SWEATMISER ANTI-SWEAT HEATER CONTROLLER APX: INSTALLATION AND OPERATION MANUAL

PULSE MODULATING ANTI-SWEAT CONTROL

Digital SWMPCB, REV. 6.2

Table of Contents

To ensure proper functionality and optimum performance, it is STRONGLY recommended that Hillphoenix specialty cases be installed/serviced by qualified technicians who have experience working with commercial refrigerated display merchandisers and storage cabinets. For a list of Hillphoenix-authorized installation/service contractors, please visit our Web site at www.hillphoenix.com.

Hillphoenix / SweatMiser

09/14

PRODUCT DESCRIPTION

The SweatMiser, from Hillphoenix, is an anti-sweat heater controller designed to dramatically reduce the cost of operating low temperature glass door cases. The SweatMiser is a stand-alone unit that uses solid state relay technology to quietly modulate the door heaters at their most energy efficient rate.

Anti-sweat heaters typically operate 24 hours per day at full load regardless of store conditions. By monitoring the dewpoint of the store, the SweatMiser is able to pulse these heaters every second. Solid state relays make this rapid pulsing of the heaters possible. The lower the dewpoint, the greater the energy savings.

The SweatMiser is capable of pulsing up to 24 anti-sweat circuits with a maximum of 30 amps per channel. The “no programming” setup allows for easy installation and service. Simply calibrate the environmental sensor and the Sweatmiser is ready to operate.

1. Locate the power distribution panels and wiring raceway containing the power feeds for the anti-sweat heaters. Whenever possible, mount the SweatMiser panel directly over this raceway. This facilitates the wiring of the heaters through the SweatMiser. Make the proper size conduit connections between the raceway and panel. (See Fig. 1 on page 4).
2. Install the combination humidity/temperature sensor on the pole nearest the aisle of the glass door cases. The sensor should be located 8 feet above floor level.
3. Use 22 AWG 6 conductor shielded cable to connect the combination humidity/temp sensor to the SweatMiser processor board. (See Fig. 2 on page 5).
4. Locate the anti-sweat circuits to be fed through the SweatMiser. NOTE: Be sure all power is disconnected from each heater circuit. Proceed with wiring the heaters to the terminal strips provided for line and load. (See Fig. 2 on page 5).
5. Connect 120 VAC (15 amp circuit) power supply to the unit as shown in Fig. 2. (240 VAC power supplies are available if required).
6. Label all circuit numbers used with the corresponding relay channel numbers on the chart provided on the inside of the SweatMiser panel door.
7. Turn on the power supply breaker feeding the panel and note the LCD readouts on the SweatMiser processor. Turn on the heater circuits and check for proper amperage and relay pulsing. Refer to the “Operations” portion of this manual for further information.

