FlexStat™

BACnet Programmable Thermostats

Operation Guide

Contents

Specifications, design, and operation are subject to change without notice.

NOTE: Menus shown in this document reflect firmware version R2.1.0.18 or later. Actual context-sensitive screens are dependent on firmware version, FlexStat model, and options selected.

Overview

The award-winning KMC FlexStat series of intelligent temperature/humidity/occupancy-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, such as packaged rooftop units, fan coil units, heat pumps, and other similar applications. In addition, applications such as pressure dependent VAV, terminal reheat, and medium-sized central station air handling equipment applications may also be addressed through the on-board libraries of programs built into the devices.

The on-board library of programs permits rapid configuration of a wide range of HVAC control applications.

The FlexStat series also provides the capability to customize the standard library of sequences using KMC software. This enables a local authorized KMC installing contractor to adapt the standard library to the unique site needs and application specific requirements of a particular project.

Terminal Blocks on Removable Backplate for Easy Wiring

EIA-485 Data Port for Quick Network Access

NOTE: For specifications, see the **BAC-12xxxx/13xxxx/14xxxx Series FlexStat Data Sheet** (914-035-01). For specifications on the older **BAC-10000 Series FlexStats** (with only three external inputs and no Ethernet or CO_2 options), see the data sheet (913-035-01) for that series.

Applications and Installation

Communication with Other BACnet Network Devices and Remote Monitoring

Temperature Sensing

CO_2

Optional Humidity, Motion, and CO_2 Sensing

Applications
- AHU
- FCU
- HPU
- RTU

Up to 6 Analog Inputs for Other Sensors or Contacts

Up to 9 (Total) Analog and Relay Outputs

24 Volts AC Power

Quick (Temporary) Network Access Through Computer Data Port
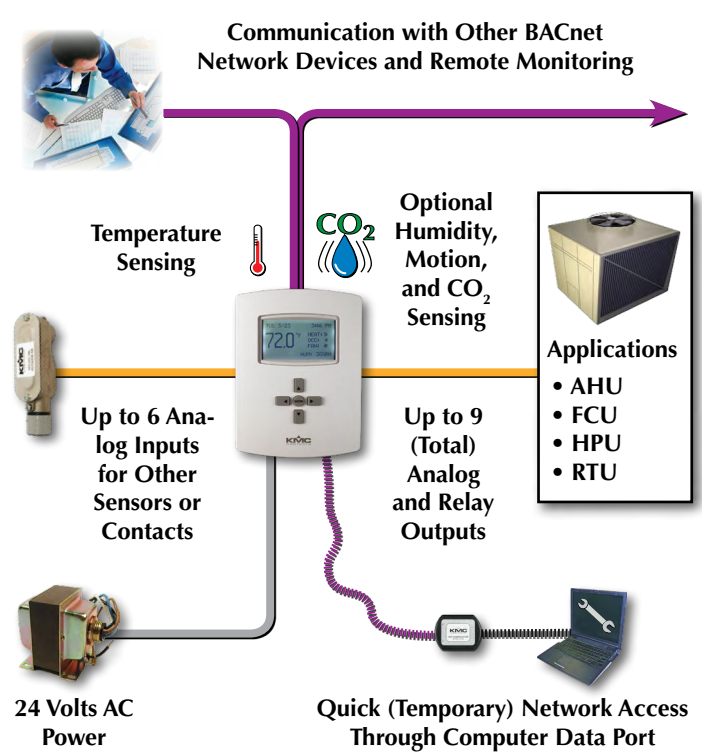
1. Wire the FlexStat's backplate to the desired equipment and set the FlexStat's end-of-line and input pull-up resistor switches.

2. Select the relevant application and options from the (Advanced) Application submenu of the Advanced Menu and other appropriate menus.

3. Configure the FlexStat for the BACnet network. (See *Network Connection on page 28*.)

For general mounting and connection details, including network wiring, EOL termination, power connections, input/output connections, pull-up resistor switch settings, see the relevant model's Installation Guide. For extended information about wiring and sequences for specific applications, see the FlexStat Application Guide.

⚠ CAUTION

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

Operation (Basic)

Home Screen

```
WED 9/3          5:43 PM
   72°F      COOL: ❄
              OCC:  ☾
              FAN:  ✦
             HUM: 31%RH
```

Setpoint Adjustment

Override

Up (Setpoint)

Left

Right

Configuration

△

◁ (ENTER) ▷

(Override) (Menu)

▽

Down (Setpoint)

Override Screens

```
        SYSTEM MODE
SYSTEM ENABLE:  AUTO
```

```
   OCCUPANCY OVERRIDE
OCC OVERRIDE:  OFF
```

```
        FAN MODES
UNOCC:  AUTO
OCC:  AUTO
```

Configuration Screens

```
 ⊥⊥        MAIN MENU        ⊤⊤
ABOUT
ADVANCED
ALARM
DATE/TIME
SCHEDULE
SETPOINTS
```

```
 ⊥⊥        ADVANCED         ⊤⊤
APPLICATION
CB PROGRAMS
COMMUNICATION
DATE/TIME
DEVICE
INPUTS
```

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

Navigation

Navigate the menus and change settings by pressing a combination of various arrow buttons and the Enter button. Push the:

- *Enter* button to select and/or exit value editing.
- *Up* or *Down* button to move among entries.
- *Right* or *Left* button to move among value fields.
- *Left* button to return to the Home screen.

NOTE: Access to various functions may require a password.

Room Temp. Setpoint Adjustment

From the Home (temperature display) screen, press the *Up* or *Down* arrow button **once** to view the existing setpoint.

To **temporarily** change the setpoint, press the *Up* or *Down* arrow button repeatedly until the desired setting is displayed and press *Enter*. (If *Enter* is not pressed, the display will return to the Home screen after about ten seconds and the new setpoint value will still be saved.) The new setpoint will hold until the next schedule change.

To **permanently** change the setpoint for occupied mode, go to the Setpoints section under the Main Menu. (In the Setpoints menu, heating/cooling setpoints/setbacks and deadband can be changed with, if required, the correct password access. See *Setpoints on page 25*.)

H/C, Fan, Occupancy, and Override

When the fan is commanded to run, the animated "FAN" icon rotates (if programmed to). When the fan command stops, the fan icon is motionless.

The "OCC" icon shows a sun when in Occupied mode and a quarter moon when in Unoccupied mode.

HEAT or COOL will show (and be animated when there is an active command to move the room temperature toward the setpoint via mechanical heating/cooling or an economizer), depending on the current mode. This can also be turned OFF.

To override these modes from the Home (temperature display) screen, press the *Left* arrow button. Press *Up* or *Down* to get to the desired line and then *Enter* (twice) to edit the mode setting. Press *Left* to exit to Home.

Main Menu and Settings

From the Home (temperature display) screen, press the *Right* arrow button to enter the Main Menu. You may need to enter a password to change any settings.

Display Options
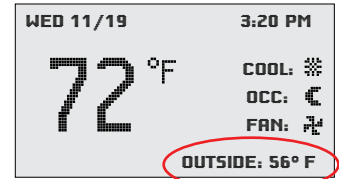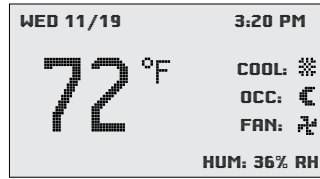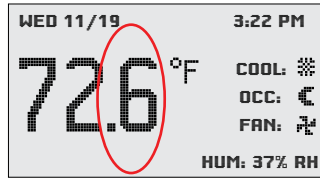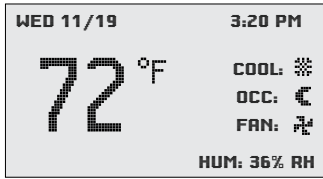
WED 11/19 3:20 PM	WED 11/19 3:22 PM
72 °F COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 36% RH	72.6 °F COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 37% RH

Fahrenheit **decimal** values are **not** displayed by default but can be enabled in the User Interface menu. See *Show Temperature Tenths (Decimals) on page 21*.

With R2.0.0.13 and later firmware, Fahrenheit temperature values on the display change in whole degree increments by default, and Celsius values change in 0.5° increments. Changing the default *No* to *Yes* will show tenths of a degree values for both scales.

This does not affect setpoint adjustments, which are always in whole degree increments for Fahrenheit and half degree increments for Celsius.

WED 11/19 3:22 PM	WED 11/19 3:22 PM
72.6 °F COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 37% RH	22.5 °C COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 37% RH

To toggle the **displayed temperature scale** between **Fahrenheit** and **Celsius**, press the *Enter* button for at least two seconds until the desired scale is displayed. (Pressing *Enter* for less time will turn on the backlight if it is off.) The desired scale will persist on the display until this process is repeated or the FlexStat is restarted.

After a restart, the temperature scale will revert to whatever scale is set in the Application menu. To change the scale so that it persists after restarting, change it in the Application menu by resetting the selected application to Not Configured, changing the temperature scale, and then reconfiguring all the application options. See *(Advanced) Application and Additional Setup on page 7*).
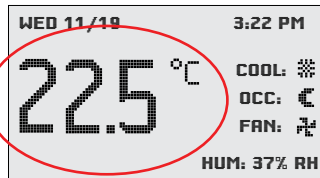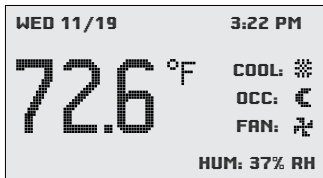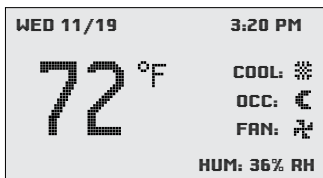
WED 11/19 3:20 PM	
72 °F COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 36% RH	72 °F ▣ COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 36% RH

Date and Time Display are enabled by default, but they can be turned off and replaced by a rotating clock icon. See *Show Time and Date on page 21*.

WED 11/19 3:20 PM	WED 11/19 3:20 PM
72 °F COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 36% RH	72 °F COOL: ❄ OCC: ☾ FAN: ⚙ OUTSIDE: 56° F

By default, **rotation values** in the lower right of the screen show relative humidity and/or CO_2 levels in models with the relevant optional sensors. If more than one value is shown, the values will rotate approximately every five seconds.

These values can be hidden if desired, and additional options are also available. See *Rotation Values on page 21*.

WED 11/19 3:20 PM	WED 11/19 3:20 PM
72 °F COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 36% RH	72 °F COOL: ❄ FAN: ⚙ HUM: 36% RH
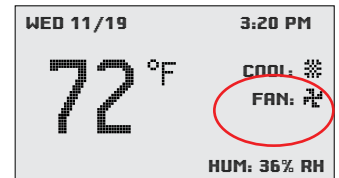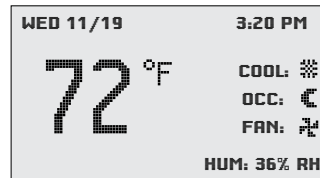
Hospitality mode has a simpler display and limited menus, and it is typically used in hotel rooms. Users typically can change only the setpoint, system mode, and fan speed. Pushing the *Left* and *Right* buttons displays customizable menu selections. See *Mode on page 21*.

WED 11/19 3:20 PM	
72 °F COOL: ❄ OCC: ☾ FAN: ⚙ HUM: 36% RH	
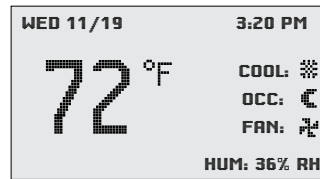
When **Display Blanking** is enabled, the display turns off at the same time the backlight goes off (after reset, initial power-up, or time-out). When any button is pressed, the display will reappear until the time-out is reached again. See *Display Blanking on page 21*.

NOTE: Displays can also be locked. **Locked UI mode** appears like Standard mode on the Home screen, but all **button** functions (except the backlight) are disabled. The setpoint and other operation functions cannot be changed by the user. See *Mode on page 21*.

NOTE: The contrast of the LCD display can also be adjusted. See *Contrast on page 21*.

Configuration (Setup)

NOTE: Menus shown in this document reflect FIRMWARE VERSION R2.1.0.18 or later. Actual context-sensitive screens are dependent on firmware version, FlexStat model, and options selected.

NOTE: If ⊞ ⊟ appear at the top of the screen (such as in the Main Menu), scroll up or down to see the rest of the menu's off-screen choices.

Main Menu Overview

```
⊞          MAIN MENU          ⊟
ABOUT
ADVANCED
ALARM
DATE/TIME
SCHEDULE
SETPOINTS
SYSTEM
```

Navigate the menus and change settings by pressing a combination of buttons. Press 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.

NOTE: A log-in may be required to access menu items.

```
          SETPOINTS
COOL   SAVE CHANGE?
HEAT      YES    NO
COOL SETBACK: 80° F
```
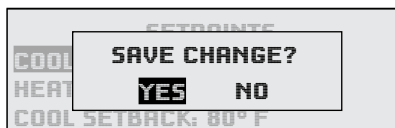
When prompted about a change (on any menu), press *Right*/*Left* to select the desired choice and then *Enter*.

About the FlexStat

```
      ABOUT FLEXSTAT
MODEL: BAC-141136CE
FW: FLEXSTAT R2.1.0.18
APP: AIR HANDLER
OPT: MOD H / MOD C
MORE

              MORE ABOUT
COMMUNICATION
FIRMWARE
HARDWARE
UPTIME: 28D 00:32:57
```
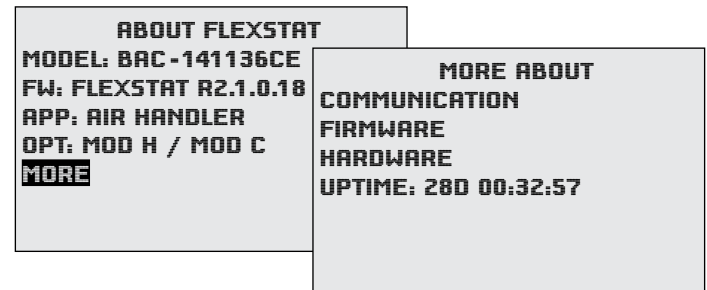
These display-only screens show the following information on various menus (select MORE and then the relevant category to see them all).

- Model number

- Firmware (FW) **type** and **version** (see *Firmware Upgrade on page 29*)

- Application **configuration** and **options** (set in the Application menu—see *(Advanced) Application and Additional Setup on page 7*)

MORE: Communication

- Device instance (set in the Device menu—see *(Advanced) BACnet Device Properties on page 17*)

- MAC address, IP address, and/or Subnet address (set in the Communications menu—see *(Advanced) Communications (BACnet) on page 14*)

MORE: Firmware

- Firmware **type**, **version** , and **build date** (see *Firmware Upgrade on page 29*)

- Application software version (ASV)

NOTE: ASV will show CUSTOM if any built-in Control Basic program (1–5) is not running or has auto-run disabled. A + sign with a number indicates the custom program number currently running (e.g., +8+9 indicates Programs 8 and 9 are running). See *(Advanced) CB (Control Basic) Programs on page 10*.

MORE: Hardware

- Model number

- Serial number of unit

- Board revision

MORE: Uptime (the amount of time since the last reset)

Advanced Menu

```
      ........  ADVANCED        "▼"
   APPLICATION
   CB PROGRAMS
   COMMUNICATION
   DATE/TIME
   DEVICE
   INPUTS
   LIMITS
```

The Advanced Menu displays various submenus. Not all submenus can be seen on the screen at one time. Scroll up or down to see additional submenus.

NOTE: The Advanced Menu has more submenus than can appear on the screen at once. Keep scrolling up or down to see all the options.

(Advanced) Application and Additional Setup

```
         APPLICATION
   DEGREES SCALE: °F
   APP:  FAN COIL
   OPT: 4-PIPE
   ADDITIONAL SETUP     ADDITIONAL SETUP
                        DAMPER
                        FAN
                        HUMIDITY
                        MOTION SENSOR
                        OPTIMUM START
                        SENSORS
                        STAGING
```

Be sure to select the correct default °F/°C temperature scale FIRST! To change the temperature scale after the application is configured, the selected application will need to be reset to Not Configured. The change will also not affect the display until after the FlexStat has been restarted.

NOTE: During normal operation (after configuration), the °F/°C temperature scale can be toggled on the display by pressing and holding the Enter button. See *Display Options on page 5*.

The type of application (as well as the model of FlexStat) affects the context-sensitive options under Additional Setup.

NOTE: **If a FlexStat is configured and then a different application is desired (e.g., AHU instead of FCU), restoring the FlexStat to its factory defaults first and then reconfiguring it is highly recommended.** See *Restore Factory on page 27*.

Auxiliary Heat (Heat Pump Only) Setup

```
        AUX HEAT SETUP
   AUX HEAT: COMP LOCKOUT
   DELAY (MINS): 60
   COMP OAT LOW: 40° F
```

For HPUs, auxiliary heat can be set for none, with compressor lockout, or without compressor lockout.

The **Delay** time controls how long the space temperature must be below the auxiliary heat's start temperature before auxiliary heat will turn on. (For more details, see the Auxiliary/Emergency Heat section under Sequence of Operation (BAC-1xx63/1xxx63) in the **FlexStat Application Guide**.)

Comp OAT Low (AV17) is the outside air temperature value, below which the compressor is locked out (when lockout is enabled). The user interface min./max. limits are 0 and 70 degrees, with a default value of 40 degrees F.

