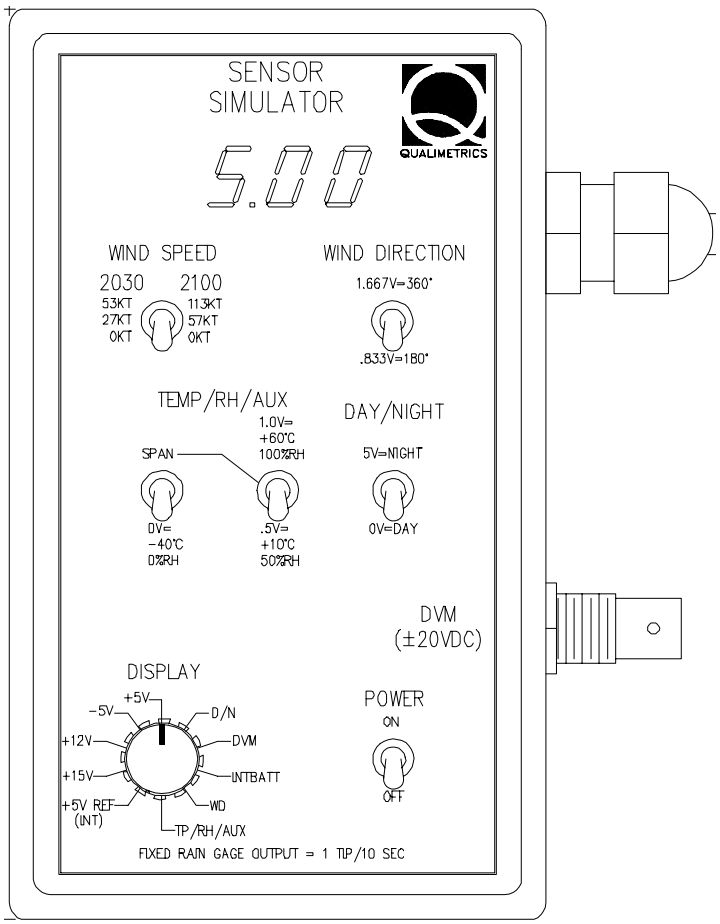
Model 11920
Sensor Simulator



User's Manual

allweatherinc

1165 National Drive • Sacramento, CA 95834 • 800.824.5873

TABLE OF CONTENTS

INTRODUCTION

The Model 11920 Sensor Simulator is designed to provide simulated sensor data to aid in the testing of the Automated Weather Observing System's (AWOS) Model 1190 Data Collection Platform (DCP). It can also be used as a digital dc voltmeter to check a system's power supplies through its built-in connectors, or, with the addition of test leads connected to its BNC connector, to check voltages at other points (within the range of ±20 Vdc).

Using the Sensor Simulator, an operator can functionally verify a system's performance. The simulator is connected in place of the system sensors, and the sensor input levels are set using switches located on the front panel. Most of the sensor inputs have three levels available: low, mid, and high. The data output values of the system under test can then be verified to correspond with the levels set on the Sensor Simulator.

CONNECTION

The Sensor Simulator requires a standard 9V battery (not supplied) to operate. Before using the simulator, install a 9V battery in the battery compartment in the back cover and attach the snap-on connector.

The Sensor Simulator cable is fitted with three connectors that connect to mating connectors on the AWOS system's Model 1190 DCP backplane. To connect the cable, disconnect the removable terminal blocks from the DCP backplane and connect the simulator cable's connectors in their place. **TB2** of the simulator cable connects to **TB2** on the backplane; **TB3** of the simulator cable connects to **TB3** on the backplane; and **TB4** of the simulator cable connects to **TB4** on the backplane. **Figure 1** shows the connections.

