectable from the Advanced > Application menu in the BAC-1xx63C (only) models. Other FlexStat models have other applications. Humidity and motion sensor options are dependent on the FlexStat model.



# Applications

## Air Handler Unit (AHU)— Modulating Heat and Modulating Cool

NOTE: See also the RTU section for 2-stage options.



**APPLICATION**  
DEGREES SCALE: °F  
APP: AIR HANDLER  
ADDITIONAL SETUP

**ADDITIONAL SETUP**  
DAMPER  
FAN  
HUMIDITY  
SENSORS  
VALVE

Input Terminals	AHU Input Connections	BACnet Objects
IN4	Opt. Outside Air Temp. (OAT)*	AI4
IN3	Opt. Mixed Air Temp. (MAT)*	AI3
GND	Ground	
IN2	Optional FST or DAT**	AI2

\*When using optional Outside Air Damper, must also have MAT/OAT inputs (typically 10K, Type III thermistors). Ensure pull-up resistor switch positions are set properly—see Illustration 3 on page 2.

\*\*Fan Status (FST) or Discharge Air Temperature (DAT) is an optional, selectable input. Ensure pull-up resistor switch positions are set properly (10K position) for the relay, switch, or Type III thermistor.

Output Terminals	AHU Output Connections (Modulating)	BACnet Objects
Analog 9	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
Relay 6		(BO6)
SC 4–6		
Relay 5		(BO5)
Relay 4		(BO4)
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 MAT/OAT inputs.

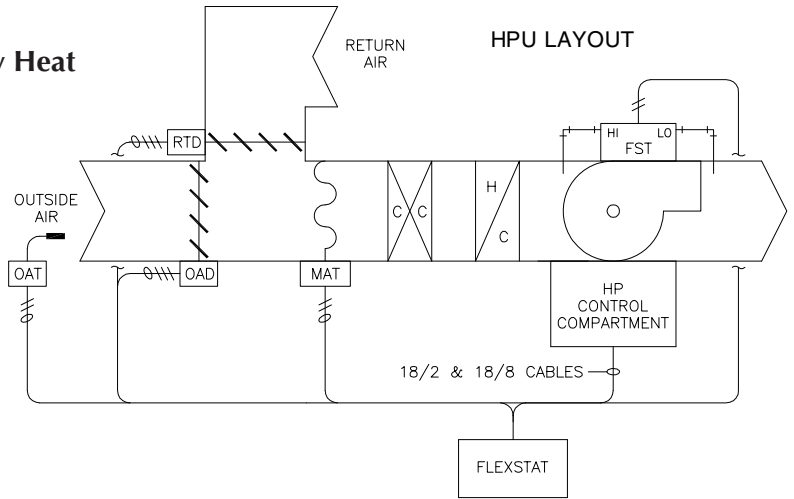
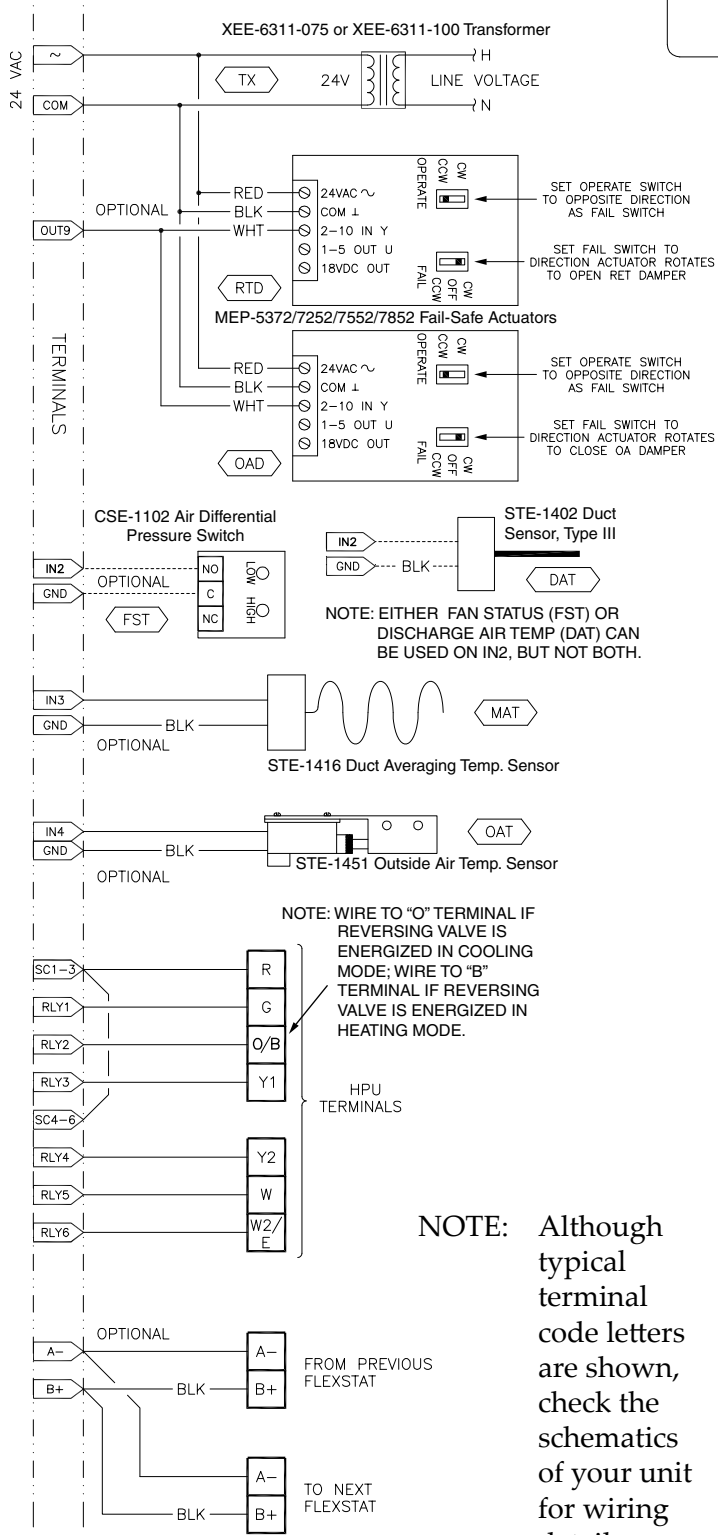
NOTE: Connections and menus reflect firmware version R1.3.0.4 or later.

