eVOLUTION SERIES™

SBC-V3T
USER MANUAL

AMERICAN AUTO-MATRIX®
SMART BUILDING SOLUTIONS®

SBC-*V3T User Manual*

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Section 5: Configuration

About This Manual

This manual includes an overview of, and instructions for wiring, installing, and configuring the *SBC*-V3T controllers. Also included are definitions of the *SBC*-V3T channels and attributes, and features of the *SBC*-STAT when used with *SBC*-V3T controllers.

This manual is divided into the following sections:

- **Section 1: Overview**, provides an introduction to and descriptions of the *SBC*-V3Tb and *SBC*-V3Td controllers and their features and components.
- **Section 2: Wiring and Installation**, details wiring and installation procedures including mounting, supplying power, connecting to the communications network, and connecting inputs and outputs.
- **Section 3: *SBC*-V3Tb Channels and Attributes**, defines the channels and attributes of the *SBC*-V3Tb controller.
- **Section 4: *SBC*-V3Td Channels and Attributes**, defines the channels and attributes of the *SBC*-V3Td controller.
- **Section 5: Configuration**, provides instructions for configuring the *SBC*-V3T controllers for use in various applications.
- **Section 6: *SBC*-STAT Features**, describes the *SBC*-STAT setpoint adjustment and LED, and the *SBC*-STAT3 menus when connected to an *SBC*-V3T.
- **Appendix A: *SBC*-V3Tb PUP Channels and Attributes**, lists the PUP channel numbers for each channel, the PUP data type, read/write access, type of storage, SoloPro for Windows location, and a description of each *SBC*-V3Tb attribute.
- **Appendix B: *SBC*-V3Td PUP Channels and Attributes**, lists the PUP channel numbers for each channel, the PUP data type, read/write access, type of storage, SoloPro for Windows location, and a description of each *SBC*-V3Td attribute.
- **Appendix C: PUP Data Type Codes**, lists the hexadecimal numbers, digit format, and a meaning of PUP data types.

Document Conventions

The following formats highlight important information:

NOTE

Notes indicate important information and appear in boxes with this format separated from the running text.

CAUTION

Cautions indicate information that may prevent serious system or user problems and appear in boxes with this format separated from the running text.

WARNING

Warnings indicate information that may prevent personal injury or equipment damage and appear in boxes with this format separated from the running text.

SECTION 1: OVERVIEW

This document provides general information regarding the SBC-*V3T model unitary controllers. Specific configuration and application information is not provided in this document, as the various* SBC-*V3T models can be used in a wide variety of applications.*

Table 1-1: SBC-*V3T Models*

SBC-V3T Controller	Digital Outputs		Analog Outputs	Universal Inputs	STAT-BUS	Real-time Clock	Pressure Sensor	Actuator
	Triacs	Relays						
SBC-V3Tb	None	5	4	5	1	Yes	Yes	Feedback
SBC-V3Td	None	None	None	1	1	External Option	No	Feedback

1.1 WHAT IS THE *SBC*-V3T?

The *SBC*-V3T model controllers (refer to Table 1-1) are static pressure (*SBC*-V3Tb) and airflow (*SBC*-V3Td) digital controllers. The *SBC*-V3T controllers enable constant volume air handler units (AHU) to supply variable amounts of air. The *SBC*-V3Tb is pre-configured as a bypass controller. The *SBC*-V3T controllers work on existing Public Unitary Protocol (PUP) networks. Through an *SBC*-STAT Sensor Bus (SSB), the *SBC*-V3T controllers communicate with *SBC*-STAT sensors without the use of an I/O point on the controller.

1.1.1 FEATURES OF THE *SBC*-V3T TYPE CONTROLLERS

- Mechanical relays equipped with a tranzorb protection device to suppress transients and contact arcing (*SBC*-V3Tb only)
- Four (4) analog outputs (AO) with 0-10VDC range, 8-bit resolution (*SBC*-V3Tb only)
- 15-bit resolution universal inputs (UI)
- Easy configuration through tools such as *SoloPro for Windows™*
- Automatic settings for Cooling Only, Heating Only, or Supply Dependant (VST) control modes
- Separate heating and cooling options for Supply Dependant (VST) mode
- Up to 115.2K baud communication rate
- Motor Management Technology™ (MMT™) for monitoring, identifying, and correcting motor shorts.
- An integrated Belimo® LM24-10P-M feedback actuator that allows you to monitor the position of the damper at all times
- An on board, solid-state pressure sensor that measures the static pressure in the ducts and enables the calibration of pressure for a wide range of duct sizes and types (*SBC*-V3Tb only)
- *SBC*-STAT features, including: digital thermostat capability; non-polar SSB wiring; light emitting diode (LED) display; password protection; easy-to-follow menu selections; a two-wire multiplexed power and data bus; a common terminal (SSB) for an analog or digital *SBC*-STAT; and the capability of having four digital *SBC*-STATs on a single controller
- Flash updates through *SoloPro for Windows* for easy incorporation of the latest firmware
- Real-time clock module for more accurate, stand alone time keeping (*SBC*-V3Tb only, external option for the *SBC*-V3Td)

1.2 INPUTS/OUTPUTS

1.2.1 UNIVERSAL INPUTS (UIS)

The *SBC*-V3T's Universal (analog) Input(s) at Terminal Block 1 are high resolution (15 bit) universal inputs that can accept 0-20mA (DC) when in *current mode*, 0-1MΩ inputs when in *resistance mode,* or 0-10VDC when in *voltage mode*. A capacitor in the circuit provides a 10Hz low-pass filter. Overrange protection is provided to clamp normal overrange conditions and to protect against damage from electrostatic discharge (ESD). Input modes are selected by positioning a jumper on the current, voltage, and resistance (IVR) pin-terminal block located adjacent to TB1 (refer to Figure 1-1). When the I and V pins are jumpered together, the UI is in current mode. When the R and V pins are jumpered together, the UI is in resistance mode. Use resistance mode for digital inputs (e.g., dry contact, occupancy detector, fan status) and thermistors. If there is no jumper, the UI is in voltage mode. The UIs can be configured for alarming, setup/setback, filtering, and input polarity. UIs can be used as a universal input, as an occupancy detection input, or as the duct temperature input.

- When a UI is in current mode, a jumper connects a 249Ω, ±1% resistor between the UI terminal and ground (COM). A 20mA current into the input will develop 4.98VDC at the UI terminal. The sensed voltage is then converted to 4-20mA. Configuration tool settings should not be confused with the 0-20mA physical input range.
- When a UI is in resistance mode, a jumper connects a 10KΩ, ±1% pull-up resistor between the UI terminal and +5VREF. When in Resistance Mode, the attribute FE0x;ST for the UI should be set to *Thermistor* or *Digital*. Multi-point calibration curve capability is available using *SoloPro for Windows*.
- In voltage mode, the UI has a DC input impedance of 200KΩ, ±1%. When in voltage mode, the UI normal physical input range is 0-10VDC. Through *SoloPro for Windows*, you can customize the input range by selecting minimum and maximum values between 0 and 10 at attributes FE01;MN and MX. It is also possible to set the zero and span points for 0-100% range results. These settings should not be confused with the 0-10VDC physical input range.

NOTE

Five (5) UIs are available on the *SBC*-V3Tb at terminals 34 **(UI1)**, 32 **(UI2)**, 30 **(UI3)**, 28 **(UI4)**, and 26 **(UI5)**. **UI2**, **UI3**, **UI4**, and **UI5** have the same characteristics as **UI1**.

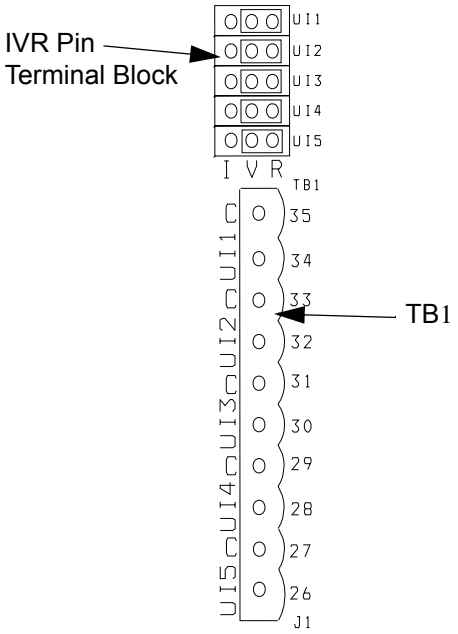


Figure 1-1: The IVR Pin Terminal Block Located Above TB1

1.2.2 DIGITAL OUTPUTS (*SBC*-V3Tb ONLY)

Digital Outputs (DOs) provide ON/OFF control of output devices such as fans, cooling, or reheat stages. All of the DOs on the *SBC*-V3Tb controller are mechanical relay (relays). The outputs enforce minimum cycle time operation, determine the polarity (ON/OFF), and provide a runtime alarm limit for the output. Through *SoloPro for Windows*, you can define normal, inverted, always on, or always off operating modes for the DOs.

Relays have a 1A, 24VAC/DC rated load, normally open, non-polar contact. A tranzorb protection device is provided to suppress transients and contact arcing. At the rated load, the relays have an operating lifetime of greater than one (1) million operations.

NOTE

AAM recommends that output loads be wired so that one side of the load is grounded when possible.

The first DO (marked K1 on the PCB) is the Fan Digital Output. It is dedicated for the use of fan control.

The second DO (marked K2 on the PCB) is Cooling Stage 1.

The third DO (marked K3 on the PCB) is Cooling Stage 2.

The fourth DO (marked K4 on the PCB) is Heating Stage 1.

The fifth DO (marked K5 on the PCB) is Heating Stage 2.

1.2.2.1 ANALOG OUTPUTS (*SBC*-V3Tb ONLY)

You can control analog outputs (AO) automatically, manually, or by a program over the EIA-485 communications network. When set to automatic control, the output is dedicated to the analog control proportional+integral+derivative (PID) loop. Modulation of reheat valves, radiation valves, or lighting ballasts is a suitable application for the AO, which has 0–10VDC output and 8-bit resolution.

NOTE

The *SBC*-V3Tb has four (4) AOs.

NOTE

There are no AOs on the *SBC*-V3Td.

Table 1-2: SBC-*V3T Input and Output Assignments*

Terminal	I/O	Description
1 (TB5)	SSB	SSB Signal
2 (TB5)	COM	SSB Common
3 (TB5)	AO1	Analog Output Channel 1- (*SBC*-V3Tb only)
4 (TB5)	COM	Analog Output Common - (*SBC*-V3Tb only)
5 (TB5)	AO2	Analog Output Channel 2 - (*SBC*-V3Tb only)
6 (TB5)	AO3	Analog Output Channel 3 - (*SBC*-V3Tb only)
7 (TB5)	COM	Analog Output Common - (*SBC*-V3Tb only)
8 (TB5)	AO4	Analog Output Channel 4 - (*SBC*-V3Tb only)
11 (TB3)	K1	Relay 1 Common
12 (TB3)	K1	Relay 1 Normally Open
13 (TB3)	K2	Relay 2 Common

Table 1-2: SBC-*V3T Input and Output Assignments*

Terminal	I/O	Description
14 (TB3)	K2	Relay 2 Normally Open
15 (TB3)	K3	Relay 3 Common
16 (TB3)	K3	Relay 3 Normally Open
17 (TB3)	K4	Relay 4 Common
18 (TB3)	K4	Relay 4 Normally Open
19 (TB3)	K5	Relay 5 Common
20 (TB3)	K5	Relay 5 Normally Open
21 (TB4)	AC Line	24 Volt AC Control Power Input
22 (TB4)	AC AUX	24 Volt AC Auxiliary Output for DC Loads (5A Fuse)
23 (TB4)	AC RET	24 Volt AC Neutral
24 (TB2)	N+	Positive 485 Network Communication Line
25 (TB2)	N-	Negative 485 Network Communication Line
26 (TB1)	UI5	Universal Input 5 - (*SBC*-V3Tb only)
27 (TB1)	COM	Common
28 (TB1)	UI4	Universal Input 4 - (*SBC*-V3Tb only)
29 (TB1)	COM	Common
30 (TB1)	UI3	Universal Input 3 - (*SBC*-V3Tb only)
31 (TB1)	COM	Common
32 (TB1)	UI2	Universal Input 2 - (*SBC*-V3Tb only)
33 (TB1)	COM	Common
34 (TB1)	UI1	Universal Input 1
35 (TB1)	COM	Common

1.3 COMPONENTS AND FEATURES

1.3.1 MOTOR MANAGEMENT TECHNOLOGY

MMT extends the functions of the LM24-10P-M actuator via:

- Alarm generation upon actuator disconnect, reconnect, or failure;
- Motor short detection and correction;
- End of travel detection; and
- Motor usage monitoring for energy conservation.

The MMT circuit measures both the motor current and voltage to detect normal, overload, stall, and shorted conditions. In case of commutator or brush shorts, the MMT circuit provides a clearing pulse to remove small amounts of debris.

Figure 1-2: SBC-*STAT3 (left),* SBC-*STAT1 and* SBC-*STAT1-D (center),* SBC-*STAT2 and* SBC-*STAT2-D (right).*

1.3.2 INTEGRATION WITH *SBC*-STATs

Terminal Block 5/SSB (**TB5:SSB**) is a non-polar, two wire, bidirectional sensor bus that can be used in either digital or analog mode. In analog mode, it supports the *SBC*-STAT1™ and *SBC*-STAT2™. In digital mode, it can communicate with multiple SSB digital devices such as the *SBC*-STAT3™, *SBC*-STAT1-D™, and *SBC*-STAT2-D™. Mode switching is automatic and any SSB digital device will override any analog device.

Through the *SBC*-STAT Bus (SSB), the *SBC*-V3T controllers can communicate with *SBC*-STAT thermostats without the use of an I/O point on the controller. The *SBC*-V3T controllers can support one (1) *SBC*-STAT1, one (1) *SBC*-STAT2, or up to four (4) digital *SBC*-STATs through the SSB.

The SSB can be used to link two or more *SBC*-V3T controllers for certain applications. When using the SSB to link *SBC*-V3T controllers, one controller must be configured as a master, and all other controllers must be configured as a slave. In addition, proper polarity must be maintained. **Connect SSB to SSB and COM to COM** (connect terminal 1 of TB5 on controller A to terminal 1 of TB5 on controller B; and connect terminal 2 of TB5 on controller A to terminal 2 of TB5 on controller B). Refer to *Section 2, Wiring and Installation*, for additional information.

CAUTION

When using the SSB to link two SBC-*V3T controllers (as needed for certain applications), polarity must be maintained. Connect SSB of controller A to SSB of controller B and COM of controller A to COM of Controller B.*

1.3.3 NETWORKING

Through *SoloPro for Windows*, you can program the *SBC*-V3T controllers and monitor/modify their setpoints. This configuration tool also allows you to use the *SBC*-V3T flash memory capabilities for downloading software updates tracked by Software Release Codes. (For more information, refer to the *SoloPro for Windows User Manual*.)

Networking is also possible using the *Auto-Pilot*™ software through the SAGE^{MAX} ™ or SF1™ area controllers. *Auto-Pilot* enables you to detect alarms, generate trends, and view color graphical displays of your system with live data.

Integration of the *SBC*-V3T controllers into an AAM system occurs through direct connection to the SAGE[MAX] or SF1, or to other unitary controllers. Networking of up to 128 *SBC*-V3T controllers is possible through a single SAGE[MAX] port.

1.3.4 PRESSURE SENSOR (*SBC*-V3Tb ONLY)

The *SBC*-V3T's on board, solid-state pressure sensor measures static pressure in the ducts. Pressure measurement and calibration is possible for a wide range of duct sizes and types.

NOTE

The *SBC*-V3Td is not equipped with a pressure sensor.

1.4 *SBC*-V3T CONTROLLERS

1.4.1 THE *SBC*-V3Tb

The *SBC*-V3Tb has five (5) relay outputs, four (4) AOs, and five (5) UIs. The *SBC*-V3Tb's pressure sensor is used for measuring static pressure. The *SBC*-V3Tb also includes an integrated Belimo LM24-10P-M feedback actuator that employs MMT to monitor, identify, and correct motor shorts. The position of the controller's integrated damper motor is controlled by the *SBC*-V3Tb's PI control loop. The feedback actuator allows you to monitor the position of the damper at all times. The *SBC*-V3Tb's on-board Real-time Clock Module broadcasts the time to all other controllers on the network.

1.4.2 THE *SBC*-V3Td

The *SBC*-V3Td is equipped with one (1) UI. The *SBC*-V3Td also includes an integrated Belimo LM24-10P-M feedback actuator that employs MMT to monitor, identify, and correct motor shorts. The position of the controller's integrated damper motor is controlled by the *SBC*-V3Td's PI control loop. The feedback actuator allows you to monitor the position of the damper at all times.

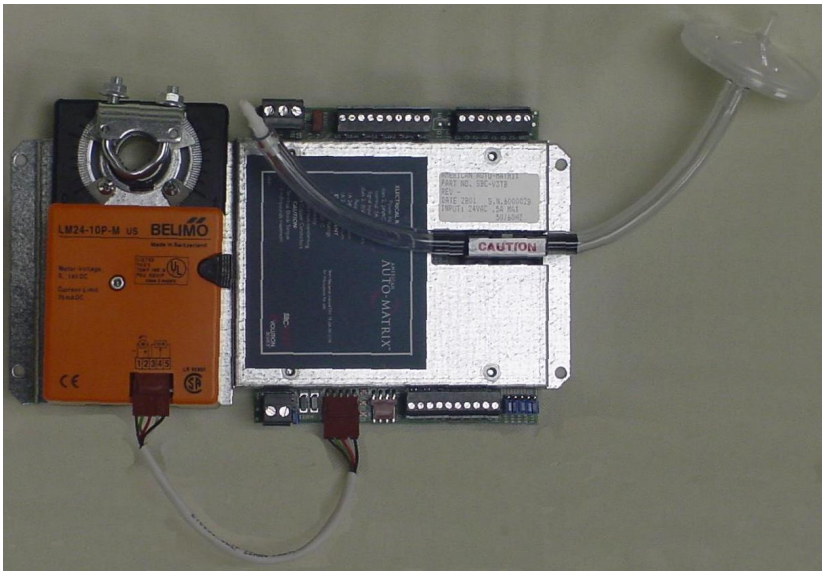


Figure 1-3: The SBC-*V3Tb*

Figure 1-4: The SBC-*V3Td*

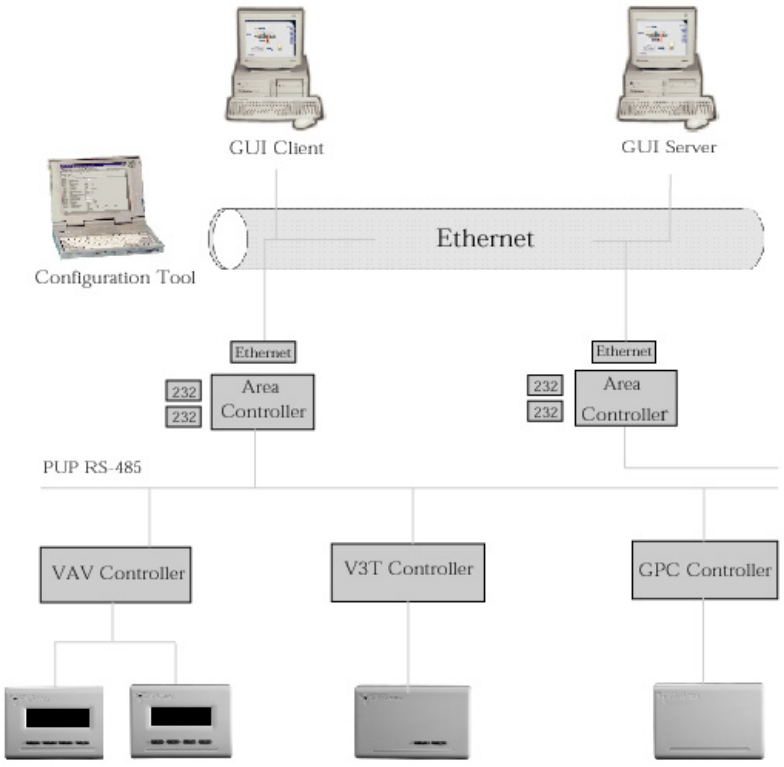


Figure 1-5: System Architecture of SBC Products

1.5 SPECIFICATIONS

1.5.1 NETWORKING

The following specifications are necessary for networking of the *SBC*-V3T controllers:

- **line signaling:** EIA-485
- **wiring:** shielded, twisted pair 18-22 AWG
- **network protection:** dual tranzorbs, Hi ESD driver
- **communications speed:** 1,200bps–115.2Kbps baud rate, programmable
- **network configuration:** multidrop to 5,000ft. (1.5km) total
- **protocol:** PUP.

1.5.2 INTEGRATED COMPONENTS

- LM24-10P-M Belimo feedback actuator with floating mount, eliminating damper shaft stress and binding.
- Pressure sensor (*SBC*-V3Tb only).

1.5.3 ACTUATOR MOTOR

- **Torque rating:** 35in. lbs. (8Nm minimum).
- **Travel time:** approximately 45 seconds.

1.5.4 TERMINATIONS

- Pluggable terminal blocks for inputs, outputs, power, and network connection.

1.5.5 INPUT SUPPLY

- NEC class 11 transformer (customer-supplied).
- 24VAC, 50/60Hz, 10VA maximum, 5VA typical.
- 5A fuse load protection.
- PTC control electronics protection.

1.5.6 OPERATING ENVIRONMENT

- **Temperature range:** 0–50°C.
- **Humidity range:** 5–95% RH noncondensing.

1.5.7 DIMENSIONS

- **Size:** 8.5 in. (21.6cm) × 5.75 in. (14.6cm) × 2.63 in. (6.7cm)
- **Shipping weight:** 2.04 lbs (.93kg) and 1.86 lbs (.84kg)

1.5.8 AGENCY APPROVALS

- UL listed 916, Management Equipment, Energy (PAZX).
- UL 873 Component-Temperature-Indicating and Regulating Equipment (XAPX2).
- Complies with FCC rules Part 15, Class B Computing Device.
- Complies with CE directives and standards.

SECTION 2: WIRING AND INSTALLATION

This section covers mounting, connecting the pressure sensor, and wiring the SBC-*V3T controllers. Wiring instructions for power, communications, and inputs/outputs appear along with safety requirements.*

2.1 INSTALLATION

The installation of the *SBC*-V3T controllers involves mounting, supplying power, connecting to the communications network, and connecting input and output devices. All wiring connections to the *SBC*-V3T are made with the use of terminal blocks (TB). The TBs are plug (female) & socket (male) style. The plug consists of terminal ports and adjustment screws. Input/output device, network, and power wires enter the terminal ports and are secured to the assembly with the adjustment screws. The socket consists of a row of pins and is permanently mounted to the printed circuit board (PCB). When connecting/disconnecting the two parts of the TB, align the holes on the plug with the pins on the socket and avoid twisting, thus damaging the assembly. Such damage will void the product warranty.

WARNING

The sockets to which the terminal block plugs connect are permanently attached to the PCB. Twisting or applying torque when connecting/ disconnecting will result in damage that will void the product warranty.

WARNING

SBC-V3T controllers should only be used in a manner specified by the manufacturer.

WARNING

Only trained personnel should service *SBC*-V3T controllers. No operator replaceable parts exist in *SBC*-V3T controllers.

WARNING

Remove power before servicing.

2.2 MOUNTING

Perform the following procedure to mount the *SBC*-V3T controller.

CAUTION

The mounting area should be free from moisture and leakage.

1. Loosen the 10mm hex nuts of the U-bolt attached to the damper clamp.
2. Adjust the alignment of the actuator to the mounting bracket so that the screw attaching the two parts fits snugly into the bottom portion of the diamond shaped hole on the bracket.
3. Place the damper clamp around the damper shaft and position the *SBC*-V3T controller on the terminal box so that at least two (2) of the controller backing's mounting holes are on the terminal box. Make sure that the bottom of the

actuator is flush with the bottom of the sheet metal plate behind it.

CAUTION

The metal of the SBC-*V3T mounting bracket must make contact with the metal of the terminal box and the terminal box must be grounded to a true earth ground. Otherwise, electrical and communications problems are likely to occur.*

4. Hand tighten the 10mm hex nuts to temporarily secure the damper clamp to the damper shaft.

NOTE

AAM recommends the use of self-drilling mounting screws for securing the controller to the terminal box. Mounting screws used to secure the controller to the terminal box are not supplied with the *SBC*-V3T controllers.

5. If you are not using self-drilling mounting screws, use the controller backing as a template and mark the mounting hole locations on the terminal box. Remove the controller, then drill pilot holes in the terminal box. AAM recommends the use of at least two (2) screws to secure the *SBC*-V3T controller to the mounting location.
6. Align the mounting holes of the *SBC*-V3T controller with the pilot holes drilled in Step 5 and secure the controller to the terminal box using mounting screws. Mounting screws used to secure the controller to the terminal box are not supplied with the *SBC*-V3T controllers.
7. Set the damper and actuator to 50 percent and fully tighten the damper clamp's 10mm hex nuts.
8. Adjust the hard stops of the damper clamp by loosening the screws that appear on top of the stops. Move the stops to the desired positions, and tighten the associated screws.

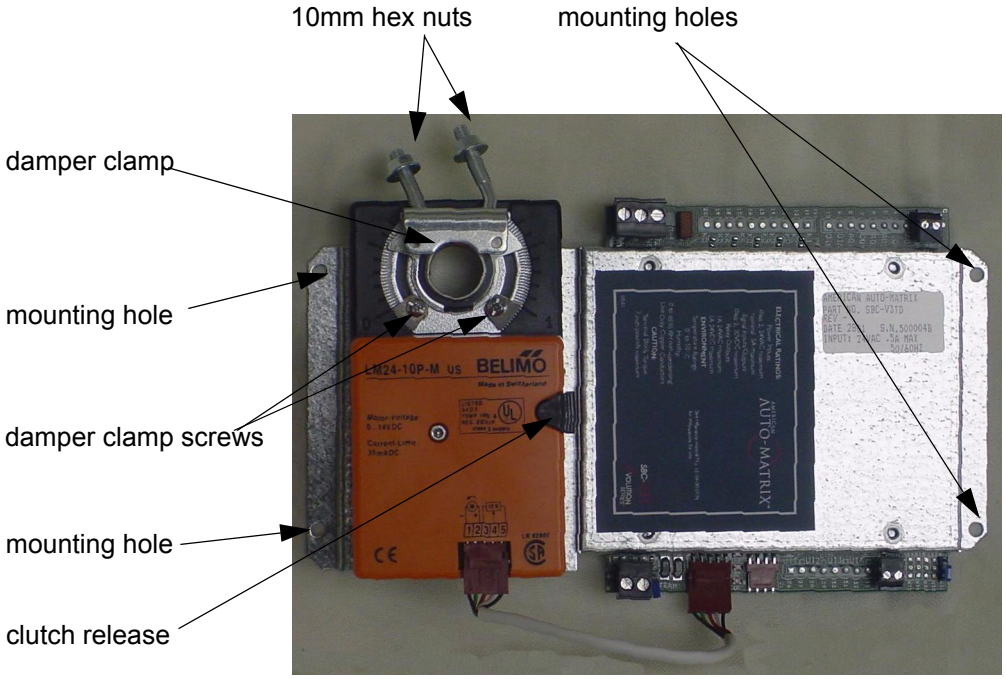


Figure 2-1: Mounting the SBC-*V3T (*SBC-*V3Td shown)*

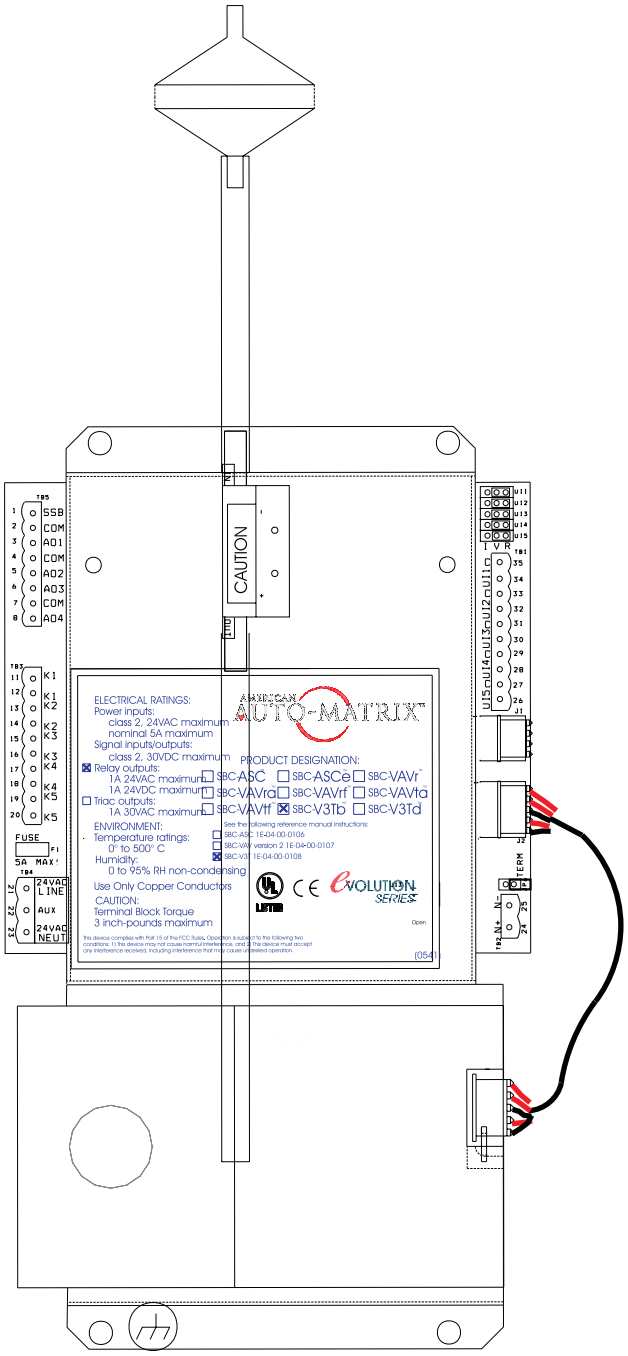


Figure 2-2: The SBC-*V3Tb*

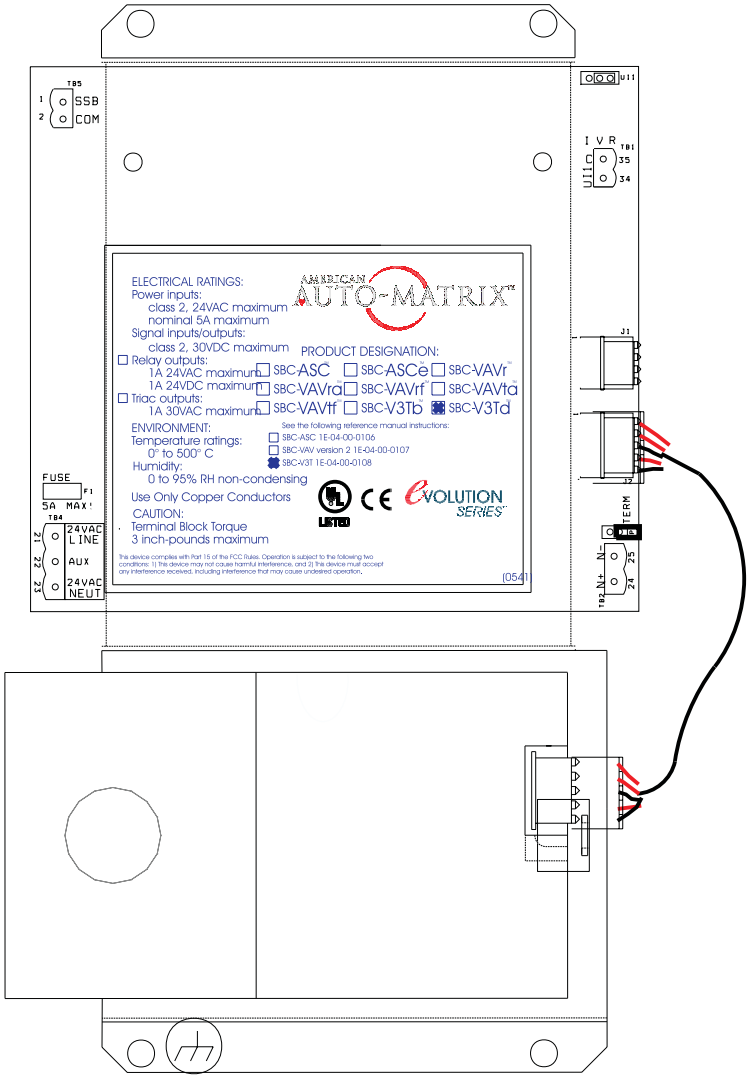


Figure 2-3: The SBC-*V3Td*

2.3 CONNECTING THE PRESSURE SENSOR (*SBC*-V3Tb ONLY)

NOTE

The *SBC*-V3Td does not have a pressure sensor.

The integral pressure sensor is a precision instrument. The *SBC*-V3Tb is shipped with a filter connected to the high pressure side of the sensor. When installing an *SBC*-V3T type controller, connect the static pressure low side of the duct airflow pitot to the filter. Do not connect anything to the high pressure side of the pressure sensor.

CAUTION

Twisting or applying torque to the pressure sensor will damage the internal components of the device. Once damaged, the device will either not work at all or will produce inaccurate measurements. If it is determined that application caused the damage, the warranty will become void.

2.4 WIRING REQUIREMENTS

WARNING

Remove power when performing the following wiring procedures for the *SBC*-V3T.

Follow the recommended wiring guidelines to reduce the chance of operation and communication errors. If you do not use proper wiring techniques, your site may not meet Federal Communications Commission (FCC) Class A regulations for radio frequency interference (RFI) emissions. All EIA-485 communications networks should employ shielded, twisted pair wiring. Each twisted pair must be individually shielded. Unshielded cables must be placed in solid metal conduit alone. Communications wiring (as well as *SBC*-STAT and other input wiring) **should not** be routed together with—or close to—other wiring carrying DC switching, AC lines, fluorescent lighting or any other RFI/electromagnetic interference (EMI)-emitting source. Failure to use these types of conductors may result in various system communications problems such as excessive network retries, noise susceptibility, and loss of communication.

2.4.1 POWER WIRING

You must use a 24VAC 50/60Hz NEC class II transformer rated at 10VA maximum (5VA typical) for power supply to the *SBC*-V3T type controllers. Figure 2-4 shows how to wire the *SBC*-V3T for power. AAM recommends that 18AWG wiring be used, but the terminals can accommodate 14–22AWG.

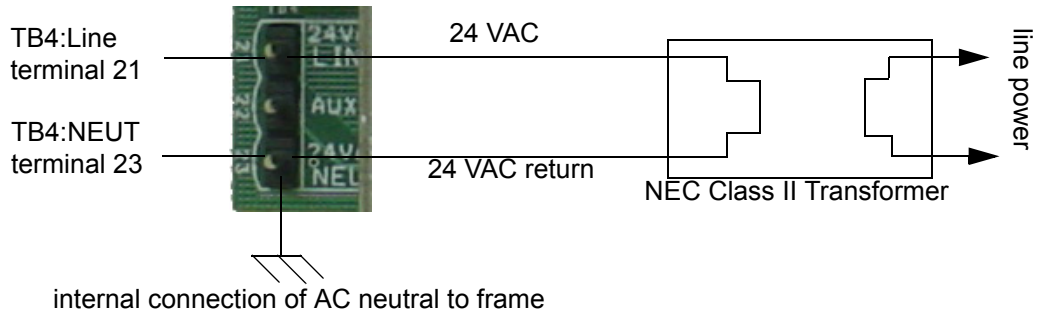


Figure 2-4: Wiring 24VAC Power

NOTE

AAM recommends that each *SBC*-V3T on a network has an individual power transformer.

CAUTION

All power transformers used must be rated to power all devices connected to them.

CAUTION

AAM does not recommend that you share power transformers among unitary controllers. If this technique is used against the recommendations of AAM, AC polarity must be maintained throughout the power network. Damage will result if two or more network devices sharing the same AC supply do not have their power correctly polarized. Such damage voids the product warranty.

2.4.2 EIA-485 COMMUNICATIONS WIRING

Figure 2-5 illustrates the EIA-485 communications network wiring for the *SBC*-V3T. For cases in which 14–22AWG, individually shielded, twisted pair wiring is recommended for optimal operations, EIA-485 (RS-485) wiring standards apply.

JP6 is an EIA-485 termination resistor of 250 ohms. Set the jumper on JP6 of the last device on the network for termination of all EIA-485 networks.

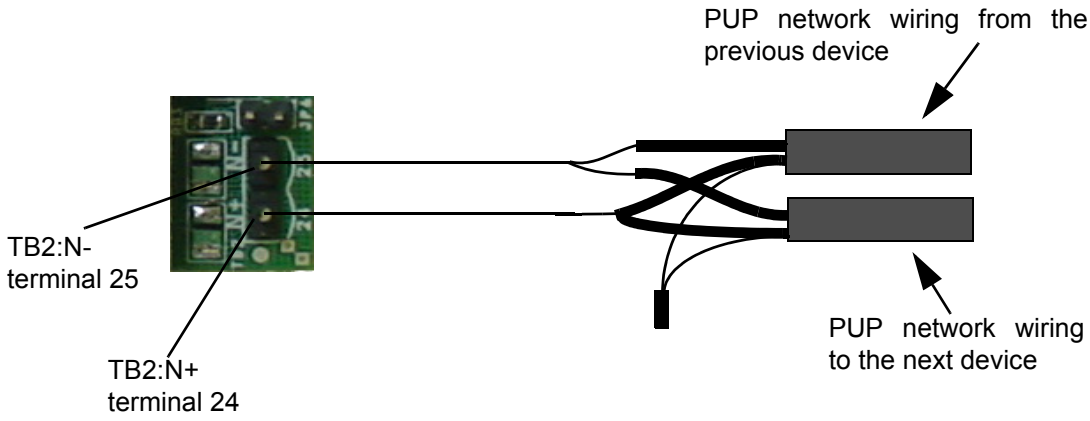


Figure 2-5: Multidrop EIA-485 Wiring

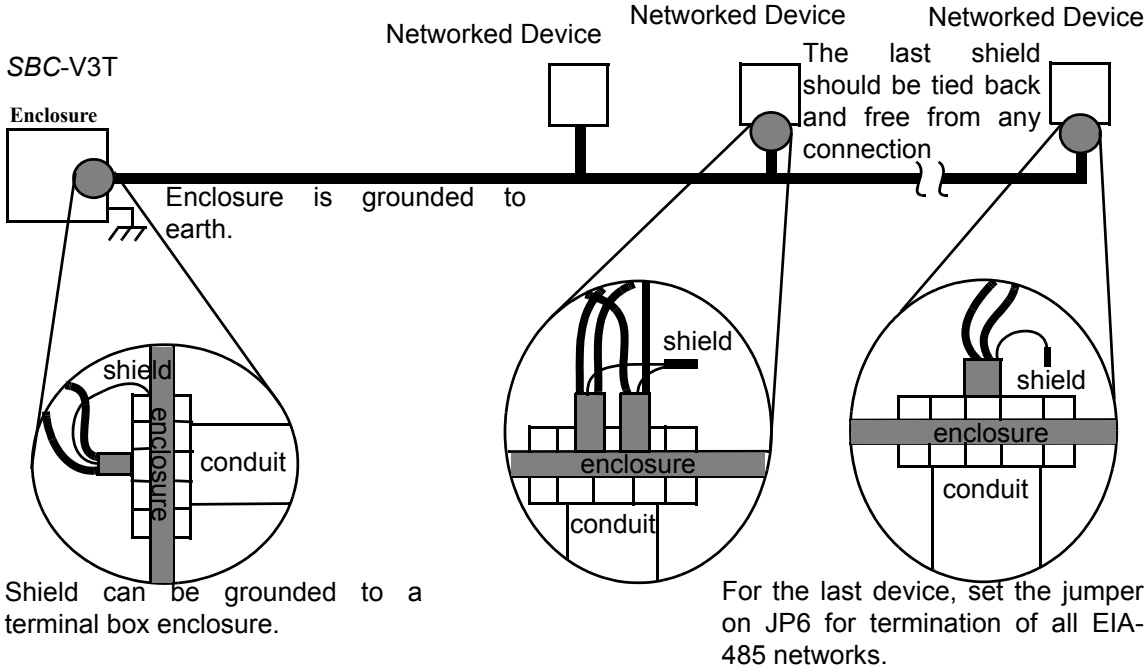


Figure 2-6: Proper Shield Wiring of Networked Devices

2.4.3 INPUT & OUTPUT WIRING

The most common wiring applications for the *SBC*-V3T type controllers appear in subsections 2.4.3.1 through 2.4.3.6. You should discuss deviations from the following examples with AAM Technical Support before making modifications to controllers. Any modifications other than those supported by AAM may void the product warranty.

The Universal Inputs (UI) can be used as voltage, current, and resistance inputs. Input modes are selected by positioning a jumper on the current, voltage, and resistance (IVR) pin-terminal block located adjacent to **TB1**. Each pin-terminal block row is labeled **UI1** through **UI5** and corresponds to the **UI**s on **TB1**. Overrange protection is provided to clamp normal overrange conditions and to protect against damage from electrostatic discharge (ESD). When the **I** and **V** pins are jumpered

together, the **UI** is in current mode. When the **R** and **V** pins are jumpered together, the **UI** is in resistance mode. If there is no jumper, the **UI** is in voltage mode. The **UI**s can be configured for alarming, setup/setback, filtering, and input polarity. **UI**s can be used as a universal input, as a occupancy detection input, or as the duct temperature input. Refer to Section 1.2.4 for additional information.

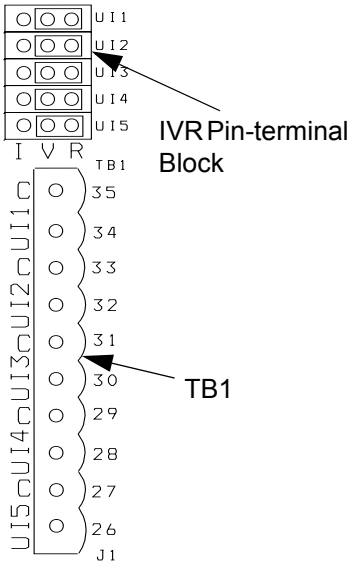


Figure 2-7: *IVR Pin-Terminal Block*

2.4.3.1 Universal Input as Voltage Input

When a **UI** is used as a 0–5VDC analog input, do not jumper the pins on the IVR pin-terminal block. For example, if **UI1** is to be used as a 0–5VDC analog input, then **UI1** is in voltage mode and therefore, the jumper on the **UI1** row of the IVR pin-terminal block should be removed.

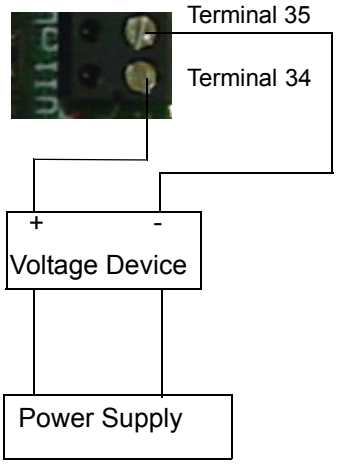


Figure 2-8: 0–5VDC Device Used on UI

2.4.3.2 Universal Input as 4–20mA Input

When using a **UI** as a 4–20mA input, the **I** and **V** pins on the IVR pin-terminal block must be jumpered together. For example, if **UI1** is to be used as a 4–20mA input, then the **UI** is in current mode and therefore, the **I** and **V** pins on the **UI1** row on the pin-terminal block should be jumpered together.

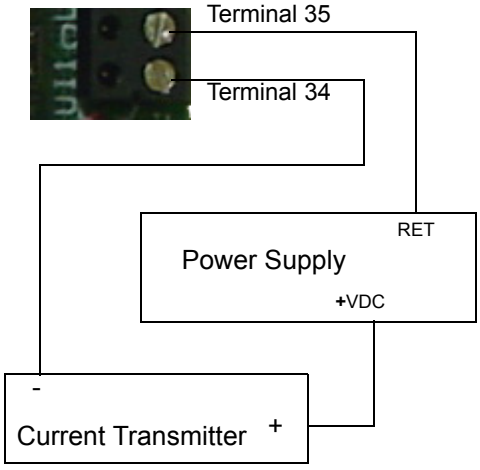


Figure 2-9: 4–20mA Device Used on UI

2.4.3.3 Universal Input as Digital Input

UIs can also be configured as a thermistor or digital input device using a dry contact. In this configuration, the **V** and **R** pins on the IVR pin-terminal block must be jumpered together.

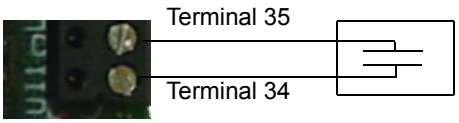


Figure 2-10: Dry Contact as Digital Input Using UI

2.4.3.4 *SBC*-STAT/THERMISTOR WIRING

Figure 2-11 illustrates wiring of the *SBC*-STAT Sensor Bus on the *SBC*-STAT3 to the *SBC*-V3T through the SSB and COM terminals on TB5. This terminal correlates to the SSB/COM terminals of the *SBC*-STAT3 as shown.

Figure 2-12 illustrates wiring of the *SBC*-STAT Communications Bus (STAT Bus) on the *SBC*-STAT2 or *SBC*-STAT1 to the *SBC*-V3T through the SSB and COM terminals on TB5. This terminal correlates to the SSB/COM terminals of the *SBC*-STAT2 and *SBC*-STAT1 as shown.

Figure 2-13 illustrates the optional network wiring of the *SBC*-STAT to the *SBC*-V3T through the N+ and N- terminals on TB2.

Using digital thermostats—*SBC*-STAT1-D, *SBC*-STAT2-D and *SBC*-STAT3—two or more *SBC*-V3Ts can be wired onto the same Sensor Bus. For this wiring structure to work properly, one *SBC*-V3T must be set up as a Master (**BM**=0), and all other *SBC*-V3Ts must be set up as Slaves (**BM**=1). When wiring multiple digital *SBC*-V3Ts, polarity must be maintained. The maximum number of digital *SBC*-STATs allowed on a Sensor Bus is four. Refer to Figure 2-14.

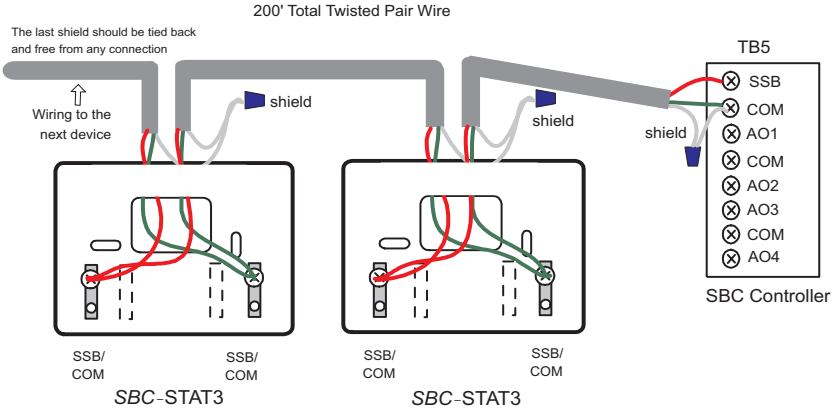


Figure 2-11: SBC-*STAT Bus Wiring of* SBC-*STAT3 to* SBC-*V3T*

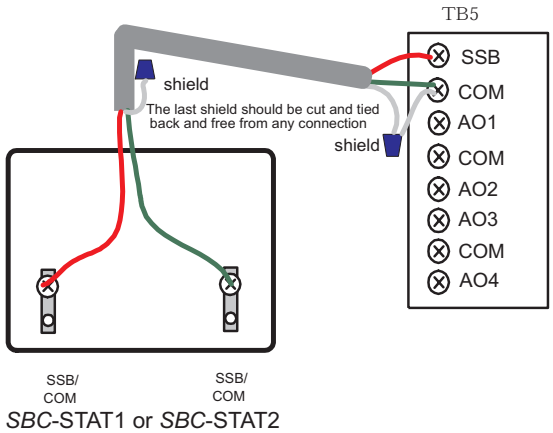


Figure 2-12: SBC-*STAT Bus Wiring of* SBC-*STAT2 or* SBC-*STAT1 to* SBC-*V3T*

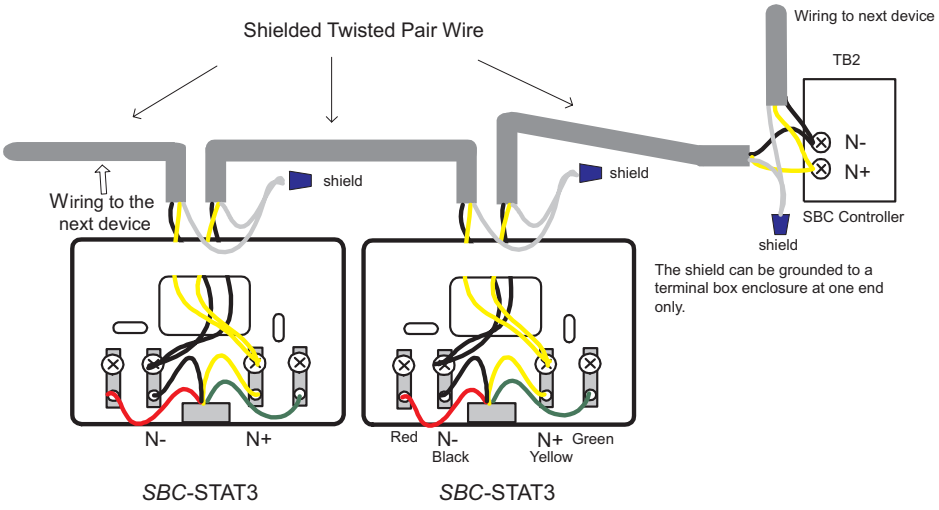


Figure 2-13: SBC-*STAT Network Wiring to* SBC-*V3T*

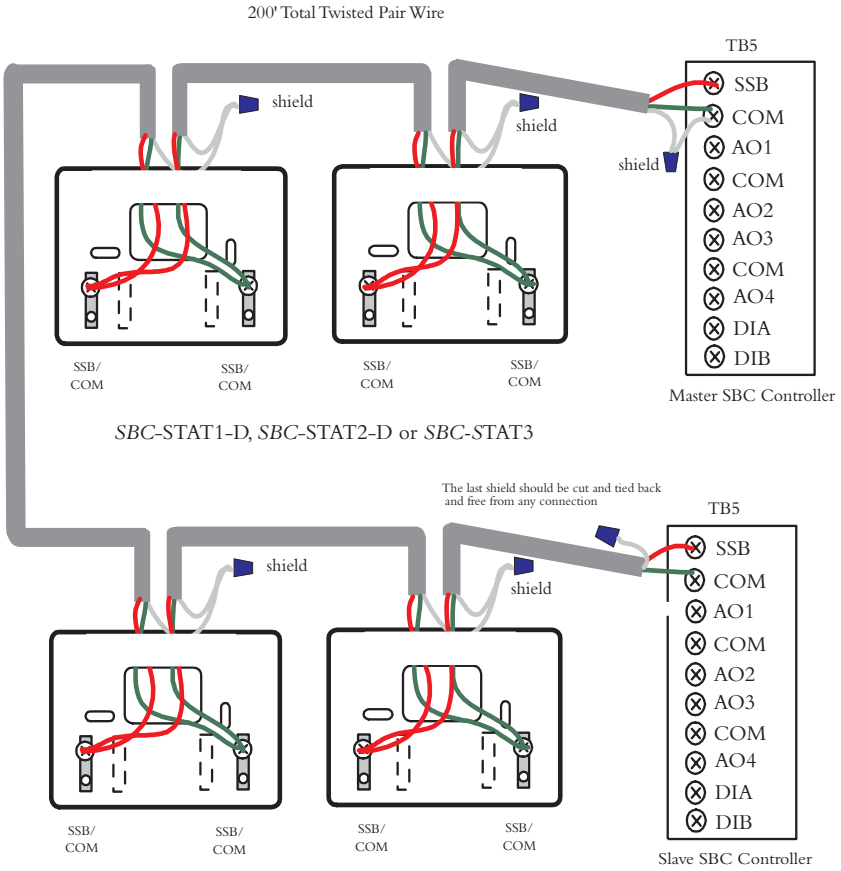


Figure 2-14: Multiple SBC-*V3Ts on a Sensor Bus*

2.4.3.5 DIGITAL OUTPUTS (*SBC*-V3Tb ONLY)

NOTE

AAM recommends that output loads be wired so that one side of the load is grounded when possible.

The *SBC*-V3T controllers have five (5) relay outputs at **TB3** terminals 11 and 12 (both marked K1 on the PCB), 13 and 14 (both marked K2 on the PCB), 15 and 16 (both marked K3 on the PCB), 17 and 18 (both marked K4 on the PCB), and 19 and 20 (both marked K5 on the PCB). When wiring, connect one of the output load wires to either K2 terminal (if using relay number 2), connect the remaining output load wire to a power source wire, then connect the other power source wire to the other K2 terminal on **TB3**. For additional information about relays, refer to *Section 1, Overview*.

