

# ***105E Temperature Probe***

## ***User Guide***

*Issued 7.11.12*

Copyright © 1999-2012 Campbell Scientific Ltd



# Guarantee

---

This equipment is guaranteed against defects in materials and workmanship. This guarantee applies for twelve months from date of delivery. We will repair or replace products which prove to be defective during the guarantee period provided they are returned to us prepaid. The guarantee will not apply to:

- Equipment which has been modified or altered in any way without the written permission of Campbell Scientific
- Batteries
- Any product which has been subjected to misuse, neglect, acts of God or damage in transit.

Campbell Scientific will return guaranteed equipment by surface carrier prepaid. Campbell Scientific will not reimburse the claimant for costs incurred in removing and/or reinstalling equipment. This guarantee and the Company's obligation thereunder is in lieu of all other guarantees, expressed or implied, including those of suitability and fitness for a particular purpose. Campbell Scientific is not liable for consequential damage.

Please inform us before returning equipment and obtain a Repair Reference Number whether the repair is under guarantee or not. Please state the faults as clearly as possible, and if the product is out of the guarantee period it should be accompanied by a purchase order. Quotations for repairs can be given on request. It is the policy of Campbell Scientific to protect the health of its employees and provide a safe working environment, in support of this policy a "Declaration of Hazardous Material and Decontamination" form will be issued for completion.

When returning equipment, the Repair Reference Number must be clearly marked on the outside of the package. Complete the "Declaration of Hazardous Material and Decontamination" form and ensure a completed copy is returned with your goods. Please note your Repair may not be processed if you do not include a copy of this form and Campbell Scientific Ltd reserves the right to return goods at the customers' expense.

Note that goods sent air freight are subject to Customs clearance fees which Campbell Scientific will charge to customers. In many cases, these charges are greater than the cost of the repair.



Campbell Scientific Ltd,  
Campbell Park, 80 Hathern Road,  
Shepshed, Loughborough, LE12 9GX, UK  
Tel: +44 (0) 1509 601141  
Fax: +44 (0) 1509 601091  
Email: [support@campbellsci.co.uk](mailto:support@campbellsci.co.uk)  
[www.campbellsci.co.uk](http://www.campbellsci.co.uk)



# PLEASE READ FIRST

---

## About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this origin.

Some useful conversion factors:

<b>Area:</b>	1 in <sup>2</sup> (square inch) = 645 mm <sup>2</sup>	<b>Mass:</b>	1 oz. (ounce) = 28.35 g 1 lb (pound weight) = 0.454 kg
<b>Length:</b>	1 in. (inch) = 25.4 mm 1 ft (foot) = 304.8 mm 1 yard = 0.914 m 1 mile = 1.609 km	<b>Pressure:</b>	1 psi (lb/in <sup>2</sup> ) = 68.95 mb
		<b>Volume:</b>	1 UK pint = 568.3 ml 1 UK gallon = 4.546 litres 1 US gallon = 3.785 litres

In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users.

Differences include the U.S standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. *Please note, however, that when a power supply adapter is ordered it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials may also not be applicable according to your locality.

Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered. Details of the alternatives will be covered in separate manuals.

Part numbers prefixed with a “#” symbol are special order parts for use with non-EU variants or for special installations. Please quote the full part number with the # when ordering.

## Recycling information



At the end of this product's life it should not be put in commercial or domestic refuse but sent for recycling. Any batteries contained within the product or used during the products life should be removed from the product and also be sent to an appropriate recycling facility.

Campbell Scientific Ltd can advise on the recycling of the equipment and in some cases arrange collection and the correct disposal of it, although charges may apply for some items or territories.

For further advice or support, please contact Campbell Scientific Ltd, or your local agent.



