BAC-19xxxx FlexStat

Application Guide

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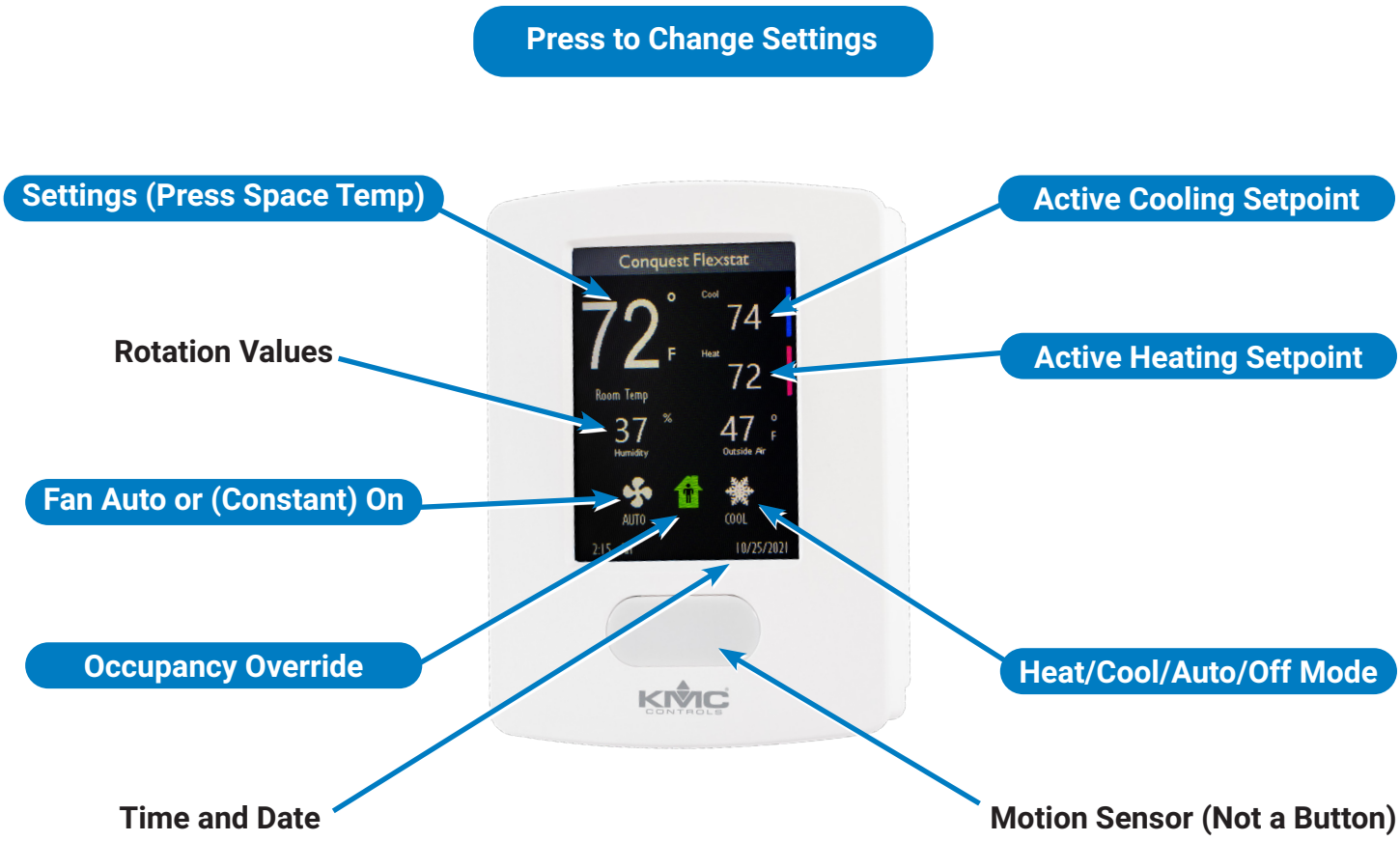
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(Default Screen Configuration Shown)

SETTINGS

NOTE: Select the (AHU, HPU, RTU, or FCU) **application and units BEFORE changing any other settings.** Changing applications later will reset most settings back to their defaults. **Use Restore APP in the Advanced menu or software to verify or change applications.** See **Advanced (Menu Options) on page 4**.

NOTE: Available menu options depend on the FlexStat model and selected application. Some options may require custom Control Basic for operation (e.g., DCV functions using an external CO_2 sensor).

NOTE: Some changes to settings will not affect operation until after the FlexStat is restarted.

NOTE: Software is required for fully configuring alarms and trends, adding custom Control Basic code, and customizing the display—see **Display Customization on page 9**. For compatible software, see the **BAC-190000 Series FlexStats data sheet**.

Accessing Settings

1. Push and hold the upper left corner of the screen (space temperature reading) to start.
2. Enter the password. See **Passwords on page 7**.
3. Press the desired selection.
4. Press **Enter**.

Configuration Navigation/Selection

1. Press the desired selection.
2. Adjust the default selection or value (by pressing the **+** or **–**) as desired.
3. Press **Enter** to save and move to the next setting.
4. Press **Done** to return to the previous or home screen.

NOTE: Available options depend on the FlexStat model and selected application.

INITIAL CONFIGURATION

For initial FlexStat configuration, following the menu steps in this order is recommended.

1. Check that the desired (AHU, FCU, HPU, or RTU) **application** is selected. If not, select it and restart the FlexStat. See Restore APP in **Advanced (Menu Options) on page 4**.

   NOTE: Changing the application later will reset most settings back to their defaults!

2. Configure the (BACnet MS/TP or Ethernet) **communications** settings. See **Communications (Menu Options) on page 5**.
3. Configure the **system** settings. See **System (Menu Options) on page 6**.
4. Configure the **setpoints**. See **Setpoints (Menu Options) on page 5**.
5. Configure the **time and screen** settings. See **Advanced (Menu Options) on page 4**.
6. Configure **schedules**. See **Schedule (Menu Options) on page 5**.

Advanced (Menu Options)

NOTE: Select the (AHU, HPU, RTU, or FCU) **application and** (English or Metric) **units BEFORE changing any other settings.** Changing applications later will reset most settings back to their defaults. **Use Restore APP or software to verify or change applications.**

- **Password 1** = Set password Level 1 (for Active Heating and Cooling Setpoints). See **Passwords on page 7**.
- **Password 2** = Set password Level 2 (for Settings menu)
- **Display** = Display options:
  - **Color Scheme**—Select Blue, Grey, Orange, or Red.
  - **Contrast**—adjust the percentage value.
  - **Brightness**—adjust the percentage value (to the minimum needed for the ambient lighting). Decreasing the default brightness, decreases energy consumption and (depending on lighting conditions) often increases the attractiveness of the display.
  - **Time Format**—display the date (if shown) as 12 Hour (MM/DD/YYYY), 12 Hour (DD/MM/YYYY), 24 Hour (MM/DD/YYYY), or 24 Hour (DD/MM/YYYY).
  - **Time Date Options**—display at the bottom of the screen Date and Time, Time Only, Date Only, or None.
  - **Inactive Timer**—Enter the **seconds** after the last press that the display blanking option activates (0=No Blanking, the default). See the Blanking Options below.
  - **Blanking Options**—Select None (default), Dim (display dims slightly), Backlight Off (display becomes entirely black), or Inactivity Screen (only space temperature is displayed on a black screen).
  - **Lockout**—Select None (default), Icon Bar, or Setpoints. If selected, the item's value can be changed only in software until this setting is changed back to None.
- **Temperature Calibration**—Offsets the space sensor's temperature reading. Press+/- to toggle between adding or subtracting °F/°C. Enter the °F/°C value by which to offset.

- **Restore APP** = Select the application (AHU, HPU, RTU, or 2- or 4-pipe FCU, dependent on model) and (English or Metric) units. The FlexStat will need to restart for this change to take effect. After restarting, most settings will change back to their defaults.

  NOTE: For customizing the display, see **Display Customization on page 9**.