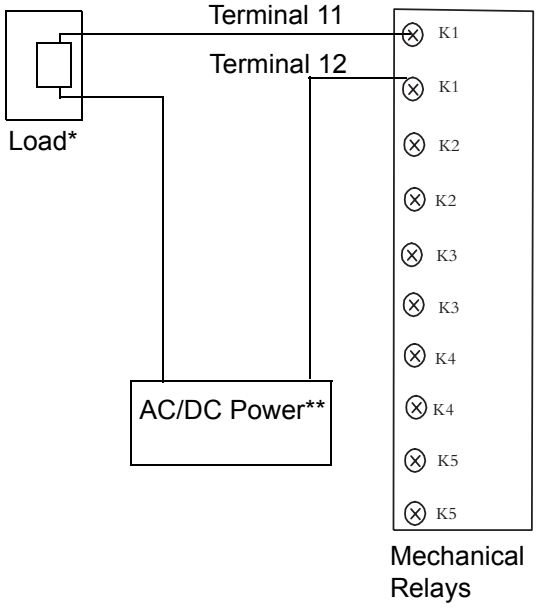
2.4.3.6 WIRING THE ANALOG OUTPUT (*SBC*-V3Tb ONLY)

You can control the four (4) analog outputs (AO) manually or by a program over the EIA-485 communications network. When set to automatic control, the output is dedicated to the analog control proportional+integral+derivative (PID) loop. Modulation of reheat valves, chiller valves, or lighting ballasts is a suitable application for AOs, which have 0–10VDC and 8-bit resolution.

Terminals 3, 5, 6, and 8 on TB5 are the AO channels 1 through 4, respectively. Pins 4 and 7 are AO common. Refer to Figure 2-15.

NOTE

There are no AOs on the *SBC*-V3Td.



*AAM recommends that output loads be wired so that one side of the load is grounded when possible.

**For low AC power, you can wire to pin 22 of TB4. You must also wire to pin 23 for neutral.

Figure 2-15: Wiring Relays Using 24VAC/DC Pilot Relays for Typical Setup

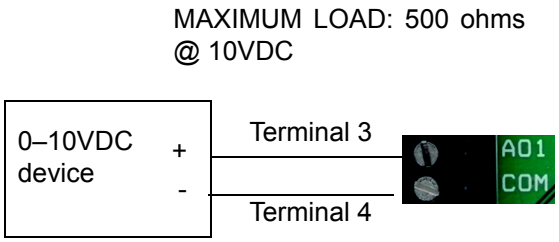


Figure 2-16: SBC-*V3T Analog Output Wired for a 0–10VDC Output Device*

SECTION 3: *SBC*-V3Tb ATTRIBUTES

This section introduces you to the groupings of attributes used to control the parameters of the SBC-*V3Tb controller over the PUP network. Detailed descriptions of all points for the controller appear here. Information on common usage of the attributes is also included.*

3.1 INTRODUCTION

Attributes have two-character names that are generally mnemonic, such as "CV" for current value. In addition, each point has a default attribute. Generally the most important or useful attribute is the default attribute. For example, analog input has zone temperature—read from the *SBC*-STAT—as its default attribute (**ZT**).

All attributes appear in boldface to facilitate locating descriptions of a particular attribute in the document text.

For a listing of each *SBC*-V3Tb attribute along with the associated channel, see **Appendix A: *SBC*-V3Tb PUP Channels and Attributes**.

3.2 ATTRIBUTES

3.2.1 SYSTEM

The following are System attributes:
FF00;**EM**, **SN**, **CT**, **VE**, **FT**, **SR**, **CM**, **UP**, **IC, RC**, **WC**, **CC**, **OC**, **ZP**, **IS**, **I1**, **I2**, **I3**, **F1**, **F2**, **F3**, **RI**, **TF**, **PD**, **PS**, **BU**, **DE**, and **RS**.

3.2.1.1 ABOUT

Attribute FF00;**EM** is Engineering Units. It specifies the type of engineering units (U.S./English or Metric) to be used for temperatures. If **EM** is set to zero, degrees are specified in Fahrenheit. If **EM** is set to 1, degrees are specified in Celsius. A change in this attribute automatically converts setpoints to the appropriate units. The display mode for digital thermostats also changes but can be set separately. English (**EM** = 0) is the default setting.

NOTE

If the value of **EM** changes, make sure any attributes set prior to the change are recalculated and reprogrammed to reflect the **EM** type chosen. Then reset the *SBC*-V3Tb. Failure to correct these entries will result in display and calculating errors.

Attribute FF00;**SN** is Serial Number. It displays the Serial Number of the *SBC*-V3Tb controller. This attribute is read-only.

Attribute FF00;**CT** is the Controller Type. This point identifies the type of device. An *SBC*-V3Tb is type 102 or 104. This attribute is read-only, and its value is established at the American Auto-Matrix factory. Flash updates for the *SBC*-V3Tb are rejected if **CT** is not 102 or 104.

Attribute FF00;**VE** is the Firmware Version. It indicates the version number of the active firmware. This attribute is read-only.

Attribute FF00;**FT** is Firmware Type. It defines the class of firmware operating system used in this controller. Only flash updates of matching firmware type will be accepted. Upgrades and conversions to other classes of firmware will require special handling. Contact American Auto-Matrix for more information. This attribute is read-only.

Attribute FF00;**SR** is the Flash Release Code. This point uniquely defines each flash firmware image. You can access updated firmware images through *SoloPro for Windows*™. The numerically higher the firmware image, the more recent it is. AAM recommends that all controllers be updated

periodically to use the latest available firmware. For instructions see the *SoloPro for Windows User Manual*. This attribute is read-only.

Attribute FF00;**CM** is the Manufacturer of the device. For American Auto-Matrix products, the number is 255. This attribute is read-only. It is useful when host systems are connected to networks with unitary controllers from different manufacturers. Flash updates are rejected if **CM** is not 255.

3.2.1.2 Diagnostics

Attribute FF00;**UP** is Flash Update Count. This counter increments each time a new flash firmware image is accepted by the controller.

Attribute FF00;**IC** is EEPROM Default Count. This counter increments whenever the EEPROM is restored to factory default settings (see System attribute DE Default Enable).

Attribute FF00;**RC** is Power-up Count. This counter increments each time power is applied to the controller. This counts power outages and noise related resets as well as resets initiated through System attribute **RS**.

Attribute FF00;**WC** is Watchdog Count. This counter increments upon firmware failure but can also be advanced during the removal of power.

Attribute FF00;**CC** is Clock Fail Count. This counter increments upon hardware failure but can also be advanced during the removal of power.

Attribute FF00;**OC** is Illegal Opcode Count. This counter increments upon firmware failure but can also be advanced during the removal of power.

Attribute FF00;**ZP** is MMT Pulse Count. This counter advances when Motor Management Technology (MMT) takes action to maintain the operation of the actuator. When several counts are tallied over a period of a few days, the actuator is reaching its end of life. Low level count activity is normal.

3.2.1.3 Interlocks

Attribute FF00;**IS** Interlock Status displays the status of all of the interlocks--bit 0 = Interlock 1, bit 1 = Interlock 2, bit 2 = Interlock 3.

Attribute FF00;**I1** Interlock 1 Channel specifies the input to be used for Interlock 1. Disabling this input disables the PID Interlock 1. Settings are 0=Disabled, 1=UI1, 2=UI2, 3=UI3, 4=UI4, and 5=UI5.

Attribute FF00;**I2** Interlock 2 Channel specifies the input to be used for Interlock 2. Disabling this input disables the PID Interlock 2. Settings are 0=Disabled, 1=UI1, 2=UI2, 3=UI3, 4=UI4, and 5=UI5.

NOTE

Settings for FF00;**I1** and **I2** on an *SBC*-VAV flashed with Bypass firmware are as follows:

0=Disabled
1=UI1
2=UI2

Attribute FF00;**I3** is Fan Failure Interlock and is used as a Proof of Flow interlock. Settings are 0=Disabled and 1=Fan Status.

Attribute FF00;**F1** is *Fan Failure Interlock Trips Fan?*. When **F1** is set to 0, Interlock 1 will not trip the fan. When set to 1 and Interlock 1 is active, the fan is shut down.

Attribute FF00;**F2** is *Fan Failure Interlock Trips Fan?*. When **F2** is set to 0, Interlock 2 will not trip the fan. When set to 1 and Interlock 2 is active, the fan is shut down.

Attribute FF00;**F3** is *Fan Failure Interlock Trips Fan?*. When **F3** is set to 0, Interlock 3 will not trip the fan. When set to 1 and Interlock 3 is active, the fan is shut down.

Attribute FF00;**RI** is Reset Fan Failure Interlock. When Fan Failure Interlock is enabled to shut down the fan (FF00;**F3**=1), setting Reset Fan Failure Interlock (FF00;**RI**=1) allows the fan to restart.

Attribute FF00;**TF** is Time in Fire. Upon receipt of a "Change Operation Mode" broadcast, the *SBC*-V3Tb remains in fire mode for the number of minutes defined in this attribute. If **TF** = 0, the *SBC*-V3Tb will remain in fire mode until the controller is reset. If **TF** = 255, then the *SBC*-V3Tb will not accept "Change of Mode" broadcasts.

3.2.1.4 POWER UP

Attribute FF00;**PD** is Power-Up Delay. It determines how long, in seconds (0–255), an *SBC*-V3Tb waits before energizing its outputs after a power loss or soft reset. During this time, all output control and alarm functions stop after cycling of power or *SBC*-V3Tb reset. This attribute defaults to a value of 5. Any setting ≤ 2 seconds will receive a value of 2 seconds.

Attribute FF00;**PS** is Power-Up State. It determines which schedule state the *SBC*-V3Tb uses after a power loss and before its time is synchronized. The selections are as follows: unoccupied = 0, warm-up = 1, occupied = 2, and night setback = 3. The default for this attribute is 2.

Attribute FF00;**BU** is Backup RAM Values. It forces the backup of the digital outputs 1-5 **RH** attribute to EEPROM. The *SBC*-V3Tb copies these values to EEPROM at midnight each day. However, you may force a copy at any time by setting **BU** to 1. The attribute returns to 0 when the backup is complete. AAM recommends that you perform a backup any time that a maintenance power down is planned.

Attribute FF00;**DE** is Default Enable. This attribute restores configuration settings to factory defaults. To set the defaults, enter a value of 197 (a value that is unlikely to occur randomly). It may take several seconds to complete the reset. Note that this will not alter the unit **ID** or selected communications baud rate.

Attribute FF00;**RS** is Reset of the *SBC*-V3Tb. This point allows a host or operator to reset the controller. You can reset by giving **RS** a value of 1, after which **RS** returns to 0 (the default).

NOTE

The Real-time Clock module periodically broadcasts the time to all controllers on the network. Manual time setting is also possible.

TABLE 3-1: SYSTEM ATTRIBUTES

	attr	description
System: About FF00		
	EM	**Engineering Units**—specifies which units of measurement to use in returning temperature values. 0 = English Units 1 = Metric Units
	SN	**Serial Number**—displays the serial number of the *SBC*-V3Tb controller.
	CT	**Controller Type**—(read-only) factory-set controller type identifies the type of unitary controller. **CT** for the *SBC*-V3Tb is 102 and 104.
	VE	**Firmware Version**—(read-only) contains the version number of the active firmware.
	FT	**Firmware Type**—defines the class of firmware operating system used in this controller.

TABLE 3-1: SYSTEM ATTRIBUTES

	attr	description
	SR	**Flash Release Code**—(read-only) uniquely defines each flash firmware image. The numerically higher the firmware image, the more recent it is.
	CM	**Manufacturer**—(read-only) is the manufacturer of the device. AAM devices are 255.
System: Diagnostics FF00		
	UP	**Flash Update Count**—increments each time a new flash firmware image is accepted by the controller.
	IC	**EEPROM Default Count**—increments whenever the EEPROM is restored to factory default settings.
	RC	**Power-up Count**—increments each time power is applied to the controller.
	WC	**Watchdog Count**—increments upon firmware failure but can also be advanced during the removal of power.
	CC	**Clock Fail Count**—increments upon hardware failure but can also be advanced during the removal of power.
	OC	**Illegal Opcode Count**—increments upon firmware failure but can also be advance during the removal of power.
	ZP	**MMT Pulse Count**—advances when MMT takes action to maintain the operation of the actuator. The activity on this count should be low. If it is high, the actuator is reaching the end of its life.
Interlocks FF00		
	IS	**Interlock Status**—displays the status of all of the interlocks. Bit 0 = Interlock 1, bit 1 = Interlock 2, bit 2 = Interlock 3.
	I1	**Interlock 1 Channel**—specifies the input to be used for Interlock 1. Disabling this input disables the PID Interlock 1. Settings are 0=Disabled, 1=UI1, 2=UI2, 3=UI3, 4=UI4, and 5=UI5. NOTE:Settings for **I1** on an *SBC*-VAV flashed with Bypass firmware are as follows: 0=disabled; 1=UI1; and 2=UI2
	I2	**Interlock 2 Channel**—specifies the input to be used for Interlock 2. Disabling this input disables the PID Interlock 2. Settings are 0=Disabled, 1=UI1, 2=UI2, 3=UI3, 4=UI4, and 5=UI5. NOTE:Settings for I2 on an *SBC*-VAV flashed with Bypass firmware are as follows: 0=disabled; 1=UI1; and 2=UI2
	I3	**Fan Failure Interlock**—is used as a Proof of Flow interlock. Settings are 0=Disabled and 1=Fan Status.
	F1	**Fan Failure Interlock Trips Fan?**—When **F1** is set to 0, Interlock 1 will not trip the fan. When set to 1 and Interlock 1 is active, the fan is shut down.
	F2	**Fan Failure Interlock Trips Fan?**—When **F2** is set to 0, Interlock 2 will not trip the fan. When set to 1 and Interlock 2 is active, the fan is shut down.
	F3	**Fan Failure Interlock Trips Fan?**—When **F3** is set to 0, Interlock 3 will not trip the fan. When set to 1 and Interlock 3 is active, the fan is shut down.

TABLE 3-1: SYSTEM ATTRIBUTES

	attr	description
	RI	**Reset Fan Failure Interlock**—When Fan Failure Interlock is enabled to shut down the fan (FF00;**F3**=1), setting Reset Fan Failure Interlock (FF00;**RI**=1) allows the fan to restart.
	TF	**Time in Fire**—Upon receipt of a "Change Operation Mode" broadcast, the *SBC*-V3T remains in fire mode for the number of minutes defined in this attribute. If **TF** = 0, the *SBC*-V3Tb will remain in fire mode until the controller is reset. If **TF** = 255, then the *SBC*-V3Tb will not accept "Change of Mode" broadcasts.
System: Power-up FF00		
	PD	**Power-up Delay**—determines how long (0-255 seconds) a *SBC*-V3Tb waits before energizing its outputs after power loss or soft reset. **PD** defaults to 5 seconds.
	PS	**Power-up State**—determines which schedule state to use after a power loss and before time sync. 0 = unoccupied 1 = warm-up 2 = occupied (default) 3 = night setback
	BU	**Backup RAM Values**—backs up digital outputs 1-5 attribute **RH** to EEPROM each day at midnight. To copy them at any other time, set **BU** = 1. (*SBC*-V3Tb only)
	DE	**Default Enable**—restores configuration settings to factory defaults. Enter 197 to set the defaults.
	RS	**Reset the *SBC*-V3Tb**—allows a host or operator to reset the controller by setting **RS** = 1.

3.2.2 SCHEDULES

The following are Schedule attributes:
F900;**CV**, **C1-C6**, **AS**, **HE**, **HO**, **ZE**, **IS**, **TM**, **DT**, **DA**, **DH**, and **H0-H9**.
F90x;**CV**, **WO**, **OC**, **UN**, **NS**, **AD**, and **AO**.

The *SBC*-V3Tb has one Main Schedule that reflects the values of and has an effect on how the other six schedules operate. The Main Schedule does not directly act as a schedule, but its current value is the present scheduled operating mode. This schedule provides attributes used to set the warm up options, the method of control employed when the *SBC*-V3Tb is in an inactive schedule state, zone reception of schedule information over the RS-485 PUP network and host schedule control options. There are four active schedule states available on the *SBC*-V3Tb:

- warm-up mode (main schedule **CV** = 1)
- occupied mode (main schedule **CV** = 2)
- unoccupied mode (main schedule **CV** = 0)
- night setback mode (main schedule **CV** = 3).

Warm-up is the period of time before occupancy. During this period, the central air handler unit supplies warm air to the VAV boxes. Warm-up provides special control action to bring the zone temperature to its desired setpoint for the occupied mode, based on the heating setpoint. The attributes used to define the warm-up temperature and flow appear in the analog inputs and damper control. Individual schedules (Schedule 1 through Schedule 6) dictate time controlled warm-up. In time based warm-up, the warm-up period ends when occupied mode begins.

Occupied mode is the period of time when the zone is occupied by people and the *SBC*-V3Tb must maintain appropriate comfort levels in the zone. The heating and cooling setpoints define a desired zone temperature range. Occupied mode ends when unoccupied mode time begins.

Unoccupied mode is the period of time when people are not expected to be in the zone and temperature control is not as strict. During unoccupied mode, the *SBC*-V3Tb maintains cooling comfort levels at setup values and heating comfort levels at setback values. These setup and setback values are used to broaden the control range between the heating and cooling setpoints in order to provide less stringent control. The attributes used to define the offsets are located in the analog inputs, but the time of implementation is set in the individual schedules (Schedule 1 through Schedule 6). Unoccupied mode usually ends when night setback begins.

Night setback is the period of time during unoccupied mode when the entire building is usually unoccupied and the air handler may be shut down. The controller provides the option to set up and set back the night setback control temperature (as does the standard unoccupied mode) and to determine when these offsets are reached or have exceeded damper control of air flow resumes. As with unoccupied mode, the attributes used to define the night setback offsets are located in the analog inputs. However the time of implementation is set in the individual schedules (Schedule 1 through Schedule 6). Figure 3-1 illustrates a standard time based flow of the *SBC*-V3Tb schedule control modes.

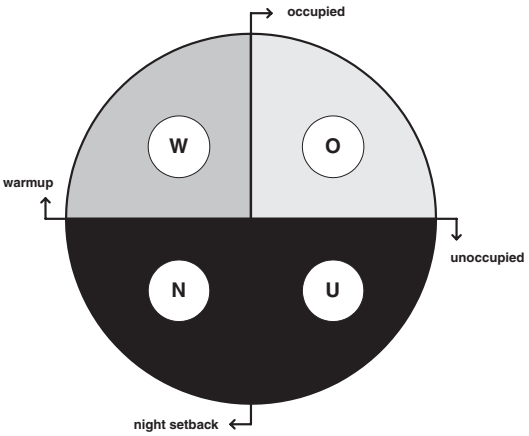


Figure 3-1: Standard Schedule Modes Rotation Example

In a situation in which schedules may overlap, the *SBC*-V3Tb will set priorities. The controller checks from Schedule 1 through Schedule 6 for the schedule with the highest priority mode. Modes take precedence in the following order:

- occupied (highest priority)
- warm-up
- unoccupied
- night setback (lowest priority).

3.2.2.1 SUMMARY

Attribute F900;**CV** is Schedule Status. It displays the current schedule state of the *SBC*-V3Tb. The controller follows a series of prioritized steps to determine the state that **CV** is in at any given time. This attribute may be affected by Schedule 1 **CV**–Schedule 6 **CV**, the host override (schedule attribute **HE**, schedule attribute **HO**), the thermostat extended occupancy and the occupancy detector. The *SBC*-V3Tb repeatedly checks to establish which is valid. Figure 3-2 shows the order of priority that the *SBC*-V3Tb checks to determine **CV**. This attribute is a read-only value. The options for this attribute are as follows: unoccupied (third priority) = 0, warm-up (second priority) = 1, occupied (first priority) = 2, and night setback (lowest priority) = 3.

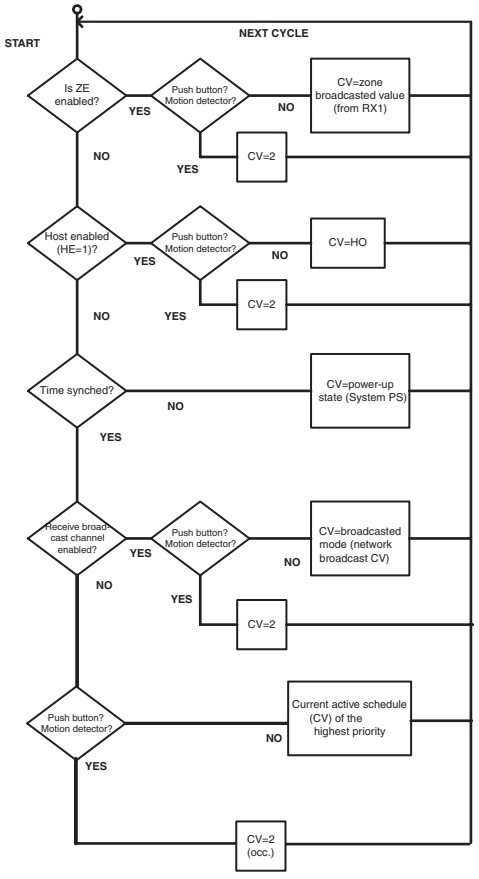


Figure 3-2: SBC-*V3Tb Priority to Determine the State of* ***CV***

Attributes F900;**C1** through F900;**C6** are the current value schedule attributes. These six points are read-only attributes that reflect the actual schedule's current mode of operation in which 0 = unoccupied, 1 = warm-up, 2 = occupied, and 3 = night setback.

Attribute F900;**AS** is the active schedule bitmap. It is a read-only attribute that displays the currently active schedules in bitmap form. When the bit corresponding to a particular schedule is set to 1, that schedule is active for the day; if the bit is set to 0, the schedule is not active. Table 3-2 shows the correlation of each bit in the bitmap to the individual schedules.

Table 3-2: Active Schedule Map

Bit Number	Schedule
0	Schedule 1
1	Schedule 2
2	Schedule 3
3	Schedule 4
4	Schedule 5
5	Schedule 6
6	unused
7	unused

Attribute F900;**HE** is the host override enable. If **HE** = 1, then **HO** is used as the host override state. When **HE** = 0, the scheduled state is controlled by **WO**, **OC**, **UN,** and **NS** or schedule broadcast. The *SBC*-V3Tb and its schedules are ignored provided **ZE** = 0 (disabled).

Attribute F900;**HO** is the host override. It specifies the desired schedule override state when schedule attribute **HE** = 1. If **HE** = 0, then **HO** is not used. Setting **HO** to 0 represents unoccupied mode, **HO** = 1 represents warm-up, **HO** = 2 represents occupied mode and **HO** = 3 represents night setback.

Attribute F900;**ZE** is the zone schedule enable. It sets the current schedule mode for the entire zone from an area controller that is broadcasting zone schedule information to multiple *SBC*-V3Ts in the zone. When enabled

(**ZE** = 1), this attribute gives priority to schedule information received from the PUP network over **HO** and the local schedules; **CV** will reflect the value broadcast over the network. Setting **ZE** = 0 (the default) disables this feature.

Attribute F900;**IS** is the Inactive Schedule State. It determines which schedule state the *SBC*-V3Tb should follow when **AD** is 0 (no active days). Valid schedule choices are unoccupied (**IS** = 0), warm-up (**IS** = 1), occupied (**IS** = 2), and night setback (**IS** = 3). This attribute defines the **CV** value to use when local scheduling is being used (the time is properly synchronized) but is inactive.

3.2.2.2 Clock/Calendar

The schedules within the *SBC*-V3Tb are local. These schedules operate when the time (schedule attribute **TM** in HH:MM format) and day of the week (schedule attribute **DA**) have been synchronized by a PUP device communicating over the EIA-485 network with synchronization capability.

NOTE

You can also set the time through the optional Real-time Clock module. Manual time setting is also possible.

Attribute F900;**TM** is the System Time attribute. It is a read-write attribute that displays the current system time in HH:MM format. This attribute defaults to an invalid time and must be set for the current system time.

Attribute F900;**DT** is the Current Date. This attribute specifies the current date in MM/DD/YY format.

Attribute F900;**DA** is the day-of-the-week attribute. It displays a read-write, numeric code (0–6) that corresponds to the current day of the week. The attribute defaults to an invalid code number. Codes for **DA** appear in Table 3-3.

Table 3-3: Day of the Week Codes

Value of **DA**	Day of the Week
0	Monday
1	Tuesday
2	Wednesday
3	Thursday
4	Friday
5	Saturday
6	Sunday
7	Holiday

Attribute F900;**DH** is Holiday. It toggles the holiday status for the current day. This point is overridden by time synchronization.

Attribute F900;**H0-H9** is Programmed Holiday. This is a specified date to be considered a holiday. Set the date to 0/0/YY to ignore.

3.2.2.3 Schedules 1 Through 6

Attribute F90x;**CV** is the Current Schedule Value. It shows the current schedule state.

Attribute F90x.**WO** is Warm-Up On Time. It specifies the time (in HH:MM format) to begin the warm-up period.

Attribute F90x;**OC** is Occupied Time. It specifies the time (in HH:MM format) to begin the occupied period and end the warm-up period.

Attribute F90x;**UN** is Unoccupied Time. It specifies the time (in HH:MM format) to begin the unoccupied period and end the occupied period.

Attribute F90x;**NS** is Night Setback Time. It specifies the time (in HH:MM format) to begin the night setback period and end the unoccupied period.

Attribute F90x;**AD** is Active Days. It shows the active days of the week during which the schedule is to follow the times in **WO**, **OC**, **UN**

and **NS**. Valid day bit numbers are 0=Monday, 1=Tuesday, 2=Wednesday, 3=Thursday, 4=Friday, 5=Saturday, 6=Sunday, and 7=Holiday. You can select active days by setting the corresponding bits to 1.

Attribute F90x;**AO** is All-Day Override. It overrides the schedule in **WO**, **OC**, **UN** and **NS** for active days. Settings are as follows: 0 = No Override, 1 = Unoccupied, 2 = Warm-Up, 3 = Occupied, and 4 = Night Setback.

Control loops of the *SBC*-V3Tb may be configured to use the current schedule state of selected schedules to adjust setpoints or control parameters. In occupied mode, for example, a setpoint value is used to determine when a certain control action occurs. In unoccupied mode, a setup (or setback) amount is added to (or subtracted from, depending on its sign) the control loop setpoint—altering the point at which the control action occurs. In unoccupied mode, the control action is less stringent because fewer (if any) people are in the building.

Schedules in the *SBC*-V3Tb can be activated based on the values assigned to the Schedule attributes. When the current day of the week matches the setting of the Schedule attribute active days (**AD**), that schedule is active for the day.

The schedule mode attributes define four windows for a schedule that is active for a set of days in the week. When the current day of the week matches one of the active schedule days (specified in **AD**), the time of day determines which of the four available modes will dictate control strategy.

The active days for the schedule are designated by the **AD** attribute. It specifies a set of the eight possible days in the week (seven days plus holiday) during which the schedule will run in one of the four available modes at any given time of the active day. See Figure 3-3 for examples of how **AD**, **WO**, **OC**, **UN** and **NS** work. Holiday schedules refer to the host system that defines the holidays in each month of the year. If the *SBC*-V3Tb has bit 7 set for a currently active schedule, then the controller will follow that schedule when the holiday bit is sent from the host. If the host broadcasts a holiday and the *SBC*-V3Tb does not have a holiday schedule, then no schedules will be active until the host clears the holiday. All schedules are independent of each other. One or more schedules may be active when the rest are inactive.

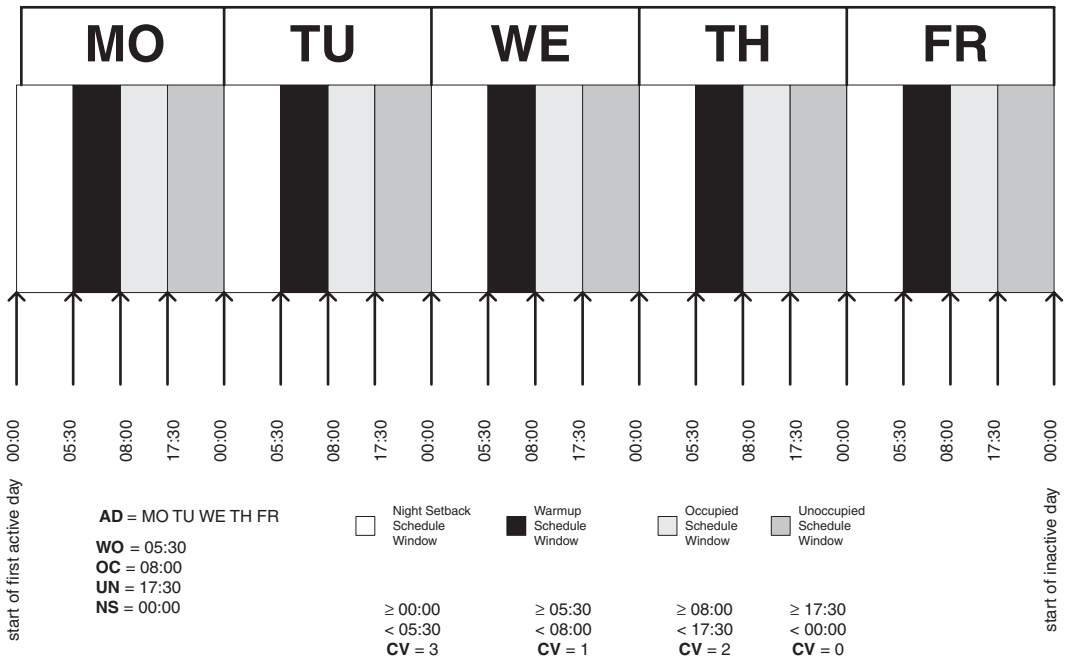


Figure 3-3: Sample Schedule 1

TABLE 3-4: SCHEDULE ATTRIBUTES

	attr	description
Schedules: Summary F900		
	CV	**Schedule Status**—displays the schedule state of the *SBC*-V3Tb. The order of priority is: Occupied = 2 (highest) Warm-up = 1 Unoccupied = 0 Night Setback = 3 (lowest)
	C1-C6	**Schedules 1-6**—(read-only) reflect the active schedule's current mode of operation.
	AS	**Active Schedule**—(read-only) displays, in bitmap form, which schedule is active. 0 = Schedule 1 1 = Schedule 2 2 = Schedule 3 3 = Schedule 4 4 = Schedule 5 5 = Schedule 6 6 and 7 = unused
	HE	**Host Override Enable**—when enabled (**HE** = 1), **HE** allows the host to set **CV** through **HO**. When disabled (**HE** = 0), the schedule state is controlled by the local schedule or schedule broadcast.
	HO	**Host Override**—specifies the desired schedule override state when **HE** = 1.
	ZE	**Zone Schedule enable**—sets the current schedule mode for the entire zone form an area controller to multiple *SBC*-V3Ts in the zone. When **ZE** = 1, priority is given to schedule information received from the PUP network over **HO** and the local schedules. When **ZE** = 0, this feature is disabled.
	IS	**Inactive Schedule State**—determines which schedule state the *SBC*-V3Tb should follow when **AD** (active days) is 0.
Schedules: Clock/ Calendar F900		
	TM	**System Time**—displays the system time in HH:MM format.
	DT	**Current Date**—specifies the current date in MM/DD/YY format.
	DA	**Day**—displays a code corresponding to the current day of the week. 0 = Monday 1 = Tuesday 2 = Wednesday 3 = Thursday 4 = Friday 5 = Saturday 6 = Sunday 7 = Holiday
	DH	**Holiday**—toggles the holiday status for the current day. Time Synchronization overrides this point.

TABLE 3-4: SCHEDULE ATTRIBUTES

	attr	description
	H0-H9	**Programmed Holiday**—a specified date to be considered a holiday. Set the date to 0/0/YY to ignore.
Schedules: (1-6) F90x		
	CV	**Current Value**—shows the current schedule state.
	WO	**Warm-up Time**—specifies the time to begin warm-up period.
	OC	**Occupied Time**—specifies the time to begin occupied period and end warm-up period.
	UN	**Unoccupied Time**—specifies the time to begin unoccupied period and end occupied period.
	NS	**Night Setback Time**—specifies the time to begin night setback period and end unoccupied period.
	AD	**Active Days**—shows the days of the week during which the schedule is to follow **WO**, **OC**, **UN**, and **NS**.
	AO	**All-day Override**—overrides the schedules in **WO**, **OC**, **UN**, and **NS**. 0 = No Override 1 = Unoccupied 2 = Warm-up 3 = Occupied 4 = Night Setback

3.2.3 Temperature (Analog Inputs)

The following are Temperature attributes:
F800-F80F;**ID**, **DL**, **RE**, **SC**, **SH**,**ER**, **ST**, and **OI**
FE00;**ZT**, **OF**, **DM**, **DL**, **RD**, **BT**, **OI**, **ZS**, **TS**, **TM**, **TP**, **TT**, **TR**, **SD**, **SE**, **ED**, **ER**, **CC**, **SC**, **UC**, **NC**, **CH**, **SH**, **UH**, **NH**, **SW**, **CV**, **LL**, **HL**, **HS**, **AS**, **AE**, **SU**, **BM**, **PU**, **PB**, **PS**, **PI**, **DS**, **DV**, **DF**, **T0-T3**, **G0-G3**, **RM**, and **PG**
FE08;**CV**, **OF**, **RE**, **DD**, **SM**, and **OI**
FE09;**CV**, **OF**, **RE**, and **OI**

3.2.3.1 Damper Units

Attribute F800-F80F;**ID** is Controller Identification ID. This attribute must contain a valid unit ID number for the damper controller.

Attribute F800-F80F;**DL** is Reported Demand Load. This attribute reports the current demand load for the referenced damper controller.

Attribute F800-F80F;**RE** is Reliability. The damper controller is marked as 'Unreliable' if there is any difficulty in communication. The resulting Demand Load and Override status are not used in control.

NOTE

The *SBC*-V3Tb must receive the token in order for it to read **DL**.

Attribute F800-F80F;**SC** is Cooling Sensitivity. This attribute defines a weighting factor for each damper controller when calling for cooling. The default value is 1. Each Demand Load (**DL**) is multiplied by this Sensitivity factor during the averaging process.

Attribute F800-F80F;**SH** is Heating Sensitivity. This attribute defines a weighting factor for each damper controller when calling for heating. The default value is 1. Each Demand Load (**DL**) is multiplied by this Sensitivity factor during the averaging process.

Attribute F800-F80F;**ER** is Extended Occupancy Remaining. This attribute reflects the extended occupancy time remaining for each damper controller. If Global Override is enabled (FE00;**SE**=1) any non-zero Extended Occupancy Remaining will also override the Bypass Controller schedule. In this case the largest value would be reflected in FE00;**ER**.

Attribute F800-F80F;**ST** is Send Supply Temp. If set to Yes (**ST**=1) the current Supply Temperature (FE00;**ST**) will be written to the Supply Temperature channel in the damper controller. Note that the Supply Temperature must be set for Override in that controller.

Attribute F800-F80F;**OI** is Override. If set to Active, the defined damper controller is used in control. If set as Bypassed, the damper controller is ignored.

3.2.3.2 Thermostat

Attribute FE00;**ZT** is Zone Temperature. It shows the current temperature value measured by the thermostat as adjusted by **OF**. This point is a read/write attribute stored in RAM. The data type of **ZT** (how the value is displayed) is always FDh (signed 9.1 digits). By setting FE00;**OI** to 1, you can override **ZT**. After overriding the attribute, you can write to **ZT** manually or through a program from a host controller on the EIA-485 communications network.

CAUTION

Care must be taken to ensure that terminal box operations are not adversely affected during use of the SBC-*V3Tb's powerful receive broadcast features. Selection of the correct input is a must. Unitary controller programmers should be absolutely sure that the actions chosen in the system are exactly what is needed for optimal operation of the* SBC-*V3Tb.*

Attribute FE00;**OF** is Temperature Correction. It defines an optional correction that may be required as an adjustment for the thermostat location and the possible measurement errors.

NOTE

If any dampers are active, the *SBC*-V3Tb will control to the calculated **DL**, not **ZT**.

Attribute FE00;**DM** is Zone Demand. It indicates the demand for the zone. A satisfied zone will indicate “vent.” If the *SBC*-V3Tb is in cooling mode and the zone temperature exceeds the cooling setpoint, “cool” is indicated. If the controller is in heating mode and the zone temperature falls below the heating setpoint, “heat” is indicated.

Attribute FE00;**DL** is Demand Load. It indicates the heating/cooling demand for the zone in terms of temperature separation from setpoints. A cooling demand will be indicated by a negative value and a heating demand by a positive value. If the zone is satisfied, then the **DL** will be 0. A cooling box is satisfied whenever the zone temperature is lower than the setpoint. If the setpoint is 72 and zone temperature is 74, then the demand load will be -2. A heating box is satisfied whenever the zone temperature is greater than the setpoint. If the setpoint is 68 and the zone temperature is 72, then the demand load will be 0. If the setpoint is 68 and the zone temperature is 66, then the demand load will be 2.

If dampers are active:

- the weighted **DL**s reported by the dampers are averaged.
- heating demand is ignored when heating is not available (OAT Lockout or Cooling Only).
- Cooling demand is ignored when cooling is not available (OAT Lockout or Heating Only).

Attribute FE00;**RD** is Reversing Delay. This attribute specifies the delay in minutes imposed before a zone can call for Heat after a period of cooling or for Cool after a period of heating.

Attribute FE00;**BT** is VAV Control Mode. Control Modes are none (**BT** = 0), cooling only (**BT** = 1), heating only (**BT** = 2), and supply dependant (**BT** = 3). The “disabled” setting supplies a constant air volume. The supply dependant setting requires source/duct air temperature and automatically selects cooling and heating modes as required.

Attribute FE00;**OI** is Override Temperature Value. When set to 1, it allows you to write to the Zone Temperature (**ZT**) directly. This would allow the Zone Temperature to be defined remotely when you are using alternate temperature sensors or diagnostics.

3.2.3.3 SETPOINT ADJUST

Attribute FE00;**ZS** is Zone Midpoint. It displays the midpoint between the current cooling and heating setpoints. This attribute reflects changes in both setpoints. A change in **ZS** results in the appropriate shift of both the cooling and heating setpoint maintaining the effective deadband.

Attribute FE00;**TS** is User Setpoint Offset. It defines an offset for application to PID setpoints. This point shows the current value calculated when you multiply the User Adjust Position (**TM**) by the User Adjust Increment (**TP**). This setting is temporary and is valid only for **TT** minutes unless **TT** = 0.

NOTE

You cannot set attribute **TS** with the *SBC*-STAT1.

Attribute FE00;**TM** is User Adjust Increment. It specifies the magnitude of incremental changes to the User Setpoint Offset (**TS**). The User Adjust Position (**TP**) is multiplied by **TM** to determine the User Setpoint Offset (**TS**) value. If the User Adjust Increment is 0, you will not be able to alter the setpoint.

Attribute FE00;**TP** is User Adjust Position. The User Setpoint Offset (**TS**) can be raised or lowered in integral steps. This attribute tracks the current step. It can be set to any signed integer but will be constrained to +/–2 when adjusted by an analog thermostat or to +/–5 when set through a digital thermostat. The point is used in combination with the User Adjust Increment (**TM**) to calculate the User Setpoint Offset.

Attribute FE00;**TT** is User Adjust Duration. The User Setpoint Offset (**TS**) is a temporary setting. The **TT** attribute defines in minutes the

duration for which the setting applies. After that time, the User Adjust Position and User Adjust Offset are reset to 0 degrees. If the User Adjust Duration is 0, then setpoint changes remain in effect until modified.

Attribute FE00;**TR** is User Adjust Remaining. It displays the time remaining before the User Setpoint Offset (**TS**) setting is reset.

Attribute FE00;**SD** is Calculated Setpoint Display. It specifies what method is used to display setpoint adjustments on an SBC-STAT3 LCD screen. A value of 0 will display +/ -2.5 adjustment. A value of 1 will display the zone midpoint shown in FE00;**ZS**. A value of 2 will display the heating setpoint shown in FE00;**CH**. A value of 3 will display the cooling setpoint shown in FE00;**CC**.

3.2.3.4 Override

During scheduled unoccupied periods, control loop setpoints and analog input alarm limits may be set up or set back to create a wider control range or deadband in the interest of conserving energy. The occupancy override feature of the *SBC*-V3Tb allows the control loop setpoints and analog input alarm limits to use their normal, nonsetup, nonsetback, occupied mode values through the *SBC*-STAT override feature. For more information, see the *SBC-STAT User Manual*.

During a scheduled unoccupied mode, you can manually override the scheduled state to occupied mode through the *SBC*-STAT; the setpoints are no longer set up or set back. The Override feature puts the selected schedules into a temporary occupied mode.

Attribute FE00;**SE** is Global Override. This attribute enables or disables the user's ability to enter extended occupancy override.

Attribute FE00;**ED** is Extended Occupancy Duration. It specifies the amount of time in minutes to extend occupancy.

Attribute FE00;**ER** is Extended Occupancy Remaining. It shows the amount of time remaining in extended occupancy. This value is set to the Extended Occupancy Duration (**ET**) when either push button on an analog thermostat is pressed. The *SBC*-STAT3 digital thermostat employs its User Menu for this function. The point **ER** is a read-only attribute that cannot be changed directly.

NOTE

Attributes **ED** and **ER** will override the power-up default schedule mode.

3.2.3.5 Cooling Setpoints

Attribute FE00;**CC** is Current Setpoint. It shows the current cooling temperature control setpoint. This will depend on setbacks and user adjustments. The attribute is read-only and is derived from **SC**. It incorporates **TS** and any unoccupied mode setback (**UC**) or any night setback (**NC**) that may be in effect.

Attribute FE00;**SC** is Occupied Setpoint. It shows the desired zone temperature setpoint to be used for cooling control in occupied mode. This value is used in **CC** and defaults to 72.0°F.

Attribute **UC** is Unoccupied Setback. It specifies, in +/- degrees, the amount to be added to the cooling setpoint (**SC**) when the *SBC*-V3Tb schedule is in unoccupied mode. When the *SBC*-V3Tb is in an unoccupied state, the **UC** offset is added to **SC**, resulting in **CC**. This is the value used to control the cooling loop. When the *SBC*-STAT is enabled (**SE** $>$ 0), the values of **TM** (thermostatic multiplier) and **TP** result in **TS**. This is added with **UC** and **SC** during unoccupied periods, resulting in **CC**. User-definable **UC** defaults to 5.0.

Attribute FE00;**NC** is Night SetBack. It specifies, in +/- degrees, the amount to be added to the cooling setpoint (**SC**) when the *SBC*-V3Tb is in night setback mode. User definable **NC** defaults to 5.0. See Figure 3-4.

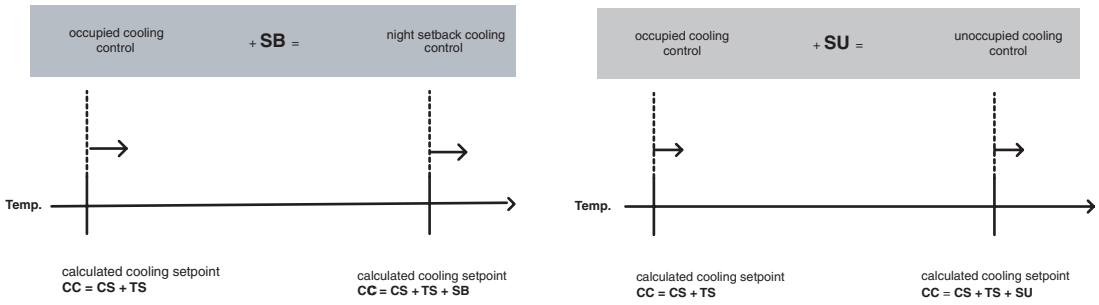


Figure 3-4: Effect of UC and NC on Cooling Control Using an SBC-*STAT*

3.2.3.6 HEATING SETPOINTS

Attribute FE00;**CH** is Current Setpoint. It shows the current heating temperature control setpoint. This will depend on setbacks and user adjustments. The point is read-only and is derived from **SH**. It incorporates **TS** and any Unoccupied Setback (**UH**) or any night setback (**NH**) that may be in effect.

Attribute FE00;**SH** is Heating Setpoint. It shows the desired zone temperature setpoint to be used for heating control.

Attributes FE00;**SC** and FE00;**SH** are the cooling and heating setpoint attributes. They create a temperature range within which no cooling or heating is required (though minimum flow position is enforced). This range is called the *deadband*. By pressing the up and down push buttons on the *SBC*-STAT3 and *SBC*-STAT2, you can shift the deadband to a range higher or lower than the range set by **SH** and **SC**. The result is a new range defined by **CH** and **CC**. When **TS** = 0, the deadband is defined by the setpoint attributes **SH** and **SC**—for example, between 68°F and 72°F (4 degrees). However if you press the up push button on the *SBC*-STAT3 or *SBC*-STAT2 to raise the temperature 4 degrees (**TS** = 4), then the deadband still has the range—4 degrees. The control setpoints will then change to 72°F and 76°F. See Figure 3-5.

Attribute FE00;**UH** is Unoccupied Setback. It specifies, in +/- degrees, the amount to be added to the heating setpoint (**SH**) when the *SBC*-V3Tb schedule is in unoccupied mode. This attribute defaults to 10.0.

Attribute FE00;**NH** is Night SetBack. It specifies, in +/- degrees, the amount to be added to the heating setpoint (**SH**) when the *SBC*-V3Tb is in night setback mode. This attribute defaults to 10.0. Figure 3-5 shows the effect of **UH** and **NH** on *SBC*-V3Tb control operations in a scheduled night setback mode.

Attribute FE00;**SW** is Warm-Up Setpoint. It shows the zone temperature setpoint to be used for heating control.

Attributes FE00;**CC** and FE00;**CH** equal the temperature setpoints **SC** and **SH**, respectively. The **CC** and **CH** points include a plus or minus offset in the calculation to account for setup and setback when the *SBC*-V3Tb is in a scheduled unoccupied or night setback mode of operation. You can use the formulas in Table 3-5 to calculate **CC** and **CH** when **SE** > 0. The value of **TS** will be a positive or a negative integer based on the value of **TP**.

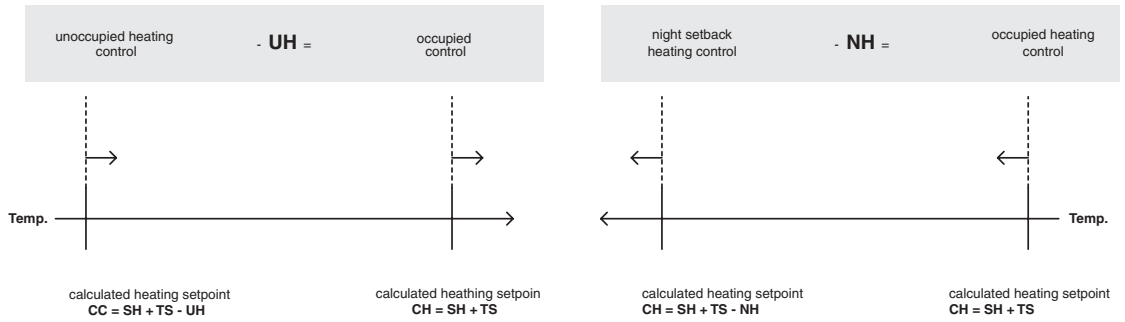


*Figure 3-5: The Effect of **UH** and **NH** on Cooling and Heating Setpoints*

*Table 3-5: **CC** and **HC** Formulas for Use With an* SBC-*STAT2, -STAT2-D, and -STAT3*

Schedule Mode	Formula
OCCUPIED	**CC** = **SC** + (**TS**) **CH** = **SH** + (**TS**)
UNOCCUPIED	**CC** = **SC** + (**TS**) + **UC** **CH** = **SH** + (**TS**) - **UH**
NIGHT SETBACK	**CC** = **SC** + (**TS**) + **NC** **CH** = **SH** + (**TS**) - **NH**

When an *SBC*-STAT1 is used with the *SBC*-V3Tb, **CC** and **CH** are calculated as in Table 3-6.

*Table 3-6: **CC** and **CH** Formulas for Use With an SBC-STAT1*

Schedule Mode	Formula
OCCUPIED	**CC** = **SC** **CH** = **SH**
UNOCCUPIED	**CC** = **SC** + **UC** **CH** = **SH** - **UH**
NIGHT SETBACK	**CC** = **SC** + **NC** **CH** = **SH** - **NH**

3.2.3.7 Alarms

Attribute FE00;**CV** is Current Value. It shows the current value of the input. As a dedicated zone temperature input, the data type is locked in as FDh (a signed 9.1 digit read out) PUP data type.

Attribute FE00;**LL** is Low Alarm Limit. It specifies the low alarm limit. If alarms are enabled and the current value drops below this value, a low limit alarm will be generated.

Attribute FE00;**HL** is High Alarm Limit. It specifies the high alarm limit. If alarms are enabled and the current value rises above this value, a high limit alarm will be generated.

Analog input alarming limits are defined using **HL** and **LL**. These limits create the upper and lower temperature limits acceptable as zone temperature values to tenths of a degree. The attributes **HL** and **LL** are only used when the input is configured for alarming. (See **AE**.) The setup/setback offset attribute **SU** affects **HL** and **LL**. When **SU** is set for some value, **HL** and **LL** will effectively slide by the amount of **SU** toward the positive side for **HL** and toward the negative side for **LL** when the *SBC*-V3Tb goes into unoccupied or night setback schedule modes. Refer to Figure 3-6 and Figure 3-7.

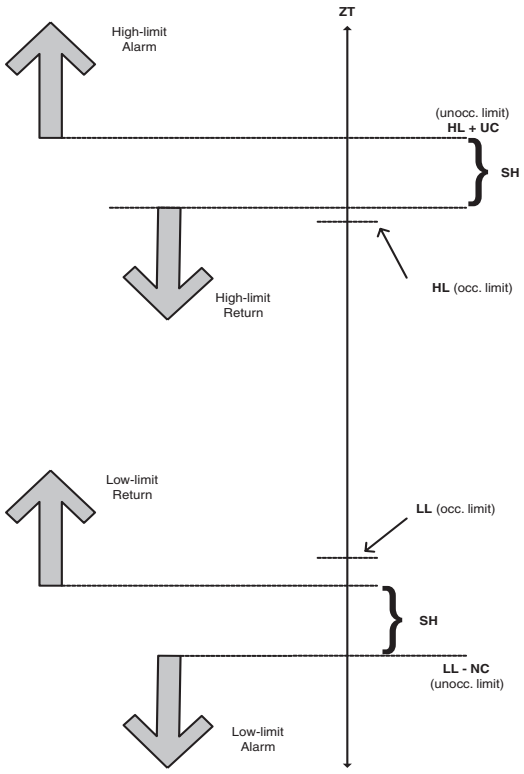


*Figure 3-6: Input Alarming for **ZT***

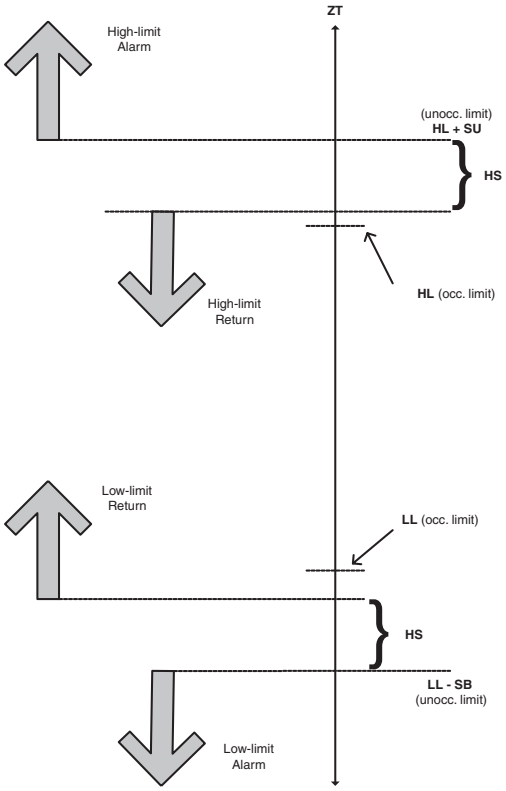


Figure 3-7: Unoccupied Shifting of Alarm Points Due to Setup/Setback

Attribute FE00;**HS** is Alarm Limit Hysteresis. It determines when the *SBC*-V3Tb returns from a high or low limit alarm. In the case of a high limit alarm, the **CV** value must drop below **HL** – **HS** to cause a high limit return. For a low limit alarm, the **CV** value must rise above **LL** + **HS** to cause a low limit return.

Attribute FE00;**AS** is Alarm Status. It shows the current alarm condition. A value of 0 indicates a normal condition; a nonzero number indicates alarm generation. Table 3-7 explains the status for each value.

Table 3-7: AS Values for Alarm Status

Value of AS	Alarm Condition
AS = 0	normal (no alarm)
AS = 1–4	unused

Table 3-7: AS Values for Alarm Status

Value of AS	Alarm Condition
AS = 5	low limit alarm
AS = 6	high limit alarm
AS = 7–12	unused

Attribute FE00;**AE** is Enable Alarming. It specifies the type of alarm checking to be done on the **CV** value. A value of 0 indicates that alarming is disabled; a nonzero number indicates one of several alarm functions. Table 3-8 defines alarm options for **AE**.

To demonstrate how limit alarming operates, let **HL** = 80.5° while alarming is enabled for high limit alarming (**AE** = 5). Then let's say that the zone temperature changes from 72.0° to 83.0° because someone opened an outside door in summertime. A high limit alarm is generated over the EIA-485 network because 83.0° > **HL**. This also causes the alarm status attribute **AS** to equal 6 (high limit alarm). The *SBC*-V3Tb modulates the damper, providing more cool air to the zone. This action eventually begins to lower the zone temperature. Once the zone temperature drops below **HL** and the offset defined by **HS**, the alarm state returns to normal (**AS** = 0).