Campbell Scientific Ltd, Campbell Park, 80 Hathern Road, Shepshed, Loughborough, LE12 9GX, UK  
Tel: +44 (0) 1509 601141 Fax: +44 (0) 1509 601091  
Email: [support@campbellsci.co.uk](mailto:support@campbellsci.co.uk)  
[www.campbellsci.co.uk](http://www.campbellsci.co.uk)



# Contents

---

*PDF viewers note: These page numbers refer to the printed version of this document. Use the Adobe Acrobat® bookmarks tab for links to specific sections.*

- 1. General ..... 1**
- 2. Specifications ..... 1**
- 3. Installation Note..... 2**
- 4. Program Examples ..... 2**





# 105E Temperature Probe

---

*The 105E is a robust thermocouple probe suitable for measuring air and soil temperatures in the range -70 °C to +100 °C. In its standard form the probe comes with 3m of cable and connects directly to current Campbell Scientific dataloggers.*



## 1. General

The 105E probes are suitable for burial and are virtually maintenance free. The sensing junction is completely sealed in potting compound in a stainless steel sheath, providing excellent protection. The outer insulation is impervious to water and has good mechanical properties. The cable fitted to 105E probes is fully screened to minimise noise pick-up on long runs.

## 2. Specifications

Thermocouple Type:	Chromel-constantan (Type E)
Calibration:	The thermocouple wire is checked using a 3-point calibration over the range -30°C to +50°C. A calibration report is provided with each probe.
Typical Accuracy:	±0.5°C (Complete sensors can be calibrated to special order)
Time Constant (63%):	<80s in air at a wind speed of 1 ms <sup>-1</sup>
Cable Length:	3m as standard (extension cable A3537 available)
Cable Insulation:	6mm diameter heavy plastic sheath, impermeable to water. Bonded polyolefin tubing strain relief.
Sensing Junction:	Soldered thermocouple junction encapsulated in potting compound within stainless steel outer sheath.
Sensing Head:	Stainless steel Diameter: 5mm Exposed length: 55mm
Connections:	Red: constantan (L – low) Purple: chromel (H – high) Yellow: shield (G – ground)

### 3. Installation Note

The 105E temperature probe can be installed in air or soil. When used in soil, the soil surrounding the probe should be free from stones or other sharp objects which could damage the probe or cable when the soil is compacted. The soil should always be fully excavated before attempting to remove or reposition a probe. Never pull the probe from the soil by its wiring as this could cause damage.

### 4. Program Examples

The following examples use the 105E probe to measure temperature using a CR10/10X datalogger and an optional 10TCRT thermocouple reference. On the CR1000 example the reference thermistor is built in to the logger wiring panel. The 10TCRT lies between the two analogue input terminal strips of the datalogger wiring panel. The 10TCRT circuitry, measurements and specifications are equivalent to Campbell Scientifics' 107 Temperature Probe.

#### Table Based Example

The CR1000 has the first of the 5 off 105E in differential channel 1. The other 4 off 105E are in consecutive differential channels 2 through to 5.

The temperature of the reference thermistor moulded in to the CR1000 wiring panel is stored in variable PTemp\_C in °C. The thermocouple temperatures are stored in the variable array Temp\_C which has been dimensioned with 5 elements to the array.

```
`Wiring Panel Temperature measurement PTemp_C:
PanelTemp(PTemp_C,_50Hz)

`Type E (Chromel-constantan) Thermocouple measurements
Temp_C(1):
TCDiff(Temp_C(1),5,mV2_5C,1,TypeE,PTemp_C,True,0,_50Hz,1,0)
```

Where:-

<code>"mV2_5C"</code>	<i>is the +/-2.5mV input voltage range</i>
<code>"TypeE"</code>	<i>is the E-type thermocouple</i>
<code>"PTemp_C"</code>	<i>is the reference temperature variable</i>
<code>"True"</code>	<i>performs a reverse measurement with low referenced to High</i>
<code>"_50Hz"</code>	<i>50Hz noise rejection</i>

#### Array Based Example

The 10TCRT is connected to single-ended channel 1 (1H), excitation channel 3 (E3) and analogue ground (AG). The temperature is measured with Instruction 11, which excites the probe with an AC excitation, makes a single-ended measurement and calculates the reference temperature (°C). In the example program, five differential 105E thermocouples are measured with Instruction 14. (Instruction 13 would be used if making single-ended measurements with the 105E.)