Communications (Menu Options)

NOTE: On "E" models, the default protocol is BACnet over Ethernet with a Device ID of 1. To see new "E" models in software, be sure the software attached to the network can discover **BACnet over Ethernet** devices. (Add a BACnet over Ethernet network in BACstac for KMC Connect and TotalControl if needed.) See **Ethernet/IP Configuration via Software on page 7**.

- **Device Instance** = Enter the Device Instance.
- **Baud Rate** = Select MS/TP baud rate selection (9600 to 115200).
- **MAC Address** = Enter the MAC address (on MS/TP models).
- **Comm Type** = Select IP or Ethernet (on Ethernet models).
- **IP Mode** = Select Normal, Foreign, or BBMD.
- **IP Address** = Enter the IP address.
- **Subnet Mask** = Enter the Subnet mask.
- **Gateway Address** = Enter the Gateway address.
- **UDP Port** = Enter the FlexStat's UDP port.
- **BMDP Port** = Enter the UDP Port of the BBMD to which the FlexStat is registering as a foreign device.
- **BBMD Address** = Enter the remote BBMD IP address.
- **Foreign Time To Live** = Enter the Interval (in seconds) at which the FlexStat (if set as a foreign device) sends a registration message to the BBMD with which it is registered.

Schedule (Menu Options)

NOTE: If no schedule is set, the FlexStat will remain in continuous occupied state as a default.

- **Setpoint Hold** = Select to run the Schedule or Hold the current setpoint.
- **Entire Week** = Set a schedule that applies to all seven days.
- **Weekdays** = Set a schedule that applies to Monday through Friday (only).
- **Weekend** = Set a schedule that applies to Saturday and Sunday (only).
- **Individual Days** = Set a schedule that applies to designated days only.
- **Holidays** = Set a schedule that applies to designated holidays. First, enter the Date, Date Range, or a Week and Day (for holidays occurring on a different date each year). Then enter at least one (and up to six) Time and Value pair(s) for the entered day.

Set Clock (Menu Options)

- **Date** = Set the date for initial or stand-alone operation.
- **Time** = Set the time for initial or stand-alone operation.
- **UTC-Offset** = Set the optional UTC offset for the relevant time zone (see **Appendix: UTC Offset Time Zones on page 25**).
- **DST Enable** = Manually turn on/off Daylight Saving Time mode.
- **DST Auto** = Enable/disable automatic Daylight Saving Time mode.

Setpoints (Menu Options)

- **Occupied Cooling** = Set the Occupied Cooling setpoint.

- **Occupied Heating** = Set the Occupied Heating setpoint.
- **Unoccupied Cooling** = Set the Unoccupied Cooling setpoint.
- **Unoccupied Heating** = Set the Unoccupied Heating setpoint
- **Min Cooling Setpoint** = Set the Minimum Cooling setpoint.
- **Max Heating Setpoint** = Set the Maximum Heating Setpoint.
- **Min Setpoint Differential** = Set the Minimum difference between the Heating and Cooling setpoints.
- **Standby Setpoint Offset** = Set the Standby Setpoint Offset.
- **Dehum Setpoint** = Set the Dehumidification Setpoint.
- **Dehum Differential** = Set the Dehumidification Differential.
- **CO2 Basic Setpoint*** = Set the setpoint for Basic DCV operation.
- **CO2 Basic Deadband*** = Set the deadband for Basic DCV operation.

***NOTE:** For **CO2 sensor and DCV operation** information, see DCV Mode in the System menu and **CO2 Sensors and DCV Operation on page 11**.

- **Economizer Enable Temp** = Set the Economizer Enable Temperature.
- **Minimum DAT** = Set the Minimum Discharge Air Temperature.

System (Menu Options)

- **Override Timer** = Set the unoccupied mode Override Timer after override has been initiated (minutes).
- **Fan Off Delay** = Set the Fan Off Delay time (minutes).
- **Occupied Fan** = Select the fan to run continuously (on) during occupied mode or to be in auto mode (off).
- **Fan Status** = Enable/disable a Fan Status alarm.
- **Equipment Delay** = Set the Equipment Delay time (minutes).
- **Stage Delay** = Set the Stage Delay time (minutes).
- **Economizer** = Enable or disable the Economizer.
- **Min Economizer Damper** = Set the Minimum Economizer Damper position.
- **Dehumidification** = Enable or disable Dehumidification.
- **Heating Fan** = (RTU) select the RTU fan to be controlled by the FlexStat (Auto) or by the RTU's internal relay only (Off) when heating is activated.
- **Standby** = Enable or disable Standby. (When enabled, the current setpoint is set back by the value of the Standby Setpoint Offset after the motion sensor does not detect motion within the time period set by the Standby Timer).
- **Standby Timer** = Set the motion sensor inactivity time before triggering Standby mode (minutes).
- **Cooling Valve Action** = Select the cooling valve for Normally Closed or Normally Open.
- **Heating Valve Action** = Select the heating valve for Normally Closed or Normally Open.
- **DCV Mode** = Select None, Basic, or Standard DCV mode. See **CO2 Sensors and DCV Operation on page 11**.
- **CO2 Ventilation** = Enable/disable CO_2 ventilation.
- **Cooling Prop** = Set the Cooling Proportional value.
- **Cooling Integral** = Set the Cooling Integral value.

- **Heating Prop** = Set the Heating Proportional value.
- **Heating Integral** = Set the Heating Integral value.
- **Reversing Valve Action** = Set the (HPU) Reversing Valve Action (active during cooling or active during heating).
- **Compressor Lockout** = Enable/disable Compressor Lockout.
- **Optimum Start** = Enable/disable Optimum Start. When enabled, Optimum Start learns as days pass the optimal times to begin and end occupied mode and adjusts the schedule times accordingly.
- **AUX Heat** = Select None, 3rd stage, or Compressor Lockout for (HPU) Auxiliary Heat.

Trends and Alarms

NOTE: Trend logs for the space temperature, active cooling setpoint, and active heating setpoint are created by default. Use KMC software to access these features.

PASSWORDS

FlexStats have security options for two levels of passwords as described below and in **Advanced (Menu Options) on page 4**.

LEVEL	DEFAULT	PROTECTS	DESCRIPTION
Level 1	0000	Setpoints	Four digits, with each digit being a number 0 to 9. If all four numbers are 0, no password is required of the user for that level.
Level 2	(See the **Conquest Controllers Default Password Technical Bulletin**)	Configuration	

NOTE: If an optional **Level 1** password is set, users must enter that password to change a setpoint. No password required (0000) is the default.

NOTE: FlexStats are factory-set with a default **Level 2** password for configuration. For more information about the default password, log in to the KMC web site and see the **Conquest Controllers Default Password Technical Bulletin**.

NOTE: For security purposes, change the controller's default password(s). **Be sure to document any changes made to passwords!**

COMMUNICATION OPTIONS

Configuration via Display Menus

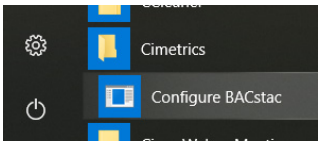
NOTE: FlexStat communications can be set in the built-in display menu system or through software.

Use the built-in menus to select the appropriate MS/TP or Ethernet/IP communication method and address information. See **Communications (Menu Options) on page 5**.

Ethernet/IP Configuration via Software

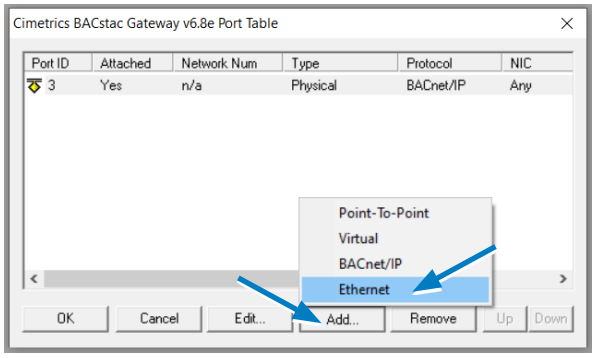
"E" model FlexStats have a default configuration of **BACnet Ethernet** and a **Device ID of 1**. To configure the FlexStat to BACnet **IP** using KMC software (see the **BAC-190000 Series FlexStats data sheet** for versions that support FlexStats), perform the following steps:

1. If necessary to see the FlexStat under Network Manager, add or change a port in BACstac to Ethernet:
   A. Click the Microsoft® Windows® **Start Menu** at the lower left corner of the screen.
   B. Click **Cimetrics**.
   C. Click **Configure BACstac**.



