



TC100
Precision
Thermocouple
Calibrator

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TC100

1. Introduction

The Martel TC100 is designed to be a simple to use, high accuracy thermocouple calibrator capable of either simulating or reading J, K, T, L, E, R, S, T, B, C, or mV thermocouple types. A standard thermocouple mini-connector along with screw terminals for bare wire makes connections easy while providing direct contact with the internal cold junction compensation circuitry.

When used as a thermocouple simulator, the TC100 provides control which allow the user to either "step" in increments or decades.

1.1 Customer Service

Corporate Office:

www.martelcorp.com

e-mail: sales@martelcorp.com

Tel: (603) 434-8179 800-821-0023

Fax: (603) 434-1653

Martel Electronics

PO Box 770

1F Commons Drive

Londonderry, NH 03053

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Beta Calibrators

2309 Springdale Rd.

Farmers Branch, Texas 75234

1.2. Unpacking Your Calibrator






Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment please call Martel Electronics at 1-800-821-0023. When the shipment is received inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.


NOTE: The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

1.3 Safety information

Symbols Used

The following table lists the International Electrical Symbols. Some or all of these symbols may be used on the instrument or in this manual.


Symbol	Description
	AC (Alternating Current)
	AC-DC
	Battery
	CE Complies with European Union Directives
	DC


 Double Insulated

 Electric Shock

 Fuse

 PE Ground

 Hot Surface (Burn Hazard)

 Read the User's Manual
(Important Information)

 Off

 On

 Canadian Standards Association

The following definitions apply to the terms "Warning" and "Caution".

- "Warning" identifies conditions and actions that may pose hazards to the user.
- "Caution" identifies conditions and actions that may damage the instrument being used.

Use the calibrator only as specified in this manual, otherwise injury and damage to the calibrator may occur.

 **Warning****To avoid possible electric shock or personal injury:**

- Do not apply more than the rated voltage. See specifications for supported ranges.
- Follow all equipment safety procedures.
- Do not use the calibrator if it is damaged. Before you use the calibrator, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Select the proper function and range for your measurement.
- Make sure the battery cover is closed and latched before you operate the calibrator.
- Remove test leads from the calibrator before you open the battery door.
- Do not use the calibrator if it operates abnormally. Protection may be impaired. When in doubt, have the calibrator serviced.
- Do not operate the calibrator around explosive gas, vapor, or dust.
- When servicing the calibrator, use only specified replacement parts.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.

 **Caution****To avoid possible damage to calibrator or to equipment under test:**

- Use the proper jacks, function, and range for your measurement or sourcing application.

2. Accessories

The following items are available for the TC100 calibrator.

<u>Item</u>	<u>P/N</u>
AC adapter/charger	1001-9V (120V) 80013 (220V)
9V NiCd battery (must use with above charger)	1002-9V
TC wire kit (J, K, T, E)	80029
TC wire kit (R, S, B, N)	80036

3. Set-Up Basic/Advanced

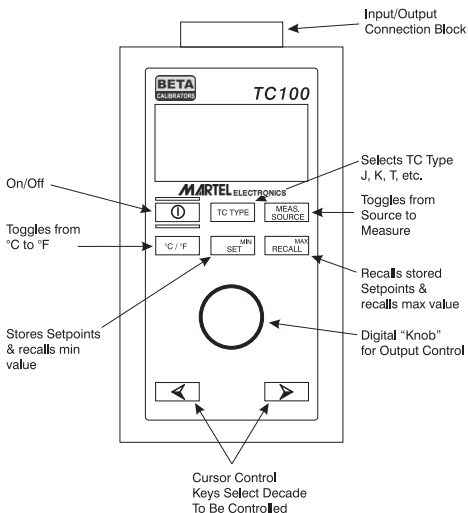


FIGURE 1

Before beginning, become familiar with the keypad layout and the configuration of the input/output jacks. See Figure 1.

In the basic or "as shipped" setup, the TC100 allows the user to step through all available T/C types (10 plus mV). In certain situations this may be confusing to infrequent users as to which type to use.