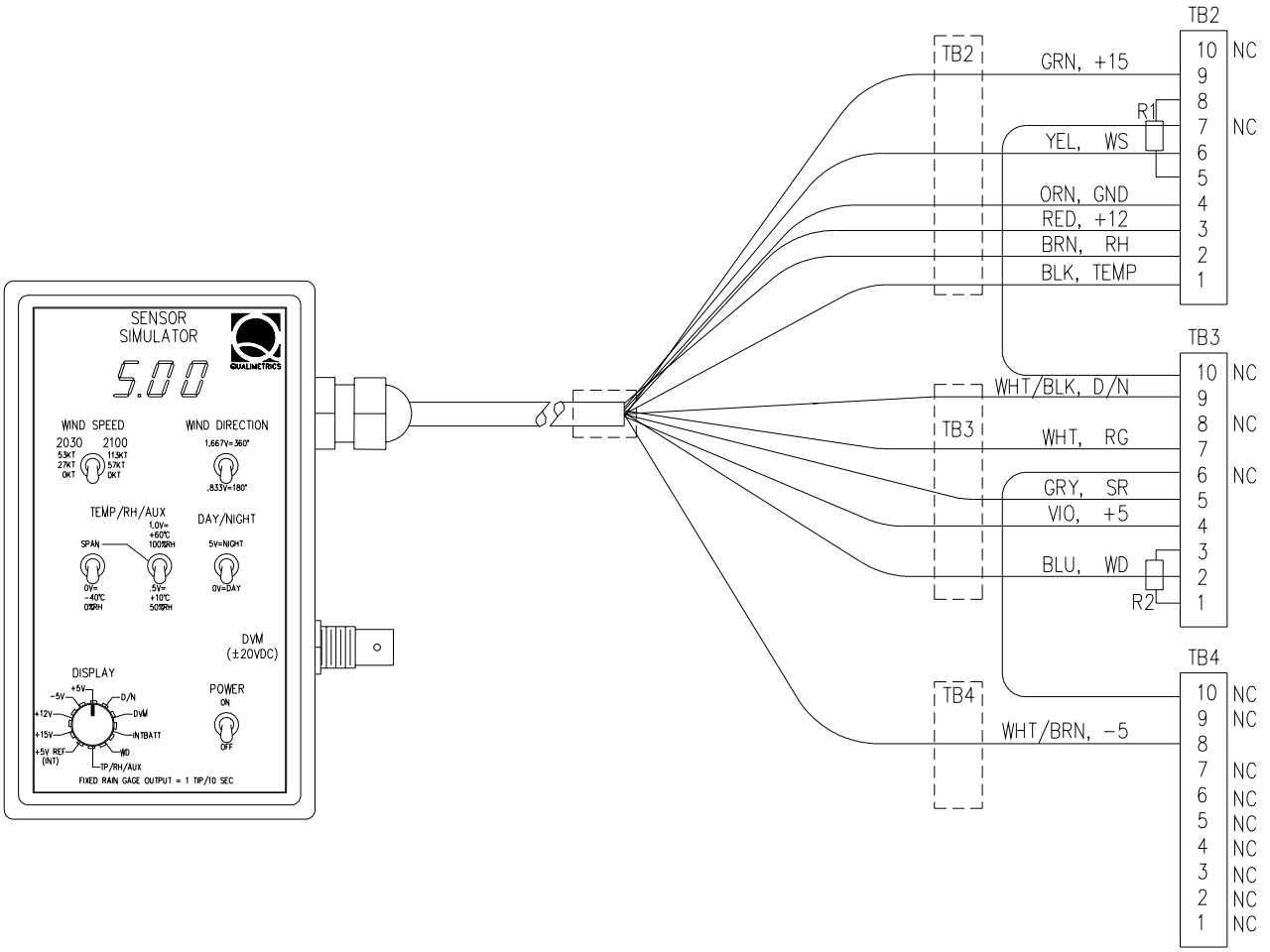


Figure 1
Sensor Simulator Interconnection

OPERATION

General

The Sensor Simulator is used to verify system performance by replacing a system's sensors with known simulated values, then comparing the system's output values with the simulated values. For example, wind speed sensors are simulated by generating a specific frequency and applying it to the weather system under test. The system is then checked to ensure that its output agrees with the applied frequency. When the simulator is connected to an AWOS Model 1190 DCP and turned on, it continuously outputs simulated values for the supported sensors according to the current settings of the simulator selector switches.

