MODEL 105T THERMOCOUPLE PROBE
INSTRUCTION MANUAL

PRELIMINARY: 31/01/99

WARRANTY AND ASSISTANCE

The **MODEL 105T THERMOCOUPLE PROBE** is warranted by CAMPBELL SCIENTIFIC (CANADA) CORP. ("CSC") 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. CSC's obligation under this warranty is limited to repairing or replacing (at CSC's option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CSC. CSC will return such products by surface carrier prepaid. This warranty shall not apply to any CSC 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. CSC is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Return Merchandise Authorization (RMA), contact CAMPBELL SCIENTIFIC (CANADA) CORP., at (780) 454-2505. An RMA number will be issued in order to facilitate Repair Personnel in identifying an instrument upon arrival. Please write this number clearly on the outside of the shipping container. Include description of symptoms and all pertinent details.

CAMPBELL SCIENTIFIC (CANADA) CORP. does not accept collect calls.

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

CAMPBELL SCIENTIFIC
CANADA CORP.
11564 - 149 street - edmonton - alberta - T5M 1W7
tel 780.454.2505 fax 780.454.2655
www.campbellsci.ca

MODEL 105T
THERMOCOUPLE PROBE

1. GENERAL DESCRIPTION

The Model 105T Thermocouple Probe is used for monitoring the temperature of water or soil. The 105T is a type T thermocouple consisting of two wires of dissimilar metals (copper/ constantan) joined at one end. The output voltage of the thermocouple is a function of this junction temperature. The -L option on the Model 105T Thermocouple Probe (105T-L) indicates that the cable length is user specified.

2. SPECIFICATIONS

Probe

ANSI Thermocouple Type T

Temperature Range	up to 50°C
Seebeck Coef	38 µV/°C @ 0°C
Interchangeability	-73°C ± 0.365°C
	20°C ± 0.1°C
	50°C ± 0.25°C

Cable

Conductors		24 AWG
Blue	+ (Copper)	
Red	- (Constantan)	
Clear	Shield	
Insulation		Extruded TPR
Jacket		Extruded TPR
Diameter		0.2 inches

3. INSTALLATION

The 105T is designed for burial in soils or submersion in water up to 50 feet.

4. WIRING

Connection to Campbell Scientific dataloggers are given in Tables 1 and 2. Because of the very small voltage levels, it is recommended that the 105T be measured differentially.

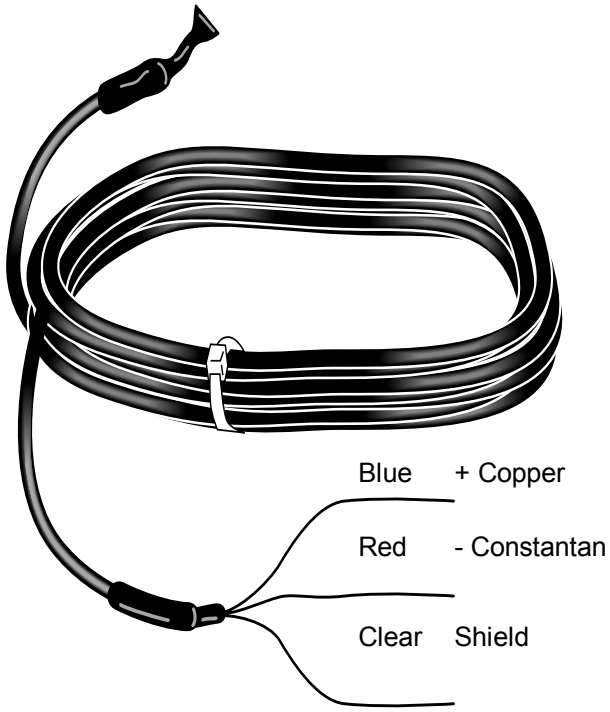

FIGURE 1. 105T Probe to Datalogger Connections

TABLE 1. Generic Datalogger Connections for Single-Ended Measurements

Description	Color	CR10(X)	CR23X, 21X, CR7
+ Copper	Blue	Single-Ended Input	Single-Ended Input
- Constantan	Red	AG	⏚
Shield	Clear	G	⏚

TABLE 2. Generic Datalogger Connections for Differential Measurements

Description	Color	CR10(X)	CR23X, 21X, CR7
+ Copper	Blue	Differential Input (H)	Differential Input (H)
- Constantan	Red	Differential Input (L)	Differential Input (L)
Shield	Clear	G	⏚

5. SAMPLE PROGRAM

This section is for users who write their own datalogger programs. A datalogger program for measuring this sensor can be created using Campbell Scientific's Short Cut Program Builder software. You do not need to read this section to use Short Cut. The CR510 Datalogger does not support thermocouple measurements.