INSTALLATION

DIMENSIONS: 24” x 24” x 6.75” – SWM-16
24” x 30” x 6.75” – SWM-24

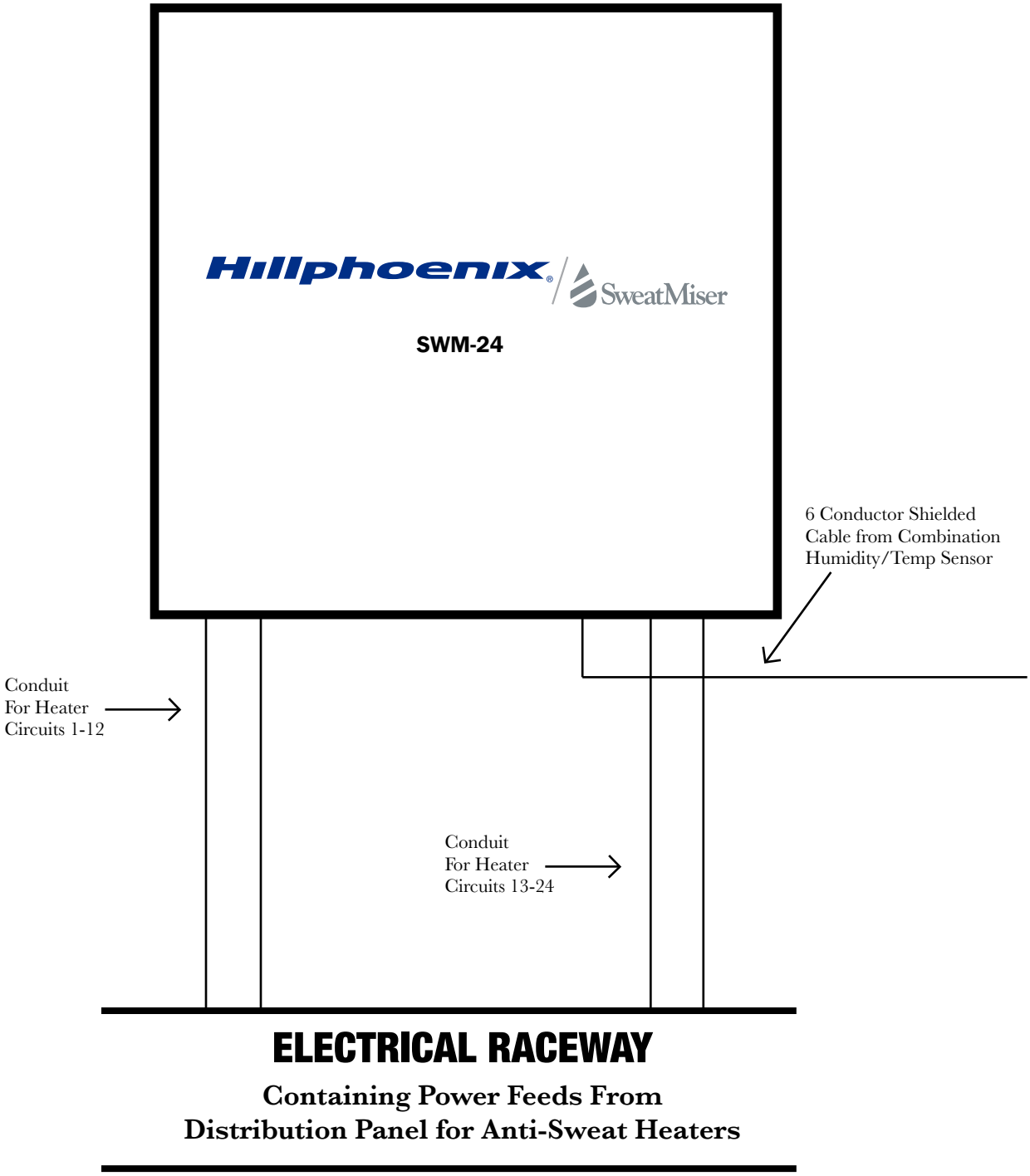
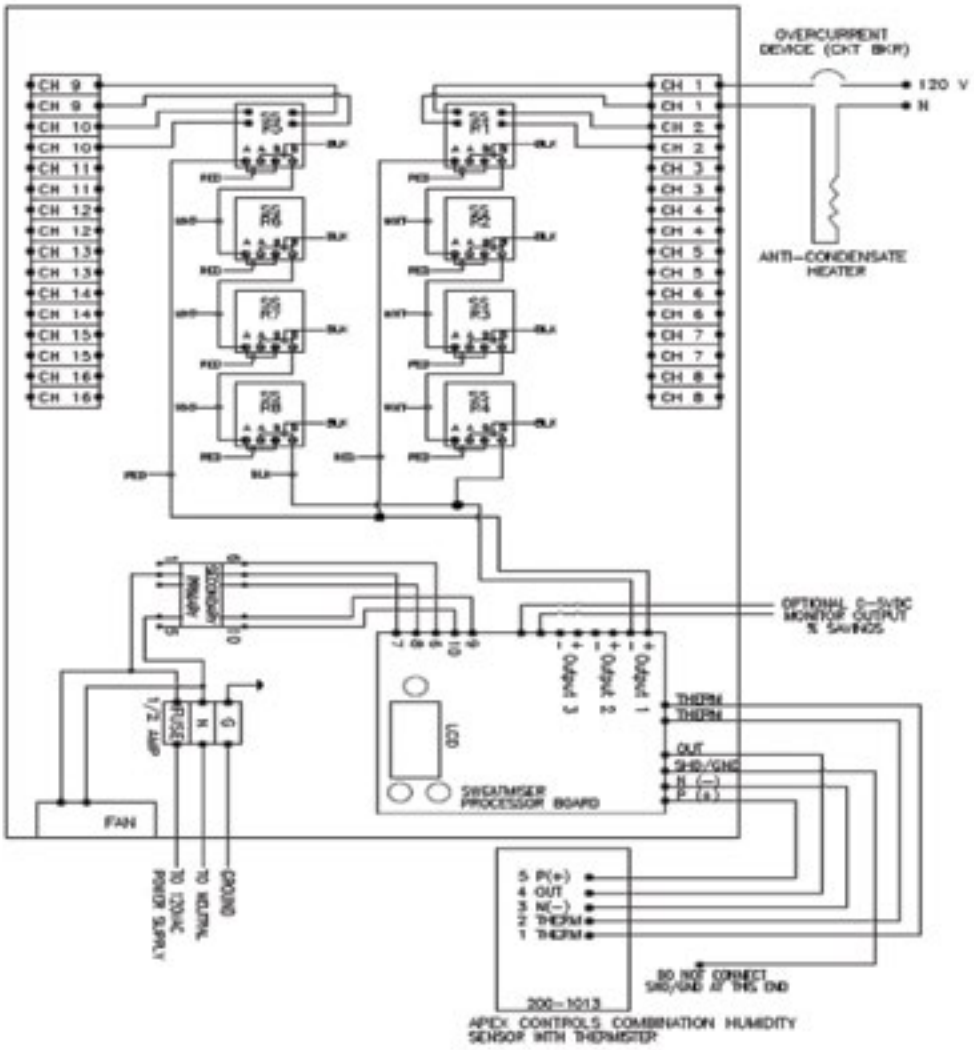