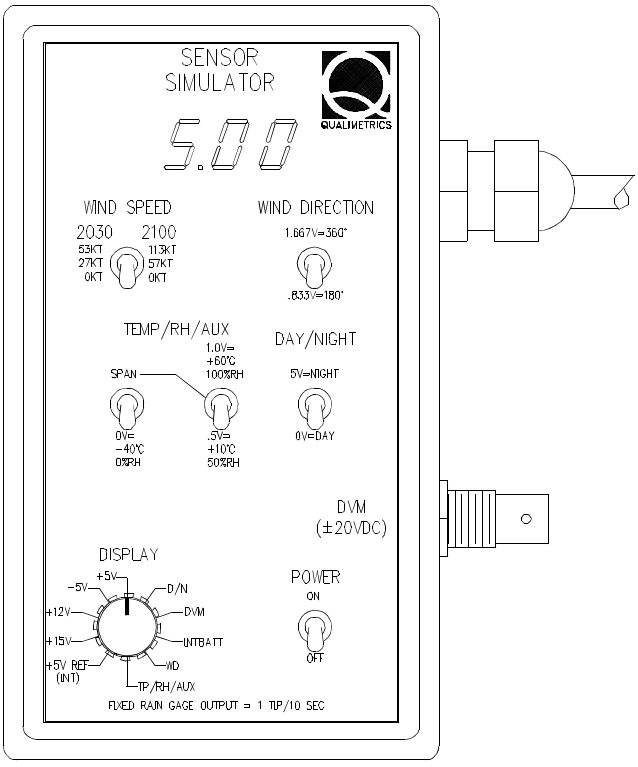


Figure 2
Sensor Simulator Front Panel

Simulated Values

The various sensor outputs are simulated as follows:

Wind speed sensors are simulated by generating a specific frequency and applying it to the weather system under test.

For wind direction, temperature, relative humidity, day/night, and auxiliary outputs, a dc voltage is generated. If the system under test is operating properly, the output values will correspond to the applied dc voltage.

A rain gauge output is simulated by a frequency output of 0.1 Hz. Therefore, a rain gauge "tip" is generated approximately once every 10 seconds.

For many of the simulated weather parameters, the operator can vary the output levels between low, mid, and high ranges using the simulator selector switches.

An LED display is provided to allow the operator to verify internal voltages, such as the internal battery or the +5 Vdc reference. The simulated dc voltage levels (for wind direction, temperature, relative humidity, day/night, and auxiliary) can also be viewed to ensure that the simulator is operating correctly.

Display Switch

The Display switch selects which parameter is displayed on the simulator's LED screen. This switch lets the user monitor:

Internal +5 volt reference (+5V REF (INT))
+15V power supply (+15V)
+12V power supply (+12V)
-5V power supply (-5V)
+5V power supply (+5V)
Day/Night Sensor simulation level (D/N)

Internal battery voltage (INTBATT)
Wind Direction simulation level (WD)
Temperature, Relative Humidity, and Auxiliary Sensor simulation levels (TP/RH/AUX)

The DVM position selects the BNC input, and changes the Sensor Simulator's function to that of a digital dc voltmeter with an input range of ± 20 Vdc.

Note: All sensors are continuously simulated regardless of the position of the Display switch.

Simulator Switches

The simulator selector switches are two- or three-position switches that allow the user to vary the simulated sensor levels among several settings. The Wind Speed, Wind Direction, and Day/Night selector switches use single switches to vary the values. The combined Temp/RH/Aux selector uses a combination of two switches to select any of three values.

Setting Wind Speed Levels

The Sensor Simulator can be used to simulate sensor outputs for the 2030 and 2100 wind speed sensors. Three possible settings are available, each of which corresponds to a different wind speed value for each of the supported models. The wind speed value registered by the system under test will therefore depend on the sensor being simulated (Model 2030 or Model 2100).