Starting BACstac

   D. Click **Add**.
   E. Select **Ethernet** and enter the necessary Port ID, Network Number, and NIC.



Creating an Ethernet Port in BACstac

F. Click **OK** and **OK**.

NOTE: Port ID and Network Numbers cannot duplicate those of another port in BACstac. It may be easier to temporarily change an existing IP port to Ethernet.

2. Under Network Manager In KMC Connect or TotalControl, right-click **BACnet** and select **Find Devices...** or **Regenerate All Networks...**.
3. Right-click the FlexStat device object, and select **Configure Device...**.
4. Under General Properties, enter the desired **Device Instance**.
5. Under IP Configuration Properties, select Comm Type: **BACnet IP**.
6. Enter the desired **IP Address**, **Default Gateway**, and **Subnet Mask**.
7. Select BACnet IP Mode: **Normal**, **Foreign Device**, or **BBMD**.

NOTE: FlexStats can be used **with** a BBMD (as a Foreign Device) but not **as** a BBMD.

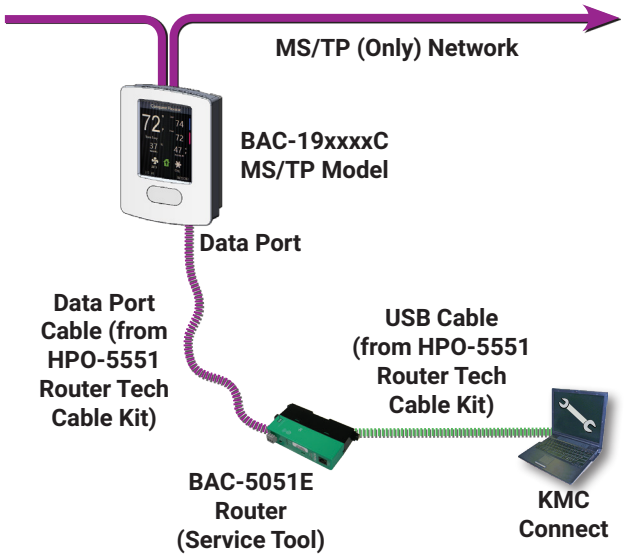
8. Click **Save Changes**.
9. Click **Refresh**.
10. Verify that the settings are valid.
    - If IP Configuration Good is **True** then proceed.
    - If IP Configuration Good is **False**, check IP Configuration Status for possible causes.
11. Under IP Configuration Command, select **Commit**.
12. Click **Save Changes** at the top.
13. Restart the FlexStat.
14. If necessary, change the BACstac port from Ethernet back to IP.

NOTE: For more details, see the software Help system.

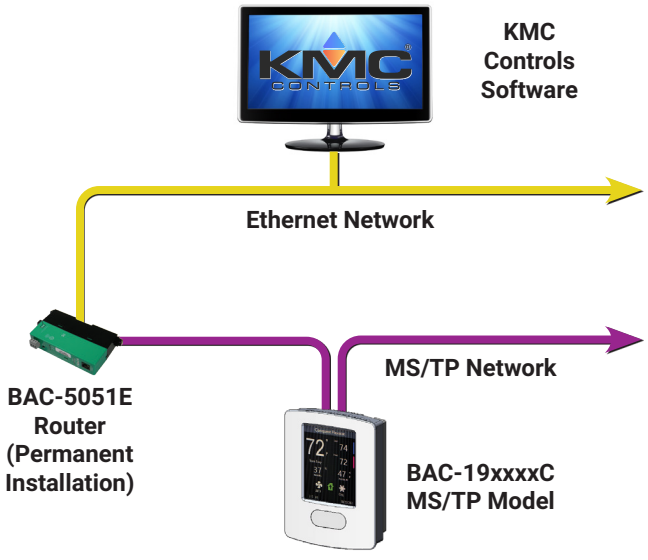
MS/TP Configuration via Software

For MS/TP models to communicate with KMC software, a router (e.g., **BAC-5051E**) is required. See the software and router product information for more details.

After discovery of the FlexStat in the software, change the MS/TP configuration as desired, restart the device, and rediscover the network.



Temporary MS/TP Network Access Through Data Port

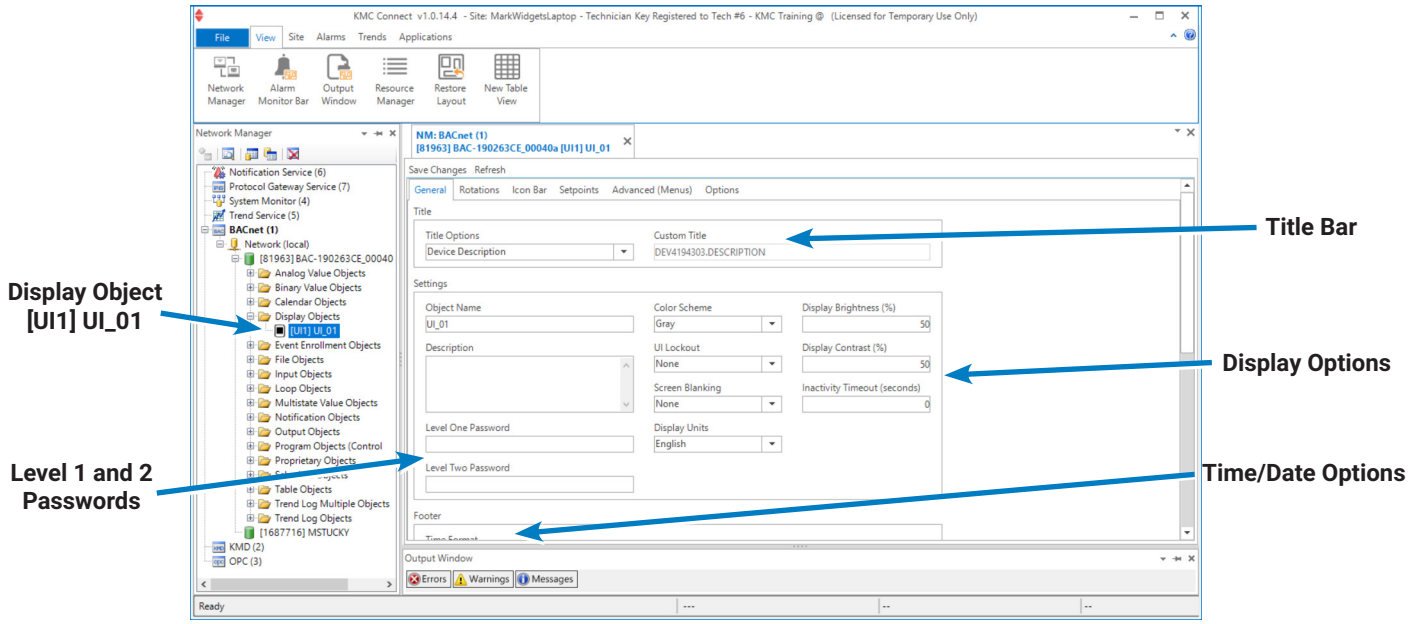


Permanent MS/TP Network Access Through Router

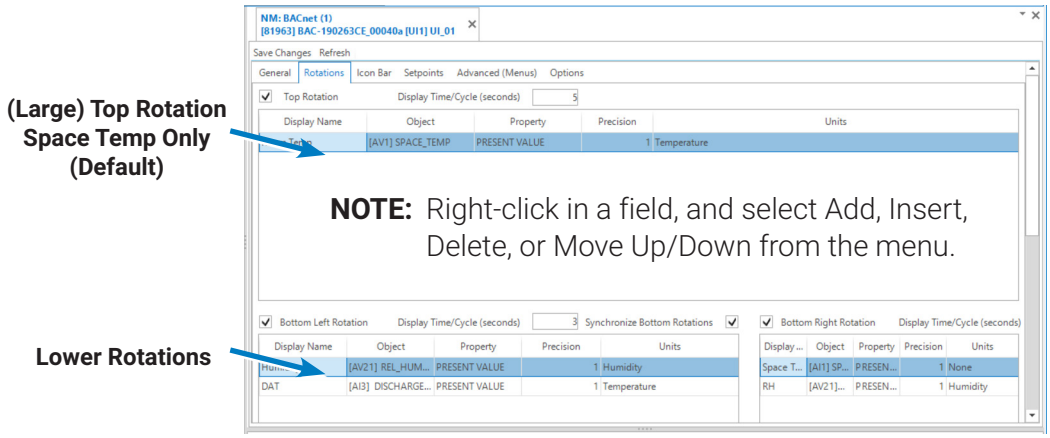
DISPLAY CUSTOMIZATION

The FlexStat menu allows basic display customization (e.g.,color theme, brightness, contrast). See **Advanced (Menu Options) on page 4**.