The temperature (°C) of the 10TCRT is stored in input location 1 and the thermocouple temperatures (°C) in locations 2-6.

1: Temp (107) (P11) *(Reference temperature from 10TCRT)*  
1: 1 Reps  
2: 1 SE Channel  
3: 3\* Excite all reps w/E3 *(see NOTE below)*  
4: 1 Loc [ REFTEMP ]  
5: 1 Mult  
6: 0 Offset

2: Thermocouple Temp (DIFF) (P14) *(105E differential measurement)*  
1: 5 Reps *(for 5 thermocouples)*  
2: 32 7.5 mV 50 Hz Rejection Range  
3: 2 DIFF Channel  
4: 2 Type E (Chromel-Constantan)  
5: 1 Ref Temp (Deg. C) Loc [ REFTEMP ]  
6: 2 Loc [ TC1\_1 ]  
7: 1 Mult  
8: 0 Offset

*(\* or 03 since excitation/integration code = 0 in this case)*

## **CAMPBELL SCIENTIFIC COMPANIES**

### **Campbell Scientific, Inc. (CSI)**

815 West 1800 North  
Logan, Utah 84321  
UNITED STATES

[www.campbellsci.com](http://www.campbellsci.com) • [info@campbellsci.com](mailto:info@campbellsci.com)

### **Campbell Scientific Africa Pty. Ltd. (CSAf)**

PO Box 2450  
Somerset West 7129  
SOUTH AFRICA

[www.csafrica.co.za](http://www.csafrica.co.za) • [sales@csafrica.co.za](mailto:sales@csafrica.co.za)

### **Campbell Scientific Australia Pty. Ltd. (CSA)**

PO Box 8108  
Garbutt Post Shop  
QLD 4814 AUSTRALIA

[www.campbellsci.com.au](http://www.campbellsci.com.au) • [info@campbellsci.com.au](mailto:info@campbellsci.com.au)

### **Campbell Scientific do Brazil Ltda. (CSB)**

Rua Luisa Crapsi Orsi, 15 Butantã  
CEP: 005543-000 São Paulo SP BRAZIL

[www.campbellsci.com.br](http://www.campbellsci.com.br) • [suporte@campbellsci.com.br](mailto:suporte@campbellsci.com.br)

### **Campbell Scientific Canada Corp. (CSC)**

11564 - 149th Street NW  
Edmonton, Alberta T5M 1W7  
CANADA

[www.campbellsci.ca](http://www.campbellsci.ca) • [dataloggers@campbellsci.ca](mailto:dataloggers@campbellsci.ca)

### **Campbell Scientific Centro Caribe S.A. (CSCC)**

300N Cementerio, Edificio Breller  
Santo Domingo, Heredia 40305  
COSTA RICA

[www.campbellsci.cc](http://www.campbellsci.cc) • [info@campbellsci.cc](mailto:info@campbellsci.cc)

### **Campbell Scientific Ltd. (CSL)**

Campbell Park  
80 Hathern Road  
Shepshed, Loughborough LE12 9GX  
UNITED KINGDOM

[www.campbellsci.co.uk](http://www.campbellsci.co.uk) • [sales@campbellsci.co.uk](mailto:sales@campbellsci.co.uk)

### **Campbell Scientific Ltd. (France)**

3 Avenue de la Division Leclerc  
92160 ANTONY  
FRANCE

[www.campbellsci.fr](http://www.campbellsci.fr) • [info@campbellsci.fr](mailto:info@campbellsci.fr)

### **Campbell Scientific Spain, S. L.**

Avda. Pompeu Fabra 7-9  
Local 1 - 08024 BARCELONA  
SPAIN

[www.campbellsci.es](http://www.campbellsci.es) • [info@campbellsci.es](mailto:info@campbellsci.es)

### **Campbell Scientific Ltd. (Germany)**

Fahrenheitstrasse13, D-28359 Bremen  
GERMANY

[www.campbellsci.de](http://www.campbellsci.de) • [info@campbellsci.de](mailto:info@campbellsci.de)