In the DOWN position, the sensor reading should be 0 knots for both the 2030 and 2100.
In the MIDDLE position, the sensor reading should be approximately 27 knots (±2 knots) for a 2030, and approximately 57 knots (±2 knots) for a 2100.
In the UP position, the sensor reading should be approximately 53 knots (±2 knots) for a 2030, and approximately 113 knots (±2 knots) for a 2100.

Setting Wind Direction Levels

Wind direction is simulated using a single two-position switch.

When the switch is in the DOWN position, the output level is 0.883V, which corresponds to a wind direction of 180° (±5°).
When the switch is in the UP position, the output level is 1.667V, which corresponds to a wind direction of 360° (±5°).

Setting Temp/RH/Aux Levels

Simulation levels for Temperature, Relative Humidity, and Auxiliary inputs are all set using a single pair of two-position switches.

When the left switch is in the DOWN position, the output level is 0V, corresponding to a temperature of -40°C (±4°C) and 0% (±3%) relative humidity.
When the left switch is in the UP position (SPAN), the output level is determined by the position of the right switch.
When the left switch is set to SPAN and the right switch is in the DOWN position, the output level is 0.5V, which corresponds to a temperature of +10°C (±3°C) and 50% (±3%) relative humidity.
When the left switch is set to SPAN and the right switch is in the UP position, the output level is 1.0V, which corresponds to a temperature of +60°C (±3°C) and 100% (±3%) relative humidity.

Setting Day/Night Levels

The Day/Night simulator switch uses two positions to simulate the daytime state (0V) and the nighttime state (+5V).

DOWN=0V, or Day
UP=+5V, or Night

Using the Sensor Simulator as a Voltmeter

When the Display switch is set to the DVM (Digital Volt Meter) position, the BNC connector voltage level will appear on the LED display. The input voltage range of the DVM is ± 20 Vdc. To use the digital dc voltmeter, test leads with a BNC type connector must be connected to the Sensor Simulator's BNC connector. The measured voltage will be displayed on the simulator's screen (provided the Display switch is in the DVM position).

Testing DCP Power Supplies

A key function of the Model 11920 Sensor Simulator is to allow the operator to measure the power supply voltages of the AWOS Model 1190 DCP. These voltages can be viewed on the LED display by setting the Display switch to +5, -5, +12, or +15. During this measurement, all sensor simulation levels will continue to be sent; sensors are continuously simulated regardless of the position of the Display switch.

Power Switch

When the power switch is ON, the Sensor Simulator will continuously output simulated sensor levels, and will monitor the selected input voltage levels.

Internal Battery

The Sensor Simulator is powered by an internal 9V battery. The status of the internal battery should be checked periodically by setting the Display selector switch to INTBATT and observing the displayed value. If the value drops below 7.5 volts, replace the 9V battery.

CALIBRATION

The Sensor Simulator includes two calibration features: a +5V internal reference calibration potentiometer (R18), and a display calibration potentiometer. Adjustment of either of these two potentiometers should be required rarely, if at all.

The simulator can be tested for calibration periodically by checking the +5V internal reference. To do this, set the Display switch to +5V REF (INT), and observe the value shown on the LED display. It should read 5.00. If a value other than this is shown (5.01, for example), either the internal +5V reference or the display may need to be adjusted. The simulator can be returned to All Weather Inc. for servicing, or the following calibration procedure can be performed.