Table 3-8: AE Alarm Enable Options

Value of AE	Alarm Type Enabled
AE = 0	disabled
AE = 1–3	unused
AE = 4	low limit alarm
AE = 5	high limit alarm
AE = 6	low and high limit
AE = 7–12	unused

Attribute FE00;**SU** is Amount to Setup/Setback Alarm Limit. It specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods. This attribute effectively shifts the points at which alarms and alarm returns are generated.

3.2.3.8 SUPPLY

Attribute FE08;**CV** is Supply Temperature. It shows the current value of source/duct temperature. This is used to select heating or cooling modes when **BT** is set to supply dependant provided that UI1 is equipped with a thermistor. This value includes the **OF** offset adjustment.

Attribute FE08;**OF** is Supply Temperature Adjustment. It defines an offset used to adjust **CV**.

Attribute FE08;**RE** is Channel Reliability. This indicates whether or not the Supply/Duct Temperature value can be trusted.

Attribute FE08;**DD** is Auto Mode Deadband. This defines the temperature difference by which the supply air must either exceed the **CH** heating setpoint for a switch to heating mode or must fall below the **CC** cooling setpoint to engage cooling mode.

NOTE

Attribute **DD** is for use when **BT** is in supply dependant mode.

Attribute FE08;**SM** is Supply Mode. It indicates the current supply mode. This would be either Cooling or Heating as specified by the System Box Type (**BT**). If **BT** is set to supply dependant, the point will indicate the current mode as determined by the source/duct temperature. The mode is cooling only if **ST** < **ZT** - **DD** and **ST** < **CC** - **DD**. The mode is heating only if **ST** > **ZT** + **DD** and **ST** > **CH** + **DD**.

Attribute FE08;**OI** is Override Supply Temperature. When set to 1, this allows the Supply Temperature (**CV**) to be altered manually.

3.2.3.9 OUTSIDE

Attribute FE09;**CV** is Outside Temperature (UI2). This attribute shows the current value of outside air temperature (OAT). This value includes the FE09;**OF** offset adjustment.

Attribute FE09;**OF** is Outside Temperature Adjustment. This attribute is used to adjust FE09;**CV**.

Attribute FE09;**RE** is Channel Reliability. This attribute indicates whether or not the OAT value can be trusted.

Attribute FE09;**OI**,Override Outside Temperature. When set to 1 this allows the Outside Temperature value (FE09;**CV**) to be altered manually.

3.2.3.10 SENSOR BUS

Attribute FE00;**BM** is Bus Mode. By default this should be set to Master (**BM**=0) unless multiple controllers are wired onto a single Sensor Bus (SSB). All additional controllers on the SSB must be configured as Slaves (**BM**=1). Masters control and communicate with digital thermostats. Slaves receive their information from the Master. Slaves receive information from the following master Zone Temperature attributes: Zone Temperature (**ZT**), User Setpoint Offset (**TS**), User Adjust Remaining (**TR**) and Extended Occupancy Remaining (**ER**).

Attribute FE00;**PU** is User P.I.N. This Personal Identification Number controls access to the User Menu. A value of 0 makes the menu always accessible. Values from 0001 to 9999 inclusive are used to control access to the menu. A matching number must be entered by the User. Values of 10,000 or greater will hide the menu. Entered P.I.N.s remain valid for only a short time after their use.

Attribute FE00;**PB** is Balancer P.I.N. This Personal Identification Number controls access to the Balance Menu. A value of 0 makes the menu always accessible. Values inclusively from 1 to 9,999 are used to control access to the menu. A matching number must be entered by the Balancer. Values of 10,000 or greater will hide the menu. Entered P.I.N. numbers remain valid for only a short time after their use.

Attribute FE00;**PS** is Service P.I.N. This Personal Identification Number controls access to the Service Menu. A value of 0 makes the menu always accessible. Values inclusively from 1 to 9,999 are used to control access to the menu. A matching number must be entered by the Servicer. Values of 10,000 or greater will hide the menu. Entered P.I.N.s remain valid for only a short time after their use.

Attribute FE00;**PI** is Installer P.I.N. This Personal Identification Number controls access to all menus. A value of 0 makes all of the menus always accessible. Values inclusively from 1 to 9,999 are used to control access. A matching number must be entered by the Installer. Values of 10,000 or greater will hide the Install Menu. An authenticated Installer can access all menus. Entered P.I.N.s remain valid for only four minutes after the last button press.

Attribute FE00;**DS** is Display Mode. It specifies whether English or Metric units are to be used for digital thermostat display on the *SBC*-STAT3. This mode is automatically altered as appropriate when the system Engineering Units attribute is set but may be modified later if required to display the alternate units.

Attribute FE00;**DV** is Display Value. By default (**DV**=0) each digital thermostat will display the identical temperature value (**ZT**) which is the average of each. With **DV**=1 each thermostat will display its own temperature (including offset).

Attribute FE00;**DF** is Display Format. This attribute defines the format used to display the current temperature on the digital thermostat. The display of the tenths digit and the Fahrenheit/Celsius character are options. Also, the display may be eliminated.

Attribute FE00;**T0** is Reading Device 0. Up to 4 digital thermostats may be used on a single Sensor Bus. This attribute reflects the raw (without offset) reading for Device 0.

Attribute FE00;**T1** is Reading Device 1. Up to 4 digital thermostats may be used on a single Sensor Bus. This attribute reflects the raw (without offset) reading for Device 1.

Attribute FE00;**T2** is Reading Device 2. Up to 4 digital thermostats may be used on a single

Sensor Bus. This attribute reflects the raw (without offset) reading for Device 2.

Attribute FE00;**T3** is Reading Device 3. Up to 4 digital thermostats may be used on a single Sensor Bus. This attribute reflects the raw (without offset) reading for Device 3.

Attribute FE00;**G0** is GID Device 0. The Global Identification for the Sensor Bus device.

Attribute FE00;**G1** is GID Device 1. The Global Identification for the Sensor Bus device.

Attribute FE00;**G2** is GID Device 2. The Global Identification for the Sensor Bus device.

Attribute FE00;**G3** is GID Device 3. The Global Identification for the Sensor Bus device.

Attribute FE00;**RM** is Reading Mode. It specifies the technique used to determine Zone Temperature when multiple thermostats are present. The default is Average mode (**RM** = 0). Highest (**RM** = 1) and Lowest (**RM** = 2) modes set **ZT** appropriately. The Hi/Lo VST mode (**RM** = 3) selects either the highest or lowest temperature depending on the supply mode. The highest temperature is used in cooling mode. The lowest temperature in heating mode.

A specific thermostat may be selected by device position 0-3 (**RM** = 4-7). Note that while thermostats appear in device positions consistently, the order may change when thermostats are added, removed or replaced. To specify a unique thermostat by its GID, select the Primary GID mode (**RM** = 8) and define the GID with the **PG** attribute.

When a single thermostat is present, its temperature is used regardless of the setting of **RM**. If a specified thermostat is absent, the Average mode (**RM** = 0) is used.

Attribute FE00;**PG** is Primary GID. It specifies the GID of the Primary thermostat in Primary GID mode (**RM** = 8). If this thermostat is not available, then the Average temperature mode (**RM** = 0) is used.

TABLE 3-9: TEMPERATURE ATTRIBUTES

	attr	description
Temperature: Damper Units: 1-15 F800-F80F		
	ID	**Controller ID**—must contain a valid unit ID number for the damper controller.
	DL	**Reported Demand Load**—reports the current demand load for the referenced damper controller. Each F800-F80F;**DL** value is multiplied by the Sensitivity (**SC** and **SH**) factor and used for calculating FE00;**DL**.
	RE	**Reliability**—The damper controller is marked as 'Unreliable' if there is any difficulty in communication. The resulting Demand Load and Override status are not used in control.
	SC	**Cooling Sensitivity**—defines a weighting factor for each damper controller when calling for cooling. The default value is 1. Each Demand Load (**DL**) is multiplied by this Sensitivity factor.
	SH	**Heating Sensitivity**—defines a weighting factor for each damper controller when calling for cooling. The default value is 1. Each Demand Load (**DL**) is multiplied by this Sensitivity factor.
	ER	**Extended Occupancy Remaining**—reflects the extended occupancy time remaining for each damper controller.
	ST	**Send Supply Temp**—If set to Yes (**ST**=1) the current Supply Temperature (FE00;**ST**) will be written to the Supply Temperature channel in the damper controller. Note that the Supply Temperature must be set for Override in that controller.

TABLE 3-9: TEMPERATURE ATTRIBUTES

	attr	description
	OI	**Override**—If set to Active, the defined damper controller is used in control. If set as Bypassed, the damper controller is ignored.
Temperature: Thermostat FE00		
	ZT	**Zone Temperature**—is the current temperature value measured by the thermostat as adjusted by **OF**. You can override **ZT** by setting **OI** = 1.
	OF	**Temperature Correction**—defines an optional correction that may be required as an adjustment for the thermostat location and the possible measurement errors.
	DM	**Zone Demand**—indicates the demand for the zone. The options are vent, cool or heat.
	DL	**Demand Load**—indicates the heating/cooling demand for the zone in terms of temperature separation from setpoints. Cooling = negative value Heating = positive value
	RD	**Reversing Delay**—specifies the delay in minutes imposed before a zone can call for Heat after a period of cooling or for Cool after a period of heating.
	BT	**V3T Control Mode**—specifies the type of V3T terminal box being used.
	OI	**Override Temperature Value**—when set to 1, it allows you to write to FE00;**ZT** directly.
Temperature: Setpoint Adjust FE00		
	ZS	**Zone Midpoint**—displays the midpoint between the current cooling and heating setpoints.
	TS	**User Setpoint Offset**—defines an offset to be applied to PID setpoints.
	TM	**User Adjust Increment**—specifies the magnitude of incremental changes to the User Setpoint Offset (FE00;**TS**).
	TP	**User Adjust Position**—the User Setpoint Offset (**TS**) can be raised or lowered in integral steps; the FE00;**TP** attribute tracks the current step.
	TT	**User Adjust Duration**—the User Setpoint Offset (**TS**) is a temporary setting; the FE00;**TT** attribute defines in minutes the duration for which the setting applies.
	TR	**User Adjust Remaining**—displays the time remaining before the User Setpoint Offset (**TS**) setting is reset.
	SD	**Calculated Setpoint Display**—allows users to choose a method of setpoint display to show on an SBC-STAT3 display.
Temperature: Override FE00		
	SE	**User Override**—enables or disables your ability to enter extended occupancy override.
	ED	**Extended Occupancy Duration**—specifies the amount of time in minutes to extend occupancy.

TABLE 3-9: TEMPERATURE ATTRIBUTES

	attr	description
	ER	**Extended Occupancy Remaining**—shows the amount of time remaining in extended occupancy.
Temperature: Cooling Setpoints FE00		
	CC	**Current Setpoint**—shows the current cooling flow control setpoint.
	SC	**Occupied Setpoint**—shows the zone temperature setpoint desired to begin cooling control.
	UC	**Unoccupied Setback**—specifies, +/- degrees, the amount to be added to the cooling setpoint (**CS**) when the *SBC*-V3Tb schedule is in unoccupied mode.
	NC	**Night Setback**—specifies, in +/- degrees, the amount to be added to the cooling setpoint (**CS**) when the *SBC*-V3Tb is in night setback mode.
Temperature: Heating Setpoints FE00		
	CH	**Current Setpoint**—shows the current heating flow control setpoint.
	SH	**Occupied Setpoint**—shows the zone temperature setpoint desired to begin heating control.
	UH	**Unoccupied Setback**—specifies, in +/- degrees, the amount to be added to the heating setpoint (**HS**) when the *SBC*-V3Tb is in unoccupied mode.
	NH	**Night Setback**—specifies, in +/- degrees, the amount to be added to the heating setpoint (**HS**) when the *SBC*-V3Tb is in night setback mode.
	SW	**Warm-up Setpoint**—shows the zone temperature setpoint desired for beginning warm-up heating control.
Temperature: Alarms FE00		
	CV	**Current Value**—shows the current value of the input.
	LL	**Low Alarm Limit**—if alarms are enabled and the current value drops below this value, a low limit alarm will be generated.
	HL	**High Alarm Limit**—if alarms are enabled and the current value rises above this value, a high limit alarm will be generated.
	HS	**Alarm Limit Hysteresis**—determines when the *SBC*-V3Tb returns from a high or low limit alarm.
	AS	**Alarm Status**—shows the current alarm condition. 0=normal 5=low limit 6=high limit 1-4 and 7-12 are unused

TABLE 3-9: TEMPERATURE ATTRIBUTES

	attr	description
	AE	**Alarm Enable**—specifies the type of alarm checking to be done on the **CV** value. 0=disabled 4=low limit alarm 5=high limit alarm 6=low and high limit 1-3 and 7-12 are unused
	SU	**Alarm Limit Setup/Setback**—specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods.
Temperature: Supply FE08		
	CV	**Supply Temperature**—shows the current value of source/duct temperature
	OF	**Supply Temperature Adjustment**—defines an offset used to adjust **ST**.
	RE	**Channel Reliability**—indicates whether or not the Supply/Duct Temperature value can be trusted.
	DD	**Auto Mode Deadband**—defines the temperature difference by which the supply air must either exceed the FE00;**HC** heating setpoint to switch to heating mode or fall below the FE00;**CC** cooling setpoint to engage cooling mode**.**
	SM	**Supply Mode**—indicates that supply air is usable for heating or cooling.
	OI	**Override Supply Temperature**—when set to 1, this attribute allows the Supply Temperature (**ST**) to be altered manually.
Temperature: Outside FE09		
	CV	**Outside Temperature**—shows the current value of outside air temperature (OAT). This value includes the FE09;**OF** offset adjustment.
	OF	**Outside Temperature Adjustment**—used to adjust FE08;**CV**.
	RE	**Channel Reliability—**indicates whether or not the OAT value can be trusted.
	OI	**Override Supply Temperature**—when set to 1 this allows the Outside Temperature value (FE09;**CV**) to be altered manually.
Temperature: Sensor Bus FE00		
	BM	**Bus Mode**—should be set to Master (**BM=**0) unless multiple controllers are wired onto a SSB. Any additional controllers on the SSB must be configured as Slaves (**BM=**1).
	PU	**User P.I.N.—**this personal identification number controls access to the User Menu.
	PB	**Balancer P.I.N.—**this personal identification number controls access to the Balance Menu.
	PS	**Service P.I.N.—**this personal identification number controls access to the Service Menu.
	PI	**Installer P.I.N.—**This personal identification number controls access to all menus.

TABLE 3-9: TEMPERATURE ATTRIBUTES

	attr	description
	DS	**Display Mode**—specifies whether English or Metric units are to be used for the digital thermostat display.
	DV	**Display Value**—when **DV**=0 each digital thermostat displays the identical temperature value (average) (FE00;**ZT**). When **DV**=1 each thermostat displays its own temperature.
	DF	**Display Format**—defines the format used to display the current temperature on the digital thermostat.
	T0	**Reading Device 0**—is the raw reading for Device 1 on a SSB.
	T1	**Reading Device 1**—is the raw reading for Device 2 on a SSB.
	T2	**Reading Device 2**— is the raw reading for Device 3 on a SSB.
	T3	**Reading Device 3**—is the raw reading for Device 4 on a SSB.
	G0	**GID Device 0**—is the global identification for the SSB device.
	G1	**GID Device 1**— is the global identification for the SSB device.
	G2	**GID Device 2**—is the global identification for the SSB device.
	G3	**GID Device 3**—is the global identification for the SSB device.
	RM	**Reading Mode**—is the technique used to determine Zone Temperature when multiple thermostats are present. 0 = Average Mode 1 = Highest 2 = Lowest 3 = Hi/Lo VST mode 4 = Device position 0 5 = Device position 1 6 = Device position 2 7 = Device position 3 8 = Primary GID mode
	PG	**Primary GID**—is the GID of the Primary thermostat in Primary GID mode (**RM** = 8)

3.2.4 PRESSURE

The following are Pressure attributes:
FA00;**CV**, **CD**, **CA**, **FH**, **CK**, **KC**, **FC**, **DM**, **CB**, **OI**, **DP**, **DM**, **DD**, **AS**, and **RZ**.
FA05;**CV**, **LL**, **HL**, **HS**, **AS**, **AE**, and **SU**.

3.2.4.1 CONTROL

Attribute FA00;**CV** is Current Value. It shows the current measured amount of static pressure in inches water column (W.C.)

Attribute FA00;**CD** is Setpoint. It shows the desired static pressure in inches W.C.

Attribute FA00;**CA** is Average. It shows the measured average static pressure in inches W.C. This displays an average of FA00;**CV**.

Attribute FA00;**FH** is Hysteresis. This attribute specifies the maximum amount of pressure sensor variation to be tolerated by the *SBC*-V3Tb before showing a valid change of pressure. This point allows you to set a hysteresis, or deadband, centered around the calculated static pressure value. This hysteresis prevents bouncing of the static pressure value. Such bouncing is usually prevalent at the lower and higher ends of the pressure range, potentially creating situations in which the damper may be toggled because of controller response. Static pressure values (**CV**) must be greater than or less than the upper and lower limits defined around **CV** by **FH**.

Attribute FA00;**CK** is Scaling Factor. It shows the scaling factor for the particular terminal box being used. The default is 250. This scaling factor may be automatically calculated using 1-Point Calibration (**KC**).

Attribute FA00;**KC** is 1-Point Calibration. Enter the static pressure value measured externally, and this will automatically adjust the Duct Scaling Factor **CK**. Note that this does not perform the function if 0 is entered or if **CV** is overridden.

Attribute FA00;**FC** is Fan. It controls the current status of the fan output.

Attribute FA00;**DM** is Bypass Damper Mode. Through this point, you can command the damper to fully open (**DM**=1) or automatic (**DM**=0).

Attribute FA00;**CB** is Calibrate Pressure Sensor. It allows a host or operator to manually calibrate the static pressure sensor. Calibration occurs when you disconnect the tube from P1 and set **CB** = 1. Once the *SBC*-V3Tb runs through its calculations and adjusts for zero pressure, **CB** automatically resets itself to 0.

Attribute FA00;**OI** is Override Pressure Measurement. It allows a host or operator to manually set the value **CV**. If **OI** is set to 0, overriding is disabled. If **OI** is set to 1, override is enabled.

3.2.4.2 BYPASS DAMPER

Attribute FA00;**DP** is Damper Position. It shows the damper position using a feedback potentiometer built into the actuator.

Attribute FA00;**DM** is Damper Mode. It can be used to command the damper to fully open (**DM**=1) or automatic (**DM**=0).

Attribute FA00;**DD** is Direction. It is used to set the direction of the damper motor. When set to 0, the motor turns in the normal direction. With set to 1, the motor turns in the opposite direction.

Attribute FA00;**AS** is Actuator Status. This attribute reports the status of the actuator as determined by the MMT. Status options are: Ready, Disconnected/Open, and Jammed/Shorted. Diagnostic alarms and returns are issued when this status changes.

Attribute FA00;**RZ** is Rejuvenate Count. When MMT detects the possibility of an actuator short, electrical pulses are used in an attempt to rejuvenate the motor. Each pulse is tallied by this attribute. The Actuator Status is changed to indicate the short if it is not rectified after 10 consecutive pulses. The Rejuvenate Count can also be used to determine the general well-being of the actuator.

3.2.4.3 ALARMS

Attribute FA05;**CV** is Current Value. It shows the current measured amount of airflow in inches W.C.

Attribute FA05;**LL** is Low Alarm Limit. It specifies the low alarm limit. If alarms are enabled and the current value (**CV**) drops below this value, a low limit alarm will be generated.

Attribute FA05;**HL** is High Alarm Limit. It specifies the high alarm limit. If alarms are enabled and the current value (**CV**) rises above this value, a high limit alarm will be generated.

Attribute FA05;**HS** is Alarm Limit Hysteresis. It determines when the *SBC*-V3Tb returns from a high or low limit alarm. In the case of a high limit alarm, the **CV** value must drop below **HL** – **HS** to cause a high limit return. For a low limit alarm, the **CV** value must rise above **LL** + **HS** to cause a low limit return.

Attribute FA05;**AS** is Alarm Status. It shows the current alarm condition. A value of 0 indicates a normal condition; a nonzero number indicates alarm generation. This attribute is read-only. Table 3-10 explains the condition for each value.

*Table 3-10: Values for Alarm Status Attribute **AS***

Value of **AS**	Alarm Condition
AS = 0	normal
AS = 1, 2, 3 & 4	unused
AS = 5	low limit
AS = 6	high limit
AS = 7–12	unused

Attribute FA05;**AE** is Alarm Enable. It specifies the type of alarm checking to be done on the **CV** value. A 0 value indicates that alarming is disabled; a non-zero value indicates one of several alarm functions. Table 3-11 lists the options for **AE**.

*Table 3-11: **AE** Alarm Enable Options*

Value of **AE**	Alarm Type Enabled
AE = 0	disabled
AE = 1–3	unused
AE = 4	low limit alarm
AE = 5	high limit alarm
AE = 6	low and high limit
AE = 7–12	unused

Attribute FA05;**SU** is Amount to Setup/Setback Alarm Limit. It specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods. See Figure 3-8.

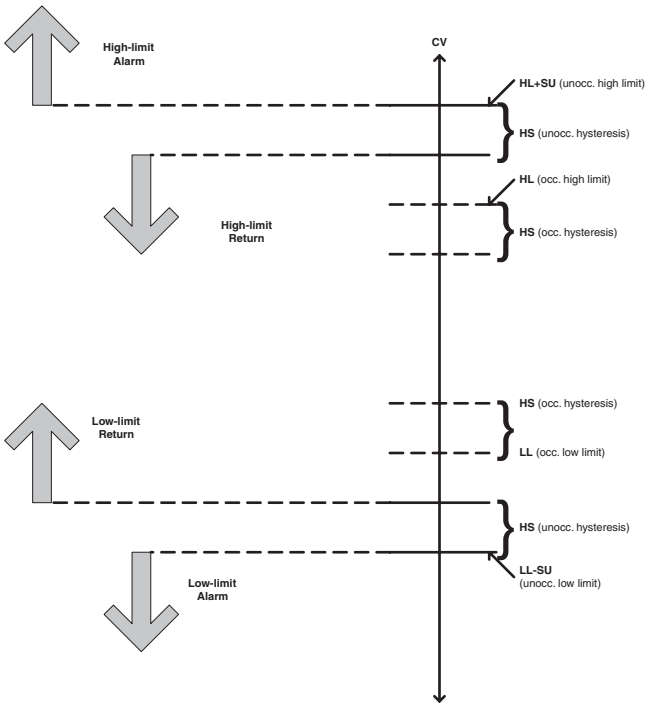


Figure 3-8: Unoccupied Setup/Setback Alarm Shifting

TABLE 3-12: PRESSURE ATTRIBUTES

	attr	description
Pressure: Control FA00		
	CV	**Current Value**—shows the current measured amount of static pressure in inches W.C.
	CD	**Setpoint**—shows the desired static pressure in inches W.C.
	CA	**Average**—shows the measured average static pressure in inches W.C. This displays an average of FA00;**CV**
	FH	**Hysteresis**—specifies the maximum amount of pressure sensor variation to be tolerated by the *SBC*-V3Tb before it shows a valid change of flow.
	CK	**Duct Scaling Factor (K)**—shows the scaling factor for the particular terminal box being used.
	KC	1**-Point Calibration**—when you enter the static pressure value measured externally, this will automatically adjust the Duct Scaling Factor (**CK**) based on the present flow reading to properly scale the duct.
	FC	**Fan**—controls the current status of the fan output.
	DM	**Damper Mode**—can be used to command the damper to fully open or to operate at minimum or maximum cooling, heating and warm-up setpoints.

TABLE 3-12: PRESSURE ATTRIBUTES

	attr	description
	CB	**Calibrate Pressure Sensor**—allows a host or operator to manually calibrate the pressure sensor.
	OI	**Override Current Value**—allows a host or operator to manually set the value of **CV**.
Pressure: Bypass Damper FA00		
	DP	**Position**—shows the damper position with an optional actuator having a built in feedback potentiometer.
	DM	**Bypass Damper Mode**—used to command the damper to fully open. 0 = Automatic 1 = Full Open
	DD	**Direction**—used to set the direction of the damper motor.
	AS	**Actuator Status**—reports the status of the actuator as determined by the MMT.
	RZ	**Rejuvenate Count**— when MMT detects the possibility of an actuator short, electrical pulses are used in an attempt to rejuvenate the motor.
Pressure: Alarms FA05		
	CV	**Current Value**—shows the current measured amount of airflow in cfm.
	LL	**Low Alarm Limit**—if alarms are enabled and the current value drops below this value, a low limit alarm will be generated.
	HL	**High Alarm Limit**—if alarms are enabled and the current value rises above this value, a high limit alarm will be generated.
	HS	**Alarm Limit Hysteresis**—determines when the *SBC*-V3Tb returns from a high or low limit alarm.
	AS	**Alarm Status**—shows the current alarm condition.
	AE	**Alarm Enable**—specifies the type of alarm checking to be done on the **CV** value.
	SU	**Alarm Limit Setup/Setback**—specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods.

3.2.5 EQUIPMENT

The following are Equipment attributes:
FB01;**CV**, **FR**, **FS**, **FX**, **FD**, **FO**, **FU**, and **FN**
FB02;**CV**, **TO**, **MX**, **MR**, **MS**, **TL**, and **CL**
FB03;**CV**, **TO**, **MR**, and **MS**
FB04;**CV**, **TO**, **MX**, **MR**, **MS**, **TH**, and **HL**
FB05;**CV**, **TO**, **MR**, and **MS**

3.2.5.1 FAN (K1)

Attribute FB01;**CV** is Fan. It defines the status of the fan.

Attribute FB01;**FR** is Minimum Run Time. It shows the minimum amount of time, in minutes, the fan output will stay energized. This prevents short cycling of the fan output.

Attribute FB01;**FS** is Minimum Off Time. This attribute shows the minimum amount of time, in minutes, the fan output will stay de-energized. This prevents short cycling of the fan output.

Attribute FB01;**FX** is Staging Delay. This attribute indicates the maximum amount of time, in minutes, that the fan will operate before energizing the first stage of heating or cooling.

Attribute FB01;**FD** is Shutoff Delay. This attribute shows the amount of time, in seconds, the fan output will stay energized once the zone temperature reaches the deadband.

Attribute FB01;**FO** is Occupied Mode. This attribute defines the mode of the fan during the occupied schedule state. When **FO** = 1, the fan runs for the entire period. When **FO** = 0, the fan shuts off when the zone temperature is within the deadband. If any active damper has a non-zero demand load, the fan will not shut off.

Attribute FB01;**FU** is Unoccupied Mode. It defines the mode of the fan during the unoccupied schedule state. When **FU** = 1, the fan runs for the entire period. When **FU** = 0, the fan shuts off when the zone temperature is within the deadband. If any active damper has a non-zero demand load, the fan will not shut off.

Attribute FB01;**FN** is Night Setback Mode. It defines the mode of the fan during the night setback schedule state. When **FN** = 1, the fan runs for the entire period. When **FN** = 0, the fan shuts off when the zone temperature is within the deadband. If any active damper has a non-zero demand load, the fan will not shut off.

3.2.5.2 COOL 1 (K2)

Attribute FB02;**CV** is Cooling Stage 1. It indicates the status of the stage output.

Attribute FB02;**TO** is Demand Offset. It indicates the demand load required before engaging the stage of cooling. Note that the stage may also engage if the Fan Staging delay expires.

Attribute FB02;**MX** is Staging Delay. It indicates the maximum amount of time, in minutes, that the stage will operate before energizing the next stage of cooling.

Attribute FB02;**MR** is Minimum Run Time. It shows the minimum amount of time, in minutes, the stage will stay energized.

Attribute FB02;**MS** is Minimum Off Time. It shows the minimum amount of time, in minutes, the stage will stay de-energized.

Attribute FB02;**TL** is DAT (Discharge Air Temperature) Low Temp Lockout. It defines the minimum Source/Duct Temperature below which cooling will be de-energized. This offers protection against freeze-up. Cooling stages will energize only if there is a reliable Source/Duct Temperature (DAT - Discharge Air Temperature) above this setting.

Attribute FB02;**CL** is OAT (Outside Air Temperature) Cooling Lockout. Cooling stages will not be engaged if a Reliable (FE09;**RE** = 0) OAT (FE09;**CV**) less than the temperature specified by this attribute is available. Stages will not be de-energized should the OAT fall below this temperature during an active cycle.

3.2.5.3 COOL 2 (K3)

Attribute FB03;**CV** is Cooling Stage 2. It indicates the status of the stage output.

Attribute FB03;**TO** is Demand Offset. It indicates the demand load required before engaging the second stage of cooling. Note that the stage may also engage if the Staging Time of the prior stage expires.

Attribute FB03;**MR** is Minimum Run Time. It shows the minimum amount of time, in minutes, the stage will stay energized.

Attribute FB03;**MS** is Minimum Off Time. It shows the minimum amount of time, in minutes, the stage will stay de-energized.

3.2.5.4 HEAT 1 (K4)

Attribute FB04;**CV** is Heating Stage 1. It indicates the status of the stage output.

Attribute FB04;**TO** is Demand Offset. It indicates the demand load required before engaging the stage of heating. Note that the stage may also engage if the Staging Delay of the prior stage expires.

Attribute FB04;**MX** is Staging Delay. It indicates the maximum amount of time, in minutes, that the stage will operate before energizing the next stage of heating.

Attribute FB04;**MR** is Minimum Run Time. It shows the minimum amount of time, in minutes, the stage will stay energized.

Attribute FB04;**MS** is Minimum Off Time. It shows the minimum amount of time, in minutes, the stage will stay de-energized.

Attribute FB04;**TH** is DAT High Temp Lockout. Heating stages will energize only if there is a reliable Source/Duct Temperature (DAT - Discharge Air Temperature) below this setting. It also defines the maximum Source/Duct Temperature above which heating will be de-energized. This offers protection against overheating.

Attribute FB04;**HL** is OAT Heating Lockout. Heating stages will not be engaged if a Reliable (FE09;**RE**=0) Outside Air Temperature (FE09;**CV**) above the temperature specified by this attribute is available. Stages will not be de-energized should the OAT rise above this temperature during an active cycle.

3.2.5.5 HEAT 2 (K5)

Attribute FB05;**CV** is Heating Stage 2. It indicates the status of the stage output.

Attribute FB05;**TO** is Demand Offset. It indicates the demand load required before engaging the second stage of cooling. Note that the stage may also engage if the Staging Delay of the prior stage expires.

Attribute FB05;**MR** is Minimum Run Time. It shows the minimum amount of time, in minutes, the stage will stay energized.

Attribute FB05;**MS** is Minimum Off Time. It shows the minimum amount of time, in minutes, the stage will stay de-energized.

TABLE 3-13: EQUIPMENT ATTRIBUTES

	attr	description
Equipment: Fan FB01		
	CV	**Target Flow**—defines the status of the fan.
	FR	**Minimum Run Time**—shows the minimum amount of time, in minutes, the fan output will stay energized
	FS	**Minimum Off Time**—shows the minimum amount of time, in minutes, the fan output will stay de-energized
	FX	**Staging Delay**—indicates the maximum amount of time, in minutes, that the fan will operate before energizing the first stage of heating or cooling.

TABLE 3-13: EQUIPMENT ATTRIBUTES

	attr	description
	FD	**Shut Off Delay**—shows the amount of time, in seconds, the fan output will stay energized once the zone temperature reaches the deadband.
	FO	**Occupied Mode**—defines the mode of the fan during the occupied schedule state. When **FO** = 1, the fan runs for the entire period. When **FO**=0, the fan shuts off when the zone temperature is within the deadband. If any active damper has a non-zero demand load, the fan will not shut off.
	FU	**Unoccupied Mode**—defines the mode of the fan during the unoccupied schedule state. When **FU** = 1, the fan runs for the entire period. When **FU** = 0, the fan shuts off when the zone temperature is within the deadband. If any active damper has a non-zero demand load, the fan will not shut off.
	FN	**Night Setback Mode**—defines the mode of the fan during the night setback schedule state. When **FN** = 1, the fan runs for the entire period. When **FN** = 0, the fan shuts off when the zone temperature is within the deadband. If any active damper has a non-zero demand load, the fan will not shut off.
Equipment: Cool 1 FB02		
	CV	**Cooling Stage 1**—indicates the status of the stage output.
	TO	**Demand Offset**—indicates the demand load required before engaging the stage of cooling.
	MX	**Staging Delay**—indicates the maximum amount of time, in minutes, that the stage will operate before energizing the next stage of cooling.
	MR	**Minimum Run Time**—shows the minimum amount of time, in minutes, the stage will stay energized.
	MS	**Minimum Off Time**—shows the minimum amount of time, in minutes, the stage will stay de-energized.
	TL	**DAT Low Temp Lockout**—is DAT Low Temp Lockout. Cooling stages will energize only if there is a reliable Source/Duct Temperature (DAT - Discharge Air Temperature) above this setting. It also defines the maximum Source/Duct Temperature below which cooling will be de-energized. This offers protection against freeze-up.
	CL	**OAT Cooling Lockout**—Cooling stages will not be engaged if a Reliable (FE09;**RE**=0) OAT (FE09;**CV**) less than the temperature specified by this attribute is available.
Equipment: Cool 2 FB03		
	CV	**Cooling Stage 2**—indicates the status of the stage output.
	TO	**Demand Offset**—indicates the demand load required before engaging the stage of cooling.
	MR	**Minimum Run Time**—shows the minimum amount of time, in minutes, the stage will stay energized.
	MS	**Minimum Off Time**—shows the minimum amount of time, in minutes, the stage will stay de-energized.
Equipment Heat 1 FB04		

TABLE 3-13: EQUIPMENT ATTRIBUTES

	attr	description
	CV	**Heating Stage 1**—indicates the status of the stage output.
	TO	**Demand Offset**—indicates the demand load required before engaging the stage of heating.
	MX	**Staging Delay**—indicates the maximum amount of time, in minutes, that the stage will operate before energizing the next stage of heating.
	MR	**Minimum Run Time**—shows the minimum amount of time, in minutes, the stage will stay energized.
	MS	**Minimum Off Time**—shows the minimum amount of time, in minutes, the stage will stay de-energized.
	TH	**DAT High Temp Lockout**—is DAT High Temp Lockout. Heating stages will energize only if there is a reliable Source/Duct Temperature (DAT - Discharge Air Temperature) below this setting. It also defines the maximum Source/Duct Temperature above which heating will be de-energized. This offers protection against overheating.
	HL	**OAT Heating Lockout**—Heating stages will not be engaged if a Reliable (FE09;**RE=**0) Outside Air Temperature (FE09;**CV**) is greater than the value set in this attribute. Stages will not be de-energized should the OAT rise above this temperature during an active cycle.
Equipment: Heat 2 FB05		
	CV	**Stage 2**—indicates the status of the stage output.
	TO	**Demand Offset**—indicates the demand load required before engaging the stage of heating.
	MR	**Minimum Run Time**—shows the minimum amount of time, in minutes, the stage will stay energized.
	MS	**Minimum Off Time**—shows the minimum amount of time, in minutes, the stage will stay de-energized.

3.2.6 AUXILIARY

The following are Auxiliary attributes:
FA11-FA14;**SP**, **CS**, **PO**, **AO**, **IN**, **IC**, **MR**, **RC**, **RV**, **RS**, **RL**, **DB**, **PB**, **RP**, **RT**, **SG**, **SU**, **ID**, **P1**, **P2**, **P3**, and **CE**.
FC01;**MS**, **IC**, **MD**, **MT**, and **MR**.
FC02;**PF**, **IC**, and **PD**.

NOTE

In the event that an *SBC*-VAV controller type flashed with bypass firmware is used, only FA11 is available.

3.2.6.1 PID CONTROL

The Analog control of the *SBC*-V3Tb is a general purpose PID loop used to control the analog output.

Proportional + Integral + Derivative (PID) represents a method of control that controls equipment according to a setpoint in proportion to the value of a measured variable. It accounts for the amount of error (difference between the measured variable and the setpoint) and the continued presence of error. You can use PID control in the analog output loop by enabling the Control Enable attribute (**CE** = 1). Setting **CE** = 0 disables PID control.

Attribute FA1x;**SP** is Loop Setpoint. It specifies the desired loop setpoint. In PID control, the setpoint is defined in **SP**. The measured input variable is the analog sensor referenced by the universal input specified in **IC**. The setpoint is expressed in the same kind of measurement units (engineering units) that the measured variable uses (e.g., degrees, inches of W.C., etc.) For example, when using the analog control attributes to adjust cooling dampers to control a temperature value that the input sensor measures (in degrees), you must express the setpoint for the analog control in degrees. The data type of **SP** is the same as the data type of the selected measured variable. This value is used with the unoccupied setup/setback and the reset to calculate **CS**.

Attribute FA1x;**CS** is Calculated Control Setpoint. It shows the actual loop control setpoint. This read-only point reflects the unoccupied setup/setback as well as any reset and/or *SBC*-STAT setpoint adjustment. This point is expressed in the same kind of measurement units (engineering units) that the measured variable uses (e.g., degrees, cfm, inches of W.C., etc.). The data type of **CS** is the same as the data type of the selected measured variable.

Attribute FA1x;**PO** is Percent Output Value. This attribute shows the output value in hundredths of a percent (e.g., 75.00%). The value is calculated based on the error, change in error and past error for the control loop. The point is then scaled to the selected engineering units of the analog output and is stuffed into the **AO** attribute as well as into **CV** of the analog output. This point can be set manually if the control loop is disabled (**CE** = 0).

Attribute FA1x;**AO** is Analog Output Value. It shows the scaled output value used by the analog output and is a reflection of the Analog Output attribute **CV**. This point is the **PO** value scaled to **MN** and **MX** of the corresponding analog output **AO**. You can write to attribute **AO** when the Analog Output attribute **AM** = 0.

Attribute FA1x;**IN** is Measured Variable's Value. It is read only and displays the value of the input selected in **IC**.

Attribute FA1x;**IC** is Loop Measured Variable. It specifies the input to be used for the control loop's measured variable. A value of 0 in **IC** disables the control loop. A nonzero value selects one of the inputs. A list of the available measured variable inputs appears in Table 3-14.

*Table 3-14: Control Loop Measured Variables Using **IC***

Value of **IC**	*SBC*-V3Tb Measured Variable
0	disabled (default)
1	Zone Temp
2	Supply Temp

*Table 3-14: Control Loop Measured Variables Using **IC***

Value of **IC**	*SBC*-V3Tb Measured Variable
3	Pressure
4	UI1
5	UI2
6	UI3
7	UI4
8	UI5
9	Zone Heating
10	Zone Cooling
11	Outside Air Temperature (OAT)

Attribute FA1x;**MR** is Maximum Amount to Reset Setpoint. It specifies the maximum amount needed to reset the loop setpoint (**SP**) based on when reset is being used. Attribute **CS** takes into account the use of the maximum reset specified in **MR**.

NOTE

The data type of **MR** is the same as the data type of the referenced input variable specified by **IC**.

Attribute FA1x;**RC** is Reset Variable's Value. It displays the value of the input selected in **RV**.

Attribute FA1x;**RV** is Reset Variable. It specifies the input to be used for calculating the reset used by the control loop. A value of 0 disables reset. A nonzero value selects one of the inputs. The reset variable can be any one of the values specified in Table 3-15. This point provides the ability to control a loop using one input while resetting the loop using a different input.

*Table 3-15: Available Inputs for Control Loop Reset Variable **RV***

Value of **RV**	*SBC*-V3Tb Reset Variable
0	disabled (default)
1	Zone Temp
2	Supply Temp
3	Pressure
4	UI1
5	UI2
6	UI3
7	UI4
8	UI5
11	Outside Air Temperature (OAT)

Attribute FA1x;**RS** is the Setpoint at Which Reset Action Begins. This attribute specifies the value at which the reset action begins. When the value of the reset variable exceeds **RS**, reset action will be used in determining the calculated setpoint. **RS** is the reset control setpoint for the value of the reset variable selected by **RV**. The data type of **RS** is the same as the data type of the reset variable specified by **RV**.

Attribute FA1x;**RL** is Limit for Maximum Reset. It specifies the value at which maximum reset is used. When the value of the reset variable is equal to **RL**, the maximum reset (**MR**) is used in determining the calculated setpoint.

The relationship between **RL** and **RS**, as well as the sign (+ or -) of **MR**, determines how changes in the reset variable **RV** affect the setpoint of the loop **SP**. Refer to Figure 3-9.

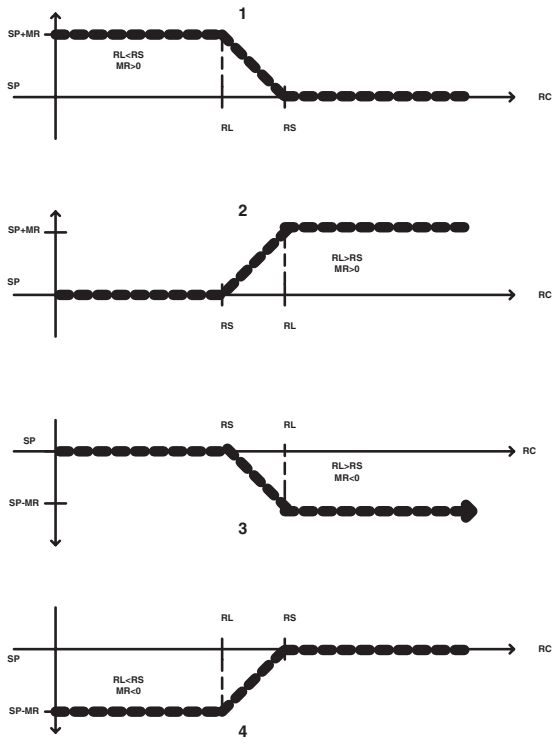


Figure 3-9: Four Forms of Reset Action

NOTE

The data types returned for attributes **RS** and **RL** are determined by the data type of the referenced reset variable specified by **RV**.

NOTE

It may not be possible to use a negative value for **MR** if the data type of the control loop's input **IC** uses an unsigned data type.

Attribute FA1x;**DB** is Deadband. It specifies the deadband within the proportional control band in which the output remains constant at a point midway between maximum output and minimum output. By specifying a **DB** that is greater than or equal to the resolution of the sensor specified in **IC**, you eliminate the possibility of cycling around the setpoint. The value of **DB** should never exceed the proportional band **PB**. If **DB** is greater than **PB**, then the control loop will not have proportional control.

The attribute FA1x;**DB** relates to the resolution of the input variable of the control loop. Recall that the range of a 16-bit, analog input is scaled into 65,535 equal divisions. The *SBC*-V3Tb can recognize input changes that are greater than or equal to the resolution of each of the divisions. For linear analog input devices having a large operational range, the size of each division is also relatively large. For a linear analog input device having a relatively small operational range, the size of each division is relatively small.

In the case of nonlinear sensors such as thermistors, the resolution of each division becomes more irregular as the temperature range extends to the outer limits of the operational range. At these outer limits of the sensor's operation range, one small division may represent a very large or very small temperature range because of the nonlinear nature of the sensor's response curve. The incidence of this phenomenon is even more pronounced with the use of an 8-bit analog input sensor. See Figure 3-10.

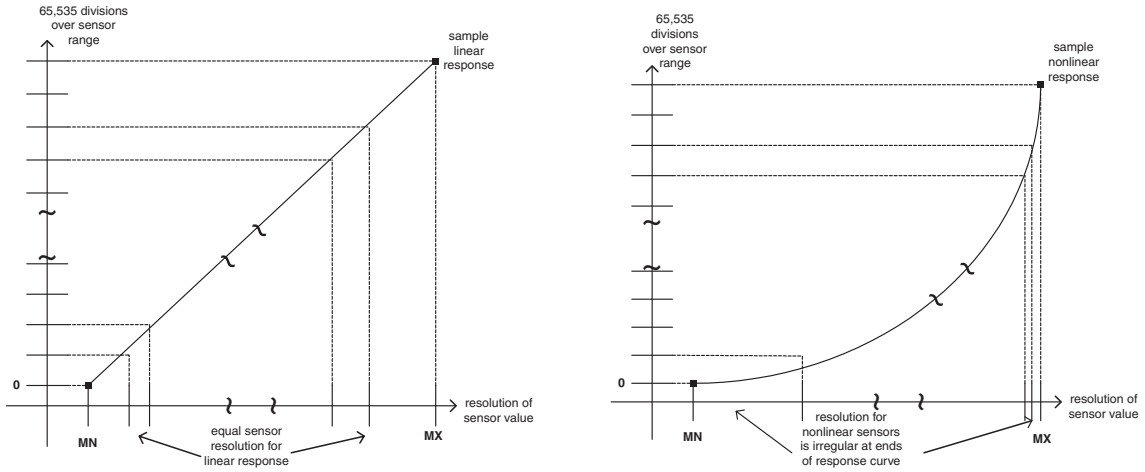


Figure 3-10: Sensor Resolution for Linear and Nonlinear Devices

Whether or not the divisions of a particular sensor represent a relatively large or relatively small number, it is important to realize that if the setpoint (**SP**) chosen does not exactly fall on one of these divisions, the *SBC*-V3Tb will never attain the setpoint. The resulting control action will be an oscillation of the output around the setpoint. In order to eliminate the effects of this hunting action, a deadband can be programmed that is centered on the selected setpoint.

Attribute FA1x;**DB** is used to specify an input variable range within the proportional band **PB**.

The size of **DB** should be based on the type of sensor input selected for the input specified in **IC**. When the value of the measured variable is within this deadband, the output signal remains constant at the midpoint of the minimum/ maximum range.

The point **DB** is centered on the setpoint **SP** to create the actual control deadband. When the value of the control variable (specified by **IC**) is within ±**DB**/2 of the setpoint **SP**, the *SBC*-V3Tb assumes that it has reached the setpoint. Refer to Figure 3-11.

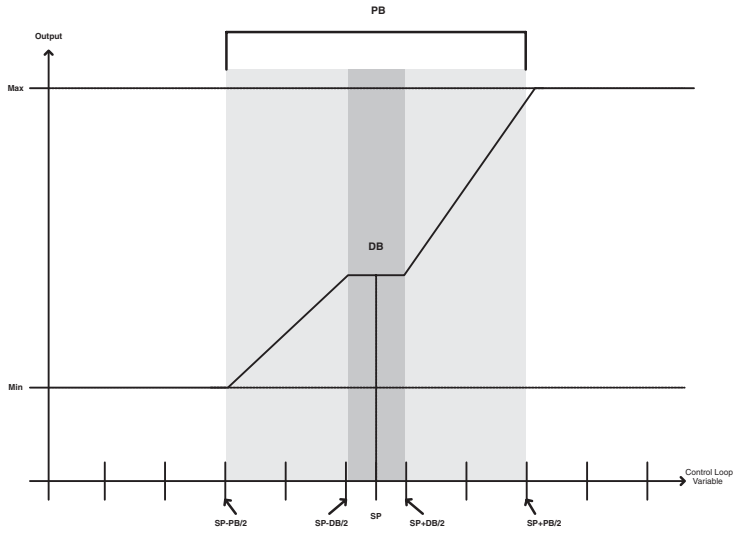


Figure 3-11: Normal Acting, Proportional Control Output Response Showing a Deadband Centered Around the Setpoint

By entering a value in FA1x;**DB** that is greater than the resolution of the measured variable sensor, you create a deadband that allows the *SBC*-V3Tb to effectively reach setpoint.

Be sure that the **DB** selected does not exceed the size of the proportional band (**PB**). The attribute **DB** is expressed in the same kind of measurement units (engineering units) that the measured variable uses (e.g., degrees, cfm, inches of W.C., etc.). The data type of **DB** is the same as the data type of the selected measured variable. The point **DB** defaults to 0.

NOTE

The data types returned for attributes **DB** and **PB** are determined by the data type of the referenced measured variable specified by **IC**.

CAUTION

*Never change **DB** to a value greater than half of the proportional band **PB**. Doing so will eliminate the effects of PID control, resulting in on/off control.*

At this point, the *SBC*-V3Tb will provide simple closed loop feedback proportional control. This means that the actual measured performance of the control (from the measured variable input) is fed back to the controller and is compared with the effective setpoint for the loop. Any difference between the actual value of the input variable and effective setpoint values is called error (**IN** – **CS**).

An analogy is helpful in explaining the effects of error. Figure 3-12 shows a simple lever and fulcrum. A change in the lever position on the error side produces a proportional change in the lever on the output side. Depending on the position of the fulcrum, a change on the error side will have a greater or lesser effect on the output side. The fulcrum position changes the ratio of error to output.

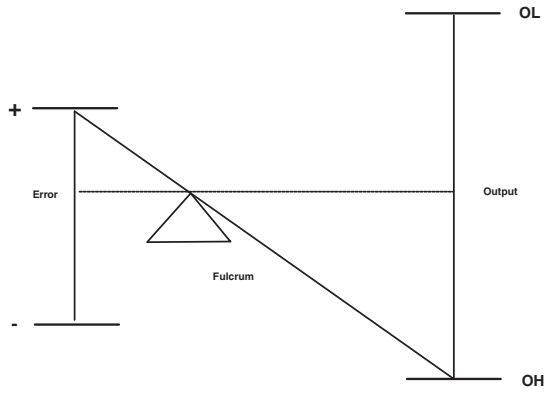


Figure 3-12: Input/Output Ratio

One problem with proportional only control is the changes in loop performance that occur when the condition being measured by the input sensor changes (e.g., the measured temperature changes when a door is opened and the room or space is flooded with cold air). As the loop environment changes, the proportional only control loop begins to cycle around an offset from the setpoint. Figure 3-13 illustrates the performance of a typical loop under proportional only control.

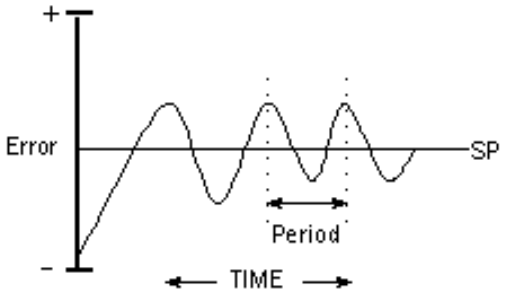


Figure 3-13: Proportional Only Control

Attribute FA1x;**PB** is Proportional Band. It specifies the input variable range over which the output value is proportional to the error value (i.e., changes in the measured variable result in proportional changes in the output signal). The proportional band is centered around setpoint for the loop. This point is expressed in the same kind of measurement units (engineering units) that the measured variable uses—for example: degrees, cfm, inches of W.C. The data type of **PB** is the

same as the data type of the selected measured variable.

NOTE

The data type of **PB** is the same as the data type of the referenced input variable specified by **IC**.

To determine **PB**, first decide how closely the *SBC*-V3Tb must control the output to the setpoint. For instance, if the setpoint is 72°F, then an acceptable control range might be within two degrees of the setpoint. This control range can be expressed as a band centered on the setpoint: from 70° to 74°, or 4 degrees—the *proportional band* (**PB**). Refer to Figure 3-14 and Figure 3-15.

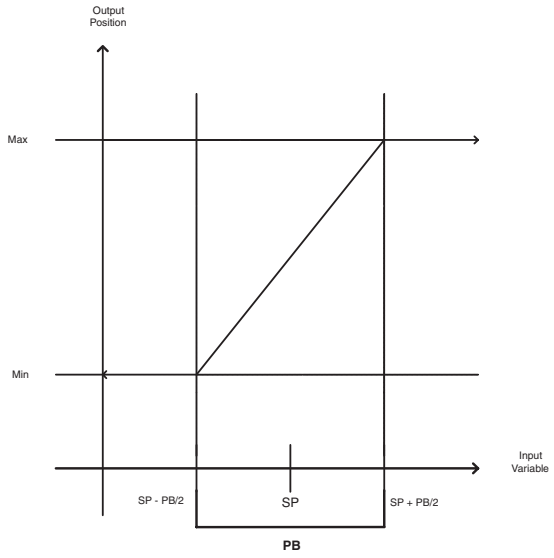


*Figure 3-14: Proportional Band for Normal Acting Control (**SG** = 0)*

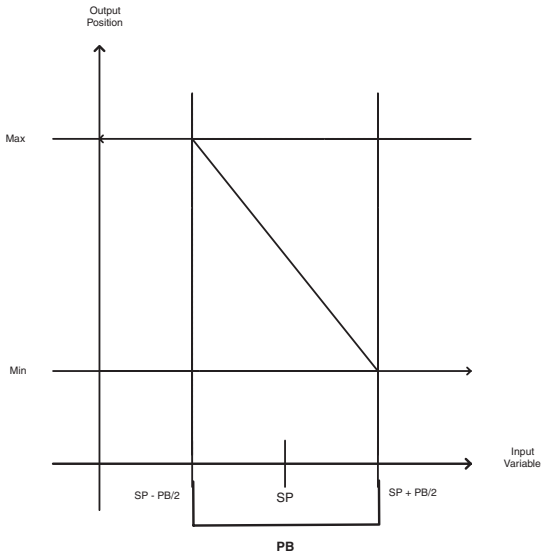


*Figure 3-15: Proportional Band for Reverse Acting Control (**SG** = 1)*

For normal acting control loops, **PO** is set to maximum output when the input variable equals the setpoint plus half of the proportional band (**SP** + **PB**/2). The point **PO** is set to minimum output when the input variable equals the setpoint minus half of the proportional band (**SP** + **PB**/2). These associations are reversed for reverse acting control loops.