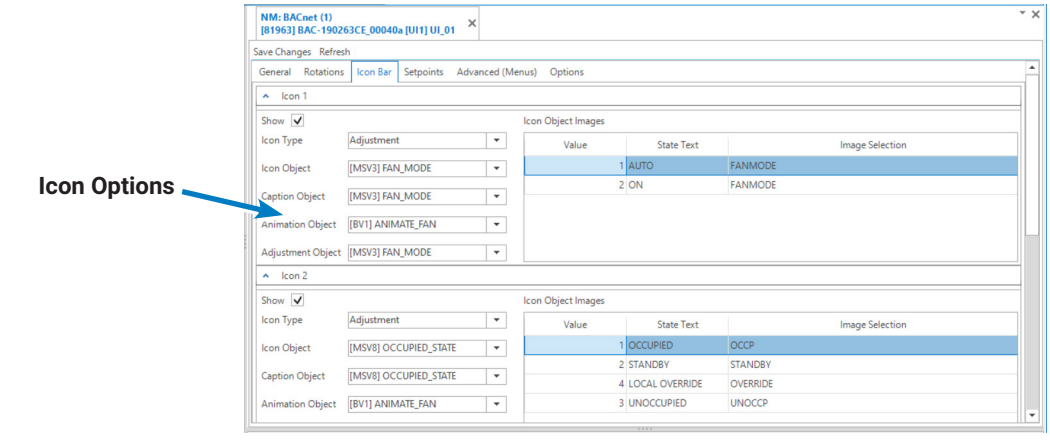
KMC software allows more complete customization in the Display Object. (See the **BAC-190000 Series FlexStats data sheet** for the current software packages and versions that support the FlexStat.) See the software Help system for more information.



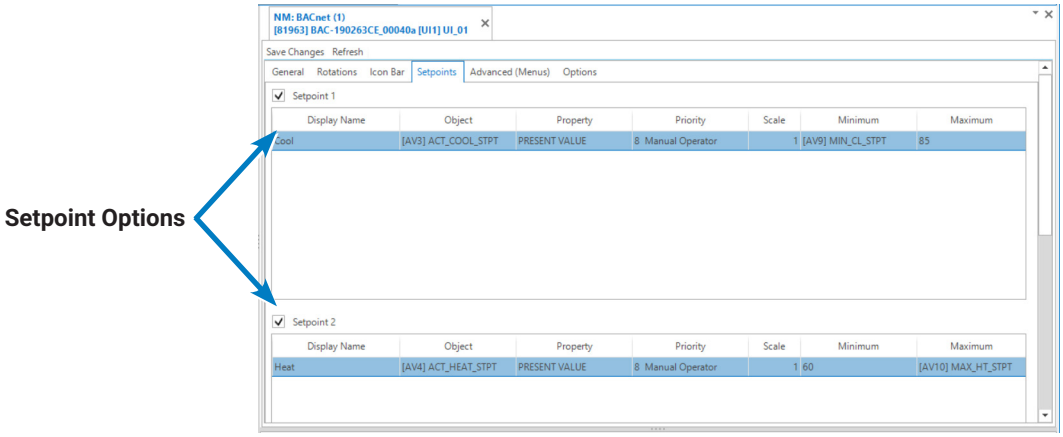
General Tab



Rotations Tab

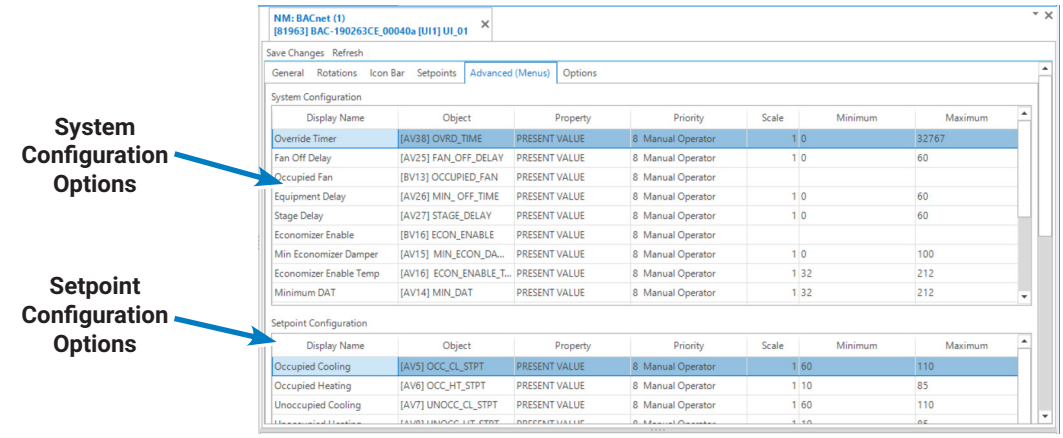


Icon Bar Tab

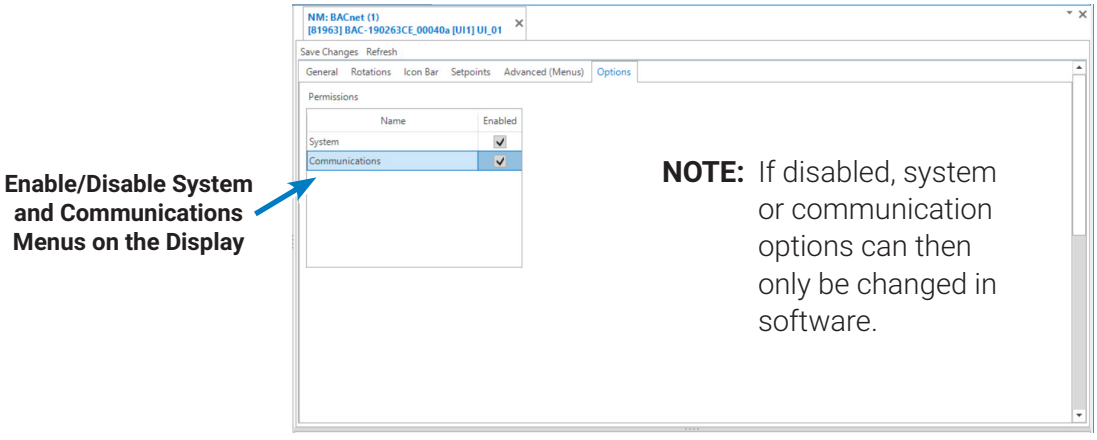


Setpoints Tab

NOTE: One setpoint can be disabled if the FlexStat is used for only cooling or only heating.



Advanced Tab



NOTE: If disabled, system or communication options can then only be changed in software.

Options Tab

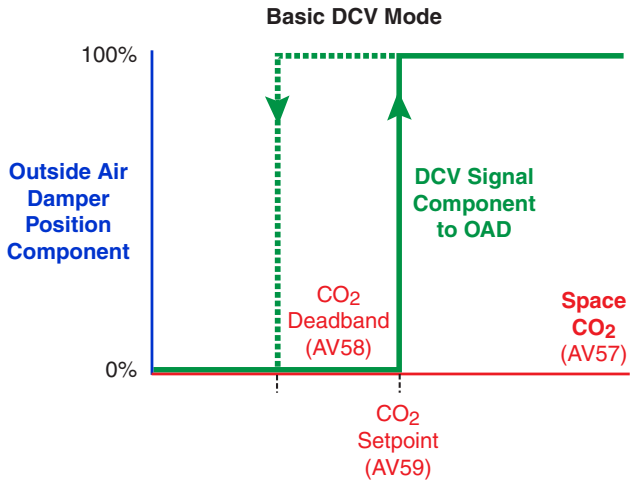
NOTE: See **Settings on page 3** for explanations of options. After saving changes, restart the FlexStat.