Programming instructions P13 or P14 are used to measure the voltage of the 105T and convert it to temperature using the equation for a type T thermocouple. This equation assumes that the termination point of the thermocouple (wiring panel) is at 0°C. Because this is not the case, we need to obtain the wiring panel temperature in order to calculate the temperature of the 105T. There is a thermistor already located in the wiring panel of the CR23X, 21X, and CR7 for this purpose.

For the CR10(X) the wiring panel temperature must be measured using a Thermocouple Reference Thermistor (CR10XTCR or CR10TCR). When installed on the CR10(X), the reference thermistor should lie between the two analog input terminal strips.

Example 1 program illustrates programming for the CR10(X) using instruction P11 to measure the Reference Thermistor and instruction P14 to make a differential measurement of the 105T. Example 2 demonstrates programming for the CR23X using P17 and P14. Refer to the datalogger manual under Programming Instructions P13 and P14 thermocouple measurements.

For applications including a multiplexer (AM416, AM16/32, or AM25T), please refer to the appropriate multiplexer manual.

Example 1. Sample CR10(X) Program using differential measurement instruction

TABLE 3. CR10XTCR or CR10TCR Wiring

Description	Color	CR10(X)
Signal	Red	SE 1 (1H)
Excitation	Black	E3
Signal Reference	Clear	AG

TABLE 4. 105T-L Wiring for Example 1

Description	Color	CR10(X)
+ Copper	Blue	2H
- Constantan	Red	2L
Shield	Clear	G

```
;Measure the temperature of the wiring panel on the CR10(X) using the CR10XTCR or CR10TCR.
;This instruction must proceed the measurement of the 105T.

1:  Temp (107) (P11)
   1:        1        Reps
   2:        1        SE Channel
   3:        3        Ex Channel Option
   4:        1        Loc [ Ref_Temp  ]
   5:        1.0      Mult
   6:        0.0      Offset

;Knowing the wiring panel temperature, we now measure the 105T voltage and use the type T
;equation to calculate the 105T temperature.  A multiplier of 1 and offset of 0 yield the
;temperature in °C in input location 2 (TC_Temp).

2:  Thermocouple Temp (DIFF) (P14)
   1:        1        Reps
   2:       21        2.5 mV 60 Hz Rejection Range
   3:        2        DIFF Channel
   4:        1        Type T (Copper-Constantan)
   5:        1        Ref Temp (Deg. C) Loc [ Ref_Temp  ]
   6:        2        Loc [ TC_Temp   ]
   7:        1.0      Mult
   8:        0.0      Offset
```

Example 2. Sample CR23X Program Using Differential Measurement Instruction

TABLE 5. 105T-L wiring for Example 2

Description	Color	CR23X
+ Copper	Blue	1H
- Constantan	Red	1L
Shield	Clear	⏚

```
;Measure the temperature of the wiring panel on the CR23X.
;This instruction must proceed the measurement of the 105T.

1:  Panel Temperature (P17)
   1:        1        Loc [ Ref_Temp  ]
```

MODEL 105T THERMOCOUPLE PROBE

;Knowing the wiring panel temperature, we now measure the 105T voltage and use the type T
;equation to calculate the 105T temperature. A multiplier of 1 and offset of 0 yield the
;temperature in °C in input location 2 (TC_Temp).

2: Thermocouple Temp (DIFF) (P14)

1:	1	Reps
2:	21	10 mV, 60 Hz Reject, Slow Range
3:	1	DIFF Channel
4:	1	Type T (Copper-Constantan)
5:	1	Ref Temp (Deg. C) Loc [Ref_Temp]
6:	2	Loc [TC_Temp]
7:	1.0	Mult
8:	0.0	Offset