1 Disconnect the snap-on connector from the 9V battery and feed the connector through the hole in the back cover.
2 Remove the four screws from the simulator's back cover and remove the back cover.
3 Remove the nut and star washer securing the BNC connector.
4 Unscrew the internal nut securing the multiwire cable.
5 Remove the knob from the rotary switch using a 1/16" hex key, and remove the nut from the switch shaft.
6 Remove the four screws holding the printed circuit board (PCB) in place and carefully lift out the PCB.
7 Reconnect the 9V battery to the clip-on connector.
8 To determine whether the problem is with the internal +5V reference or the display, the +5V reference can be tested by taking a voltage reading at TP1 on the PCB. If 5.000V is seen at TP1, the display needs to be calibrated (see **step 6**). If the voltage at TP1 is other than 5.000, adjust potentiometer R18 until the voltage at TP1 is 5.000V. Following this adjustment, the display should read 5.00. If it does not, you will also need to calibrate the display, as explained in the next step.
9 The display is calibrated through a potentiometer on the back of the PCB. To adjust this potentiometer, insert a screwdriver through the hole in the PCB immediately behind the LED display. While watching the display, adjust the potentiometer until the display reads 5.00.
10 Disconnect the 9V battery.
11 Replace the PCB in the case and secure it with the four screws removed in **step 3**.
12 Refasten all hardware removed or loosened in steps 3 through 5.
13 Feed the battery connector through the hole in the back cover and into the battery compartment.
14 Replace the back cover and fasten with the four screws removed in **step 2**.
15 Reinstall the 9V battery and reconnect the snap-on connector.

MAINTENANCE

No maintenance is required with the Model 11920 Sensor Simulator.

SPECIFICATIONS

Supply Voltage	Standard 9V battery
Operating Temperature	-20 to +60 C
Storage Temperature	-30 to + 75 C
DVM Input Limits	-20 to +20 Vdc
Battery Life	Approx. 6 hours cont.
Size	5.6" X 3.2"

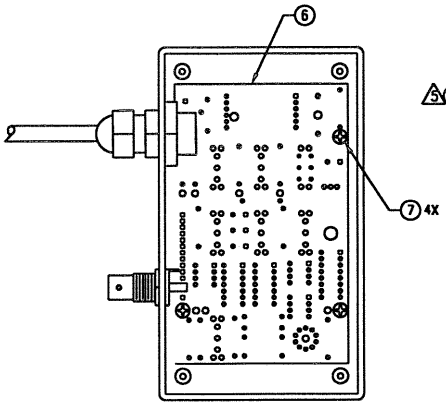
DRAWINGS

The following pages contain drawings to aid in the use and maintenance of the Sensor Simulator.

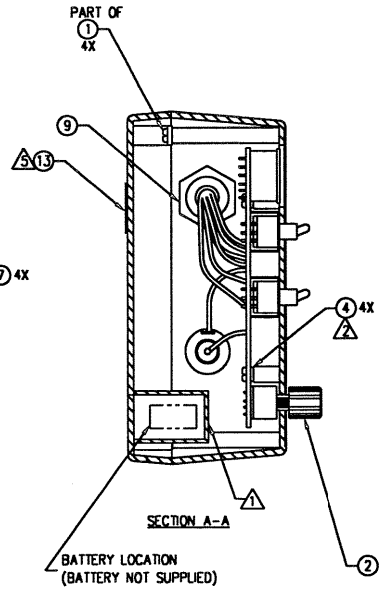
REVISIONS			DWG NO. M403313-003	
REV	ECO	DESCRIPTION	DATE	APPROVED
A	4701	INITIAL RELEASE	10/12/97	PK
B	4797	REVISE NOTE 4	8/10/98	CP
C	4916	REVISE NOTE 3, ADD ITEMS 14 & 15		

NOTES: UNLESS OTHERWISE SPECIFIED:

1. REMOVE ONE "U" SHAPED PLASTIC RIB FROM THE TOP OF THE BATTERY COMPARTMENT TO ALLOW FOR BATTERY SNAP TO PASS THRU.
2. BOND FIBER WASHER, ITEM 4, WITH INSTANT ADHESIVE (LOCTITE #414) TO ENCLOSURE STANDOFFS 4 PLACES. BOND PRIOR TO INSTALLING PCB, ITEM 6.
3. INSTALL LABEL, ITEM 5, 3 PLACES APPROXIMATELY AS SHOWN. MARK LABEL WITH TB2, TB3 AND TB4 AS SHOWN.
4. CUT OFF AND DISCARD THE LARGE END OF BOTH TIE WRAPS. INSERT AND CLAMP THE TIE WRAP ENDS TO KEEP THE CONNECTORS PROPERLY ORIENTED.
5. SERIAL TAG; MARK WITH MODEL NO. 11920.
6. USE LOCTITE 425.
7. MOUNT RESISTORS AS FLUSH TO THE CONNECTOR AS POSSIBLE.