Fig. 1

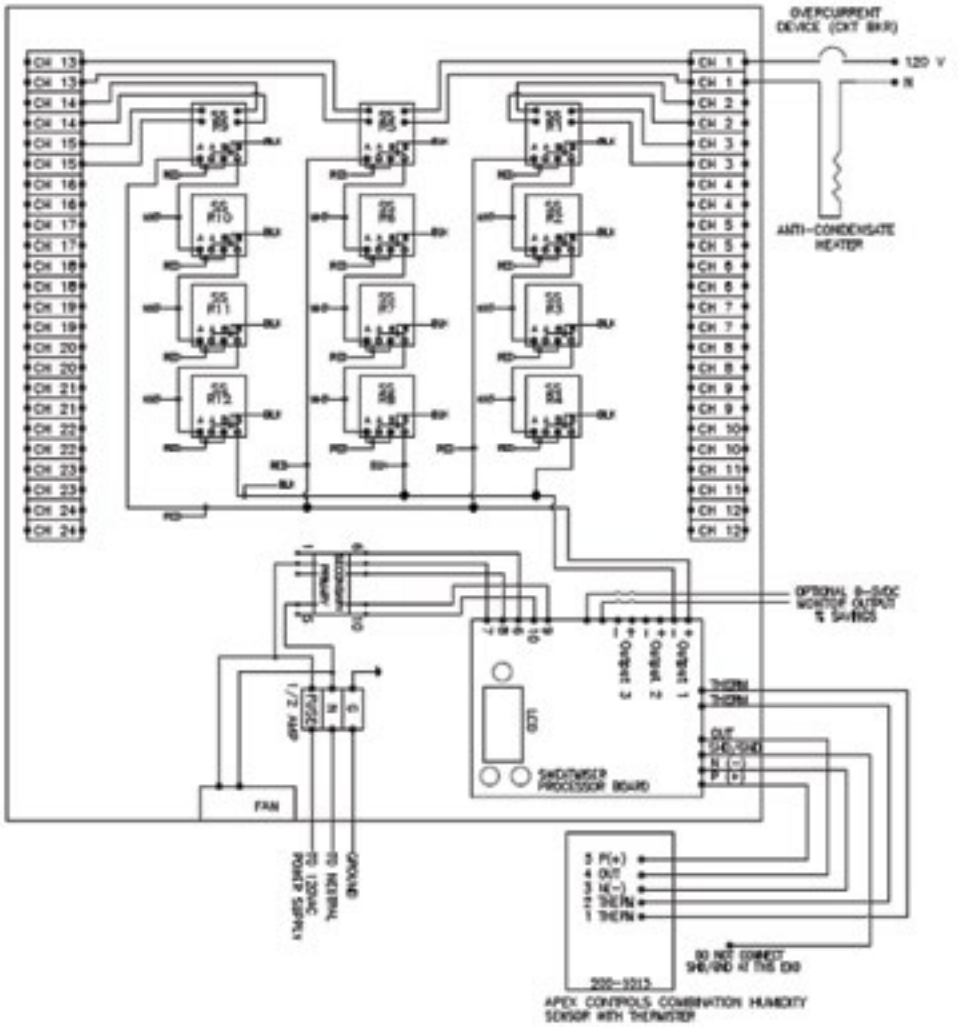
SweatMiser solid state relays are powered by a combination series/parallel harness. A 20vdc output from the board is divided over the 4 relays with each one receiving 5vdc. This 5 volt signal is then paralleled to the two channels (A&B) on each relay. This is typical for each bank of relays.