Attribute FA1x;**RP** is Reset Period. This attribute specifies the reset period (in seconds) over which the error history is accumulated. If **RP** = 10 seconds with a constant error of 2.0, then the error history would increase by 0.2 every second. In five seconds, the error history would be 1.0. At the end of ten seconds, the error history would be 2.0. Setting **RP** to 0 disables integral action. The longer **RP** is, the less effect it has on the control response. Figure 3-16 shows the response of a typical control loop when integral action is used in addition to proportional action (PI control). A value of 0 disables the reset period.

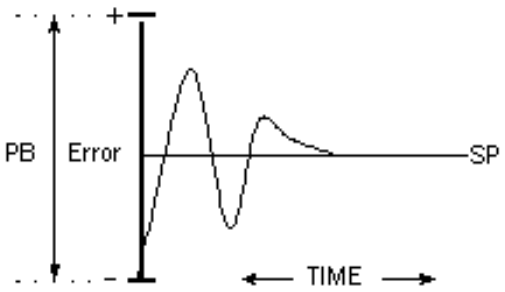


Figure 3-16: Proportional + Integral (PI) Control

At the start-up of the loop or following a change in setpoint, the error is fairly large. Proportional action causes the loop output to accelerate toward the setpoint. However by the time the loop response reaches the setpoint value, it has gained inertia from the preceding proportional action. This causes the loop to overshoot the setpoint. As the loop exceeds the setpoint moving toward its first peak, the error sum is accumulating. This slows down the acceleration, eventually causing the downturn in response.

As the error falls and then drops below the setpoint, the error sum will be reduced because now the error is in the opposite direction. The cycle continues in diminishing peaks until it finally converges at the setpoint.

The proportional control action of the loop has a major effect on integral action. Increasing **PB** results in a smaller integral effect for a given value of **RP**. In general, decreasing the proportional band **PB** will increase the amount of overshoot. On the other hand, the larger **PB** is, the slower the loop response.

Several important factors may not be obvious to inexperienced users of these DDC techniques.

First, whenever the error falls outside of the proportional band—that is, ±**PB**/2 from the setpoint, two important things happen: the controller's output is fully pegged in the appropriate direction, and the error sum stops accumulating. The control produces its maximum output because it must bring the error within the proportional band again. The error sum is accumulating so that it does not "wind up" a massive error sum that would take many control cycles to dissipate. This feature is called antireset windup.

Antireset windup also makes the loop recover quickly when it reenters the proportional band. Another feature of antireset windup is that the error history is limited to **PB**/2 because that is all that is required to produce maximum output. Additional error accumulation would only slow down loop recovery.

To quicken loop response while eliminating overshoot, derivative action must be taken. Derivative action takes into account the rate of change in error and allows the *SBC*-V3Tb to counter the effects of the error's rate of change on the control output. To find the change in error, subtract the current error (read every second by the PID loop) from the previous second's error. A percentage of this change (specified by **RT**) becomes the derivative contribution to the PID output.

Attribute FA1x;**RT** is Derivative Rate. It specifies a percentage of change in error that is to be used in calculating **PO**. The value is specified in percent per second. The point **RT** can have any value from 0.0 to 25.5%/second. The effect of adding derivative action to the output response appears in Figure 3-17.

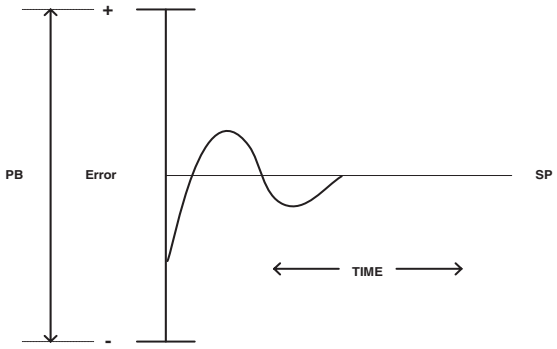


Figure 3-17: Proportional + Integral + Derivative (PID) Control

Attribute FA1x;**SG** is Control Action. It specifies the control action for the control loop. When **SG** = 0 (normal), a positive error causes an increase in output. When **SG** = 1 (reverse), a positive error causes a decrease in output.

This point determines the response of the loop output to the kind of error. If the output action is to be increased (toward max) when the error is positive (**MV** > **SP**), set **SG** to normal (0). If the output action is to be decreased (toward min) for positive error, set **SG** to reverse (1). (Attribute **SG** is also used during schedule control to determine whether **SU** is added to **SP** [**SG** = 0] or subtracted from **SP** [**SG** = 1] during unoccupied periods.) For more information, refer to attribute **SU**.

Proportional only control produces cycling, and its performance changes when the measured environment changes. The way to eliminate cycling and to compensate for load changes is to use *integral* action, the *I* part for PID control.

Rather than responding exclusively to the loop error from moment to moment as is the case with proportional action, integral action is based on a summation of the error that has occurred over some period. This error sum is used to reset, or modify, the response of the control loop (output) based on a running average of the error. The amount of time over which the error averaging is accumulated is called the *reset period*.

Attribute FA1x;**SU** is Unoccupied Setup/ Setback. This point specifies the amount to add (if **SG** = 0) or subtract (if **SG** = 1) from the setpoint during an unoccupied period. The adjusted setpoint will be displayed in **CS**. The attribute **CS** (the effective setpoint incorporates any setup/setback that may exist as well as any reset or setpoint adjustment from the *SBC*-STAT. The data type of the value specified in **SU** is the same as the data type of the referenced measured variable specified by **IC**.

Attribute FA1x;**ID** is Interlock Enable/Disable. This attribute enables/disables the interlocks for the PID. When an interlock input is = 1 (enabled), the PID control output is set to the value of the interlock failure position.

PID interlock priority is as follows:
. Interlock 1 (highest)
. Interlock 2
. Fan Status (lowest)

FA1x;**P1** is Interlock 1 Position. This attribute specifies the PID output value when the current value of Interlock 1 is equal to 1.

FA1x;**P2** is Interlock 2 Position. This attribute specifies the PID output value value when the current value of Interlock 2 is equal to 1.

FA1x;**P3** is No Flow Position. This attribute specifies the PID output value when the current value of Fan Status is equal to 0 (No Flow).

Attribute FA1x;**CE** is Enable Control Loop. It enables the PID loop. When **CE** = 0, **PO** is not updated but may be set manually. When **CE** = 1, PO is updated by the PID control loop and if the analog output is set to automatic control, the **AO** value will be set accordingly.

3.2.6.2 Occupancy Detector

NOTE

In the event that an *SBC*-VAV controller type flashed with bypass firmware is used and UI1 is used for source temperature and UI2 is used for OAT, an Occupancy Detector can not be used.

The Occupancy Detector attributes allow you to define the circumstances under which the *SBC*-V3Tb will automatically switch to an extended occupied mode during unoccupied periods when occupancy detector is used with the controller.

Attribute FC01;**MS** is Occupancy Status. This read-only point shows the status of the occupancy detector digital input. To enable occupancy detection, **MT** must be > 0 and UIx MUST be configured as digital (UIx **ST** = 0). If either of these two conditions are not met, **MS** will display 0. When this point is enabled (**MS** = 1) and when occupancy in the zone is detected during unoccupied periods, the occupancy input extends occupancy time by the amount specified in **MT**.

Attribute FC01;**IC** is Occupancy Status Input. It specifies the binary input channel to be used

for detection. This point uses a nonzero value from UIx to indicate occupancy.

Attribute FC01;**MD** is Extended Occupancy Delay. It sets the amount of time, in seconds, during which the occupancy detector must remain on before the occupancy detector will override the zone. This prevents false triggers that might occur as others pass quickly through the zone.

Attribute FC01;**MT** is Extended Occupancy Duration. It defines, in minutes, the length of time needed to override the zone whenever occupancy is detected.

Attribute FC01;**MR** is Extended Occupancy Remaining. This read-only point displays the time remaining for occupancy detector override.

3.2.6.3 FAN STATUS

Attribute FC02;**PF** is Fan Status. It shows the status of the fan for proof of flow. To prevent over-pressure, the *SBC*-V3Tb will open the damper to 100% when the fan is disengaged or when Fan Status reports No Flow (FC02;**PF**=0).

Attribute FC02;**IC** is Status Input. It selects the digital input where a non-zero value indicates flow.

Attribute FC02;**PD** is Delay. It shows the amount of time, in seconds, imposed before enabling a positive flow indication.

3.2.6.4 ECONOMIZER

The PID economizer operates between a low (FA01;**OL**) and high temperature limit (FA01;**OH**). If the Outside Air Temperature (OAT) is outside of the limits, the PID output is set to the calculated minimum position limit (FA01;**EM**). The PID output is active when the unit is in occupied mode and inactive during all other schedule modes.

The economizer control loop setpoint is the value of a measured variable which is centered between **PB**. When the value of the measured variable is equal to the value of the setpoint, the output of the PID loop should be at 50% of its output range.

The analog output for the economizer control loop is AO1 on terminal block TB2. A 0-10VDC signal or 0-20mA (current sourcing) signal is used to drive a standard analog motor actuator.

FA01;**EE** is Economizer Enable. This attribute specifies the PID channel or Digital Output to be used for economizer control. When **EE** is set to zero, economizer control is disabled.

The settings for **EE** are as follows: 0=Off, 1=PID 1, 2=PID 2, 3=PID 3, 4=PID 4, 5=DO 3, and 6=DO 5. Setting **EE** to either 5 (DO 3) or 6 (DO 5) enables the user of external, pre-packaged economizers.

NOTE

The settings for an *SBC*-VAV unitary controller flashed with Bypass firmware are as follows:
0=Off
1=PID
5=DO3
6=DO5

NOTE

Assigning a digital output to enable/disable an external economizer using DO3 or DO5 overrides the Cooling Stage 2 or Heat Stage 2 request.

FA01;**OH** is OAT High Limit. This attribute specifies the OAT high limit. If the OAT is above the high limit and the economizer is enabled, the PID is set to the Minimum Position (as specified in FA01;**EM**).

FA01;**OL** is OAT Low Limit. This attribute specifies the OAT low limit. If the OAT is below the low limit and the economizer is enabled, the PID is set to the Minimum Position (as specified in FA01;**EM**).

FA01;**EM** is Minimum Position. This attribute specifies the PID minimum position in percent for the economizer damper.

FA01;**ED** is Economizer Staging Delay. This attribute specifies how many minutes the controller waits before using additional cooling stages after the economizer damper reaches 100%.

FA01;**CM** is Calculated Economizer Minimum Position. This attribute displays the actual minimum position of the economizer damper.

FA01;**MV** is Reset variable for economizer minimum position. **MV** allows you to specify an input sensor that is to be used to reset the minimum position of the economizer (FA01;**EM**). The minimum position reset variable can be any of the following:

. any available *SBC*-V3Tb universal inputs
. zone temperature
. supply temperature
. outside temperature.

FA01;**MP** is Reset setpoint for economizer minimum position. This attribute specifies the value at which the reset action begins. When the value of the reset variable exceeds **MP**, reset action will be used in determining the economizer minimum position.

FA01;**MR**,Maximum Reset for economizer minimum position. This attribute specifies the maximum amount to reset the minimum position setpoint (**EM**) by when reset is being used.

FA01;**ML** is Limit for maximum economizer minimum position reset. This attribute specifies the value at which maximum reset is used. When the value of the reset variable is equal to **ML**, the maximum reset (**MR**) is used in determining the calculated minimum position.

TABLE 3-16: AUXILIARY ATTRIBUTES

	attr	description
Aux: PID Control: 1-4 FA1x		
	SP	**Loop Setpoint**—specifies the desired loop setpoint.
	CS	**Control Setpoint**—shows the actual loop control setpoint.
	PO	**Percent Output**—shows the output value in hundredths of a percent.
	AO	**Analog Output Current Value**—shows the scaled output value used by the analog output.
	IN	**Input Channel Value**—displays the value of the input selected in **IC**.
	IC	**Input Channel**—specifies the input to be used for the measured variable for the control loop. 0= disabled 1=Zone Temp 2=Supply Temp 3=Flow 4=UI1 5=UI2 (NA for *SBC*-VAV controller types flashed with bypass firmware) 6=UI3 (NA for *SBC*-VAV controller types flashed with bypass firmware) 7=UI4 (NA for *SBC*-VAV controller types flashed with bypass firmware) 8=UI5 (NA for *SBC*-VAV controller types flashed with bypass firmware)
	MR	**Maximum Reset**—specifies the maximum amount by which to reset the loop setpoint (**SP**) when reset is being used.
	RC	**Reset Variable Value**—displays the value of the input selected in **RV**.

TABLE 3-16: AUXILIARY ATTRIBUTES

	attr	description
	RV	**Reset Variable**—specifies the input to be used for calculating the reset. 0=disabled 1=Zone Temp 2=Supply Temp 3=Flow 4=UI1 5=UI2 6=UI3 (NA for *SBC*-VAV controller types flashed with bypass firmware) 7=UI4 (NA for *SBC*-VAV controller types flashed with bypass firmware) 8=UI5 (NA for *SBC*-VAV controller types flashed with bypass firmware) 11=OAT
	RS	**Reset Setpoint**—specifies the value at which the reset action begins.
	RL	**Reset Limit**—specifies the value at which maximum reset is used.
	DB	**Deadband**—specifies the input variable range over which the output value is proportional to the error value.
	PB	**Proportional Band**—specifies the input variable range over which the output value is proportional to the error value.
	RP	**Reset Period**— specifies the reset period (in seconds) over which the error history is accumulated.
	RT	**Rate**—specifies a percentage of change in error that is to be used in calculating **PO**.
	SG	**Control Sign**—specifies the control action for the control loop.
	SU	**SetUp/Setback**—specifies the amount to add (if **SG** = 0) or subtract (if **SG** = 1) from the setpoint during an unoccupied period.
	ID	**Interlock Enable/Disable**—when an interlock input is enabled, the PID control output is set to the value of the interlock failure position. PID interlock priority is as follows: Interlock 1 (highest) Interlock 2 Fan Status (lowest)
	P1	**Interlock 1 Postion**—specifies the PID output value when the current value of Interlock 1 is equal to 1.
	P2	**Interlock 2 Position**—specifies the PID output value when the current value of Interlock 2 is equal to 1.
	P3	**Fan Status Position**—specifies the PID output value when the current value of Interlock 3 is equal to 0 (No Flow).
	CE	**Control Enabled**—enables the PID loop.
Aux: Occupancy Detector FC01		

TABLE 3-16: AUXILIARY ATTRIBUTES

	attr	description
	MS	**Occupancy Status Input**—specifies the input channel to be used**.** 0 = none 1 = UI1 2 = UI2 (NA for *SBC*-VAV controller types flashed with bypass firmware) 3 = UI3 (NA for *SBC*-VAV controller types flashed with bypass firmware) 4 = UI4 (NA for *SBC*-VAV controller types flashed with bypass firmware) 5 = UI5 (NA for *SBC*-VAV controller types flashed with bypass firmware)
	IC	**Occupancy Detector Enable**—uses a nonzero value from UI1 to indicate occupancy.
	MD	**Extended Occupancy Delay**—sets the amount of time, in seconds, during which the occupancy detector must remain on before it will override the zone.
	MT	**Extended Occupancy Duration**—defines, in minutes, the length of time to override the zone whenever occupancy is detected.
	MR	**Extended Occupancy Remaining**—displays the time remaining for occupancy detector override.
Aux: Fan Status FC02		
	PF	**Fan Status**—shows the status of the fan for Proof of Flow.
	IC	**Status Input**—selects the digital input where a non-zero value indicates flow. 0 = none 1 = UI1 2 = UI2 (NA for *SBC*-VAV controller types flashed with bypass firmware) 3 = UI3 (NA for *SBC*-VAV controller types flashed with bypass firmware) 4 = UI4 (NA for *SBC*-VAV controller types flashed with bypass firmware) 5 = UI5 (NA for *SBC*-VAV controller types flashed with bypass firmware)
	PD	**Delay**—shows the amount of time, in seconds, imposed before enabling a positive flow indication.
Aux: Economizer FA01		
	EE	**Economizer Enable**—specifies the PID channel or Digital Output to be used for economizer control. A value of zero in **EE** disables economizer control. **EE** Settings are: 0=Off 1=PID 1 2=PID 2 (NA for *SBC*-VAV controller types flashed with bypass firmware) 3=PID 3 (NA for *SBC*-VAV controller types flashed with bypass firmware) 4=PID 4 (NA for *SBC*-VAV controller types flashed with bypass firmware) 5=DO 3 6=DO 5 NOTE: Assigning a digital output to enable/disable an external economizer using DO3 or DO5 overrides the Cooling Stage 2 or Heat Stage 2 request.
	OH	**OAT High Limit**—specifies the Outside Air Temperature (OAT) high limit. If the OAT is above the high limit, the PID is set to the Economizer Minimum position (**EM**).
	OL	**OAT Low Limit**—specifies the Outside Air Temperature (OAT) low limit. If the OAT is below the low limit, the PID is set to the Economizer Minimum position (**EM**).
	EM	**Economizer Minimum Postion**—specifies the PID minimum position in percent for the economizer damper.

TABLE 3-16: AUXILIARY ATTRIBUTES

	attr	description
	ED	**Economizer Staging Delay**—specifies how many minutes the controller waits before using additional cooling stages after the economizer damper reaches 100%.
	CM	**Calculated Economizer Minimum Position**—displays the actual minimum position of the economizer damper.
	MV	**Reset Variable for Economizer Minimum Position**—specifies the input to be used for calculating the reset. A value of zero disables reset, a non-zero value selects one of the inputs.
	MP	**Reset Setpoint for Economizer Minimum Position**—specifies the value at which the reset action begins. When the value of the reset variable exceeds **MP**, reset action will be used in determining the economizer minimum position.
	MR	**Maximum Reset for Economizer Minimum Position**—specifies the maximum amount to reset the minimum position setpoint (**EM**) by when reset is being used.
	ML	**Limit for Maximum Economizer Minimum Position Reset**—specifies the value at which maximum reset is used. When the value of the reset variable is equal to **ML**, the maximum reset (**MR**) is used in determining the calculated minimum position.

3.2.7 I/O Setup

The following are Input/Output Setup attributes:
FE01-FE05;**CV**, **RE**, **ST**, **DT**, **MN**, **MX**, **LL**, **HL**, **HS**, **AS**, **AE**, **SU**, **IP**, **IF**, and **OI**.
FD01-FD01;**CV**, **DT**, **MN**, **MX**, **LS**, **HS**, and **AM**.
FB01-FB05;**CV**, **OP**, **RH**, **RL**, and **OI**.

NOTE

In the event that an *SBC*-VAV controller type flashed with bypass firmware is used, only UI1 and UI2 are available.

3.2.7.1 Input (UIx)

I/O Setup (UIx) offers specific operational options. As a universal input it can be used as the referenced input for PID analog control. It provides you with the option to use any one of several *SBC*-V3Tb features. It can be used for the duct temperature input, fan status input, analog control PID input, outside air temperature input, or as an occupancy detection input of the *SBC*-V3Tb. When used as an occupancy detection sensor input, UIx is dedicated to the *SBC*-V3Tb occupancy detection feature—allowing for automatic unoccupied override. This sends the *SBC*-V3Tb into an occupied mode of operation when occupancy is detected in the control area.

Attribute FE0x;**CV** is Current Value. It shows the current value of UIx. This attribute is read-only unless overridden (**OI** = 1).

Attribute FE0x;**RE** is Data Reliability and can be either a 0 or 1. It is set to 1 if the universal input is questionable. The input is considered unreliable during the input filtering delay time. Any time the digital input changes state (from 0 to 1 or from 1 to 0), it is considered questionable. If the digital input remains stable (does not change state) for **IF** seconds, the corresponding bit in **RE** is set back to 0—indicating a reliable/stable value. If the digital input does change state before **IF** seconds expire, the reliability bit remains set to 1—indicating that the change of state may be a digital input bounce.

Attribute FE0x;**ST** is Sensor Type. Through this point, you can select one of the following input types: digital, linear (scaled **MN** to **MX**), 4–20mA linear (scaled **MN** to **MX**) or thermistor table 1 (-22.0 to 122.0°F). The associated settings appear in Table 3-17.

Table 3-17: Sensor Types for FE0x

Value of **ST**	Sensor Type
ST = 0	digital
ST = 1	unused
ST = 2	full scale, linear input scaled from **MN** to **MX** (0–10VDC)
ST = 3	4–20mA input scaled from **MN** to **MX**
ST = 4, 5 or 6	unused
ST = 7	–22.0 to 122.0°F (–30.0 to 50.0°C) thermistor (default)

When **ST** = 0, the universal input will be configured to operate as a digital input and will allow **CV** to display a 1 or a 0—the meaning of which is dependent on **IP** (input polarity). If **IP** = 0, a low voltage input (<2.5VDC) to the universal input will result in **CV** = 0; a high voltage (>2.5VDC) applied to the universal input will result in **CV** = 1. If **IP** = 1, a low voltage applied to the universal input will read as **CV** = 1; a high voltage will result in **CV** = 0.

Setting **ST** to 2 and having the *SBC*-V3Tb set up to use the appropriate hardware input provides the ability to use a 0–10VDC device as the input. The minimum and maximum values of the range are set in attributes **MN** and **MX**. For example if the input value is to be displayed as a percentage, then set **ST** = 2, **MN** = 0 and **MX** = 100 (0–100%). The *SBC*-V3Tb will determine the voltage input converted internally to raw counts, will scale the raw counts (0–255) across the range 0–100 and will display the value of the input as a range of 0–100. For linear voltage devices, be sure that the appropriate jumper on the PCB is properly set. For more information, refer to *Section 2: Wiring and Installation*.

The following sample calculation shows how the *SBC*-V3Tb scales raw counts on the 10-bit UI1 using a current value of 115. (The result is rounded.)

$$\textbf{CV} = \textbf{MN} + \left[\frac{\text{Current Counts} \times \textbf{MX}}{\text{Max Counts}}\right]$$

$$\textbf{CV} = 0.00 + \left[\frac{115 \times 100}{65{,}535}\right]$$

$$\textbf{CV} = 0.00 + \left[\frac{11500}{65{,}535}\right]$$

$$\textbf{CV} = 0.18$$

The following sample calculation shows how the *SBC*-V3Tb scales raw counts on the 10-bit input using a current value of 185 counts.

$$\textbf{CV} = \textbf{MN} + \left[\frac{\text{Current Counts} \times (\textbf{MX})}{\text{Max Counts}}\right]$$

$$\textbf{CV} = 0.0 + \left[\frac{185 \times 100}{65{,}535}\right]$$

$$\textbf{CV} = 0.0 + \left[\frac{18500}{65{,}535}\right]$$

$$\textbf{CV} = 0.28$$

If the input's value was 185 in raw counts according to the percentage scaling of **MN** and **MX**, then the value of 0.28 (rounded) would be displayed in **CV**.

If you make the value of **MN** greater than the value of **MX**, the input is configured for reverse scaling. This is useful for 5–0VDC sensors (as opposed to 0–5VDC sensors).

The *SBC*-V3Tb also provides linear input scaling for 4–20mA current transmitters (**ST** = 3). For sensors that provide a 4–20mA signal, set **ST** = 3. Attributes **MN** and **MX** are used in the same way as they are for **ST** = 2. For information on hardware settings, refer to *Section 2: Wiring and Installation*. Figure 3-18 illustrates the counts used by a 4–20mA device.

Set **ST** = 7 if using a thermistor. For information on hardware settings, refer to *Section 2: Wiring and Installation*.

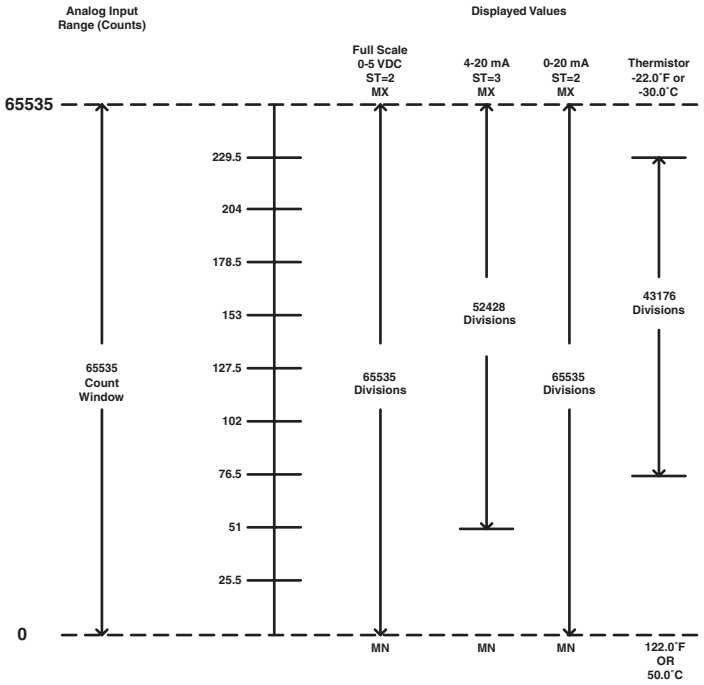


Figure 3-18: Analog Sensor Types

Attribute FE0x;**DT** is PUP Data type for Input. It specifies the PUP data type for the input. The data type determines how certain universal input attributes are displayed. This point affects the display of **CV**, **MN**, **MX**, **SU**, **LL**, **HL**, and **HS**. Data type codes determine the number of decimal places in the value and whether or not the value is signed (positive or negative) or unsigned. This attribute defaults to 253 (signed 9.1 digit).

Attribute FE0x;**MN** is Minimum Scaled Value. It specifies the minimum engineering unit for the input corresponding to the lowest value measured at the input connection.This point is used to scale the measured value to meaningful engineering units for display.

Attribute FE0x;**MX** is Maximum Scaled Value. It specifies the maximum engineering unit for the input corresponding to the highest value measured at the input connection.This point is used to scale the measured value to meaningful engineering units for display.

Attributes **MN** and **MX** program the minimum and maximum scaled values for linear, analog inputs (**ST** = 2 and **ST** = 3). For example if the input value is to be displayed as a percentage, you would set **ST** = 2, **MN** = 0, and **MX** = 100 (0–100%). The *SBC*-V3Tb will scale the raw counts 0–255 for 8-bit inputs across the range 0–100 and will display the value of the input for a range of 0–100. For linear input devices, be sure that the appropriate hardware is set on the *SBC*-V3Tb. For information on hardware settings, refer to *Section 2: Wiring and Installation*.

Attributes **LL**, **HL**, **HS**, **AS**, and **SU** provide parameters for analog PUP alarming. The **AE** attribute determines whether or not input alarming is used.

Attribute FE0x;**LL** is Low Alarm Limit. It specifies the low alarm limit. If alarms are enabled and the current value drops below this value, a low limit alarm will be generated.

Attribute FE0x;**HL** is High Alarm Limit. It specifies the high alarm limit. If alarms are enabled and the current value rises above this value, a high limit alarm will be generated.

The data types of **LL** and **HL** are specified by the data type attribute **DT** of the universal inputs.

Attribute FE0x;**HS** is Alarm Limit Hysteresis. It determines when the *SBC*-V3Tb returns from a high or low limit alarm. In the case of a high limit alarm, the **CV** value must drop below **HL** – **HS** to cause a high limit return. For a low limit alarm, the **CV** value must rise above **LL** + **HS** to cause a low limit return.

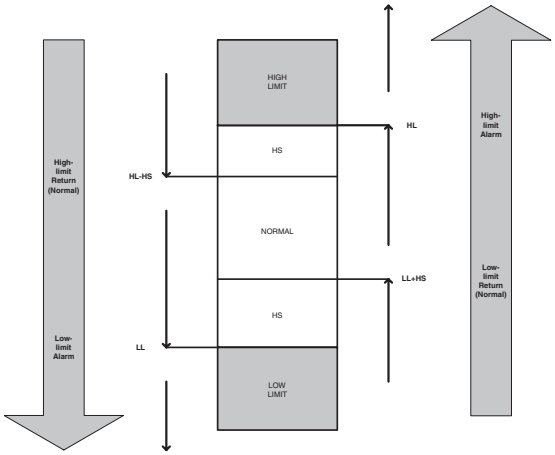


Figure 3-19: Alarm States and Thresholds for Limit Alarming

Attribute FE0x;**AS** is Alarm Status. It shows the current alarm condition. A value of 0 indicates a normal condition. A nonzero number indicates alarm generation. Table 3-18 explains each status.

Table 3-18: Values for Alarm Status Attribute

Value of **AS**	Alarm Condition
AS = 0	normal (no alarm)
AS = 1	contact (0 ⟶ 1**)**
AS = 2	contact (1 ⟶ 0)
AS = 3	change of state
AS = 4	unused

Table 3-18: Values for Alarm Status Attribute

Value of **AS**	Alarm Condition
AS = 5	low limit alarm
AS = 6	high limit alarm

Attribute FE0x;**AE** is Alarm Enable. It specifies the type of alarm checking to be done on the **CV** value. A value of 0 indicates that alarming is disabled; a nonzero value selects one of several alarm functions. Table 3-19 lists the options for **AE**.

Table 3-19: Alarm Enable Options

Value of AE	Alarm Type Enabled
AE = 0	disabled
AE = 1	contact, 0 ⟶ 1
AE = 2	contact, 1 ⟶ 0
AE = 3	change of state, 1 ⟷ 0
AE = 4	low limit alarm
AE = 5	high limit alarm
AE = 6	low and high limit
AE = 7–12	unused

Attribute FE0x;**SU** is the Amount to Setup/ Setback Alarm Limit. It specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods. The attribute is added to **HL** defining the unoccupied high-limit alarm

threshold; **SU** is subtracted from **LL** defining the unoccupied low-limit alarm threshold.

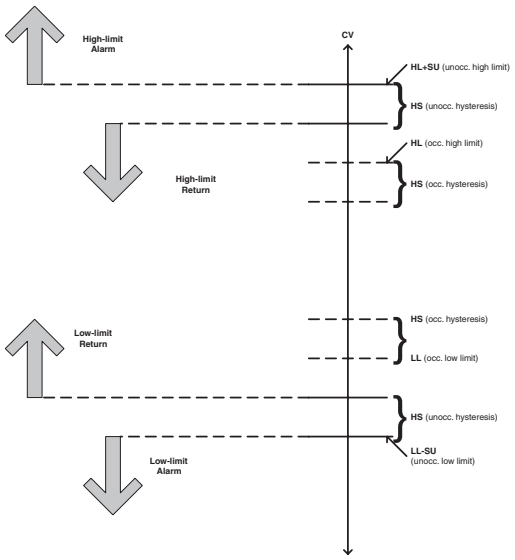


Figure 3-20: Unoccupied Setup/Setback Alarm Shifting

Attribute FE0x;**IP** is Input Polarity. It specifies the input polarity when configured as digital. A value of 0 in **IP** indicates that a low voltage displays as **CV** = 0 and a high voltage displays as **CV** = 1. A value of 1 in **IP** indicates that a low voltage displays as **CV** = 1, and a high voltage displays as **CV** = 0.

Attribute FE0x;**IF** is Input Filter Delay. It specifies the amount of time in tenths of seconds during which an input configured as digital must remain stable in order for the value to be considered reliable if fluctuations are not uncommon. This is also the weighted gain if the input is configured as analog. This attribute is used in the following equation to calculate the average value:

$$\text{Average Value} = \frac{(\text{Old Value} \times \mathbf{IF}) + \text{New Value}}{\mathbf{IF} + 1}$$

Attribute FE0x;**IF** for digital inputs is determined by the amount of time that the input is in the most recent change of state. The attribute's resolution for digital inputs is user adjustable in tenths of seconds. The default for digital and analog input filtering is 0.0.

Attribute FE0x;**OI** is Override Input. It allows a host or operator to directly set the value of the source/duct temperature. This attribute defaults to 0. When it is enabled (**OI** = 1), you can manually write to **CV**.

CAUTION

*If the Zone Temperature attribute **OI** is enabled and the power to the unit is removed or lost, you must immediately rewrite to the Zone Temperature attribute **CV**. The attribute **CV** will have 00.0 reading when power is restored to the unit. If not corrected, this situation will have a detrimental effect on the operation of the unit.*

3.2.7.2 Analog Outputs (AO1 Through AO4)

NOTE

The *SBC*-V3Tb has four (4) AOs. In the event that an *SBC*-VAV controller type is flashed with bypass firmware, only one (1) AO is available.

Analog Outputs provide an 8-bit, 0–10VDC output signal. You can control the analog outputs by writing a value to **CV**, by having a host controller on the EIA-485 communications network write a value to **CV** (still in manual mode), or by automatically controlling the *SBC*-V3T's analog control.

Attribute FD0x;**CV** is Current Output Value. It shows the current value for the analog output, any portion of the 0–10VDC signal. This value may be set manually or automatically. In manual mode (**AM** = 0), the analog output is set by an operator or host by changing **CV**. In automatic mode (**AM** = 1), the analog controls are used to set the value. See the PID control subsection in this section for more information.

Attribute FD0x;**DT** is PUP Data type for Output. It specifies the PUP data type for the analog output. The data type determines how certain analog output attributes are displayed. This point affects the display of **CV**, **MN** and **MX**. The attribute defaults to 252 (unsigned, 9.1 digit).

Attribute FD0x;**MN** is Minimum Scaled Value. It specifies the minimum scaled value for the analog output corresponding to the lowest value output. This point is used to scale the measured value to meaningful engineering units for display.

Attribute FD0x;**MX** is Maximum Scaled Value. It specifies the maximum scaled value for the analog output corresponding to the highest value output. This point is used to scale the measured value to meaningful engineering units for display.

NOTE

Reverse scaling can be accomplished by setting **MN** > **MX**. The attributes **MN** and **MX** default to 0.00 and 100.0, respectively.

Attribute FD0x;**LS** is Minimum Scaled Voltage. It specifies the actual analog output value for a **CV** value of **MN**.

Attribute FD0x;**HS** is Maximum Scaled Voltage. It specifies the actual analog output value for a **CV** value of **MX**.

Attributes **LS** and **HS** specify a range of the total output signal that is then scaled across **MN** and **MX**. The low and high voltages can range from 0.0VDC to 10.0VDC. Reverse scaling can be accomplished by setting **LS** > **HS**. Attributes **LS** and **HS** default to 0.0% and 100.0%, respectively. For example if the analog output value **CV** is to be displayed as a percentage (0–100) of a 10VDC output range, then set **MN** to 0 and **MX** to 100 (a 0.0%–100.0% display range). Set **LS** = 0.0% and **HS** = 100.0% (the full range of the output signal) because **CV** = 0 represents 0.0% of the output range **CV** = 100 represents 100.0% of the output range. Refer to Figure 3-21.

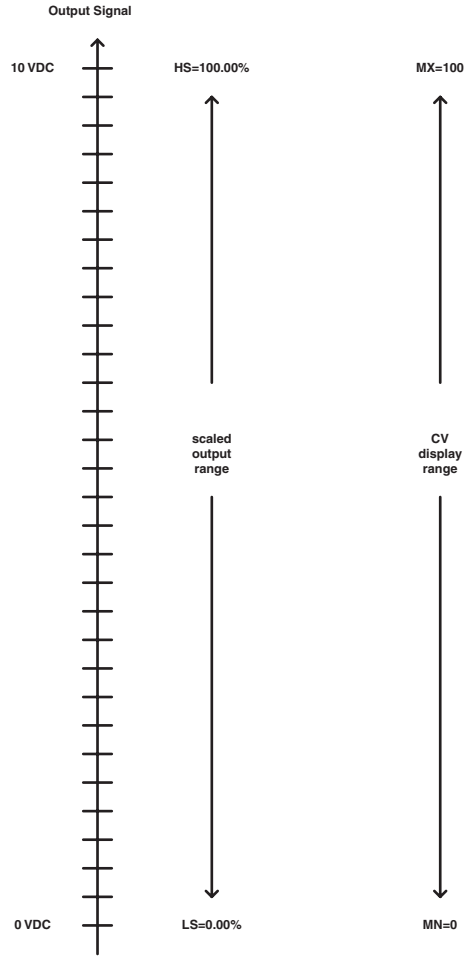


Figure 3-21: Analog Output Example 1

Attributes **MN** and **MX** can be adjusted to display the output signal between a particular range other than a typical 0–100%. Similarly **LS** and **HS** may be adjusted if the desired output signal is something other than the standard 0–10VDC. For example, assume that an actuator requires a 2–10VDC signal to go full stroke. Further assume that the application requires **CV** to be displayed as the current voltage (rather than 0%–100%). In this example, **MN** = 2.0 and **MX** = 10.0 to represent the display range of the output signal in engineering units (2–10VDC). Attribute **LS** would be set to 20% (20% × 10VDC range = 2VDC minimum signal) and **HS** would be set to 100% (100% × 10VDC range = 10VDC maximum signal). Refer to Figure 3-22.

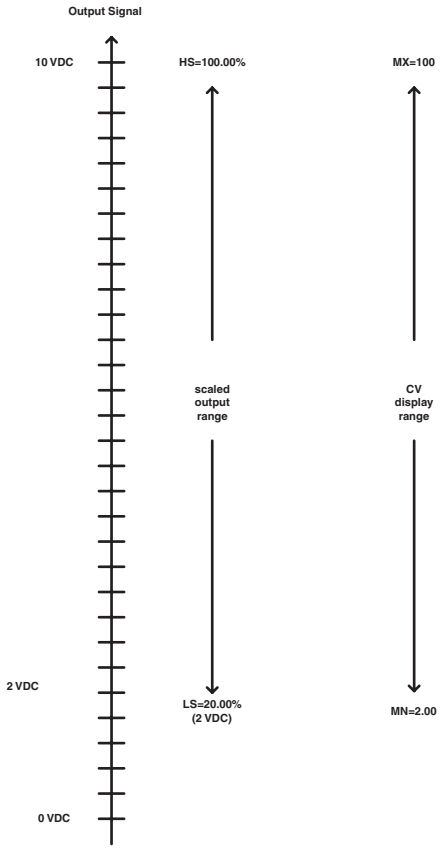


Figure 3-22: Analog Output Example 2

Attribute FD0x;**AM** is Automatic/Manual Control. It selects the control mode for the analog output. If **AM** = 0 (Manual), then **CV** must be set manually to the desired value by changing **CV**. If **AM** = 1 (Automatic), then **CV** is set by the corresponding analog control loop. (Control loop FA14 controls FD04.)

3.2.7.3 Relay Outputs

Attribute FB0x;**CV** is Current Value. It defines the status of the output.

Attribute FB0x;**OP** is Output Polarity. It is used to define whether the output is normal acting (**OP** = 0) or reverse acting (**OP** = 1). As a *normal* acting output, the output is off when fan control is not calling for the fan to be on, and the DO is on when there is a call for the fan to be on. When configured for *reverse* acting, the output is on when fan control is not calling for the fan to be on, and the output is off when the control loop is calling for the fan to be on.

Attribute FB0x;**RH** is Runtime Hours. It is a time tracking attribute that displays hours and tenths of hours. The point reflects the amount of time that the output is actually allowing the fan to run as determined by the Relay Output attribute **OP** and the control loop demand. Run hours are stored in EEPROM automatically at midnight and when the System attribute **BU** is enabled. Attribute **RH** is restored with the latest backed up information upon restoration of power after shut down or power loss. This attribute defaults to 0.

NOTE

You should perform an attribute back up (System attribute **BU** = 1) after clearing the Relay Output attribute **RH**. Otherwise the most recent “stored” value will be restored in **RH** after a power loss.

Attribute FB0x;**RL** is Runtime Limit. It specifies a runtime limit in hours for the output. Once the run hours for the fan output exceed the runtime limit (**RH** > **RL**), the *SBC*-V3Tb will generate a runtime limit alarm. To clear the run limit alarm or to receive another run limit alarm, you MUST set **RH** to 0.

Attribute FB0x;**OI** is Override. This attribute overrides the digital output. You can choose from four options: On (**OI** = 1) constantly energizes the output; Off (**OI** = 0) disables the output; Auto (**OI** = 2) allows for automatic control; Manual (**OI** = 3) allows the **CV** to be directly written.

NOTE

OI default is *off* so that equipment does not accidentally start when connected to the V3Tb.

TABLE 3-20: INPUT/OUTPUT ATTRIBUTES

	attr	description
I/O Setup: Universal Inputs (UI1-UI5) FE0x		
	CV	**Current Value**—(read-only unless **OI** = 1) shows the current value of UI1.
	RE	**Channel Reliability**—can be either a 0 or 1. It is set to 1 if the universal input is questionable. Any time the digital input changes state (from 0 to 1 or from 1 to 0), it is considered questionable. If the digital input remains stable (does not change state) for **IF** seconds, the corresponding bit in **RE** is set back to 0—indicating a reliable/stable value. If the digital input does change state before **IF** seconds expire, the reliability bit remains set to 1—indicating that the change of state may be a digital input bounce.
	ST	**Sensor Type**—allows you to select an input type. 0 = digital 1 = unused 2 = full scale, linear input scaled from **MN** to **MX** 3 = 4-20mA input scaled from **MN** to **MX** 4, 5, or 6 = unused 7 = -22.0 to 122.0°F thermistor
	DT	**Datatype for Input**—specifies the PUP data type for the input. The default is 253 (signed 9.1 digit).
	MN	**Minimum Scaled Value**—program the minimum scaled values for linear, analog inputs.
	MX	**Maximum Scaled Value**—program the maximum scaled values for linear, analog inputs.
	LL	**Low Alarm Limit**—specifies the low alarm limit. If alarms are enabled and the current value drops below this value, a low limit alarm will be generated.
	HL	**High Alarm Limit**—specifies the high alarm limit. If alarms are enabled and the current value rises above this value, a high limit alarm will be generated.
	HS	**Alarm Limit Hysteresis**—a value that determines when the *SBC*-V3Tb returns from a high- or low-limit alarm. For a high-limit alarm, the **CV** must drop below **HL** - **HS** to cause a high limit return. For a low-limit alarm, the **CV** value must rise above **LL** + **HS** to cause a low limit return.
	AS	**Alarm Status**—shows the current alarm condition. 0 = normal 1 = contact (0 to 1) 2 = contact (1 to 0) 3 = change of state 4 = unused 5 = low limit alarm 6 = high limit alarm
	AE	**Alarm Enable**—specifies the type of alarm checking to be done on the **CV** value. 0 = disabled 1 = contact (0 to 1) 2 = contact (1 to 0) 3 = changed of state 4 = low limit alarm 5 = high limit alarm 6 = low and high limit 7-12 = unused

TABLE 3-20: INPUT/OUTPUT ATTRIBUTES

	attr	description
	SU	**Alarm Limit Setup/Setback**—specifies a value that is added to **HL** and subtracted from **LL** during unoccupied periods.
	IP	**Input Polarity**—specifies the input polarity when configured as digital input. 0 = low voltage displays as **CV** = 0, high voltage displays as **CV** = 1 1 = low voltage displays as **CV** = 1, high voltage displays as **CV** = 0
	IF	**Input Filtering/Averaging**—specifies the amount of time in tenths of seconds during which an input configured as digital must remain stable in order for the value to be considered reliable if fluctuations are not uncommon.
	OI	**Override Input**—enables/disables overriding **CV**. If **OI** = 0, override is disabled and **CV** displays the value of the input. If **OI** = 1, the override is enabled and the value of **CV** can be manually changed. 0 = disabled 1 = enabled
I/O Setup: Analog Outputs (UI1-UI5) FD0x		
	CV	**Current Value**—shows the current value for the corresponding analog output.
	DT	**Datatype for Input**—specifies the PUP data type for the analog output. **DT** affects the display of **CV**, **MN**, and **MX**. **DT** defaults to 252 (unsigned, 9.1 digit).
	MN	**Minimum Value**—specifies the minimum scaled value for the analog output corresponding to the highest value output.
	MX	**Maximum Value**—specifies the maximum scaled value for the analog output corresponding to the highest value output.
	LS	**Low Scaled Voltage**—specifies the actual analog output value for a **CV** value of **MN**.
	HS	**High Scaled Voltage**—specifies the actual analog output value for a **CV** value of **MX**.
	AM	**Control Mode**—specifies how the analog output is controlled: 0 = manual 1 = automatic
I/O Setup: Relay Outputs (UI1-UI5) FB0x		
	CV	**Current Value**—shows the current value for the analog output.
	OP	**Output Polarity**—allows you to change the polarity of the output.
	RH	**Runtime Hours**—shows the total amount of time, in hours, during which the output has been energized.
	RL	**Runtime Limit**—specifies a run time limit in hours for the output.

TABLE 3-20: INPUT/OUTPUT ATTRIBUTES

	attr	description
	OI	**Override**—overrides the digital output. 0 = Off (default) 1 = On 2 = Auto 3 = Manual

3.2.8 NETWORKING

There following are Networking attributes:
FF00;**ID**, **ZN**, **CP**, **TP**, **ER**, and **U1-U4.**
F000;**CV**, **RB**, and **BE**.
F005;**CV** and **RB**.

3.2.8.1 CONFIGURATION

Attribute FF00;**ID** is the Unit Number. This value is used to set a unique network address for each controller connected on a multidrop network. Each **ID** is factory set to the last four digits of the board serial number. Valid values are 0 to 9999. For example, if the serial number is 100072, the Unit ID is 72. If the serial number is 498765, the Unit ID is 8765.

Attribute FF00;**ZN** is Zone Number. The Zone Number (from 0 to 65,535) is used to group controllers together so that they can be controlled simultaneously. For example you can set a group of controllers to enter Warm-up Mode all at the same time. The Zone Number programs a Zone Address. The *SBC*-V3Tb uses this code to decide whether or not a PUP Write Zone Attribute command should be honored by this unit. This attribute defaults to 0.

Table 3-21: Communication Speed Options

Value of CP	Baud Rate
0	9600
1	4800
2	2400
3	1200
6	38.4K
7	19.2K
8	115.2K
9	57.6K

Attribute FF00;**CP** is Communication Speed. It specifies the communication speed (baud rate) at which devices on the network will communicate. American Auto-Matrix unitary controllers communicate over EIA-485 networks using PUP. All devices on the same multidrop must have **CP** set to the same value. Valid baud rates are as follows: 0=9600, 1=4800, 2=2400, 3=1200, 6=38.4K, 7=19.2K, 8=115.2K, and 9=57.6K. This attribute defaults to 0.

NOTE

In order for a change of **CP** to take effect, you must reset the *SBC*-V3Tb.

Attribute FF00;**TP** is Token Passing Type. This attribute defines the mode for token passing. When a controller is an Irresponsible Peer it will always return a token to the device that passed it, after performing any pending transactions. In Full Administrator mode, the token is passed to each unit listed in the Peer List (FF00;**U1** through FF00;**U4**).

Attribute FF00;**ER** is Token Recovery. This attribute enables Token Recovery. In a token passing environment there should always be network activity, but if a token is lost the network will fall silent. If Token Recovery is enabled, and a token is lost, Full Administrator will detect the condition and initiate a new token.

Attribute FF00;**U1**-**U4** is Peer Unit Number. This attribute defines the Unit ID of a peer. In Full Administrator mode the token is passed to each unit in the Peer List.

3.2.8.2 OAT BROADCAST

The OAT Broadcast channel attributes allow the *SBC*-V3Tb to receive outside air temperature broadcasts.

Attribute F000;**CV** is Current Value. It shows the value of the broadcast OAT received.

Attribute F000;**RB** is Receive Broadcast?. It enables reception of OAT broadcasts and sets FE09;**CV** based on the received value.

Attribute F000;**BE** is Broadcast Enable. It enables the active broadcast of a reliable FE09;**CV** OAT value.

3.2.8.3 SCHEDULE BROADCAST

The Schedule Broadcast attributes allow the *SBC*-V3Tb to receive network schedule information.

Attribute F005;**CV** is Current Value. It shows the current value of the network broadcast schedule values received by the *SBC*-V3Tb. When **RB** is enabled, **CV** is forced into the Main Schedule attribute **CV** and is used as the functioning schedule value of the *SBC*-V3Tb.

Attribute F005;**RB** is Receive Broadcast. It enables the *SBC*-V3Tb to receive network broadcasts and sets F900;**CV** value based on the received value. If **RB** = 0, then receive broadcast is disabled. If **RB** = 1, then the *SBC*-V3Tb receives the network value and places it in **CV** and Main Schedule attribute **CV**. (This overrides the schedules of the *SBC*-V3Tb, which become ineffective.

TABLE 3-22: NETWORK ATTRIBUTES

	attr	description
Network: Configuration: FF00		
	ID	**Unit ID**—is a unique network address for each controller connected on a multidrop network.
	ZN	**Zone Number**—(from 0 to 65,535) is used to group controllers together so that they can be controlled simultaneously.
	CP	**Communication Speed**—specifies the communication speed (baud rate) at which devices on the network will communicate. 0=9600 1=4800 2=2400 3=1200 6=38.4K 7=19.2K 8=115.2K 9=57.6K
	TP	**Token Passing Type**—defines the mode for token passing. When a controller is an Irresponsible Peer it will always return a token to the device that passed it, after performing any pending transactions. In Full Administrator mode, the token is passed to each unit listed in the Peer List (FF00;**U1** through FF00;**U4**)
	ER	**Token Recovery**—in a token passing environment there should always be network activity, but if a token is lost the network will fall silent. If Token Recovery is enabled, and a token is lost, Full Administrator will detect the condition and initiate a new token.
	U1-U4	**Peer Unit Number**—defines the Unit ID of a peer. In Full Administrator mode the token is passed to each unit in the Peer List.
Network: OAT Broadcast F000		
	CV	Current Value—shows the value of the broadcast OAT received.
	RB	**Receive Broadcast?**—enables reception of OAT broadcasts and sets FE09;**CV** based on the received value.
	BE	**Broadcast Enable**—enables the active broadcast of a reliable FE09;**CV** OAT value

TABLE 3-22: NETWORK ATTRIBUTES

	attr	description
Network: Schedule Broadcast F005		
	CV	**Current Value**—shows the current value of the network broadcast schedule values received by the *SBC*-V3Tb.
	RB	**Receive Broadcast**—enables the *SBC*-V3Tb to receive network broadcasts and sets F900;**CV** based on the received value.

SECTION 4: *SBC*-V3Td ATTRIBUTES

This section introduces you to the groupings of attributes used to control the parameters of the SBC-*V3Td model controllers over the PUP network. Detailed descriptions of all points for the controller appear here. Information on common usage of the attributes is also included.*

4.1 INTRODUCTION

Attributes have two-character names that are generally mnemonic, such as "CV" for current value. In addition, each point has a default attribute. Generally the most important or useful attribute is the default attribute. For example, analog input has zone temperature—read from the *SBC*-STAT—as its default attribute (**ZT**).

All attributes appear in boldface to facilitate locating descriptions of a particular attribute in the document text.

For a listing of each *SBC*-V3Td attribute along with the associated channel, see **Appendix B: *SBC*-V3Td PUP Channels and Attributes**.

4.2 ATTRIBUTES

4.2.1 SYSTEM

The following are System attributes:
FF00;**EM**, **SN**, **CT**, **VE**, **OS**, **FT**, **SR**, **CM**, **UP**, **IC, RC**, **WC**, **CC**, **OC**, **ZP**, **PD**, **PS**, **DE**, and **RS**.

4.2.1.1 ABOUT

Attribute FF00;**EM** is Engineering Units. It specifies the type of engineering units (U.S./English or Metric) to be used for temperatures. If **EM** is set to zero, degrees are specified in Fahrenheit. If **EM** is set to 1, degrees are specified in Celsius. A change in this attribute automatically converts setpoints to the appropriate units. The display mode for digital thermostats also changes but can be set separately. English (**EM** = 0) is the default setting.

NOTE

If the value of **EM** changes, make sure any attributes set prior to the change are recalculated and reprogrammed to reflect the **EM** type chosen. Then reset the *SBC*-V3Td. Failure to correct these entries will result in display and calculating errors.

Attribute FF00;**SN** is Serial Number. It displays the Serial Number of the *SBC*-V3Td controller. This attribute is read-only.

Attribute FF00;**CT** is the Controller Type. This point identifies the type of device. An *SBC*-V3Td is type 103. This attribute is read-only, and its value is established at the American Auto-Matrix factory. Flash updates for the *SBC*-V3Td are rejected if **CT** is not 103.

Attribute FF00;**VE** is the Firmware Version. It indicates the version number of the active firmware. This attribute is read-only.

Property **OS** is Kernel Version. This property is read-only.

Attribute FF00;**FT** is Firmware Type. It defines the class of firmware operating system used in this controller. Only flash updates of matching firmware type will be accepted. Upgrades and conversions to other classes of firmware will require special handling. Contact American Auto-Matrix for more information. This attribute is read-only.

Attribute FF00;**SR** is the Flash Release Code. This point uniquely defines each flash firmware image. You can access updated firmware images through *SoloPro for Windows*™. The numerically higher

the firmware image, the more recent it is. AAM recommends that all controllers be updated periodically to use the latest available firmware. For instructions see the *SoloPro for Windows User Manual*. This attribute is read-only.

Attribute FF00;**CM** is the Manufacturer of the device. For American Auto-Matrix products, the number is 255. This attribute is read-only. It is useful when host systems are connected to networks with unitary controllers from different manufacturers. Flash updates are rejected if **CM** is not 255.

4.2.1.2 Diagnostics

Attribute FF00;**UP** is Flash Update Count. This counter increments each time a new flash firmware image is accepted by the controller.

Attribute FF00;**IC** is EEPROM Default Count. This counter increments whenever the EEPROM is restored to factory default settings (see System attribute **DE** Default Enable).

Attribute FF00;**RC** is Power-up Count. This counter increments each time power is applied to the controller. This counts power outages and noise related resets as well as resets initiated through System attribute **RS**.

