

## Thermocouple Simulation THER



- External Unit
- Low noise & Thermally stable
- Integrated temperature sensor for accurate cold junction compensation
- Supports types K • J • T • R • S • E • N • B
- Works with ProCal Calibration software and 2000 Series Virtual Front Panel.

### Dedicated External Adapter For the Ultimate in Accuracy

Temperature gradients / thermal EMFs which can be introduced by internally mounted thermocouple simulation methods are one of the greatest sources of error with thermocouple temperature calibration.

For the ultimate in accuracy, Transmille has designed a dedicated external unit. This keeps the electronics required to generate the low level signals used for thermocouple simulation as close as possible to the measuring input of the thermometer. This allows the signal to be as free from electrical noise as possible, and also eliminates errors caused by heat generated by surrounding electronics in the calibrator.

### Direct Connection - No compensation cables required

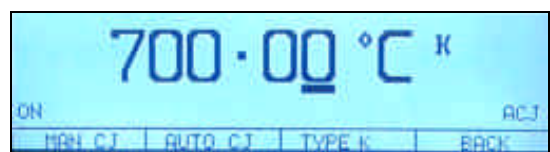
- **Uses neutral (copper) thermocouple plug** - For direct connection to any thermocouple type input without the need for compensation cables
- **CJC sensor built in to thermocouple plug** For automatic CJC compensation



Special care has been taken over the cold junction compensation - a common source of errors in thermocouple calibration. The cold junction compensation (CJC) sensor is mounted in the thermocouple plug itself. By measuring the cold junction at the instruments input allows any type of thermocouple to be simulated without using compensation cables.

### Intuitive Operation & Control

- Easy selection of thermocouple type
- Auto / Manual Cold Junction compensation



Quick and easy to use, simply plug in the temperature adapter into the 2000 Series calibrator, select thermocouple simulation mode and thermocouple type using the softkeys and enter the temperature required.

### Supports any temperature standard using Virtual Front Panel software

- Control directly from a PC
- Extend functionality
- Create custom conversion tables for any thermocouple standard



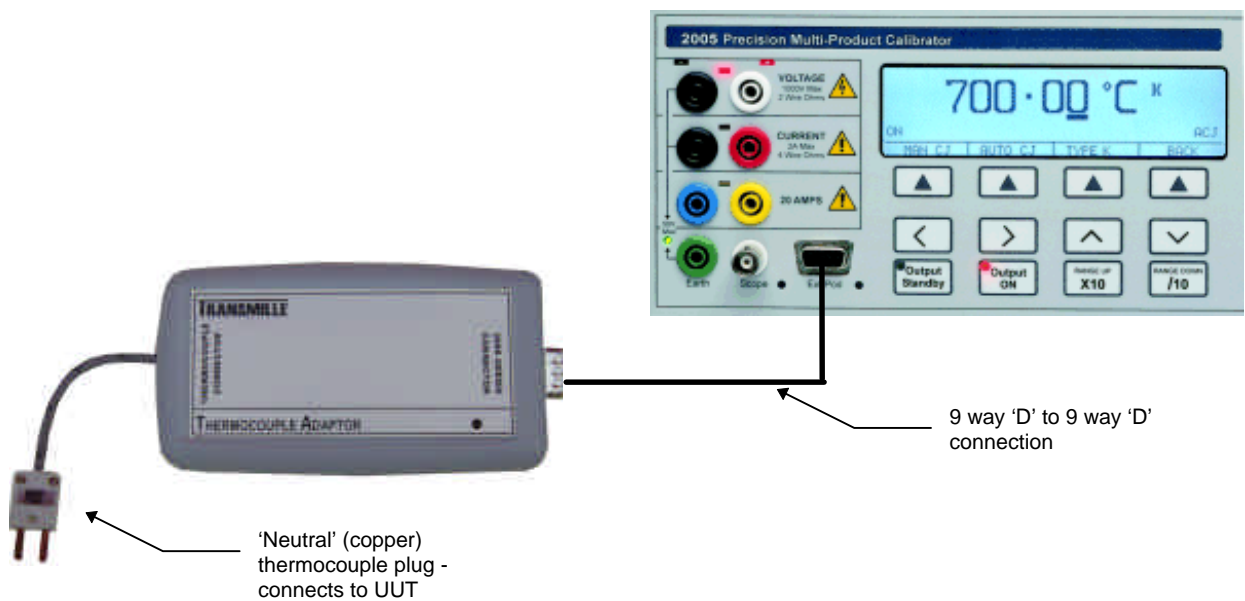
Using the Virtual Front Panel software from Transmille, custom configuration of temperature values can be achieved to any temperature standard providing the best flexibility.