Damper (Economizer) Setup

```
     ........  DAMPER SETUP     "▼"
   ECON: MODULATING
   DCV: ADVANCED
   DCV SETUP
   MIN POSITION: 0%
   CNTRL (0-100%): 2-10 V
   ECON ENBLE TEMP: 55° F
   LOW LIMIT ALARM: 45° F
```

If the **Economizer** option is selected when there is no mixed air temperature sensor connected, a Low Limit Alarm will result. See *Alarms on page 23*. A Low Limit Alarm will close the dampers, open the hot water valve if present, and shut the unit down.

Outside Air Damper Low Limit maintains a minimum mixed air temperature. It will override economizing, DCV, or other calls for ventilation if low temperature threatens to damage equipment. For modulating economizers, OAD Low Limit is enabled by default but can be disabled if desired (such as for an AHU with gas heat).

⚠ CAUTION

Do not disable the OAD Low Limit if coils or other equipment may consequently be damaged by low temperatures.

When BAC-1xxxxx models have an application with the **CO$_2$ sensor AND the modulating economizer option enabled**, menu items for **DCV (Demand Control Ventilation)** will appear. **For information about the DCV options, see** *(Advanced) CO2 Sensor (and DCV) on page 11*.

For **RTU** applications in a BAC-1xxx**63**, if the economizer is enabled as:

- **Off/On**, then BO6 (Binary Output or Relay 6) enables a connected economizer to control with its factory-installed economizer controls. This is for free cooling only, and there is no DCV function.

- **Modulating**, then a DCV menu appears (if a CO$_2$ sensor is present) and AO9 (Analog Output 9) controls a connected economizer. This is for free cooling and/or DCV.

NOTE: In a BAC-1xxx**63,** BO6 and AO9 do not operate simultaneously—one or the other must be selected. FCU applications have no economizer, and HPU and AHU applications have only the modulating economizer option.

NOTE: In a BAC-1xxx**36,** only the modulating damper option is available (in AHU applications).

Fan Setup

```
        FAN SETUP
SPEEDS: CONSTANT SPEED
OFF DELAY (SECS): 180
UNOCC: AUTO
OCC: AUTO
HTG FAN: AUTO
```

For heating applications, Heating Fan is set to Auto by default but can be disabled if needed (such as for an FCU that is factory wired to run at a fixed speed or for a baseboard heater without a fan). The Heating Fan selection is only available when the application supports heating and either Occupied fan or Unoccupied fan is set to Auto.

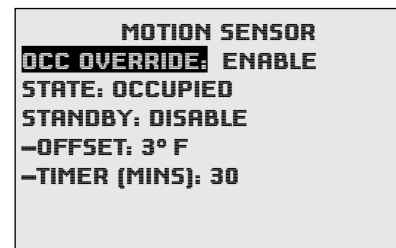**NOTE:** For a Fan Fail Alarm, see *Sensor Setup on page 9* and *Alarms on page 23*.

Humidity Setup

```
    HUMIDITY SETUP
DEHUMIDIFICATION
HUMIDIFICATION        DEHUMIDIFICATION
                   DEHUM: ENABLE
```
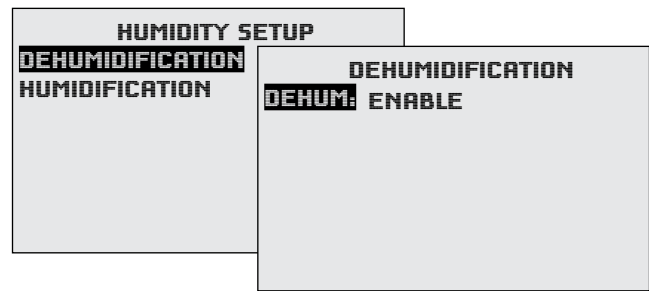
NOTE: If a dehumidification option is enabled, the Space Humidity Alarm will also be enabled. See *Alarms on page 23*.

NOTE: To see the dehumidification option in the Additional Setup menu for a **Heat Pump** application, select an Aux. Heat option other than None (the default).

Motion Sensor Setup

```
      MOTION SENSOR
OCC OVERRIDE: ENABLE
STATE: OCCUPIED
STANDBY: DISABLE
–OFFSET: 3° F
–TIMER (MINS): 30
```

A motion/occupancy sensor may be enabled (the default) to trigger occupancy override (enabled by default, but only functional during scheduled off times) and occupancy standby in relation to the scheduled on and off times. (See the chart.)

During scheduled OFF (unoccupied) times, temperature is controlled according to the setting of the appropriate heat or cool *setback* (see *Setpoints on page 25*). **Occupancy override** (for 1 hour as a default) starts when the sensor detects motion. Temperature will start being controlled according to the appropriate *setpoint*. Occupancy override will end (with the default setting) 1 hour after motion was last detected. The length of occupancy override is configurable in the System menu. See *System Modes on page 25*.

During scheduled ON (occupied) times, temperature is controlled according to the setting of the appropriate heat or cool *setpoint.* If enabled, **occupancy standby** sets the temperature back or up (according to the heating/cooling mode) by the Offset amount when no motion is detected for the Timer amount (30 minutes by default). The normal setpoint is restored when motion is detected *twice* (to reduce false detections) within three minutes.

NOTE: Occupancy standby, when activated, lets the temperature go down or up (according to the relevant mode) by the Offset amount (3° by default), not the Setback setting in the Setpoints menu (which usually has a larger temperature differential meant for a longer off time).

NOTE: When the **Advanced** DCV mode is selected, **Standby is enabled by default and when reverting from Standby back to Occupied mode, the setpoint is restored by 1° every 15 minutes**—to further conserve energy according to the guidelines by Portland Energy Conservation, Inc. (PECI). In **Basic or Standard** DCV mode or no DCV is selected, the setpoint value is restored by the full amount immediately when reverting from Standby back to Occupied mode (although it may still take some time for the room to reach its normal temperature). See *(Advanced) CO2 Sensor (and DCV) on page 11*.

NOTE: DCV is only available in models with the built-in CO_2 sensor.
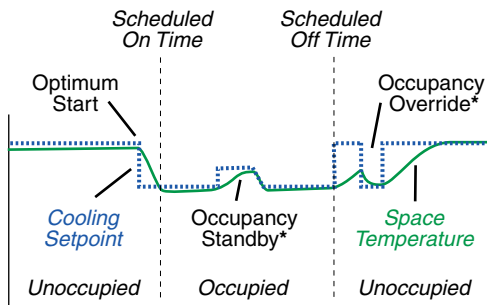
(*Available only on FlexStats with motion sensors)

The **State** field monitors whether motion has been detected during the last scan of the motion sensor input (BI6). Detected motion will show an "occupied" state. This can be used during troubleshooting to determine if motion is being detected.

Optimum Start Setup

When Optimum Start is enabled, the FlexStat soon "learns" the amount of time required to reach the setpoint from the setback/setup temperature.

It will then adjust the actual start time needed to reach the desired setpoint at the beginning of the scheduled On times. (See the chart in the (Advanced) Motion Sensor section.) It will also make seasonal temperature adjustments if an outside air temperature sensor is connected appropriately.

NOTE: For maximum efficiency, if Optimum Start is enabled, set times in schedules for when the room temperature should **reach** the setpoint, not when heating/cooling equipment should start (which would be earlier). See *Schedules on page 24*.

NOTE: For details of the energy-saving calculations performed, see the Optimum Start section in the relevant Sequence of Operation in the **FlexStat Application Guide**.

Sensor Setup
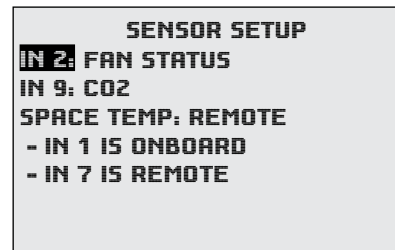
Input 7 (AI7) can be configured for a **remote space temperature sensor**. Then space temperature can be configured for onboard (internal AI1), remote (AI7), averaging of the two, the lowest reading, or the highest reading. To calibrate and change the thermistor type, see *(Advanced) Inputs on page 17*.

Input **2** (AI2) can be configured for **fan status** (dry contact) or unused.

- If AI2 is set for **fan status** and no closed contact is detected when there is a call for fan operation, a Fan Fail Alarm is created. See *Alarms on page 23*.

- If AI2 is set for **unused**, built-in applications will not use it, but the input would be available for custom programming.

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. For more information, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

In BAC-12xxxx/13xxxx/14xxxx models, Input **9** (AI9) can be configured for an external KMC SAE-10xx

CO_2 sensor. For more information, see *DCV (Demand Control Ventilation) Setup on page 11*.

See also *Motion Sensor Setup on page 8*.

Setback (OAT) Lockout Setup

```
        SETBACK LOCKOUT
OAT LOCKOUT:  ENABLE
LOCKOUT TEMP: 30° F
```
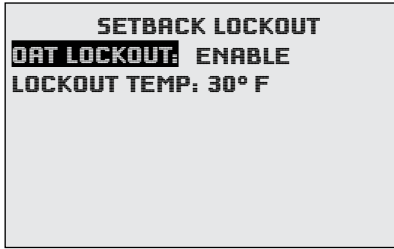
Setback OAT lockout is **disabled** by default. When enabled, AI4 is configured for OAT and the Lockout Temp selection appears in the menu. This may be useful when a system, such as an HPU, may have difficulty recovering from the unoccupied setpoint to the occupied setpoint during very cold weather.

NOTE: When enabled, the default value is 30° F (–1° C) for HPU and 10° F (–12° C) for all other applications. The value is adjustable between –50 and 120° F (–45.5 and 49° C).

Staging Setup

```
           STAGING
STG DELAY (MINS):  3
```
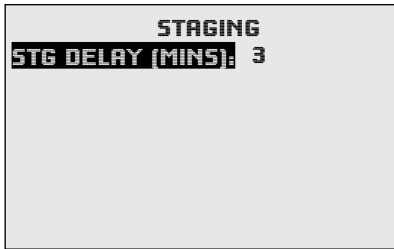
After the first stage starts in multistage heating or cooling, the default delay time before the second stage can start is 3 minutes.

Valve Setup

```
         VALVE SETUP
CLG (0-100%):  0-10V
HTG (0-100%): 0-10V
```
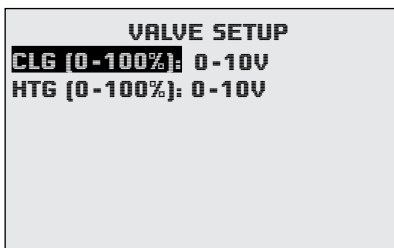
Proportional valves have a 0–10 VDC default for 0–100% open. Change as needed (e.g., 10–2 VDC).

(Advanced) CB (Control Basic) Programs

```
 ⏚     CB PROGRAMS    ᵂ
PROG1: RUNNING
PROG2: RUNNING       PROGRAM #1
PROG3: RUNNING   SETPOINTS & MODES
PROG4: RUNNING   AUTO-RUN: TRUE
PROG5: RUNNING   CHANGE: READY
PROG6: HALTED    STATE: RUNNING
PROG7: IDLE      HALT REASON: NORMAL
                 HALT DESC:
                 OUT OF SERVICE: FALSE
```
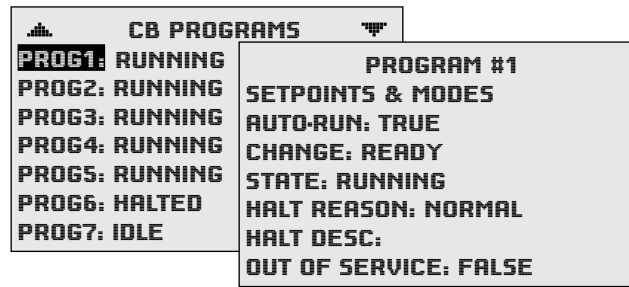
To halt or load/run the built-in (1–5) and custom (6–10) Control Basic programs, navigate to the desired line and selection.

If **custom** Control Basic programs are installed and **a restore to factory settings is performed, all factory programs are restarted but all custom Control Basic programs are halted.** Change the state of each program by loading/running the program from the CB Programs menu (or BACstage or TotalControl).

If **custom** Control Basic programs are installed **and set to autorun,** whenever the **firmware is updated, ALL (factory and custom) programs are halted.** If **custom** Control Basic programs are installed **but NOT set to autorun,** whenever the firmware is updated, factory programs are restarted but any (manual) running **custom** programs are **halted** at restart.
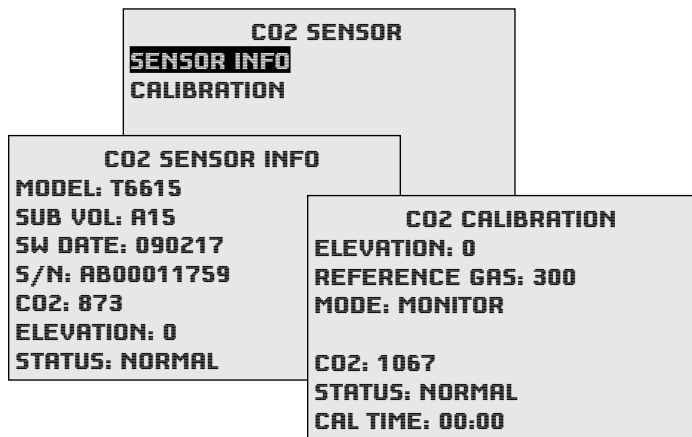
Change the state of each custom program by using the Update Manager or loading/running each program from the CB Programs menu (or BACstage or TotalControl).

```
         UPDATE MANAGER
PROGRAM CONFIG ERROR

ENABLE FACTORY: NO
ENABLE CUSTOM: NO
EDIT CB PROGRAMS
DONE
```
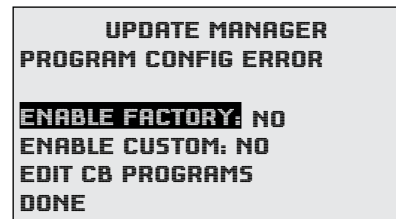
In the About menu, ASV will show CUSTOM if any built-in Control Basic program (1–5) is not running or has auto-run disabled. See *About the FlexStat on page 6*.

NOTE: **Customized programs are the responsibility of the user.** KMC Controls does not provide support for such programs.

(Advanced) CO₂ Sensor (and DCV)

```
        CO2 SENSOR
SENSOR INFO
CALIBRATION
```

```
      CO2 SENSOR INFO
MODEL: T6615
SUB VOL: A15
SW DATE: 090217
S/N: AB00011759
CO2: 873
ELEVATION: 0
STATUS: NORMAL
```

```
         CO2 CALIBRATION
ELEVATION: 0
REFERENCE GAS: 300
MODE: MONITOR

CO2: 1067
STATUS: NORMAL
CAL TIME: 00:00
```

CO₂ Sensor Setup and Information

NOTE: Set the desired CO₂ setpoint under the Setpoints menu. See *Setpoints on page 25*.

For maximum sensor accuracy, **enter the elevation (altitude) above sea level** of the building's location. (The default value is 0.) Elevation for any particular location can be found at such sources as **elevation-map.net**. (For very tall buildings, the upper floors would have a higher elevation than lower floors.)

After power is first applied or the FlexStat is restarted, the sensor goes through a **warm-up** for approximately half a minute. During the time the sensor count will be 0 ppm and the Status line will display WARMUP instead of NORMAL.

The **sensor and its firmware** are identified by the model, the compilation subvolume (SUB VOL), compilation date (SW DATE in yymmdd format), and serial number.

NOTE: With the CO₂ sensor enabled, a trend log is automatically generated. See *(Advanced) Trend Logs on page 20*.

The BAC-1**3**xxxx models do **not** have a calibration with gas option. It uses Automatic Background Logic, or ABC Logic™, a patented self-calibration technique designed to be used **in applications where concentrations will drop to outside ambient conditions (approximately 400 ppm) at least three times in a 14 day period,** typically during unoccupied periods.

The BAC-1**4**xxxx models have a **calibration option for applying gas to the sensor** for maintaining maximum accuracy. These models have a dual channel sensor (a CO₂ channel measures gas concentration, and a reference channel measures the sensor signal intensity). Self-calibrations are performed approximately every 24 hours using the reference channel.

During the self-calibration the sensor PPM reading is frozen and will not react to changing CO₂.

For **instructions on calibrating** the BAC-14xxxx models **with gas**, see the CO₂ Sensor Calibration section in the **FlexStat Application Guide**.