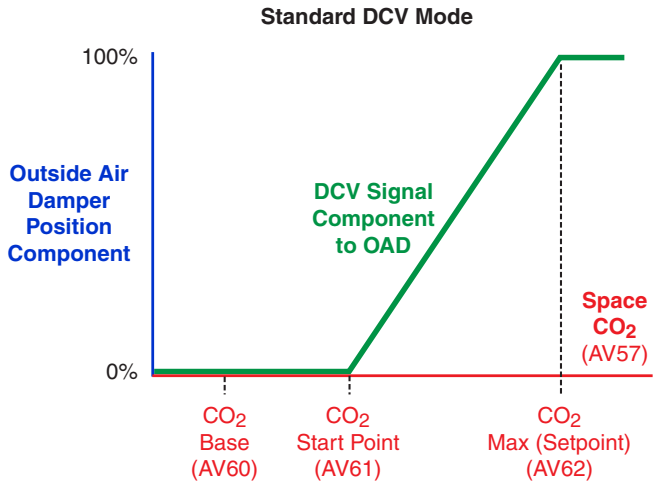
CO_2 SENSORS AND DCV OPERATION

Introduction

BAC-19**5**xxx and BAC-19**3**xxx model FlexStats include CO_2 sensors for **DCV (Demand Control Ventilation)** operation in (BAC-19xx63) RTU, HPU, 4-pipe FCU, and (BAC-19xx36) AHU applications with an outside air damper. See the illustrations and descriptions of Basic and Standard DCV options and operations.

NOTE: High CO_2 measurements may indicate high levels of other airborne containments.





DEMAND CONTROL VENTILATION					
Description	**Menu Options**	**Notes**	**Default Value**	**Object**	**DCV Mode**
CO_2 Level		Available as a rotation value on the display.	0 ppm	AV57	
Select DCV Mode	DCV Mode	Select None, Basic, or Standard.	None	MSV12	
Basic DCV Setpoint	CO2 Basic Setpoint	In **Basic** DCV mode, the desired CO_2 level at which point the economizer damper opens for maximum outside air flow.	1200 ppm	AV59	Basic
Basic DCV Deadband	CO2 Basic Deadband	In **Basic** DCV mode, the amount the CO_2 level must drop below the setpoint before DCV control is relinquished (and outside DCV air flow returns to minimum).	200 ppm	AV58	
Standard DCV Baseline (Outside Air CO_2 Level)*		In **Standard** DCV mode, the presumed average CO_2 concentration level of **outside** air at the building's location. Every week after installation, the lowest detected reading in the previous week is written into AV60 (replacing the original default or previous value).	380 ppm	AV60	Standard
Standard DCV Start Point*		In **Standard** DCV mode, the CO_2 level (setpoint) at which the economizer damper **begins to** modulate **open**. It equals the DCV CO_2 baseline plus **200** ppm, and the value is recalculated weekly.	580 ppm	AV61	
Standard DCV Maximum Allowed CO_2 Level*		In **Standard** DCV mode, the maximum allowed CO_2 concentration level during an occupied period. The economizer damper modulates to **fully open** at this level. It equals the DCV CO_2 baseline plus **600** ppm, and the value is recalculated weekly.	980 ppm	AV62	
*NOTE: Standard DCV values are self-calculating and are not configurable by the user in the FlexStat menu.					

NOTE: A modulating **OAD** (Outside Air Damper) is required for DCV. An OAD is used by both DCV mode and economizer mode. Economizer mode brings outside air into a building for "free" cooling when appropriate conditions are met. The OAD opens to the greatest call between the needs of DCV mode and economizer mode.

NOTE: Whenever DCV is initiated, the fan is set to On. If the fan is multi-speed or modulating, it is set to its maximum output.

NOTE: The FlexStat's CO_2 sensor uses a **self-calibration** technique designed to be used in applications where **CO_2 concentrations will periodically drop to outside ambient conditions** (approximately 400 ppm), typically during unoccupied periods. (There is no provision for calibrating with gas.)

NOTE: Models without CO_2 sensors still have DCV applications available that customers can enable in the Control Basic code for use with external CO_2 sensors. This requires custom programming by the customer.

NOTE: If more than one CO_2 sensor is attached to the FlexStat (which requires custom configuration), the DCV application will use the CO_2 sensor with the highest CO_2 reading.

NOTE: See also the white paper **Demand Control Ventilation Benefits for Your Building**.

Basic DCV Mode

Basic DCV mode is On/Off and aims to optimize IAQ (Indoor Air Quality). It maximizes the supply of fresh outside air to the space after a sufficient level of occupancy is detected (from the CO_2 level exceeding the CO_2 Setpoint).

During occupied mode, the modulating OAD is controlled typically by the economizer application. When the space CO_2 rises above the CO_2 setpoint (e.g., 1200 ppm), the damper opens to its maximum position. The OAD remains fully open until the space CO_2 falls below the CO_2 setpoint minus the CO_2 deadband (e.g., 200 ppm or a reading of 1000 ppm).

When Basic DCV mode is selected, **adjust the setpoint and deadband for the situation.**

Standard DCV Mode

Standard DCV mode is continuously variable and aims to optimize energy efficiency while also still supplying adequate levels of fresh outside air to the space. Setpoints for minimum and maximum DCV airflows are automatically calculated based on the lowest weekly measured CO_2 levels. The setpoint values have no user configuration, and they do not appear in the menu.

NOTE: In Standard DCV mode, the damper is at the minimum position (assuming there is no other demand on the economizer) at the DCV start point. The start point equals the calculated baseline (e.g., 380 ppm) plus 200 ppm (e.g., 580 ppm). At the maximum allowed CO_2 level (e.g., 980 ppm), the damper opens to its maximum position.

NOTE: Standard DCV mode complies with **2019 California Title 24 Part 6 120.1(c)4**. To comply with Title 24:

- If there is an outside air CO_2 sensor, then the OAD begins to modulate open starting at the baseline CO_2 level plus 200 ppm setpoint to the maximum open setpoint at the baseline CO_2 level plus 600 ppm.
- If there is no outside CO_2 sensor, then the baseline CO_2 level shall be set to 400 ppm (for Title 24).

NOTE: Every week after the FlexStat's installation, the lowest detected space CO_2 reading in the previous week is written into AV60 (replacing the original default or previous value). This value is assumed to be the approximate CO_2 level of outside air during an unoccupied period—thereby emulating an outside CO_2 sensor. The value in AV60 is used in the DCV calculations for the following week until it is replaced by an updated value.

WIRING CONSIDERATIONS

General Wiring Considerations

⚠ CAUTION

The BAC-19xxxx models are NOT compatible with the backplates of older BAC-10xxx/12xxxx/13xxxx/14xxxx FlexStats! If replacing an older FlexStat, replace the backplate as well.

⚠ CAUTION

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

⚠ CAUTION

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

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

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

- 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 transformers, 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.

Ethernet Network Wiring Considerations

- For BAC-19xxxxC**E** models (only), plug an **Ethernet patch cable** into the back of the FlexStat.
- The Ethernet patch cable should be T568B Category 5 or better and a maximum of 328 feet (100 meters) between devices.