Attribute FF00;**WC** is Watchdog Count. This counter increments upon firmware failure but can also be advanced during the removal of power.

Attribute FF00;**CC** is Clock Fail Count. This counter increments upon hardware failure but can also be advanced during the removal of power.

Attribute FF00;**OC** is Illegal Opcode Count. This counter increments upon firmware failure but can also be advanced during the removal of power.

Attribute FF00;**ZP** is MMT Pulse Count. This counter advances when Motor Management Technology (MMT) takes action to maintain the operation of the actuator. When several counts are tallied over a period of a few days, the actuator is reaching its end of life. Low level count activity is normal.

4.2.1.3 Power Up

Attribute FF00;**PD** is Power-Up Delay. It determines how long, in seconds (0–255), a *SBC*-V3Td waits before energizing its outputs after a power loss or soft reset. During this time, all output control and alarm functions stop after cycling of power or *SBC*-V3Td reset. This attribute defaults to a value of 5. Any setting ≤ 2 seconds will receive a value of 2 seconds.

Attribute FF00;**PS** is Power-Up State. It determines which schedule state the *SBC*-V3Td uses after a power loss and before its time is synchronized. The selections are as follows: unoccupied = 0, warm-up = 1, occupied = 2, and night setback = 3. The default for this attribute is 2.

NOTE

The optional real-time clock module (*SBC*-RTC2) periodically broadcasts the time to all controllers on the network. Manual time setting is also possible.

Attribute FF00;**DE** is Default Enable. This attribute restores configuration settings to factory defaults. To set the defaults, enter a value of 197 (a value that is unlikely to occur randomly). It may take several seconds to complete the reset. Note that this will not alter the unit **ID** or selected communications baud rate.

The attribute FF00;**RS** is Reset of the *SBC*-V3Td. This point allows a host or operator to reset the controller. You can reset by giving **RS** a value of 1, after which **RS** returns to 0 (the default).

TABLE 4-1: SYSTEM ATTRIBUTES

	attr	description
System: About FF00		
	EM	**Engineering Units**—specifies which units of measurement to use in returning temperature values. 0 = English Units 1 = Metric Units
	SN	**Serial Number**—displays the serial number of the *SBC*-V3Td controller.
	CT	**Controller Type**—(read-only) factory-set controller type identifies the type of unitary controller. **CT** for the *SBC*-V3Td is 103.
	VE	**Firmware Version**—(read-only) contains the version number of the active firmware.
	FT	**Firmware Type**—defines the class of firmware operating system used in this controller.
	SR	**Flash Release Code**—(read-only) uniquely defines each flash firmware image. The numerically higher the firmware image, the more recent it is.
	CM	**Manufacturer**—(read-only) is the manufacturer of the device. AAM devices are 255.
System: Diagnostics FF00		
	UP	**Flash Update Count**—increments each time a new flash firmware image is accepted by the controller.
	IC	**EEPROM Default Count**—increments whenever the EEPROM is restored to factory default settings.
	RC	**Power-up Count**—increments each time power is applied to the controller.
	WC	**Watchdog Count**—increments upon firmware failure but can also be advanced during the removal of power.
	CC	**Clock Fail Count**—increments upon hardware failure but can also be advanced during the removal of power.
	OC	**Illegal Opcode Count**—increments upon firmware failure but can also be advance during the removal of power.
	ZP	**MMT Pulse Count—**advances when MMT takes action to maintain the operation of the actuator. The activity on this count should be low. If it is high, the actuator is reaching the end of its life.
System: Diagnostics FF00		
	PD	**Power-up Delay**—determines how long (0-255 seconds) a *SBC*-V3Td waits before energizing its outputs after power loss or soft reset. **PD** defaults to 5 seconds.
	PS	**Power-up State**—determines which schedule state to use after a power loss and before time sync. 0 = unoccupied 1 = warm-up 2 = occupied (default) 3 = night setback

TABLE 4-1: SYSTEM ATTRIBUTES

	attr	description
	DE	**Default Enable**—restores configuration settings to factory defaults. Enter 197 to set the defaults.
	RS	**Reset the *SBC*-V3Td**—allows a host or operator to reset the controller by setting **RS** = 1.

4.2.2 SCHEDULES

The following are Schedule attributes:
F900;**CV**, **C1-C6**, **AS**, **HE**, **HO**, **ZE**, **IS TM**, **DT**, **DA**, **DH**, and **H0-H9**.
F90x;**CV**, **WO**, **OC**, **UN**, **NS**, **AD**, and **AO**.

The *SBC*-V3Td has one Main Schedule that reflects the values of and has an effect on how the other six schedules operate. The Main Schedule does not directly act as a schedule, but its current value is the present scheduled operating mode. This schedule provides attributes used to set the warm up options, the method of control employed when the *SBC*-V3Td is in an inactive schedule state, zone reception of schedule information over the RS-485 PUP network and host schedule control options. There are four active schedule states available on the *SBC*-V3Td:

- warm-up mode (main schedule **CV** = 1)
- occupied mode (main schedule **CV** = 2)
- unoccupied mode (main schedule **CV** = 0)
- night setback mode (main schedule **CV** = 3).

Warm-up is the period of time before occupancy. During this period, the central air handler unit supplies warm air to the VAV boxes. Warm-up provides special control action to bring the zone temperature to its desired setpoint for the occupied mode, based on the heating setpoint. The attributes used to define the warm-up temperature and flow appear in the analog inputs and damper control. Individual schedules (Schedule 1 through Schedule 6) dictate time controlled warm-up. In time based warm-up, the warm-up period ends when occupied mode begins.

Occupied mode is the period of time when the zone is occupied by people and the *SBC*-V3Td must maintain appropriate comfort levels in the zone. The heating and cooling setpoints define a desired zone temperature range. Occupied mode ends when unoccupied mode time begins.

Unoccupied mode is the period of time when people are not expected to be in the zone and temperature control is not as strict. During unoccupied mode, the *SBC*-V3Td maintains cooling comfort levels at setup values and heating comfort levels at setback values. These setup and setback values are used to broaden the control range between the heating and cooling setpoints in order to provide less stringent control. The attributes used to define the offsets are located in the analog inputs, but the time of implementation is set in the individual schedules (Schedule 1 through Schedule 6). Unoccupied mode usually ends when night setback begins.

Night setback is the period of time during unoccupied mode when the entire building is usually unoccupied and the air handler may be shut down. The controller provides the option to set up and set back the night setback control temperature (as does the standard unoccupied mode) and to determine when these offsets are reached or have exceeded damper control of airflow resumes. As with unoccupied mode, the attributes used to define the night setback offsets are located in the analog inputs. However the time of implementation is set in the individual schedules (Schedule 1 through Schedule 6). illustrates a standard time based flow of the *SBC*-V3Td schedule control modes.

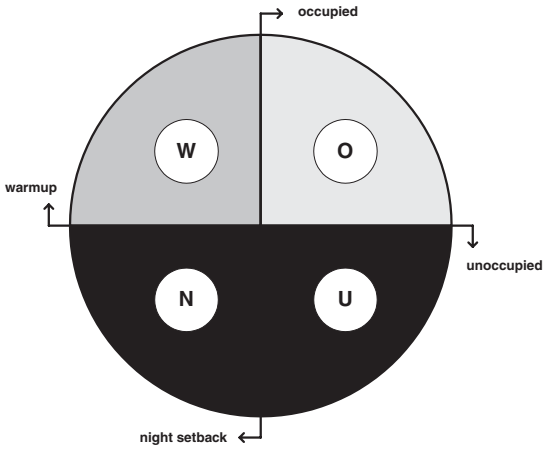


Figure 4-1: Standard Schedule Modes Rotation Example

In a situation in which schedules may overlap, the *SBC*-V3Td will set priorities. The controller checks from Schedule 1 through Schedule 6 for the schedule with the highest priority mode. Modes take precedence in the following order:

- occupied (highest priority)
- warm-up
- unoccupied
- night setback (lowest priority).

4.2.2.1 Clock/Calendar

The schedules within the *SBC*-V3Td are local. These schedules operate when the time (schedule attribute **TM** in HH:MM format) and day of the week (schedule attribute **DA**) have been synchronized by a PUP device communicating over the RS-485 network with synchronization capability.

NOTE

You can also set the time through the optional Real-time Clock module. Manual time setting is also possible.

Attribute F900;**TM** is the System Time attribute. It is a read-write attribute that displays the current system time in HH:MM format. This attribute defaults to an invalid time and must be set for the current system time.

Attribute F900;**DT** is the Current Date. This attribute specifies the current date in MM/DD/YY format.

Attribute F900;**DA** is the day-of-the-week attribute. It displays a read-write, numeric code (0–6) that corresponds to the current day of the week. The attribute defaults to an invalid code number. Codes for **DA** appear in Table 4-2.

Table 4-2: Day of the Week Codes

Value of **DA**	Day of the Week
0	Monday
1	Tuesday
2	Wednesday
3	Thursday
4	Friday
5	Saturday
6	Sunday
7	Holiday

Attribute F900;**DH** is Holiday. It toggles the holiday status for the current day. This point is overridden by time synchronization.

Attribute F900;**H0-H9** is Programmed Holiday. This is a specified date to be considered a holiday. Set the date to 0/0/YY to ignore.

4.2.2.2 Summary

Attribute F900;**CV** is Schedule Status. It displays the current schedule state of the *SBC*-V3Td. The controller follows a series of prioritized steps to determine the state that **CV** is in at any given time. This attribute may be affected by Schedule 1 **CV**–Schedule 6 **CV**, the host override (schedule attribute **HE**, schedule attribute **HO**), the thermostat extended occupancy and the occupancy detector. The *SBC*-V3Td repeatedly checks to establish which is valid. Figure 4-2 shows the order of priority that the *SBC*-V3Td checks to determine **CV**. This attribute is a read-only value. The options for this attribute are as follows: unoccupied (third priority) = 0, warm-up (second priority) = 1, occupied (first priority) = 2, and night setback (lowest priority) = 3.

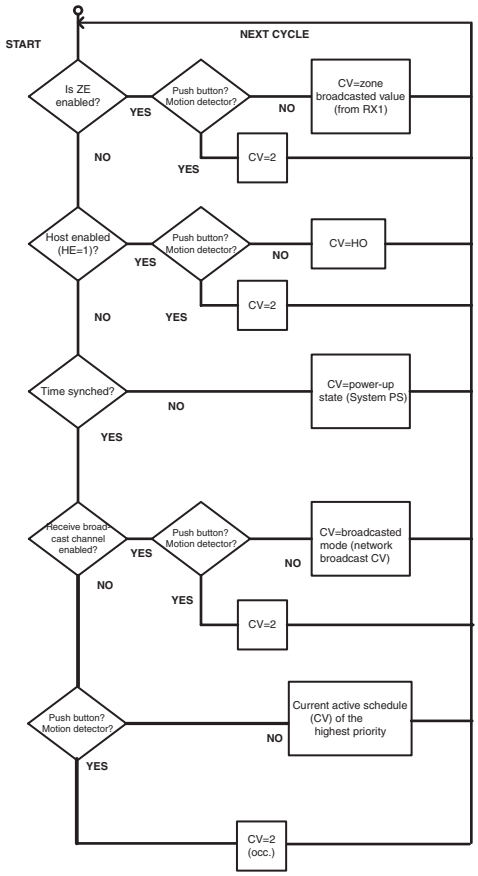


Figure 4-2: SBC-*V3Td Priority to Determine the State of* ***CV***

Attributes F900;**C1** through F900;**C6** are the current value schedule attributes. These six points are read-only attributes that reflect the actual schedule's current mode of operation in which 0 = unoccupied, 1 = warm-up, 2 = occupied, and 3 = night setback.

Attribute F900;**AS** is the active schedule bitmap. It is a read-only attribute that displays the currently active schedules in bitmap form. When the bit corresponding to a particular schedule is set to 1, that schedule is active for the day; if the bit is set to 0, the schedule is not active. Table 4-3 shows the correlation of each bit in the bitmap to the individual schedules.

Table 4-3: Active Schedule Map

Bit Number	Schedule
0	Schedule 1
1	Schedule 2
2	Schedule 3
3	Schedule 4
4	Schedule 5
5	Schedule 6
6	unused
7	unused

Attribute F900;**HE** is the host override enable. If **HE** = 1, then **HO** is used as the host override state. When **HE** = 0, the scheduled state is controlled by **WO**, **OC**, **UN** and **NS** or schedule broadcast. The *SBC*-V3Td and its schedules are ignored provided **ZE** = 0 (disabled).

Attribute F900;**HO** is the host override. It specifies the desired schedule override state when schedule attribute **HE** = 1. If **HE** = 0, then **HO** is not used. Setting **HO** to 0 represents unoccupied mode, **HO** = 1 represents warm-up, **HO** = 2 represents occupied mode and **HO** = 3 represents night setback.

Attribute F900;**ZE** is the zone schedule enable. It sets the current schedule mode for the entire zone from an area controller that is broadcasting zone schedule information to multiple *SBC*-V3Ts in the zone. When enabled (**ZE** = 1), this attribute gives priority to schedule information received from the PUP network over **HO** and the local schedules; **CV** will reflect the value broadcast over the network. Setting **ZE** = 0 (the default) disables this feature.

Attribute F900;**IS** is the Inactive Schedule State. It determines which schedule state the *SBC*-V3Td should follow when **AD** is 0 (no active days). Valid schedule choices are unoccupied (**IS** = 0), warm-up (**IS** = 1), occupied (**IS** = 2) and night setback (**IS** = 3). This attribute defines the **CV** value to use when local scheduling is being used (the time is properly synchronized) but is inactive.

4.2.2.3 SCHEDULES 1 THROUGH 6

Attribute F90x;**CV** is the Current Schedule Value. It shows the current schedule state.

Attribute F90x.**WO** is Warm-Up On Time. It specifies the time (in HH:MM format) to begin the warm-up period.

Attribute F90x;**OC** is Occupied Time. It specifies the time (in HH:MM format) to begin the occupied period and end the warm-up period.

Attribute F90x;**UN** is Unoccupied Time. It specifies the time (in HH:MM format) to begin the unoccupied period and end the occupied period.

Attribute F90x;**NS** is Night Setback Time. It specifies the time (in HH:MM format) to begin the night setback period and end the unoccupied period.

Attribute F90x;**AD** is Active Days. It shows the active days of the week during which the schedule is to follow the times in **WO**, **OC**, **UN** and **NS**. Valid day bit numbers are 0=Monday, 1=Tuesday, 2=Wednesday, 3=Thursday, 4=Friday, 5=Saturday, 6=Sunday, and 7=Holiday. You can select active days by setting the corresponding bits to 1.

Attribute F90x;**AO** is All-Day Override. It overrides the schedule in **WO**, **OC**, **UN** and **NS**

for active days. Settings are as follows: 0 = No Override, 1 = Unoccupied, 2 = Warm-Up, 3 = Occupied, and 4 = Night Setback.

Control loops of the *SBC*-V3Td may be configured to use the current schedule state of selected schedules to adjust setpoints or control parameters. In occupied mode, for example, a setpoint value is used to determine when a certain control action occurs. In unoccupied mode, a setup (or setback) amount is added to (or subtracted from, depending on its sign) the control loop setpoint—altering the point at which the control action occurs. In unoccupied mode, the control action is less stringent because fewer (if any) people are in the building.

Schedules in the *SBC*-V3Td can be activated based on the values assigned to the Schedule attributes. When the current day of the week matches the setting of the Schedule attribute active days (**AD**), that schedule is active for the day.

The schedule mode attributes define four windows for a schedule that is active for a set of days in the week. When the current day of the week matches one of the active schedule days (specified in **AD**), the time of day determines which of the four available modes will dictate control strategy.

The active days for the schedule are designated by the **AD** attribute. It specifies a set of the eight possible days in the week (seven days plus holiday) during which the schedule will run in one of the four available modes at any given time of the active day. See Figure 4-3 for examples of how **AD**, **WO**, **OC**, **UN** and **NS** work. Holiday schedules refer to the host system that defines the holidays in each month of the year. If the *SBC*-V3Td has bit 7 set for a currently active schedule, then the controller will follow that schedule when the holiday bit is sent from the host. If the host broadcasts a holiday and the *SBC*-V3Td does not have a holiday schedule, then no schedules will be active until the host clears the holiday. All schedules are independent of each other. One or more schedules may be active when the rest are inactive.

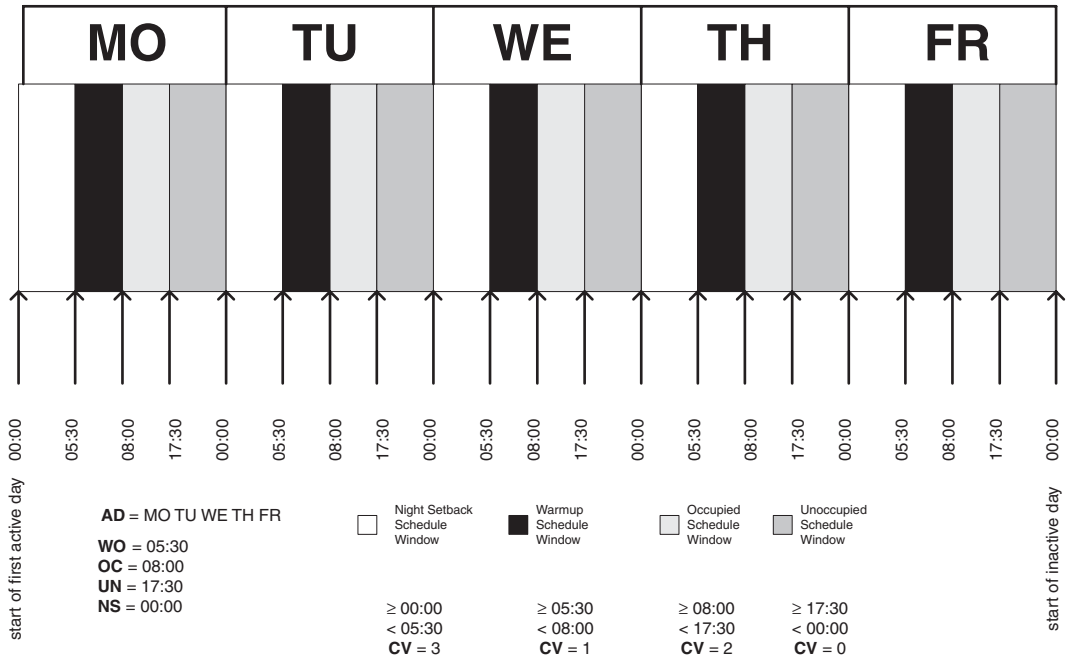


Figure 4-3: Sample Schedule 1

TABLE 4-4: SCHEDULE ATTRIBUTES

	attr	description
Schedules: Summary F900		
	CV	**Schedule Status**—displays the schedule state of the *SBC*-V3Td. The order of priority is: Occupied = 2 (Highest) Warm-up = 1 Unoccupied = 0 Night Setback = 3 (Lowest)
	C1-C6	**Schedules 1-6**—(read-only) reflect the active schedule's current mode of operation.
	AS	**Active Schedule**—(read-only) displays, in bitmap form, which schedule is active. 0 = Schedule 1 1 = Schedule 2 2 = Schedule 3 3 = Schedule 4 4 = Schedule 5 5 = Schedule 6 6 and 7 = unused
	HE	**Host Override Enable**—when enabled (**HE** = 1), **HE** allows the host to set **CV** through **HO**. When disabled (**HE** = 0), the schedule state is controlled by the local schedule or schedule broadcast.
	HO	**Host Override**—specifies the desired schedule override state when **HE** = 1.
	ZE	**Zone Schedule enable**—sets the current schedule mode for the entire zone form an area controller to multiple *SBC*-V3Ts in the zone. When **ZE** = 1, priority is given to schedule information received from the PUP network over **HO** and the local schedules. When **ZE** = 0, this feature is disabled.
	IS	**Inactive Schedule State**—determines which schedule state the *SBC*-V3Td should follow when **AD** (active days) is 0.
Schedules: Clock/ Calendar F900		
	TM	**Current Time**—displays the system time in HH:MM format.
	DT	**Current Date**—specifies the current date in MM/DD/YY format.
	DA	**Day**—displays a code corresponding to the current day of the week. 0 = Monday 1 = Tuesday 2 = Wednesday 3 = Thursday 4 = Friday 5 = Saturday 6 = Sunday 7 = Holiday
	DH	**Holiday**—toggles the holiday status for the current day. Time Synchronization overrides this point.

TABLE 4-4: SCHEDULE ATTRIBUTES

	attr	description
	H0-H9	**Programmed Holiday**—a specified date to be considered a holiday. Set the date to 0/0/YY to ignore.
Schedules: (1-6) F90x		
	CV	**Current Mode**—shows the current schedule state.
	WO	**Warm-up Time**—specifies the time to begin warm-up period.
	OC	**Occupied Time**—specifies the time to begin occupied period and end warm-up period.
	UN	**Unoccupied Time**—specifies the time to begin unoccupied period and end occupied period.
	NS	**Night Setback Time**—specifies the time to begin night setback period and end unoccupied period.
	AD	**Active Days**—shows the days of the week during which the schedule is to follow **WO**, **OC**, **UN**, and **NS**.
	AO	**All-day Override**—overrides the schedules in **WO**, **OC**, **UN**, and **NS**. 0 = No Override 1 = Unoccupied 2 = Warm-up 3 = Occupied 4 = Night Setback

4.2.3 TEMPERATURE (ANALOG INPUTS)

The following are Temperature attributes:
FE00;**ZT**, **OF**, **DM**, **DL**, **RD**, **BT**, **OI**, **ZS**, **TS**, **TM**, **TP**, **TT**, **TR**, **SD**, **SE**, **ED**, **ER**, **CC**, **SC**, **UC**, **NC**, **CH**, **SH**, **UH**, **NH**, **SW**, **CV**, **LL**, **HL**, **HS**, **AS**, **AE**, **SU**, **BM**, **PU**, **PB**, **PS**, **PI**, **DS**, **DV**, **DF**, **T0-T3**, **G0-G3**, **RM,** and **PG**.
FE08;**CV**, **OF**, **RE**, **DD**, **SM**, and **OI**.

4.2.3.1 THERMOSTAT

Attribute FE00;**ZT** is Zone Temperature. It shows the current temperature value measured by the thermostat as adjusted by **OF**. This point is a read/write attribute stored in RAM. The data type of **ZT** (how the value is displayed) is always FDh (signed 9.1 digits). By setting FE00;**OI** to 1, you can override **ZT**. After overriding the attribute, you can write to **ZT** manually or through a program from a host controller on the EIA-485 communications network.

CAUTION

Care must be taken to ensure that terminal box operations are not adversely affected during use of the SBC-*V3Td's powerful receive broadcast features. Selection of the correct input is a must. Unitary controller programmers should be absolutely sure that the actions chosen in the system are exactly what is needed for optimal operation of the* SBC-*V3Td.*

Attribute FE00;**OF** is Temperature Correction. It defines an optional correction that may be required as an adjustment for the thermostat location and the possible measurement errors.

Attribute FE00;**DM** is Zone Demand. It indicates the demand for the zone. A satisfied zone will indicate "vent." If the *SBC*-V3Td is in cooling mode and the zone temperature exceeds the cooling setpoint, "cool" is indicated. If the controller is in heating mode and the zone temperature falls below the heating setpoint, "heat" is indicated.

Attribute FE00;**DL** is Demand Load. It indicates the heating/cooling demand for the zone in terms of temperature separation from setpoints. A cooling demand will be indicated by a negative value and a heating demand by a positive value. If the zone is satisfied, then the Demand Load will be 0. A cooling box is satisfied whenever the zone temperature is lower than the setpoint. If the setpoint is 72 and zone temperature is 74, then the demand load will be -2. A heating box is satisfied whenever the zone temperature is greater than the setpoint. If the setpoint is 68 and the zone temperature is 72, then the demand load will be 0. If the setpoint is 68 and the zone temperature is 66, then the demand load will be 2.

Attribute FE00;**BT** is V3T Control Mode. Control Modes are none (**BT** = 0), cooling only (**BT** = 1), heating only (**BT** = 2), and supply dependant (**BT** = 3). The "disabled" setting supplies a constant air volume. The supply dependant setting requires source/duct air temperature and automatically selects cooling and heating modes as required.

Attribute FE00;**OI** is Override Temperature Value. When set to 1, it allows you to write to the Zone Temperature (**ZT**) directly. This would allow the Zone Temperature to be defined remotely when you are using alternate temperature sensors or diagnostics.

4.2.3.2 SETPOINT ADJUST

Attribute FE00;**ZS** is Zone Midpoint. It displays the midpoint between the current cooling and heating setpoints. This attribute reflects changes in both setpoints. A change in **ZS** results in the appropriate shift of both the cooling and heating setpoint maintaining the effective deadband.

Attribute FE00;**TS** is User Setpoint Offset. It defines an offset for application to PID setpoints. This point shows the current value calculated when you multiply the User Adjust Position (**TM**) by the User Adjust Increment (**TP**). This setting is temporary and is valid only for **TT** minutes unless **TT** = 0.

NOTE

You cannot set attribute **TS** with the *SBC*-STAT1.

Attribute FE00;**TM** is User Adjust Increment. It specifies the magnitude of incremental changes to the User Setpoint Offset (**TS**). The User Adjust Position (**TP**) is multiplied by **TM** to determine the User Setpoint Offset (**TS**) value. If the User Adjust Increment is 0, you will not be able to alter the setpoint.

Attribute FE00;**TP** is User Adjust Position. The User Setpoint Offset (**TS**) can be raised or lowered in integral steps. This attribute tracks the current step. It can be set to any signed integer but will be constrained to +/–2 when adjusted by an analog thermostat or to +/–5 when set through a digital thermostat. The point is used in combination with the User Adjust Increment (**TM**) to calculate the User Setpoint Offset.

Attribute FE00;**TT** is User Adjust Duration. The User Setpoint Offset (**TS**) is a temporary setting. The **TT** attribute defines in minutes the duration for which the setting applies. After that time, the User Adjust Position and User Adjust Offset are reset to 0 degrees. If the User Adjust Duration is 0, then setpoint changes remain in effect until modified.

Attribute FE00;**TR** is User Adjust Remaining. It displays the time remaining before the User Setpoint Offset (**TS**) setting is reset.

Attribute FE00;**SD** is Calculated Setpoint Display. It specifies what method is used to display setpoint adjustments on an SBC-STAT3 LCD screen. A value of 0 will display +/ -2.5 adjustment. A value of 1 will display the zone midpoint shown in FE00;**ZS**. A value of 2 will display the heating setpoint shown in FE00;**CH**. A value of 3 will display the cooling setpoint shown in FE00;**CC**.

4.2.3.3 Override

During scheduled unoccupied periods, control loop setpoints and analog input alarm limits may be set up or set back to create a wider control range or deadband in the interest of conserving energy. The occupancy override feature of the *SBC*-V3Td allows the control loop setpoints and analog input alarm limits to use their normal, nonsetup, nonsetback, occupied mode values through the *SBC*-STAT override feature. For more information, see the *SBC-STAT User Manual*.

During a scheduled unoccupied mode, you can manually override the scheduled state to occupied mode through the *SBC*-STAT; the setpoints are no longer set up or set back. The Override feature puts the selected schedules into a temporary occupied mode.
Attribute FE00;**SE** is User Override. This attribute enables or disables the user's ability to enter extended occupancy override.

Attribute FE00;**ED** is Extended Occupancy Duration. It specifies the amount of time in minutes to extend occupancy.

Attribute FE00;**ER** is Extended Occupancy Remaining. It shows the amount of time remaining in extended occupancy. This value is set to the Extended Occupancy Duration (**ET**) when either push button on an analog thermostat is pressed. The *SBC*-STAT3 digital thermostat employs its User Menu for this function. The point **ER** is a read-only attribute that cannot be changed directly.

NOTE

Attributes **ED** and **ER** will override the power-up default schedule mode.

4.2.3.4 Cooling Setpoints

Attribute FE00;**CC** is Current Setpoint. It shows the current cooling temperature control setpoint. This will depend on setbacks and user adjustments. The attribute is read-only and is derived from **SC**. It incorporates **TS** and any unoccupied mode setback (**UC**) or any night setback (**NC**) that may be in effect.

Attribute FE00;**SC** is Occupied Setpoint. It shows the desired zone temperature setpoint to be used for cooling control in occupied mode. This value is used in **CC** and defaults to 72.0°F.

Attribute **UC** is Unoccupied Setback. It specifies, in +/- degrees, the amount to be added to the cooling setpoint (**SC**) when the *SBC*-V3Td schedule is in unoccupied mode. When the *SBC*-V3Td is in an unoccupied state, the **UC** offset is added to **SC**, resulting in **CC**.

This is the value used to control the cooling loop. When the *SBC*-STAT is enabled (**SE** > 0), the values of **TM** (thermostatic multiplier) and **TP** result in **TS**. This is added with **UC** and **SC** during unoccupied periods, resulting in **CC**. See Figure 4-4. User-definable **UC** defaults to 5.0.

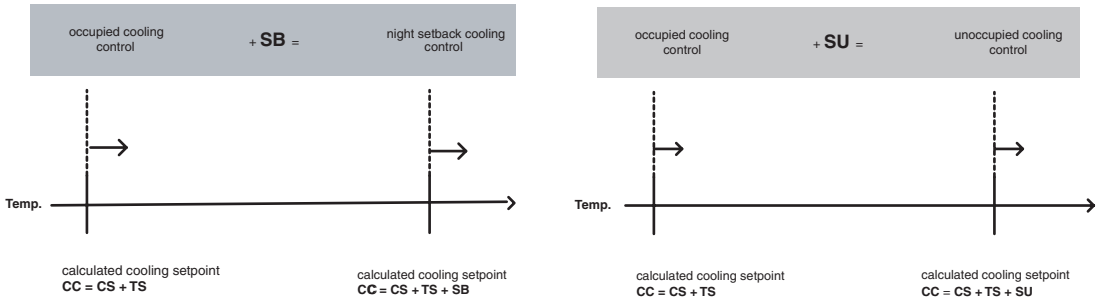


Figure 4-4: Effect of SU and SB on Cooling Control Using an SBC-*STAT*

Attribute FE00;**NC** is Night SetBack. It specifies, in +/- degrees, the amount to be added to the cooling setpoint (**SC**) when the *SBC*-V3Td is in night setback mode. User definable **NC** defaults to 5.0. See Figure 4-4.

4.2.3.5 HEATING SETPOINTS

Attribute FE00;**CH** is Current Setpoint. It shows the current heating temperature control setpoint. This will depend on setbacks and user adjustments. The point is read-only and is derived from **SH**. It incorporates **TS** and any Unoccupied Setback (**UH**) or any night setback (**NH**) that may be in effect.

Attribute FE00;**SH** is Heating Setpoint. It shows the desired zone temperature setpoint to be used for heating control.

Attribute FE00;**UH** is Unoccupied Setback. It specifies, in +/- degrees, the amount to be added to the heating setpoint (**SH**) when the *SBC*-V3Td schedule is in unoccupied mode. This attribute defaults to 10.0. \

Attribute FE00;**NH** is Night SetBack. It specifies, in +/- degrees, the amount to be added to the heating setpoint (**SH**) when the *SBC*-V3Td is in night setback mode. This attribute defaults to 10.0.

Attribute FE00;**SW** is Warm-Up Setpoint. It shows the zone temperature setpoint to be used for heating control.

Attributes FE00;**SC** and FE00;**SH** are the cooling and heating setpoint attributes. They create a temperature range within which no cooling or heating is required (though minimum flow position is enforced). This range is called the *deadband*. By pressing the up and down push buttons on the *SBC*-STAT3 and *SBC*-STAT2, you can shift the deadband to a range higher or lower than the range set by **SH** and **SC**. The result is a new range defined by **CH** and **CC**. When **TS** = 0, the deadband is defined by the setpoint attributes **SH** and **SC**—for example, between 68°F and 72°F (4 degrees). However if you press the up push button on the *SBC*-STAT3 or *SBC*-STAT2 to raise the temperature 4 degrees (**TS** = 4), then the deadband still has the range—4 degrees. The control setpoints will then change to 72°F and 76°F.

Attributes FE00;**CC** and FE00;**CH** equal the temperature setpoints **SC** and **SH**, respectively. The **CC** and **CH** points include a plus or minus offset in the calculation to account for setup and setback when the *SBC*-V3Td is in a scheduled unoccupied or night setback mode of operation. You can use the formulas in Table 4-5 to calculate **CC** and **CH** when **SE** > 0. The value of **TS** will be a positive or a negative integer based on the value of **TP**.

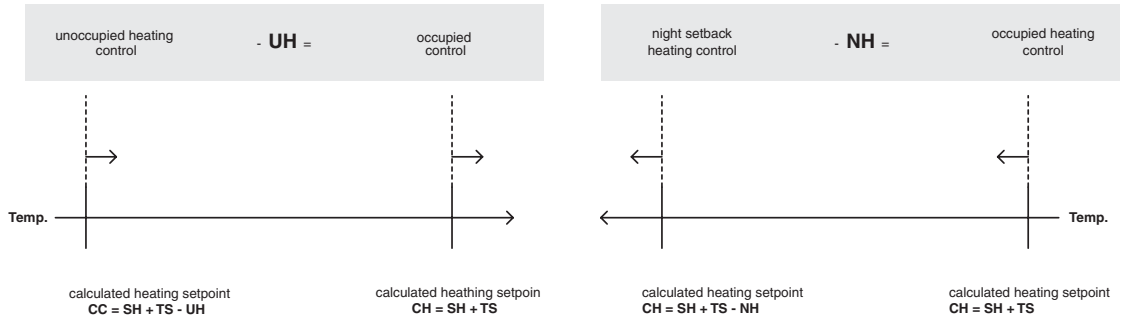


*Figure 4-5: The Effect of **TS** on Cooling and Heating Setpoints*

*Table 4-5: **CC** and **HC** Formulas for Use With an* SBC-*STAT2, -STAT2D, and -STAT3*

Schedule Mode	Formula
OCCUPIED	**CC** = **SC** + (**TS**) **CH** = **SH** + (**TS**)
UNOCCUPIED	**CC** = **SC** + (**TS**) + **UC** **CH** = **SH** + (**TS**) — **UH**
NIGHT SETBACK	**CC** = **SC** + (**TS**) + **NC** **CH** = **SH** + (**TS**) — **NH**

When an *SBC*-STAT1 is used with the *SBC*-V3Td, **CC** and **CH** are calculated as in Table 4-6.

*Table 4-6: **CC** and **HC** Formulas for Use With an* SBC-*STAT1*

Schedule Mode	Formula
OCCUPIED	**CC** = **SC** **CH** = **SH**
UNOCCUPIED	**CC** = **SC** + **UC** **CH** = **SH** — **UH**
NIGHT SETBACK	**CC** = **SC** + **NC** **CH** = **SH** — **NH**

4.2.3.6 Alarms

Attribute FE00;**CV** is Current Value. It shows the current value of the input. As a dedicated zone temperature input, the data type is locked in as FDh (a signed 9.1 digit read out) PUP data type.

Attribute FE00;**LL** is Low Alarm Limit. It specifies the low alarm limit. If alarms are enabled and the current value drops below this value, a low limit alarm will be generated.

Attribute FE00;**HL** is High Alarm Limit. It specifies the high alarm limit. If alarms are enabled and the current value rises above this value, a high limit alarm will be generated.

Analog input alarming limits are defined using **HL** and **LL**. These limits create the upper and lower temperature limits acceptable as zone temperature values to tenths of a degree. The attributes **HL** and **LL** are only used when the input is configured for alarming. (See **AE**.) The setup/setback offset attribute **SU** affects **HL** and **LL**. When **SU** is set for some value, **HL** and **LL** will effectively slide by the amount of **SU** toward the positive side for **HL** and toward the negative side for **LL** when the *SBC*-V3Td goes into unoccupied or night setback schedule modes. Refer to Figures 4-6 and 4-7.

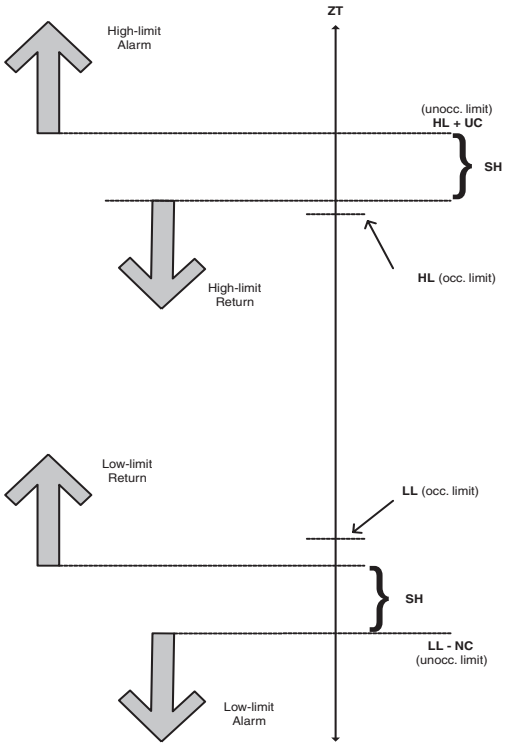


*Figure 4-6: Input Alarming for **ZT***

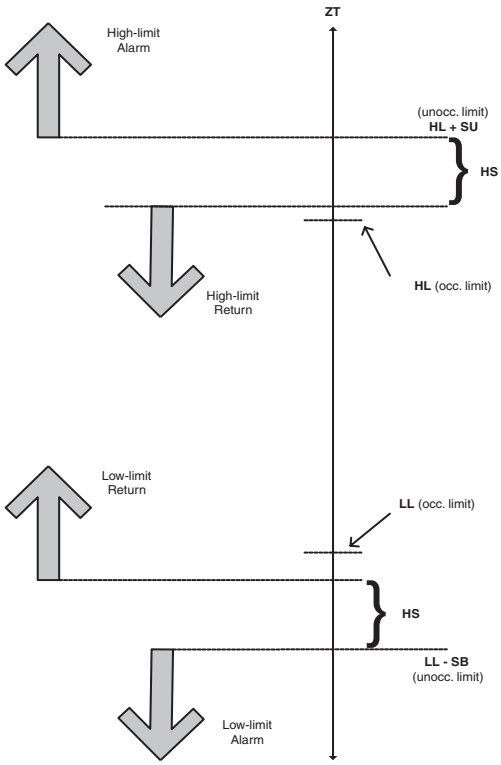


Figure 4-7: Unoccupied Shifting of Alarm Points Due to Setup/Setback

Attribute FE00;**HS** is Alarm Limit Hysteresis. It determines when the *SBC*-V3Td returns from a high or low limit alarm. In the case of a high limit alarm, the **CV** value must drop below **HL** – **HS** to cause a high limit return. For a low limit alarm, the **CV** value must rise above **LL** + **HS** to cause a low limit return.

Attribute FE00;**AS** is Alarm Status. It shows the current alarm condition. A value of 0 indicates a normal condition; a nonzero number indicates alarm generation. Table 4-7 explains the status for each value.

*Table 4-7: **AS** Values for Alarm Status*

Value of AS	Alarm Condition
AS = 0	normal (no alarm)
AS = 1–4	unused
AS = 5	low limit alarm
AS = 6	high limit alarm
AS = 7–12	unused

Attribute FE00;**AE** is Enable Alarming. It specifies the type of alarm checking to be done on the **CV** value. A value of 0 indicates that alarming is disabled; a nonzero number indicates one of several alarm functions. Table 4-8 defines alarm options for **AE**.

To demonstrate how limit alarming operates, let **HL** = 80.5° while alarming is enabled for high limit alarming (**AE** = 5). Then let's say that the zone temperature changes from 72.0° to 83.0° because someone opened an outside door in summertime. A high limit alarm is generated over the EIA-485 network because 83.0° > **HL**. This also causes the alarm status attribute **AS** to equal 6 (high limit alarm). The *SBC*-V3Td modulates the damper, providing more cool air to the zone. This action eventually begins to lower the zone temperature. Once the zone temperature drops below **HL** and the offset defined by **HS**, the alarm state returns to normal (**AS** = 0).

*Table 4-8: **AE** Alarm Enable Options*

Value of AE	Alarm Type Enabled
AE = 0	disabled
AE = 1–3	unused
AE = 4	low limit alarm
AE = 5	high limit alarm
AE = 6	low and high limit
AE = 7–12	unused

Attribute FE00;**SU** is Amount to Setup/Setback Alarm Limit. It specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods. This attribute effectively shifts the points at which alarms and alarm returns are generated.

4.2.3.7 Supply

Attribute FE08;**CV** is Supply Temperature. It shows the current value of source/duct temperature. This is used to select heating or cooling modes when **BT** is set to supply dependant provided that UI1 is equipped with a thermistor. This value includes the **OF** offset adjustment.

Attribute FE08;**OF** is Supply Temperature Adjustment. It defines an offset used to adjust **CV**.

Attribute FE08;**RE** is Channel Reliability. This indicates whether or not the Supply/Duct Temperature value can be trusted.

Attribute FE08;**DD** is Auto Mode Deadband. This defines the temperature difference by which the supply air must either exceed the **CH** heating setpoint for a switch to heating mode or must fall below the **CC** cooling setpoint to engage cooling mode.

NOTE

Attribute **DD** is for use when **BT** is in supply dependant mode.

Attribute FE08;**SM** is Supply Mode. It indicates the current supply mode. This would be either Cooling or Heating as specified by the System Box Type (**BT**). If **BT** is set to supply dependant, the point will indicate the current mode as determined by the source/duct temperature. In the event that the **CC** is greater than the **HC** [FE00;**CC** > FE00;**HC**], the **DD** attribute must be set to half the difference between the setpoints to create a deadband with a wide enough range to provide sufficient heating/cooling. For example, if you set **CC** to 74° and **HC** is 70°, set **DD** to 2° to create a sufficient deadband.

Attribute FE08;**OI** is Override Supply Temperature. When set to 1, this allows the Supply Temperature (**CV**) to be altered manually.

4.2.3.8 Sensor Bus

Attribute FE00;**BM** is Bus Mode. By default this should be set to Master (**BM**=0) unless multiple controllers are wired onto a single Sensor Bus (SSB). All additional controllers on the SSB must be configured as Slaves (**BM**=1). Masters control and communicate with digital thermostats. Slaves receive their information from the Master. Slaves receive information from the following master Zone Temperature attributes: Zone Temperature (**ZT**), User Setpoint Offset (**TS**), User Adjust Remaining (**TR**) and Extended Occupancy Remaining (**ER**).

Attribute FE00;**PU** is User P.I.N. This Personal Identification Number controls access to the User Menu. A value of 0 makes the menu always accessible. Values from 0001 to 9999 inclusive are used to control access to the menu. A matching number must be entered by the User. Values of 10,000 or greater will hide the menu. Entered P.I.N.s remain valid for only a short time after their use.

Attribute FE00;**PB** is Balancer P.I.N. This Personal Identification Number controls access to the Balance Menu. A value of 0 makes the menu always accessible. Values inclusively from 1 to 9,999 are used to control access to the menu. A matching number must be entered by the Balancer. Values of 10,000 or greater will hide the menu. Entered P.I.N.

numbers remain valid for only a short time after their use.

Attribute FE00;**PS** is Service P.I.N. This Personal Identification Number controls access to the Service Menu. A value of 0 makes the menu always accessible. Values inclusively from 1 to 9,999 are used to control access to the menu. A matching number must be entered by the Servicer. Values of 10,000 or greater will hide the menu. Entered P.I.N.s remain valid for only a short time after their use.

Attribute FE00;**PI** is Installer P.I.N. This Personal Identification Number controls access to all menus. A value of 0 makes all of the menus always accessible. Values inclusively from 1 to 9,999 are used to control access. A matching number must be entered by the Installer. Values of 10,000 or greater will hide the Install Menu. An authenticated Installer can access all menus. Entered P.I.N.s remain valid for only four minutes after the last button press.

Attribute FE00;**DS** is Display Mode. It specifies whether English or Metric units are to be used for digital thermostat display on the *SBC*-STAT3. This mode is automatically altered as appropriate when the system Engineering Units attribute is set but may be modified later if required to display the alternate units.

Attribute FE00;**DV** is Display Value. By default (DV=0) each digital thermostat will display the identical temperature value (ZT) which is the average of each. With DV=1 each thermostat will display its own temperature (including offset).

Attribute FE00;**DF** is Display Format. This attribute defines the format used to display the current temperature on the digital thermostat. The display of the tenths digit and the Fahrenheit/Celsius character are options. Also, the display may be eliminated.

Attribute FE00;**T0** is Reading Device 0. Up to 4 digital thermostats may be used on a single Sensor Bus. This attribute reflects the raw (without offset) reading for Device 0.

Attribute FE00;**T1** is Reading Device 1. Up to 4 digital thermostats may be used on a single Sensor Bus. This attribute reflects the raw (without offset) reading for Device 1.

Attribute FE00;**T2** is Reading Device 2. Up to 4 digital thermostats may be used on a single Sensor Bus. This attribute reflects the raw (without offset) reading for Device 2.

Attribute FE00;**T3** is Reading Device 3. Up to 4 digital thermostats may be used on a single Sensor Bus. This attribute reflects the raw (without offset) reading for Device 3.

Attribute FE00;**G0** is GID Device 0. The Global Identification for the Sensor Bus device.

Attribute FE00;**G1** is GID Device 1. The Global Identification for the Sensor Bus device.

Attribute FE00;**G2** is GID Device 2. The Global Identification for the Sensor Bus device.

Attribute FE00;**G3** is GID Device 3. The Global Identification for the Sensor Bus device.

Attribute FE00;**RM** is Reading Mode. It specifies the technique used to determine Zone Temperature when multiple thermostats are present. The default is Average mode (**RM** = 0). Highest (**RM** = 1) and Lowest (**RM** = 2) modes set **ZT** appropriately. The Hi/Lo VST mode (**RM** = 3) selects either the highest or lowest temperature depending on the supply mode. The highest temperature is used in cooling mode. The lowest temperature in heating mode.

A specific thermostat may be selected by device position 0-3 (**RM** = 4-7). Note that while thermostats appear in device positions consistently, the order may change when thermostats are added, removed or replaced. To specify a unique thermostat by its GID, select the Primary GID mode (**RM** = 8) and define the GID with the **PG** attribute.

When a single thermostat is present, its temperature is used regardless of the setting of **RM**. If a specified thermostat is absent, the Average mode (**RM** = 0) is used.

Attribute FE00;**PG** is Primary GID. It specifies the GID of the Primary thermostat in Primary GID mode (**RM**=8). If this thermostat is not available, then the Average temperature mode (**RM**=0) is used.

TABLE 4-9: TEMPERATURE ATTRIBUTES

	attr	description
Temperature: Thermostat FE00		
	ZT	**Zone Temperature**—is the current temperature value measured by the thermostat as adjusted by **OF**. You can override **ZT** by setting **OI** = 1.
	OF	**Temperature Correction**—defines an optional correction that may be required as an adjustment for the thermostat location and the possible measurement errors.
	DM	**Zone Demand**—indicates the demand for the zone. The options are vent, cool or heat.
	DL	**Demand Load**—indicates the heating/cooling demand for the zone in terms of temperature separation from setpoints. Cooling = negative value Heating = positive value
	BT	**V3T Control Mode**—specifies the type of terminal box being used.
	OI	**Override Temperature Value**—when set to 1, it allows you to write to FE00;**ZT** directly.
Temperature: Setpoint Adjust FE00		
	ZS	**Zone Midpoint**—displays the midpoint between the current cooling and heating setpoints.
	TS	**User Setpoint Offset**—defines an offset to be applied to PID setpoints.
	TM	**User Adjust Increment**—specifies the magnitude of incremental changes to the User Setpoint Offset (FE00;**TS**).
	TP	**User Adjust Position**—the User Setpoint Offset (**TS**) can be raised or lowered in integral steps; the FE00;**TP** attribute tracks the current step.
	TT	**User Adjust Duration**—the User Setpoint Offset (**TS**) is a temporary setting; the FE00;**TT** attribute defines in minutes the duration for which the setting applies.
	TR	**User Adjust Remaining**—displays the time remaining before the User Setpoint Offset (**TS**) setting is reset.
	SD	**Calculated Setpoint Display**—allows users to choose a method of setpoint display to show on an SBC-STAT3 display.
Temperature: Override FE00		
	SE	**User Override**—enables or disables the ability to enter extended occupancy override.
	ED	**Extended Occupancy Duration**—specifies the amount of time in minutes to extend occupancy.

TABLE 4-9: TEMPERATURE ATTRIBUTES

	attr	description
	ER	**Extended Occupancy Remaining**—shows the amount of time remaining in extended occupancy.
Temperature: Cooling Setpoints FE00		
	CC	**Current Setpoint**—shows the current cooling flow control setpoint.
	SC	**Occupied Setpoint**—shows the zone temperature setpoint desired to begin cooling control.
	UC	**Unoccupied Setback**—specifies, +/– degrees, the amount to be added to the cooling setpoint (**CS**) when the *SBC*-V3Td schedule is in unoccupied mode.
	NC	**Night Setback**—specifies, in +/– degrees, the amount to be added to the cooling setpoint (**CS**) when the *SBC*-V3Td is in night setback mode.
Temperature: Heating Setpoints FE00		
	CH	**Current Setpoint**—shows the current heating flow control setpoint.
	SH	**Occupied Setpoint**—shows the zone temperature setpoint desired to begin heating control.
	UH	**Unoccupied Setback**—specifies, in +/– degrees, the amount to be added to the heating setpoint (**HS**) when the *SBC*-V3Td is in unoccupied mode.
	NH	**Night Setback**—specifies, in +/- degrees, the amount to be added to the heating setpoint (**HS**) when the *SBC*-V3Td is in night setback mode.
	SW	**Warm-up Setpoint**—shows the zone temperature setpoint desired for beginning warm-up heating control.
Temperature: Alarms FE00		
	CV	**Current Value**—shows the current value of the input.
	LL	**Low Alarm Limit**—if alarms are enabled and the current value drops below this value, a low limit alarm will be generated.
	HL	**High Alarm Limit**—if alarms are enabled and the current value rises above this value, a high limit alarm will be generated.
	HS	**Alarm Limit Hysteresis**—determines when the *SBC*-V3Td returns from a high or low limit alarm.
	AS	**Alarm Status**—shows the current alarm condition. 0 = normal 5 = low limit 6 = high limit 1-4 and 7-12 are unused

TABLE 4-9: TEMPERATURE ATTRIBUTES

	attr	description
	AE	**Alarm Enable**—specifies the type of alarm checking to be done on the **CV** value. 0 = disabled 4 = low limit alarm 5 = high limit alarm 6 = low and high limit 1-3 and 7-12 are unused
	SU	**Alarm Limit Setup/Setback**—specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods.
Temperature: Supply FE08		
	CV	**Supply Temperature**—shows the current value of source/duct temperature
	OF	**Supply Temperature Adjustment**—defines an offset used to adjust **ST**.
	RE	**Channel Reliability**—indicates whether or not the Supply/Duct Temperature value can be trusted.
	DD	**Auto Mode Deadband**—defines the temperature difference by which the supply air must either exceed the FE00;**HC** heating setpoint to switch to heating mode or fall below the FE00;**CC** cooling setpoint to engage cooling mode.
	SM	**Supply Mode**—indicates that supply air is usable for heating or cooling.
	OI	**Override Supply Temperature**—when set to 1, this attribute allows the Supply Temperature (**ST**) to be altered manually.
Temperature: Sensor Bus FE00		
	BM	**Bus Mode**—should be set to Master (**BM**=0) unless multiple controllers are wired onto a SSB. Any additional controllers on the SSB must be configured as Slaves (**BM**=1).
	PU	**User P.I.N.**—this personal identification number controls access to the User Menu.
	PB	**Balancer P.I.N.**—this personal identification number controls access to the Balance Menu.
	PS	**Service P.I.N.**—this personal identification number controls access to the Service Menu.
	PI	**Installer P.I.N.**—This personal identification number controls access to all menus.
	DS	**Display Mode**—specifies whether English or Metric units are to be used for the digital thermostat display.
	DV	**Display Value**—when **DV**=0 each digital thermostat displays the identical temperature value (average) (FE00;**ZT**). When **DV**=1 each thermostat displays its own temperature.
	DF	**Display Format**—defines the format used to display the current temperature on the digital thermostat.
	T0	**Reading Device 0**—is the raw reading for Device 1 on a SSB.
	T1	**Reading Device** 1—is the raw reading for Device 2 on a SSB.
	T2	**Reading Device 2**— is the raw reading for Device 3 on a SSB.

TABLE 4-9: TEMPERATURE ATTRIBUTES

	attr	description
	T3	**Reading Device 3**—is the raw reading for Device 4 on a SSB.
	G0	**GID Device 0**—is the global identification for the SSB device.
q	**G1**	**GID Device** 1— is the global identification for the SSB device.
	G2	**GID Device 2**—is the global identification for the SSB device.
	G3	**GID Device 3**—is the global identification for the SSB device.
	RM	**Reading Mode**—is the technique used to determine Zone Temperature when multiple thermostats are present. 0 = Average Mode 1 = Highest 2 = Lowest 3 = Hi/Lo VST mode 4 = Device position 0 5 = Device position 1 6 = Device position 2 7 = Device position 3 8 = Primary GID mode
	PG	**Primary GID**—is the GID of the Primary thermostat in Primary GID mode (**RM**=8)

4.2.4 Flow

The following are Flow attributes:
FA00;**CD**, **AC**, **DM**, **DP**, **EP**, **EF**, **DD**, **AS**, and **RZ**.
FA01;**CM**, **CX**, **CP**, **CI**, **HM**, **HX**, **HP**, **HI**, **WM**, **WX**, **WP**, and **WI**.

