

Single-Channel Pulse Modulating Anti-Sweat Control (SC-PMAC) Installation and Operation Manual



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Please Note: This manual covers the Single Channel PMAC panel (P/N 851-1020) and control modules (P/N 851-1010). The standard PMAC panel and the PMAC Solo panel are covered in the Pulse Modulating Anti-Sweat Control (PMAC) Installation and Operation Manual (P/N 026-1501 Rev 1).

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1 Overview

The Single-Channel Pulse Modulating Anti-Sweat Control (SC-PMAC) is a solid-state anti-sweat heater control system designed to dramatically reduce the cost of operating anti-sweat heaters on low-temperature door-type cases found in most supermarkets.

Normally, anti-sweat heaters operate continuously with no controls, even though 100% operation is required only when in-store humidity levels are high. An SC-PMAC provides a means for pulsing power to the heaters based on environmental conditions, so that heaters will be on for less time during periods where the in-store dewpoint is low. This reduces operating costs by limiting heater operation, and increases heater life by limiting heat cycle fatigue since the heaters are rarely turned off completely.

The SC-PMAC consists of a central panel (*P/N 851-1020*) and a set of control modules (*P/N 851-1010*), each of which controls the heater for one door case. The panel processes commands from the central site controller, which may be an Einstein RX or BX, an RMCC, or a BEC. The panel then sends ON and OFF commands to each of its control modules, which pulse the heaters at the requested time interval. A single panel may control up to 48 modules, each of which controls a single door case.

The RMCC is capable of controlling up to eight heater circuits in a single zone, while the BEC allows SC-PMAC-controlled heater circuits to be operated in two separate zones. Two-zone control allows heaters in higher humidity zones, such as door cases near prep rooms, to be controlled separately from other case heaters. An Einstein RX or BX can be configured with up to eight zones.

1.1. Features

- Full Solid-State Control
- Quiet Operation
- Easily added to existing systems
- Remote communications through the BEC, RMCC, or Einstein controllers
- Controlled by the store environment (humidity and temperature)
- Distributed control module system
- Easy installation
- Max. 12 Amps at 240 VAC

2 Installation

This section of the manual covers wiring and installation for the SC-PMAC control system.

2.1. Panel Mounting

Mount the SC-PMAC panel in a central location such as a motor or electrical room. The room's ambient temperature should always be below 100° F. *Figure 2-1* has the mounting dimensions.

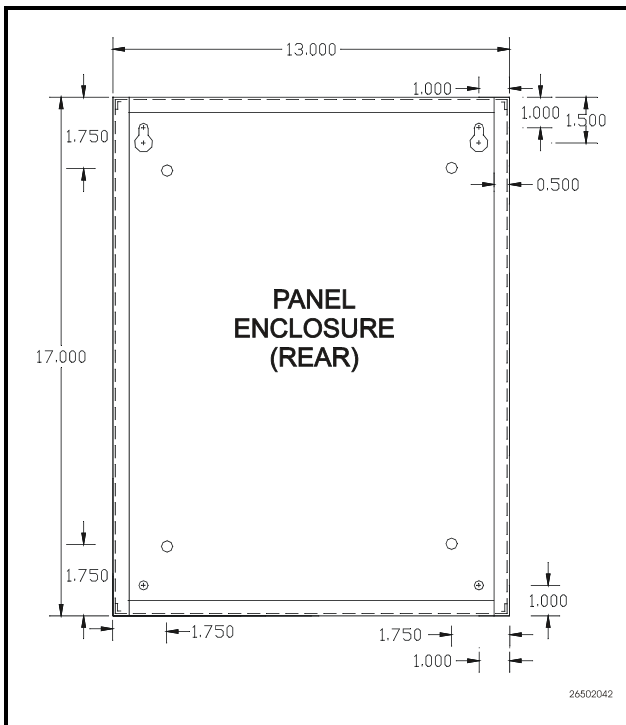


Figure 2-1 - SC-PMAC Panel Dimensions

2.2. Control Module Mounting

The SC-PMAC control modules are mounted somewhere on the case, either in the raceway or on top of the case. The module may be mounted either horizontally or vertically. If mounting horizontally, mount with the heat sink facing up to allow heat to dissipate. If mounting vertically, mount the module so that the heat sink fins are vertical (up-and-down) to allow air to rise through the channels between the heat sink fins. *Figure 2-2* has the mounting dimensions.

When mounting a control module, be sure to leave enough room on both ends of the module to allow easy access to wire connections.