# Heat Pump Unit (HPU)— 1 or 2 Compressors with Auxiliary and Emergency Heat

## ⚠ 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.



APPLICATION

DEGREES SCALE: °F

APP: HEAT PUMP

OPT: 1 STAGE

ADDITIONAL SETUP

ADDITIONAL SETUP

AUX HEAT

DAMPER

FAN

HUMIDITY

SENSORS

VALVE

NOTE: To see Humidity options in the Additional Setup menu, select an Aux. Heat option other than None (the default).

Input Terminals	HPU Input Connections	BACnet Objects
IN4	Opt. Outside Air Temp. (OAT)*	AI4
IN3	Opt. Mixed Air Temp. (MAT)*	AI3
GND	Ground	
IN2	Optional FST or DAT**	AI2

\*When using optional Outside Air Damper, must also have MAT/OAT inputs (typically 10K, Type III thermistors). Ensure pull-up resistor switch positions are set properly—see Illustration 3 on page 2.

\*\*Fan Status (FST) or Discharge Air Temperature (DAT) is an optional, selectable input. Ensure pull-up resistor switch positions are set properly (10K position) for the relay, switch, or Type III thermistor.

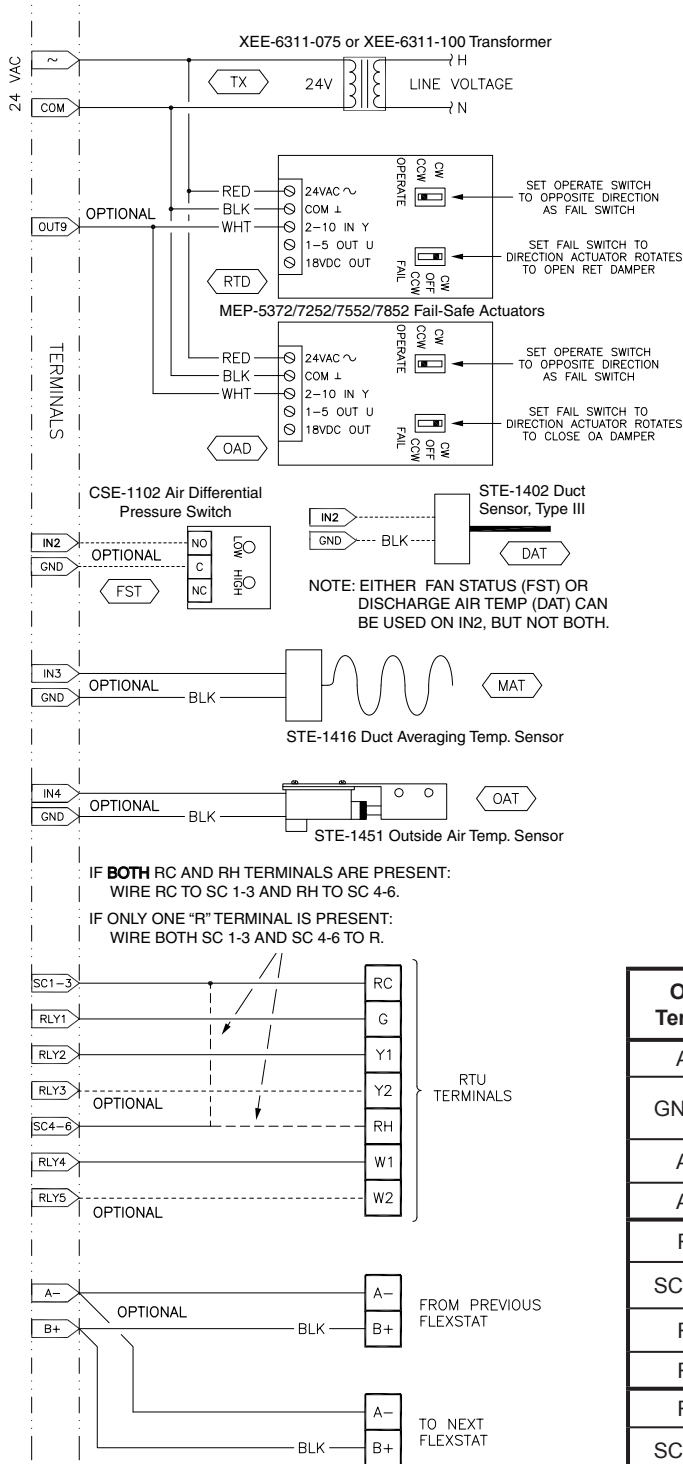
Output Terminals	Typical Terminal Codes	HPU Output Connections	BACnet Objects
Analog 9		Outside Air Damper (OAD/RTD)*	AO9
GND		Ground (for analog output terminals 7–9)	
Analog 8			(AO8)
Analog 7			(AO7)
Relay 6	W2/E	Emergency Heat (Optional)	BO6
SC 4–6	R	24 VAC (for relay terminals 4–6)	
Relay 5	W	Auxiliary Heat (Optional)	BO5
Relay 4	Y2	Compressor 2 (Optional)	BO4
Relay 3	Y1	Compressor 1	BO3
SC 1–3	R	24 VAC (for relay terminals 1–3)	
Relay 2	O/B	Reversing Valve (see O/B Note in schematic)	BO2
Relay 1	G	Fan	BO1

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

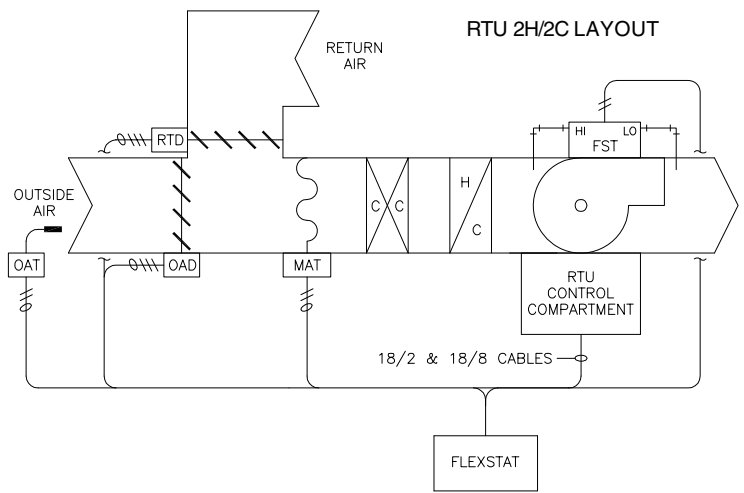
NOTE: Although typical terminal code letters are shown, check the schematics of your unit for wiring details.