See Extended specifications for full details

## Thermocouple Simulation Option - Operation

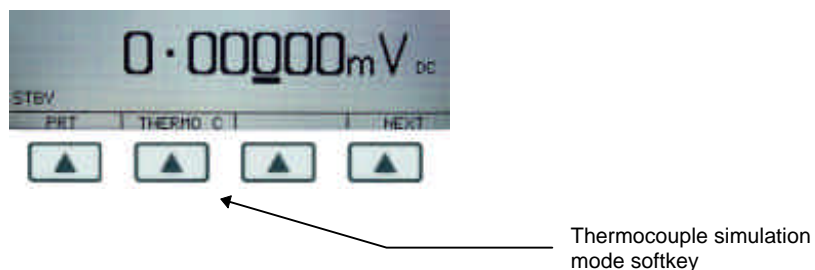
### Thermocouple Adapter Connection

Using the supplied adapter connection lead (9 way 'D' type to 9 way 'D' type), connect the thermocouple adapter to the feature connection on the front panel of the 2000 series calibrator.



### Starting the Thermocouple Simulation Option

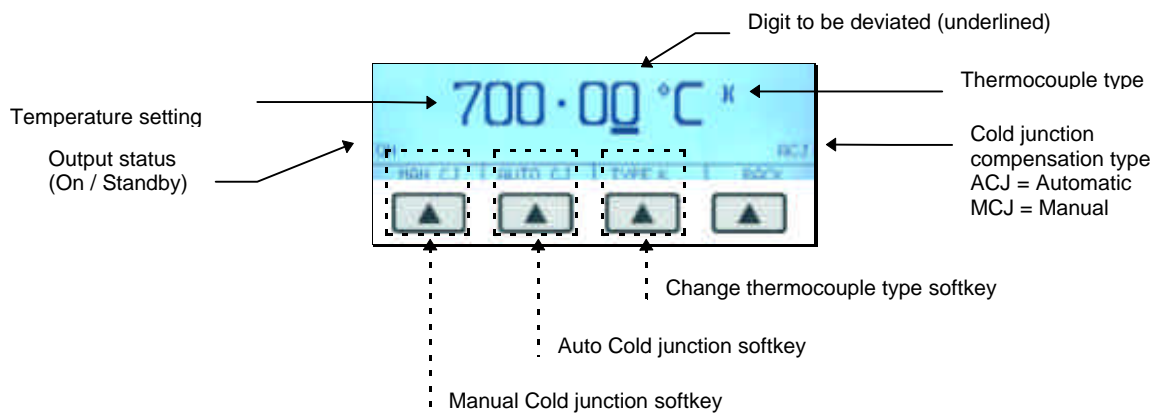
To start the oscilloscope calibration option, press the softkey below the **THERMO C** menu item



**TIP** : If the **THERMO C** menu item is not displayed, press the **NEXT** softkey to go to the next menu level.

## Thermocouple Simulation Option Operation

The thermocouple simulation option allows the user to enter a temperature in °C and set the calibrator to the specific voltage output which corresponds to the thermocouple type selected. On entering thermocouple simulation mode, type K will be the default function. The display below will be shown indicating the currently selected range and output status :



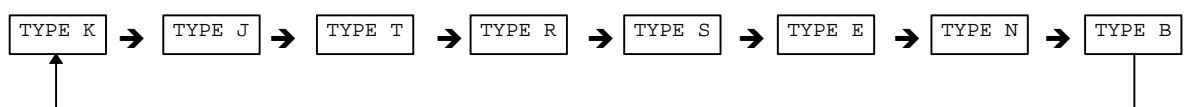
Once in thermocouple mode, the menus available at the bottom of the screen will change to reflect the thermocouple mode options - the available menu items are :

- MAN CJ

Selects the manual cold junction compensation mode  
This allows cold junction value to be set to zero.
- AUTO CJ

Selects the automatic cold junction compensation mode  
This allows the calibrator to use the built in temperature sensor within the adapter's thermocouple plug to compensate for the cold junction measured between the adapter plug and the UUT socket.
- TYPE K

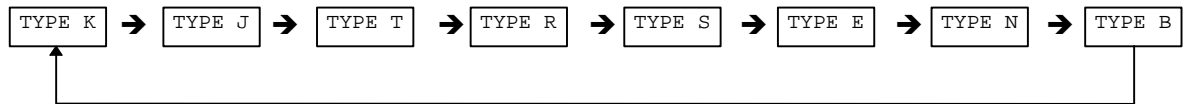
Selects the thermocouple type currently being simulated.  
Pressing this softkey allows the user to cycle through the available thermocouple types in the following order



1. Connect the thermocouple simulation adapter to the 2000 Series calibrator via its feature connector using the supplied 9 way 'D' type to 9 way 'D' type lead. Connect the UUT to the thermocouple plug extending from the opposite end of the thermocouple simulation adapter.

Set the UUT to the required range.

