MODEL 107-LC TEMPERATURE PROBE
INSTRUCTION MANUAL
FOR
METDATA1

REVISION: 4/03

Warranty and Assistance

The **107-LC TEMPERATURE PROBE FOR METDATA1** is warranted by CAMPBELL SCIENTIFIC, INC. to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise. Batteries have no warranty. CAMPBELL SCIENTIFIC, INC.'s obligation under this warranty is limited to repairing or replacing (at CAMPBELL SCIENTIFIC, INC.'s option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CAMPBELL SCIENTIFIC, INC. CAMPBELL SCIENTIFIC, INC. will return such products by surface carrier prepaid. This warranty shall not apply to any CAMPBELL SCIENTIFIC, INC. products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose. CAMPBELL SCIENTIFIC, INC. is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 753-2342. After an applications engineer determines the nature of the problem, an RMA number will be issued. Please write this number clearly on the outside of the shipping container. CAMPBELL SCIENTIFIC's shipping address is:

CAMPBELL SCIENTIFIC, INC.
RMA#_____
815 West 1800 North
Logan, Utah 84321-1784

CAMPBELL SCIENTIFIC, INC. does not accept collect calls.

Non-warranty products returned for repair should be accompanied by a purchase order to cover the repair.

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Model 107-LC Temperature Probe for MetData1

1. General

The 107 Air/Soil/Water Temperature Probe uses a thermistor to measure temperature. Custom lead lengths are available up to 1000 ft.

For air temperature measurement, a 41303 radiation shield is used to mount and limit solar radiation loading of the 107. The 107 probe is designed to be buried or submerged in water up to 100 feet.

1.1 Specifications

Temperature
Measurement Range: -35° to +50°C

Thermistor Inter-
Changeability Error: Typically <±0.2°C over 0°C to 60°C; ±0.4 @ -35°C.

Polynomial
Linearization Error: <±0.5°C over -35°C to +50°C.

NOTE The black outer jacket of the cable is Santoprene® rubber. This compound was chosen for its resistance to temperature extremes, moisture, and UV degradation. However, this jacket will support combustion in air. It is rated as slow burning when tested according to U.L. 94 H.B. and will pass FMVSS302. Local fire codes may preclude its use inside buildings.

2. Accuracy

The overall probe accuracy is a combination of the thermistor's interchangeability specification, the precision of the bridge resistors, and the polynomial error. In a "worst case" all errors add to an accuracy of ±0.4°C over the range of -24° to 48°C and ±0.9°C over the range of -38°C to 53°C. The major error component is the interchangeability specification of the thermistor, tabulated in Table 2-1. For the range of 0° to 50°C the interchangeability error is predominantly offset and can be determined with a single point calibration. Compensation can then be done with an offset entered in the measurement instruction. The bridge resistors are 0.1% tolerance with a 10 ppm temperature coefficient. Polynomial errors are tabulated in Table 2-2 and plotted in Figure 2-1.

TABLE 2-1. Thermistor Interchangeability Specification

Temperature (°C)	Temperature Tolerance (±°C)
–40	0.40
–30	0.40
–20	0.32
–10	0.25
0 to +50	0.20

TABLE 2-2. Polynomial Error

-40 to +56	<±1.0°C
-38 to +53	<±0.5°C
-24 to +48	<±0.1°C

TABLE 2-3. Temperature, Resistance, and Datalogger Output

Temperature °C	Resistance OHMS	Output °C
-40.00	4067212	-39.18
-38.00	3543286	-37.55
-36.00	3092416	-35.83
-34.00	2703671	-34.02
-32.00	2367900	-32.13
-30.00	2077394	-30.18
-28.00	1825568	-28.19
-26.00	1606911	-26.15
-24.00	1416745	-24.11
-22.00	1251079	-22.05
-20.00	1106485	-20.00
-18.00	980100	-17.97
-16.00	869458	-15.95
-14.00	772463	-13.96
-12.00	687276	-11.97
-10.00	612366	-10.00
-8.00	546376	-8.02
-6.00	488178	-6.05
-4.00	436773	-4.06
-2.00	391294	-2.07
0.00	351017	-0.06
2.00	315288	1.96
4.00	283558	3.99
6.00	255337	6.02
8.00	230210	8.04
10.00	207807	10.06
12.00	187803	12.07
14.00	169924	14.06
16.00	153923	16.05
18.00	139588	18.02
20.00	126729	19.99
22.00	115179	21.97
24.00	104796	23.95