## Roof Top Unit (RTU)— 1 or 2 Heat and 1 or 2 Cool

**NOTE:** Terminal connections and menus reflect firmware version R1.3.0.4 or later. (Relay 3 and 4 were swapped in versions earlier than R0.0.0.0.)



**NOTE:** This was 2 Heat and 2 Cool in firmware R1.3.04 and earlier. Multistage was added later.



**APPLICATION**  
DEGREES SCALE: °F  
APP: ROOF TOP  
OPT: 1H/1C  
ADDITIONAL SETUP

**ADDITIONAL SETUP**  
DAMPER  
FAN  
HUMIDITY  
SENSORS

**NOTE:** Although typical terminal code letters are shown, check the schematics of your unit for wiring details.

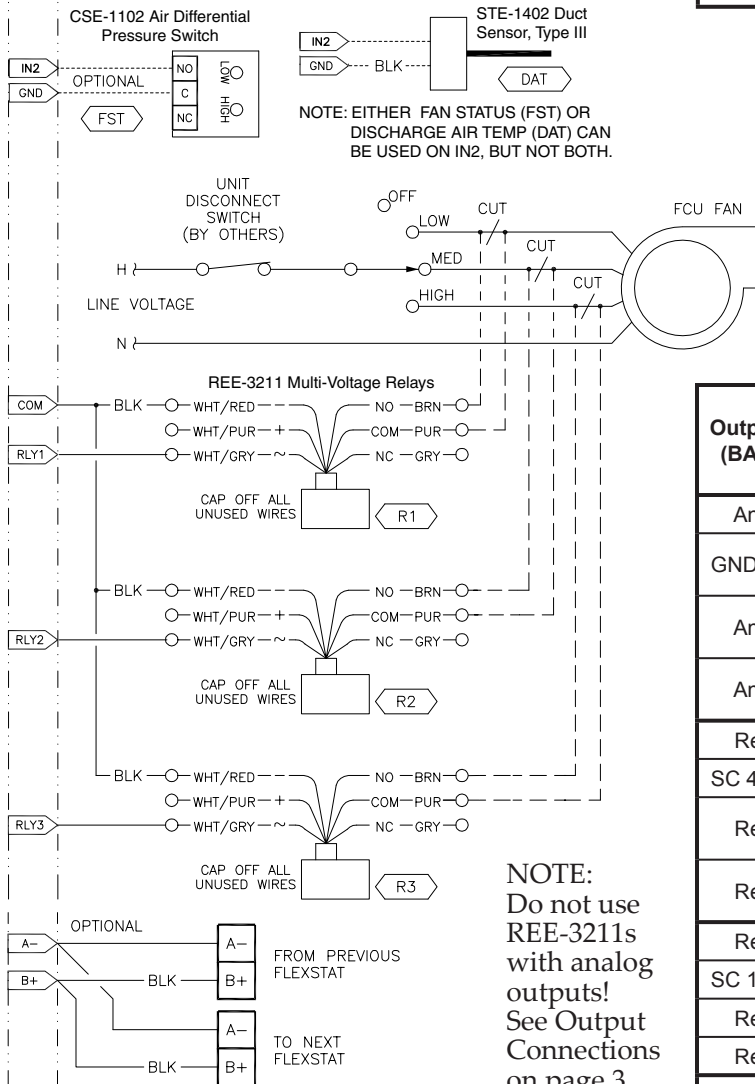
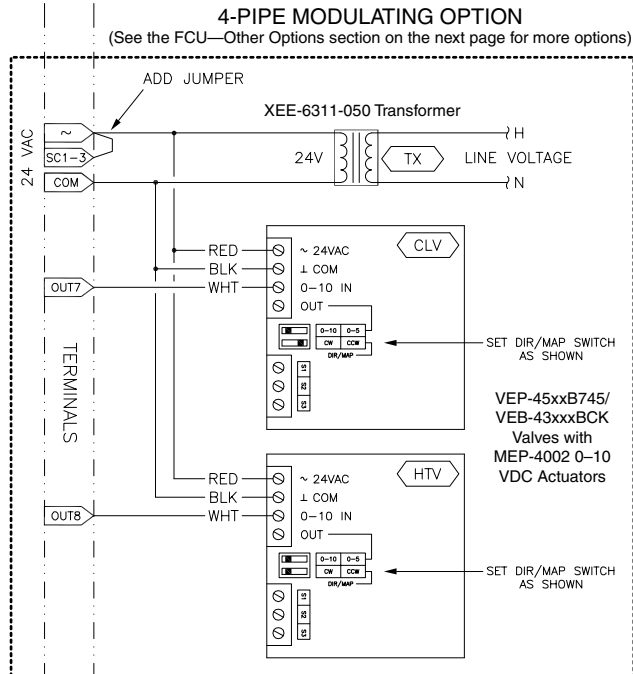
Input Terminals	RTU Input Connections	BACnet Objects
IN4	Opt. Outside Air Temp. (OAT)*	AI4
IN3	Opt. Mixed Air Temp. (MAT)*	AI3
GND	Ground	
IN2	Optional FST or DAT**	AI2