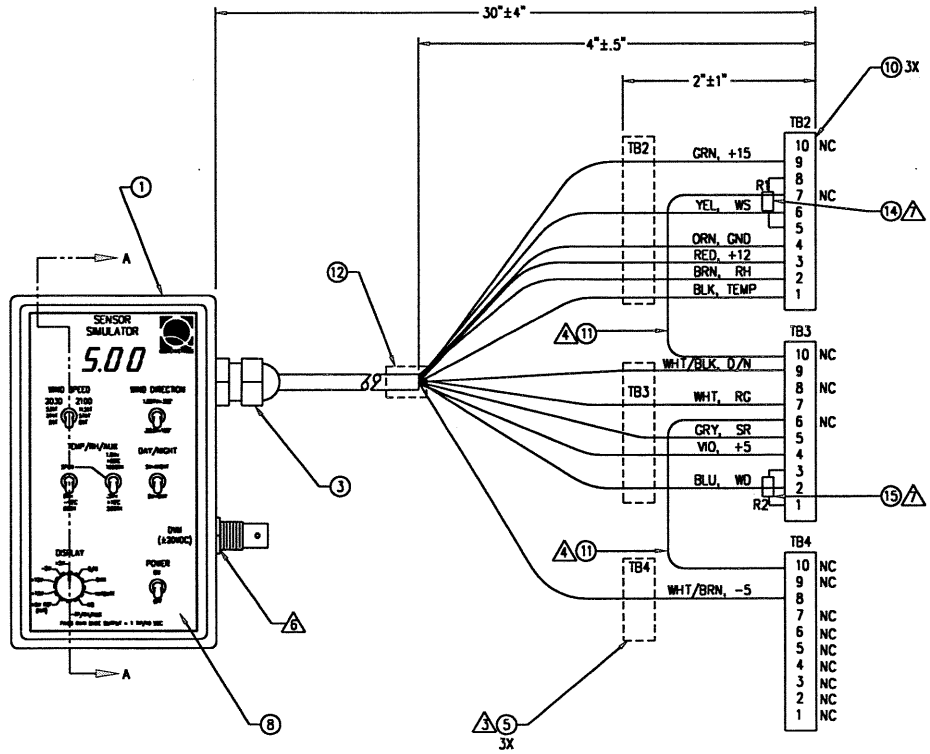


BOTTOM VIEW
BOTTOM COVER REMOVED FOR CLARITY



SECTION A-A

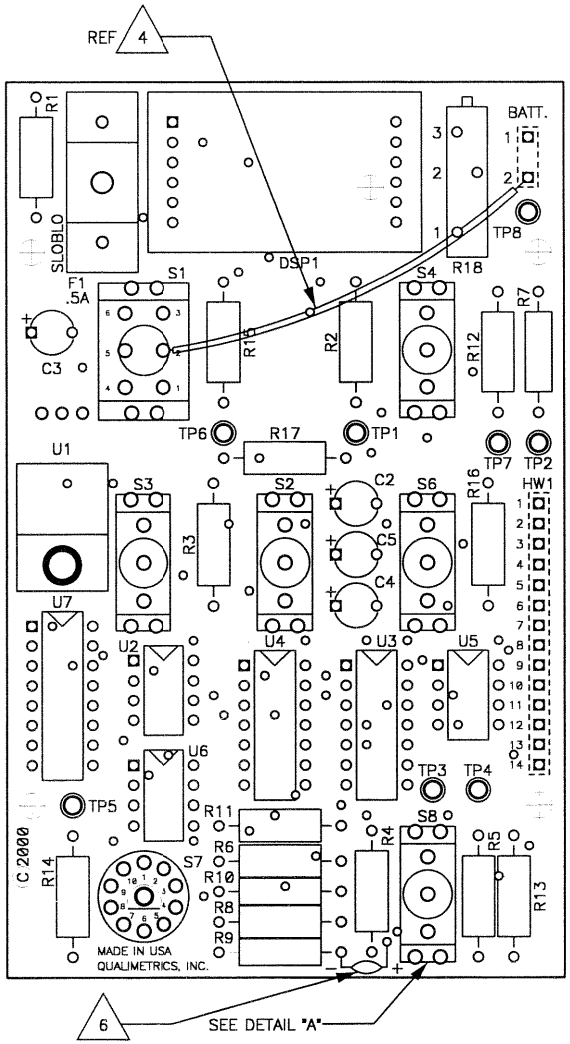
BATTERY LOCATION
(BATTERY NOT SUPPLIED)