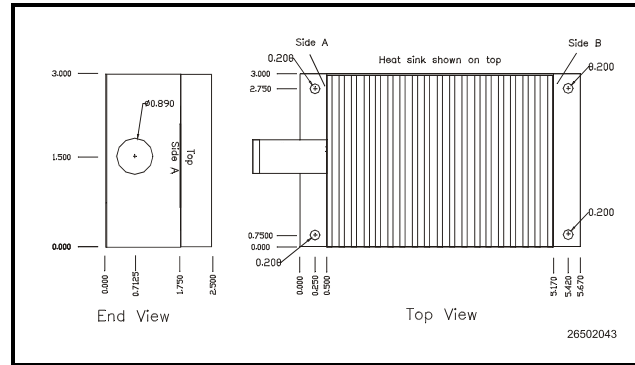


Figure 2-2 - SC-PMAC Control Module Mounting

2.3. SC-PMAC Wiring

Wiring an SC-PMAC system consists of making power and RS485 network connections to the SC-PMAC panel, connecting all control modules to outputs on the SC-PMAC panel, and connecting each control module to the anti-sweat heater on the door case.

2.3.1. Panel Wiring

The SC-PMAC panel requires 110VAC power to operate. Connect the incoming power lines to the 110VAC terminals as shown in *Figure 2-3*.

The 8DO control board inside the SC-PMAC panel communicates with Emerson site controllers (Einstein or REFLECS controllers) via the RS485 I/O network (COM A and COM D on the REFLECS controllers). Using Belden 8641 three-connected shielded wire, connect the panel to the RS485 I/O network as shown in **Detail A-A** of *Figure 2-3*. Refer to the manual for your Emerson site controller for more information about RS485 I/O networking. Also refer to **Section 2.4.**, *8DO Board Configuration* for information on setting up the 8DO board.

2.3.2. Control Module Wiring

The SC-PMAC panel has eight sets of four output terminals. Each set of terminals (1-8) corresponds to a channel on the 8DO. Up to 6 control modules may be connected in parallel to each channel.

Each channel has two positive and two negative terminals (labeled OUT1 through OUT8). The extra positive and negative terminals are there for convenience; you may connect control modules to one or both of these terminals. Using Belden 8641 cable, connect the BLACK wire from the positive terminal on the panel to the positive terminal on the control module. Wire the WHITE wire to the negative terminals. Additional control modules on the channel may be arranged in a chain, as shown in *Figure 2-3*.

2.3.3. Control Module Heater Wiring

Each control module has a 36" three-wire pigtail for connection to the case anti-sweat heater element. Using 14AWG wiring, connect the BLACK wire to HOT on the breaker panel, and connect the WHITE wire from the control module to the heater. The other end of the heater should be connected to NEUTRAL on the breaker panel. The GREEN wire should be tied to ground. See *Figure 2-3*.