DCV (Demand Control Ventilation) Setup

```
⏶       DAMPER SETUP       ⏷
ECON: MODULATING
DCV: ADVANCED
DCV SETUP
MIN PO
CNTRL
ECON
LOW LI
```

```
⏶        DCV SETUP        ⏷
VENT MODE: STARTUP
DCV DAMPER SETUP
CO2 MAX (PPM): 1000
CO2 BASE (PPM):
OA AREA: 2%
OA FULL: 5%
OA MAX: 40%
```

```
⏶        DCV SETUP        ⏷
OA PURGE: 0%
OA LOW VENT: 65°F
OA HIGH VENT: 80°F
FAN MAX OFF (MINS): 30
CLG DESIGN TEMP: 95°F
HTG DESIGN TEMP: 20°F
VENT OVRIDE (MINS): 30
```
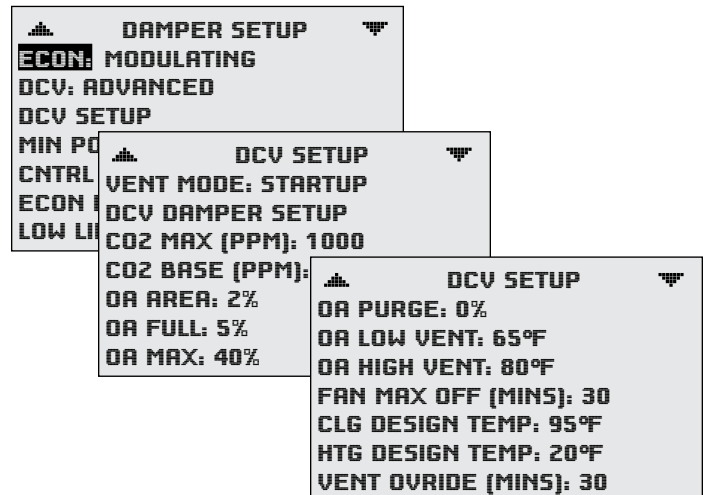
The CO₂ sensor is used with DCV (Demand Control Ventilation sequences to provide optimal ventilation and energy savings for a space. When BAC-12xxxx/13xxxx/14xxxx models have an application with the CO₂ sensor AND a modulating economizer option enabled, menu items for DCV (Demand Control Ventilation) will appear. Most DCV settings are accessed from the Damper setup menu. See *Damper (Economizer) Setup on page 7*, *Setpoints on page 25*, and *DCV (Demand Control Ventilation) on page 24*.

Although BAC-1**2**xxxx FlexStats do not have a built-in CO₂ sensor, they still have DCV control sequences available. When DCV is enabled in the Damper Setup menu of these models, **IN9** is assumed to be connected to an external SAE-10xx CO₂ (duct or space) sensor. **0–5 VDC on that input** (configured in the *(Advanced) Inputs* menu) **will map to 0–2000 ppm. The output of the connected SAE-10xx must also be configured to match the FlexStat's input** (see the installation guide for the appropriate SAE-10xx model), and the FlexStat's IN9 **pull-up resistor** must be set for **0–12 VDC** (see the appropriate FlexStat installation guide)! BAC-13xxxx/14xxxx FlexStats also have the external sensor option, and if used, the **highest** of the two readings (internal vs. external) will be used to control DCV sequences. The CO₂ ppm display (if enabled) also shows the highest of the two levels. (Allow at least 15 minutes after installation for the reading to stabilize.)

NOTE: Not all applications have a modulating economizer option. **Without a modulating economizer selected, DCV will not appear in any menus,** but the (Advanced) CO_2 Sensor menu will remain and the CO_2 ppm readings will still show on the display.

NOTE: An alarm is generated when the CO_2 level is too high for too long. See *Alarms on page 23*.

NOTE: The various Outside Air (OA) % settings available are the percentage that the OA **damper is open** and not the percentage of OA flow. These settings should be measured and set accordingly.

NOTE: **See the DCV section in the relevant Sequence of Operation of the FlexStat Application Guide for more information about the modes and options described in general terms here.**

The three types of DCV configurations available are:

- **BASIC DCV**—Provides simple DCV, modulating the outside air damper in direct response to the current CO_2 level with respect to its setpoint. Basic DCV is much more energy efficient than no DCV at all, while maintaining adequate IAQ (Indoor Air Quality). It is the easiest DCV method to configure. However, where VOCs, radon, or other pollutants become excessive during unoccupied times (with no ventilation), the FlexStat's Standard or Advanced DCV configuration is recommended.
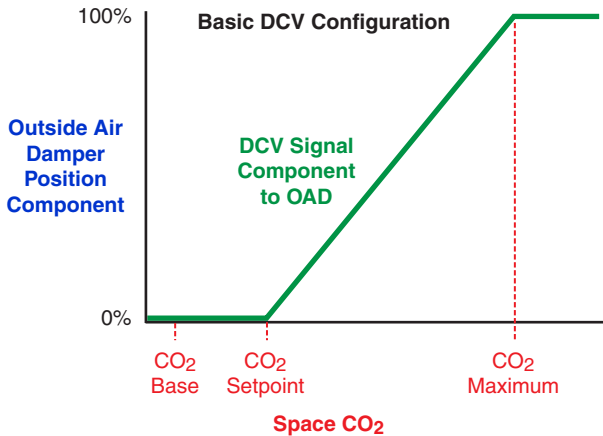
STANDARD DCV—When the BAC-13xxxx settings are properly configured, this complies with **CA Title 24, Section 121(c)**. This would also apply to a properly configured BAC-12xxxx with a remote SAE-10xx CO_2 sensor. Standard DCV, under most conditions, is somewhat less energy efficient than Basic, but it enhances IAQ.*

*NOTE: The CO_2 sensors in the BAC-13xxxx series FlexStats (as well as properly configured SAE-10xx CO_2 detectors) have been certified to comply with CA Title 24, Section 121(c), as well as sub-paragraph 4.F that specifies accuracy will be maintained within tolerance for a minimum of 5 years without recalibration. **See the data sheet for more information.**
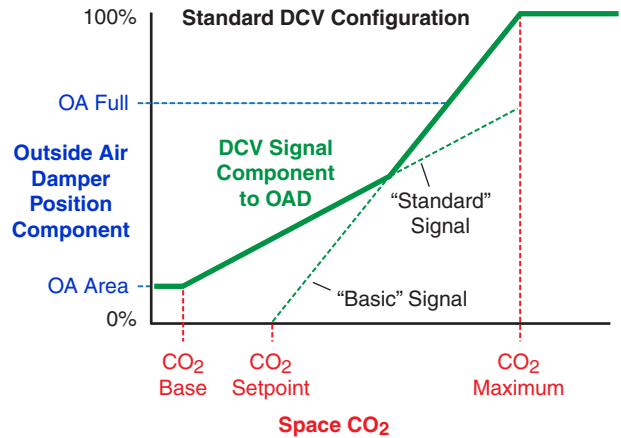
- **ADVANCED DCV**—When the settings are properly configured, this configuration complies with **CA Title 24, Section 121(c)** and **ASHRAE Standard 62.1-2007** and follows guidelines by **Portland Energy Conservation, Inc. (PECI)**. Although Advanced DCV is the most complex to configure, it is more energy efficient than Standard while still optimizing IAQ.
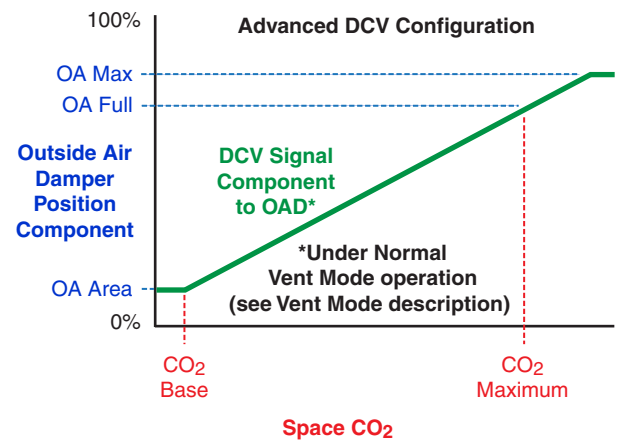
NOTE: The three graphs above show the DCV **component** of the signal to the outside air damper. Depending on the conditions and the DCV configuration, the signal to the damper might be controlled by Minimum Position, Economizer Loop, or other components. The **maximum** of these

component values is used, not the sum of them. (If there is a Low Limit alarm, however, these signals are overridden, and the damper is closed.)

The three types of configurations have various combinations of the following DCV OPTIONS.

CLG DESIGN TEMP = The highest outside air temperature (95° F default) for which the building's cooling system is designed.

CO2 MAX (PPM) = The desired maximum CO_2 concentration level during an occupied period (1000 ppm default). In BASIC and STANDARD DCV modes, the economizer damper will modulate to fully open at this level.

CO2 SETPT (PPM) = The desired CO_2 level at which point the economizer damper will begin modulating open from MIN POSITION (600 ppm default). Below this level, the economizer damper will be at MIN POSITION during Occupied mode. (This can be adjusted no lower than the CO2 BASE.)

CO2 BASE (PPM) = The presumed average CO_2 concentration level of outside air at the building's location (400 ppm default).

DCV DAMPER SETUP = A test mode is used to determine proper outside air damper position values for OA AREA, OA FULL, OA MAX, and OA PURGE. The required airflows for these four positions are determined by ASHRAE 62.1-2007 section 6.2.6.2. A technician/balancer uses this menu to set specific damper positions and measure the resulting airflows. The damper positions are then correlated to the required airflows. One hour after the setup mode is activated, it will return to the default AUTO setting, or it can be manually set to AUTO after testing is completed.

FAN MAX OFF (MINS) = The maximum time (30 default) the supply fan may remain off during occupied times.

HTG DESIGN TEMP = The lowest outside air temperature (20° F default) for which the building's heating system is designed.

OA AREA = The outside air damper position (2% default) required to provide the outdoor air rate based on the zone area. This is based on ASHRAE 62.1-2007 section 6.2.6.2.

(Note that this value represents the damper position, not the minimum outside air percentage.) The OA damper shall be at this position when Space CO2 is at or below CO2 BASE. The value is determined using DCV DAMPER SETUP.

OA FULL = The outside air damper position (5% default) for the OA AREA **plus** the people occupying the space. The outside air damper shall be at this position when Space CO2 is at CO2 MAX. The value is determined using DCV DAMPER SETUP.

OA HIGH VENT = The highest temperature (80° F default) that would use 100% OA for recovery.

OA LOW VENT = The lowest temperature (65° F default) which would use 100% OA for recovery. (If outside air temp is between OA low vent and OA high vent, the outside air damper will be open 100% during recovery mode.)

OA MAX = The maximum allowable % of outside air damper position (40% default) for *ventilation* (not cooling) purposes. The value is determined using DCV DAMPER SETUP.

OA PURGE = During the 60 minutes prior to scheduled start time, the outside air damper will open to this position (0% default) to perform a purge of the zone. The value is determined using DCV DAMPER SETUP.

(*Available only on FlexStats with motion sensors)
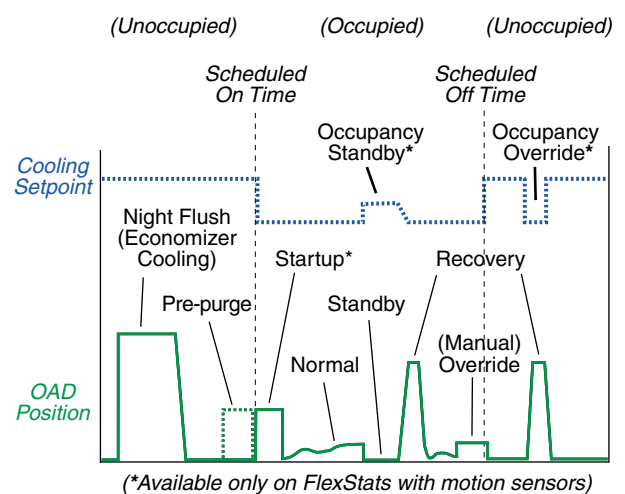
**VENT MODE** = Displays (only) in which ventilation mode the FlexStat is functioning (see illustration):

• **Normal**—Typical ventilation during the occupied period (after Pre-purge,

Startup, or Recovery modes have finished and returned the ventilation rate to "normal" operation).

- **Pre-purge**—If enabled in the programming (disabled by default), the space is ventilated with maximum outside air for 60 minutes before the occupied start time. (See Startup.)

- **Startup**—If pre-purge is disabled (default) and the motion sensor detects motion during the 20 minutes after occupied start time, the space is ventilated with maximum outside air until 20 minutes after occupied start time.

- **Standby**—After the motion sensor has not detected motion for 30 minutes, temperature setpoints are adjusted (down for heating and up for cooling), and the outside air damper is closed.

- **Recovery**—After a period in which the supply fan was off, the space is ventilated with an increased percentage of outside air (to compensate for the previous reduced ventilation).

- **Override**—Ventilation override has been manually selected from the DCV menu, and the space is temporarily (30 minutes default) driven to the full ventilation position (for maximum design occupancy) if it is not already at that position. See *DCV (Demand Control Ventilation) on page 24*.

VENT OVRIDE (MINS) = Amount of time for Ventilation Override operation (30 minutes default). See *DCV (Demand Control Ventilation) on page 24*.

(Advanced) Communications (BACnet)
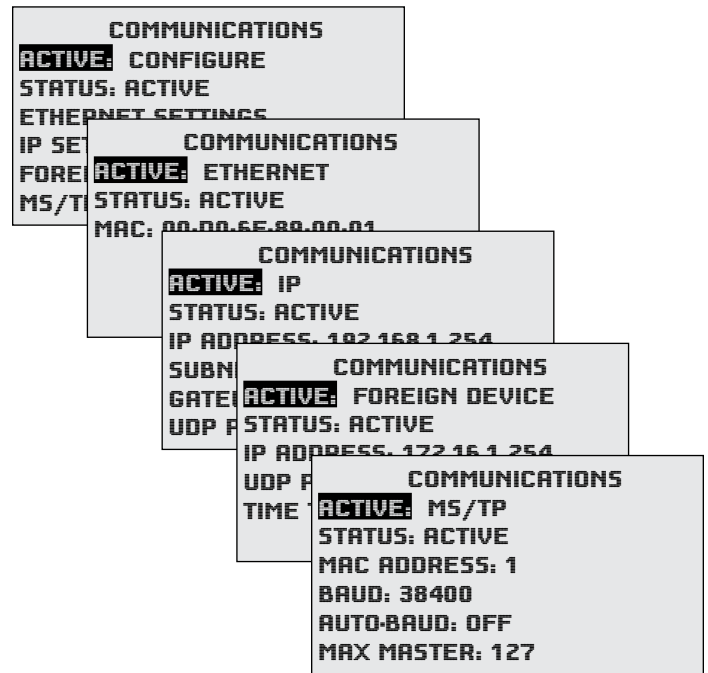
For MS/TP communications, connect the EIA-485 wiring to –*A* and +*B* terminals on the backplate (see the relevant model's installation guide). For Ethernet IP, and Foreign Device communications (on relevant "E" models), plug an Ethernet cable directly into the RJ-45 modular jack on the back of the FlexStat.

To set protocol and parameters for BACnet communications,

1. Select *Active: Configure*.

2. Configure the desired protocol.

3. Select *Active: [protocol]* and restart the FlexStat.

NOTE: Even if MS/TP is the only option in firmware R2.0.0.6 and later, **ACTIVE: CONFIGURE MUST FIRST BE SELECTED before any of the values can be changed!** Otherwise the values are read only.

Only one protocol can be enabled at any time. The IP/Ethernet modes do not serve as routers for the MS/TP connection.

To communicate with a KMD-5576 through the data port at the bottom of the case, IP/Ethernet-enabled FlexStat models in one of the Ethernet or IP modes must (temporarily) be set for MS/TP mode (and restarted)!

For **MS/TP** EIA-485 communications, the Max Master is the highest MAC address a device will attempt to locate when polling for master devices on the local network. To avoid possible communication issues with the network or a computer connected through a KMD-5576 USB Communicator, **the Max Master number should be the lowest number needed for that network.**

Max Info Frames is the maximum number of information frames (data packets) that a controller may send out before it must pass the token.

For **IP** and **IP Foreign Device** communications, consult with the system administrator for the appropriate settings for the IP Address, Subnet Mask, Gateway, and UDP Port.

Ethernet communications are essentially plug-and-play, and the MAC address is not changeable.

In firmware R2.1.0.7 and later, the Communications menu has a Status line that indicates the **Route Status** of the active network communications protocol. See the Route Status chart for possible indicators and potential troubleshooting action.

In firmware R2.1.0.7 and later, **MS/TP Diagnostics** is at the bottom of the MS/TP menu (when MS/TP is the active communications port). It consists of a set of internal MS/TP communication status and error counters from that FlexStat's perspective. The MS/TP Diagnostics menu has two selections:

• **View Metrics** displays a list of internal status and event counters showing the health of the MS/TP network. (**PFM** = Poll For Master.)

• **View Masters** displays a list of MS/TP master MAC addresses as seen by this device.

On both screens, pressing the Enter key invokes a pop-up dialog that allows the user to clear the diagnostic data.

Route Status		
Status	**Description**	**Action**
Active	The network is functioning correctly and capable of passing traffic.	None required.
Down	Something is impeding the traffic in that network.	Probably requires manual intervention. Conditions that cause a network to be down range from configuration to wiring problems.
Duplicate MAC	Another MS/TP device has the same MAC address.	Change the MST/TP MAC address in the device containing the duplicate number.
Sole Master	The FlexStat is not detecting any other master device on the local MS/ TP networks. (Slave devices however, may be present.)	Requires corrective action only if other master devices are known to be connected to the local MS/TP network.