\*When using optional Outside Air Damper, must also have MAT/OAT inputs (typically 10K, Type III thermistors). Ensure pull-up resistor switch positions are set properly—see Illustration 3 on page 2.  
\*\*Fan Status (FST) or Discharge Air Temperature (DAT) is an optional, selectable input. Ensure pull-up resistor switch positions are set properly (10K position) for the relay, switch, or Type III thermistor.

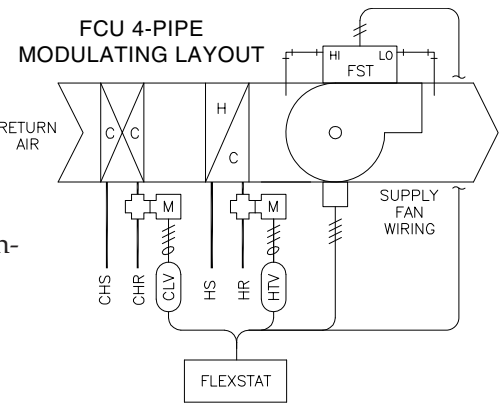
Output Terminals	Typical Terminal Codes	RTU Output Connections (1 or 2 H and 1 or 2 C)	BACnet Objects
Analog 9		Outside Air Damper (OAD/RTD)*	AO9
GND		Ground (for analog output terminals 7–9)	
Analog 8			(AO8)
Analog 7			(AO7)
Relay 6			(BO6)
SC 4–6	RH/R	24 VAC (for relay terminals 4–6)	
Relay 5	W2	Heat 2 (Optional)	BO5
Relay 4	W1	Heat 1	BO4
Relay 3	Y2	Cool 2 (Optional)	BO3
SC 1–3	RC/R	24 VAC (for relay terminals 1–3)	
Relay 2	Y1	Cool 1	BO2
Relay 1	G	Fan	BO1

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

# Fan Coil Unit (FCU)— 2 or 4 Pipe, Modulating or 2 Position



**NOTE:**  
Do not use REE-3211s with analog outputs!  
See Output Connections on page 3.



**NOTE:**  
Humidity and occupancy sensor options are dependent on FlexStat model.

Input Terminals	FCU Input Connections	BACnet Objects
IN4		(A14)
IN3	Supply Water Temp. (W-TMP)*	AI3
GND	Ground	
IN2	Optional FST or DAT**	AI2

\*Input for Supply Water Temp is typically a 10K, Type III thermistor. Ensure pull-up resistor switch positions are set properly—see Illustration 3 on page 2.  
\*\*Fan Status (FST) or Discharge Air Temp (DAT) is an optional, selectable input. Ensure pull-up resistor switch positions are set properly (10K position) for the relay, switch, or Type III thermistor.