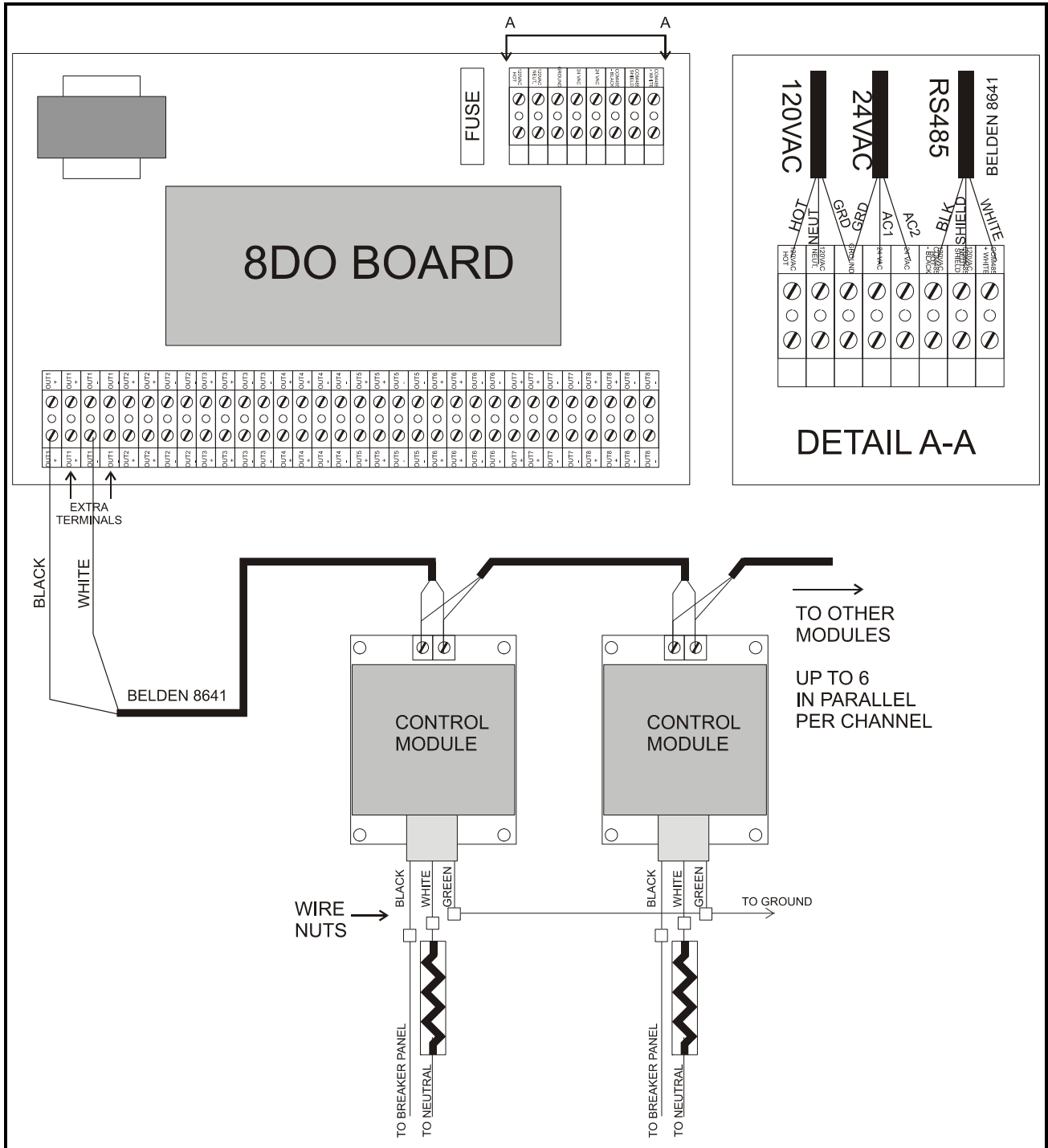


Figure 2-3 - SC-PMAC Panel and Control Module Wiring

2.4. 8DO Board Configuration

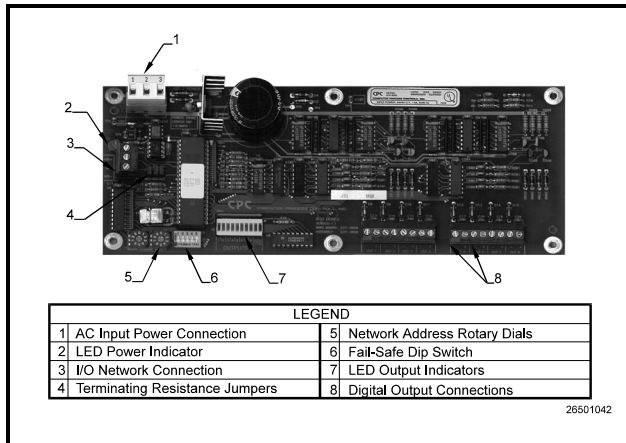


Figure 2-4 - 8DO Board

The 8DO (Digital Output) Expansion Board, supplied with the SC-PMAC panel, and shown in **Figure 2-4**, is used to connect refrigeration and environmental control components, which must be controlled by digital output, to an RS485 communication network (COM A and COM D networks). An adjustable dip switch, rotary dials, and jumpers are used to configure the 8DO board to fit a variety of applications. **Table 2-1** provides the required information to configure the 8DO board to allow communication between the RMCC, Einstein or BEC, the SC-PMAC panel, and the control modules.

Component Setting	Connection	Action/Notes
Fail-Safe Dip Switch (S3)	Positions 1-4, UP Position 5, unused	Provides continuous 12VDC to the SC-PMAC relays during network communication loss.
Rotary Dials (S1) (S2)	0 1	Addresses the SC-PMAC 8DO board as the #1 8DO board on the RS485 network.
Jumpers JU1 JU2 JU3	UP/DOWN UP/DOWN UP/DOWN	If the SC-PMAC 8DO board is the last board on the RS485 network, set the jumpers UP. If the board is in the middle of the RS485 network, set the jumpers down.
Network Connection	Connect to RS485 Network (see <i>Figure 3</i>)	Must "daisy-chain" with other network boards.

Table 2-1 - SC-PMAC 8DO Setup

2.4.1. Digital Outputs

The 8DO Expansion Board uses eight digital outputs, which modulate at a programmable frequency regulated by a signal sent from the controller via the I/O Network.