26.00	95449	25.94
28.00	87026	27.93
30.00	79428	29.95
32.00	72567	31.97
34.00	66365	33.99
36.00	60752	36.02
38.00	55668	38.05
40.00	51058	40.07
42.00	46873	42.07
44.00	43071	44.05
46.00	39613	46.00
48.00	36465	47.91
50.00	33598	49.77
52.00	30983	51.59
54.00	28595	53.35
56.00	26413	55.05
58.00	24419	56.70
60.00	22593	58.28

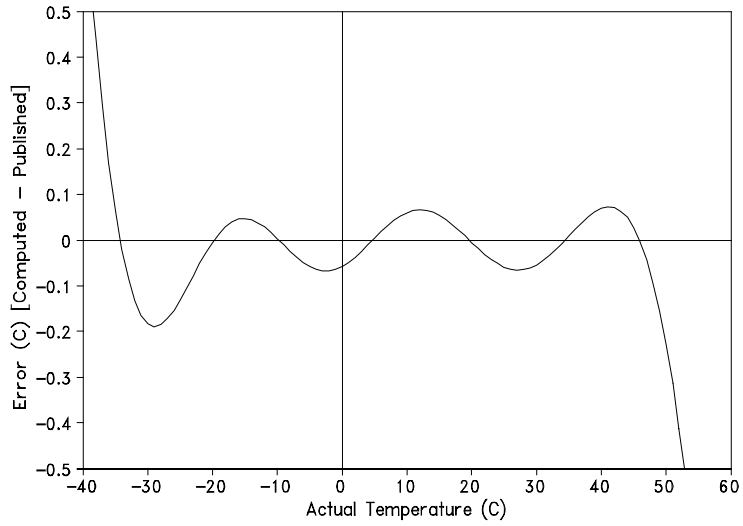

FIGURE 2-1. Error Produced by Polynomial Fit to Published Values

3. Installation

The 107 must be housed inside a radiation shield when used in the field. The 41303 Radiation Shield (see Figure 3-1) mounts to a CM6 or CM10 tripod. The UT018 mounting arm and UT6P Radiation Shield mount to a UT30 tower.

The standard lead length of 6 feet and 9 feet allow the 107 to be mounted at a 2 meter height on the CM6/CM10 tripod or the UT30 tower respectively.

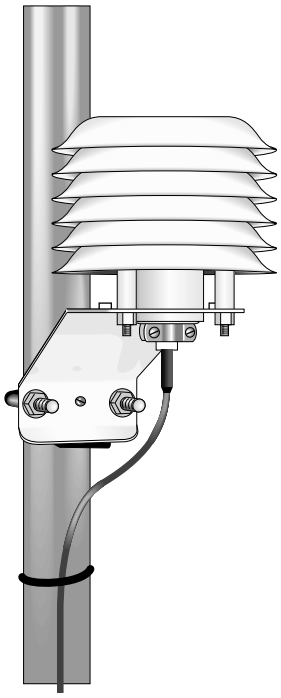

FIGURE 3-1. 107 and 41303 Radiation Shield on a CM6/CM10 Tripod Mast

4. Connection

The 107 cable is attached to the MetData1 connector #4 or #7. Connector #4 uses single-ended input 4L (channel 8) and connector #7 uses single-ended input 5H (channel 9).

5. Programming

NOTE Information in this section is not necessary when programming the MetData1 with the Short Cut Program Builder software.

Instruction 11 is used to measure temperature. Instruction 11 provides AC excitation, makes a single-ended voltage measurement, and calculates temperature with a fifth order polynomial. A multiplier of 1.0 and an offset of 0.0 yields temperature in Celsius. For Fahrenheit, use a multiplier of 1.8 and an offset of 32.

MetData1 Datalogger Program Example

```
01:  Temp 107 Probe (P11)
   1:   1              Rep
   2:   8 or 9**       IN Chan
   3:   3              Excite all reps w/EXchan 3
   4:   11*            Loc [:Air_Temp]
   5:   1              Mult
   6:   0              Offset
*   Proper entries will vary with input location assignments.
**  Specify input channel #8 for connector #4.  Specify input channel #9 for connector #7.
```

6. Maintenance and Calibration

The 107 Probe requires minimal maintenance. Check monthly to make sure the radiation shield is free from debris.

For most applications it is unnecessary to calibrate the 107 to eliminate the thermistor offset. However, for those users that are interested, the following briefly describes calibrating the 107 probes.

A single point calibration can be performed to determine the 107 temperature offset (thermistor interchangeability). This calibration will not remove the polynomial error. The value of the offset must be chosen so that the probe outputs the temperature calculated by the polynomial, not the actual calibration temperature. For example, a 107 is placed in a calibration chamber that is at 0°C and the probe outputs 0.1°C. The offset is -0.16, because at 0°C the polynomial calculates a temperature of -0.06°C (Table 7-1).