SWM-16
Fig. 2

INSTALLATION

SweatMiser solid state relays are powered by a combination series/parallel harness. A 20vdc output from the board is divided over the 4 relays with each one receiving 5vdc. This 5 volt signal is then paralleled to the two channels (A&B) on each relay. This is typical for each bank of relays.



SWM-24
Fig. 3

Change the "MODE" to "BYPASS" on the LCD Display. While in bypass, confirm that all relays are operating properly. Using an amp probe, verify that each SSR (Solid State Relay) channel being used is drawing amperage. Record the amperage for each channel on the inside SweatMiser door. (Note: while in bypass the % Savings on the LCD Display will read 00).

Change the "MODE" to "PULSE" on the LCD Display, which puts the SweatMiser in operation mode. The Pulse Rate LED should pulse on/off as the VDC signal to the SSR is cycled. Check each SSR channel to confirm pulse operation. With an amp probe, confirm that each relay is cycling on/off. The signal will switch too fast to read the amperage, but you will see the meter ramping up/down, indicating the load is being cycled. Additionally, you can check the pulse operation with an AC voltmeter on the load side of the relay. Again, the pulse will be too fast to read the voltage, but you will see the meter ramping up/down as the relay is cycled.

Scroll through the LCD Display and make sure that the Dewpoint Min / Max and the Pulse Rate Min / Max are set to their Factory Setpoints:

Dewpoint	Min = 20 Max = 55
Pulse Rate	Min = 20 Max = 99

Walk each aisle of glass doors in the store. Make sure no fans or lights are wired through the SweatMiser. Open at least one door per case and listen to be sure no fans are pulsing. Look for any lights going on/off, a sure sign they are wired through a SSR channel.

Confirm proper installation of the humidity sensor. Make sure it is mounted level and neat and confirm that the cover is seated firmly to the base.

OPERATION: DISPLAY SCREENS

The SweatMiser processor board shown in Fig. 4 on page 10 uses a LCD Display to both show and change values associated with SweatMiser operation. Each of these values are updated several times a second. You can scroll through the screens by using the Up and Down buttons located on the right side of the LCD. To change a value on any screen (Store DewPoint and Output 1 Savings are calculated numbers and cannot be changed) hold the button on the left side of the LCD while pressing the Up or Down buttons on the right side of the screen.

STORE HUMIDITY

Displayed as %RH, this readout is adjustable via the LCD Display shown in Fig. 4. Simply use a sling Psychrometer or an accurate electronic RH sensor to establish the store RH near the location of the installed RH sensor. Adjust the LCD until the SweatMiser readout matches the sling readout. Refer to Trouble Shooting section of this manual for further information.

STORE TEMPERATURE

The integral 10 k ohm thermister located in the combination humidity/temp sensor provides the current store temperature in degrees Fahrenheit. If required, this readout may be calibrated using the LCD Display shown in Fig. 4. Refer to Trouble Shooting section of this manual for further information.

STORE DEWPOINT

The SweatMiser calculates Dewpoint using the RH and temperature sensor inputs and a builtin psychrometric chart. Dewpoint is displayed as °F and is used to determine the pulse rate to the solid state relays.

MODE SELECTION

The SweatMiser has three different possible Modes of operation. The most common Mode is "Pulse". If the user selects "Mode Pulse", then the SweatMiser will pulse the relays at a savings rate that is displayed on the LCD screen, calculated by the processor.

Bypass Mode allows the user to keep the relays closed 100% of the time, thus allowing all power to flow to the heaters as if the SweatMiser had never been installed (Savings is 0% in this Mode).

Load Shed Mode allows the user to keep the relays open 100% of the time, thus allowing no power to the heaters. This mode is intended to allow the user to take advantage of utility rates where the customer obtains a large savings for turning loads off for a short period of time (Savings in this Mode is 100%).