Each of the eight outputs is designed to drive a solid-state device, and is capable of supplying approximately 150 mA at +12 volts (unregulated). Each output has current limiting circuitry to prevent damage when short-circuited. When an output is overloaded, the corresponding LED indicator flashes quickly, indicating current limiting is in effect.

2.4.2. Fail-Safe Dip Switch

The fail-safe dip switch, S3, allows the user to provide continuous voltage to the case heaters during network communication loss. In general, the fail-safe dip switches should always remain in the UP position to ensure voltage is always provided to the case heaters. If the switches are set in the DOWN position, no voltage will be sent to the heaters during network communication loss.

2.4.3. Network Jumpers

The network jumpers—JU1, JU2, and JU3—define whether the SC-PMAC 8DO board is the first or last board, or a middle board on the RS485 communication network.

3 Configuring RMCC, BEC, and Einstein

A BEC, RMCC, or Einstein is capable of controlling eight anti-sweat heater circuits. BECs allow the eight heaters to be controlled in two different zones, RMCCs one zone, and Einstein eight zones. Each zone requires its own dewpoint sensor and setpoint(s). A humidity sensor and temperature sensor may be used in lieu of a dewpoint sensor.

The following sections outline the procedure for setting up anti-sweat control in the BEC, RMCC and Einstein. For detailed information on system programming, users should consult *P/N 026-1103, BEC Installation and Operation Manual*, *P/N 026-1102, RMCC Installation and Operation Manual*, or *P/N 026-1601, Einstein RX Installation and Operation Manual*.

3.1. BEC and RMCC Page Layout

Each data screen used in anti-sweat setup is shown in sections to follow, along with key graphics that show the exact key sequence necessary to access the screen from the main menu. Although most of these buttons are self-explanatory, several require further discussion.



Data Entry. The Data Entry button means that data, such as circuit numbers, may be required before

pressing the button. These data vary from screen to screen and a description of the data is provided when necessary.



Follow-On Keystroke. When a subscripted number appears next to a key graphic, it means that the key should be pressed that number of times to reach the desired screen. In some instances, a subscripted number may be

followed by a + symbol: 2+. This means that the key may need to be pressed an additional time to reach the desired screen.

3.1.1. Data Ranges and Default Settings

Data ranges for data fields—the information supplied in the help prompt lines—are displayed in brackets and bold type [-99° - 99°] either at the heading for the particular field description, or—when a heading does not exist—within the body of the description. Suggested or default values for a particular entry are always shown in brackets and bold type immediately following the data range [-99° - 99°] [-15.5].

3.2. Programming the BEC

3.2.1. Input Definitions

BEC -INPUT DEFINITIONS-								12:00
Input		Bd	Pt	Input		Bd	Pt	
AHU 1	TMP 1	00	00	AHU 1	TMP 2	00	00	
AHU 1	TMP 3	00	00	AHU 1	TMP 4	00	00	
AHU 2	TMP 1	00	00	AHU 2	TMP 2	00	00	
AHU 2	TMP 3	00	00	AHU 2	TMP 4	00	00	

↑=PREV, ↓=NEXT ←- -> SET 0=MENU

Define 16AI or 8IO board and point addresses for the anti-sweat humidity and temperature sensors. Use the down arrow keys to locate the following inputs: (ASC HUM1, ASC TEMP 1, ASC HUM2, ASC TEMP 2) and the anti-sweat override inputs (ASC #1 OVRD - ASC #8 OVRD). Refer to *P/N 026-1103, Building Environmental Control I&O Manual, Section 6.10.1., Input Definition*, for more information.

3.2.2. Output Definitions

BEC -OUTPUT DEFINITIONS-								12:00
Output		Bd	Pt	Output		Bd	Pt	
SEN CTL 01		00	00	SEN CTL 02		00	00	
SEN CTL 03		00	00	SEN CTL 04		00	00	
SEN CTL 05		00	00	SEN CTL 06		00	00	
SEN CTL 07		00	00	SEN CTL 08		00	00	

↑=PREV, ↓=NEXT ←- -> SET 0=MENU

Define 8RO and/or 8DO board and point addresses for the anti-sweat heater zones. Use the down arrow keys to locate the following outputs: (ANTI-SWT 1 - ANTI-SWT 8). Refer to *P/N 026-1103, Building Environmental Control I&O Manual, Section 6.10.2., Output Definition*, for more information.