MS/TP Network Wiring Considerations

- Use 18 gauge, twisted-pair, shielded cable with capacitance of no more than 51 picofarads per foot (167 pf/m) for all network wiring. Log in and see the **EIA-485 Network Wire Recommendations Technical Bulletin** for recommendations. For principles and good practices when connecting an MS/TP network, see **Planning BACnet Networks (Application Note AN0404A**).
- To maintain critical communications in case of an open conductor on the network cable, use redundant wiring routed separately to enhance reliability.
- Connect no more than 128 addressable BACnet master devices (total) to one MS/TP network. The devices can be any mix of controllers or routers. (Up to 127 slave devices can also be connected.)
- Limiting the MS/TP network size to no more than about 30 controllers will optimize network performance.
- If the network has more than 31 MS/TP devices or if the cable length exceeds 4,000 feet (1,220 meters), use a **KMD-5575** repeater (on an MS/TP-only network if the baud rate on the network is no higher than 38.4K baud) or a faster **BAC-5051E** router with an Ethernet network. For each network segment, connect the shields to a good earth ground at only one end of the segment; tape back the shield ground at the other end. Generally, use no more than four KMD-5575 repeaters per MS/TP network.
- Use a **KMD-5567** surge suppressor where a cable exits the building.
- Avoid possible ground loops. See **Avoiding and Troubleshooting Ground Loops Application Guide**.
- For troubleshooting wiring, see **Wiring Issues on page 23** and the **MS/TP Troubleshooting Using a Multimeter - Bifurcation** video and downloadable troubleshooting guide.

RESTARTING THE FLEXSTAT

Types of Restart

If the FlexStat is not operating correctly, restart (reinitialize or reset) it. Any restart interrupts normal operation, and three types of restart exist:

- A **warm start** is generally the least disruptive option (restarting normal operation the quickest).
- If problems still persist, try a **cold start**.
- If problems still persist, **restoring applications** (and reconfiguring and reprogramming the FlexStat) may be required.

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 up to half a minute, 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.

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

- Zeroes 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:

- Zeroes 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 several 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 (when possible) or KMC software 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 six hours). If the RAM checksum test fails, a cold start will be done instead.

NOTE: 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 software for more information.

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

- From KMC software, select Reinitialize Device > Warm Start.
- Momentarily remove power to the FlexStat.

To perform a COLD start, select Reinitialize Device > Cold Start in KMC software.

To restore the app, do one of the following:

- From the FlexStat menu, select Advanced > Restore APP > another application and/or units. Let the FlexStat restart. Restore to the original application in the same manner.
- From KMC software, right-click the FlexStat in the Network Manager and select **Configure Device...**, expand Application Properties, select the application and units in the Base

Application Index drop-down menu, click **Save Changes**, right-click the FlexStat in the Network Manager, select **Reinitialize Device....** Restore to the original application in the same manner.

NOTE: After the application has been changed, most settings are returned to their defaults. Configure them as needed.

TROUBLESHOOTING

Alarm Issues

Alarm, (False) Fan Status Fail

- Check configuration. Be sure the Fan Status option is not enabled when there is no sensor/switch for it.
- Check fan status input wiring.
- Check the connected fan status sensor/switch.
- Using KMC software, check that BI6 (or equivalent fan status binary input) is not configured as "Out Of Service."

Alarms, Other

NOTE: Use KMC software to create any additional alarms—see the Help system in software for more information.

Back-Up Issues

NOTE: Backing up the existing settings and firmware image before or during the upgrade process is recommended practice.

- Use KMC software to back up FlexStats. See the software documentation.
- See also **Updating Firmware Issues on page 22**.

Communication Issues

(MS/TP) Data Port Communication Issues

NOTE: For Ethernet-enabled models, the EIA-485 data port is not supported.

- See the **BAC-5051E** documentation.
- Reduce the Max Master number down to the minimum needed for that network.
- See also **MS/TP Network Communication Issues on page 16** below.

Ethernet/IP Network Communication Issues

- Restart the FlexStat.
- Check communication settings.
- Use a BAC-5051E router to check route status for network issues such as duplicate network numbers.

MS/TP Network Communication Issues

- Check the phasing of the power and network lines. See **Wiring Issues on page 23**.
- Check MAC address and device instance numbers (especially for duplicate numbers on the network).
- Check that EOL switches are fully latched in the correct positions (see the **BAC-19xxxx FlexStat Installation Guide**).
- Check the baud rate setting (which should be the same on all the controllers on the network).
- Check the Max Master setting in a configuration tool. It should be (just) higher than the highest numbered controller.
- Ensure wiring is correct. See **Wiring Issues on page 23**.
- See **Planning BACnet Networks (Application Note AN0404A)**.
- Check for ground loops. See **Avoiding and Troubleshooting Ground Loops Application Guide**.

- See the **MS/TP Troubleshooting Using a Multimeter - Bifurcation** video and downloadable troubleshooting guide.

Cover, Display, and Reset Issues

Cover Binds on Backplate

⚠ CAUTION

BAC-19xxxx FlexStats are NOT COMPATIBLE with the backplates of older BAC-10xxx/12xxxx/13xxxx/14xxxx series FlexStats! If replacing an older FlexStat, replace the backplate as well.

- To remove the cover, turn the hex screw in the bottom of the FlexStat **CLOCKWISE only until it clears the cover**. Swing the cover up from the backplate (mounting base).

⚠ CAUTION

To prevent the mounting screw from causing damage to the case or circuit board, DO NOT TURN THE SCREW IN FARTHER THAN NECESSARY to remove the cover. Using a power screwdriver on this screw 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 might 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 off the cover and examine pins and terminal socket connectors.

Display Is Blank, Erratic, or Frozen

- If the display comes on when an area is pushed, Screen Blanking is enabled. See **Advanced (Menu Options) on page 4**.

- Check for a tripped circuit breaker to the transformer.

- Carefully remove the FlexStat cover from the backplate. Check pins and connectors. Reinstalling the cover on the backplate should restart the FlexStat if it is supplied adequate power.

- If the FlexStat has been damaged, check the phasing of the power and network lines. See **Wiring Issues on page 23**.

- See also **Display Keeps Resetting on page 17**.

Display Keeps Resetting

- Carefully remove the FlexStat cover from the backplate, check pins and connectors, and reinsert. (See **Cover Binds on Backplate on page 17**.)

- 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" in measurements A meter may be too slow to register transient dips or peaks during startup. See **Wiring Issues on page 23**.

- Put the FlexStat on a backplate connected to a (test) transformer with short wiring, enough capacity (VA), 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.

Configuration and Programming Issues

NOTE: Use the relevant KMC software or app to perform the following tasks

Application Is Not Correct

NOTE: **Select the** (AHU, HPU, RTU, or FCU) **application and units BEFORE changing any other settings.** Changing applications later will reset most settings back to their defaults. **Use Restore APP in the Advanced menu or KMC software to verify or change applications.** See **Advanced (Menu Options) on page 4**.

- Select the correct application either through the menu or through KMC software.
- Select a different model FlexStat with the necessary options.

NOTE: BAC-19xx**36** models support (only) Air Handling Units and Unit Ventilators (4-Pipe). BAC-19xx**63** models support (only) Fan Coil Units (2- and 4-Pipe), Heat Pump Units, and Roof Top Units.

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 software.

NOTE: Control Basic programs 1 through 5 are used for built-in applications. Programs 6 through 10 are empty and can be used for additional programming. Using KMC software, 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. Make a backup before modifying any built-in programs!

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

- Check that program objects are running and they have Run on Cold Start selected.
- Check that program objects are not configured as Out Of Service.
- Check the Control Basic code for errors in syntax, priority levels, and other issues. For assistance with Control Basic commands, see the Help system in the software.
- If firmware has just been upgraded, see **Updating Firmware Issues on page 22**.

Configuration Issues

- Check for proper connections between the controller and software.
- See the help information in the documentation for the software.
- To restore configuration values to their factory defaults, change and then restore the application.

Objects Are Missing

- For missing objects (e.g., objects that have been accidentally deleted), use KMC software to create objects.

(Unknown) Password Is Required

- A default Level 2 password is required for initial configuration. See the **Conquest Controllers Default Password Technical Bulletin (TB150716)** by logging into the **KMC web site**.

NOTE: If a Level 1 or 2 password is configured for 0000 in the Advanced menu, that password screen is bypassed in later use.

NOTE: To enhance security after configuration, change the Level 2 password in the Advanced menu. Be sure to document the new password for future reference!

- If a **user-configured** Level 2 password has been forgotten, use KMC software to view the password in the Display Objects screen. In KMC software, both levels of passwords can be viewed and changed as desired without having to first enter either one.

Software Not Compatible with the FlexStat

- Upgrade to the latest version of KMC software. See the **BAC-190000 Series FlexStats data sheet** for versions of KMC software that support the FlexStat.