2. Select the thermocouple type to be simulated using thermocouple type selection softkey  Pressing this softkey allows the user to cycle through the available thermocouple types in the following order :



3. Select the cold junction setting using the softkeys :

**Manual Cold Junction Compensation**

Sets the cold junction to zero

**Automatic Cold Junction Compensation**

Activates the built in temperature sensor in the thermocouple plug to accurately compensate for the temperature at the point of connection.

4. Use the calibrator keypad to key in the required temperature, for example 450.5° :

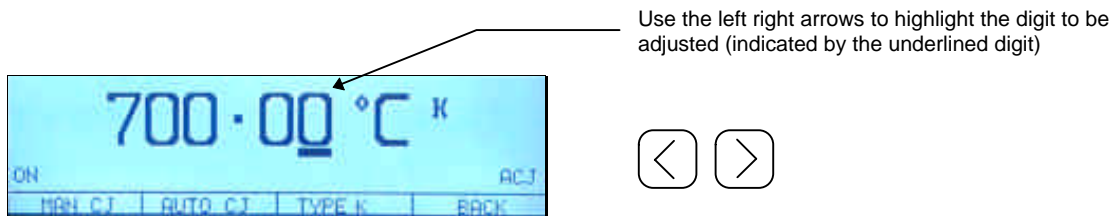
Ensure the calibrator output is turned ON by pressing the  key.



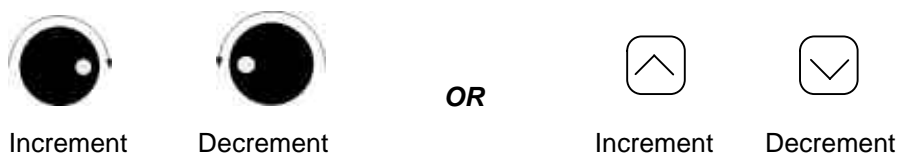
**Note** : The LED in the top left hand corner of the Output ON key will illuminate and the display will indicate ON in the left hand corner.

5. To deviate the temperature output from the nominal value, use the deviation function.

This is controlled by using the left and right arrow keys to select the digit to be increased or decreased



To increase or decrease the digit, simply use the up down keys on the calibrator's keyboard or use the digital potentiometer



**Note :** The thermocouple type, temperature and cold junction compensation settings can be changed at any time by re-entered / selecting the setting required



**TIP**

Automatic or manual cold junction value is only updated when a temperature is entered or the output is set to standby, then on (i.e. to apply the change from automatic to manual cold junction, the output must be re-entered or the output set to *standby*, then to *output on*).

Calibration times using the thermocouple simulation option to calibrate temperature instrumentation can be significantly reduced by using the ProCal calibration software available from Transmille which allows a pre-defined sequence of tests (known as a procedure) to be set up. This allows the computer to automatically step through these tests, control the calibrator, set the correct outputs and record the amount of deviation in relation to the instrument's specifications.

## 2000 Series Thermocouple Simulation Adaptor Specifications

General Specifications	
Adaptor connection	Connects to male 'D' type feature connector on 2000 Series front panel
Indicators	Incorporates an 'Active' LED mounted in the adaptor case
Adaptor Dimensions	12.5cm x 6.5cm x 2.5cm
Connections	1 x 9 way male 'D' type connector 1 x Neutral (copper) industry standard thermocouple plug with <b>integral temperature sensor</b>
Connection to Calibrator	Via supplied 9 Way male to female serial lead (straight through connection)
Sensor Type	Thermistor Sensor incorporated into thermocouple plug to eliminate any lead effects
Output impedance	10 Ohms

Thermocouple Type	Range	90 Day <sup>1</sup> Rel. (°C)	180 Year <sup>1</sup> Rel. (°C)	1 Year <sup>1</sup> Rel. (°C)	2 Year <sup>1</sup> Rel. (°C)
J	-210°C to 150°C	0.04	0.05	0.05	0.07
	150°C to 1200°C	0.24	0.27	0.30	0.42
K	-270°C to 200°C	0.08	0.09	0.10	0.14
	200°C to 1250°C	0.28	0.32	0.35	0.49
T	-200°C to 400°C	0.16	0.18	0.20	0.28
R	-50°C to 500°C	0.16	0.18	0.20	0.28
	500°C to 1750°C	0.80	0.90	1.00	1.40
S	-100°C to 1200°C	0.24	0.27	0.30	0.42
	1200°C to 1800°C	1.12	1.26	1.40	1.96
B	-100°C to 1200°C	0.08	0.09	0.10	0.14
	1200°C to 1800°C	1.04	1.17	1.30	1.82
N	-270°C to 260°C	0.08	0.09	0.10	0.14
	260°C to 1300°C	0.32	0.36	0.40	0.56

Note 1 : Does not include cold junction compensation errors

Specifications apply between 17°C and 27°C.

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

Due to continuous development specifications may be subject to change.