4.2.4.1 Control

Attribute FA00;**CD** is Target Flow. It shows the desired flow (cfm) setpoint calculated by the cooling or heating PI loops. You can write to this point only in Manual mode or with CAV Box Type. When set manually, this point is preserved in EEPROM configuration memory. Manual Target Flow settings are no longer lost when power is removed. This feature is required for CAV applications.

Attribute FA00;**AC** is Control Mode. When set to Auto, the Target Flow (**CD**) is determined by the control algorithms and setpoints. Select Manual to override the Target Flow.

Attribute FA00;**DM** is Damper Mode. Through this point, you can command the damper to open fully (**DM**=1). The attribute includes settings that force the damper to control cooling minimum flow (**DM**=2), cooling maximum flow (**DM**=3), Heating minimum flow (**DM**=4), heating maximum flow (**DM**=5,) warm-up minimum flow (**DM**=6) and warm-up maximum flow (**DM**=7). Enabling either **CM**, **CX**, **HM**, **HX**, **WM**, or **WX** forces the target flow (**CD**) to the appropriate flow setting. Manual/Auto Target Flow values are restored when the damper is returned to Automatic (**DM**=0).

4.2.4.2 Cooling

Attribute FA01;**CM** is Cooling Minimum Flow. It shows the allowable minimum (cooling) duct flow, in CFM, required while the controller is at the calculated cooling setpoint **CC**. See Figure 4-8.

The point FA01;**CM** has a range of 0 to 65,535 with a default of 100.

Attribute FA01;**CX** is Cooling Maximum Flow. It shows the allowable maximum (cooling) duct flow. This point has a range of 0–65,535 and defaults to 500.

Attribute FA01;**CP** is Cooling Proportional Band. It specifies, in degrees (0.0 to 100), the offset from the calculated cooling control setpoint that determines the proportional band for damper control. The damper controls air flow based on area temperature from **CM** (cooling minimum flow) to **CX** (cooling maximum flow) when cooling is called for by the controller. This point defaults to 5.0°. The cooling proportional band is an offset that begins at the calculated cooling control setpoint (**CC**). The cooling proportional band ends at **CC** + **CP**. The attribute **CC** defaults to 5.0°.

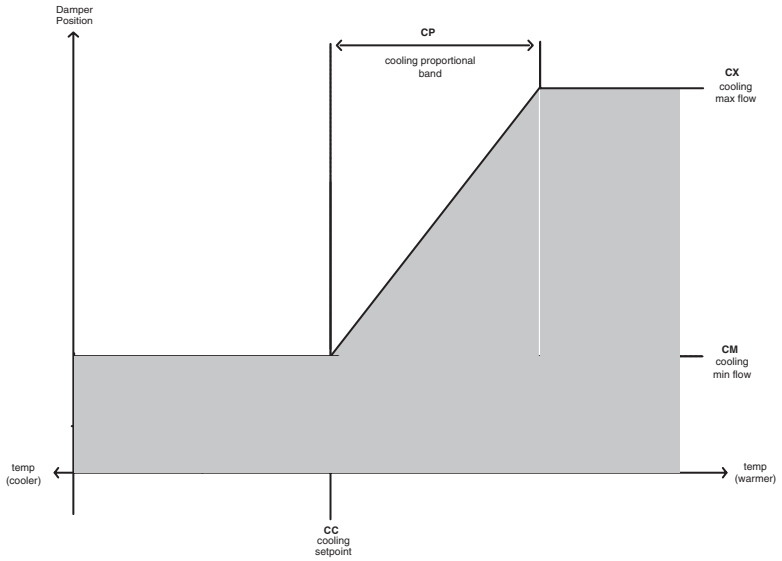


Figure 4-8: Cooling Only Mode

NOTE

The attribute **CC** reflects the thermostat setpoint. value of the *SBC*-STAT and any setup, whereas **CS** does not. The *SBC*-V3Td uses **CC** in its control algorithm.

Attribute FA01;**CI** is Cooling Integration Constant. It shows the amount of proportional error history (0 to 25.5%) used to calculate the desired position for the cooling duct damper. This point is also used to calculate the error for the heating proportional band in Heating Only mode. The attribute is calculated each time the loop runs (once per second) creating an accumulated *integral sum*. This "integral sum," applied once per minute, is used to control overshoot while the loop is operating within the confines of the proportional band. Figure 4-9 illustrates the concepts of control using proportional only and proportional + integral action. This point defaults to 0.0.

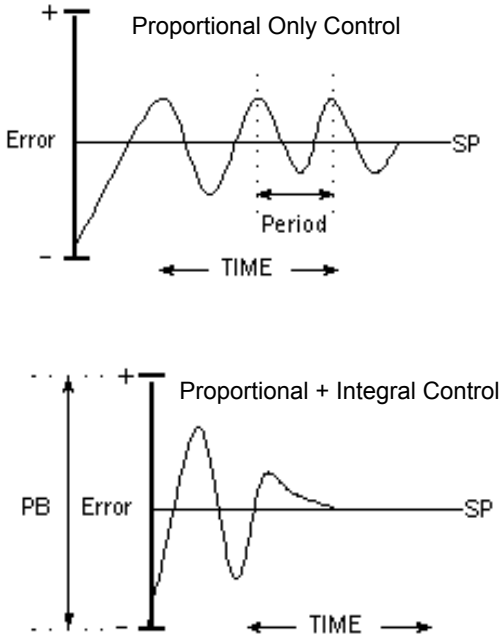


Figure 4-9: Examples of Proportional and Proportional + Integral Control

The P+I control loop controls the amount of integral (integral sum) that is accumulated during use of the antireset windup strategy. When the control loop reaches its maximum (maximum air flow) or its minimum (minimum air flow), the integral sum is dumped. Integral

will begin to calculate again when the control is once more within the proportional band.

4.2.4.3 Heating

Attribute FA01;**HM** is Heating Minimum Flow. It shows the allowable minimum heating duct flow during heating. The point **HM** has a range of 0–65,535 and defaults to 100. See Figure 4-10.

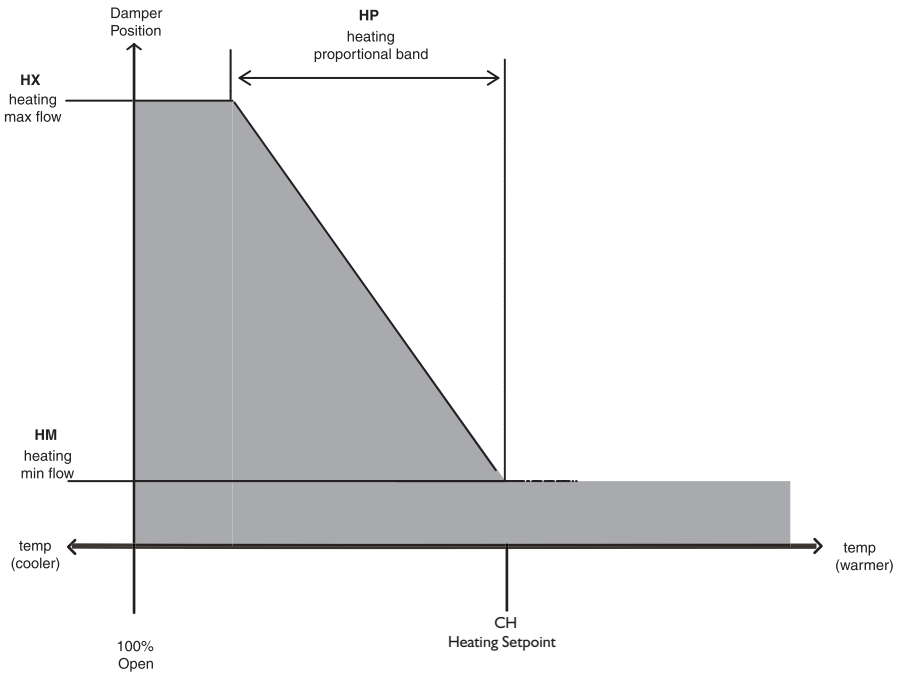


Figure 4-10: Heating Only Mode

Attribute FA01;**HX** is Heating Maximum Flow. It shows the allowable maximum heating duct flow during heating. This attribute defaults to 500 and can be set from 0 to 65,535.

Attribute FA01;**HP** is Heating Proportional Band. It specifies, in degrees (0.0 to 100), the offset from the calculated heating control setpoint that determines the proportional band for the heating duct damper control. This point is an offset from **HC** (calculated heating setpoint) creating an operational band in which the damper controls air flow based on area temperature from **HM** (heating minimum flow) to **HX** (heating maximum flow) when heating is called for by the controller. Attribute **HP** defaults to 5.0°.

Attribute FA01;**HI** is Heating Integration Constant. It shows the amount of proportional error history (0 to 25.5%) used to calculate the desired position for the heating duct damper. The value for this point is calculated each time that the loop runs (once per second) creating an accumulated *integral sum*. This integral sum, applied once per minute, is used to control overshoot while the loop is separating within the confines of the proportional band.

The P+I control loop controls the amount of integral (integral sum) that is accumulated by using an antireset windup strategy. When the control loop reaches its maximum (maximum air flow) or its minimum (minimum air flow), the integral sum is dumped. Integral will begin to be calculated again when the control is once more within the proportional band.

4.2.4.4 Warm-Up

Attribute FA01;**WM** is Warm-Up Minimum Flow. It shows the allowable minimum heating duct flow during warm-up.

The *SBC*-V3Td provides for user tailored warm-up operation through attribute settings. (See the Schedules subsection of this section.)

Attribute **WX** is Warm-up Maximum Flow. It shows the allowable maximum (heating) duct flow during warm-up which can be called for by schedule. This attribute defaults to 400 and has a setting range of 0 to 65,535.

Attribute FA01;**WP** is Warm-Up Proportional Band. It specifies, in degrees (0.0 to 100), the offset from the calculated heating control setpoint that determines the proportional band for the warm-up heating duct damper control.
Attribute FA01;**WI** is Warm-Up Integration Constant. It shows the amount of proportional error history (0 to 25.5%) used to calculate the desired position for the heating duct damper.

4.2.4.5 DAMPER

Attribute FA00;**DP** is Damper Position. It shows the damper position of the actuator using the built-in feedback potentiometer.

Attribute FA00;**EP** is Estimated Target Position. It shows the estimated target position with which the loop should control the damper to bring the flow closer to the setpoint. A change in **EP** causes the damper to move in the proper control direction.

Attribute FA00;**EF** is Estimated Flow at Full Open. It shows the estimated flow at full open in cfm.

Attribute FA00;**DD** is Damper Direction. It is used to set the direction of the damper motor. When the attribute is set to 0, the motor turns in the normal direction. With the attribute set to 1, the motor turns in the opposite direction.

Attribute FA00;**AS** is Actuator Status. It reports the status of the actuator as determined by MMT. Possible values are Ready, Disconnected/Open, and Jammed/Shorted. Diagnostic alarms and returns are issued when this status changes.

Attribute FA00;**RZ** is Rejuvenate Count. When MMT detects the possibility of an actuator short, electrical pulses are used to rejuvenate the motor. Each pulse is tallied by this attribute. The Actuator Status is changed to indicate the short if it is not rectified after 10 consecutive pulses. The Rejuvenate Count can be used to determine the general well-being of the actuator.

TABLE 4-10: FLOW ATTRIBUTES

	attr	description
Flow: Control FA00		
	CD	**Target Flow**—shows the desired flow (cfm) setpoint calculated by the cooling or heating PI loops.
	AC	**Control**—when set for Auto, the Target Flow (**CD**) is determined by the control algorithms and setpoints.
	DM	**Damper Mode**—can be used to command the damper to fully open or to operate at minimum or maximum cooling, heating and warm-up setpoints.
Flow: Cooling FA01		
	CM	**Cooling Minimum Flow**—shows the allowable minimum (cooling) duct flow.
	CX	**Cooling Maximum Flow**—shows the allowable maximum (cooling) duct flow.
	CP	**Cooling Proportional Band**—specifies, in degrees (0.0 to 25.5), the offset from the calculated cooling control setpoint **CC** that determines the proportional band for damper control.

TABLE 4-10: FLOW ATTRIBUTES

	attr	description
	CI	**Cooling Integration Constant**—shows the amount of proportional error history (0 to 100%) used to calculate the desired position for the cooling duct damper.
Flow: Heating FA01		
	HM	**Heating Minimum Flow**—shows the allowable minimum heating duct flow during heating.
	HX	**Heating Maximum Flow**—shows the allowable maximum heating duct flow during heating.
	HP	**Heating Proportional Band**—specifies, in degrees (0.0 to 25.5), the offset from the calculated heating control setpoint that determines the proportional band for the heating duct damper control.
	HI	**Heating Integration Constant**—shows the amount of proportional error history (0 to 100%) used to calculate the desired position for the heating duct damper.
Flow: Warm-up FA01		
	WM	**Warm-up Minimum Flow**—shows the allowable minimum heating duct flow during warm-up heating.
	WX	**Warm-up Maximum Flow**—shows the allowable maximum heating duct flow during **warm-up heating.**
	WP	**Warm-up Proportional Band**—specifies in degrees (0.0 to 25.5) the offset from the calculated heating control setpoint that determines the proportional band for the warm-up heating duct damper control.
	WI	**Warm-up Integration Constant**—shows the amount of proportional error history (0 to 100%) used to calculate the desired position for the heating duct damper.
Flow: Damper FA00		
	DP	**Position**—shows the damper position of the actuator using the built-in feedback potentiometer.
	EP	**Estimated Target Position**—shows the estimated target position with which the loop should control the damper to bring the flow closer to the setpoint.
	EF	**Estimated Flow at Full Open**—shows the estimated flow at full open in cfm.
	DD	**Direction**—used to set the direction of the damper motor.
	AS	**Actuator Status**—reports the status of the actuator as determined by the MMT.
	RZ	**Rejuvenate Count**— when MMT detects the possibility of an actuator short, electrical pulses are used in an attempt to rejuvenate the motor.

4.2.5 AUXILIARY

The following are Auxiliary attributes: FC01;**MS**, **IC**, **MD**, **MT**, and **MR**.

4.2.5.1 OCCUPANCY DETECTOR

NOTE

If UI1 is used for supply temperature, it can not be used for occupancy detection.

The Occupancy Detector attributes allow you to define the circumstances under which the *SBC*-V3Td will automatically switch to an extended occupied mode during unoccupied periods when occupancy detector is used with the controller.

Attribute FC01;**MS** is Occupancy Status. This read-only point shows the status of the occupancy detector digital input. To enable occupancy detection, **MT** must be > 0 and UI1 MUST be configured as digital (UI1 **ST** = 0). If either of these two conditions are not met, **MS** will display 0. When this point is enabled (**MS** = 1) and when occupancy in the zone is detected during unoccupied periods, the occupancy input extends occupancy time by the amount specified in **MT**.

Attribute FC01;**IC** is Status Input. It enables occupancy detection (**IC** = 1) and specifies the binary input channel to be used for detection. This point uses a nonzero value from **UI1** to indicate occupancy.

Attribute FC01;**MD** is Extended Occupancy Delay. It sets the amount of time, in seconds, during which the occupancy detector must remain on before the occupancy detector will override the zone. This prevents false triggers that might occur as others pass quickly through the zone.

Attribute FC01;**MT** is Extended Occupancy Duration. It defines, in minutes, the length of time needed to override the zone whenever occupancy is detected.

Attribute FC01;**MR** is Extended Occupancy Remaining. This read-only point displays the time remaining for occupancy detector override.

TABLE 4-11: AUXILIARY ATTRIBUTES

	attr	description
Aux: Occupancy Detector FC01		
	MS	**Occupancy Detector Input Status**—shows the status of the occupancy detector digital input.
	IC	**Occupancy Detector Enable**—uses a nonzero value from UI1 to indicate occupancy.
	MD	**Extended Occupancy Delay**—sets the amount of time, in seconds, during which the occupancy detector must remain on before it will override the zone.
	MT	**Extended Occupancy Duration**—defines, in minutes, the length of time to override the zone whenever occupancy is detected.

TABLE 4-11: AUXILIARY ATTRIBUTES

	attr	description
	MR	**Extended Occupancy Remaining**—displays the time remaining for occupancy detector override.

4.2.6 I/O SETUP

The following are Input/Output Setup attributes:
FE01;**CV**, **RE**, **ST**, **DT**, **MN**, **MX**, **LL**, **HL**, **HS**, **AS**, **AE**, **SU**, **IP**, **IF**, and **OI**.

4.2.6.1 INPUT (UI1)

I/O Setup (UI1) offers specific operational options. It provides you with the option to use any one of several *SBC*-V3Td features. It can be used for the duct temperature input or as an occupancy detection input. When used as an occupancy detection sensor input, UI1 is dedicated to the *SBC*-V3Td occupancy detection feature—allowing for automatic unoccupied override. This sends the *SBC*-V3Td into an occupied mode of operation when occupancy is detected in the control area. Each use precludes the use of the input for other functions. For instance if the input is used for occupancy detection, supply temperature disabled.

Attribute FE01;**CV** is Current Value. It shows the current value of UI1. This attribute is read-only unless overridden (**OI** = 1).

Attribute FE01;**RE** is Data Reliability and can be either a 0 or 1. It is set to 1 if the universal input is questionable. The digital input is considered unreliable during the input filtering delay time. Any time the digital input changes state (from 0 to 1 or from 1 to 0), it is considered questionable. If the digital input remains stable (does not change state) for **IF** seconds, the corresponding bit in **RE** is set back to 0—indicating a reliable/stable value. If the digital input does change state before **IF** seconds expire, the reliability bit remains set to 1—indicating that the change of state may be a digital input bounce.

Attribute FE01;**ST** is Sensor Type. Through this point, you can select one of the following input types: digital, linear (scaled **MN** to **MX**), 4–20mA linear (scaled **MN** to **MX**), or thermistor (-22.0 to 122.0°F). This attribute's default setting is *Thermistor* (**ST** = 7). The associated settings appear in Table 4-12.

Table 4-12: Sensor Types for FE01

Value of **ST**	Sensor Type
ST = 0	digital
ST = 1	unused
ST = 2	full scale, linear input scaled from **MN** to **MX** (0–10VDC)
ST = 3	4–20mA input scaled from **MN** to **MX**
ST = 4, 5 or 6	unused
ST = 7	–22.0 to 122.0°F (–30.0 to 50.0°C) thermistor (default)

When **ST** = 0, the universal input will be configured to operate as a digital input and will allow **CV** to display a 1 or a 0—the meaning of which is dependent on **IP** (input polarity). If **IP** = 0, a low voltage input (<2.5VDC) to the universal input will result in **CV** = 0; a high voltage (>2.5VDC) applied to the universal input will result in **CV** = 1. If **IP** = 1, a low voltage applied to the universal input will read as **CV** = 1; a high voltage will result in **CV** = 0.

Setting **ST** to 2 and having the *SBC*-V3Td set up to use the appropriate hardware input

provides the ability to use a 0–10VDC device as the input. The minimum and maximum values of the range are set in attributes **MN** and **MX**. For example if the input value is to be displayed as a percentage, then set **ST** = 2, **MN** = 0 and **MX** = 0 (0–100%). The *SBC*-V3Td will determine the voltage input converted internally to raw counts, will scaled the raw counts (0–255) across the range 0–100 and will display the value of the input as a range of 0–100. For linear voltage devices, be sure that the appropriate jumper on the PCB is properly set. For more information, see *Section 2: Wiring and Installation*.

The following sample calculation shows how the *SBC*-V3Td scales raw counts on the 10-bit UI1 using a current value of 115. (The result is rounded.)

$$\mathbf{CV} = \mathbf{MN} + \left[\frac{\text{Current Counts} \times \mathbf{MX}}{\text{Max Counts}}\right]$$

$$\mathbf{CV} = 0.00 + \left[\frac{115 \times 100}{65{,}535}\right]$$

$$\mathbf{CV} = 0.00 + \left[\frac{11500}{65{,}535}\right]$$

$$\mathbf{CV} = 0.18$$

The following sample calculation shows how the *SBC*-V3Td scales raw counts on the 10-bit input using a current value of 185 counts.

$$\mathbf{CV} = \mathbf{MN} + \left[\frac{\text{Current Counts} \times (\mathbf{MX})}{\text{Max Counts}}\right]$$

$$\mathbf{CV} = 0.0 + \left[\frac{185 \times 100}{65{,}535}\right]$$

$$\mathbf{CV} = 0.0 + \left[\frac{18500}{65{,}535}\right]$$

$$\mathbf{CV} = 0.28$$

If the input's value was 185 in raw counts according to the percentage scaling of **MN** and **MX**, then the value of 0.25 (rounded) would be displayed in **CV**.

If you make the value of **MN** greater than the value of **MX**, the input is configured for reverse scaling. This is useful for 5–0VDC sensors (as opposed to 0–5VDC sensors).

The *SBC*-V3Td also provides linear input scaling for 4–20mA current transmitters (**ST** = 3). For sensors that provide a 4–20mA signal, set **ST** = 3. Attributes **MN** and **MX** are used in the same way as they are for **ST** = 2. For information on hardware settings, refer to Section 2: Wiring and Installation. Figure 4-11 illustrates the counts used by a 4–20mA device.

Attribute FE01;**DT** is PUP Data type for Input. It specifies the PUP data type for the input. The data type determines how certain universal input attributes are displayed. This point affects the display of **CV**, **MN**, **MX**, **SU**, **LL**, **HL** and **HS**. Data type codes determine the number of decimal places in the value and whether or not the value is signed (positive or negative) or unsigned. This attribute defaults to 253 (signed 9.1 digit).

Attribute FE01;**MN** is Minimum Scaled Value. It specifies the minimum engineering unit for the

input corresponding to the lowest value measured at the input connection.This point is used to scale the measured value to meaningful engineering units for display.

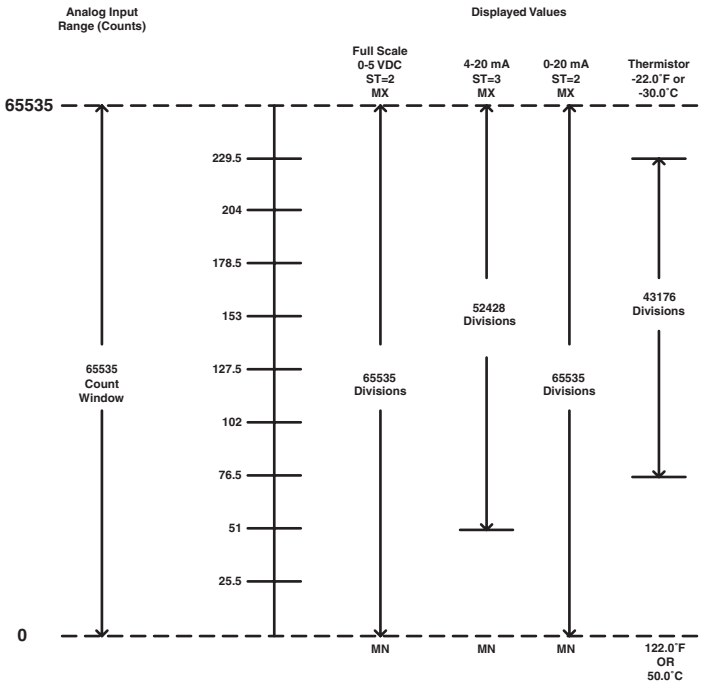


Figure 4-11: Analog Sensor Types

Attribute FE01;**MX** is Maximum Scaled Value. It specifies the maximum engineering unit for the input corresponding to the highest value measured at the input connection.This point is used to scale the measured value to meaningful engineering units for display.

Attributes **MN** and **MX** program the minimum and maximum scaled values for linear, analog inputs (**ST** = 2 and **ST** = 3). For example if the input value is to be displayed as a percentage, you would set **ST** = 2, **MN** = 0 and **MX** = 100 (0–100%). The *SBC*-V3Td will scale the raw counts 0–255 for 8-bit inputs across the range 0–100 and will display the value of the input for a range of 0–100. For linear input devices, be sure that the appropriate hardware is set on the *SBC*-V3Td. For information on hardware settings, refer to *Section 2: Wiring and Installation*.

Attributes **LL**, **HL**, **HS**, **AS** and **SU** provide parameters for analog PUP alarming. The **AE** attribute determines whether or not input alarming is used.

Attribute FE01;**LL** is Low Alarm Limit. It specifies the low alarm limit. If alarms are enabled and the current value drops below this value, a low limit alarm will be generated.

Attribute FE01;**HL** is High Alarm Limit. It specifies the high alarm limit. If alarms are enabled and the current value rises above this value, a high limit alarm will be generated.

The data types of **LL** and **HL** are specified by the data type attribute **DT** of the universal inputs.

Attribute FE01;**HS** is Alarm Limit Hysteresis. It determines when the *SBC*-V3Td returns from a high or low limit alarm. In the case of a high limit alarm, the **CV** value must drop below **HL** – **HS** to cause a high limit return. For a low limit alarm, the **CV** value must rise above **LL** + **HS** to cause a low limit return.

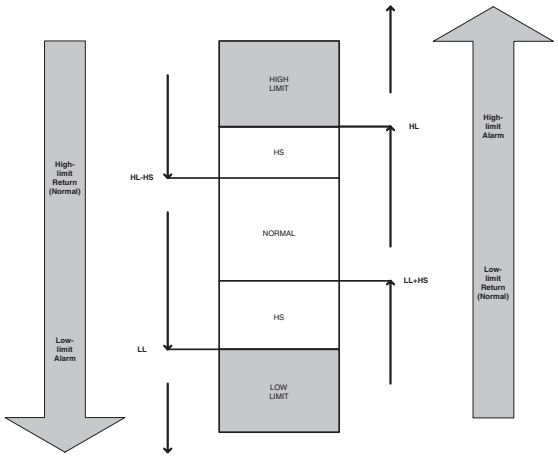


Figure 4-12: Alarm States and Thresholds for Limit Alarming

Attribute FE01;**AS** is Alarm Status. It shows the current alarm condition. A value of 0 indicates a normal condition. A nonzero number indicates alarm generation. Table 4-13 explains each status.

Table 4-13: Values for Alarm Status Attribute

Value of **AS**	Alarm Condition
AS = 0	normal (no alarm)
AS = 1	contact (0 ⟶ 1)
AS = 2	contact (1 ⟶ 0)
AS = 3	change of state
AS = 4	unused
AS = 5	low limit alarm
AS = 6	high limit alarm

Attribute FE01;**AE** is Alarm Enable. It specifies the type of alarm checking to be done on the **CV** value. A value of 0 indicates that alarming is disabled; a nonzero value selects one of several alarm functions. Table 4-14 lists the options for **AE**.

Table 4-14: Alarm Enable Options

Value of **AE**	Alarm Type Enabled
AE = 0	disabled
AE = 1	contact, 0 ⟶ 1
AE = 2	contact, 1 ⟶ 0
AE = 3	change of state, 1 ⟷ 0
AE = 4	low limit alarm
AE = 5	high limit alarm
AE = 6	low and high limit
AE = 7–12	unused

Attribute FE01;**SU** is the Amount to Setup/ Setback Alarm Limit. It specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods. The attribute is added to **HL** defining the unoccupied high-limit alarm threshold; **SU** is subtracted from **LL** defining the unoccupied low-limit alarm threshold.

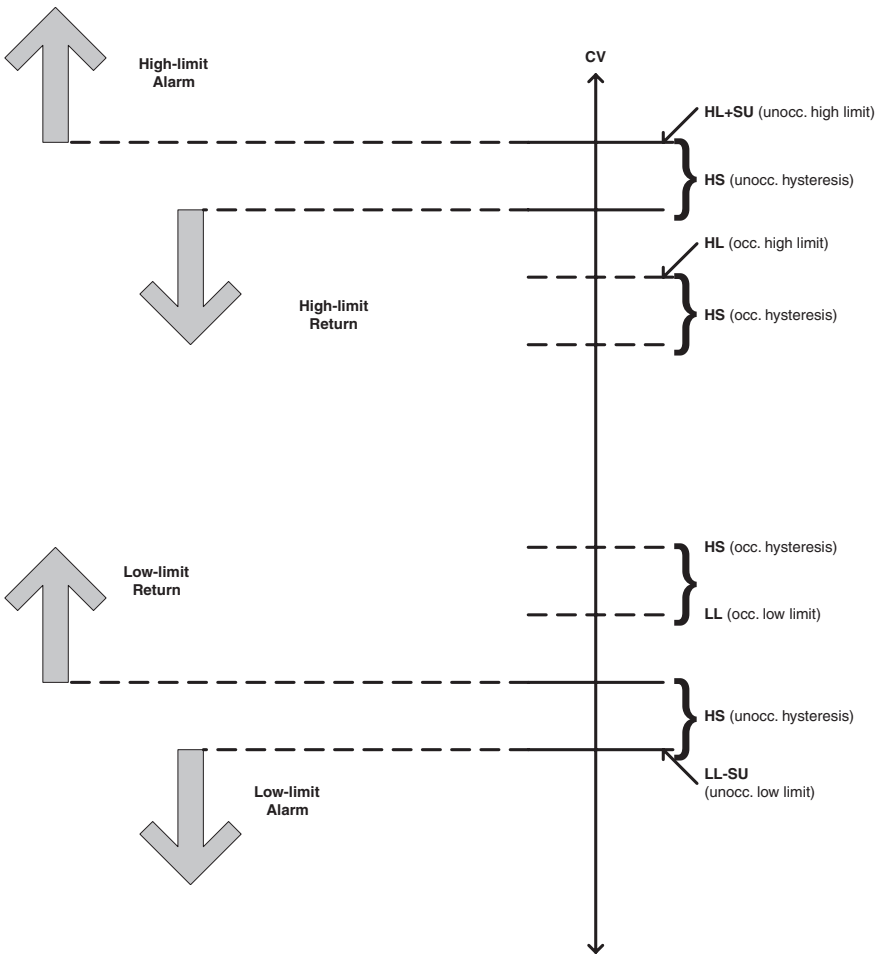


Figure 4-13: Unoccupied Setup/Setback Alarm Shifting

Attribute FE01;**IP** is Input Polarity. It specifies the input polarity when configured as digital. A value of 0 in **IP** indicates that a low voltage displays as **CV** = 0 and a high voltage displays as **CV** = 1. A value of 1 in **IP** indicates that a low voltage displays as **CV** = 1, and a high voltage displays as **CV** = 0.

Attribute FE01;**IF** is Input Filter Delay. It specifies the amount of time in tenths of seconds during which an input configured as digital must remain stable in order for the value to be considered reliable if fluctuations are not uncommon. This is also the weighted gain if the input is configured as analog. This attribute is used in the following equation to calculate the average value:

$$\text{Average Value} = \frac{(\text{Old Value} \times \mathbf{IF}) + \text{New Value}}{\mathbf{IF} + 1}$$

Attribute FE01;**IF** for digital inputs is determined by the amount of time that the input is in the most recent change of state. The attribute's resolution for digital inputs is user adjustable in tenths of seconds. The default for digital and analog input filtering is 0.0.

Attribute FE01;**OI** is Override Input. It allows a host or operator to directly set the value of the source/duct temperature. This attribute defaults to 0. When it is enabled (**OI** = 1), you can manually write to **CV**.

CAUTION

*If the Zone Temperature attribute **OI** is enabled and the power to the unit is removed or lost, you must immediately rewrite to the Zone Temperature attribute **CV**. The attribute **CV** will have 00.0 reading when power is restored to the unit. If not corrected, this situation will have a detrimental effect on the operation of the unit.*

TABLE 4-15: INPUT/OUTPUT ATTRIBUTES

	attr	description
I/O Setup: Universal Input (UI1) FE01		
	CV	**Current Value**—(read-only unless **OI** = 1) shows the current value of UI1.
	RE	**Channel Reliability**—can be either a 0 or 1. It is set to 1 if the universal input is questionable. Any time the digital input changes state (from 0 to 1 or from 1 to 0), it is considered questionable. If the digital input remains stable (does not change state) for **IF** seconds, the corresponding bit in **RE** is set back to 0—indicating a reliable/stable value. If the digital input does change state before **IF** seconds expire, the reliability bit remains set to 1—indicating that the change of state may be a digital input bounce.
	ST	**Sensor Type**—allows you to select an input type. 0 = digital 1 = unused 2 = full scale, linear input scaled from **MN** to **MX** 3 = 4-20mA input scaled from **MN** to **MX** 4, 5 or 6 = unused 7 = -22.0 to 122.0°F thermistor
	DT	**Datatype for Input**—specifies the PUP data type for the input. The default is 253 (signed 9.1 digit).
	MN	**Minimum Scaled Value**—program the minimum scaled value for linear, analog inputs.
	MX	**Maximum Scaled Value**—program the maximum scaled values for linear, analog inputs.
	LL	**Low Alarm Limit**—specifies the low alarm limit. If alarms are enabled and the current value drops below this value, a low limit alarm will be generated.
	HL	**High Alarm Limit**—specifies the high alarm limit. If alarms are enabled and the current value rises above this value, a high limit alarm will be generated.
	HS	**Alarm Limit Hysteresis**—a value that determines when the *SBC*-V3Td returns from a high- or low-limit alarm. For a high-limit alarm, the **CV** must drop below **HL** - **HS** to cause a high limit return. For a low-limit alarm, the **CV** value must rise above **LL** + **HS** to cause a low limit return.

TABLE 4-15: INPUT/OUTPUT ATTRIBUTES

	attr	description
	AS	**Alarm Status**—shows the current alarm condition. 0 = normal 1 = contact (0 to 1) 2 = contact (1 to 0) 3 = change of state 4 = unused 5 = low limit alarm 6 = high limit alarm
	AE	**Alarm Enable**—specifies the type of alarm checking to be done on the **CV** value. 0 = disabled 1 = contact (0 to 1) 2 = contact (1 to 0) 3 = changed of state 4 = low limit alarm 5 = high limit alarm 6 = low and high limit 7-12 = unused
	SU	**Alarm Limit Setup/Setback**—specifies a value that is added to **HL** and subtracted from **LL** during unoccupied periods.
	IP	**Input Polarity**—specifies the input polarity when configured as digital. 0 = low voltage displays as **CV** = 0, high voltage displays as **CV** = 1 1 = low voltage displays as **CV** = 1, high voltage displays as **CV** = 0
	IF	**Input Filtering/Averaging**—specifies the amount of time in tenths of seconds during which an input configured as digital must remain stable in order for the value to be considered reliable if fluctuations are not uncommon.
	OI	**Override Input**—enables/disables overriding **CV**. If **OI** = 0, override is disabled and **CV** displays the value of the input. If **OI** = 1, the override is enabled and the value of **CV** can be manually changed. 0 = disabled 1 = enabled

4.2.7 NETWORKING

There following are Networking attributes:
FF00;**ID**, **ZN**, **CP**, **TP**, **ER**, **U1-U4**, **MS.**
F005;**CV** and **RB**.

4.2.7.1 CONFIGURATION

Attribute FF00;**ID** is the Unit Number. This value is used to set a unique network address for each controller connected on a multidrop. Each **ID** is factory set to the last four digits of the board serial number. Valid values are 0 to 9999. For example, if the serial number is 100072, the Unit ID is 72. If the serial number is 498765, the Unit ID is 8765.

Attribute FF00;**ZN** is Zone Number. The Zone Number (from 0 to 65,535) is used to group controllers together so that they can be controlled simultaneously. For example you can set a group of controllers to enter Warm-Up Mode all at the same time. The Zone Number programs a Zone Address. The *SBC*-V3Td uses this code to decide whether or not a PUP Write Zone Attribute command should be honored by this unit. This attribute defaults to 0.

Table 4-16: Communication Speed Options

Value of **CP**	Baud Rate
0	9600
1	4800
2	2400
3	1200
6	38.4K
7	19.2K
8	115.2K
9	57.6K

Attribute FF00;**CP** is Communication Speed. It specifies the communication speed (baud rate) at which devices on the network will communicate. American Auto-Matrix unitary controllers communicate over EIA-485 networks using PUP. All devices on the same multidrop must have **CP** set to the same value. Valid baud rates are as follows: 0=9600, 1=4800, 2=2400, 3=1200, 6=38.4K, 7=19.2K, 8=115.2K, and 9=57.6K. This attribute defaults to 0.

NOTE

In order for a change of **CP** to take effect, you must reset the *SBC*-V3Td.

Attribute FF00;**TP** is Token Passing Type. This attribute defines the mode for token passing. When a controller is an Irresponsible Peer it will always return a token to the device that passed it, after performing any pending transactions. In Full Administrator mode, the token is passed to each unit listed in the Peer List (FF00;**U1** through FF00;**U4**).

Attribute FF00;**ER** is Token Recovery. This attribute enables Token Recovery. In a token passing environment there should always be network activity, but if a token is lost the network will fall silent. If Token Recovery is enabled, and a token is lost, Full Administrator will detect the condition and initiate a new token.

Attribute FF00;**U1**-**U4** is Peer Unit Number. This attribute defines the Unit ID of a peer. In Full Administrator mode the token is passed to each unit in the Peer List.

MS is the Trend Master Unit Number. The default value of 65535 disables *SBC*-STAT trending capabilities. To enable *SBC*-STAT trending, enter the Unit Number of the Trend Master.

4.2.7.2 SCHEDULE BROADCAST

The Schedule Broadcast attributes allow the *SBC*-V3Td to receive network schedule information.

Attribute F005;**CV** is Current Value. It shows the current value of the network broadcast schedule values received by the *SBC*-V3Td. When **RB** is enabled, **CV** is forced into the Main Schedule attribute **CV** and is used as the functioning schedule value of the *SBC*-V3Td.

Attribute F005;**RB** is Receive Broadcast. It enables the *SBC*-V3Td to receive network

broadcasts and sets F900;**CV** value based on the received value. If **RB** = 0, then receive broadcast is disabled. If **RB** = 1, then the *SBC*-V3Td receives the network value and places it in **CV** and Main Schedule attribute **CV**. (This overrides the schedules of the *SBC*-V3Td, which become ineffective.

TABLE 4-17: NETWORK ATTRIBUTES

	attr	description
Network: Configuration FF00		
	ID	**Unit ID**—is a unique network address for each controller connected on a multidrop.
	ZN	**Zone Number**—(from 0 to 65,535) is used to group controllers together so that they can be controlled simultaneously.
	CP	**Communication Speed**—specifies the communication speed (baud rate) at which devices on the network will communicate. 0=9600 1=4800 2=2400 3=1200 6=38.4K 7=19.2K 8=115.2K 9=57.6K
	TP	**Token Passing Type**—defines the mode for token passing. When a controller is an Irresponsible Peer it will always return a token to the device that passed it, after performing any pending transactions. In Full Administrator mode, the token is passed to each unit listed in the Peer List (FF00;**U1** through FF00;**U4**).
	ER	**Token Recovery**—in a token passing environment there should always be network activity, but if a token is lost the network will fall silent. If Token Recovery is enabled, and a token is lost, Full Administrator will detect the condition and initiate a new token.
	U1-U4	**Peer Unit Number**—defines the Unit ID of a peer. In Full Administrator mode the token is passed to each unit in the Peer List.
Network: Schedule Broadcast F005		
	CV	**Current Value**—shows the current value of the network broadcast schedule values received by the *SBC*-V3Td.
	RB	**Receive Broadcast**—enables the *SBC*-V3Td to receive network broadcasts and sets F900;**CV** based on the received value.

SECTION 5: CONFIGURATION

This section includes configuration instructions for SBC-*V3T controllers in V3T systems. The* SBC-*V3Tb can be flashed with the Rooftop application, while the* SBC-*V3Td can be configured to control airflow to the zone. This section also includes configuration instructions for scheduling, auxiliary functions such as fan operation and heating and cooling, and alarming.*

5.1 SCHEDULING

Scheduling controls the current zone temperature setpoint of the *SBC*-V3T. Internal schedules can be defined by the user in the Schedules:Clock/Calendar and Summary [F900] channel attributes, and the Schedules:(1-6) [F90(1-6)] attributes. Using these channels, the user can determine when and in which schedule mode (or state) the *SBC*-V3T will operate—occupied, warm-up, unoccupied, or night setback. See the Channels and Attributes section earlier in this manual for more information on each attribute.

The *SBC*-V3T is equipped with:

- a Schedules:Clock/Calendar channel with user-definable attributes that reflect the current time, date, and day, and whether or not the current day is a holiday
- a Schedules:Summary channel
- six internal schedule channels in which the user can define the *SBC*-V3T schedule modes.

The Schedules:Summary channel:

- reflects the values of and has an effect on how the six internal schedule channels operate
- allows the user to select the schedules status when the *SBC*-V3T schedule is in an inactive state
- indicates the zone reception of schedule information over the EIA-485 PUP network
- includes host schedule control options.

In addition, the user can enter the dates of ten (10) holidays in the Schedules:Clock/Calendar channel.

To configure the internal schedules by which you want the *SBC*-V3T to operate, refer to Table 5-1.

NOTE

Before configuring the internal schedules, set the Schedules:Clock/Calendar:**Date** [F900;**DT**] and **Current Time** [F900;**TM**]. If you manually set the time and date, also click on the radio button next to the current day in the **Day** [F900;**DA**] attribute. Even if the current day is already selected (this attribute defaults to *Monday*), you must click on the radio button next to the current day to set it.

Table 5-1: Configuring the SBC-V3T for Internal Scheduling

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Schedules: Clock/Calendar: **Current Time**	In the field provided, enter the current time or verify that the clock has been synchronized, and enter the current date and day.	Set F900;**TM**=the current time or verify that the clock has been synchronized.
Schedules: Clock/Calendar: **Current Date**	In the field provided, enter the current date. (E.g., 9/15/01)	Set F900;**DT** to the current date.

Table 5-1: Configuring the SBC-V3T for Internal Scheduling

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Schedules: Clock/Calendar: **Day**	Click on the radio button next to the current day.	Set F900;**DA** to the current day.
Schedules: (1-6): **Warm-up Time**	In the field provided, enter the time at which you want warm-up mode to begin.	Set F90(1-6);**WO**=the time at which you want warm-up mode to begin.
Schedules: (1-6): **Occupied Time**	In the field provided, enter the time at which you want occupied mode to begin. (Warm-up mode ends at this time.)	Set F90(1-6);**OC**=the time at which you want occupied mode to begin. (Warm-up mode ends at this time.)
Schedules: (1-6): **Unoccupied Time**	In the field provided, enter the time at which you want unoccupied mode to begin. (Occupied mode ends at this time.)	Set F90(1-6);**UN**=the time at which you want unoccupied mode to begin. (Occupied mode ends at this time.)
Schedules: (1-6): **Night Setback Time**	In the field provided, enter the time at which you want night setback mode to begin. (Unoccupied Mode ends at this time.)	Set F90(1-6);**NS**=the time at which you want night setback mode to begin. (Unoccupied Mode ends at this time.)
Schedules: (1-6): **Active Days**	Click on (place a check in) the check boxes next to the day(s) by which you want the schedule to run.	Use the F90(1-6);**AD** bitmap to select the days by which you want the schedule to run. Set the days you want to be active=1.

In a situation in which schedules may overlap, the *SBC*-V3T will prioritize the schedule modes. The controller checks Schedule 1 through Schedule 6 for the highest priority schedule mode, and operates in that mode. Schedule modes take precedence in the following order:

1. Occupied (highest priority)
2. Warm-up
3. Unoccupied
4. Night Setback (lowest priority)

Eight factors can cause the current internal schedule to be overridden. The following list is the order of precedence in which the overrides can occur.

1. User Override from *SBC*-STAT (highest priority)
2. Occupancy Detection
3. Broadcast Zone Value
4. Host Override
5. Power-up State
6. Schedule Broadcast
7. All-day Override
8. Inactive Schedule State (lowest priority)

The following subsections provide an explanation of the eight factors that can cause the current internal schedule to be overridden.

Table 5-2: Changing the Inactive Schedule State

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Schedules: Summary: **Inactive Schedule State**	Select the desired schedule mode from the drop-down box.	Set F900;**IS**=to the desired schedule mode. ▼ Unoccupied=0 ▼ Warm-up=1 ▼ Occupied=2 ▼ Night Setback=3

5.1.1 INACTIVE SCHEDULE STATE

The current internal schedule will be overridden if the Schedules:Summary:**Inactive Schedule State** [F900;**IS**] attribute is set to a higher priority schedule mode than the current internal schedule's active mode. For example, if the current internal schedule's active mode is unoccupied, and **IS** is warm-up, the current internal schedule will be overridden and the *SBC*-V3T will operate in warm-up mode (warm-up mode is a higher priority schedule mode than unoccupied mode). To change **IS**, refer to Table 5-2.

The schedule mode set in **IS** will be the active schedule mode unless:

- the active schedule mode is a higher priority mode
- all-day override occurs
- a scheduled broadcast is received
- a soft reset of the *SBC*-V3T occurs or power is restored after an unscheduled power loss and the current time is **not** set or has **not** been synchronized
- the host overrides the schedule
- a zone broadcast is received
- an occupancy sensor is properly configured and occupancy is detected
- user override occurs.

5.1.2 ALL-DAY OVERRIDE

The current internal schedule can be overridden using the Schedules:(1-6):**All-day Override** [F90(1-6);**AO** attribute. For example, if the internal schedule in the Schedules:2 [F902] channel is the active schedule, and unoccupied is the active schedule mode, the user can override the unoccupied mode by setting **AO** to another desired schedule mode. The *SBC*-V3T will remain in **AO** mode until Schedules:2 is no longer the active schedule. To employ all-day override, refer to Table 5-3.

The schedule mode set in **AO** will be the active mode until:

- the internal schedule that is being effected by the all-day override is no longer the active schedule
- the active internal schedule's **AO** attribute is set to *none* [F90(1-6);**AO**=0]
- a scheduled broadcast is received
- a soft reset of the *SBC*-V3T occurs or power is restored after an unscheduled power loss and the current time is **not** set or has **not** been synchronized
- the host overrides the schedule
- a zone broadcast is received
- an occupancy sensor is properly configured and occupancy is detected
- user override occurs.

Table 5-3: Overriding the Current Internal Schedule Using All-day Override

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Schedules: (1-6) [whichever schedule is the active schedule]: **All-day Override**	Select the desired schedule mode from the drop-down box in the active internal schedule.	Set F90(1-6);**AO**=the desired schedule mode. ▼ None=0 ▼ Unoccupied=1 ▼ Warm-up=2 ▼ Occupied=3 ▼ Night setback=4

5.1.3 SCHEDULE BROADCAST

Broadcast Schedules are schedules sent out by networked controllers. The active internal schedule will be overridden if the *SBC*-V3T is configured to receive network broadcast schedules. If the Network:Schedule Broadcast:**Receive Broadcast?** [F005;**RB**] attribute is enabled, the current schedule will reflect the Network:Schedule Broadcast:**Current Value** [F005;**CV**] attribute. To configure the *SBC*-V3T to receive network broadcast schedules, refer to Table 5-4.

The schedule mode set by the schedule broadcast is the active mode until:

- a soft reset of the *SBC*-V3T occurs or power is restored after an unscheduled power loss and the current time is **not** set or has **not** been synchronized
- the host overrides the schedule
- a zone broadcast is received
- an occupancy sensor is properly configured and occupancy is detected
- user override occurs.

Table 5-4: Configuring the SBC-V3T to Receive Broadcast Schedules

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Network: Schedule Broadcast: **Receive Broadcast**	Click on the radio button next to *Yes*.	Set F005;**RB**=1.
Schedules: Summary: **Host Overrides Local Schedules?**	Click on the radio button next to *No*.	Set F900;**HE**=0.
Schedules: Summary: **Zone Broadcast Enabled?**	Click on the radio button next to *No*.	Set F900;**ZE**=0.
Schedules: Clock/Calendar: **Current Time**	In the field provided, enter the current time of day or verify that the clock has been synchronized.	Set F900;**TM**=the current time, or verify that the clock has been synchronized.

Table 5-4: Configuring the SBC-V3T to Receive Broadcast Schedules

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Schedules: Clock/Calendar: **Day**	Click on the radio button next to the current day. Note that even if the correct day is already selected, you must click on it again to activate the setting.	Set F900;**DA**=the current day.

5.1.4 POWER-UP STATE

If an unscheduled power loss occurs and power is restored, or if a soft reset of the *SBC*-V3T occurs (System:Power-up:**Reset the Controller?** enabled [FF00;**RS**=1]), the *SBC*-V3T will operate in the schedule mode defined by the user in the **Power-up State** [FF00;**PS**] attribute until the Schedules:Clock/Calendar:**Current Time** [F900;**TM**] is set or synchronized by a host. To set the schedule mode in which you want the *SBC*-V3T to operate upon power restoration or after a soft reset has occurred, refer to Table 5-5.

NOTE

The *SBC*-V3T will remain in the schedule mode set in **PS** until **TM** is set or synchronized by a host. Once the **TM** is set or synchronized, the *SBC*-V3T will return to its internal schedule mode. Also note that one of the other overriding factors may be preventing the *SBC*-V3T from returning to the expected schedule mode once the **TM** is set or synchronized.

Table 5-5: Setting the SBC-V3T's Power-up State

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
System: Power-up: **Power-up State**	Click on the radio button next to the schedule mode in which you want the *SBC*-V3T to operate upon power restoration or after a soft reset has occurred.	Set FF00;**PS**=the schedule mode in which you want the *SBC*-V3T to operate upon power restoration or after a soft reset has occurred. ▼ Unoccupied=0 ▼ Warm-up=1 ▼ Occupied=2 ▼ Night setback=3

5.1.5 HOST OVERRIDE

When the Schedules:Summary:**Host Overrides Local Schedules?** [F900;**HE**] attribute is enabled, the host can set the value of the **Schedule Status** [F900;**CV**] attribute through the **Host Schedule Setting** [F900;**HO**] attribute. To enable host override, set **HE** to *yes* [F900;**HE**=1].

The schedule mode set in **HO** will be the active mode unless:

- a soft reset of the *SBC*-V3T occurs or power is restored after an unscheduled power loss and the current time is **not** set or has **not** been synchronized
- a zone broadcast is received
- an occupancy sensor is properly configured and occupancy is detected
- user override occurs.

5.1.6 ZONE SCHEDULING

Zone scheduling allows controllers with the same zone number to be scheduled identically by a master unit. If the Schedules:Summary:**Received Schedule** [F900;**ZE**] attribute is enabled, zone scheduling is in effect and the *SBC*-V3T's schedule follows the last value successfully written to the **Current Value** [F900;**CV**] attribute by a PUP network 'Zone Attribute Write' command specifically for the defined zone. The defined zone is determined by the user in the Network:Configuration:**Zone Number** [FF00;**ZN**] attribute. All controllers on the network with the same **ZN** will receive the broadcast. To configure the *SBC*-V3T to receive zone scheduling broadcasts, refer to Table 5-6.

The broadcast Zone Schedule will be the active schedule mode unless:

- an occupancy sensor is properly configured and occupancy is detected
- user override occurs.

Table 5-6: Configuring the SBC-V3T to Receive Zone Scheduling Broadcasts

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Schedules: Summary: **Zone Broadcast Enabled?**	Click on the radio button next to *Yes*.	Set F900;**ZE**=1.
Network: Configuration: **Zone Number**	The value entered in the field next to this attribute must be the same as the master unit that broadcasts the zone scheduling, otherwise, the *SBC*-V3T will not receive the zone scheduling broadcast.	FF00;**ZN** must be=the master unit that broadcasts the zone scheduling, otherwise, the *SBC*-V3T will not receive the zone scheduling broadcast.

5.1.7 USER OVERRIDE

If the active schedule is unoccupied mode, user override is possible. If the user presses the up or down arrow push-button on the *SBC*-STAT2 or *SBC*-STAT3 and the Temperature:Override:**User Override** attribute is enabled [FE00;**SE**=1], the *SBC*-V3T will go to occupied mode. The duration of this mode, which is also called extended occupancy, can be set by the user using the Temperature:Override:**Extended Occupancy Duration** [FE00;**ED**] attribute. To configure the *SBC*-V3T for user override ability via an *SBC*-STAT, refer to Table 5-7.

Table 5-7: Configuring the SBC-V3T for User Override Ability

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Override: **Global (User) Override**	Click on the radio button next to *Enabled*.	Set FE00;**SE**=1.
Temperature: Override: **Extended Occupancy Duration**	In the field provided, enter the number of minutes you want the *SBC*-V3T to remain in occupied mode (extended occupancy) once the up or down arrow push-button on the *SBC*-STAT2 or STAT3 is pressed. This value must be greater than zero, otherwise, user override will not take effect.	Set FE00;**ED**=the number of minutes you want the *SBC*-V3T to remain in occupied mode (extended occupancy) once the up or down arrow push-button on the *SBC*-STAT2 or *SBC*-STAT3 is pressed. This value must be > 0, otherwise, user override will not take effect.

5.1.8 OCCUPANCY DETECTION

The occupancy detection feature enables the *SBC*-V3T to automatically go to occupied mode, (also called extended occupancy,) provided that an occupancy sensor is properly installed and the *SBC*-V3T is properly configured. The length of time that the *SBC*-V3T will operate in extended occupancy is defined by the user in the Aux:Occupancy Detector:**Extended Occupancy Duration** [FC01;**MT**] attribute. To configure the *SBC*-V3T for occupancy detection capability, refer to Table 5-8.

NOTE

If the **Extended Occupancy Duration** is not set to a value greater than zero [FC01;**MT** > 0], the *SBC*-V3T will not go into extended occupancy when occupancy is detected.