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.
- The CO_2 models periodically self-calibrate. During the self-calibration, the sensor PPM reading may appear frozen and not react to changing CO_2.
- Using KMC software, check that the input is not configured as "Out Of Service."
- See **CO2 and DCV Sequences Are Not Working on page 19** and **Input, Sensor, and Value Issues on page 19**.

CO_2 and DCV Sequences Are Not Working

- Ensure that the desired CO_2 DCV mode is enabled (under System in Settings or MSV12).
- Check that an economizer is enabled.
- For Basic DCV, adjust the CO2 setpoint and/or deadband (under the Setpoints menu or AV58/AV59).
- Check that conditions for self-calibration are met. The CO_2 sensor uses a self-calibration technique designed to be used in applications where CO_2 concentrations will periodically drop to outside ambient conditions (approximately 400 ppm), typically during unoccupied periods.
- In KMC software, check that AV57 (ROOM_CO2) is not out of service.

CO_2 Level Is "Too High"

- To reduce nuisance complaints by occupants, turn off visibility of the CO_2 level rotation in the display.
- See the **CO2 and DCV Sequences Are Not Working on page 19** section above.

Input Values Outside Expected Range

- After initial power-up, allow time for readings to stabilize.
- Using KMC software, check the sensor's input is properly configured and does not have "Out Of Service" selected.
- Check connected sensors and input wiring. See **Wiring Issues on page 23**.

  NOTE: Faulty wiring on one input can potentially cause fluctuating input values on other inputs.

- Check the application configuration.
- Restore the FlexStat application settings (see **Restarting the FlexStat on page 15**) and reconfigure the settings

Humidification/Dehumidification Issues

- Check the application configuration.
- See also **Input Values Outside Expected Range on page 19**.

Motion/Occupancy Sensor Does Not Work

- After an initial power-up or restart, the motion/occupancy sensor requires about 30 seconds before it will begin responding to motion.
- Using KMC software, check that the motion sensor is enabled and detects motion.
- 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.
- See the Motion Sensing and Troubleshooting (Location) sections in the **Room Sensor and Thermostat Mounting and Maintenance Application Guide**.
- Connect remote motion sensors to an input (requires custom programming).
- Using KMC software, check that the motion-related objects (BI9, BV6, and MSV1) are not configured as Out Of Service.

Temperature Reading Is Incorrect

NOTE: Fahrenheit **decimal** values are **not** displayed by default but can be enabled by setting Precision to 0.1 in the Display Object's Rotations tab. The size of the digits, however, are considerably reduced.

- After applying power for the first time (or after an outage), allow the FlexStat to self-calibrate a half hour before verifying temperature reading.
- Check that the correct °F/°C temperature scale is selected.
- Check that the sensor is properly mounted in a proper location. See the **Room Sensor and Thermostat Mounting and Maintenance Application Guide**.
- Check that the temperature sensors are not covered or blocked.
- Check for the correct remote temperature sensor configuration.
- Using KMC software, check that AI1 and AV1 (space temp.) are not configured as "Out Of Service."
- See also **Input Values Outside Expected Range on page 19**.

Temperature Setpoint Is Not Maintained

- Select Occupied mode from the Home Menu.
- Override the fan to On from the Home Menu.
- Check that the appropriate application is selected.
- Check inputs and outputs.
- Check schedules.
- Check that room temperature is being sensed correctly—see **Time and/or Date Are Not Correct on page 21**.
- Check that the corresponding analog value object (e.g., AV3, AV4) is not configured as Out Of Service.
- 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, decrease the amount of setback or adjust the schedule.
- 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.)

Operation Issues

Schedules Do Not Operate Properly

- Check for proper schedule configuration.
- Check the FlexStat's time. See **Time and/or Date Are Not Correct on page 21**.
- Using KMC software, check the outputs. Check that the schedule object is not configured as Out Of Service.

Time and/or Date Are Not Correct

NOTE: When a FlexStat is unpowered long enough to lose the RTC (Real Time Clock) time, it will revert to the default time and date of 12:00 AM 01/01/2000.

- Using KMC software, send a time synchronization command.
- Set the time and date in the menu. See **Set Clock (Menu Options) on page 5**.
- Check the DST (Daylight Saving Time) settings.
- Check the UTC Offset.

Trends Do Not Work

NOTE: A trend log for space temperature, cooling setpoint, and heating setpoint are automatically generated. Use KMC software to view it and create other trend logs.

- Check that the trend log object Start Time and Stop Time are valid in the configuration.
- Check that Log Enable is selected.
- Check that the log is not full because Stop When Full is selected.
- Check that trend log objects are not configured as Out Of Service.
- Check the relevant sensors. See **Input, Sensor, and Value Issues on page 19**.

Other Issues

- Thoroughly check appropriate connections, wiring, and settings.
- Restart the FlexStat.
- Consult with the network administrator for proper network settings.
- Contact KMC Controls technical support.

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 (SC). See the installation guide or the backplate's terminal label for the correct terminal.

NOTE: Each short-circuit protected universal output capable of driving up to **100 mA** (at 0–12 VDC) or **100 mA total** for all outputs. Excessive loads will be clamped at the maximum. External relays may chatter or fail to latch if they need more current than the maximum allowed.

- Check that the (total) current draw of the load is no more than 100 mA. Substitute an output device that draws less current.
- Using KMC software, check the outputs. Check that the output object (e.g., AO7) is not configured as Out Of Service.
- Check for proper output object configuration.
- Check that the output is on.
- Check the Control Basic programs, loop objects, and schedules.
- See **Wiring Issues on page 23**.
- See also **Fan Does Not Run on page 22**.

Damper/Economizer Does Not Work

- Enable the economizer in the System section of Settings.
- Connect to the correct output.

Fan Does Not Run

NOTE: The animated fan icon is coupled with BV1 in the packaged programming (not the actual fan output terminal).

- Select Occupied mode from the Home screen by pressing the icon.
- Override the fan to On from the Home screen by pressing the icon.
- See **Wiring Issues on page 23**.
- Check that the appropriate application is selected.
- Check the fan.
- Restart the FlexStat.

Relay (External) Does Not Work

- See **Analog Output Does Not Work on page 21**.
- See **Relay (Internal) Does Not Work on page 22**.

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

- Check the current draw of load. Substitute an output device that draws less current.
- Using KMC software, check the outputs. Check that the output object (e.g., BO4) is not configured as Out Of Service.
- Check for proper output object configuration.
- Check that the output is on.
- See **Wiring Issues on page 23**.
- Restart the FlexStat.

Updating Firmware Issues

NOTE: Use KMC software to update firmware **over the network**. See the **BAC-190000 Series FlexStats data sheet** for versions of KMC software that support the FlexStat.

Finding and Selection Issues

- To view and download **firmware updates** from FlexStat product pages on the KMC Controls web site, you must log in with a valid user name and password.
- **Use firmware designated for over-the-network updates**. Firmware meant for the HTO-1104 Firmware Upgrade Kit will not work over the network.
- **Ensure firmware for the correct model is selected**. 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** is recommended practice.

Malfunction after Firmware Update

- Restart the FlexStat.
- 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!

- Change the state of each custom program by loading/running each program from KMC software.

  NOTE: See also **Control Basic Programs Do Not Work on page 18**.)

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

Power Issues

- Check for a tripped circuit breaker to the transformer.
- Check for proper supply voltage and phasing from the transformer (or power supply) and that the transformer has enough capacity (VA) for all connected devices. See the devices' 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 voltage meter may be too slow to register transient dips or peaks during startup.

Protocol Issues

NOTE: On "E" models, the default protocol is BACnet over Ethernet with a Device ID of 1.

- To see new "E" models in KMC software, be sure the software attached to the network can discover BACnet over Ethernet devices. (Add a BACnet over Ethernet network in BACstac if needed.) See **Ethernet/IP Configuration via Software on page 7**.
- To prevent losing communication with "E" models, changing from the default Ethernet to an IP setting requires multiple steps in software. See **Ethernet/IP Configuration via Software on page 7**.