(Advanced) Date/Time
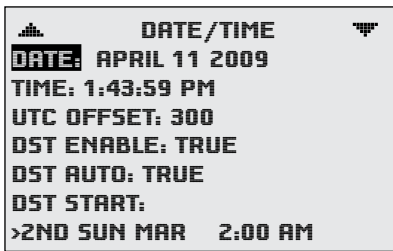
```
 ⣀⡀      DATE/TIME        ⣿⡇
DATE: APRIL 11 2009
TIME: 1:43:59 PM
UTC OFFSET: 300
DST ENABLE: TRUE
DST AUTO: TRUE
DST START:
>2ND SUN MAR   2:00 AM
```

NOTE: When a FlexStat is powered up after losing the RTC (Real Time Clock) time, it will revert to the default time and date of January 1, 2000, 12:00:00 AM.

For areas that observe **DST (Daylight Saving Time)**, select True/On for DST ENABLE and DST AUTO. The DST period is currently the second Sunday of March through the first Sunday of November, but these rules can be changed in the menu if the official period changes or if the installed location needs a schedule adjustment for better operation.

NOTE: If DST is enabled but the Auto setting is not, the actual calendar dates (instead of using the general rules) will need to be entered every year.

NOTE: An issue can occur **if a FlexStat has been unpowered long enough for it to lose its RTC timekeeping during the period DST is in effect AND a time synchronization command is sent from BACstage or TotalControl** to the FlexStat. The time will be restored to the correct time and date. However, the FlexStat will assume that this time is non-DST. Within about one minute after the initial time synchronization (during DST months), the device time will reset to DST mode, and the device time will move one hour ahead. This will affect the displayed time on the LCD display as well as any schedules. This issue will not affect powered-up FlexStats during non-DST periods (e.g., most of November through February). If the time has erroneously advanced one hour after an initial time synch command, the easiest solution is to simply send a second time synch command. This will correct the device time. Alternately, the hour can be changed in the FlexStat's menu.

If the FlexStat is used in a BACnet network with UTC (Coordinated Universal Time) synchronization (via broadcasting or addressing a single thermostat) set the UTC Offset value. The UTC Offset value is in minutes and corresponds to the distance of the local time zone to the zero degree meridian. In stand-alone operation or networks that do not have UTC broadcasts, setting this value is not necessary.

Sample Time Zones	Offset to Equal UTC
Alaska	9 hours = **540** minutes
USA/Canada Pacific Standard Time	8 hours = **480** minutes
USA/Canada Mountain Standard Time	7 hours = **420** minutes
USA/Canada Central Standard Time	6 hours = **360** minutes
USA/Canada Eastern Standard Time	5 hours = **300** minutes
Bolivia, Chile	4 hours = **240** minutes
Argentina, Uruguay	3 hours = **180** minutes
United Kingdom, Portugal	0 hours = **0** minutes
Europe (most countries)	–1 hours = **–60** minutes
Egypt, Israel, Turkey	–2 hours = **–120** minutes
Kuwait, Saudi Arabia	–3 hours = **–180** minutes
United Arab Emirates	–4 hours = **–240** minutes
India, Sri Lanka	–5.5 hours = **–330** minutes
China, Mongolia	–8 hours = **–480** minutes
Korea, Japan	–9 hours = **–540** minutes
New Zealand	–12 hours = **–720** minutes

NOTE: The BACnet standard for this offset value is: "The time zones to the west of the zero degree meridian shall be positive values, and those to the east shall be negative values." The value is in **minutes**, not hours.

(Advanced) BACnet Device Properties

```
              DEVICE
INSTANCE: 1
NAME: FlexStat__101
LOCATION: KMC Controls
```
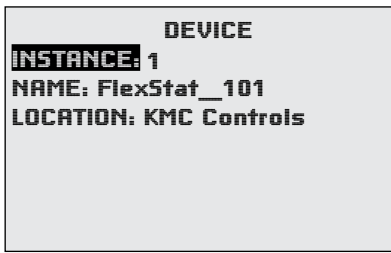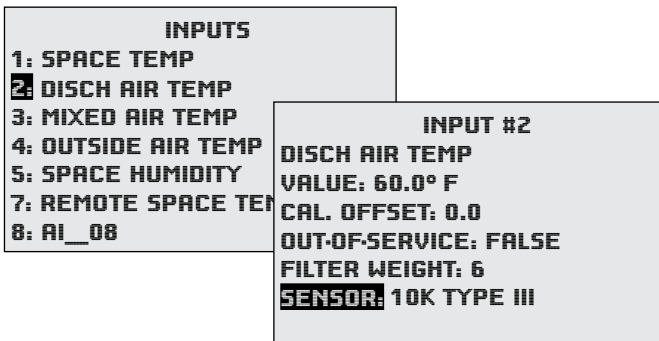
To set the BACnet device instance, name, and location, press:

1. *Up/Down* to move among entries.

2. *Enter* to select.

NOTE: **In firmware versions R1.3.0.4 and earlier, the FlexStat could also be restarted or restored to factory defaults from this menu.** In R2.0.x, this function was moved to a separate menu. See *(Advanced) Restart/ Restore on page 18* and *Resetting the FlexStat on page 26* for more information about that function.

(Advanced) Inputs

```
             INPUTS
1: SPACE TEMP
2: DISCH AIR TEMP
3: MIXED AIR TEMP
4: OUTSIDE AIR TEM      INPUT #2
5: SPACE HUMIDITY    DISCH AIR TEMP
7: REMOTE SPACE TE   VALUE: 60.0° F
8: AI__08            CAL. OFFSET: 0.0
                     OUT-OF-SERVICE: FALSE
                     FILTER WEIGHT: 6
                     SENSOR: 10K TYPE III
```

Inputs vary according to model, selected application, and selected application options. See *(Advanced) Application and Additional Setup on page 7*.

Value will show a temperature reading or a voltage (0.0 to 3.0), depending on the sensor. Analog sensors (built-in or external) can be calibrated by adjusting the Calibration Offset value (see the **FlexStat Application Guide** for details).

Filter Weight smooths (dampens) input value readings, reducing sensitivity to noise and temperature spikes. Smaller filter weight values (more sensitive) cause the sensor readings to react more quickly to sudden changes, and larger values (more stable) cause sensor readings to react more slowly to sudden changes. Areas subject to sudden swings of temperature from factors such as door openings and closings

may benefit from adjusting the filter weight. Temporarily reducing filter weight may also be helpful for some diagnostic or commissioning purposes (but the defaults should be restored for normal operation). For much more information, see the **FlexStat Application Guide**.

Calibration Offset can be used to calibrate an analog input by changing the value. For details of calibrating the internal temperature sensor, see the **FlexStat Application Guide**. (A CO_2 sensor has a different calibration method, using a gas cylinder.)

"**Out-of-Service**: False" means the input is active (*not* out of service). If it is "true," the input is inactive. The FlexStat menu only shows the status. The status can only be changed through BACstage or TotalControl.

(Advanced) Temp. Setpoint Limits

```
              LIMITS
OCC MIN CLG: 66° F
OCC MAX HTG: 80° F
UNOCC MIN CLG: 66° F
UNOCC MAX HTG: 80° F
MIN SETPT DIFF: 2° F
```
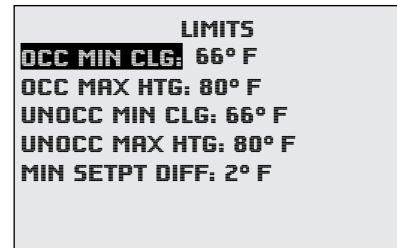
This menu permits changes to the minimum and maximum allowed user/operator setpoint values.

NOTE: For Minimum Setpoint Differential, see the diagram.

	Heating Proportional Band	Minimum Setpoint Differential	Cooling Proportional Band
R2.0.0.x and Later Firmware	**Heating Proportional Band**	**Minimum Setpoint Differential**	**Cooling Proportional Band**
R1.4.0.1 and Earlier Firmware	*Deadband*	*Min. Setpoint Differential*	*Deadband*
Other Common Terms	Setpoint Span		Setpoint Span
	Throttling Range	Deadband	Throttling Range
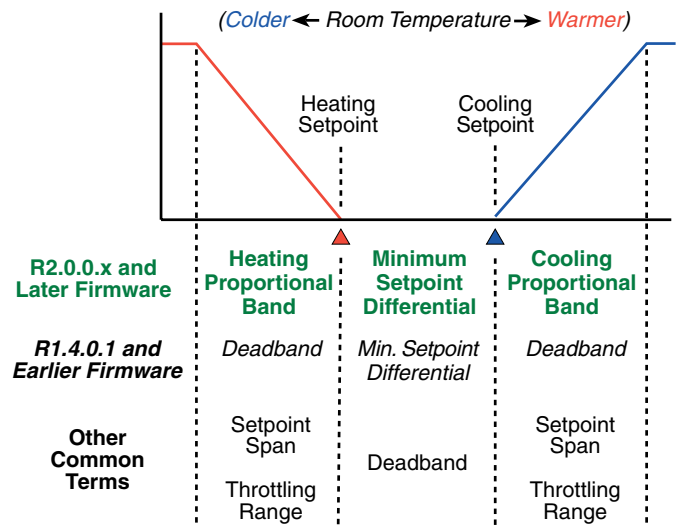
(Advanced) PID Loop Configuration

```
        LOOP CONFIGURATION
COOL PROP: 2.0° F
HEAT PROP: 2.0° F
COOL INTG: 0/hr
HEAT INTG: 0/hr
ECON PROP COLD: 30° F
ECON PROP NORMAL: 15° F
ECON INTG: 0/hr
```

This menu allows changes to the default PID (Proportional Integral Derivative) loop values.

NOTE: Cooling Proportional Band and Heating Proportional Band were called Deadband in FlexStat firmware versions earlier than R2.0.0.6 (see the diagram).

NOTE: Economizer values only appear if a modulating economizer option is selected in the Advanced > Application > Additional Setup > Damper menu. See *Damper (Economizer) Setup on page 7*.

NOTE: If space temperature is overshooting the setpoint or oscillating, try increasing the proportional band by a degree. If the problem persists, try increasing the integral value slightly (up to 20% if the value is not 0). If the problem still persists, try setting the integral value to 0. (The optimal integral value is dependent on the characteristics of the particular space and HVAC system. In firmware R2.1.0.1 and earlier, default integral values of COOLING INTG (AV80) and HEATING INTG (AV81) were 4 and ECON INTG (AV82) was 6. The default in later versions was changed to 0.

(Advanced) Restart/Restore

```
        RESTART/RESTORE
RESTART: WARM START
RESTORE FACTORY: NO
```

To change perform a warm start, cold start, or restore to factory defaults, press:

1. *Up/Down* to move among entries.

2. *Enter* to select.

See *Resetting the FlexStat on page 26* for more information about this function.

(Advanced) Security Levels and Passwords

```
            SECURITY
ACCESS LEVELS
PASSWORDS
```
```
    ACCESS LEVELS                 PASSWORDS
SETPOINT ADJ: NONE        USER:        1 0 0 0
MAIN MENU: ADMIN          OPERATOR:    1 2 3 4
SYSTEM MODE: OPER         ADMIN:       5 6 7 8
OCC OVERRIDE: USER
FAN OCC/UNOCC: OPER
```

Access to the Main Menu, Setpoint Adjust, and System/Occupancy/Fan settings have a default password level of User. This level can be changed for each function to None, Operator, or Administrator through the Access Levels menu. Passwords are set in the Passwords menu.

Any person can view the display but might not be able to change any settings without logging in with one of the three levels of passwords:

- None (Level "0"): No password is required (everyone has access). (For example, anyone can adjust a setpoint with Access Level None even if all other functions require a password.)

- User (Level 1): See the Menu Items Access Levels chart.

- Operator (Level 2): See the Menu Items Access Levels chart.

- Administrator (Level 3): Can access all menus and change all editable values. **DO NOT FORGET THIS PASSWORD!**

Changes in security levels and/or passwords take effect AFTER the current Administrator log-in has timed out. Time-out occurs 60 seconds (default) AFTER the last button press!

NOTE: Desired length of inactivity time-out can be changed in the User Interface menu. See *(Advanced) User Interface (UI) on page 21*.

NOTE: **Setting a password to (the default) 0000 eliminates the password prompt and allows full access for that level. If no password is set for ADMIN, no password prompt will occur. If any password is set for ADMIN, the menu items accessible at the various levels are shown in the following chart.**

Menu Items Access Levels			
Menus	User	Operator	Administrator
Home Screen	*= Selectable, Default is User*		
Setpoint Adjust (Up/Down)	✔*	✔*	✔*
System Mode (Auto/Heat/Cool/Off)	✔*	✔*	✔*
Occupancy Override (On/Off)	✔*	✔*	✔*
Fan Modes (Auto/On/Off)	✔*	✔*	✔*
Main Menu (Default is User)			
About	✔	✔	✔
Advanced		✔	✔
Alarm		✔	✔
Date/Time		✔	✔
Schedule		✔	✔
Setpoints		✔	✔
System		✔	✔
Trend Viewer	✔	✔	✔
Advanced Menu			
Application			✔
Additional Setup			✔
Control Basic Programs		✔	✔
Communication			✔
Date/Time		✔	✔
Device			✔
Inputs		✔	✔
Limits		✔	✔
Motion Sensor		✔	✔
Security			✔
Trend Logs		✔	✔
Test		✔	✔
This chart shows conditions in which an administrator password is set (is not 0000) and default password levels are used.			

NOTE: When setting a password, the *Up* button increases the alphanumeric value (0 through 9 and then A through Z). The *Down* button decreases the value. **DO NOT FORGET THE ADMIN PASSWORD!**

The required password level is specified in the prompt.

To **lock the buttons** after configuration is complete (and disable further changes), select Locked UI mode. See .

For **additional physical security and protection from vandalism**, install the FlexStat inside a third-party locking thermostat guard/cover (but proper airflow must be maintained).

(Advanced) Test

The test menu merely tests the display's pixels and key functions (as verification during manufacturing).

(Advanced) Trend Logs

```
⚊ᵢₗ      TREND LOGS     ▼
TREND 1:  TRUE
TREND 2: TRUE
TREND 3: FALSE
TREND 4. FALSE
TREN  ⚊ᵢₗ      TREND #1      ▼
TREN  SPACE TEMPERATURE LOG
TREN  OBJECT REF: AI1
      LOG ENABLE: TRUE
      INTERVAL (MINS): 10
      STOP W/FULL: FALSE
      RESET COUNT: NO    ⚊ᵢₗ  TL #1-SPACE TEMP  ▼
      COUNT: 256         APR17 1:27PM, 71.4
      TOTAL CNT: 613     APR17 2:27PM, 71.5
      VIEW LOG BUFFER    APR17 3:27PM, 71.6
                         APR17 4:27PM, 71.8
                         APR17 5:27PM, 76.3
                         APR17 6:27PM, 81.2
                         APR17 7:27PM, 82.3
```

The FlexStat generates one or more default trend logs that are dependent on options and applications:

- **Space temperature** is always the default trend log #**1**. (Before firmware R2.0.0.12, this monitored AI1, but later firmware monitors AV40 to allow for a remote space temperature sensor and average/highest/lowest reading options.)

- Models with CO_2 sensors will have default trend log #**3**. (The onboard CO_2 sensor is AI10, the optional remote CO_2 sensor is AI9, but the trend log monitors AV78, which gives the highest of the two readings.) See also *Damper (Economizer) Setup on page 7*, *(Advanced) CO2 Sensor (and DCV) on page 11*, *Setpoints on page 25*, and *DCV (Demand Control Ventilation) on page 24*.

Other options that can be **user-configured** for trend logs include the following:

- The **humidity sensor** is AI5 but is mapped to **AV22** for display purposes.

- When AI4 is configured for **OAT**, OAT is mapped to **AV23** for display purposes.

- The **motion sensor** is **BI6**. However, BI6 is active only when motion is detected by the sensor. People sitting quietly in an office, for example, will not activate the sensor. Unless trend logs are configured for impractically short intervals, some or even most motion detections will not be recorded. Motion sensor occupancy override is **BV24** and standby is **BV35**—either of these may be more practical to use as a trend log.

NOTE: In firmware earlier than R2.1.0.18, if **AI2** was configured for **discharge air temperature**, this became default trend log #**2**. For later firmware, use KMC Connect or TotalControl to create a custom trend if this is desired. For more information, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

See the FlexStat Application Guide and relevant FlexStat Installation Guide for other desired input and output objects in an application.

To set the desired object to track, press:

1. *Up/Down* to move among entries.

2. *Enter* to select.

NOTE: The BACnet standard for log **intervals** is hundredths of seconds. The simplified display on the FlexStat converts the value to minutes. However, BACstage™ and TotalControl® **do** display hundredths of seconds but in different ways. For a "10" (minute) interval on a FlexStat display, TotalControl would show "00:10:00.00" (hours**:**minutes**:**seconds**.**hundredths of seconds) and BACstage would show "60000" (hundredths of seconds) instead.

The trend log buffer may be viewed by scrolling down and selecting View Log Buffer. The buffer may also be viewed from the Main Menu by scrolling down to the *Trend Viewer* (see *page 26*).