Table 5-8: Configuring the SBC-V3T for Occupancy Detection Capability

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
I/O Setup: Universal Inputs (UI1-UI5): **Sensor Type**	Click on the radio button next to *Digital*.	Set FE04;**ST**=0.
Aux: Occupancy Detector: **Status Input**	Click on the drop-down menu and select a desired input.	Set FC01;**IC**=1 for UI1 ▼ 2=UI2 ▼ 3=UI3 ▼ 4=UI4 ▼ 5=UI5
Aux: Occupancy Detector: **Extended Occupancy Delay**	In the field provided, enter the desired number of seconds the occupancy detector is to detect occupancy before overriding the zone. This prevents false triggering of occupancy detection in the event that someone or something quickly passes through the zone.	Set FC01;**MD**=the desired number of seconds the occupancy detector is to detect occupancy before overriding the zone. This prevents false triggering of occupancy detection in the event that someone or something quickly passes through the zone.
Aux: Occupancy Detector: **Extended Occupancy Duration**	In the field provided, enter the desired number of minutes the *SBC*-V3T is to remain in extended occupancy once occupancy is detected. This value must be greater than zero, otherwise the *SBC*-V3T will not go into extended occupancy.	Set FC01;**MT**=the desired number of minutes the *SBC*-V3T is to remain in extended occupancy once occupancy is detected. This value must be > 0, otherwise the *SBC*-V3T will not go into extended occupancy.

5.2 SETTING THE TEMPERATURE SETPOINTS

This section provides guidelines for configuring the temperature setpoints of the *SBC*-V3T. The *SBC*-V3T maintains the zone according to the Temperature:Heating/Cooling Setpoints:**Current Setpoints** [FE00;**CH** and FE00;**CC**].

NOTE

Before setting the temperature setpoints, set the System:About:**Engineering Units** to the desired unit of measurement—*English* or *Metric*. Set FF00;**EM**=the desired engineering units.

- English=0
- Metric=1

Changing **EM** will automatically convert all setpoint and offset attributes to the same units.

Table 5-9: Setting the Heating Control Temperature Setpoints

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Heating Setpoints: **Occupied Setpoint**	In the field provided, enter the temperature that you want the zone to maintain when the active schedule mode is occupied. During occupied mode, the Temperature:Heating Setpoints:**Current Setpoint** is equal to the **Occupied Setpoint**.	Set FE00;**SH**=the temperature that you want the zone to maintain when the active schedule mode is occupied. During occupied mode: FE00;**CH**=FE00;**SH**
Temperature: Heating Setpoints: **Unoccupied Setback**	In the field provided, enter the value you want subtracted from the **Occupied Setpoint** when the active schedule mode is unoccupied. For example, if the **Occupied Setpoint** is 70° and the **Unoccupied Setback** is 4°, the value in the Temperature:Heating Setpoints:**Current Setpoint** attribute will be 66° when the active schedule mode is unoccupied.	Set FE00;**UH**=the value to be subtracted from FE00;**SH** when the active schedule mode is unoccupied. During unoccupied mode: FE00;**CH**=**SH** - **UH**
Temperature: Heating Setpoints: **Night Setback**	In the field provided, enter the value you want subtracted from the **Occupied Setpoint** when the active schedule mode is night setback. For example, if the **Occupied Setpoint** is 70° and the **Night Setback** is 8°, the value in the Temperature:Heating Setpoints:**Current Setpoint** attribute will be 62° when the active schedule mode is night setback.	Set FE00;**NH**=the value to be subtracted from FE00;**SH** when the active schedule mode is night setback. During night setback mode: FE00;**CH**=**SH** - **NH**

Table 5-9: Setting the Heating Control Temperature Setpoints

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Heating Setpoints: **Warm-up Setpoint**	In the field provided, enter the temperature that you want the zone to maintain when warm-up is the active schedule mode. During warm-up mode, the Temperature:Heating Setpoints:**Current Setpoint** is equal to the **Warm-up Setpoint**.	Set FE00;**SW**=the temperature that you want the zone to maintain when Warm-up is the active schedule mode. During warm-up mode: FE00;**CH**=**SW**

Table 5-10: Setting the Cooling Control Temperature Setpoints

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Cooling Setpoints: **Occupied Setpoint**	In the field provided, enter the temperature that you want the zone to maintain when the active schedule mode is occupied. During occupied mode, the Temperature:Cooling Setpoints:**Current Setpoint** is equal to the **Occupied Setpoint**.	Set FE00;**SC**=the temperature that you want the zone to maintain when the active schedule mode is occupied. During occupied mode: FE00;**CC**=FE00;**SC**
Temperature: Cooling Setpoints: **Unoccupied Setback**	In the field provided, enter the value you want added to the **Occupied Setpoint** when the active schedule mode is unoccupied. For example, if the **Occupied Setpoint** is 70° and the **Unoccupied Setback** is 4°, the value in the Temperature:Cooling Setpoints:**Current Setpoint** attribute will be 74° when the active schedule mode is unoccupied.	Set FE00;**UC**=the value to be added to FE00;**SC** when the active schedule mode is unoccupied. During unoccupied mode: FE00;**CC**=**SC** + **UC**
Temperature: Cooling Setpoints: **Night Setback**	In the field provided, enter the value you want added to the **Occupied Setpoint** when the active schedule mode is night setback. For example, if the **Occupied Setpoint** is 70° and the **Night Setback** is 8°, the value in the Temperature:Cooling Setpoints:**Current Setpoint** attribute will be 78° when the active schedule mode is night setback.	Set FE00;**NC**=the value to be added to FE00;**SC** when the active schedule mode is night setback. During night setback mode: FE00;**CC**=**SC** + **NC**

5.3 CONFIGURING THE *SBC*-V3Tb

The *SBC*-V3Tb can operate five devices.

- Fan
- Heat 1
- Heat 2
- Cool 1
- Cool 2

The following subsections provide explanations of and configuration instructions for the *SBC*-V3Tb devices.

5.3.1 FAN CONTROL

The bypass application accommodates a fan which is controlled in one of two ways: auto mode (temperature controlled) or always on.

Temperature-based fan control is used when the Zone Temperature is outside the deadband. When the temperature is within the deadband, the fan will cycle off. By selecting always on, the fan will remain on in that schedule mode.

NOTE

To prevent over-pressure upon fan start-up, the bypass damper will open when the fan is off.

During occupied, unoccupied, and night setback periods of operation for a fan, you must select *Always on* or *Auto*.

Table 5-11: Configuring the SBC-V3Tb for Fan Control

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Equipment: Fan: **Occupied Mode**	Click on the radio button next to *Auto* for the fan to shut off when the zone temperature is within the deadband during occupied mode. Click on the radio button next to *On* for the fan to run for the entire occupied period.	Set FB01;**FO**=0 for the fan to shut off when the zone temperature is within the deadband. Set FB01;**FO**=1 for the fan to run for the entire occupied period.
Equipment: Fan: **Unoccupied Mode**	Click on the radio button next to *Auto* for the fan to shut off when the zone temperature is within the deadband during unoccupied mode. Click on the radio button next to *On* for the fan to run for the entire unoccupied period.	Set FB01;**FU**=0 for the fan to shut off when the zone temperature is within the deadband. Set FB01;**FU**=1 for the fan to run for the entire unoccupied period.
Equipment: Fan: **Night Setback Mode**	Click on the radio button next to *Auto* for the fan to shut off when the zone temperature is within the deadband during night setback mode. Click on the radio button next to *On* for the fan to run for the entire night setback period.	Set FB01;**FN**=0 for the fan to shut off when the zone temperature is within the deadband. Set FB01;**FN**=1 for the fan to run for the entire night setback period.

5.3.2 HEAT 1/HEAT 2

Each heating stage is cycled on and off to maintain a zone temperature within a programmable deadband around a programmable setpoint.

OAT Heating Lockout (Heat 1)
Heating stages will not be engaged if a Reliable (FE09;**RE**=0) Outside Air Temperature (FE09;**CV**) is above the temperature specified by this attribute. Stages will not be de-energized should the OAT rise above this temperature during an active cycle.

NOTE

If FE09;**RE** is unreliable, the OAT will not be used. The OAT becomes reliable when FE09;**OI**=1, and a value is written to FE09;**CV**, or a reading from the sensor automatically updates FE09;**CV**. If the channel is configured to Receive Broadcasts (F000;**RB**=1), the channel becomes reliable when a broadcast is received.

DAT High Limit Lockout (Heat 1)
Heating stages will be engaged if there is a reliable DAT below this setting. If the DAT rises above the temperature in this attribute, the heating stages will be shut off.

Table 5-12: Configuring the Heating Stages

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Equipment: Heat1: **OAT Heating Lockout**	In the field provided, enter a temperature value above which heating stages will not be engaged.	Set FB04;**HL**=to a value above which heating stages will not be engaged.
Equipment: Heat1: **DAT High Limit Lockout**	In the field provided, enter a temperature value. If during heating the DAT rises above this value, the heating stages will not be engaged and will be shut off.	Set FB04;**TH**=to a temperature value. If during heating the DAT rises above this value, the heating stages will not be engaged and will be shut off.

5.3.3 COOL1/COOL 2

Each cooling stage is cycled on and off to maintain a zone temperature within a programmable deadband around a programmable setpoint.

OAT Cooling Lockout (Cool 1)
Cooling stages will not be engaged if a Reliable (FE09;**RE**=0) Outside Air Temperature (FE09;**CV**) is available that is below the temperature specified by the OAT Cooling Lockout. Stages will not be de-energized should the OAT fall below this temperature during an active cycle.

NOTE

If FE09;**RE** is unreliable, the OAT will not be used. The OAT becomes reliable when FE09;**OI**=1, and a value is written to FE09;**CV**, or a reading from the sensor automatically updates FE09;**CV**. If the channel is configured to Receive Broadcasts (F000;**RB**=1), the channel becomes reliable when a broadcast is received.

DAT Low Limit Lockout (Cool 1)
A discharge-air temperature low limit may be enforced for cooling stages. If the DAT falls below the temperature in this attribute, cooling will be shut off.

Table 5-13: Configuring the Cooling Stages

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Equipment: Cool1: **OAT Cooling Lockout**	In the field provided, enter a temperature value below which cooling stages will not be engaged.	Set FB02;**CL**=to a value below which cooling stages will not be engaged.
Equipment: Cool1: **DAT Low Limit Lockout**	In the field provided, enter a temperature value. If during cooling the DAT falls below this value, the cooling stages will not be engaged and will be shut off.	Set FB02;**TL**=to a temperature value. If during heating the DAT falls below this value, the heating stages will not be engaged and will be shut off.

5.4 CONFIGURING THE *SBC*-V3Tb TO CONTROL A BYPASS DAMPER

Refer to Table 5-14 to configure the *SBC*-V3Tb to control a bypass damper.

Table 5-14: Configuring the SBC-*V3Tb to Control a Bypass Damper*

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Pressure: Control: **SP Setpoint**	In the field provided, enter the Static Pressure Setpoint in inches W.G.	Set FA00;**CD**=to the Static Pressure Setpoint (in inches W.G.)

5.5 DIGITAL OUTPUTS

The digital (relay) outputs are used to determine the state of the *SBC*-V3Tb outputs. The configuration of the digital outputs includes the Current Value, Output Polarity, Runtime Hours, Runtime Limit, and Override.

To allow full configuration before controller operation, Input/Output Setup:Relay Outputs:**Override** is factory set to Off (**OI**=0). After all other configurations are complete, each digital output must be manually enabled as appropriate to the installation.

Table 5-15: Configuring the Digital Outputs

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Input/Output Setup: Relay Outputs: **Output Polarity**	Click the radio button next to the desired output polarity: Normal or Reverse. When **CV**=1, setting **OP** to normal (0) energizes the output. When **CV**=0, setting **OP** to reverse (1) energizes the output.	Set FB0x;**OP** to the desired Output Polarity: ▼ 0=Normal ▼ 1=Reverse
Input/Output Setup: Relay Outputs: **Runtime Limit**	In the field provided, enter a run time limit in hours for the output. When the run hours for the output exceed the runtime limit (**RH**>**RL**), the *SBC*-V3T will generate a runtime limit alarm	Set FB0x;**RL=**a run time limit in hours. When the run hours for the output exceed the runtime limit (FB0x;**RH**>FB0x;**RL**), the *SBC*-V3T will generate a runtime limit alarm.
Input/Output Setup: Relay Outputs: **Override**	After setting up and verifying all other configuration options, click the radio button next to the appropriate Override option: *Off, On, Auto, Manual.*	Set FB0x;**OI**=appropriate option: ▼ 0=Off (default) ▼ 1=On ▼ 2=Auto ▼ 3=Manual

5.6 CONFIGURING THE *SBC*-V3Tb FOR USE WITH MULTIPLE DAMPER CONTROLLERS

The *SBC*-V3Tb controls the supply air temperature based on the reported demand loads of the active dampers. The *SBC*-V3Tb will ignore heating and cooling demand loads when the supply air temp is not suitable. This may be during OAT Lockout or when the controller is configured for Heating or Cooling Only.

NOTE

A full administrator with token recovery enabled must be on the network. If the *SBC*-V3Tb is not the full administrator, then the full administrator must have the *SBC*-V3Tb's unit ID in its peer list. The *SBC*-V3Tb must get the token in order to poll the damper controllers for their demand load.

Table 5-16: Configuring the SBC-*V3Tb for use with Multiple Damper Controllers*

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Damper Units: (0-15): **Controller ID**	In the field provided, enter the ID number of the *SBC*-V3Td controller.	Set F80x;**ID**=the ID number of the *SBC*-V3Td controller.
Temperature: Damper Units: (0-15): **Send Supply Temp**	Click the radio button next to *Yes* if you want the current supply temperature to be written to the supply temperature channel of the damper controller. Note that the damper controller's *Override Supply Temperature* attribute must be enabled.	Set F80x;**ST**=1 if you want the current supply temperature to be written to the supply temperature channel of the damper controller. Note that the damper controller's *Override Supply Temperature* attribute must be enabled.
Temperature: Damper Units: (0-15): **Override**	Click the radio button next to *Active* if you want to consider that damper's demand load. Click the radio button next to *Bypassed* to bypass that damper.	Set F80x;**OI**=0 if you want to consider that damper's demand load. Set F80x;**OI**=1 to bypass that damper.

5.7 CONFIGURING THE *SBC*-V3Td

The *SBC*-V3Td can operate in one of four control modes:

- None [Constant Air Volume (CAV)]
- Cooling Only
- Heating Only
- Supply Dependant (VST)

Sections 5.7.1 through 5.7.4 provide configuration instructions for each of these modes.

5.7.1 CONSTANT AIR VOLUME (CAV)

The *SBC*-V3Td is capable of controlling CAV terminal boxes. With a CAV unit, zone temperature is not a control factor. Instead, the value defined by the user in the Flow:Control:**Target Flow** [FA00;**CD**] attribute becomes the constant volume setpoint. The *SBC*-V3Td will modulate the damper appropriately to maintain the **CD** while airflow is present. To configure the *SBC*-V3Td for CAV control, refer to Table 5-17.

5.7.2 COOLING ONLY

When configured for cooling only control, the *SBC*-V3Td uses Proportional + Integral (PI) control to modulate the damper and control airflow to the zone based on two factors; the Temperature:Thermostat:**Zone Temperature** [FE00;**ZT**] and the Temperature:Cooling Setpoints:**Current Setpoint** [FE00;**CC**]. If **ZT** is greater than **CC**, the *SBC*-V3Td will open the damper and provide cool air to the zone to maintain **ZT** as close as possible to the **CC**.

NOTE

Scheduling controls the current temperature setpoint.

Cooling only works on a forward acting ramp that slopes from the values defined by the user in the Flow:Cooling:**Cooling Minimum Flow** [FA01;**CM**] and **Cooling Maximum Flow** [FA01;**CX**] attributes. When the **ZT** strays from the **CC**, the *SBC*-V3Td opens the damper—increasing the supply airflow to the zone. As the **ZT** reaches the **CC**, the *SBC*-V3Td closes the damper to minimize airflow. Refer to Table 5-18 to configure the *SBC*-V3Td for cooling only control.

Table 5-17: Configuring the SBC-*V3Td for CAV Control*

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Thermostat: **V3T Control Mode**	Click on the radio button next to *None (CAV)*.	Set FE00;**BT**=0
Flow: Control: **Target Flow**	In the field provided, enter the desired constant volume setpoint (in cfm).	Set FA00;**CD**=desired constant volume setpoint

Table 5-18: Configuring the SBC-V3Td for Cooling Only Control

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Thermostat: **V3T Control Mode**	Click on the radio button next to *Cooling Only*.	Set FE00;**BT**=1.
Set the temperature setpoints as desired.		

5.7.3 HEATING ONLY

When configured for heating only control, the *SBC*-V3Td uses PI control to modulate the damper and control airflow to the zone based on two factors; the Temperature:Thermostat:**Zone Temperature** [FE00;**ZT**] and the **Current** (heating) **Setpoint** [FE00;**CH**]. If the **ZT** is less than the **Current Setpoint**, the *SBC*-V3Td will open the damper and provide warm air to the zone to maintain a **ZT** as close as possible to the **Current Setpoint**.

NOTE

Scheduling controls the **Current** (temperature) **Setpoint**.

Heating only works on a reverse acting ramp that slopes from the values defined by the user in the Flow:Heating:**Heating Minimum Flow** [FA01;**HM**] to the **Heating Maximum Flow** [FA01;**HX**] attributes. When **ZT** strays from **CH**, the *SBC*-V3Td opens the damper—increasing the supply airflow to the zone. As **ZT** reaches the **CH**, the *SBC*-V3Td closes the damper to minimize airflow. To configure the SBC-V3Td for Heating Only control, refer to Table 5-19.

Table 5-19: Configuring the SBC-*V3Td for Heating Only Control*

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Thermostat: **V3T Control Mode**	Click on the Radio Button next to *Heating Only*.	Set FE00;**BT**=2.
Set the temperature and flow setpoints as desired.		

5.7.4 SUPPLY DEPENDANT

When operating in supply dependant mode, the *SBC*-V3Td monitors the temperature of the source/duct air, determines whether or not the air is hot or cold enough to heat or cool the zone, then automatically functions in heating or cooling mode accordingly. For example, if the Temperature:Supply:**Supply Temperature** [FE00;**ST**] is greater than *both* the Temperature:Thermostat:**Zone Temperature** [FE00;**ZT**] and the Temperature:Heating Setpoints:**Current Setpoint** [FE00;**CH**], the *SBC*-V3Td will operate in heating mode and open the damper to provide the warm supply air to the zone (the source, or supply air is warm enough to heat the space). Conversely, if **ST** is less than *both* **ZT** and the Temperature:Cooling Setpoints:**Current Setpoint** [FE00;**CC**], the *SBC*-V3Td will operate in cooling mode and open the damper to provide the cool supply air to the zone (the source, or supply air is cold enough to cool the space).

Using the **Auto Mode Deadband** [FE08;**DD**] attribute, the user can define the point at which the terminal box will go into cooling or heating mode. For example, if **DD** is set to 3° and the **Current** (temperature) **Setpoint** is 70°:

- the *SBC*-V3Td will switch to heating only mode and supply the warm source air to the zone when the **Supply Temperature** exceeds 73°
- the *SBC*-V3Td will switch to cooling only mode and supply the cool source air to the zone when the **Supply Temperature** drops below 67°
- the *SBC*-V3Td will remain in the last active mode when the temperature is in the dead-band (67 to 73°).

The mode in which the *SBC*-V3Td is operating will be indicated in the Temperature:Supply:**Supply Mode** attribute (FE08;**SM** will=0 if in cooling mode and 1 if in heating mode).

When in VST mode, the *SBC*-V3Td will override the minimum airflow settings to prevent undesired cooling and heating. Dampers will fully close when the supply air is not suitable for what the zone is calling.

In the event that the **CC** is greater than the **CH** [FE00;**CC** > FE00;**CH**], the **DD** attribute must be set to half the difference between the setpoints to create a deadband with a wide enough range to provide sufficient heating/ cooling. For example, if you set **CC** to 74° and **CH** is 70°, set **DD** to 2° to create a sufficient deadband. To configure the *SBC*-V3Td for Supply Dependant operation, refer to Table 5-20.

Table 5-20: Configuring the SBC-*V3Td for Supply Dependant (VST) Operation*

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Temperature: Thermostat: **V3T Control Mode**	Click on the radio button next to *Supply Dependant (VST)*.	Set FE00;**BT=**3.
Flow: Damper: **Estimated Flow at Full Open**	In the field provided, enter the desired rate of airflow with the damper fully open in CFM.	Set FA00;**EF=**to the desired rate of airflow (in CFM) with the damper fully open. When the damper is fully open, air will flow at this rate.

5.7.5 SETTING THE *SBC*-V3Td FLOW SETPOINTS

This section provides guidelines for configuring the flow setpoints of the *SBC*-V3Td.

Table 5-21: Setting the Cooling Control Flow Attributes

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Flow: Cooling: **Cooling Minimum Flow**	In the field provided, enter the value of the minimum rate at which you want air to flow through the duct. This value is measured in CFM.	Set FA01;**CM**=the value of the minimum rate at which you want air to flow through the duct. This value is measured in CFM.
Flow: Cooling: **Cooling Maximum Flow**	In the field provided, enter the value of the maximum rate at which you want air to flow through the duct. This value is measured in CFM.	Set FA01;**CX**=the value of the maximum rate at which you want air to flow through the duct. This value is measured in CFM.
Flow: Cooling: **Cooling Proportional Band**	In the field provided, enter the number of degrees from the **Occupied Setpoint** over which proportional cooling will take place.	Set FA01;**CP**=the number of degrees from FE00;**CS** over which proportional heating will take place.
Flow: Cooling: **Cooling Integration Constant**	In the field provided, enter the percentage of accumulated error used to calculate the required supply airflow. AAM recommends setting this attribute to 5%.	Set FA01;**CI**=the percentage of accumulated error used to calculate the required supply airflow. AAM recommends setting this attribute equal to 5%.

Table 5-22: Setting the Heating Control Flow Attributes

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Flow: Heating: **Heating Minimum Flow**	In the field provided, enter the value of the minimum rate at which you want air to flow through the duct. This value is measured in CFM.	Set FA01;**HM** = the value of the minimum rate at which you want air to flow through the duct. This value is measured in CFM.
Flow: Heating: **Heating Maximum Flow**	In the field provided, enter the value of the maximum rate at which you want air to flow through the duct. This value is measured in CFM.	Set FA01;**HX** = the value of the maximum rate at which you want air to flow through the duct. This value is measured in CFM.

Table 5-22: Setting the Heating Control Flow Attributes

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Flow: Heating: **Heating Proportional Band**	In the field provided, enter the number of degrees from the **Occupied Setpoint** over which proportional heating will take place.	Set FA01;**HP** = the number of degrees from FE00;**HS** over which proportional heating will take place.
Flow: Heating: **Heating Integration Constant**	In the field provided, enter the percentage of accumulated error used to calculate the required supply airflow. AAM recommends setting this attribute to 5%.	Set FA01;**HI** = the percentage of accumulated error used to calculate the required supply airflow. AAM recommends setting this attribute to 5%.

Table 5-23: Setting the Warm-up Flow Attributes

Attribute Path for Graphical User Interface (GUI) Utility:**Attribute Name**	GUI Configuration Utility Setting	Channel Setting
Flow: Warm-up: **Warm-up Minimum Flow**	In the field provided, enter the value of the minimum rate at which you want air to flow through the duct when the active schedule mode is warm-up.	Set FA01;**WM=**the value of the minimum rate at which you want air to flow through the duct when the active schedule mode is warm-up.
Flow: Warm-up: **Warm-up Maximum Flow**	In the field provided, enter the value of the maximum rate at which you want air to flow through the duct when the active schedule mode is warm-up.	Set FA01;**WX=**the value of the maximum rate at which you want air to flow through the duct when the active schedule mode is warm-up.
Flow: Warm-up: **Warm-up Proportional Band**	In the field provided, enter the number of degrees from the **Warm-up Setpoint** over which proportional heating will take place.	Set FA01;**WP=**the number of degrees from FE00;**WS** over which proportional heating will take place.
Flow: Warm-up: **Warm-up Integration Constant**	In the field provided, enter the percentage of accumulated error used to calculate the required supply airflow. AAM recommends setting this attribute to 10%.	Set FA01;**WI=**the percentage of accumulated error used to calculate the required supply airflow. AAM recommends setting this attribute equal to 10%.

NOTE

The **Minimum** and **Maximum Flow** attributes should not exceed the minimum and maximum allowable rates of flow specified by the manufacturer of the VAV terminal box.

SECTION 6: *SBC*-STAT FEATURES

SBC-STATs use information from a connected *SBC* controller. The *SBC*-STAT3 displays this information on its graphical display and gives the user the ability to navigate through the menus using its four buttons. The following section describes the *SBC*-STAT setpoint adjustment and LED, and the *SBC*-STAT3 menus when connected to an *SBC*-V3T.

6.1 TEMPERATURE DISPLAY

When connected to an *SBC*-V3T, an *SBC*-STAT3 displays the room temperature (in degrees Celsius or Fahrenheit) with **Warm-up**, **Setback**, **Occupied**, or **Unoccupied** on the bottom left of the display. Also **Heat**, **Cool**, or **Vent** is displayed on the bottom right of the display.

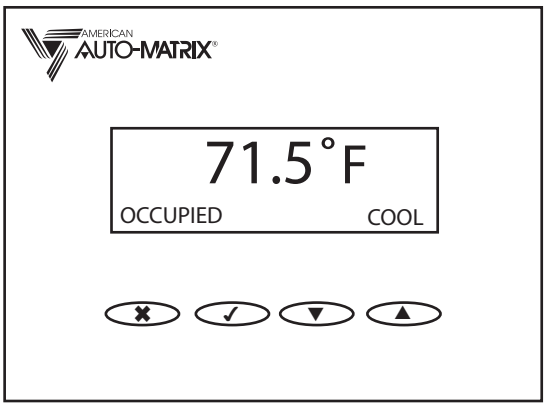


Figure 6-1: Room Temperature Display

6.2 SETPOINT ADJUSTMENT DISPLAY

When you press the up or down arrow button on the *SBC*-STAT3, a setpoint adjustment display appears and the LED blinks.

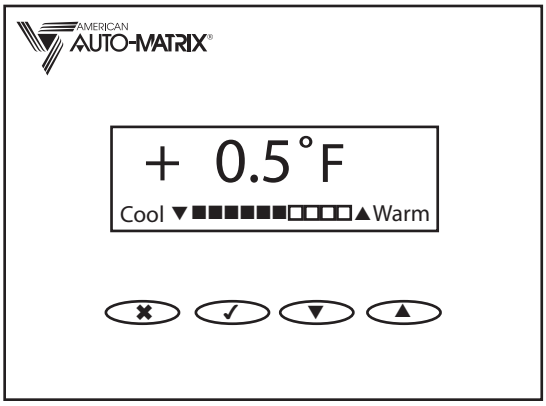


Figure 6-2: Setpoint Adjustment Display

6.2.1 *SBC*-STAT2

When the up or down arrow button is first pressed, the LED will flash to indicate the current setpoint. If the up or down arrow is pressed again within 15 seconds the setpoint will change one position and the red LED will flash for that setpoint. The setpoint range is one (1) through five (5) flashes. Each additional flash indicates a warmer setting. See Table 6-1: LED for more information on the blinking pattern for setpoint adjustment.

6.2.2 *SBC*-STAT2-D

When the up or down arrow button is first pressed, the LED will flash to indicate the current setpoint. If the up or down arrow is pressed again within 15 seconds the setpoint will change one position and the red LED will flash for that setpoint. The setpoint can be adjusted five increments on either side of zero with zero being six (6) red flashes. See Table 6-1: LED for more information on the blinking pattern for setpoint adjustment.

6.2.3 *SBC*-STAT3

When the up or down arrow button is first pressed, the current setpoint offset will be displayed on the graphical display. If the button is pressed again within 15 seconds, the setpoint will move one increment in the direction of the button pressed. The setpoint can be adjusted five increments on either side of zero with zero being six (6) red flashes. The magnitude of the increment is programmed at installation.

6.3 LED

The following table lists the blinking patterns that occur during specific events in the *SBC*-STAT.

Table 6-1: LED

Event	*SBC*-STAT2 flash	*SBC*-STAT2-D flash	*SBC*-STAT3 flash
Setpoint adjustment	coldest = 1 red flash colder = 2 red flashes normal = 3 red flashes warmer = 4 red flashes warmest = 5 red flashes	coldest = 1 red flash = 2 red flashes = 3 red flashes = 4 red flashes = 5 red flashes normal = 6 red flashes = 7 red flashes = 8 red flashes = 9 red flashes = 10 red flashes warmest = 11 red flashes	coldest = 1 red flash = 2 red flashes = 3 red flashes = 4 red flashes = 5 red flashes normal = 6 red flashes = 7 red flashes = 8 red flashes = 9 red flashes = 10 red flashes warmest = 11 red flashes
Override mode	red flash every 6 seconds	red flash every 6 seconds	no flash
Occupied mode	no flash	solid green	solid green
Warm-up	no flash	flashing green	flashing green
Night Setback	no flash	periodic yellow flash	periodic yellow flash
Unoccupied mode	no flash	periodic yellow flash	periodic yellow flash
Menus	no flash	no flash	solid yellow

6.4 OVERRIDE MODE

NOTE

Users can not enter override mode through an *SBC*-STAT unless the following criteria are met:

- The *SBC*-V3T's Temperature:Override: **User Override** attribute is enabled [FE00;**SE** = 1];
- The **Extended Occupancy Duration** attribute is greater than or equal to 1 [FE00;**ED** ≥ 1]; and
- The active schedule mode is warm-up, unoccupied, or night setback.

The *SBC*-STAT2 and *SBC*-STAT2-D can enter override mode through any keypress. Once in override mode, the LED will flash red every six seconds. To cancel override mode hold down the up or down arrow button for five seconds or until the LED starts flashing. The LED will flash a minimum of ten times to confirm the cancellation.

Through the *SBC*-STAT3, override mode will begin when:

- the up or down arrow button on the *SBC*-STAT3 is pressed; or
- the user enters override mode through the User Menu. Refer to Section 6.6.1.

6.5 MENU ACTIONS

When you enter a menu you can enable/disable or set/edit a value. Sections 6.5.1 and 6.5.2 describe how to perform these actions.

6.5.1 ENABLE/DISABLE VALUES

After entering a menu, use the up and down arrows to highlight a selection, then press the ✓ button to initiate an action or enable/disable a function. Press the ✖ button to exit and return to the previous menu. Refer to Section 6.6 for more information about the *SBC*-STAT3 menus.

NOTE

Only one action per menu can be enabled at any time. To disable an action highlight the action and press ✓.

6.5.2 SETTING VALUES

Options in the Install, Calibrate (*SBC*-V3Tb only), Balance (*SBC*-V3Tb only), and Service menus allow values to be set. Selecting one of these options opens an Edit screen allowing you to use the ✓ button to move places to the right and the ▲ and ▼ buttons to change values. Once you have entered a desired value, press ✓ to highlight **set** and press ✓ once more to store the value and return to the previous menu. To exit the Edit screen without saving any changes, press ✖.

6.6 *SBC*-STAT3 MENUS

The *SBC*-STAT3 displays a menu system through which the user navigates using the *SBC*-STAT3 buttons.

The menus provide different levels of monitoring and control. They are as follows:

- User
- Install
- Calibrate (*SBC*-V3Tb only)
- Balance (*SBC*-V3Td only)
- Service

Sections 6.6.1 through 6.6.5 further describe the *SBC*-STAT3 menus.

6.6.1 USER MENU

The main menu is the User Menu. The User Menu can be reached by pressing the Select button (✓) while viewing the room temperature display.

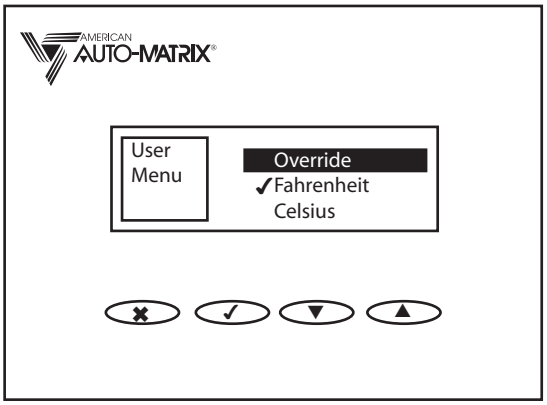


Figure 6-3: User Menu

From the User Menu, the user can press the up and down arrow buttons to highlight an entry. The entries are **Override**, degrees **Fahrenheit**, and degrees **Celsius**. Highlight then press the Select button (✓) to initiate an action or enable/disable a function. Press the Escape button (✖) to exit and return to the previous menu.

NOTE

If the user selects **Override** while the + icon is displayed, extended occupancy will be canceled.

6.6.2 INSTALL MENU

To enter the Install Menu, press the Escape (✖) and Up (▲) buttons simultaneously. A password prompt will appear. Enter your four digit password using the up and down arrow buttons. The default passwords are as follows:

- **User**: No password required
- **Install**: 3300
- **Calibrate**: 2200 (*SBC*-V3Tb only)
- **Balance**: 2200 (*SBC*-V3Td only)
- **Service**: 1100

Press Select (✓) to move each place to the right. Once you have selected the correct password press ✓ one more time to enter the Install Menu.

Through the Install Menu, users can:

- View **Ctrl Mon** functions (further described in Section 6.6.2.1);
- Perform an **LED Test** (further described in Section 6.6.2.2);
- Monitor and edit the **Properties** of the SBC controller (further described in Section 6.6.2.3), and
- **Reset** the *SBC*-STAT3 and the *SBC*-V3T (further described in Section 6.6.2.4)

The menu display remains on for four minutes. The LED flashes yellow 15 seconds before the display clears. Pressing any button while viewing the menu extends the time the menu is displayed. To exit out of a menu press the ✖ button until the room temperature screen is displayed.

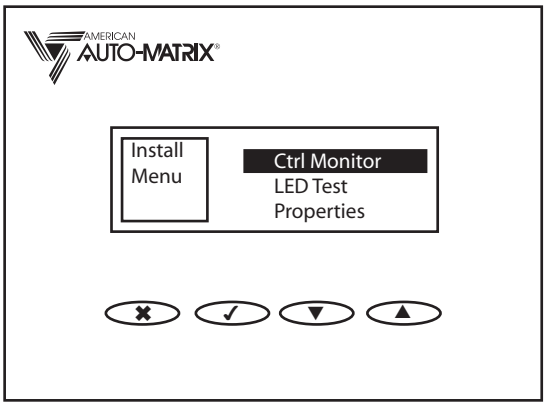


Figure 6-4: Install Menu

6.6.2.1 CONTROL MONITOR

The first menu option listed in the Install Menu is **Ctrl Monitor**. This option allows the monitoring of temperature and flow control operation.

NOTE

There are two (2) *SBC*-V3Tb Control Monitor screens and only one (1) *SBC*-V3Td Control Monitor screen.

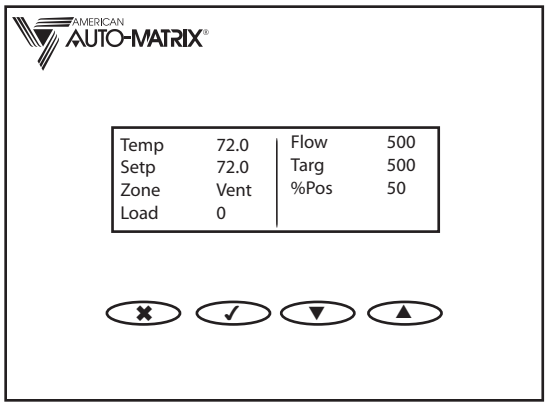


Figure 6-5: SBC-*V3Tb Ctrl Monitor Screen 1*

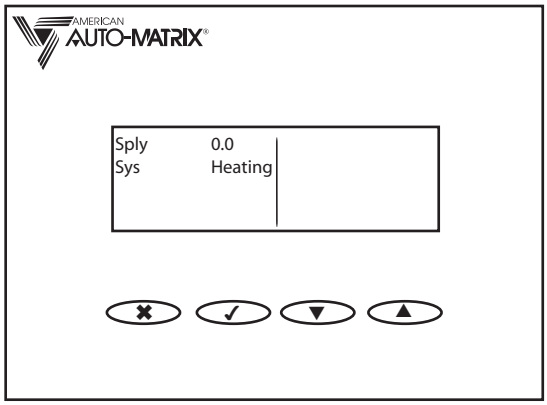


Figure 6-6: SBC-*V3Tb Ctrl Monitor Screen 2*

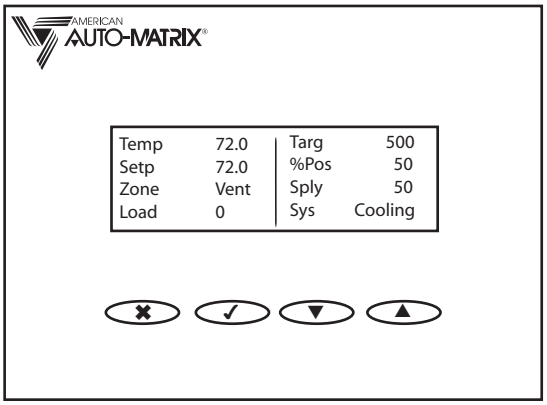


Figure 6-7: SBC-*V3Td Ctrl Monitor Screen*

6.6.2.2 LED Test

A temporary option under the Install menu is LED test. This allows the installer to toggle the LED modes. The modes are:

- Green
- Red
- Bright Red Flash
- Green Flash
- Slow Yellow Flash
- Yellow Flash
- Yellow.

6.6.2.3 Properties

This option gives the installer access to the Channels and Attributes of the connected controller. Press the ▲ and ▼ arrow buttons to scroll through the attributes and to monitor the value of each attribute. Press the ✓ to select the attribute, then you can scroll through all of the attributes for the selected channel. Also, new values can be set for all read/write attributes. If an invalid value is entered, "ERROR" will appear. Figure 6-8 shows a read only Properties screen and Figure 6-9 shows read/write Properties screen.

At the bottom of each Properties screen, the functions of each button are listed. These functions will change as you navigate through each screen. For example, by pressing the ✓ while viewing a read/write attribute, the ✓ button will have the following functions: attr, edit, next, and set.

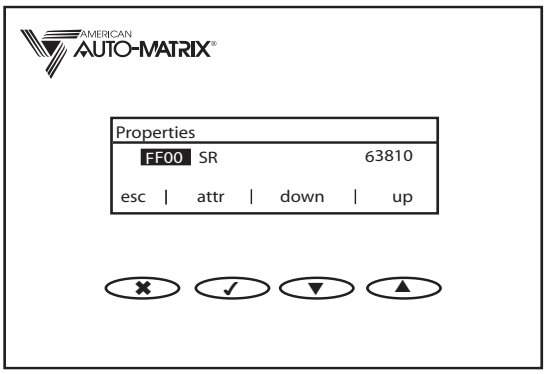


Figure 6-8 Read only Properties Screen

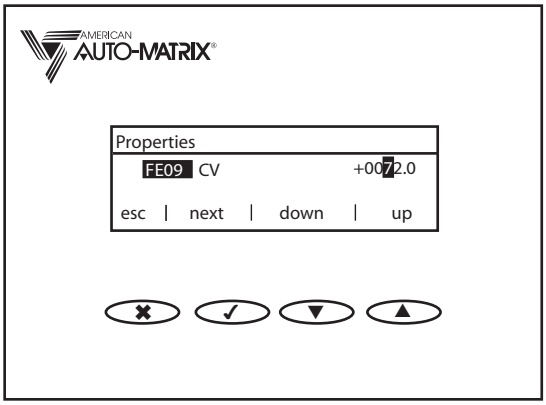


Figure 6-9: Read/Write Properties Screen

6.6.2.4 Reset

This option restarts the SBC Controller and the *SBC*-STAT3.

6.6.3 CALIBRATE MENU (*SBC*-V3Tb ONLY)

Through the Calibrate (Cal) Menu, users can:

- View **Ctrl Monitor** functions (refer to Section 6.6.3.1);
- Perform **Calibrate** functions (further described in Section 6.6.3.2);
- Perform **Damper Mode** functions (further described in Section 6.6.4.2);
- **Reset** the *SBC*-STAT3 and the *SBC*-V3T (refer to Section 6.6.2.4)

To access the Calibrate Menu, press the ✖ and the ✓ buttons simultaneously. Enter your four digit password using the up and down arrow buttons to scroll through the numbers and Select (✓) to move each place to the right. Once you have selected the correct password press ✓ one more time to enter the Calibrate Menu screen.

6.6.3.1 *SBC*-V3Tb CONTROL MONITOR

The first menu option listed in the Calibrate Menu is **Ctrl Monitor**. This option allows the monitoring of temperature and flow control operation.

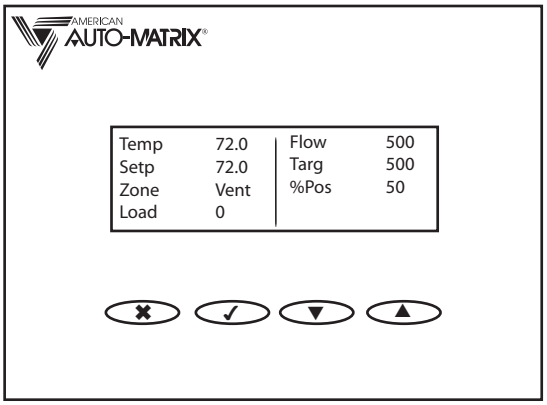


Figure 6-10: SBC-*V3Tb Ctrl Monitor Screen 1*

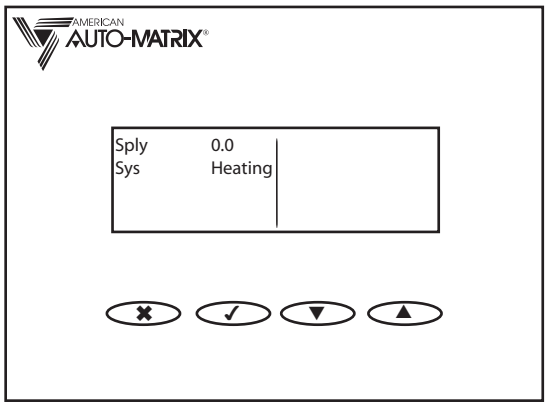


Figure 6-11: SBC-*V3Tb Ctrl Monitor Screen 2*

6.6.3.2 CALIBRATE (*SBC*-V3Tb ONLY)

Sections 6.6.3.2.1 through 6.6.3.2.4 describe the functions that can be performed from the Calibration menu.

6.6.3.2.1 MEASURED SP

Here the measured Pressure in inches W.C. is entered during the calibration process. The 1st Measured SP calculates the K Factor.

6.6.3.2.2 ZERO SP CAL

Selecting this option opens a screen allowing you to press ✓ to initiate the Zero Offset calibration.

6.6.3.2.3 K FACTOR

For the initial SBC controller setup, the K Factor can be estimated. Performing a field flow calibration is required for precise flow measurement. After the calibration procedure is complete you can view the precise K Factor by Selecting this option. For information on entering a value, see **Setting Values** earlier in this section.

6.6.3.2.4 Z OFFSET

Here you can view or set the **Zero Offset** value determined by the calibration process.

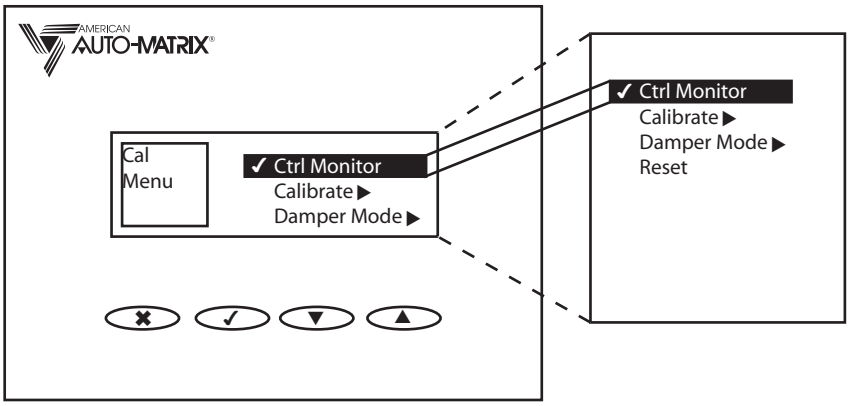


Figure 6-12: Cal Menu

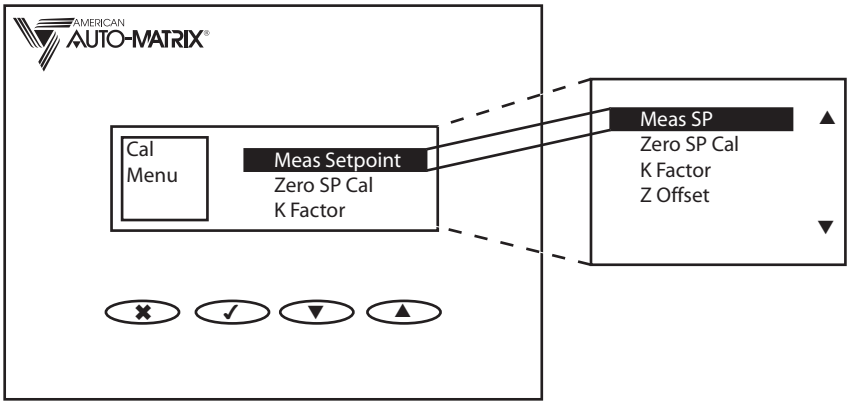


Figure 6-13: Calibration Menu

6.6.3.3 *SBC*-V3Tb DAMPER MODE

From this menu, users can change the Flow:Damper:**Damper Mode** [FA00;**DM**] attribute setting. The Damper Modes for the *SBC*-V3Tb are as follows:

- Controlled (Automatic)
- Full Open

NOTE

Only one mode can be selected at a time.

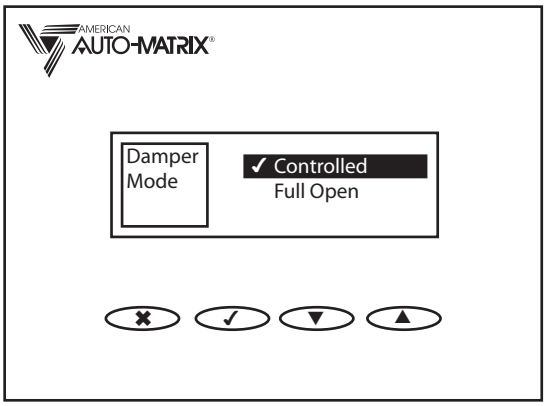


Figure 6-14: SBC-*V3Tb Damper Menu*

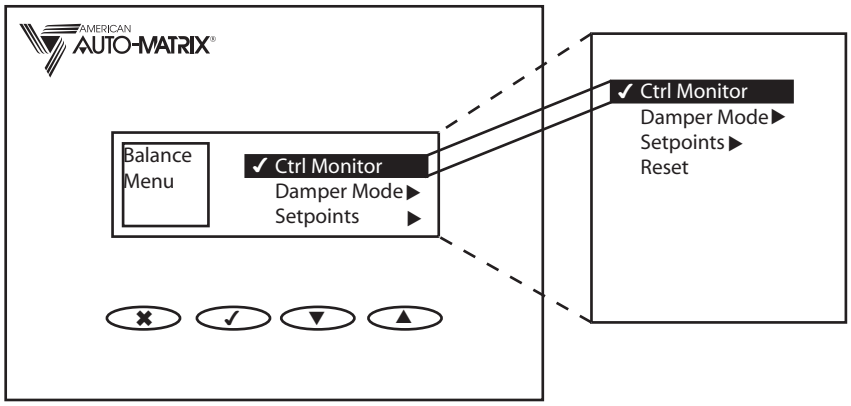


Figure 6-15: SBC-*V3Td Balance Menu*

6.6.4 BALANCE MENU (*SBC*-V3Td ONLY)

Through the Balance Menu, users can:

- View **Ctrl Monitor** functions (refer to Section 6.6.2.1);
- Perform **Damper Mode** functions (further described in Section 6.6.4.2);
- Perform **Setpoint** adjustments (further described in Section 6.6.4.3); and)
- **Reset** the *SBC*-STAT3 and the *SBC*-V3T (refer to Section 6.6.2.4)

To access the Balance Menu, press the ✖ and the ✓ buttons simultaneously. Enter your four digit password using the up and down arrow buttons to scroll through the numbers and Select (✓) to move each place to the right. Once you have selected the correct password press ✓ one more time to enter the Balance Menu screen (as shown in Figure 6-13).

6.6.4.1 *SBC*-V3Td CONTROL MONITOR

The first menu option listed in the Calibrate Menu is **Ctrl Monitor**. This option allows the monitoring of temperature and flow control operation.

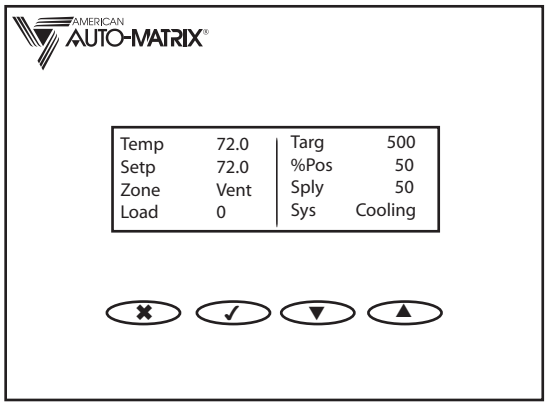


Figure 6-16: SBC-*V3Td Ctrl Monitor Menu*

6.6.4.2 *SBC*-V3Td DAMPER MODE

From this menu, users can change the Flow:Damper:**Damper Mode** [FA00;**DM**] attribute setting.

The Damper Modes for the *SBC*-V3Td are as follows:

- Controlled (Automatic)
- Full Open
- Min Cool
- Max Cool
- Min Heat
- Max Heat
- Min Warm-up
- Max Warm-up

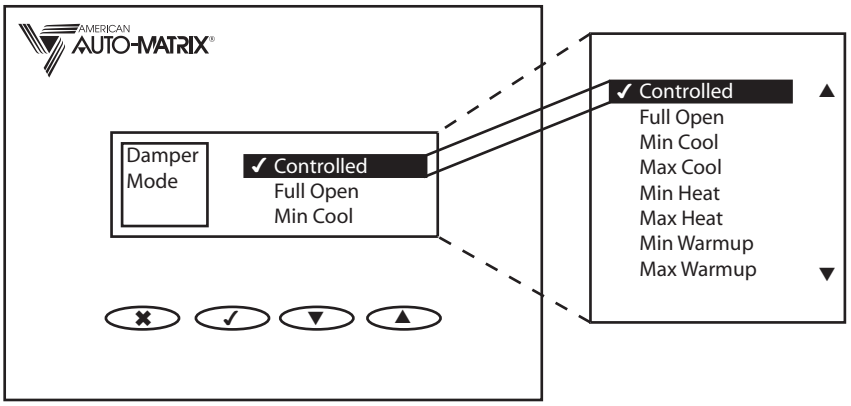


Figure 6-17: SBC-*V3Td Damper Mode Menu*

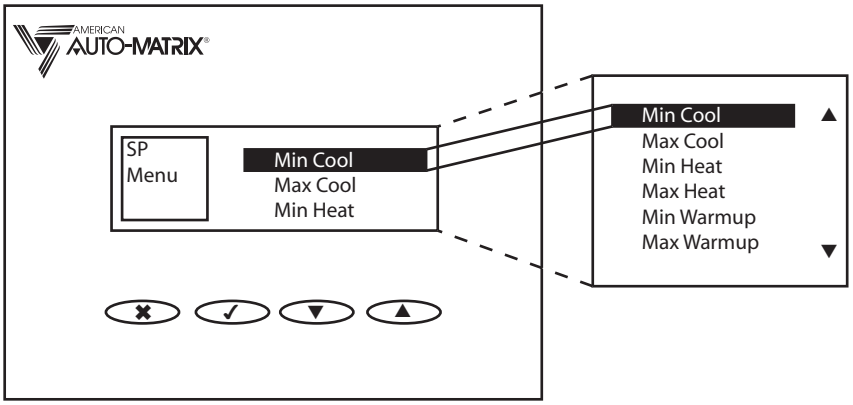


Figure 6-18: Setpoints Menu

NOTE

Only one mode can be selected at a time.

6.6.4.3 SETPOINTS (*SBC*-V3Td ONLY)

Through this menu, you can view and edit the following flow setpoints:

- Min Cool [Flow:Cooling:**Cooling Minimum Flow** (FA01;**CM**)]
- Max Cool [Flow:Cooling:**Cooling Maximum Flow** (FA01;**CX**)]
- Min Heat [Flow:Cooling:**Heating Minimum Flow** (FA01;**HM**)]
- Max Heat [Flow:Cooling:**Heating Maximum Flow** (FA01;**HX**)]
- Min Warm-up [Flow:Cooling:**Warm-up Minimum Flow** (FA01;**WM**)]
- Max Warm-up [Flow:Cooling:**Warm-up Maximum Flow** (FA01;**WX**)]

6.6.5 SERVICE MENU

To enter the Service Menu press the Escape and Down (✖▼) buttons simultaneously. Enter your four digit password using the up and down arrow buttons. Press the Select (✓) to move each place to the right. Once you have selected the correct password, press Select one more time to enter the Service Menu. The default password for this menu is 1100.

Through the Service Menu, users can:

- View **Ctrl Monitor** functions (refer to Section 6.6.2.1);
- Adjust the Heating, Cooling, and Warm-up setpoints (further described in Section 6.6.5.2);
- Perform **Damper Mode** functions (further described in Section 6.6.4.2);
- Perform flow **Setpoint** adjustments (refer to Section 6.6.4.3); and
- **Reset** the *SBC*-STAT3 and the *SBC*-V3T (refer to Section 6.6.2.4).