3.2.3. Dewpoint/Humidity Offsets

DEWPOINT/HUMIDITY OFFSETS				12:00
Circuit 1	Dewpoint Offset:	000	F	
	Humidity Offset:	000	%	
Circuit 2	Dewpoint Offset:	000	F	
	Humidity Offset:	000	%	

↑=PREV, ←- -> SET 0=MENU

If the dewpoint cell or relative humidity sensor is known to read high or low, offsets may be specified in the Dewpoint Offset and Humidity Offset fields to correctly calibrate the sensors. Users may enter a value from -20% to 20% or from -20° to 20°.

3.2.4. Outputs Setup

ANTI-SWEAT OUTPUTS SETUP				12:00
ON/OFF Interval: 010sec (use<240 if 8DO)				
#	Name	Circuit #	8DO?	
1.		0	NO	
2.		0	NO	
3.		0	NO	
4.		0	NO	

↑=PREV, ↓=NEXT, ←- -> SET 0=MENU

Setup data such as heater interval times, names, and board and circuit assignments are entered in the Anti-Sweat Outputs Setup screen.

ON/OFF Interval [1 - 999 sec.] [10 sec.]

All anti-sweat circuits pulse heaters ON for a percentage of a defined time interval. This interval is entered in the ON/OFF Interval field. If an 8DO board is being used, the value should be less than 240 seconds.

Name [15 characters max]

In the field to the right of the anti-sweat zone number, a name may be entered.

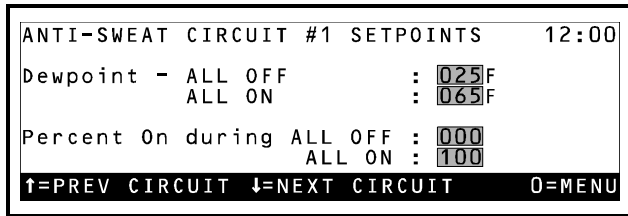
Circuit # [1 - 2] [0]

There are two separate anti-sweat circuits. Each circuit has its own sensors and setpoints. Enter a one to assign the selected zone to Circuit 1, or enter a two to select Circuit 2. Unused heaters should have a zero in this field.

8DO [(Y)es/(N)o] [(N)o]

Emerson recommends anti-sweat heaters be operated by 8DO Digital Output boards. If a heater is connected to an 8DO board, enter (Y)es in the 8DO field; otherwise, enter (N)o.

3.2.5. Setpoints



Anti-sweat circuits are controlled by comparing a measured or calculated dewpoint value to a range of dewpoints defined in the Anti-Sweat Circuit Setpoints screen. See *P/N 026-1103, Building Environmental Control I&O Manual, Section 3.5., Anti-Sweat Control*, for a complete explanation of anti-sweat control.

Dewpoint All OFF/All ON [-20° - 99°] [25°/65°]

The Dewpoint All OFF setpoint is the minimum dewpoint below which the anti-sweat circuit's heaters will re-main OFF at all times. The Dewpoint All ON setpoint is the maximum dewpoint above which the anti-sweat circuit's heaters will remain ON at all times. Between these dewpoint values, the anti-sweat circuit will pulse ON and OFF for a percentage of the time interval defined in the Outputs Setup screen.

Percent On During All OFF [0 - 30%] [0%]

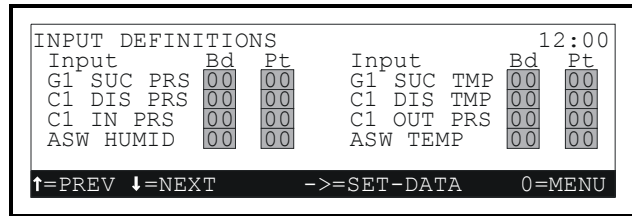
By default, anti-sweat circuits operate at 0% when the dewpoint is below the Dewpoint All OFF setpoint. If desired, a higher value for All OFF may be specified.

Percent On During All ON [70 - 100%] [100%]

By default, anti-sweat circuits operate at 100% when the dewpoint is above the Dewpoint All ON setpoint. If desired, a lower value for All ON may be specified.