(Advanced) User Interface (UI)

```
        USER INTERFACE
CONTRAST  63
DISPLAY BLANKING: NO
INACTIVITY (SECS): 60
ROTATION VALUES
SHOW TEMP TENTHS: NO
SHOW TIME & DATE: YES
MODE: STANDARD
```

```
  ⛰        USER INTERFACE       ⵜ
ROTATION VALUES
SHOW TEMP TENTHS: NO
SHOW TIME & DATE: YES
MODE: HOSPITALITY

HOSPITALITY OPTIONS
SETPT CNTRL:  SINGLE
```
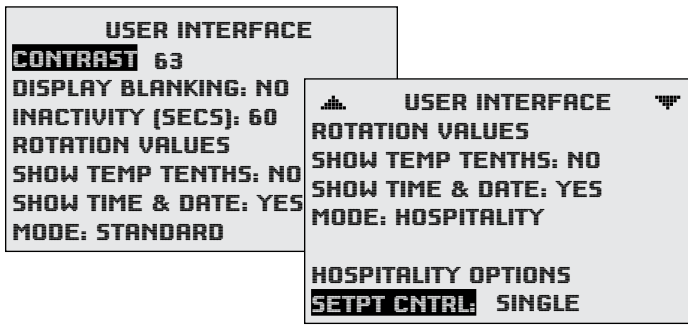
Contrast

Enables adjusting LCD display text contrast from 30 to 63% to compensate for lighting conditions. Higher settings are recommended for most conditions.

Display Blanking

When Display Blanking is enabled (Y), the display turns off at the same time the backlight goes off (after reset, initial power-up, or time-out). When any button is pressed, the display will reappear until the time-out is reached again. See *Display Options on page 5*.

Inactivity

The menu/display/backlight time-out (seconds since the last button is pushed) is set in Inactivity.

Rotation Values

```
        ROTATION VALUES
1: HUM: SHOW
2: OAT: HIDE
3: CO2: SHOW
4: UI4: HIDE
```
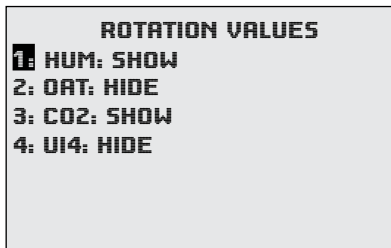
The Rotation Values menu allows easy setting of what applicable optional values (e.g., humidity, outside air temperature, and/or CO_2 level) will display on the lower right of the screen (such as "HUM: 46% RH" shown on the Hospitality Mode sample screen). **If more than one value is shown, the values will rotate approximately every five seconds.** See *Display Options on page 5*.

In applicable models, humidity and CO_2 levels are shown by default but can be hidden if desired.

UI4, the fourth rotation value, is available for custom programming (using BACstage or TotalControl). To program UI4 to display setpoint, MAT, or other value, see the Sample Custom Applications section in the **FlexStat Application Guide**.

Show Temperature Tenths (Decimals)

With R2.0.0.13 and later firmware, Fahrenheit temperature values on the display change in whole degree increments by default, and Celsius values change in 0.5° increments. Changing the default *No* to *Yes* will show tenths of a degree values for both scales. See *Display Options on page 5*.

This does not affect setpoint adjustments, which are always in whole degree increments for Fahrenheit and half degree increments for Celsius.

Show Time and Date

Time and date appear at the top of the display by default. Setting the value to No, replaces the top line with a spinning clock icon. See *Display Options on page 5*.

Mode

Mode toggles the home screen and other menus between the default Standard mode and the (more restricted) Hospitality and Locked UI modes. See *Display Options on page 5*.

NOTE: COMPLETE ALL OTHER NECESSARY CONFIGURATION BEFORE SELECTING HOSPITALITY OR LOCKED UI MODE! After Hospitality or Locked UI mode is selected, it is intentionally difficult to revert to Standard mode!

NOTE: As additional security against unauthorized bypass of Hospitality or Locked UI mode from the FlexStat, set at least an Operator level password. See *(Advanced) Security Levels and Passwords on page 18*.

NOTE: To further configure the FlexStat or revert to Standard mode, see the FlexStat Application Guide.

Locked UI mode (also known as Mode 3) appears like Standard Mode on the Home screen, but all **button** functions (except the backlight) are **locked**.

Hospitality mode (also known as Mode 2) has limited menus and is typically used in hotel rooms. Users typically can change only the setpoint, system mode, and fan speed. Pushing the *Left* and *Right* buttons displays **customizable menu selections** (dependent on the configuration), such as **System** (Auto, Heat, Cool, and Off) and **Fan** (Auto, High, Medium). A three-speed fan displays Auto, Low, Medium, and High, but a one-speed fan displays Auto and On.

For Hospitality mode, Setpoint Control configuration options are Single Setpoint or Schedule:

- **Single Setpoint** will keep the setpoint at whatever the user has last selected (except when a motion sensor optionally puts the FlexStat in standby mode—see *Motion Sensor Setup on page 8*). The FlexStat will stay On (in occupied mode), and the schedule will be ignored.

- To use the **Schedule** option, the schedule must be configured **before** entering Hospitality mode. (See *Schedules on page 24*.) If no schedule is configured by the user, the default schedule is always On (occupied).

(Hospitality Mode Sample Screens)

WED 10/01		3:20 PM	

72.6 °F   COOL ❄   **(Field A Selection)**

HIGH   **(Field B Selection)**

WELCOME   **(*Field C Message*)**

HUM: 46% RH   **(Rotation Value)**

Pushing *Enter* Button Toggles °F/°C Temperature Scale

Pushing *Left* Button Goes to Field A Screen

SYSTEM MODE

AUTO
HEAT
COOL
OFF

(Pushing *Right* Button Goes to Field B Screen)
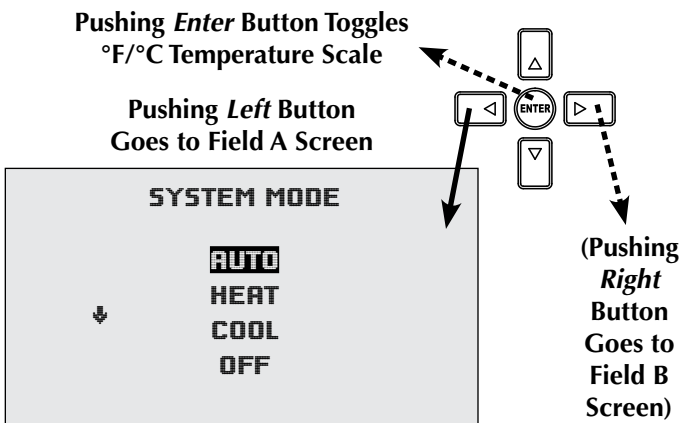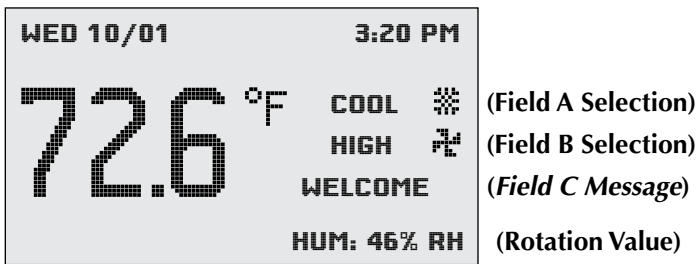
(No Field C Screen Exists)

NOTE: In Hospitality mode, **users have continuing control over single, occupied, and unoccupied setpoints.** Under the Single Setpoint option, the setpoint will remain at whatever value was last selected by a user until a user adjusts the setpoint again. Under the Schedule option, the setpoint

values persist even after switching between scheduled occupied and unoccupied periods. For example, if a user changes the occupied cooling setpoint to 76°, the occupied cooling setpoint will remain at 76° on subsequent days until a user adjusts it again. The same is true for the unoccupied setpoint. **To automatically reset setpoints to default values at particular times,** a building automation system can overwrite the setpoint value objects or custom programming can be put into the FlexStat. See the **FlexStat Application Guide**.

Custom Hospitality mode programming is required for:

- Use of **Field C** for displaying messages.

- Creating additional/alternate menu options.

- Any use of AHU or RTU applications in firmware **R1.3.0.11**. (Firmware earlier than R1.3.0.11 did not support Hospitality mode at all, and R1.3.0.11 natively supported only FCU or HPU applications in Hospitality mode. The latest firmware supports all the applications.)

- Automatic periodic resetting of setpoints to a default after a user has changed them.

See the FlexStat Application Guide for more information about custom programming for Hospitality mode.

NOTE: If this new feature does not work (is "Inactive") after upgrading the firmware (especially from R1.3.0.4 or earlier), you may need to restore the factory default (especially if there is custom programming or configuration in the FlexStat) and reconfigure the FlexStat. See *Restore Factory on page 27*.

NOTE: Auto in System Mode does not currently have an icon implemented with it. Manually selecting Heat or Cool will display an icon on the Home screen.

Alarms

```
SAT 4/11          ALARMS
                + SPACE TEMP ALARM 04/11
72.6               04/11/09   08:37:56
                <AI1> SPACETEMP
SERVICE         PRESENT VALUE = 90.1
                EXCEEDS HIGH__LIMIT
                <EE1>          DELETE ALARM?
                SPACETEMPA
                                 YES    NO
```
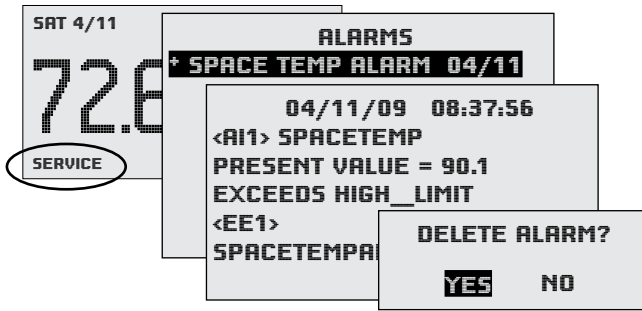
A flashing "SERVICE" on the Home screen indicates an alarm. To view and delete alarms, press:

1. *Right* to move among fields.

2. *Enter* to select. (*Enter* on Alarm Details screen to delete the alarm.)

3. *Left* to go back one page.

Built-in alarms are triggered under these conditions (as applicable to model and configured options):

- **Space Temp Alarm**—temperature outside the range of 56 to 86° F for over 300 seconds. (The monitored object is AV40, mapped from AI1 and/or AI7.)

- **Space Humidity Alarm**—humidity above 65% for over 300 seconds. This is available only in FlexStat models with a humidity sensor and a dehumidification option selected in the Humidity setup. See *Humidity Setup on page 8*. (The monitored object is AI5.)

- **Fan Fail Alarm**—no fan status signal within five seconds of call for fan (and Input 2 is configured for the fan status sensor option). See *Sensor Setup on page 9*. (The monitored object is BV5, mapped from AI2.)

- **Low Limit Alarm**—discharge air temperature (DAT) is below the adjustable (under Damper Setup) low limit alarm temp for one second (when configured for the economizer option). **After a low limit alarm is generated, the fan will not run until after the FlexStat is restarted. See Restart under *Resetting the FlexStat on page 26*. See also *Damper (Economizer) Setup on page 7*.** (The monitored object is BV4, mapped from AI3.)

- **NOTE:** Firmware R2.1.0.18 changed the Low Limit Alarm reference from the mixed air temperature (MAT) sensor to the DAT sensor. For more information, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

- **CO_2 Alarm**—carbon dioxide level is higher than 1,050 ppm (or lower than 300 ppm, indicating a sensor error) for more than 450 seconds. This is available only in FlexStats with a CO_2 sensor and the DCV option enabled in the Damper setup. See *Damper (Economizer) Setup on page 7* and *(Advanced) CO2 Sensor (and DCV) on page 11*. (The monitored object is AV78, mapped from AI9 and/or AI10.)

- **NOTE:** **Time delays and limits** can be modified in the corresponding Event Enrollment objects using TotalControl. Additional alarms may be added using TotalControl up to a total of ten.

- **NOTE:** See also see *(Advanced) Trend Logs on page 20*.

Date/Time

```
          DATE/TIME
DATE:  APR 11 2009
TIME: 1:43:59 PM
```
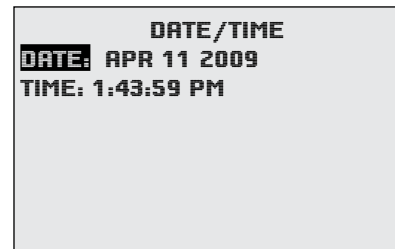
This menu allows changes to the date and time information (only). More options (such as UTC offset and daylight saving time options) are available in the *(Advanced) Date/Time* menu (see *page 16*).

DCV (Demand Control Ventilation)

```
        DEMAND CONTROL VENT
VENT OVERRIDE:  OFF
VENT MODE: STARTUP
```
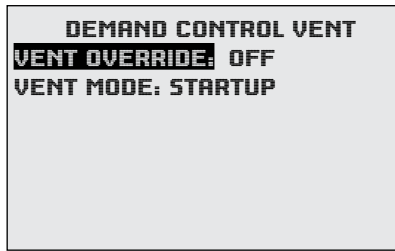
This menu appears under the Main Menu only if DCV Advanced Setup is selected. For more options and information, see *(Advanced) CO2 Sensor (and DCV) on page 11* and *Damper (Economizer) Setup on page 7*.

Ventilation Override is for temporarily flushing a space with maximum fresh air. When Ventilation Override is set to On, it activates the fan (if not already running) for 30 minutes (default) with the outside air damper open to its fullest ventilation position. Turning it Off during the 30 minutes returns the fan and damper to their normal modes. To turn Ventilation Override on or off, press:

1. *Up/Down* to move among entries.

2. *Enter* to select.

3. *Right/Left* to move among value fields.

4. *Up/Down* to increment/decrement value.

Mode displays whether the FlexStat is functioning in Normal, Pre-purge, Startup, Standby, Recovery, or Override mode. Except for Override mode, these modes cannot be changed directly by the user.

Schedules

```
            SCHEDULE
ENTIRE WEEK [MON-SUN]
WEEKDAYS [MON-FRI]
WEEKEND [SAT-SUN]          ENTIRE WEEK
INDIVIDUAL DAYS      1:  7:30:00 AM ON
HOLIDAYS             2:  5:15:00 PM OFF
                     3:
                     4:
                     5:
                     6:
                     [→] DELETES ENTRY
```
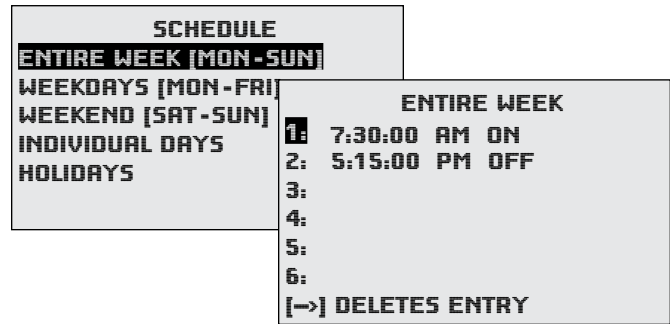
To select the desired schedule, press:

1. *Up/Down* to move among entries.

2. *Enter* to select.

3. *Left* to go back one page.

To enter weekly schedules for occupied (ON) and unoccupied (OFF) times, press:

1. *Right/Left* to move among days and *Enter* to select.

2. *Up/Down* to move among entries and *Enter* to select and edit.

3. *Right/Left* to move among value fields.

4. *Up/Down* to increment/decrement value.

5. *Enter* to exit value editing.

6. *Left* to move back to days or back one page.

NOTE: If a day of a week (e.g., Friday) has a different schedule than the rest, using the Weekdays menu first and then modifying that one day in the Individual Days menu may be easier (two entries) than entering schedules for each day separately in the Individual Days menu (five entries).

NOTE: The last overlapping entry overrides any other. For example, suppose the WEEKDAYS menu is used to set all weekdays for 7:00 AM ON and 5:00 PM OFF, and then the INDIVIDUAL DAYS menu is used to add some additional evening meeting ON times for Tuesday and Wednesday. If the WEEKDAYS menu is later used to change the ON time from 7:00 to 7:15, schedules for all the individual week days will be reset to conform to what appears in the WEEKDAYS menu and any special times for individual days

will be erased. (Special day schedules will then need to be added again through the INDIVIDUAL DAYS menu).

```
             HOLIDAYS
 HOL1: JAN 1 2009
 HOL2: MAR 21 2009
 HOL3: MAY 26 2009
 HOL4: JULY 4 2009
 HOL5: SEPT 1 2009
 HOL6: NOV 27 2009
 HOL7: NOV 28 2009
```

The Holiday entries will override the normal occupied weekly schedule entries and keep those days' settings at their setback values. Setback values are entered in the Setpoints section of the Main Menu. (See also the maximum and minimum cooling/heating setpoint values in *(Advanced) Temp. Setpoint Limits on page 17*.)

NOTE: For maximum efficiency, if Optimum Start is enabled, set On times in schedules for when the room temperature should reach the setpoint, not when heating/cooling equipment should start (which would be earlier). See *Optimum Start Setup on page 9*.

Setpoints

```
 ┈     SETPOINTS      ▼
 COOL SETPT:  74° F
 HEAT SETPT: 70° F
 COOL SETBACK: 80° F
 HEAT SETBACK: 64° F
 CO2 SETPOINT [PPM]: 600
```
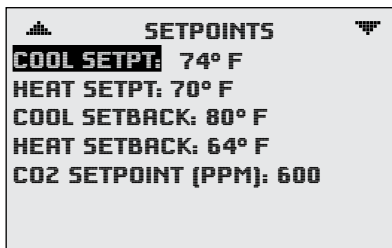
In the Setpoints menu, setpoints and setbacks for various values are set. (The current room temperature setpoint can also be manually changed from the Home menu.)

