MODEL ASPTC ASPIRATED SHIELD
WITH FINE WIRE THERMOCOUPLE

REVISION: 9/96

WARRANTY AND ASSISTANCE

The **MODEL ASPTC ASPIRATED SHIELD WITH FINE WIRE THERMOCOUPLE** 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.

CAMPBELL SCIENTIFIC, INC.

815 W. 1800 N.
Logan, UT 84321-1784
USA
Phone (435) 753-2342
FAX (435) 750-9540
www.campbellsci.com

Campbell Scientific Canada Corp.
11564 -149th Street
Edmonton, Alberta T5M 1W7
CANADA
Phone (780) 454-2505
FAX (780) 454-2655

Campbell Scientific Ltd.
Campbell Park
80 Hathern Road
Shepshed, Loughborough
LE12 9GX, U.K.
Phone +44 (0) 1509 601141
FAX +44 (0) 1509 601091

MODEL ASPTC ASPIRATED SHIELD WITH FINE WIRE THERMOCOUPLE

1. GENERAL

The model ASPTC is an aspirated shield with a chromel-constantan thermocouple temperature sensor. One ASPTC can be used to measure absolute air temperature. Two ASPTCs are used to make delta temperature measurements. The differential voltage thermocouple instruction, Instruction 14, is recommended to measure the ASPTC, because a differential measurement reduces noise.

1.1 SPECIFICATIONS

Shield

UV Stabilized Polyethylene

Length	72 cm
Height	14 cm
Width	10 cm

Fan

Air Velocity at Thermocouple	5.5 m/s @ 12 VDC
Expected Life	60,000 hrs @ 25 °C
Current Drain	140 mA @ 12 VDC
Thermal Fuse	Opens @ 640 mA
Operating Range	6-14 VDC

Reverse Polarity Protected

Thermocouple

Type	Chromel-Constantan
Diameter	0.003 inches

1.2 POWER CONSIDERATIONS

The ASPTC should be powered by an external 12 VDC deep cycle, battery with an MSX20R solar panel or the PS12LA with the AC charger. A PS12LA with a solar panel will not have enough reserve power for overcast days.

2. MOUNTING

The ASPTC can be mounted on the UT018 crossarm (Figure 2.1) or Campbell Scientific's Bowen Ratio arms.

When using the Bowen Ratio arms to mount the ASPTC, mount it to the side of the arm such that the ASPTC intake is at the same height as the water vapor intake.

The ASPTC may also be mounted on a user supplied crossarm with a square cross section (1.5 in. x 1.5 in.).

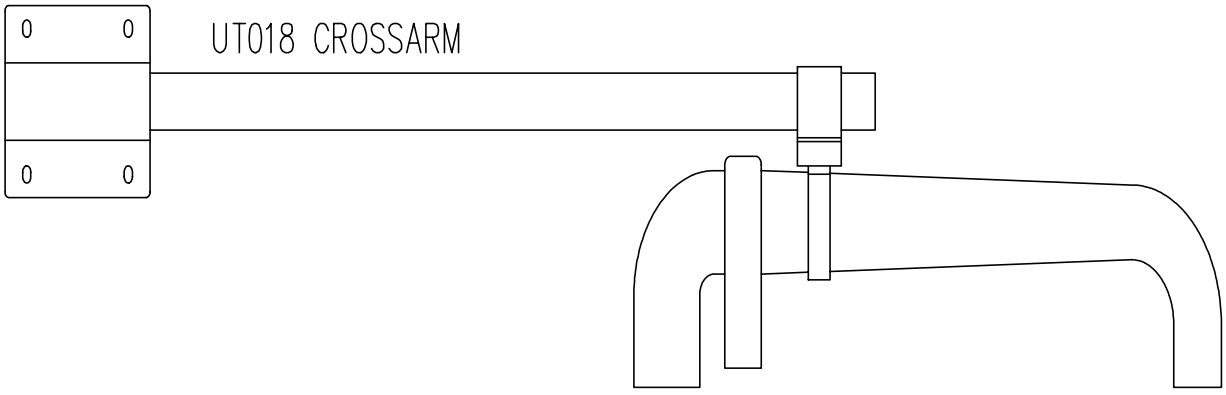

FIGURE 2.1. Mounting the ASPTC

3. PROGRAMMING

3.1 ABSOLUTE TEMPERATURE

The ASPTC is wired to the datalogger as shown in Figure 3.1-1.

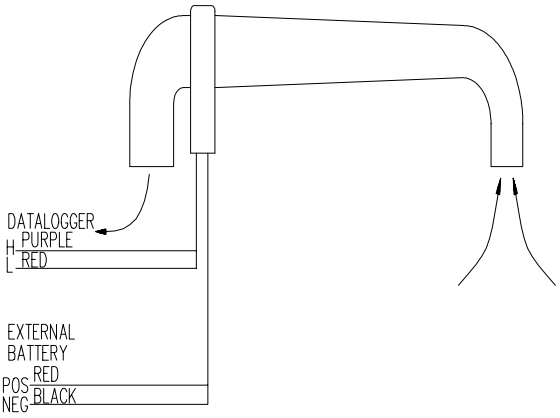

FIGURE 3.1-1. Wiring for a Single ASPTC

The temperature of the datalogger wiring panel is used as the reference temperature for the thermocouple measurement. The CR10(X) panel temperature is measured with the CR10TCR using Instruction 11. The 21X panel temperature is found using Instruction 17. The 21X panel temperature thermistor is located under differential input channel 4. Wiring the ASPTC into differential channel 4 reduces potential error caused by temperature gradients on the terminal strip. The terminal strip cover should always be installed on the datalogger wiring panel when measuring thermocouples.