PERCENT SAVINGS - OUTPUT 1

This display shows the energy savings accomplished by the SweatMiser at that instant. The percentage is calculated from the pulse rate being sent to the solid state relays. For example, if the relays are being cycled ON 6/10 of a second and off for 4/10 of a second, the savings would be 40%. A 0-5 VDC analog output is provided for optional remote monitoring by electronic equipment. The terminals for this output are shown in Fig. 4.

PERCENT SAVINGS - OUTPUT 2

This display shows the energy savings accomplished by the SweatMiser at that instant. The default Savings value for this output is Output 1. If the user does not make any adjustments via the LCD Display, then Output 2 will have the same pulse rate as Output 1. However, if the user desires to separate one group of cases from the population and have a unique pulse rate on this section, then the user can increase or decrease the savings on this output. Once the user sets their desired level of savings on Output 2, then a bias will be calculated and will be applied to this output as Output 1 changes. For example, If Output 1 savings is 60% and the user changes Output 2 Savings to 30%, then Output 2 will always be 50% less than Output 1, unless the user makes another change.

PERCENT SAVINGS - OUTPUT 3

This display shows the energy savings accomplished by the SweatMiser at that instant. The default Savings value for this output is Output 1. If the user does not make any adjustments via the LCD Display, then Output 3 will have the same pulse rate as Output 1. However, if the user desires to separate one group of cases from the population and have a unique pulse rate on this section, then the user can increase or decrease the savings on this output. Once the user sets their desired level of savings on Output 3, then a bias will be calculated and will be applied to this output as Output 1 changes. For example, If Output 1 savings is 60% and the user changes Output 3 Savings to 30%, then Output 3 will always be 50% less than Output 1, unless the user makes another change.

The SweatMiser comes factory pre-set to operate in any store with no adjustments necessary. However, to optimize your energy savings you may want to make a couple of simple adjustments. There are two sets of parameter adjustments that can be made by setting four setpoints. The LCD Display has screens that are used to set the pulse rate and dewpoint limits.

The "DewPoint Setpoint" screens determine the dewpoint temperature range. The numbers represent 10°F increments and are factory set at 20 and 55 degrees F.

The "Pulse Rate" screens determine the upper and lower limits to which the pulse rate may be adjusted. The numbers on the screens represent tenths of second pulse rates and are factory set to 20%.

Table 1 on page 11 sights examples of various setpoint parameters. This board has single degree resolution. Keep in mind that the idea is to increase savings as much as possible without having your glass doors fogging or sweating. Store environment plays a large role in how you operate the SweatMiser. You may experiment with the factory setpoints to determine the most efficient operation of your anti-sweat heaters.

Pulse Rate Examples (If you want to be more conservative, increase your PR Min, more aggressive, decrease PR MAX):

PR MAX sets the minimum savings percentage. A PR MAX of 99% means in extreme environments the minimum savings will be 0%.

PR MIN sets the maximum savings in extreme environments. A PR MIN of 20% means max savings is 80%, PR MIN of 30% means max savings of 70%.

DEWPOINT SETPOINT EXAMPLES:

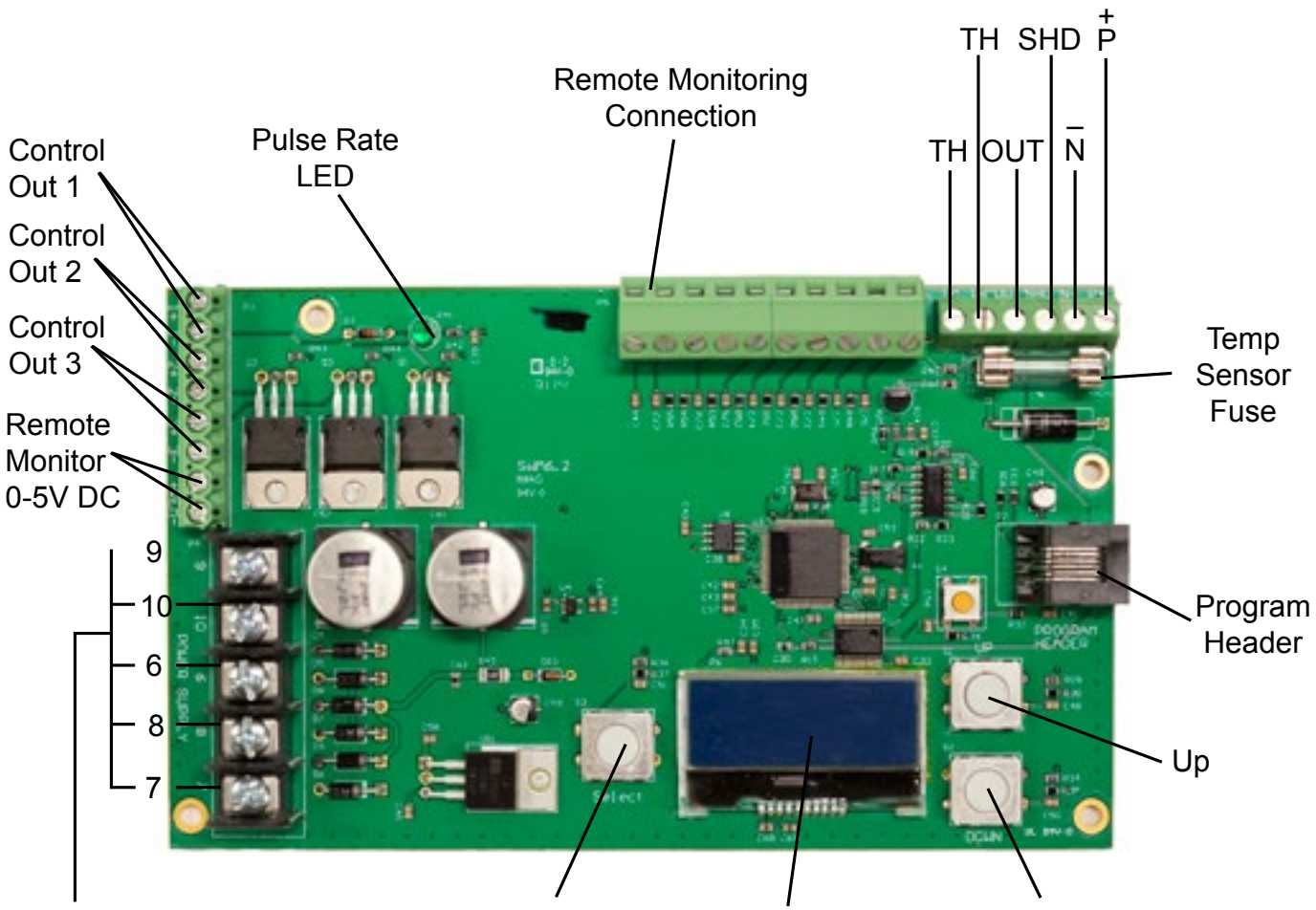
Once actual Store Dewpoint is greater than the MAX DP setpoint, then savings is capped at the minimum which is 100% - MAX PR setpoint.

Example: DP MAX = 50 F
Store DP = 51 F
PR MAX = 90%
Savings = 10%

Once actual Store Dewpoint is less than the MIN DP setpoint, then savings is capped at the maximum which is 100% - MIN PR Setpoint.

Example: DP MIN = 20 F
Store DP = 19 F
PR MIN = 20%
Savings = 80%

PROCESSOR BOARD



9 & 10- 10VAC
6 & 8- 32VAC
6 & 7- 16VAC
7 & 8- 16VAC

Fig. 4

EXAMPLE

	Factory Setpoints	Progressive Setpoints
Dewpoint Limits		
MAX	55°F	80°F
MIN	20°F	10°F
Pulse Rate Limits		
MAX	99%	80%
MIN	20%	0%

TABLE 1

TROUBLESHOOTING PROCEDURES

ALL DOORS SWEATING

1. Check processor to ensure LCD is lit.
2. If not, check 120 VAC power supply to panel and 24 VAC output of transformer to SweatMiser processor. See Fig. 4 for specific voltages.
3. If LCD is lit, check the savings rate that can be seen on the mode screen. A savings rate of 5% means that the heaters are on 95% of the time. The green LED in the top left corner of the circuit board can be used as a quick check, the green LED is lit when the processor is sending a control signal to the relays to close. If the green LED stays illuminated then all relays should be closed 100% of the time. If there is still sweating with a Savings Rate of 0%, then the store humidity is likely too high and the dehumidifier should be checked.
4. If any readings are out of range, reset the processor by cycling the power off then on again.
5. Readings should be correct or within a reasonable range that can be calibrated. Refer to the Temperature and Humidity Sensor portion of the Trouble Shooting procedures
6. Once the LCD readouts are confirmed verify that all relays are pulsing by checking each load at the solid state relay with an amp probe. Each load should be pulsing along with the pulsing LED on the processor. Refer to Start Up section for further information.