Wiring Issues

- Review the wiring information in **Wiring Considerations on page 13**, the **BAC-19xxxx FlexStat Installation Guide**, and the **BAC-19xxxx FlexStat Sequence of Operation and Wiring Guide**.
- Remove the FlexStat from the backplate and inspect the terminals for loose or shorted wires.
- Check for ground loops. See **Avoiding and Troubleshooting Ground Loops Application Guide**.
- Use a voltmeter and ohmmeter to check the terminals for expected values. See the backplate terminals illustration.

  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 23**.

- Check the wiring at the connected devices.

  ⚠ 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.

⚠ CAUTION

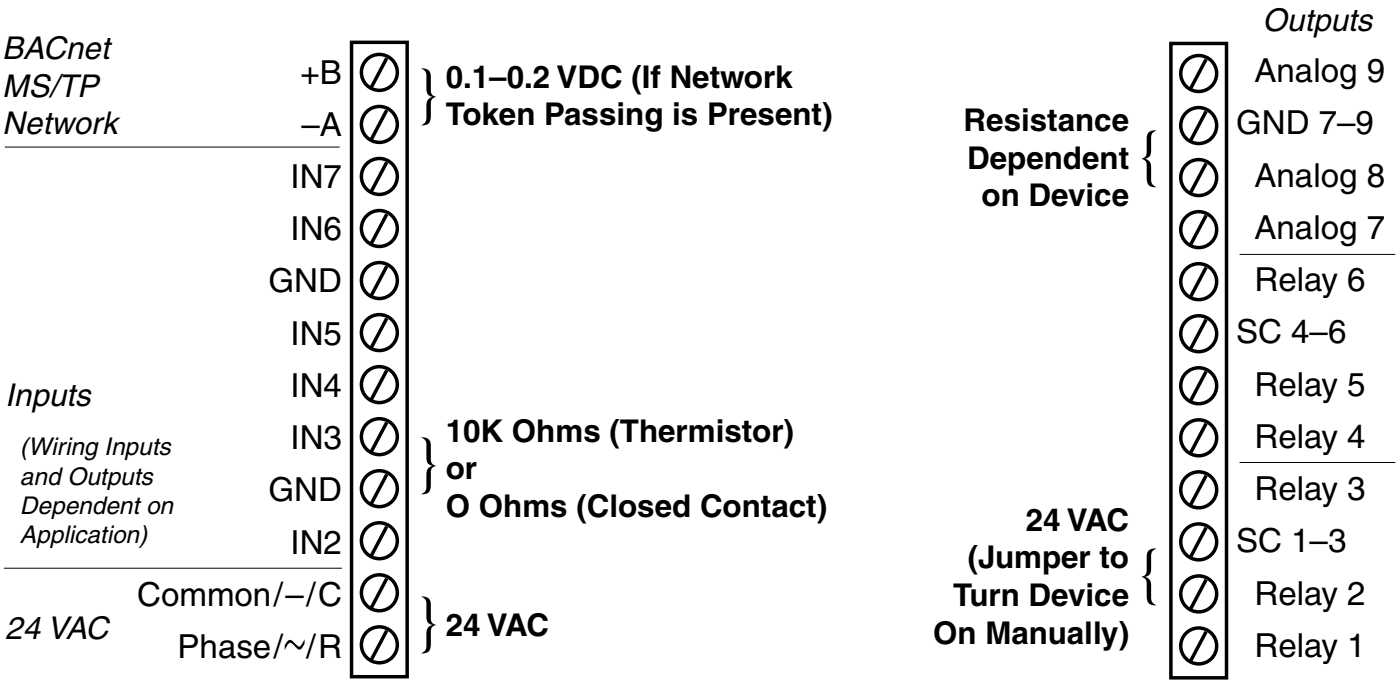
Do not mistakenly connect 24 VAC to an analog output ground. This is not the same as a relay's switched common. See the backplate's terminal label for the correct terminal.

⚠ CAUTION

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

⚠ CAUTION

BAC-19xxxx FlexStats are NOT COMPATIBLE with the backplates of older BAC-10xxx/12xxxx/13xxxx/14xxxx series FlexStats! If replacing an older FlexStat, replace the backplate as well.



Terminal Voltages and Resistances with FlexStat REMOVED from Backplate

NOTE: BAC-19xxx63C Backplate Terminals Shown with FlexStat Removed; Outputs and Inputs Vary According to Application

NOTE: Values Shown Are Approximate!

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

APPENDIX: UTC OFFSET TIME ZONES

To select a time zone and optional DST, see **Set Clock (Menu Options) on page 5**.

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.**

UTC (also commonly known as Zulu or Greenwich Mean Time) is, for example, **5** hours ahead of **Eastern Standard Time** or **4** hours ahead of **Eastern DST (Daylight Saving Time)**. See the chart below for more time zone conversions.

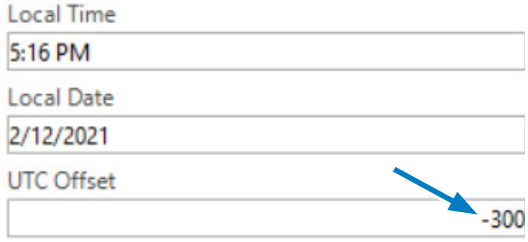
SAMPLE TIME ZONES*	OFFSET FROM UTC TO EQUAL LOCAL TIME**	+/– SIGN IN FLEXSTAT
American Samoa, Midway Atoll	UTC – **660** minutes (11 hours)	**None (+)*** (West of 0 degree Meridian)
Hawaii, Aleutian Islands	UTC – **600** minutes (10 hours)	
Alaska, French Polynesia	UTC – **540** minutes (9 hours) or 480 minutes (8 hours) during DST	
USA/Canada Pacific Standard Time	UTC – **480** minutes (8 hours) or 420 minutes (7 hours) during DST	
USA/Canada Mountain Standard Time	UTC – **420** minutes (7 hours) or 660 minutes (6 hours) during DST	
USA/Canada Central Standard Time	UTC – **360** minutes (6 hours) or 300 minutes (5 hours) during DST	
USA/Canada Eastern Standard Time	UTC – **300 (default)** minutes (5 hours) or 240 minutes (4 hours) during DST	
Bolivia, Chile	UTC – **240** minutes (4 hours)	
Argentina, Uruguay	UTC – **180** minutes (3 hours)	
United Kingdom, Iceland, Portugal	**0** hours	
Austria, Belgium, Denmark, Italy	UTC + **60** minutes (1 hour)	**–** (East of 0 degree Meridian)
Egypt, Israel, Turkey	UTC + **120** minutes (2 hours)	
Kuwait, Saudi Arabia	UTC + **180** minutes (3 hours)	
United Arab Emirates	UTC + **240** minutes (4 hours)	
Maldives, Pakistan	UTC + **300** minutes (5 hours)	
India, Sri Lanka	UTC + **330** minutes (5.5 hours)	
Bangladesh, Bhutan	UTC + **360** minutes (6 hours)	
Laos, Thailand, Vietnam	UTC + **420** minutes (7 hours)	
China, Mongolia, Western Australia	UTC + **480** minutes (8 hours)	
Korea, Japan	UTC + **540** minutes (9 hours)	
Central Australia	UTC + **570** minutes (9.5 hours)	
Eastern Australia, Tasmania	UTC + **600** minutes (10 hours)	
Vanuatu, Solomon Islands	UTC + **660** minutes (11 hours)	
New Zealand, Fiji	UTC + **720** minutes (12 hours)	

*Minor parts of the named areas may be in other time zones.

**May also need to convert from 24 to 12 hour format.

***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.

The UTC-Offset in the FlexStat display menu has no provision for a – sign. Use KMC software to add the – sign for time zones in the Eastern hemisphere as shown on the right.



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IMPORTANT NOTICES

NOTE: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. A BAC-19xxxx Class A digital apparatus complies with Canadian ICES-003.

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HANDLING PRECAUTIONS

For **digital and electronic** sensors, thermostats, and controllers, take reasonable precautions to prevent electrostatic discharges to the devices when installing, servicing, or operating them. Discharge accumulated static electricity by touching one's hand to a securely grounded object before working with each device.



SUPPORT

Additional KMC product information and resources are available on the web at **www.kmccontrols.com**. Log in to see all available files.



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