The optional advanced setup mode allows a supervisor through password control to "blank out" or disable unwanted T/C types so that only the proper T/C types can be selected. The following procedure outlines how this is done:

1. Hold down the **TC TYPE** key at power up.
2. The word **PASS** will be displayed and you need to introduce the password 123 as follows:
Rotate the knob to 1, press **SET** key, rotate to 2, press **SET**, rotate to 3, press **SET**.
3. You can toggle through all the thermocouple types by pressing **TC TYPE** key.
4. Press **SET** key for the ones that you want to keep.
5. The last TC type is mV. By pressing **TC TYPE** key again, you'll exit from this mode and return to normal operation.
6. If you missed one, repeat the entire procedure again.

4. Operating Procedure

1. Turn on power and select the desired thermocouple type by depressing the T/C Select key. Once the desired T/C is selected, it will remain in memory until a new T/C type is selected.

2. Select either Input or Output mode depending on whether you want to read a thermocouple or simulate a thermocouple signal.
3. Connect the appropriate thermocouple to the mini-connector or screw terminals on the top of the TC100. **Note:** for best accuracy, allow 3 to 5 minutes for the T/C connector (or wire) to stabilize to the same temperature as the connector block.
4. If you are using the TC100 in the output mode use the cursor control keys to select the decade to be controlled. Note that the cursor is the line under a specific digit.

5. Operating Connections and Precautions

1. When operating in the thermocouple output mode, the TC100 has the ability to simulate up to 10 T/C types plus mV into devices which measure thermocouples:

NOTE: If the TC100 is improperly connected to a low impedance load (either a short or near short) the display will flash.

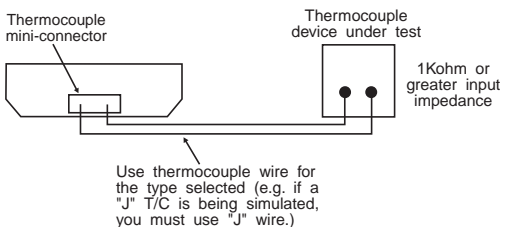


FIGURE 2
SIMULATING A THERMOCOUPLE OUTPUT

2. When operating in the thermocouple Measure Mode the TC100 can be used to read the temperature of a thermocouple probe.

In this mode, the TC100 will detect an open circuit should the thermocouple junction malfunction. In this case, the display will indicate "OL". It will also indicate "OL" if no probe is connected in the Input Mode.

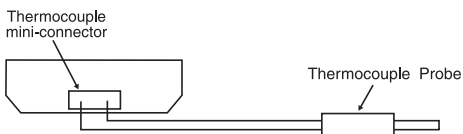


FIGURE 3
READING A THERMOCOUPLE PROBE

6. Battery Save Feature

The TC100 incorporates an Auto Shut Off or Battery Save feature that will automatically turn off the TC100 after a preset amount of time (up to 30 minutes) The factory default setting is 30 minutes, but can be changed or disabled by completing the following steps:

- 1) Turn on the TC100. Closely watch the display during power up.
- 2) The display will indicate the amount of time the battery save feature is set for (off to 30 minutes). Immediately adjust the knob to change the time period or disable the function.

7. Setpoint Feature

The TC100 allows the user to program up to 3 setpoints for each TC type (including mV). to set the setpoints complete the following procedure:

- 1) Turn on the TC100 and select the Source Mode.
- 2) Select the TC type to be simulated and correct units (either °C or °F).
- 3) Press to see what is currently stored in each of the 3 setpoints.
- 4) To store a new value adjust the output to the desired value then press the key.
- 5) Repeat steps 3 & 4 until all 3 setpoints are stored.
- 6) Once the setpoints are stored, press the key to recall the newly stored setpoints.
- 7) Each press of the key will increment to the next stored setpoint.

Note: Setpoints are non-volatile and will remain in memory until changed.

8. Min/Max Datalogging

When the TC100 is in the measure mode it will continuously monitor and store the minimum and maximum values for that particular input. To operate the datalogging feature use the following procedure:

- 1) Place the TC100 in the measure mode.
- 2) Connect a thermocouple (or probe).
- 3) Clear the min/max memory by pressing both keys (min and max) simultaneously. The LCD will display "CLR" when the memory is cleared.
- 4) Allow the unit to log min. and max. for as long as required.

Warning: You may want to disable the Battery Save feature before using the Datalogging Mode to prevent the TC100 from turning off prematurely.

- 5) At any time press the min. or max. to display the value stored.
- 6) Turning off the TC100 or changing modes will clear the memory. Be sure to record your data before turning off the unit.