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

**NOTE:** To see Humidity options in the Additional Setup menu, select the 4-Pipe option.

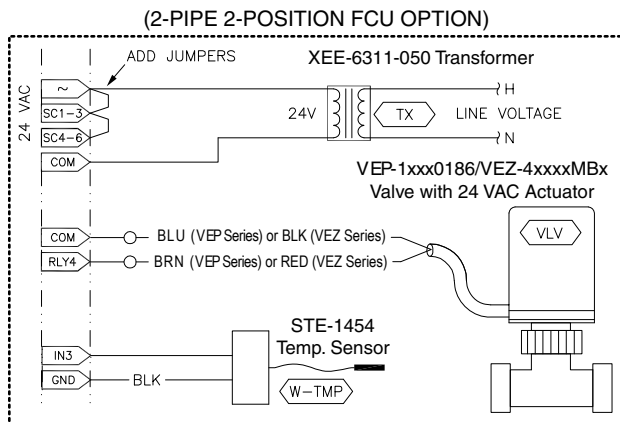
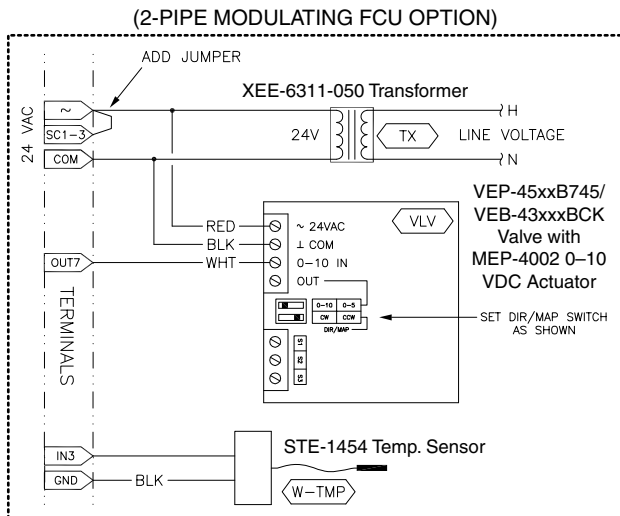
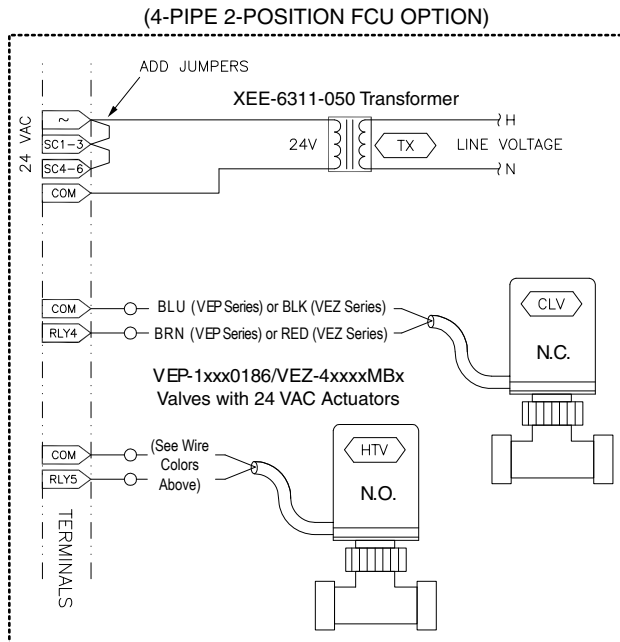
Output Terminals (BAC-1xxx63C)	FCU Output Connections		BACnet Objects
	2-Pipe	4-Pipe	
Analog 9			(A09)
GND	Ground (for analog output terminals 7–9)		
Analog 8		Heat Valve, Proportional (HTV)	AO8
Analog 7	Valve, Proportional (VLV)	Cool Valve, Proportional (CLV)	AO7
Relay 6			(BO6)
SC 4–6	24 VAC (for relay terminals 4–6)		
Relay 5		Heat Valve, 2-Position (HTV)	BO5
Relay 4	Valve, 2-Position (VLV)	Cool Valve, 2-Position (CLV)	BO4
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

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



## Fan Coil Unit (FCU)—Other Options

**NOTE:** See the FCU—Overview section on the previous page for the 4-Pipe Modulating option and the general schematic.



## Additional Resources

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

For specifications, see the [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.



## Important Notices

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