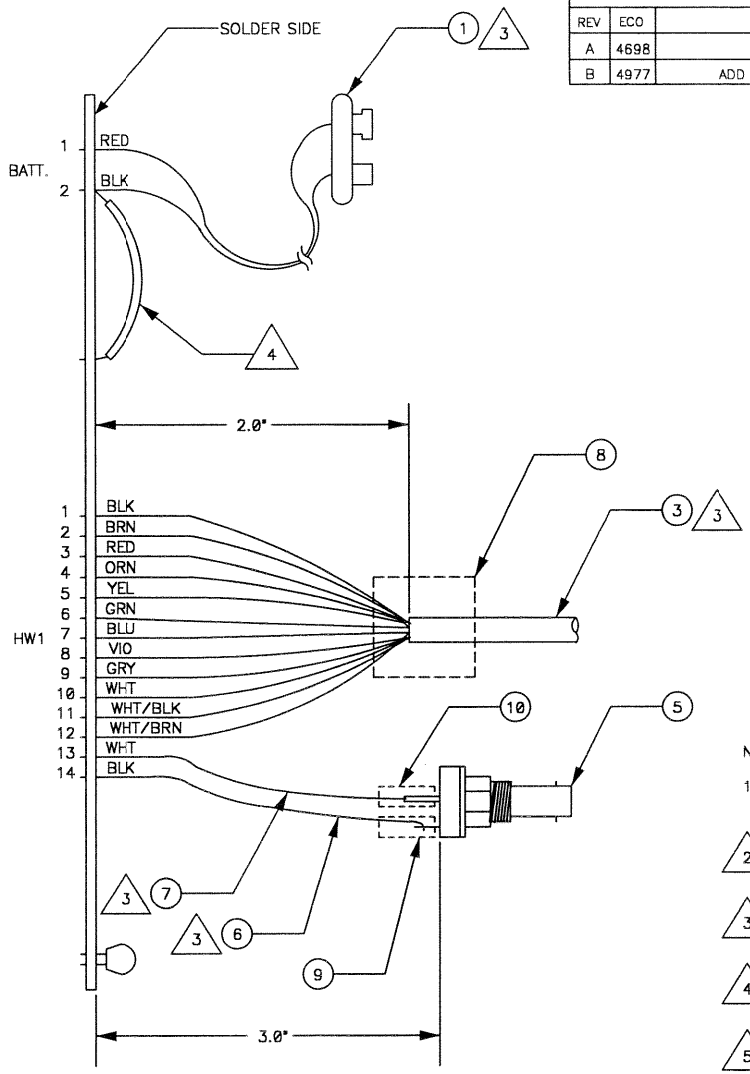


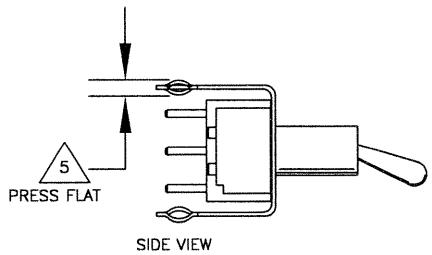
EXCEPT AS MAY OTHERWISE BE SPECIFIED BY CONTRACT, THIS DOCUMENT AND THE DATA DISCLOSED HEREIN AND HEREWITH, IS NOT TO BE USED, REPRODUCED OR DISCLOSED, IN WHOLE OR IN PART, TO ANYONE WITHOUT THE WRITTEN PERMISSION OF QUALIMETRICS, INC..