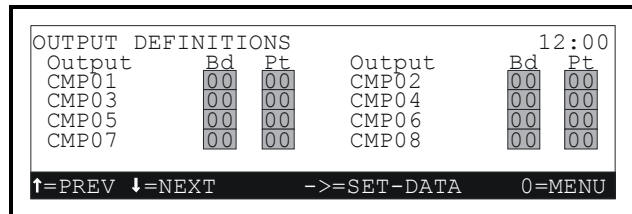
3.3. Programming the RMCC

3.3.1. Input Definitions



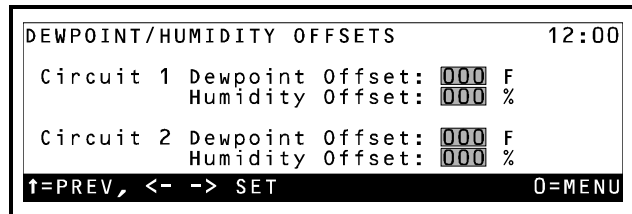
Define 16AI or 8IO board and point addresses for the anti-sweat humidity and temperature sensors (ASW HUMID, ASW TEMP) and the anti-sweat override inputs (ASW OVRD #1 - ASW #8 OVRD). Refer to *P/N 026-1102, Refrigeration Monitor and Case Control I&O Manual, Section 7.9.1., Input Definitions*, for more information.

3.3.2. Output Definitions



Define 8DO board and point addresses for the anti-sweat heater zones (ASW 1 - ASW 8). Refer to *P/N 026-1102, Refrigeration Monitor and Case Control I&O Manual, Section 7.9.2., Output Definitions*, for more information.

3.3.3. Dewpoint/Humidity Offsets



If the dewpoint cell or relative humidity sensor is known to read high or low, offsets may be specified in the Dewpoint Offset and Humidity Offset fields to correctly calibrate the sensors. Users may enter a value from -20% to 20% or from -20° to 20°.

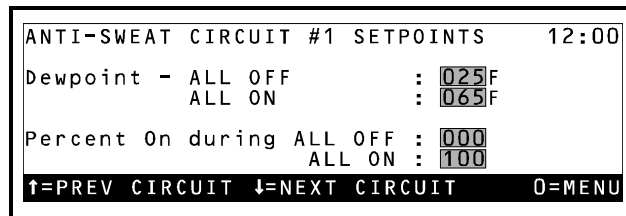
ON/OFF Interval [1 - 240 sec.] [10 sec.]

The 8DO on the SC-PMAC panel pulses heaters ON for a percentage of a defined time interval. This interval is entered in the ON/OFF Interval field.

Name [15 characters max]

In the field to the right of the anti-sweat heater number, a name may be entered.

3.3.4. Anti-Sweat Circuit Setpoints



Anti-sweat circuits are controlled by comparing a measured or calculated dewpoint value to a range of dewpoints defined in the Anti-Sweat Circuit Setpoints screen.

Dewpoint All OFF/All ON [-20° - 99°] [25°/65°]

The Dewpoint All OFF setpoint is the minimum dewpoint below which the anti-sweat circuit's heaters will remain OFF at all times. The Dewpoint All ON setpoint is the maximum dewpoint above which the anti-sweat circuit's heaters will remain ON at all times. Between these dewpoint values, the anti-sweat circuit will pulse ON and OFF for a percentage of the time interval defined in the Outputs Setup screen.

Percent On During All OFF [0 - 30%] [0%]

By default, anti-sweat circuits operate at 0% when the dewpoint is below the Dewpoint All OFF setpoint. If desired, a higher value for All OFF may be specified.

Percent On During All ON [70 - 100%] [100%]

By default, anti-sweat circuits operate at 100% when the dewpoint is above the Dewpoint All ON setpoint. If desired, a lower value for All ON may be specified.

3.4. Programming Einstein

3.4.1. Setting Up Zones

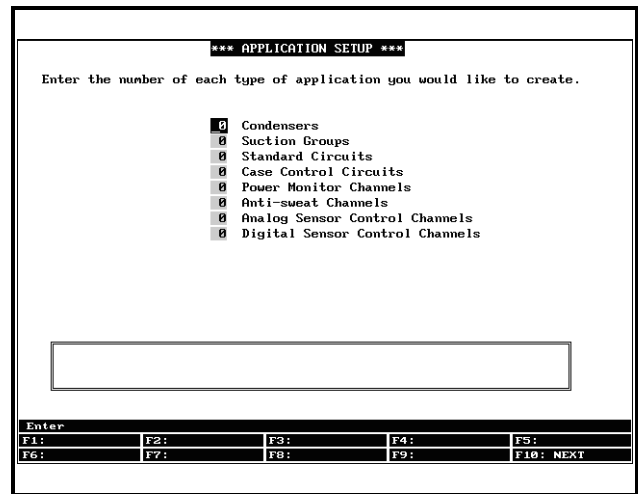


Figure 3-1 - Application Setup Screen

If you are programming the Einstein controller for the first time, at power-up, the initial setup will have you include the number of anti-sweat channels (see *Figure 3-1*). This is the number of zones that the SC-PMAC will control. After entering the number of zones, move on to *Section 3.4.2., Configuring Zones*.