NOTE: In firmware version R2.0.0.6, Minimum Setpoint Differential, was moved to the Limits menu. See *(Advanced) Temp. Setpoint Limits on page 17*. Also, "Deadband" was separated into Heating and Cooling Proportional Bands and moved to the Loops menu. See *(Advanced) PID Loop Configuration on page 18*.

System Modes

```
              SYSTEM
 SYSTEM ENABLE: AUTO
 OCC OVRIDE [HRS]: 1.0
```
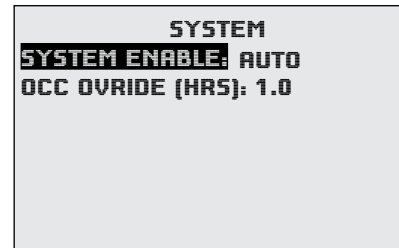
This menu allows changes to system enable (auto, off, heat, or cool modes) and occupancy override time.

Occupancy Override on this menu is the amount of time (in hours) a manual change in the setpoint (via the Up and Down buttons) will be allowed to override the scheduled setpoint. **When the time is set to 0, the override state will last until the next schedule change.**

NOTE: Occupancy override can also be removed while on the Home screen by pushing the left button, navigating to OCC, hitting Enter twice, and changing ON to OFF. See *H/C, Fan, Occupancy, and Override on page 4*.

Access to the Main Menu, setpoint adjust, and System/Occupancy/Fan override have a default password level of User. This level can be changed for each function to None, Operator, or Administrator through this screen. Passwords are set in the (Advanced) Passwords menu. See *(Advanced) Security Levels and Passwords on page 18*.

NOTE: In earlier firmware, Inactivity and Display Blanking were also on this menu. They were moved to the User Interface menu. See *(Advanced) User Interface (UI) on page 21*.

Trend Viewer

```
  ⛰     TREND VIEWER    ▼
1: SPACE TEMP          34
2: SPACE HUMIDITY      27
3: FAN                 19
4: COOL 1              18
5: COOL 2              21
6:
7:
        ⛰  TL #1 SPACE TEMP  ▼
      APR11 1:27PM, 70.3
      APR11 2:27PM, 71.3
      APR11 3:27PM, 71.6
      APR11 4:27PM, 71.8
      APR11 5:27PM, 76.3
      APR11 6:27PM, 81.2
      APR11 7:27PM, 82.3
```

To **view** trend log buffers, press:

1. *Up/Down* to move among entries.

2. *Enter* to select.

Trend logs are **set up** in the *(Advanced) Trend Logs* menus (see *page 19*).

Resetting the FlexStat

Types of Reset

If the FlexStat is not operating correctly or **if a low limit alarm has occurred**, the FlexStat should be reset (reinitialized). Any reset interrupts normal operation, and three types of reset exist:

- A **warm start** is generally the least disruptive option (restarting normal operation the quickest).

- If problems still persist, try a **cold start**. (This should also be used after a new Control Basic program is loaded and compiled.)

- If problems still persist (or major changes in a firmware update have taken place) **restoring factory defaults** (and reconfiguring and reprogramming the FlexStat) may be required.

The "up time" since the last reset can be seen in the About menu. See *About the FlexStat on page 6*.

Warm and Cold Starts

⚠ CAUTION

During a restart, the analog outputs go to zero, and relays go to their normally open state. A restart is a process that lasts around ten seconds, and it may result in several changes of state for an output, turning equipment off and on abruptly. Before resetting the FlexStat, manually override equipment as needed. If a large fan is controlled by the FlexStat, for example, set a minimum off time. See *Fan Setup on page 8* (built-in, selectable applications with compressors have a default programmed minimum off time of 300 seconds).

A **warm start** does the following in the FlexStat:

- **(After zeroing out objects during the restart process) restores present values of objects to their last values before the restart** (until they are updated by the FlexStat's programs).

- Restarts the controller's Control Basic programs.

- Leaves configuration and programming intact.

⚠ CAUTION

If the checksum test in RAM fails during a warm start, a cold start is performed instead.

A **cold start** does the following in the FlexStat:

- **(After zeroing out objects during the restart process) returns all object values to their relinquished defaults** (until they are updated by the FlexStat's programs).

- Restarts the controller's Control Basic programs.

- Leaves configuration and programming intact.

NOTE: Menu changes may take up to about two minutes to write to nonvolatile Flash memory. If power to the FlexStat is lost during this time, changes may be lost. **Restarting the FlexStat from its menu, TotalControl, or BACstage are the recommended methods.**

NOTE: When power is restored after an outage, the FlexStat will attempt to do a warm start as long as the values in RAM are retained (up to about four hours). If the the RAM checksum test fails, a cold start will be done instead. (In custom Control Basic programming, using the POWERLOSS command may be desirable to determine start-up conditions and to take appropriate actions—see the Help system in TotalControl or BACstage for more information.)

```
.···.        ADVANCED        ᵂ
CO2 SENSOR
DATE/TIME        RESTART/RESTORE
DEVICE        RESTART: WARM START
INPUTS        RESTORE FACTORY: NO
LIMITS
LOOPS
RESTART/RESTORE
```
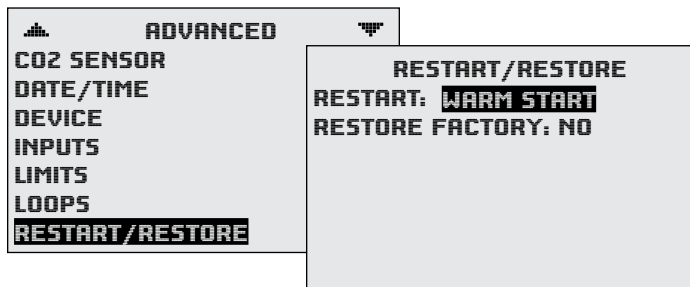
To perform a WARM start, do one of the following:

- From the FlexStat menu, select Advanced > Restart/Restore > Warm Start.

- From TotalControl or BACstage, select Reinitialize Device > Warm Start.

- Momentarily remove power to the FlexStat.

To perform a COLD start, do one of the following:

- From the FlexStat menu, select Advanced > Restart/Restore > Cold Start.

- From TotalControl or BACstage, select Reinitialize Device > Cold Start.

Restore Factory

Restore Factory (restoring the FlexStat to the factory settings) does the following:

- Clears present values.

- Restores the object database/configuration to the defaults.

- Restarts the controller's (factory installed) Control Basic programs.

NOTE: The MAC address and device instance are **not** restored to their original defaults, and custom Control Basic programs are **not** deleted. If **custom** Control Basic programs are installed, all factory programs are restarted **but all custom Control Basic programs are halted.** Custom programs may be restarted by loading/running the programs from the CB Programs menu. See *(Advanced) CB (Control Basic) Programs on page 10*.

⚠ CAUTION

When returned to factory defaults, analog outputs will go to zero and relays will go to their normally open state. Before restarting the thermostat, manually override equipment as needed.

⚠ CAUTION

After a return to factory defaults, applications are unconfigured. You must select the desired application and appropriate settings before connected equipment will operate properly. (See *(Advanced) Application and Additional Setup on page 7*.)

To restore the FlexStat to factory settings:

1. Select Restore Factory from the Advanced > Restart/Restore menu.

2. When prompted for the required restart, press Enter. (To Cancel, press the right button and then Enter or just let the display time-out).

3. After the FlexStat has restarted, review the settings and reconfigure as needed.

```
.···.        ADVANCED        ᵂ
CO2 SENSOR
DATE/TIME        RESTART/RESTORE
DEVICE        RESTART: NO
INPUTS        RESTORE FACTORY: YES
LIMITS
LOOPS                RESTART REQUIRED!
RESTART/RESTORE
                RESTART  CANCEL
```
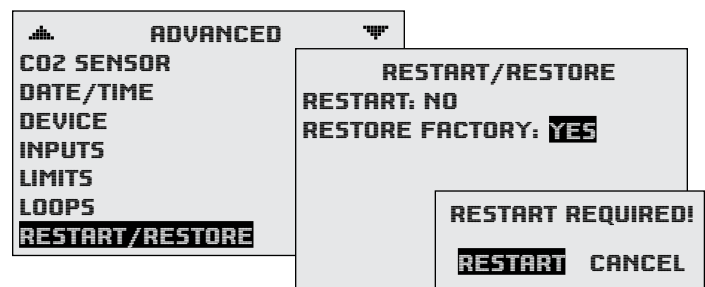
Network Connection

MS/TP Network Communication

Connect the EIA-485 MS/TP network wiring and set the EOL switches accordingly. (See the Installation Guide for wiring and end-of-line switch information.)

From the FlexStat menus, adjust the device instance number, the MAC address, and baud rate from the defaults as necessary. Set the Max Master to the minimum necessary for the network. See *(Advanced) BACnet Device Properties on page 17* and *(Advanced) Communications (BACnet) on page 14*.)

NOTE: The current FlexStat MAC address and device instance numbers can be viewed in the About menu. Each BACnet device on a network must have a unique MAC address and device instance.

| EOL On | Off | Off | Off | EOL On |
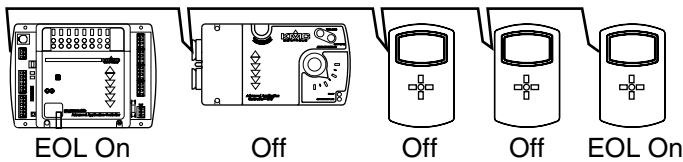
IP/Ethernet Network Communication

Plug in an Ethernet cable into the (optional) RJ-45 jack on the back.

For **IP** and **IP Foreign Device** communications, consult with the system administrator for the appropriate settings for the IP Address, Subnet Mask, Gateway, and UDP Port.

Ethernet communications are essentially plug-and-play, and the MAC address is not changeable.

Only one protocol can be enabled at any time. See *(Advanced) Communications (BACnet) on page 14*.

IP/Ethernet Network
(Optional)

PC Data Port Connection

The FlexStat is equipped with a PC data port located at the bottom of the thermostat housing. This port provides a temporary EIA-485 connection to the digital network for network setup or troubleshooting.

To connect a computer to the port, the EIA-485 signal is converted to a USB signal with a:

• KMC BAC-5051E router for use with its built-in diagnostic web pages in a browser or with KMC Connect.

• KMD-5576 USB communicator for use with BACstage.

To connect to the data port:

1. Connect the keyed, flat end of the interface cable (included with the KMD-5576 or the HPO-5551 tech cable kit for the BAC-5051E) to the port on the bottom of the FlexStat.

2. Connect the other end of the cable to the BAC-5051E or KMD-5576.

3. Connect the cable from the BAC-5051E or KMD-5576 to the computer's USB port.

See the instructions included with the relevant device and software.
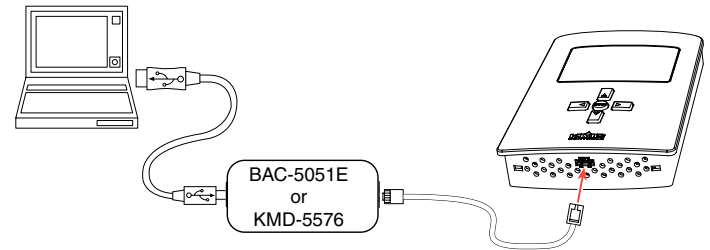
NOTE: For IP/Ethernet-enabled models, a FlexStat in one of the Ethernet or IP modes must (temporarily) be set for MS/TP mode (and restarted) to communicate through the data port at the bottom of the cover. See *(Advanced) Communications (BACnet) on page 14* and *Resetting the FlexStat on page 26*.

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 an optional built-in motion sensor, occasionally wipe dust or dirt off the lens—but do not use any fluid on the sensor.

Programming (Custom)

The FlexStat has a library of built-in applications and options that are configured through the FlexStat's display. Beyond these standard configurations, custom changes can be added to a FlexStat using KMC's BACstage (ver. 2.4.0.26 or later) or TotalControl (ver. 2.0.5 or later). See the **FlexStat Application Guide** for more information.

NOTE: **Customized programs are the responsibility of the user.** KMC Controls does not provide support for such programs.

Accessories

See the **BAC-12xxxx/13xxxx/14xxxx Series FlexStat Data Sheet**.

Firmware Upgrade

The existing version of firmware can be viewed from the About the FlexStat screen. (See *About the Flex-Stat on page 6*).

Firmware in the FlexStat can be upgraded using a PC and an **HTO-1104** Firmware Flash Upgrade Kit available from KMC Controls. (For full upgrade instructions, see the HTO-1104 Installation Guide.)
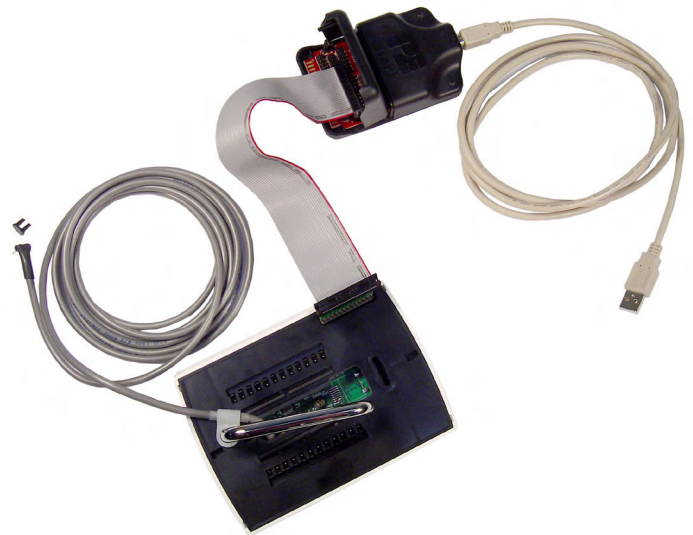
Troubleshooting

Alarm Issues

Alarm, (False) Fan Fail

- Check configuration. Be sure the Fan Status option is not selected when there is no sensor/switch for it.

- Check that the IN2 (fan status) input pull-up resistor switches are fully latched in the correct positions. Any passive, dry contact should use the 10K Ohm setting. (See the Connections and Wiring section of the relevant FlexStat Installation Guide.)

- Check IN2 (fan status) input wiring.

- Check the connected fan status sensor/switch.

- Using BACstage or TotalControl, check that AI2 (fan status) is not configured as "Out Of Service."

Alarm, (False) Low Limit (Freeze Stat)

- Check the Low Limit Alarm setting—see *Damper (Economizer) Setup on page 7*.

- Check configuration. Be sure the Economizer option is not selected when there is no mixed air temperature sensor.

- Check that the IN3 (mixed air temp.) input pull-up resistor switches are fully latched in the correct positions (see the Connections and Wiring section of the relevant FlexStat Installation Guide).

- Check IN3 (mixed air temperature) input wiring.

- Check the connected mixed air temperature sensor.

- Using BACstage or TotalControl, check that AI3 (mixed air temp.) is not configured as "Out Of Service."

NOTE: **After a low limit alarm is generated, the fan will not run until after the FlexStat is restarted.** (See *Resetting the FlexStat on page 26*.)

Alarm, (False) Space Temp. or Humidity

- See *Alarms on page 23*.

- See *Temperature Reading Is Incorrect on page 35*.

- See *Temperature Setpoint Is Not Maintained on page 35*.

- Using TotalControl, adjust the limits or time delay.

Back-Up Issues

NOTE: Backing up the existing settings and firmware image before or during the upgrade process (using the Firmware Upgrade Tool, TotalControl, or BACstage) is recommended practice.

- See the documentation for the program used to back-up the FlexStat.

- See service bulletin SB1111A Back-up and Restore Issues, concerning unconfigured event enrollment objects and checksum errors on NIC cards.

- For HTO-1103 FlexStat Firmware Upgrade Kits received prior to Feb. 7, 2012 that have Rev. D (on the silver label) of the programming pod, see service bulletin SB0212A FlexStat Programming Pod Jumper Position.

- See also *Firmware Upgrade Failures on page 38*.

Communication Issues

NOTE: For a "COMM ERROR" on the display, see *(Advanced) CO2 Sensor (and DCV) on page 11*.

Data Port Communication Issues

- For Ethernet-enabled models, a FlexStat in one of the Ethernet or IP modes must (temporarily) be set for MS/TP mode (and restarted) to communicate through the data port at the bottom of the cover. See *(Advanced) Communications (BACnet) on page 14* and *Resetting the FlexStat on page 26*.

- Upgrade to the latest software version.

- Check the settings for the USB port on the computer (Device Manager > Ports).

- In BACstage, check the MS/TP port (Access > Connection Parameters).

- Reduce the Max Master number down to the minimum needed for that network—see *(Advanced) Communications (BACnet) on page 14*.

- Install the latest port driver and check latency settings. See Latency Settings for KMD-5576 Service Bulletin (SB0308A) on the KMC web site.

- See also *MS/TP Network Communication Issues* below.

Ethernet/IP Network Communication Issues

- Check communication settings—see *(Advanced) Communications (BACnet) on page 14*

MS/TP Network Communication Issues

NOTE: **In firmware R2.0.0.6 and later, Configure must first be selected before any values can be changed.**

- Check the phasing of the power and network lines. See *Wiring Issues on page 40*.

- Check route status, MAC address, and device instance numbers (especially for duplicate numbers on the network)—see *(Advanced) Communications (BACnet) on page 14* and *(Advanced) BACnet Device Properties on page 17*.