APPEND THE FOLLOWING DOCUMENTS WHEN CHANGING THIS DOCUMENT:	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES .XX=±.010 ANGLES ±1/2° .XXX=±.005 CONCENTRICITY .003 TIR DO NOT SCALE DRAWING	DRAWN BY: J.CONNER 7-9-97	TITLE: ASSEMBLY DWG, SENSOR SIMULATOR, AWOS
	MATL: SEE BILL OF MATERIALS	REVISED BY: Chander Palhan 7-24-01	QUALIMETRICS
	FINISH: AS ISSUED	CHECKED BY:	SIZE D DWG NO. M403313-003
	TREATMENT: NONE	DESIGN ENGINEER: J.CONNER 10-14-97	
		PROJECT MANAGER: J.CONNER 10-13-97	
		APPROVALS DATE	SCALE SCALE RELEASE DATE 10-12-97 SHEET 1 OF 1

REVISIONS			DWG NO. M404809-003	
REV	ECO	DESCRIPTION	DATE	APPROVED
A	4698	INITIAL RELEASE	10-16-97	BRG
B	4977	ADD C6,IT-10 AND CHG QTY OF IT-9.		







DETAIL "A"
SCALE = NONE

NOTES: UNLESS OTHERWISE SPECIFIED:

1. TRIM ALL COMPONENT LEADS IN COMPLIANCE WITH ALL WEATHER,INC. WORKMANSHIP MANUAL.

2. ENSURE PCB ASSEMBLY IS CORRECTLY LABELED IN COMPLIANCE WITH QAI228.

3. SOLDER WIRES TO PCB SOLDER SIDE PADS AS SHOWN.

4. INSTALL JUMPER WIRE ON SOLDER SIDE OF PCB BETWEEN BATT PIN-2 AND S1 PIN-2 AS SHOWN.

5. PRIOR TO INSTALLATION, USE NEEDLE NOSE PLIERS TO PRESS FLAT THE FOUR SUPPORT PINS OF ALL SWITCHES EXCEPT S7 AS SHOWN IN DETAIL A.

6. INSTALL CAPACITOR (C6) OBSERVING THE SHOWN POLARITY, ON THE SOLDER SIDE OF PCB.

APPEND THE FOLLOWING DOCUMENTS WHEN CHANGING THIS DOCUMENT:	

REFERENCE DOCUMENTS	
A/W	M405575-011
FAB	M405575-012
SCH	M404809-004

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES
XX= +/- .010 ANGLES= +/- 1/2 DEGREE
XXX= +/- .005 FRACTIONS= +/- .02
DO NOT SCALE DRAWING

MATL: SEE BILL OF MATERIALS

FINISH: AS ISSUED

TREATMENT:

DRAWN BY: Daynn Miller	7/9/97	
REVISED BY: B. GALARPE	5-27-03	
CHECKED BY:		
DESIGN ENGINEER: MICHAEL HOOVER	10-15-97	
PROJECT MANAGER: JJ SPOTTS	10-17-97	
APPROVALS	DATE	

TITLE: PCB ASSEMBLY DCP SENSOR SIMULATOR, AWOS

allweatherinc

SIZE C | DWG NO. M404809-003

SCALE NONE | RELEASE DATE | SHEET 1 OF 1

All Weather Inc.
1165 National Drive
Sacramento, CA 95834
Fax: 916.928.1165
Phone: 916.928.1000
Toll Free: 800.824.5873
www.allweatherinc.com

11920-001
ECN 4870
June, 2000