Otherwise, to include a SC-PMAC into the system after the controller has been programmed:

1. From the Main Status Screen, press **F7** (Actions), **Z** (Control Appl Setup), and then **1** for Add Control Application.
2. Press **Enter**.
3. Press **F7** (heads up) then scroll to Anti-Sweat.
4. Enter the number of anti-sweat channels you will be using. You can utilize up to eight channels.
5. Press **Enter**.

3.4.2. Configuring Zones

You now have SC-PMAC zones designated for the Einstein controller. Next, you must configure each SC-PMAC zone. From the Main Status Screen:

1. Press **F5** (MORE), then **I** (Anti-Sweat).
2. The Select Application screen will appear. Highlight the first zone to configure by using the arrow keys and press **Enter**.

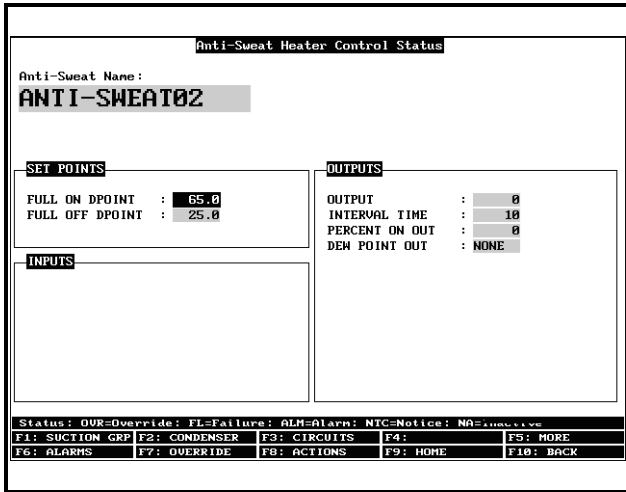


Figure 3-2 - Application Status Screen

The Application Status screen will appear. See **Figure 3-2**.

3. Press F8 (ACTIONS) then **B** (Setup).

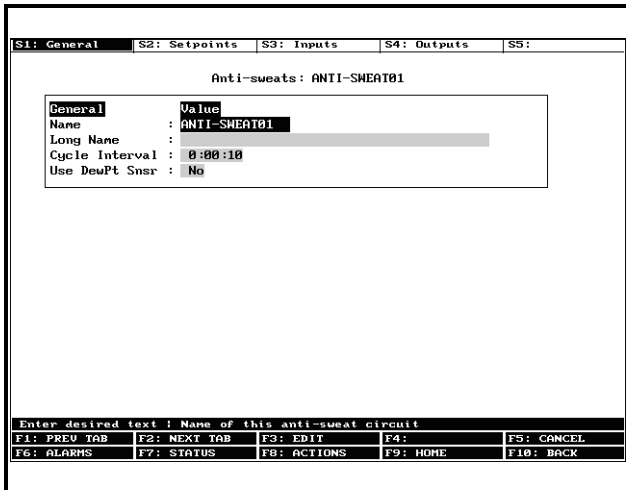


Figure 3-3 - General Setup Screen

4. The Anti-sweat General Setup screen will appear. See **Figure 3-3**. Enter the name of the zone, cycle interval, and "YES" if you are using a dewpoint sensor and press **Enter**.

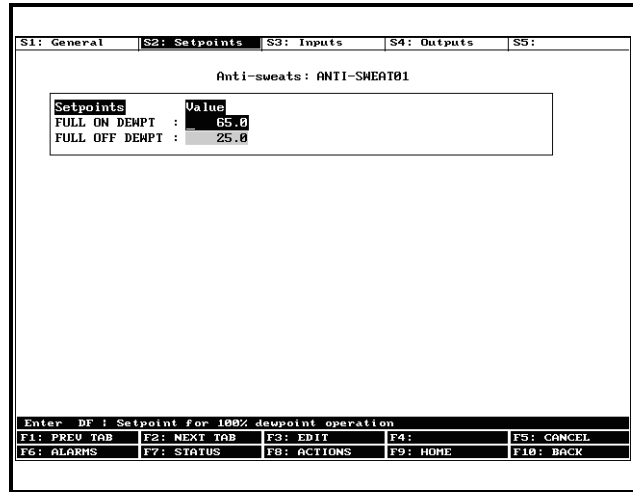


Figure 3-4 - Setpoints Screen

5. Press **F2** to advance to the Setpoints screen. See **Figure 3-4**.
6. Enter the value for the Full On dewpoint and Full Off thresholds and press **Enter**.