6.6.5.1 LOCAL TEMP

This option toggles the multiple thermostat display between zone and individual modes.

6.6.5.2 TEMP OFFSET, COOLING SP, HEATING SP, OR WARM-UP SP

These options open an Edit screen allowing you to change a value. Use the up arrow button to toggle between a negative (-) and positive (+) sign. Use the ✓ button to move places to the right and the up and down arrows to change a value. Once you have entered a desired value, press ✓ to highlight set and press ✓ once more to store the value and return to the Service Menu. To exit the Edit screen without saving any changes, press ✖.

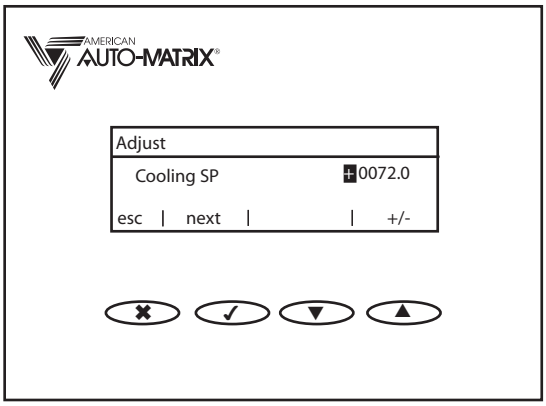


Figure 6-19: Cooling SP Screen

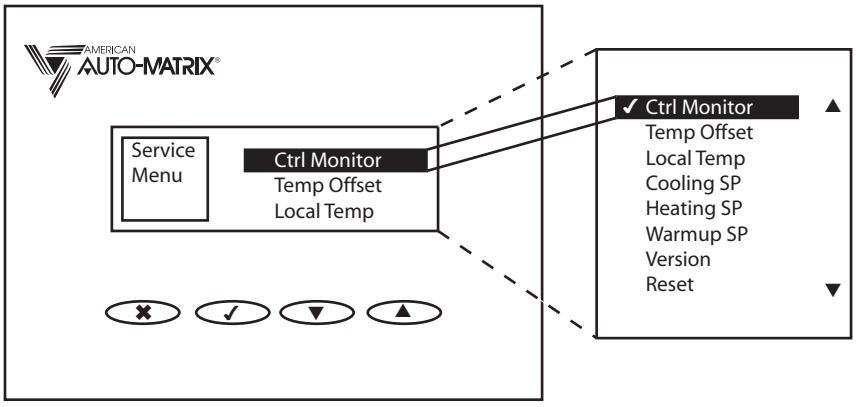


Figure 6-20 Service Menu

6.6.5.3 Version

This option displays:

- *SBC* controller's **Serial Number**,
- The **Version Number** of the software,
- The **Release Code**,
- The **Firmware Type**,
- The **Controller Type**,
- The *SBC* controller's **Unit ID**,
- The **Thermostat Version**, and
- The **Global ID**.

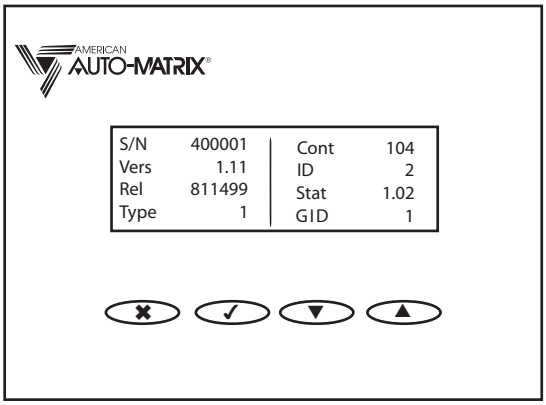


Figure 6-21: Version Screen

APPENDIX A: *SBC*-V3Tb PUP CHANNELS AND ATTRIBUTES

The following tables contain a list of Public Unitary Protocol (PUP) attribute and channel assignments for the *SBC*-V3Tb.

Each attribute is given with its PUP channel assignment, PUP data type, access code, where it is stored, its *SoloPro for Windows* location and a brief description.

SYSTEM CHANNEL, FF00

FF00 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
SR	FE	R	RAM Flash	System/ About	**Flash Release Code** uniquely defines each flash firmware image
TF	FE	RW	EE 0	System/ Interlocks	**Time in Fire** number of minutes the *SBC*-V3Tb remains in fire mode upon receipt of a "Change Operation Mode" broadcast. If **TF** = 0, the *SBC*-V3Tb will remain in fire mode until the controller is reset. If **TF** = 255, then the *SBC*-V3Tb will not accept "Change of Mode" broadcasts.
TP	FE	RW	EE 0 Irresponsible Peer	Network/ Configuration	**Token Passing Type** defines the mode for token passing. When a controller is an Irresponsible Peer it will always return a token to the device that passed it, after performing any pending transactions. In Full Administrator mode, the token is passed to each unit listed in the Peer List (FF00;**U1** through FF00;**U4**). describes the mode for token passing 0=Irresp. Peer 1=Full Administrator
U1-U4	FE	RW	EE 65535	Network/ Configuration	**Peer Unit Number** defines the Unit ID of a peer. In Full Administrator mode the token is passed to each unit in the Peer List.
UP	FE	R	EE 0	System/ Diagnostics	**Flash Update Count** increments each time a new flash firmware image is accepted by the controller.
VE	FA	R	RAM Flash	System/ About	**Version Number** contains the factory-set firmware version
WC	FE	RW	EE 0	System/ Diagnostics	**Watchdog Count** increments upon firmware failure but can also be advanced during the removal of power
ZN	FE	RW	EE 0	Network/ Configuration	**Zone Number** from 0 to 65,535 used to group controllers so that they can be controlled simultaneously
ZP	FE	R	RAM 0	System/ Diagnostics	**MMT Pulse Count** advances when MMT takes action to maintain the operation of the actuator
BU	FE	RW	RAM 0	System/ Power-up	**Back Up RAM Values** copies specific attribute values from RAM to EEPROM when set to 1: 0=normal operation, 1=back up RAM to EEPROM
CC	FE	RW	EE 0	System/ Diagnostics	**Clock Fail Count** increments upon hardware failure but can also be advanced during the removal of power
CM	FE	R	RAM 255 Factory Set	System/ About	**Controller Manufacturer** contains the factory-set manufacturer number for the unitary controller
CP	FE	RW	EE 0	Network/ Configuration	**Communication Speed** specifies the communication speed (baud rate) at which devices on this network will communicate 0=9600 1=4800 2=2400 3=1200 4=reserved 5=reserved 6=38.4K 7=19.2K 8=115.2K 9=57.6K

FF00 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CT	FE	R	RAM 104 Factory Set	System/ About	**Controller Type** factory-set controller type identifies the type of unitary controller
DE	FE	RW	RAM 0	System/ Power-up	**Default Enable** this attribute is used to restore configuration settings to factory defaults
EM	FE	RW	EE 0	System/ About	**English/Metric** specifies which units of measurement to use in returning temperature and airflow values: 0=English Units; 1=Metric Units
ER	FE	RW	EE 0 Disabled	Network/ Configuration	**Token Recovery** enables Token Recovery. In a token passing environment there should always be network activity, but if a token is lost the network will fall silent. If Token Recovery is enabled, and a token is lost, Full Administrator will detect the condition and initiate a new token. 0=Disabled 1=Enabled
F1	FE	RW	EE 0	System/ Interlocks	**Fan Failure Interlock Trips Fan?** When **F1** is set to 0, Interlock 1 will not trip the fan. When set to 1 and Interlock 1 is active, the fan is shut down.
F2	FE	RW	EE 0	System/ Interlocks	**Fan Failure Interlock Trips Fan?** When **F2** is set to 0, Interlock 2 will not trip the fan. When set to 1 and Interlock 2 is active, the fan is shut down.
F3	FE	RW	EE 0	System/ Interlocks	**Fan Failure Interlock Trips Fan?** When **F3** is set to 0, Interlock 3 will not trip the fan. When set to 1 and Interlock 3 is active, the fan is shut down.

FF00 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
FT	FE	R	RAM 3 Factory Set	System/ About	**Firmware Type** defines the class of firmware operating system used in this controller
IC	FE	R	EE 0	System/ Diagnostics	**EEPROM Default Count** increments whenever the EEPROM is restored to factory default settings (see FF00;**DE** Default Enable)
ID	FE	RW	EE Factory Set	Network/ Configuration	**Unit Number** used to set a unique network address for each controller connected to a multi-drop
IS	E9	R	RAM N/A	System/ Interlocks	**Interlock Status** displays the status of all of the interlocks **bit 0=interlock 1** **bit 1=interlock 2** **bit 2=interlock 3**
I1	FE	RW	EE 0	System/ Interlocks	**Interlock 1 Channel** specifies the input to be used for interlock 1. Disabling this input disables the PID interlock 1 **0=Disabled** **1=UI1** 2=UI2 3=UI3 4=UI4 5=UI5 6=OIA/B
I2	FE	RW	EE 0	System/ Interlocks	**Interlock 1 Channel** specifies the input to be used for interlock 1. Disabling this input disables the PID interlock 1 **0=Disabled** **1=UI1** 2=UI2 3=UI3 4=UI4 5=UI5 6=OIA/B
I3	FE	RW	EE 0	System/ Interlocks	**Fan Failure Interlock** used as a Proof of Flow interlock. 0=Disabled 1=Fan Status.
OC	FE	RW	EE 0	System/ Diagnostics	**Illegal Opcode Count** increments upon firmware failure but can also be advanced during the removal of power

FF00 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
PD	FE	RW	EE 5	System/ Power-up	**Power On Delay** time delay in seconds (0–255) that must elapse after the *SBC*-V3T is reset before output control or alarm functions can begin: 0=no delay, 1–255=delay specified in seconds
PS	FE	RW	EE 2	System/ Power-up	**Power Up State** schedule state the *SBC*-V3T will operate in when it is initially powered or the state that it will operate in when power is restored after a power failure 0=unoccupied 1=warmup 2=occupied 3=night setback
RC	FE	RW	EE 0	System/ Diagnostics	**Power-up Count** increments each time power is applied to the controller. This counts power outages and noise related resets as well as resets initiated through FF00;**RS**.
RI	FE	RW	EE 0	System/ Interlocks	**Reset Fan Failure Interlock** When Fan Failure Interlock is enabled to shut down the fan (FF00;**F3**=1), setting **RI**=1 allows the fan to restart.
RS	FE	RW	RAM 0	System/ Power-up	**Reset the Controller?** used to reset the *SBC*-V3T: 0=disabled (default), 1=reset the *SBC*-V3T
SN	FE	R	RAM factory set	System/ About	**Serial Number** displays the serial number of the *SBC*-V3T controller

OUTSIDE TEMPERATURE CHANNEL, FE09

FE09 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FD	R (RW if OI=1)	RAM NA	Temperature/ Outside	**Outside Temperature** shows the current value of outside air temperature (OAT). This value includes the FE09;**OF** offset adjustment
OF	FD	RW	EE 0	Temperature/ Outside	**Outside Temperature Adjustment** defines an offset used to adjust FE00;**ST**
OI	FE	RW	EE 0	Temperature/ Outside	**Override Outside Temperature?** this attribute allows the Supply Temperature (FE00;**ST**) to be altered manually 0=No 1=Yes
RE	FE	RW	RAM 1	Temperature/ Outside	**Channel Reliability** indicates whether or not the OAT value can be trusted 0=Reliable 1=Unreliable

SUPPLY TEMPERATURE CHANNEL, FE08

FE08 Attr.	Data Type	Access	Store & Default	SP for WIndows Location	Description
CV	FD	R (RW if OI=1)	RAM NA	Temperature/ Supply	**Supply Temperature** shows the current value of source/duct temperature.
DD	FC	RW	EE 2.5°F	Temperature/ Supply	**Auto Mode Dead Band** defines the temperature difference by which the supply air must either exceed the FE00;**HC** heating setpoint to switch to heating mode or fall below the FE00;**CC** cooling setpoint to engage cooling mode
OF	FD	RW	EE 0	Temperature/ Supply	**Supply Temperature Adjustment** defines an offset used to adjust FE00;**ST**
OI	FE	RW	EE 0	Temperature/ Supply	**Override Supply Temperature?** this allows the Supply Temperature (**CV**) to be altered manually 0=No 1=Yes
RE	FE	RW	RAM	Temperature/ Supply	**Channel Reliability** indicates whether or not the Supply/Duct Temperature value can be trusted 0=Reliable 1=Unreliable
SM	FE	R	RAM NA	Temperature/ Supply	**Supply Mode** indicates that supply air is suitable for heating or cooling 0=Cooling 1=Heating

UI1 - UI5 CHANNEL, FE01-FE05

FE0x Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FD	R (RW if **OI**=1)	RAM NA	I/O Setup/Universal Inputs (UI1 - UI5)	**Source Temperature** shows the current value of source/duct temperature
DT	FE	RW	EE 253	I/O Setup/Universal Inputs (UI1 - UI5)	**Data Type for Input** specifies the PUP data type for the input
HL	FD	RW	EE 0.0	I/O Setup/Universal Inputs (UI1 - UI5)	**High Alarm Limit** if alarms are enabled and the current value rises above this value, a high limit alarm will be generated
HS	FD	RW	EE 0.0	I/O Setup/Universal Inputs (UI1 - UI5)	**Alarm Limit Hysteresis** determines when the *SBC*-V3Tb returns from a high or low limit alarm
IF	FE	RW	EE 0.0	I/O Setup/Universal Inputs (UI1 - UI5)	**Input Filter Delay** specifies the amount of time in tenths of seconds during which an input configured as digital input must remain stable for the value to be considered reliable
IP	FE	RW	EE 0	I/O Setup/Universal Inputs (UI1 - UI5)	**Input Polarity** specifies the input polarity when the input is configured as a digital input 0=Normal 1=Reverse
LL	FD	RW	EE 0.0	I/O Setup/Universal Inputs (UI1 - UI5)	**Low Alarm Limit** specifies the maximum engineering unit for the input corresponding to the highest value measured at the input connection
MN	FD	RW	EE 0.0	I/O Setup/Universal Inputs (UI1 - UI5)	**Minimum Scaled Value** specifies the minimum engineering unit for the input corresponding to the lowest value measured at the input connection
MX	FD	RW	EE 0.0	I/O Setup/Universal Inputs (UI1 - UI5)	**Maximum Scaled Value** specifies the minimum engineering unit for the input corresponding to the lowest value measured at the input connection
OI	FE	RW	EE 0	I/O Setup/Universal Inputs (UI1 - UI5)	**Override Input** allows a host or operator to directly set the value of the source/duct temperature 0=No 1=Yes
RE	FE	R	RAM NA	I/O Setup/Universal Inputs (UI1 - UI5)	**Data Reliability** an analog input value is considered unreliable if it is out of range for the selected sensor type
ST	FE	RW	EE 7	I/O Setup/Universal Inputs (UI1 - UI5)	**Sensor Type** selects one of the following input types: 0= digital 2= full-scale linear -5V dc or 0-20mA scaled from MN to MX 3= 4–20mA liner scaled from MN to MX 7= -22.0 to 122.0°F thermistor 1,4,5, and 6 unused
SU	FD	RW	EE 0.0	I/O Setup/Universal Inputs (UI1 - UI5)	**Amount of Setup/Setback Alarm Limit** specifies the amount added to FE04;HL or subtracted from FE04;**LL** during unoccupied periods

FE0x Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
AE	FE	RW	EE 0	I/O Setup/Universal Inputs (UI1 - UI5)	**Alarm Enable** specifies the type of alarm checking to be done on the FE04;**CV** value 0=disabled 1= contact (0→1) 2=contact (1→0) 3=contact (1↔0) 4=low limit alarm 5=high limit alarm 6=low and high limit
AS	FE	R	RAM 0	I/O Setup/Universal Inputs (UI1 - UI5)	**Alarm Status** shows the current alarm condition 0=no alarm 1=contact (0→1) 2=contact (1→0) 3=change of state 4=unused 5=low limit alarm 6=high limit alarm

TEMPERATURE CHANNEL, FE00

FE00 Attr.	Data Type	Access	Store & Default	SP for Windows location	Description
ZT	FD	RW (W if FE00; **OI**=1)	RAM NA	Temperature/ Thermostat	**Zone Temperature** shows the current temperature value measured by the thermostat as adjusted by FE00;**OF**
AE	FE	RW	EE 0	Temperature/ Alarms	**Alarm Enable** specifies the type of alarm checking to be done on the CV value 0=disabled 4=low limit alarm 5=high limit alarm 6=low and high limit 1-3 and 7-12 are unused
AS	FE	R	RAM 0	Temperature/ Alarms	**Alarm Status** shows the current alarm condition 0=normal 5=low limit 6=high limit 1-4 and 7-12 are unused
BM	FE	RW	EE 0	Temperature/ Sensor Bus	**Bus Mode, Master, Slave** should be set to Master unless multiple controllers are wired onto a SSB. Any additional controllers on the SSB must be configured as Slaves 0=Master 1=Slave
BT	FE	RW	EE 1 cooling only	Temperature/ Thermostat	**Control Mode** this attribute specifies the type of terminal box being used 0=None 1=Cooling Only 2=Heating Only 3=Supply Dependant (VST)
CC	FD	R	RAM NA	Temperature/ Cooling Setpoints	**Current Setpoint** this attribute shows the current cooling flow control setpoint
CH	FD	R	RAM	Temperature/ Heating Setpoints	**Current Setpoint** this attribute shows the current heating flow control setpoint
CV	FD	RW	RAM NA	Temperature/ Alarms	**Current Value** shows the current value of the input
DF	FE	RW	EE 0	Temperature/ Sensor Bus	**Display Format** describes the format used to display the current temperature on the digital thermostat 0=##d 1=##.#d 2=##df 3=##.#df 4=None
DL	FD	R	RAM NA	Temperature/ Thermostat	**Demand Load** indicates the heating/cooling demand of the zone in terms of the temperature separation from setpoints
DM	FE	R	RAM NA	Temperature/ Thermostat	**Zone Demand** indicates the demand for the zone 0=Vent 1=Cool 2=Heat
DS	FE	RW	EE 0 degrees F	Temperature/ Sensor Bus	**Display Mode** specifies whether English or Metric units are to be used for the digital thermostat display 0=Fahrenheit 1=Celsius
DV	FE	RW	EE 0	Temperature/ Sensor Bus	**Display Value** when FE00;**DV**=0 each digital thermostat displays the identical temperature value (average) (FE00;**ZT**). When FE00;**DV**=1, each thermostat displays its own temperature
ED	FE	RW	EE 60 minutes	Temperature/ Override	**Extended Occupancy Duration** this attribute specifies the amount of time in minutes to extend occupancy

FE00 Attr.	Data Type	Access	Store & Default	SP for Windows location	Description
ER	FE	R	RAM NA	Temperature/ Override	**Extended Occupancy Remaining** this attribute shows the amount of time remaining in extended occupancy
G0	FE	R	RAM NA	Temperature/ Sensor Bus	**GID Device 0** is the global identification for the SSB device
G1	FE	R	RAM NA	Temperature/ Sensor Bus	**GID Device 1** is the global identification for the SSB device
G2	FE	R	RAM NA	Temperature/ Sensor Bus	**GID Device 2** is the global identification for the SSB device
G3	FE	R	RAM NA	Temperature/ Sensor Bus	**GID Device 3** is the global identification for the SSB device
HL	FD	RW	EE 0.0	Temperature/ Alarms	**High Alarm Limit** if alarms are enabled and the current value rises above this value, a high limit alarm will be generated
HS	FD	RW	EE 0.0	Temperature/ Alarms	**Alarm Limit Hysteresis** determines when the *SBC*-V3Tb returns from a high or low limit alarm
LL	FD	RW	EE 0.0	Temperature/ Alarms	**Low Alarm Limit** if alarms are enabled and the current value drops below this value, a low limit alarm will be generated
NC	FD	RW	EE 5.0	Temperature/ Cooling Setpoints	**Night Setback** specifies, in +/- degrees, the amount to be added to the cooling setpoint (FE00;**CS**) when the *SBC*-V3Tb is in night setback mode
NH	FD	RW	EE 10.0°F	Temperature/ Heating Setpoints	**Night Setback** specifies, in +/- degrees, the amount to be added to the heating setpoint (FE00;**HS**) when the *SBC*-V3Tb is in night setback mode
OF	FD	RW	EE 0	Temperature/ Thermostat	**Temperature Correction** this defines the correction that is being applied to temperature readings
OI	FE	RW	EE 0	Temperature/ Thermostat	**Override Temperature Value** allows you to write directly to FE00;**ZT** 0=No 1=Yes
PB	FE	RW	EE 2200	Temperature/ Sensor Bus	**Balancer P.I.N.** this personal identification number controls access to the Balance Menu
PG	FE	RW	EE	Temperature/ Sensor Bus	**Primary GID** Specifies the GID of the Primary thermostat in Primary GID mode (**RM**=8). If unavailable then (**RM**=0) is used.
PI	FE	RW	EE 3300	Temperature/ Sensor Bus	**Installer P.I.N.** This Personal Identification Number controls access to all menus.
PS	FE	RW	EE 1100	Temperature/ Sensor Bus	**Service P.I.N.** this personal identification number controls access to the Service Menu
PU	FE	RW	EE 0000	Temperature/ Sensor Bus	**User P.I.N.** this personal identification number controls access to the User Menu
RD	FC	RW	EE 0	Temperature/ Thermostat	**Reversing Delay** specifies the delay in minutes imposed before a zone can call for Heat after a period of cooling or for Cool after a period of heating.

FE00 Attr.	Data Type	Access	Store & Default	SP for Windows location	Description
RM	FE	RW	EE	Temperature/ Sensor Bus	**Read Mode** Specifies the technique used to determine Zone Temperature when multiple thermostats are present. Avg=0 Highest=1 Lowest=2 Hi/Lo VST=3 Device 0=4 Device 1=5 Device 2=6 Device 3=7 Primary GID=8
SC	FD	RW	EE 72.0	Temperature/ Cooling Set-points	**Cooling Setpoint** shows the zone temperature set-point desired to begin cooling control
SD	FE	RW	EE 0	Tempera-ture/Setpoint Adjust	Calculated Set-point Display allows users to configure the dis-play of setpoint adjustment.
SE	FE	RW	EE 1 enables	Temperature/ Override	**Global Override** enables or dis-ables your ability to enter extended occupancy over-ride 0=Disabled 1=Enabled
SH	FD	RW	EE 68.0°F	Temperature/ Heating Set-points	**Heating Setpoint** this attribute shows the zone temperature set-point desired to begin heating control
SU	FC	RW	EE 0.0	Temperature/ Alarms	**Amount to Setup/Setback Alarm Limit** specifies the amount added to **HL** or subtracted from **LL** during unoccupied peri-ods
SW	FD	RW	EE 72.0°F	Temperature/ Heating Set-points	**Warm-up Set-point** shows the zone temperature set-point desired for beginning warm-up heating control
T0	FD	R	RAM NA	Temperature/ Sensor Bus	**Reading Device 0** is the raw read-ing for Device 1 on a SSB
T1	FD	R	RAM NA	Temperature/ Sensor Bus	**Reading Device 1** is the raw read-ing for Device 2 on a SSB
T2	FD	R	RAM NA	Temperature/ Sensor Bus	**Reading Device 2** is the raw read-ing for Device 3 on a SSB
T3	FD	R	RAM NA	Temperature/ Sensor Bus	**Reading Device 3** is the raw read-ing for Device 3 on a SSB
TM	FD	RW	EE 0.5°F	Temperature/ Setpoint Adjust	**User Adjust Increment** this attribute specifies the magnitude of incremental changes to the User Setpoint Off-set (FE00;**TS**)
TP	FF	RW	RAM 0	Temperature/ Setpoint Adjust	**User Adjust Position** the User Setpoint Offset (FE00;**TS**) can be raised or lowered in inte-gral steps; the FE00;**TP** attribute tracks the current step
TR	FE	RW	RAM 0	Temperature/ Setpoint Adjust	**User Adjust Remaining** dis-plays the time remaining before the User Setpoint Offset (FE00;**TS**) setting is reset
TS	FD	RW	RAM 0	Temperature/ Setpoint Adjust	**User Setpoint Offset** this attribute defines an offset to be applied to PID setpoints
TT	FE	RW	EE 120 min-utes	Temperature/ Setpoint Adjust	**User Adjust Duration** the User Setpoint Offset (FE00;**TS**) is a temporary setting; the FE00;**TT** attribute defines in minutes the duration for which the setting applies

FE00 Attr.	Data Type	Access	Store & Default	SP for Windows location	Description
UC	FD	RW	EE 5.0	Temperature/ Cooling Set-points	**Unoccupied Set-back** this attribute specifies, +/- degrees, the amount to be added to the cool-ing setpoint (FE00;**CS**) when the *SBC*-V3Tb schedule is in unoccupied mode
UH	FD	RW	EE 10.0°F	Temperature/ Heating Set-points	**Unoccupied Set-back** specifies, in +/- degrees, the amount to be added to the heat-ing setpoint (FE00;**HS**) when the *SBC*-V3Tb is in night setback mode
ZS	FD	RW	RAM	Temperature/ Setpoint Adjust	**Zone Midpoint** displays the mid-point between the current cooling and heating set-points.

AO 1-4 SETUP CHANNEL, FD01-FD04

FD0x Attr.	Data Type	Access	Store & Value	SP for Windows Location	Description
CV	FD	RW	RAM 0.0	I/O Setup/ Analog Outputs (AO1 - AO4)	**Current Output Value** shows the current value of the analog output
DT	FE	RW	EE 252	I/O Setup/ Analog Outputs (AO1 - AO4)	**Data Type for Output** specifies the PUP data type for the analog output
HS	FA	RW	EE 100.0	I/O Setup/ Analog Outputs (AO1 - AO4)	**Maximum Scaled Voltage** specifies the actual analog output value for a FD01;**CV** value of FD01;**MX**
LS	FA	RW	EE 0.00	I/O Setup/ Analog Outputs (AO1 - AO4)	**Minimum Scaled Voltage** specifies the actual analog output value for a FD01;**CV** value of FD01;**MX**
MN	FD	RW	EE 0.0	I/O Setup/ Analog Outputs (AO1 - AO4)	**Minimum Scaled Value** specifies the minimum scaled value for the analog output corresponding to the lowest value output
MX	FD	RW	EE 100.0	I/O Setup/ Analog Outputs (AO1 - AO4)	**Maximum Scaled Value** specifies the maximum scaled value for the analog output corresponding to the highest value output
AM	FE	RW	EE 0	I/O Setup/ Analog Outputs (AO1 - AO4)	**Control Mode** selects the control mode for the analog output 0=Manual 1=Automatic

FAN STATUS CHANNEL, FC02

FC00 Attr.	Data Type	Access	Store & Value	SP for Windows Location	Description
PF	FE	R	RAM	Aux/Fan Status	**Fan Status** shows the status of the fan for Proof of Flow 0=No Flow 1=Flow
IC	FE	RW	EE	Aux/Fan Status	**Status Input** uses a nonzero value to indicate flow 0=None 1=UI1 2=UI2 3=UI3 4=UI4 5=UI5
PD	FE	RW	EE	Aux/Fan Status	**Delay** shows the amount of time, in seconds, imposed before enabling a positive flow indication

OCCUPANCY DETECTION CHANNEL, FC01

FC00 Attr.	Data Type	Access	Store & Value	SP for Windows Location	Description
MS	FE	R	RAM NA	Aux/Occupancy Detector	**Occupancy Status** shows the status of the occupancy detector digital input 0=No Detction 1=Detection
MT	FE	RW	EE 0	Aux/Occupancy Detector	**Extended Occupancy Duration** defines, in minutes, the length of time to override the zone whenever occupancy is detected
IC	FE	RW	EE 0	Aux/Occupancy Detector	**Status Input** uses a nonzero value from UI1 to indicate motion 0=None 1=UI1 2=UI2 3=UI3 4=UI4 5=UI5
MD	FE	RW	EE 30	Aux/Occupancy Detector	**Extended Occupancy Delay** sets the amount of time, in seconds, during which the occupancy detector must remain on before it will override the zone
MR	FE	R	RAM NA	Aux/Occupancy Detector	**Extended Occupancy Remaining** displays the time remaining for occupancy detector override

RELAY OUTPUTS CHANNEL, FB01-FB05

FB01-FB05 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW	RAM NA	I/O Setup/ Relay Outputs K1-K5	**Current Output Value** shows the current value for the analog output 0=Off 1=On
OI	FE	RW	EE	I/O Setup/ Relay Outputs K1-K5	**Override** Overrides the output.
OP	FE	RW	EE 0	I/O Setup/ Relay Outputs K1-K5	**Output Polarity** allows you to change the polarity of the output
RH	FC	RW	RAM *	I/O Setup/ Relay Outputs K1-K5	**Runtime Hours** shows the total amount of time, in hours, during which the output has been energized
RL	FC	RW	EE 0.0	I/O Setup/ Relay Outputs K1-K5	**Runtime Limit** specifies a run time limit in hours for the output

*Run hours are automatically backed up at midnight; restoration occurs when the unit is powered up after loss of power or after a reset.

HEAT 2 CHANNEL, FB05

FB05 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW	RAM NA	Equipment/ Heat 2 (K5)	**Stage 2** defines the status of the output 0=Off 1=On
MR	FC	RW	EE 3.0	Equipment/ Heat 2 (K5)	**Minimum Run Time** shows the minimum amount of time, in minutes, the stage will stay energized
MS	FC	RW	EE 7.0	Equipment/ Heat 2 (K5)	**Minimum Off Time** shows the minimum amount of time, in minutes, the stage will stay de-energized
TO	FC	RW	EE 2.0	Equipment/ Heat 2 (K5)	**Demand Offset** indicates the demand offset from zero required before engaging the stage. Note that the stage may also engage if the Staging Delay of the prior stage expires.

HEAT 1 CHANNEL, FB04

FB04 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW	RAM NA	Equipment/ Heat 1 (K4)	**Stage 1** defines the status of the output 0=Off 1=On
HL	FC	RW	EE 80.0	Equipment/ Heat 1 (K4)	**OAT Heating Lockout** Heating stages will not be engaged if a Reliable (FE09;**RE**=0) Outside Air Temperature (FE09;**CV**) is available that is above the temperature specified by this attribute. Stages will not be de-energized should the OAT rise above this temperature during an active cycle.
MR	FC	RW	EE 3.0	Equipment/ Heat 1 (K4)	**Minimum Run Time** shows the minimum amount of time, in minutes, the stage will stay energized.
MS	FC	RW	EE 7.0	Equipment/ Heat 1 (K4)	**Minimum Off Time** shows the minimum amount of time, in minutes, the stage will stay de-energized.
MX	FC	RW	EE 20.0	Equipment/ Heat 1 (K4)	**Staging Delay** indicates the maximum amount of time, in minutes, that the stage will operate before energizing the next stage of heating.
TH	FC	RW	EE 105.0	Equipment/ Heat 1 (K4)	**DAT High Temp Lockout** Heating stages will be engaged only if there is a Reliable Source/ Duct Temperature (DAT - Discharge Air Temperature) below this setting.
TO	FC	RW	EE 0.0	Equipment/ Heat 1 (K4)	**Demand Offset** indicates the demand offset from zero required before engaging the stage. Note that the stage may also engage if the Staging Time of the prior stage expires.

COOL 2 CHANNEL, FB03

FB03 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW	RAM NA	Equipment/ Cool 2 (K2)	**Stage 2** defines the status of the stage output 0=Off 1=On
MR	FC	RW	EE 3.0	Equipment/ Cool 2 (K2)	**Minimum Run Time** shows the minimum amount of time, in minutes, the stage will stay energized.
MS	FC	RW	EE 7.0	Equipment/ Cool 2 (K2)	**Minimum Off Time** shows the minimum amount of time, in minutes, the stage will stay de-energized.
TO	FC	RW	EE 2.0	Equipment/ Cool 2 (K2)	**Demand Offset** indicates the demand offset from zero required before engaging the stage. Note that the stage may also engage if the Staging Delay of the prior stage expires.

COOL 1 CHANNEL, FB02

FB02 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW	RAM NA	Equipment/ Cool 1 (K2)	**Stage 1** defines the status of the stage output 0=Off 1=On
MR	FC	RW	EE 3.0	Equipment/ Cool 1 (K2)	**Minimum Run Time** shows the minimum amount of time, in minutes, the stage will stay energized
MS	FC	RW	EE 7.0	Equipment/ Cool 1 (K2)	**Minimum Off Time** shows the minimum amount of time, in minutes, the stage will stay de-energized.
MX	FC	RW	EE 20.0	Equipment/ Cool 1 (K2)	**Staging Delay** indicates the maximum amount of time, in minutes, that the stage will operate before energizing the next stage of cooling.
TL	FC	RW	EE 45.0	Equipment/ Cool 1 (K2)	**DAT Low Temp Lockout** Defines the minimum Source/ Duct Temperature (DAT - Discharge Air Temperature) below which cooling will be disengaged. This offers protection against freeze up.
TO	FC	RW	EE 0.0	Equipment/ Cool 1 (K2)	**Demand Offset** indicates the demand offset from zero required before engaging the stage. Note that the stage may also engage if the Staging Delay expires.
CL	FC	RW	EE 55.0	Equipment/ Cool 1 (K2)	**OAT Cooling Lockout** Cooling stages will not be engaged if a Reliable (FE09;**RE**=0) Outside Air Temperature (FE09;**CV**) is available that is below the temperature specified by this attribute. Stages will not be de-energized should the OAT fall below this temperature during an active cycle.

FAN CHANNEL, FB01

FB01 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW	RAM NA	Equipment/ Fan (K1)	**Fan** defines the status of the fan output 0=Off 1=On
FD	FC	RW	EE 30	Equipment/ Fan (K1)	**Shutoff Delay** shows the amount of time, in seconds, the fan output will stay energized once the zone temperature reaches the deadband
FN	FE	RW	EE 0	Equipment/ Fan (K1)	**Night Setback Auto On** defines the mode of the fan during the night setback schedule state. When **FN**=1, the fan runs for the entire period. When **FN**=0, the fan shuts off when the zone temperature is within the deadband
FO	FE	RW	EE 0	Equipment/ Fan (K1)	**Occupied Mode Auto On** defines the mode of the fan during the occupied schedule state. When **FO**=1, the fan runs for the entire period. When **FO**=0, the fan shuts off when the zone temperature is within the deadband
FR	FC	RW	EE 0.5	Equipment/ Fan (K1)	**Minimum Run Time** shows the minimum amount of time, in minutes, the fan output will stay energized
FS	FC	RW	EE 1.0	Equipment/ Fan (K1)	**Minimum Off Time** shows the minimum amount of time, in minutes, the fan output will stay de-energized
FU	FE	RW	EE 1	Equipment/ Fan (K1)	**Unoccupied Mode, Auto On** defines the mode of the fan during the unoccupied schedule state. When **FU**=1, the fan runs for the entire period. When **FU**=0, the fan shuts off when the zone temperature is within the deadband
FX	FC	RW	EE 0.0	Equipment/ Fan (K1)	**Staging Delay** indicates the maximum amount of time, in minutes, that the fan will operate before energizing the first stage of heating or cooling

ANALOG PID CHANNEL, FA11-FA14

FA1x Attr.	Data Type	Access	Store & Value	SP for Windows Location	Description
AO	FD	RW	RAM NA	Aux/PID Control	**Analog Output Value** shows the scaled output value used by the analog output
CE	FE	RW	EE 0	Aux/PID Control	**Enable Control Loop** enables the PID loop 0=No 1=Yes
CS	FD	R	RAM NA	Aux/PID Control	**Calculated Control Setpoint** shows the actual loop control setpoint
DB	FC	RW	EE 0	Aux/PID Control	**Dead band** specifies the input variable range over which the output value is proportional to the error value
IC	FE	RW	EE 0	Aux/PID Control	**Loop Measured Variable** specifies the input to be used for the measured variable for the control loop 0=Disabled 1=Zone Temp 2=Supply Temp 3=Pressure 4=UI1 5=UI2 6=UI3 7=UI4 8=UI5 9=Zone Heating 10=Zone Cooling
IN	FC	R	RAM 0	Aux/PID Control	**Measured Variable's Value** displays the value of the input selected in FA04;**IC**
MR	FD	RW	EE 0	Aux/PID Control	**Maximum Amount to Reset Setpoint** specifies the maximum amount by which to reset the loop setpoint (**SP**) when reset is being used
PB	FC	RW	EE 0	Aux/PID Control	**Proportional Band** specifies the input variable range over which the output value is proportional to the error value
PO	FC	RW	RAM NA	Aux/PID Control	**Percent Output Value** shows the output value in hundredths of a percent
P1	FC	RW	EE 0	Aux/PID Control	**Interlock 1 Position** specifies the PID output value when Interlock 1 is active and enabled.
P2	FC	RW	EE 0	Aux/PID Control	**Interlock 2 Position** specifies the PID output value when Interlock 2 is active and enabled.
P3	FC	RW	EE 0	Aux/PID Control	**No Flow Position** specifies the PID output value when the current value of Fan Status is equal to 0 (No Flow).
RC	FC	R	RAM NA	Aux/PID Control	**Reset Variable's Value** displays the value of the input selected in **RV**
RL	FC	RW	EE 0	Aux/PID Control	**Limit for Maximum Reset** specifies the value at which maximum reset is used
RP	FE	RW	EE 0	Aux/PID Control	**Reset Period** specifies the reset period (in seconds) over which the error history is accumulated
RS	FC	RW	EE 0	Aux/PID Control	**Setpoint at Which Reset Action Begins** specifies the value at which the reset action begins
RT	FC	RW	EE 0	Aux/PID Control	**Derivative Rate** specifies a percentage of change in error that is to be used in calculating FA1x;**PO**
RV	FE	RW	EE 0	Aux/PID Control	**Reset Variable** specifies the input to be used for calculating the reset 0=disabled 1=Zone Temp 2=Supply Temp 3=Pressure 4=UI1 5=UI2 6=UI3 7=UI4 8=UI5

FA1x Attr.	Data Type	Access	Store & Value	SP for Windows Location	Description
SG	FE	RW	EE 0	Aux/PID Control	**Control Action** specifies the control action for the control loop 0=Normal 1=Reverse
SP	FD	RW	EE 0	Aux/PID Control	**Loop Setpoint** specifies the desired loop setpoint
SU	FC	RW	EE 0	Aux/PID Control	**Unoccupied Setup/ Setback** specifies the amount to add (if **SG=**0) or subtract (if **SG**=1) from the set-point during an unoccupied period

PRESSURE CHANNEL, FA05

FA05 Attr.	Data Type	Access	Store & Value	SP for Windows Location	Description
CV	FE	R when FA00;**OI** =0, RW when FA00;**OI** =1	RAM NA	Pressure/ Alarms	**Current Value** shows the current measured amount of pressure in inches W.G.
HL	FE	RW	EE 0	Pressure/ Alarms	**High Alarm Limit** if alarms are enabled and the current value rises above this value, a high limit alarm will be generated
HS	FE	RW	EE 0	Pressure/ Alarms	**Alarm Limit Hysteresis** determines when the *SBC*-V3Tb returns from a high or low limit alarm
LL	FE	RW	EE 0	Pressure/ Alarms	**Low Alarm Limit** if alarms are enabled and the current value drops below this value, a low limit alarm will be generated
SU	FE	RW	EE 0	Pressure/ Alarms	**Amount to Setup/Setback Alarm Limit** specifies the amount added to **HL** or subtracted from **LL** during unoccupied periods
AE	FE	RW	EE 0	Pressure/ Alarms	**Alarm Enable** specifies the type of alarm checking to be done on the **CV** value 0=Disable 4=Low Limit 5=High Limit 6=Low/High Limit
AS	FE	R	RAM 0	Pressure/ Alarms	**Alarm Status** shows the current alarm condition 0=No Alarm 5=Low 6=High

ECONOMIZER CHANNEL, FA01

FA01 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
EE	FE	RW	EE 0	Auxiliary/ Economizer	**Economizer Enable** specifies the PID channel or DO to be used for economizer control. 0=Off 1=PID 1 2=PID 2 3=PID 3 4=PID 4 5=DO 3 6=DO 5 NOTE: Only settings 0, 1, 5, and 6 are available on *SBC*-VAV's flashed with the Bypasss Application.
OH	FD	RW	EE 60.0	Auxiliary/ Economizer	**OAT High Limit** If the OAT is above the high limit and the economizer is enabled, the PID is set to the Minimum Position (as specified in FA01;**EM**).
OL	FC	RW	EE 45.0	Auxiliary/ Economizer	**OAT Low Limit** If the OAT is below the low limit and the economizer is enabled, the PID is set to the Minimum Position (as specified in FA01;**EM**).
EM	FC	RW	EE 10.0	Auxiliary/ Economizer	**Minimum Position** specifies the PID minimum position in percent for the economizer damper.
ED	FC	RW	EE 1.0	Auxiliary/ Economizer	**Economizer Staging Delay** Specifies how many minutes the controller waits before using additional cooling stages after the economizer damper reaches 100%.
CM	FC	RW	RAM N/A	Auxiliary/ Economizer	**Calculated Minimum Position** displays the actual minimum position of the economizer damper
MV	FC	RW	EE 0	Auxiliary/ Economizer	**Reset variable** allows you to specify an input sensor that is to be used to reset the minimum position of the economizer (FA01;**EM**).

FA01 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
MP	FC	RW	EE 0	Auxiliary/ Economizer	**Reset Setpoint** Specifies the value at which the reset action begins. When the value of the reset variable exceeds **MP**, reset action will be used in determining the economizer minimum position.
MR	FC	RW	EE 0	Auxiliary/ Economizer	**Maximum Reset** specifies the maximum amount by which to reset the minimum position setpoint (**EM**) when reset is being used.
ML	FC	RW	EE 0	Auxiliary/ Economizer	**Reset Limit** When the value of the reset variable is equal to **ML**, the maximum reset (**MR**) is used in determining the calculated minimum position.

PRESSURE CHANNEL, FA00

FA00 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW with OI=1	RAM NA	Pressure/ Control	**Current Value** shows the current measured amount of pressure in inches W.G.
DD	FE	RW	EE 0	Pressure/ Bypass Damper	**Direction** used to set the direction of the damper motor 0=Normal 1=Reverse
DM	FE	RW	EE 0	Pressure/ Bypass Damper	**Damper Mode** can be used to command the damper to fully open or to operate at minimum or maximum cooling, heating, and warm-up setpoints
DP	FE	R	RAM NA	Pressure/ Bypass Damper	**Damper Position** shows the damper position
FC	FE	RW	RAM 0	Pressure/ Control	**Fan** shows the current status of the fan output
FH	FE	RW	EE 0.20	Pressure/ Control	**Static Pressure Hysteresis** specifies the maximum amount of flow sensor variation to be tolerated by the *SBC*-V3Tb before it shows a valid change of flow
KC	FE	RW	RAM 0.00	Pressure/ Control	**1-Point Calibration** when you enter the pressure value measured externally, this will automatically adjust the Scaling Factor (FA00;**CK**) based on the present pressure reading to properly scale the duct
OI	FE	RW	EE 0	Pressure/ Control	**Override Pressure Measurement** allows a host or operator to manually set the value of the current pressure
RZ	FE	R	RAM NA	Pressure/ Bypass Damper	**Rejuvenate Count** when MMT detects the possibility of an actuator short, electrical pulses are used in an attempt to rejuvenate the motor
AS	FE	R	RAM NA	Pressure/ Bypass Damper	**Actuator Status** reports the status of the actuator as determined by the MMT 0=Ready 1=Disconnected/ Open 2=Jammed/ shorted
CA	FE	R	RAM NA	Pressure/ Control	**Average Pressure** shows the measured average pressure in inches W.C.
CB	FE	RW	RAM 0	Pressure/ Control	**Calibrate Pressure Sensor** allows a host or operator to manually calibrate the pressure sensor
CD	FE	RW	EE 1.00	Pressure/ Control	**Static Pressure Setpoint** shows the desired pressure setpoint
CK	FE	RW	EE 250	Pressure/ Control	**Scaling Factor** shows the scaling factor as required to calibrate the static pressure reading.

SCHEDULES CHANNEL, F901-F906

F901-F906 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	R	RAM NA	Schedules/ 1-6	**Current Schedule Value** indicates the current state of the schedule: 0=unoccupied mode, 1=warm-up, 2=occupied mode, 3=night setback
NS	E6	RW	EE 08:00	Schedules/ 1-6	**Night Setback** start time in short military format when night setback should begin
OC	E6	RW	EE 08:00	Schedules/ 1-6	**Occupied Time** start time in short military format when occupied mode should begin
UN	E6	RW	EE 17:00	Schedules/ 1-6	**Unoccupied Time** start time in short military format when unoccupied mode should begin
WO	E6	RW	EE 08:00	Schedules/ 1-6	**Warm-up Time** start time in short military format when warm-up mode should begin
AD	E9	RW	EE M T W T F	Schedules/ 1-6	**Active Days** Day-of-week map specifying which of eight possible days of the week (seven days plus holiday) that the schedule is active
AO	FE	RW	EE 0	Schedules/ 1-6	**All-Day Override** this attribute is used to override the schedule in **WO**, **OC**, **UN,** and **NS** for active days

SCHEDULES CHANNEL, F900

F900 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	R	RAM NA	Schedules/ Summary	**Current Value for Schedule** read only attribute that displays the present schedule operating state of the *SBC*-V3Tb as determined by priority checking
DA	FE	RW	RAM NA	Schedules/ Clock/Calendar	**Day of the Week** specifies the current day of the week as a number from 0–7; must be set by a host controller for proper operation (default invalid): bit #0=Monday bit #1=Tuesday bit #2=Wednesday bit #3=Thursday bit #4=Friday bit #5=Saturday bit #6=Sunday bit #7=Holiday
DH	FE	RW	RAM	Schedules/ Clock/Calendar	**Holiday** toggles the holiday status for the current day
DT	E4	RW	RAM	Schedules/ Clock/Calendar	**Current Date** specifies the current date
H0-H9	E4	RW	EE	Schedules/ Clock/Calendar	**Programmed Holiday** specifies the date to be considered a holiday. To ignore, set to 0/0/YY
HE	FE	RW	EE 0	Schedules/ Summary	**Host Overrides Local Schedule?** specifies whether the *SBC*-V3Tb will operate from its local schedules or from a host on the network: 0=**CV** is set by schedules F901–F906, 1=**CV** is set by **HO** (**ZE** must=0)
HO	FE	RW	RAM 0	Schedules/ Summary	**Host Schedule Override** specifies the desired schedule override state of the *SBC*-V3Tb when **HE**=1: 0=unoccupied 1=warm-up 2= occupied 3=night setback
IS	FE	RW	EE 3	Schedules/ Summary	**Inactive Schedule** specifies which of the four possible schedule modes is used by the *SBC*-V3Tb schedules during inactive schedule periods (when current day of the week is not an active day)
TM	E6	RW	RAM NA	Schedules/ Clock/Calendar	**Time** specifies the current system time (HH:MM) in military format from 00:00 to 23:59 (default invalid)

F900 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
ZE	FE	RW	EE 0	Schedules/ Summary	**Zone Schedule Enable** used to set the current schedule mode for the entire zone from the network broadcast of a controller capable of broadcasting zone schedule information to multiple *SBC*-V3Tbs in the zone 0=No 1=Yes
AS	E9	R	RAM NA	Schedules/ Summary	**Active Schedule Bitmap** displays the currently active schedules in bitmap form bit #0=F901 bit #1=F902 bit #2=F903 bit #3=F904 bit #4=F905 bit #5=F906 Bits #6 and #7 are unused
C1	FE	R	RAM NA	Schedules/ Summary	**Current Value of Schedule 1** reflects the current value of F901;**CV**
C2	FE	R	RAM NA	Schedules/ Summary	**Current Value of Schedule 2** reflects the current value of F902;**CV**
C3	FE	R	RAM NA	Schedules/ Summary	**Current Value of Schedule 3** reflects the current value of F903;**CV**
C4	FE	R	RAM NA	Schedules/ Summary	**Current Value of Schedule 4** reflects the current value of F904;**CV**
C5	FE	R	RAM NA	Schedules/ Summary	**Current Value of Schedule 5** reflects the current value of F905;**CV**
C6	FE	R	RAM NA	Schedules/ Summary	**Current Value of Schedule 6** reflects the current value of F906;**CV**

DAMPER CHANNELS, F800-F80F

F800 -F815 Attr.	Data Type	Access	Store & Default	SP for Windows Location	Description
ID	FE	RW	EE 0	Temperature/ Damper Units/(0-15)	**Controller ID** must contain a valid unit ID number for the damper controller
OI	FE	RW	EE 0	Temperature/ Damper Units/(0-15)	**Override** If set to Active, the defined damper controller is used in control. If set as Bypassed, the damper controller is ignored. 0=Active 1=Bypassed
RE	FE	R	RAM 1	Temperature/ Damper Units/(0-15)	**Reliability** Reliable, Unreliable 0=Relliable 1=Unreliable
SC	F8	RW	EE 1.0	Temperature/ Damper Units/(0-15)	**Cooling Sensitivity** defines a weighting factor for each damper controller when calling for cooling.
SH	F8	RW	EE 1.0	Temperature/ Damper Units/(0-15)	**Heating Sensitivity** defines a weighting factor for each damper controller when calling for cooling.
ST	FE	RW	EE 0	Temperature/ Damper Units/(0-15)	**Send Supply Temperature** If set to Yes (**ST**=1) the current Supply Temperature (FE00;**ST**) will be written to the Supply Temperature channel in the damper controller. Note that the Supply Temperature must be set for Override in that controller.
DL	FD	R	RAM NA	Temperature/ Damper Units/(0-15)	**Reported Demand Load** reports the current demand load for the referenced damper controller.
ER	FE	R	RAM 0	Temperature/ Damper Units/(0-15)	**Extended Occupancy Remaining** reflects the extended occupancy time remaining for each damper controller

NETWORK CHANNEL, F005

F005	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FE	RW	RAM 0	Network/ Schedule Broadcast	**Current Value** shows the current value of the network broadcast schedule values received by the *SBC*-V3Tb
RB	FE	RW	EE 0	Network/ Schedule Broadcast	**Receive Broadcast?** enables the *SBC*-V3Tb to receive network broadcasts and sets the F900;**CV** value based on the received value 0=No 1=Yes

NETWORK CHANNEL, F000

F000	Data Type	Access	Store & Default	SP for Windows Location	Description
CV	FD	R	RAM 0	Network/OAT Broadcast	**Current Value** shows the current value of the network broadcast schedule values received by the *SBC*-V3Tb
RB	FE	RW	EE 0	Network/OAT Broadcast	**Receive Broadcast** enables the *SBC*-V3Tb to receive network broadcasts and sets the F900;**CV** value based on the received value 0=No 1=Yes
BE	FE	RW	EE	Network/OAT Broadcast	**Broadcast Enable** enables the active broadcast of a reliable FE09;**CV** OAT value. 0=No 1=Yes

APPENDIX B: PUP DATA TYPES

This Appendix lists the hexadecimal and decimal PUP numeric data type codes. The hexadecimal codes are followed by h and the decimal codes are provided in parentheses.

Code	Digit Format	Meaning
FFh (255)	±XXXXXXXXXX.	signed 10 digit
FEh (254)	XXXXXXXXXX.	unsigned 10 digit
FDh (253)	±XXXXXXXXX.X	signed 9.1 digit
FCh (252)	XXXXXXXXX.X	unsigned 9.1 digit
FBh (251)	±XXXXXXXX.XX	signed 8.2 digit
FAh (250)	XXXXXXXX.XX	unsigned 8.2 digit
F9h (249)	±XXXXXXX.XXX	signed 7.3 digit
F8h (248)	XXXXXXX.XXX	unsigned 7.3 digit
F7h (247)	±XXXXXX.XXXX	signed 6.4 digit
F6h (246)	XXXXXX.XXXX	unsigned 6.4 digit
F5h (245)	±XXXXX.XXXXX	signed 5.5 digit
F4h (244)	XXXXX.XXXXX	unsigned 5.5 digit
F3h (243)	±XXXX.XXXXXX	signed 4.6 digit
F2h (242)	XXXX.XXXXXX	unsigned 4.6 digit
F1h (241)	±XXX.XXXXXXX	signed 3.7 digit
F0h (240)	XXX.XXXXXXX	unsigned 3.7 digit
EFh (239)	±XX.XXXXXXXX	signed 2.8 digit
EEh (238)	XX.XXXXXXXX	unsigned 2.8 digit
EDh (237)	±X.XXXXXXXXX	signed 1.9 digit
ECh (236)	X.XXXXXXXXX	unsigned 1.9 digit
EBh (235)	±.XXXXXXXXXX	signed .10 digit
EAh (234)	.XXXXXXXXXX	unsigned .10 digit
E9h (233)	channel map	one bit per channel
E8h (232)	bitmap of text	one bit per text field
E7h (231)	BCD (H/S/M)	hours is LSB

Code	Digit Format	Meaning
E6h (230)	BCD (H/M)	hours is LSB
E5h (229)	packed BCD	8 BCD digits as 4 bytes
E4h (228)	BCD date (Y/M/D)	MSW is year LSW/MSB is month LSW/LSB is day
E3h (227)	Binary date	MSW is year LSW/MSB is month LSW/LSB is day
E2h (226)	reserved	
E1h (225)	reserved	
E0h (224)	IEEE 784 32-bit floating point	
DFh-00h (223-0)	reserved	