NOTE: For a detailed discussion on thermocouple measurements, see the Measurement Section of the datalogger manuals.

EXAMPLE 1. Sample CR10(X)/21X Instructions for measuring Absolute Temperature with ASPTC

1: Temp (107) (P11)*

1:	1	Reps
2:	1	SE Channel
3:	3	Excite all reps w/E3
4:	1**	Loc [CR10TCR_C]
5:	1	Mult
6:	0	Offset

CAUTION: The CR10TCR reference temperature must be in degrees Celsius when used in Instruction 14.

2: Thermocouple Temp (DIFF) (P14)

1:	1	Reps
2:	21†	± 2.5 mV 60 Hz Rejection Range
3:	6***	DIFF Channel
4:	2	Type E (Chromel-Constantan)
5:	1**	Ref Temp Loc [CR10TCR_C]
6:	2**	Loc [ASPTC_C]
7:	1‡	Mult
8:	0‡	Offset

* Instruction 17 is used to find the panel temperature on a 21X.

** Proper entries will vary depending on the program.

*** Differential input channel 4 on the 21X.

† On the 21X the 5 mV slow input range is used.

‡ For degrees Fahrenheit use a Mult of 1.8 and Offset of 32.

3.2 DELTA TEMPERATURE

Delta temperature can be measured with two ASPTCs. Wire them as shown in Figure 3.2-1. A voltage is induced between the lower and upper ASPTC and is directly related to the difference in temperature at those two levels. There is no inherent sensor offset error. The delta temperature is then measured directly with Instruction 14. The temperature of the lower ASPTC is used as the reference for the differential thermocouple measurement.

If the accuracy of the absolute temperature at both the lower and upper ASPTC is a concern, measure both ASPTCs with Instruction 14 (differential voltage thermocouple measurement) as outlined in Section 3.1. To find the delta temperature, simply subtract the upper temperature from the lower one.

If the 21X is used to power the fans (or any other 12 VDC sensor) the current drawn by the fans may cause a difference in ground potential between the 21X ground terminals and the reference ground point in the datalogger. This ground potential difference results in an offset on single ended measurements. In thermocouple measurements this offset can translate to as much as ±1°C. This offset does not affect differential measurements, thus, the delta temperature is not affected.

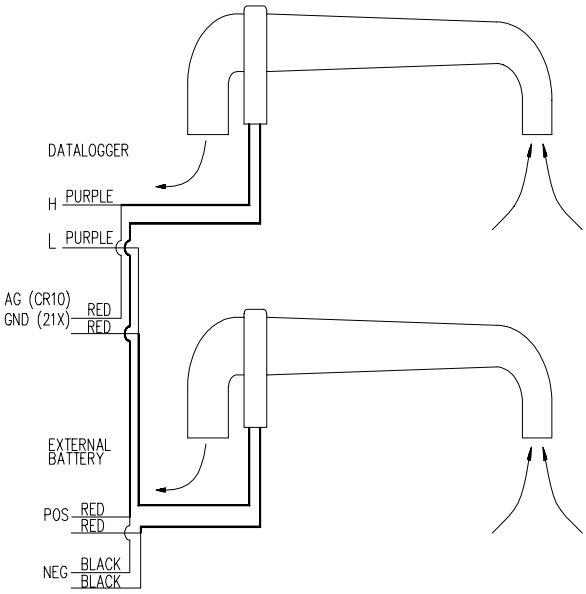

FIGURE 3.2-1. Wiring for a Pair of ASPTCs

EXAMPLE 2. Sample CR10(X)/21X Instructions for Measuring Temperature Gradient with the ASPTC

1: Temp (107) (P11)*

1:	1	Reps
2:	1	SE Channel
3:	3	Excite all reps w/E3
4:	1**	Loc [CR10TCR_C]
5:	1	Mult
6:	0	Offset

2: Thermocouple Temp (SE) (P13)

1:	1	Reps
2:	21†	± 2.5 mV 60 Hz Rejection Range
3:	12***	SE Channel
4:	2	Type E (Chromel-Constantan)
5:	1**	Ref Temp Loc [CR10TCR_C]
6:	2**	Loc [ASP_LWR]
7:	1	Mult
8:	0	Offset

CAUTION: The CR10TCR reference temperature must be in degrees Celsius when used in Instruction 14.

3: Thermocouple Temp (DIFF) (P14)

1:	1	Reps
2:	21†	± 2.5 mV 60 Hz Rejection Range
3:	6***	DIFF Channel
4:	2	Type E (Chromel-Constantan)
5:	2**	Ref Temp Loc [ASP_LWR]
6:	3**	Loc [ASP_UPR]
7:	1‡	Mult
8:	0‡	Offset

4: Z=X-Y (P35)

1:	2**	X Loc [ASP_LWR]
2:	3**	Y Loc [ASP_UPR]
3:	4**	Z Loc [del_ASP]

* Instruction 17 is used to find the panel temperature on a 21X.

** Proper entries will vary depending on the program.

*** Single ended input channel 8 and differential input channel 4 on the 21X.

† On the 21X the 5 mV slow input range is used.

‡ For degrees Fahrenheit use a Mult of 1.8 and Offset of 32.

4. MAINTENANCE

Keep the intake and thermocouple free from debris. Debris can be blown away with a can of compressed air. Tweezers may also be used to pick the debris from the thermocouple. Be careful not to damage the junction.