ONE SECTION OF DOORS SWEATING

1. Refer to #6 above and determine which load is not being pulsed through the solid state relays by checking each with an amp probe.
2. If there are no amps on the circuit, check for 120Vac on both sides of the relay. One side of the relay should be the circuit panel and will have 120Vac. There will also be 120Vac on the heater side of the relay if the relay is closed. If you have voltage on both sides of the relay but no amps are being pulled, that means that the relay is closed and power is being sent to the case but the case has an issue. If you do not have voltage on both sides of the relay and the relay is getting a control signal; your relay may be bad. Trying using a nearby spare or replace the relay.
3. If a load is not pulsing, verify that the circuit breaker to that load is not tripped. If the power supply is OK, turn off the power to the affected relay and move the wires for that circuit to another relay that has a spare set of unused contacts. If no spare points are available, the relay must be replaced.
4. Reapply power and check the load for proper pulsing.
5. If all loads are cycling properly and a section of doors is sweating, the problem is outside the SweatMiser. Check for loose wires in all connections in wireway. If all are OK, the case heater is most likely the problem.

RESET PROCEDURES

1. Screen not displaying or locked up - press white reset button located above the upper right-hand corner of the LCD Display.
2. Factory Reset - to restore factory default setpoints, press all three LCD buttons (UP, Down, and Change) at the same time quickly. Temp & Humidity settings will need to be re-calibrated.

The SweatMiser displays are significantly different from the temperature and humidity readings recorded with proper instruments at the sensor location, refer to the following.

1. Confirm that the point-to-point wiring from the sensor to the SweatMiser PCB is correct and that all connections are tight. Refer to the wiring diagrams on pgs 5 & 6.
2. Check the mounting and location of the sensor. The sensor should be no higher than 8' above the finished floor and centrally located in the area of the low temperature glass doors being controlled. Confirm that the sensor is firmly seated into the base.
3. The wiring from the sensor to the SweatMiser board should be 22 ga. 6 conductor with shield (General Cable # C0783 or equivalent). Confirm that the shield wire is terminated on the SHD/GND terminal on the SWM board only. Do not terminate the shield wire at the sensor. Refer to the wiring diagrams on pgs 5 & 6 for proper sensor wiring.
4. Confirm proper SweatMiser LCD temperature readout by comparing the resistance value from the humidity sensor to the values listed on the reference charts in this section. Both wires must be removed from the 2 "Therm" terminals to properly read the resistance value coming from the integral 10K ohm thermister of the sensor. Once disconnected, read and record the resistance value across the two "Therm" wires. Adjust the temperature value on the LCD Display on the SweatMiser board so that the "Store Temp" LCD value matches the referenced Temp/Resistance value.
5. Confirm proper SweatMiser LCD Relative Humidity readout. Confirm 20 VDC output to sensor across terminals P & N. Measure and record the RH% from the sensor across the two terminals marked "Out and "N-". The 0-5 VDC reading relates to 0-100% RH. Adjust the RH value on the LCD Display until the RH% LCD readout matches the % Humidity/VDC chart for the VDC reading taken.

TEMPERATURE/RESISTANCE & HUMIDITY/VOLTAGE CHART

Thermister resistance should be measured at the two wires entering the board with the wires lifted off the "Therm" terminal points

TEMP	APROX RESISTANCE
59	15710
60	15316
61	14924
62	14547
63	14178
64	13822
65	13477
66	13138
67	12812
68	12490
69	12185
70	11882
71	11593
72	11309
73	11031
74	10763
75	10502
76	10250
77	10000
78	9763
79	9529
80	9302
81	9037
82	8864
83	8655
84	8449
85	8252
86	8058

Humidity Sensor output is 0-5 VDC based upon 0-100% Humidity. This is measured from the "OUT" terminal to the "N" Negative Terminal

% HUMIDITY	DC VOLTAGE
30	1.50
35	1.75
40	2.00
45	2.25
50	2.50
55	2.75
60	3.00
65	3.25

Dist. Panel	Circuit #	Circuit Name	SweatMiser Channel #	Amperage
			1	A
			2	A
			3	A
			4	A
			5	A
			6	A
			7	A
			8	A
			9	A
			10	A
			11	A
			12	A
			13	A
			14	A
			15	A
			16	A
			17	A
			18	A
			19	A
			20	A
			21	A
			22	A
			23	A
			24	A

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