9. Maintenance

A. Battery Selection

The TC100 operates on a standard 9V alkaline battery or an optional rechargeable 9V Ni-Cd battery. For most applications the 9V alkaline battery will suffice; however, in heavy use applications the 9V Ni-Cd may be a better choice. The 9V Ni-Cd battery supplied by Martel will offer approximately 7 hours of continuous use on a full charge (the alkaline battery will yield about 25 hours). The optional 1001-9V charger supplied by Martel will provide an overnight charge rate (10-12 hours) and will also power the TC100 for bench use while maintaining a float charge on the Ni-Cd battery.

Warning: Never connect the AC adapter/charger with the 9V alkaline battery installed.

To order the 9V Ni-Cd battery or AC adapter/charger contact Martel Electronics at 800-821-0023.

B. Input Protection

The TC100 incorporates a fuseless input protection and will tolerate most misconnections up to 250 VAC or 250 VDC for up to 30 seconds duration. Because of this protection no fuse is required.

C. Calibration

The TC100 is designed to hold its rated accuracy for a minimum of one (1) year. It is therefore recommend that an annual re-calibration be done to ensure operation within specification. Contact Martel's Customer Service Department for re-calibration information at 1-800-821-0023 or www.sales@martelcorp.com.

10. Specifications

(1 year at 23°C ±5°C; % of reading unless otherwise noted)

Output Voltage

Range	-10 to +75.000 mV
Resolution	1 mV
Accuracy	±0.007 % of reading, ±5 μV
Output Impedance	>1 Ohm

Input Voltage

Range	-10 to +75.000 mV
Resolution	1 mV
Accuracy	±0.007 % of reading, ±5 μV
Input Impedance	> 1 MegOhm

Thermocouple Source/Measure

Types	J, K, T, E, R, S, B, L, U, C, mV
Resolution	
Source	±0.1°C or °F
Measure	±0.01°C or °F
Accuracy	

J	±0.5 °C; -210 °C to -100 °C ±0.25 °C; -100 °C to +1,200 °C
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K	±0.6 °C; -200 °C to -100 °C ±0.3 °C; -100 °C to +1,000 °C ±0.5 °C; +1,000 °C to +1,372 °C
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T	±0.7 °C; -200 °C to -150 °C ±0.3 °C; -150 °C to +400 °C
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E	±0.5 °C; -200 °C to -100 °C ±0.2 °C; -100 °C to +1,000 °C
---	--

R	±1.8 °C; 0 °C to 250 °C ±1.0 °C; 250 °C to +1,767 °C
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S	±1.8 °C; 0 °C to 250 °C ±1.0 °C; 250 °C to +1,767 °C
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B	±1.7 °C; 600 °C to 1,000 °C ±1.2 °C; 1,000 °C to 1,820 °C
---	--

L	±0.5 °C; -200 °C to -100 °C ±0.4 °C; -100 °C to +900 °C
---	--

U	±0.7 °C; -200 °C to 0 °C ±0.3 °C; 0 °C to +600 °C
---	--

C	±0.4 °C; 0 to °C 1,000 °C ±0.7 °C; 1,000 °C to +1,800 °C ±1.2 °C; +1,800 °C to +2,316 °C
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CJC Temperature Offset

±0.05 °C/°C outside of 23±5 °C

Warm-up Time

1 minute to specification

Environmental

Operating	-10 °C to +55 °C
Storage	-20 °C to +70 °C

Power Requirements

Battery	9 Volt alkaline; 006P/ IEC 6F22/ NEDA1604 Optional NiCad Optional AC adapter/charger
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Mechanical Dimensions

5.7" x 3.15" x 1.43"
(14.47 cm x 8.00 cm x 3.63 cm)

Weight 12 ounces (340 grams)

Notes: 1. Temperature standard ITS-90.

11. Warranty

Martel Electronics Corporation warrants all products against material defects and workmanship for a period of twelve (12) months after the date of shipment. Problems or defects that arise from misuse or abuse of the instrument are not covered. If any product is to be returned, a "Return Material Authorization" number must be obtained from our Customer Service Department. This number must be indicated on the return package as notice to our Receiving Department to accept the shipment. Any package not so marked will not be accepted and will be returned to the shipper. Martel will not be responsible for damage as a result of poor return packaging. Out of warranty repairs and recalibration will be subject to specific charges. Under no circumstances will Martel Electronics be liable for any device or circumstance beyond the value of the product.



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