- Check that EOL switches are fully latched in the correct positions (see the relevant FlexStat Installation Guide).

- Check baud rate—see *(Advanced) Communications (BACnet) on page 14*.

- Reduce the Max Master number down to the minimum needed for that network—see *(Advanced) Communications (BACnet) on page 14*.

- Ensure wiring is correct. See *Wiring Issues on page 40*.

- If a new BAC-12xxxx FlexStat is installed on an old BAC-10000 series backplate, the input/power/communications terminals are misaligned. MS/TP communications may be damaged. Replace the old backplate with the new backplate that is designed for and included with the BAC-12xxxx. If the FlexStat is damaged, replace it with another BAC-12xxxx.

⚠ CAUTION

The 6-external-input BAC-12xxxx/13xxxx/14xxxx series are NOT COMPATIBLE WITH THE BACKPLATES OF OLDER (3-external-input) BAC-10000 Series FlexStats! If replacing an older 3-external-input FlexStat, replace the backplate as well.

Cover, Display, and Reset Issues

Cover Binds on Backplate

- To remove the cover, turn the hex screws in the bottom and top of the FlexStat **CLOCKWISE only until they clear the cover**. Pull the cover away from the backplate (mounting base).

⚠ CAUTION

To prevent mounting screws from causing damage to the case or circuit board, DO NOT TURN THE SCREWS IN FARTHER THAN NECESSARY to remove the cover. Using a power screwdriver on these screws is not recommended. Also, use only the mounting screws supplied by KMC Controls since other types of screws may damage the FlexStat.

- **Carefully** remove the FlexStat cover from the backplate and inspect for bent pins and/or terminal socket connectors. If cover pins are bent, use a needle-nose pliers to straighten them. If socket connectors are bent, use a pointed object (such as a thumbtack or straightened paperclip) to straighten them. (Pushing the pointed object into the socket from the back side can be helpful.)

- Replace the backplate.

NOTE: **When installing the cover on the backplate, be sure to not pinch or dislodge any wiring. Do not use excessive force. If there is any binding, pull out cover and examine pins and terminal socket connectors.**

⚠ CAUTION

The 6-external-input BAC-12xxxx/13xxxx/14xxxx series are NOT COMPATIBLE WITH THE BACKPLATES OF OLDER (3-external-input) BAC-10000 Series FlexStats! If replacing an older 3-external-input FlexStat, replace the backplate as well.

Display Is Blank (or Erratic)

- If the display comes on when a button is pushed, Display Blanking is enabled. (See *(Advanced) User Interface (UI) on page 21*.)

- Check for a tripped circuit breaker to the transformer.

- Carefully remove the FlexStat cover from the backplate. (See *Cover Binds on Backplate on page 31*.) Check pins and connectors. Ensure the WD (watch dog) jumper is properly installed on its two pins closest to the center of the board (see *Firmware Upgrade Failures on page 38*). Reinstalling the cover on the backplate should restart the FlexStat if it is supplied adequate power.

- Check for proper supply voltage and phasing from the transformer and that the transformer has enough capacity (VA) for all connected devices. See their respective data sheets and **Tips for Connecting 24-Volt Power Application Note (AN0604D)**.

- NOTE: **Wiring must be adequate to avoid excessive voltage drop on long runs! Allow plenty of "cushion." A meter may be too slow to register transient dips or peaks during startup.** See *Wiring Issues on page 40*.

- Put another FlexStat on the installed backplate, and if the second FlexStat functions properly, replace the first FlexStat.

- If the FlexStat has been damaged, check the phasing of the power and network lines. See *Wiring Issues on page 40*.

- See also *Display Keeps Resetting on page 32*.

⚠ CAUTION

The 6-external-input BAC-12xxxx/13xxxx/14xxxx series are NOT COMPATIBLE WITH THE BACKPLATES OF OLDER (3-external-input) BAC-10000 Series FlexStats! If replacing an older 3-external-input FlexStat, replace the backplate as well.

Display Freezes (Buttons Have No Effect)

- Carefully remove the FlexStat cover from the backplate and ensure the WD (watch dog) jumper is installed on its two pins closest to the center of the board (see *Firmware Upgrade Failures on page 38*). The jumper is temporarily removed during a firmware update and should be reinstalled when the process is completed. Reinstalling the cover on the backplate will restart the FlexStat.

- If the **display is functioning (e.g. time is updating correctly), but the buttons have no effect except to turn on the backlight,** the FlexStat is in Locked UI mode. See *(Advanced) User Interface (UI) on page 21*.

- **See a**lso *(Advanced) CO2 Sensor (and DCV) on page 11*.

Display Keeps Resetting

- Carefully remove the FlexStat cover from the backplate, check pins and connectors, and reinsert. (See *Cover Binds on Backplate on page 31*.)

- Check for proper supply voltage from the transformer and that the transformer has enough capacity (VA) for all connected devices (see their respective data sheets).

- NOTE: **Wiring must be adequate to avoid excessive voltage drop on long runs! Allow plenty of "cushion" in measurements A meter may be too slow to register transient dips or peaks during startup.** See *Wiring Issues on page 40*.

- Put the FlexStat on a backplate connected to a (test) transformer with short wiring and no other connected devices. If the FlexStat works with the test transformer, the wiring and/or transformer in its previous location is inadequate. If it does not work with the test transformer, replace the FlexStat.

- Put another FlexStat on the installed backplate, and if the second FlexStat functions properly, replace the first FlexStat.

"SYSTEM ERROR" Is Displayed

- NOTE: The next line is something like "CO2: COMM ERROR," and the buttons have no effect.

- Restart the FlexStat. (See *Resetting the FlexStat on page 26*.) If the buttons don't function, carefully remove the FlexStat cover from the backplate and reinsert it (or cycle the power from the circuit breaker).

Custom Programming and Web Issues

Control Basic Programs Do Not Work

NOTE: The FlexStat has a library of built-in applications and options that are configured through the FlexStat's display. Beyond these standard configurations, custom changes can be added to a FlexStat using KMC's BACstage (ver. 2.4.0.26 or later) or TotalControl (ver. 2.0.5 or later).

NOTE: Control Basic (read-only) programs 1 through 5 are used for built-in applications and can **not** be modified directly. Programs 6 through 10 are empty and can be used for additional programming. Using BACstage or TotalControl, a program (1 through 5) can be copied, pasted into a new program code object (6 through 10), edited, and run in place of the original. (Although programs 1–5 cannot be edited, they can be halted and set to not autorun after restart.)

NOTE: **Customized programs are the responsibility of the user.** KMC Controls does not provide support for such programs.

- In the **FlexStat Application Guide**, **carefully REVIEW ALL the information in the Custom Programming section!**

- Set programs to autorun and/or check if they have halted. Review *(Advanced) CB (Control Basic) Programs on page 10*.

- Ensure objects are written to correct priority levels. See the Custom Web Graphics section in the **FlexStat Application Guide**.

- Custom programming requires BACstage (ver. 2.4.0.26 or later) or TotalControl (ver. 2.0.5 or later). Upgrade to the latest version for the most complete functionality.

- For assistance with Control Basic commands, see the Help system in TotalControl or BACstage.

- If firmware has just been upgraded, see *FlexStat Malfunctions After Upgrade on page 39*.

Custom Web Graphics Do Not Work

- In the **FlexStat Application Guide**, review the Custom Web Graphics section.

- See also *Control Basic Programs Do Not Work* above.

Input, Sensor, and Value Issues

CO_2 Level Value Is Frozen or Is 0

- After power is first applied or the FlexStat is restarted, the sensor goes through a **warm-up** for approximately half a minute. During the time the sensor count will be 0 ppm. See *(Advanced) CO2 Sensor (and DCV) on page 11*.

- The BAC-14xxxx models self-calibrates approximately every 24 hours. During the self-calibration the sensor PPM reading is frozen and will not react to changing CO_2.

- Using BACstage or TotalControl, check that the input is not configured as "Out Of Service."

- See *CO2 and DCV Sequences Are Not Working on page 33* and *Input Values Are Outside the Expected Range on page 34*.

CO_2 and DCV Sequences Are Not Working

- Check the remote CO_2 sensor setup (if applicable). When DCV is enabled in the BAC-1**2**xxxx (without a built-in CO_2 sensor) Damper Setup menu, **IN9** is assumed to be connected to an external SAE-10xx CO_2 sensor. **0–5 VDC on that input** (configured in the *(Advanced) Inputs* menu) **will map to 0–2000 ppm. The output of the connected SAE-10xx must be operating properly and be configured to match the FlexStat's input** (see the installation guide for the appropriate SAE-10xx model), **and the FlexStat's IN9 pull-up resistor must be set for 0–12 VDC** (see the appropriate FlexStat installation guide)! BAC-13xxxx/14xxxx FlexStats also have the external sensor option, and if used, the **highest** of the two readings (internal vs. external) will be used to control DCV sequences. The CO_2 ppm display (if enabled) also shows the highest of the two levels.

- Check DCV (Demand Control Ventilation) settings and sensor calibration. See *Damper (Economizer) Setup on page 7*, *(Advanced) CO2 Sensor (and DCV) on page 11*, *Setpoints on page 25*, and *DCV (Demand Control Ventilation) on page 24*.

CO$_2$ Level Is "Too High"

- See the CO$_2$ and DCV Sequences Are Not Working section above.

- To reduce nuisance complaints by occupants, turn off the visibility of the CO$_2$ level rotation in the display. See *(Advanced) User Interface (UI) on page 21*.

DCV Menu Is Not Visible

- In the BAC-12xxxx/13xxxx/14xxxx models, DCV Setup is visible only when an application with **a modulating economizer option is enabled**. See *Damper (Economizer) Setup on page 7*.

"InActive" Inputs in the Sensor Setup Menu

- In the (Advanced) Application Menu, change APP to NOT CONFIGURED and press Enter. After the "Busy" box disappears, change APP back to the desired application and reselect the desired options under the Additional Setup menu. See *(Advanced) Application and Additional Setup on page 7*).

- Restore the FlexStat to factory settings (see *Resetting the FlexStat on page 26*) and reconfigure it.

Input Values Are Outside the Expected Range

- Check that **ALL** the input pull-up resistor switches are fully latched in the correct positions. See the Connections and Wiring section of the relevant FlexStat Installation Guide. **A single incorrect switch position may affect multiple inputs. All input switches must be latched in either the 10K Ohm or the 0–12 VDC position even if no input is connected! Input switch pairs (3-4, 5-6, and 7-8) must never have both switches set in the same direction—if switch 3 is set to the left, for example, 4 must be set to the right (or vice versa).**

- Check that the correct input type is selected on the Inputs screen. A Type III thermistor is the default on external inputs. See *(Advanced) Inputs on page 17*.

- Check input wiring. See *Wiring Issues on page 40*.

- Check connected sensors.

- For an external CO$_2$ sensor connected to IN9, allow at least 15 minutes after installation for the reading to stabilize.

- For IN1, IN2, IN7, and IN9, check the sensor setup. See *Sensor Setup on page 9*.

- Using BACstage or TotalControl, check that the input is not configured as "Out Of Service."

- In the (Advanced) Application Menu, change APP to NOT CONFIGURED and press Enter. After the "Busy" box disappears, change APP back to the desired application and reselect the desired options under the Additional Setup menu. See *(Advanced) Application and Additional Setup on page 7*).

- Restore the FlexStat to factory settings (see *Resetting the FlexStat on page 26*) and reconfigure.

Humidification/Dehumidification Issues

- See *Humidity Setup on page 8*.

Motion/Occupancy Sensor Does Not Work

- The initial firmware (R.1.0.0.0 and earlier) did not support this sensor within the built-in selectable programs. Custom programming was required—see the **FlexStat Application Guide**. Upgrade to the latest firmware for built-in support.

- After an initial power-up or restart, the motion/occupancy sensor requires about 30 seconds before it will begin responding to motion.

- The motion/occupancy sensor initiates override only during "off" times in the schedule. See *Schedules on page 24*.

- Check that the motion sensor is enabled and detects motion. See *Motion Sensor Setup on page 8*.

- Using BACstage or TotalControl, check that BI6 (occ status) is not configured as "Out Of Service."

- The FlexStat must be installed where there is a clear view of typical traffic area (reliable range is out to about 33 feet). Remove or move obstacles. Reinstall the FlexStat in a more optimal location if necessary.

- Connect remote motion sensors to an input (requires custom programming).

- For more information on detection performance, patterns, configuration, programming, and other issues, see the Motion/Occupancy Sensor section in the **FlexStat Application Guide**.

Temperature Reading Is Incorrect

- Check that the correct °F/°C temperature scale is selected—see *Navigation on page 4*.

- Fahrenheit **decimal** values are **not** displayed by default but can be enabled in the User Interface menu—see *Show Temperature Tenths (Decimals) on page 21*.

- Check for the correct remote temperature sensor configuration—see *Sensor Setup on page 9*.

- After applying power for the first time (or after an outage), allow the FlexStat to self-calibrate a few minutes before verifying temperature reading. (Allow BAC-13xxxx/14xxxx FlexStats with CO2 sensors to stabilize for about 30 minutes.)

- If the discrepancy is small, adjust the calibration offset—see *(Advanced) Inputs on page 17*.

- Check that the thermistor (on models without humidity sensors) is centered in its hole at the bottom of the case and has an air gap around it. Also check that its leads are not pinched, shorted, or broken and that the tape holding down the leads is not loose. (Some early models with humidity sensors did not have the additional thermistor—temperature was derived from the same chip that measured humidity.)

- Using BACstage or TotalControl, check that AI1 (space temp.) is not configured as "Out Of Service."

- Check that the FlexStat is **NOT** mounted on an exterior wall, mounted on or near a large thermal mass (e.g., concrete block wall), blocked from normal air circulation by obstructions, exposed to heat sources (e.g., lights, computers, copiers, coffee makers) or to sunlight (at **any** time of the day), exposed to drafts from windows or air vents, or exposed to air flow through the conduit from leaks in plenum ducts (put sealant inside conduit to block air leaks).

- See also *Input Values Are Outside the Expected Range on page 34*.

Temperature Setpoint Is Not Maintained

- Select Occupied mode from the Home Menu—see *H/C, Fan, Occupancy, and Override on page 4*.

- Override the fan to On from the Home Menu—see *H/C, Fan, Occupancy, and Override on page 4*.

- Check that the appropriate application is selected—see *(Advanced) Application and Additional Setup on page 7*.

- Check that room temperature is being sensed correctly—see *Temperature Reading Is Incorrect on page 35*.

- If space temperature is overshooting the setpoint or oscillating, try increasing the proportional band by a degree. If the problem persists, try increasing the integral value slightly (up to 20%). If the problem still persists, try setting the integral value to 0. (The optimal integral value is dependent on the characteristics of the particular space and HVAC system.) See *(Advanced) PID Loop Configuration on page 18*.

- In 2-pipe FCU applications, check the changeover water temperature sensor and wiring.

- If the HVAC system has trouble recovering from the unoccupied setpoint to the occupied setpoint during very cold weather, enable/adjust the setback lockout. See *Setback (OAT) Lockout Setup on page 10*.

Trend Log Not Working

- Check the sensor. See *Sensor Setup on page 9*.

- Check the trend log configuration. See *(Advanced) Trend Logs on page 20*.

NOTE: In firmware earlier than R2.1.0.18, if **AI2** was configured for **discharge air temperature**, this became default trend log #**2**. For later firmware, use KMC Connect or TotalControl to create a custom trend if this is desired. For more information, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

Time and/or Date Are Not Correct

NOTE: When a FlexStat is powered up after losing the RTC (Real Time Clock) time, it will revert to the default time and date of January 1, 2000, 12:00:00 AM.

- Set time and date in the menu. See *Date/Time on page 23* and/or *(Advanced) Date/Time on page 16*.

- Check the DST (Daylight Saving Time) settings. See *(Advanced) Date/Time on page 16*.

- Using BACstage or TotalControl, send a time synchronization command.

NOTE: An issue can occur if a FlexStat has been un-powered long enough for it to lose its RTC timekeeping during the period **DST (Daylight Saving Time) is in effect** (currently the second Sunday of March through the first Sunday of November) **and** a time synchronization command is sent from BACstage or TotalControl to the FlexStat. The time will be restored to the correct time and date. However, the FlexStat will assume that this time is non-DST. Within about one minute after the initial time synchronization (during DST months), the device time will reset to DST mode, and the device time will move one hour ahead. This will affect the displayed time on the LCD display as well as any schedules. This issue will not affect newly powered FlexStats during non-DST periods (e.g., most of November through February). If the time has erroneously advanced one hour after an initial time synch command, the easiest solution is to simply send a second time synch command. This will correct the device time. Alternately, the hour can be changed in the FlexStat's menu.

Output, Fan, and Relay Issues

Analog Output Does Not Work

⚠ 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.

NOTE: The **maximum current of an analog output is 20 mA @ 12 VDC**. Excessive loads will be clamped at the maximum. Relays may chatter or fail to latch if they need more current than the maximum allowed. KMC REE-3111/3112 relays, for example, could be connected to the analog outputs, but REE-3211/3221/3213 relays would not operate reliably with analog outputs because their required power exceeds the FlexStat's capacity. (REE-3211/3221/3213 relays could, however, be used with the FlexStat relays and a separate power source.)

