

Figures 2 and 3 illustrate the proper connection procedure.

Figure 2

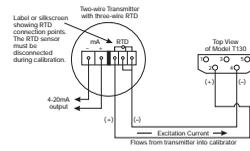
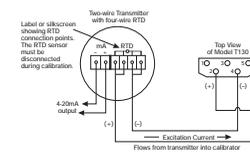


Figure 3



In both of these examples a jumper(s) must be made at the device under test for the circuit to work properly. The proper connections for these jumpers are generally shown by the label or silkscreen on the device under test. If proper RTD connections are not obvious refer to instruction manual for the device under test.

## 2. RTD Read Mode

The T130 can also be used to read an RTD probe or similar RTD sensor. The T130 only works in the 4 wire mode; however, 2 and 3 wire RTD's can be read as long as multiple connections are made at the RTD loads. Refer to the label on the rear of the T130 for connection information.

## SPECIFICATIONS

<b>Ranges</b>	PT385	-200 to 850°C
	PT392	-200 to 850°C
	Ni120	-80 to 320°C
	Jis.392	-200 to 850°C

**Resolution** 1°C or 1°F

**Accuracy** ±1°C

**Excitation Current Range (Source Mode)** 0.125 to 2.0mA continuous

**Operating Temp.** 0 to 50°C

**Storage Temp.** -20 to 60°C

**Temperature Coef.** ±.01% F.S./°C

**Power**<sup>1</sup> 9V alkaline battery

**Case Size** 1.43" x 3.15" x 5.7"

**Weight** 12 oz.

Notes: <sup>1</sup> A low battery indication is given at 5.5 volts.

## MAINTENANCE

Generally, with normal usage, this calibrator should hold its rated specifications for at least 12 months. Beyond this, it should remain within 1.5X of its specification over its useful life, provided it is not abused or tampered with. If after the stated warranty period, the device falls out of calibration, it can be returned to Martel for re-calibration. Please call 1-800-821-0023 for pricing and return information.

## WARRANTY

Martel 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 by calling our Customer Service Department at 1-800-821-0023.



P.O. Box 897  
Windham, NH 03087

1-800-821-0023



# Tuff Tools Model T130 Hand-held RTD Calibrator

## OPERATING INSTRUCTIONS

## GENERAL DESCRIPTION

The T130 is designed to be a simple to use, high accuracy RTD Calibrator capable of either simulating or reading several common RTD Types. When being used as an RTD simulator the T130 can calibrate a wide range of RTD Transmitters and recording devices due to its low excitation current capability. The step and scroll keys allow the user to make output changes quick and easily.

## INSTALLATION

### UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call Martel at 1-800-821-0023.

When you receive the shipment, 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.*

## SET-UP

Before beginning, become familiar with the keypad layout and the configuration of the input/output jacks. Remember, these jacks are used in multiple configurations so pay careful attention to the jack identification label on back of unit and how the test leads are connected for the specific application.

## OPERATING PROCEDURE

1. Turn on power and select desired RTD type by depressing the Range key. Once the desired range has been selected it will remain in memory until a new range is selected.

2. Select either input or output by depressing the In/Out key.

NOTE: The display will read "OPEN" if the unit is not connected to either an RTD or RTD measuring device.

3. Connect the T130 to the device under test as shown in the operating modes section.
4. If you are using the T130 in the output mode use the Step or Scroll keys to set output.

The Step key will step in 100° increments and the Scroll key allows single degree increments which will increase in speed if the switch is depressed for several seconds.

## OPERATING MODES

### 1. RTD Simulation Mode

One of the most common uses of the T130 is for simulating an RTD when calibrating an RTD measuring device such as a transmitter, data logger, PLC or similar product. To understand how to calibrate an RTD measuring device, it's important to have a general understanding of how an RTD operates.

By design, an RTD is a resistive sensor which changes its resistance value (ohms) as a function of temperature. Unlike a thermocouple, it does not "put out" a voltage or current but is strictly a passive device. Because of this, a current must be passed through the RTD so that a voltage can be developed across the RTD and then amplified by the measuring device. Ohm's Law is a simple algebraic expression which describes the relations between voltage, current and resistance.

Ohm's Law states:  $V = I \times R$

where  $V = \text{Voltage}$

$I = \text{Current}$

$R = \text{Resistance}$

From this equation, we can see that the voltage developed across the RTD is equal to the current traveling through it times its resistance. Therefore, for a fixed current, the voltage measured will be directly proportional to the temperature.

Figure 1 illustrates a typical example of how an RTD transmitter measures an RTD sensor using a fixed current.

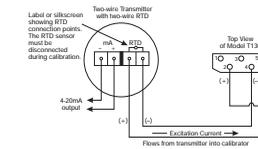


Figure 1

In this example a two-wire RTD transmitter is being calibrated using the T130 in the simulation mode. The transmitter under test supplies an excitation current into the calibrator and the calibrator adjusts the voltage drop at the terminals to yield the desired resistance for a given temperature. For the T130 to operate properly the excitation current must be in the range of 0.125mA to 2mA and the polarity must be correct. Too low of excitation current or pulsed excitation current will be indicated by the word "OPEN" flashing on the display. Reverse polarity will be indicated by "REV.POL" on the display. If your device requiring calibration has a pulsed excitation current refer to the PTC-9002.

The example in Figure 1 shows an RTD Transmitter with the RTD sensor having two connection points. In many cases, however, RTD devices have 3 and 4 wire connections.