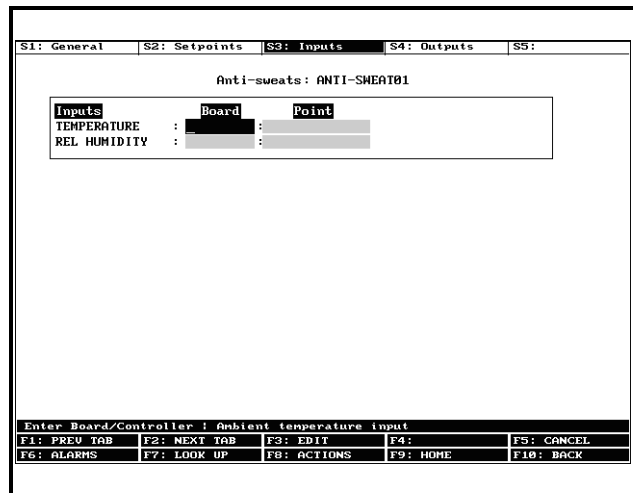


Figure 3-5 - Inputs Screen

7. Press **F2** to advance to the Inputs screen. See **Figure 3-5**.
8. If you are using temperature and humidity sensors to calculate the dewpoint, enter the board and point input locations for these devices here. If you are using a dewpoint sensor (see **step 4**.), enter the board and point input location for the sensor here.

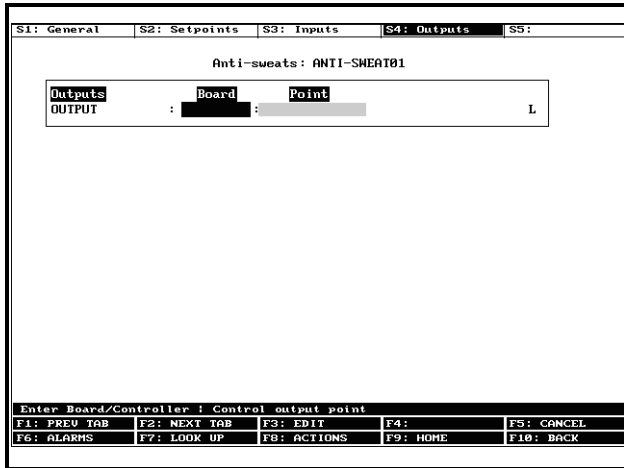


Figure 3-6 - Outputs Screen

9. Press **F2** to advance to the Outputs screen as seen in *Figure 3-6*.
10. In the Output field, enter the point on the 8DO board (located in the SC-PMAC) that corresponds to the anti-sweat channel you wish to control. See *Table 3-1*.

8DO Point	Anti-Sweat Channels
1	1 - 2
2	3 - 4
3	5 - 6
4	7 - 8
5	9 - 10
6	11 - 12
7	13 - 14
8	15 - 16

Table 3-1 - 8DO Board Points to SC-PMAC Channels

11. If you are using this anti-sweat application to control more than one of your anti-sweat channels:

From the Outputs screen:

- a. Press **F3** (Edit).
- b. Press **2** (Set Multiple Outputs).

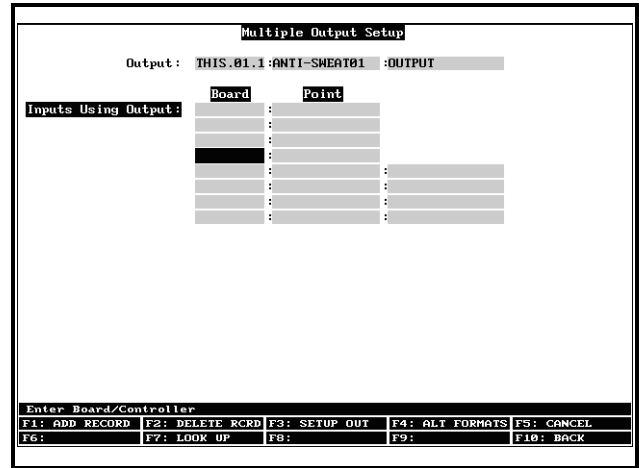


Figure 3-7 - Multiple Output Setup Screen

- c. Press **F1** (Add Record) for each point on the 8DO board you want to control from the one input.
 - d. For each output, and press **F4** (Alt Format) then **1** (for Board : Point).
 - e. Enter the board and point number of the 8DO point.
 - f. Continue steps "d" and "e" until all channels are configured.
12. Press **F9** (HOME) to return to the main status screen.

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