- Check current draw of load—it must be 20 mA or less. Substitute an output device that draws less current.

- Check that the output is on.

- See *Wiring Issues on page 40*.

- See also *Fan Does Not Run on page 37*.

- If Restore Factory has just been performed, see the Note and Cautions in *Restore Factory on page 27*.

- If the firmware has just been upgraded, firmware for the wrong model type may have been installed (e.g., BAC-1xx63 firmware accidentally installed in a model BAC-1xx36). In the About menu, ASV may simply read "CUSTOM" instead of something like "BAC_1xx36 R1.1.0.5" as it normally would have done. If so, repeat the firmware upgrade and ensure that the correct type of firmware is selected for the connected model.

NOTE: ASV in the About menu will also show CUSTOM if any built-in Control Basic program (1–5) is not running or has auto-run disabled.

Damper/Economizer Does Not Work

- Configure the economizer in the Damper Setup menu. See *Damper (Economizer) Setup on page 7*.

- Connect to the correct output. See *Damper (Economizer) Setup on page 7*.

Fan Does Not Run

NOTE: The animated fan icon is coupled with BV18 in the packaged programming (not the actual fan output terminal).

- Select Occupied mode from the Home Menu— see *H/C, Fan, Occupancy, and Override on page 4*.

- Override the fan to On from the Home Menu— see *H/C, Fan, Occupancy, and Override on page 4*.

- See *Wiring Issues on page 40*.

- Check that the appropriate application is selected—see *(Advanced) Application and Additional Setup on page 7*.

- Check the fan configuration—see *Fan Setup on page 8*.

- Restart the FlexStat. **After a low limit alarm is generated, the fan will not run until after the FlexStat is restarted. (See *Resetting the FlexStat on page 26*.)**

Relay (External) Does Not Work

- See *Analog Output Does Not Work on page 36*.

- See *Relay (Internal) Does Not Work on page 37*

Relay (Internal) Does Not Work

⚠ CAUTION

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

NOTE: 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, 4–6, and 7–9). Do not attach a device that draws current that exceeds the corresponding value. Relays are NO, SPST (Form "A").

- Check current draw of load. Substitute an output device that draws less current.

- Check that the output is on.

- See *Wiring Issues on page 40*.

- Restart the FlexStat.

- If Restore Factory has just been performed, see the Note and Cautions in *Restore Factory on page 27*.

- If the firmware has just been upgraded, firmware for the wrong model type may have been installed (e.g., BAC-1xx63 firmware accidentally installed in a model BAC-1xx36). In the About menu, ASV may simply read "CUSTOM" instead of something like "BAC_1xx36 R1.1.0.5" as it normally would have done. If so, repeat the firmware upgrade and ensure that the correct type of firmware is selected for the connected model.

NOTE: ASV in the About menu will also show CUSTOM if any built-in Control Basic program (1–5) is not running or has auto-run disabled.

Upgrading Firmware Issues

NOTE: **See also the HTO-1103 (KMD-5699) FlexStat Firmware Flash Upgrade Kit Installation Guide, for more information.** (The KMD-5699 product number was changed to HTO-1103 in August 2010.)

⚠ CAUTION

To prevent damaging the FlexStat or programming pod, be sure all the pins align properly with the sockets!

To prevent damage, never plug the programming pod into a FlexStat that is powered. Always attach the power cable last.

To prevent the possibility of damage caused by a ground loop between the FlexStat transformer and the computer power supply, using an optically isolated USB hub or using a laptop operating on batteries only is recommended.

Firmware Upgrade Failures

- If a message appears that the operation has failed, **ensure the WD (watch dog) jumper is TEMPORARILY removed during the upgrade process! Reinstall the jumper on the two pins closest to the center of the board after the upgrade process is complete!** (See illustration below.) After the update, a FlexStat with a missing jumper may seem to be operating correctly, but it may lock up at a later time.

NOTE: To replace a lost WD jumper, use a standard 2.54 mm computer jumper sourced locally. A KMC HPO-0063 jumper can also be used if the finger tab is cut off to clear the backplate.

- If the **USB port does not appear in the drop-down list**, close the tool, remove power to the FlexStat, disconnect the FlexStat from the USB port, reconnect the FlexStat to the USB port, restore power to the FlexStat, and restart the tool.
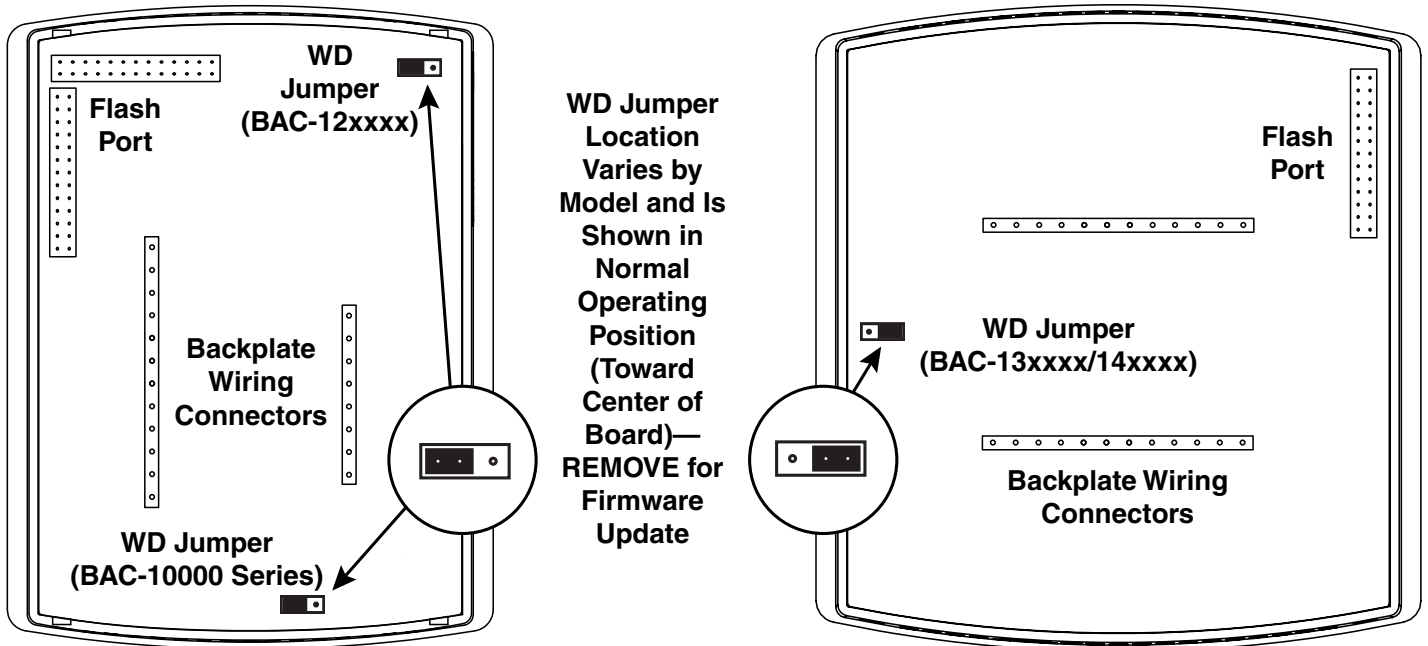
- For any **communication error** (such as an "Operation has failed!" message) check all connections and restart the Firmware Upgrade Tool. If the HTO-1103 kit was received prior to Feb. 7, 2012 and has Rev. D on the silver label of the programming pod, see the FlexStat Programming Pod Jumper Position Service Bulletin SB0212A to check for the correct jumper position within the pod.

- For **display/interface issues** in the Firmware Upgrade Tool, right-click in the firmware panel (on the right) and select *Restore Defaults*.

- To view and download **firmware updates** from within the tool or from KMC's Partner Portal web site (**partners.kmccontrols.com**), you must log-in with a valid user name and password.

- **Ensure firmware for the correct model is selected** in the Firmware Upgrade Tool. If firmware for the wrong model is accidentally installed, the outputs will not match the applications/configuration on the display.

- **NOTE:** **Backing up** the existing settings and firmware image **before or during the upgrade process** (using the Firmware Upgrade Tool, TotalControl, or BACstage) is recommended practice.

FlexStat Malfunctions After Upgrade

- After the update process is over, if the FlexStat **display remains blank but the backlight is on or the display locks up at a later time, check that the WD jumper is reinstalled on the CORRECT pins**. (See the illustration on the previous page.)

- Check the application configuration.

- **NOTE:** Restoring to the factory defaults and reconfiguring might be needed if how the FlexStat operates changes. **Read all notes accompanying the firmware update!**

- **NOTE:** If **custom** Control Basic programs are installed **and set to autorun**, whenever the **firmware is updated, ALL (factory and custom) programs are halted.** If **custom** Control Basic programs are installed **but NOT set to autorun, whenever the firmware is updated, factory programs are restarted but any (manual) running custom programs are halted at restart.**

- Change the state of each custom program by using the Update Manager or loading/running each program from the CB Programs menu (or BACstage or TotalControl).

```
        UPDATE MANAGER
PROGRAM CONFIG ERROR

ENABLE FACTORY: NO
ENABLE CUSTOM: NO
EDIT CB PROGRAMS
DONE
```
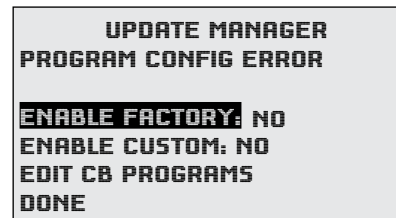
- **NOTE:** See also *Control Basic Programs Do Not Work on page 33*.)

- **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. For more information, see the FlexStat Economizer Change of MAT to DAT Service Bulletin available on the KMC Partners web site.

- **NOTE:** **Customized programs are the responsibility of the user.** KMC Controls does not provide support for such programs.

Wiring Issues

Installation Wiring Considerations

⚠ CAUTION

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

- 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!

- For information on principles and good practices when connecting an MS/TP network, see **Tips for Connecting 24-Volt Power Application Note (AN0604D)**.

- 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., 8 conductor) and outputs (e.g., 12 conductor) is recommended. Grounds for all the inputs can be combined on one wire.

Troubleshooting Wiring Problems

- Review the wiring information in the relevant FlexStat installation guide.

- Remove the FlexStat from the backplate and inspect the terminals for loose or shorted wires.

- Use a voltmeter and ohmmeter to check the terminals for expected values. See the illustration below and the Connections and Wiring section of the relevant FlexStat Installation Guide.

NOTE: Voltage on the BACnet MS/TP terminals changes according to the signals (passing of the token) between controllers on the network. No voltage may indicate a bad connection or simply no active network.

NOTE: **Wiring must be adequate to avoid excessive voltage drop on long runs! Allow plenty of "cushion" in measurements A meter may be too slow to register transient dips or peaks during startup.** See *Wiring Issues on page 40*.

- Check the wiring at the connected devices.

⚠ 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.

NOTE: **Values Shown Are Approximate!**

NOTE: BAC-1xxx63 Backplate Terminals Shown with FlexStat Removed; Outputs and Inputs Vary According to Application

NOTE: SC = Switched (Relay) Common, Should Have the Phase Side of 24 VAC Connected

BACnet MS/TP Network
+B ⊘ } 0.1–0.2 VDC (If Network Token Passing is Present)
−A ⊘

Inputs
(Wiring Inputs and Outputs Dependent on Application)
IN4 ⊘
IN3 ⊘
GND ⊘ } 10K Ohms (Thermistor) or 0 Ohms (Closed Contact)
IN2 ⊘

24 VAC
Common/−/C ⊘
Phase/~/R ⊘ } 24 VAC

Outputs
Resistance Dependent on Device {
Analog 9 ⊘
GND 7–9 ⊘
Analog 8 ⊘
Analog 7 ⊘
Relay 6 ⊘
SC 4–6 ⊘
Relay 5 ⊘
Relay 4 ⊘
Relay 3 ⊘

24 VAC (Jumper to Turn Device On Manually) {
SC 1–3 ⊘
Relay 2 ⊘
Relay 1 ⊘

Terminal Voltages and Resistances with FlexStat REMOVED from Backplate

Support

FlexStats come with a printed Installation Guide. Additional resources for configuration, application, operation, programming, upgrading and much more are available on the award-winning KMC Controls web site (**www.kmccontrols.com**).

The collection of FlexStat support documents won a prestigous publications award for technical marketing support from the Chicago chapter of the Society for Technical Communication in 2010. In 2013, the **FlexStat Catalog Supplement and Selection Guide** was part of a collection of five **KMC catalogs and supplements** that won two awards from the Society for Technical Communication.

Important Notices

Reference

Acronyms and Abbreviations

Common acronyms and abbreviations in FlexStat and related documents include:

amp = amperes

A = amperes

AAC = Advanced Application Controller

A/C = air conditioning

AC = alternating current

AHU = air handling unit

AI = analog input

avg. = average

AWG = American Wire Gauge

BACnet = Building Automation Control network

BTL = BACnet Testing Laboratories

C = Celsius

cfh = cubic feet per hour

cfm = cubic feet per minute

cm = centimeters

DA = direct acting

DAT = discharge air temperature

DST = Daylight Saving Time

DC = direct current

DCV = Demand Control (or Controlled) Ventilation

DPDT = double pole double throw

DPST = double pole single throw

EIA = Electronic Industries Alliance

EOL = end of line

F = Fahrenheit

FCU = fan coil unit

FIU = fan induction unit

FST = fan status

ft-lbs. = foot pounds

g = grams

HPU = heat pump unit

HVAC = heating ventilating and air conditioning

Hz = hertz

IP = Internet protocol

LAT = leaving air temperature (same as DAT)

LCD = liquid crystal display

mA = milliamperes

MAC = media access control

MAT = mixed air temperature

max. = maximum

min. = minimum

mm = millimeters

MS/TP = master-slave/token-passing

NC = normally closed

NO = normally open

OAD = outside air damper

OAT = outside air temperature

pF = picofarad

RA = reverse acting

RH = relative humidity

RS = Recommended Standard

RTC = real time clock

RTD = return air damper

RTU = roof top unit

SAT = supply air temperature

SPDT = single pole double throw

SPST = single pole single throw

UL = Underwriters Laboratories

USB = universal serial bus

UTC = Coordinated Universal Time

V = volts

VA = volt-ampere

VAC = volts alternating current

VAV = variable air volume

VDC = volts direct current

NOTE: See also the *Definitions of Terms on page 43*.

Definitions of Terms

Air Handling Unit (AHU)—An HVAC system component that conditions and delivers air through the system. It typically contains one or more supply and return fans, heating/cooling coils, and filters to condition the air.

BACnet® (Building Automation Control Network)—An interoperable, nonproprietary, communication protocol standard conceived by a consortium of building managers, system users, and manufacturers. BACnet defines how information is packaged for transportation between building automation system vendors.

DCV (Demand Control Ventilation)—Ventilation provided in response to the actual (vs. the design) number of occupants and occupant activity, usually done by using CO_2 sensors to control an air handling system. See *(Advanced) CO2 Sensor (and DCV) on page 11*.

EIA-485—A serial communications standard in which the voltage difference between two wires conveys the data. It is commonly used to network controllers via twisted-pair wiring. It was formerly known as RS-485.

Fan Coil Unit (FCU)—A fan terminal unit that conditions the air in a single room or zone. FCUs generally contain heating and cooling coils and have the ability to supply outside air to a space.

Heat Pump Unit (HPU)—A unit that uses direct expansion to remove or add heat to a space. On a call for heat, the heat pump pulls heat from a source such as outside air or the ground and puts it into a space. On a call for cooling, the process is reversed.

Max Master—The highest MAC address a device will attempt to locate when polling for master devices on the local network.

MS/TP (Master Slave/Token Passing)—A protocol (using the EIA-485 signaling standard) in which master devices can initiate requests for data but slave devices cannot (since slaves can only reply to messages from other devices). KMC advanced application controllers are all MS/TP master devices.

Native BACnet Device—A device that is fully BACnet compatible and uses BACnet as its primary, if not exclusive, method of communication.

PID (Proportional Integral Derivative) Control—A control algorithm that enhances the PI control algorithm by adding a component that is proportional to the rate of change (derivative) of the deviation of the controlled variable. This compensates for system dynamics and allows faster control response.

PID Loop Controller—A controller with an algorithm that calculates an output value that is based on the sensed value and the required setpoint. PID loop controllers provide more accurate and stable control than simpler controllers.

Proportional Control—A type of control in which a controlled device may operate at any position between fully closed to fully open. Within a specific range, the output response maintains a constant ratio to the input signal.

Protocol—A definition or set of communication rules by which information is exchanged between devices on a network.

Real Time Clock (RTC)—A device that keeps track of the current time in a controller even if power is interrupted for a period of time.

Relative Humidity (RH)—The ratio of the amount of water vapor in air to the maximum amount of water vapor that could be in the air if the vapor were at its saturation conditions.

Roof Top Unit (RTU)—An HVAC unit that is supplied as a package and installed outside of a building.

Unit Ventilator—A type of fan coil unit installed in a window or outside wall that supplies outside air ventilation in addition to heating and cooling.

USB (Universal Serial Bus)—A popular, plug-and-play, high-speed, serial computer interface.

UTC (Coordinated Universal Time)—An international standard for determining time zones.

Index

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