

# PIECAL 510B/511B RTD Simulator

## Operating Instructions



(Shown without optional boot)



(Shown with optional boot)

## Product Description

- **Easy to use**

With the PIECAL 510B/511B you can check & calibrate all your RTD instruments. Automatic indication of connections on the display for simple hookups. Choose a single RTD type for the Model 510B or simulate 10 RTD types with the Model 511B.

- **Take it into the shop, plant or field**

Carry it without worry - protect it with an optional rubber boot and rugged, low profile switches. Easy to operate even in the dark areas of the plant with the backlit display.

- **Calibrate directly in temperature (°C & °F)**

Stop carrying around a decade box and RTD resistance tables. The PIECAL 510B/511B works with the RTDs you use including Platinum 100 (alpha = 3850, 3902, 3926) & 1000 (alpha = 3850, 3750) Ohm, Copper 10 & 50 Ohm, Nickel 100 and 120 Ohm. Easily set any value quickly to within 0.1° with the adjustable digital potentiometer "DIAL" plus store any three temperatures for instant recall with the EZ-CHECK™ switch.

- **Compatible with all process instruments**

Connect directly to the RTD inputs of smart transmitters, PLCs, DCS and multichannel recorders and verify their outputs or displays. Works with older instruments with fixed excitation currents and newer multichannel instruments that switch the excitation current between input channels.

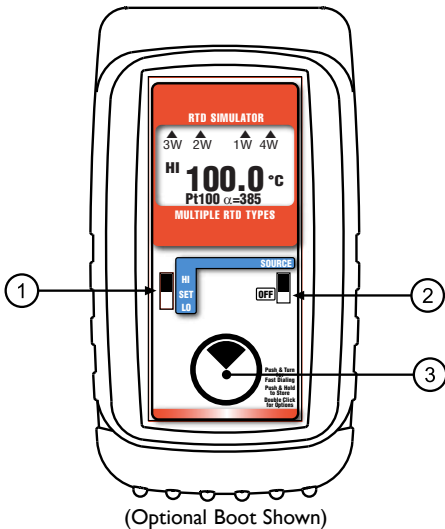
Practical Instrument Electronics

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## Basic Operation



### ① EZ-CHECK™ Switch

**SOURCE:** Instantly output two preset RTD temperatures by moving the EZ-CHECK™ switch to the "LO" position or "HI" position. For fast three point checks select the "DIAL" position. The PIECAL 510B/511B will remember the last "DIAL" value, even with the power off. These values can easily be changed to suit the calibration requirements.

### ② SOURCE/OFF Switch

Select "SOURCE" to output in °C, °F or ohms.

### ③ EZ-DIAL™ KNOB

**SOURCE:** Turn the knob to adjust the output level. Turn clockwise to increase the output, counter clockwise to decrease the output in 0.1° steps at a time. Push down and turn the EZ-DIAL knob for faster dialing. Press and hold the knob for two seconds to store desired EZ-Check™ HI/LO points in SIMULATE mode.

Double click the knob to get into the PIECAL 510B/511B Configuration Mode. Use configuration to select °C or °F, RTD Type (511B only) and Auto Off On/Off.

### Changing Batteries

Low battery is indicated by "BAT" on the display. Approximately one to four hours of typical operation remain before the PIECAL 510B/511B will automatically turn off. To change the batteries; remove the optional rubber boot, remove the battery door from the back of the unit by sliding the door downward. This allows access to the battery compartment. Replace with four (4) "AA" 1.5V batteries being careful to check the polarity. Replace the battery door and replace the boot. All stored configuration options (RTD Type, EZ-CHECK Memories, etc.,) are reset to factory settings when the batteries are removed.

**Note:** Alkaline batteries are supplied and recommended for maximum battery life and performance.

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# Configuration

## Configure the Calibrator

Move ② POWER SWITCH to “SOURCE”.

MODEL 51# V#.#  
DOUBLE CLICK  
EZ-DIAL KNOB  
FOR CONFIGURATION

### Setup

Double click the ③ DIAL KNOB at any time the unit is on and the following displays will appear for 15 seconds:

> EXIT	15
TEMP UNITS	°C
RTD Pt 100 $\alpha$ =3850	
AUTO OFF	ON

Turn the ③ DIAL KNOB to move through the menu. Press the ③ DIAL KNOB to toggle between OFF and ON or to scroll through the settings.

**EXIT MENU** - exits this menu immediately and saves any changes. Menu will automatically exit after 15 seconds of inactivity (countdown timer is displayed).

**TEMP UNITS** - pressing the knob will toggle between °C and °F.

### RTD -

510: pressing the knob will toggle between the factory configured RTD (Pt, Cu & Ni) and Ohms.

511: pressing the knob will cycle through the ten different RTD types (Pt, Cu & Ni) at different base resistances and alpha values and Ohms.

**AUTO OFF** - If AUTO OFF is ON, the unit will turn off after 30 minutes of inactivity to save battery life. If AUTO OFF is OFF the unit will stay on until the POWER SWITCH is moved to the off position.

**Note:** All settings are remembered even with the power off. Removing the batteries resets the values to factory defaults.

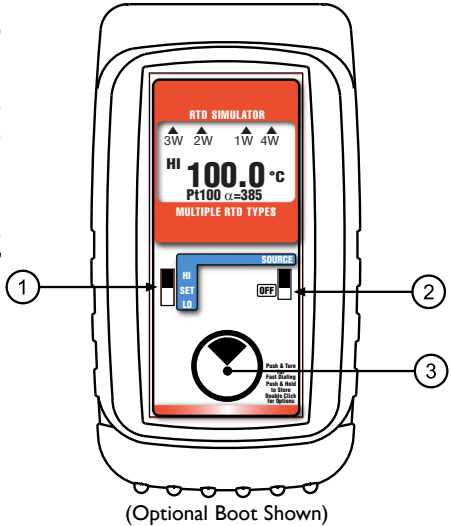
# Calibrating RTD Instruments

## Source

Choose this function to provide a simulated RTD signal into controllers, temperature transmitters, indicators or any input devices that measure thermocouple sensors.

- 1) Disconnect the RTD sensor from the device to be calibrated.
- 2) Select "**SOURCE**" with slide switch ②.
- 3) Connect the PIECAL 510B/511B to the device using 2, 3 or 4 wires matching the connections of the sensor that was just removed.

The output is adjusted in 0.1° (or 0.01/0.1 ohm) increments by turning the knob ③ while the EZ-CHECK™ switch ① is in the "HI", "LO" or "SET" position. Press and turn the knob for faster dialing with 10° (or 1.00/10.0 ohm) increments.



## Storing EZ-CHECK Outputs

### Storing HI and LO EZ-CHECK Outputs

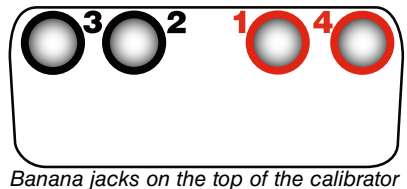
Choose this function to provide a simulated RTD signal into controllers, temperature transmitters, indicators or any other input device that measure thermocouple sensors..

- 1) Store your high (SPAN) output temperature by moving the EZ-CHECK switch to the **HI** position and turn the ③ EZ-Dial knob until the desired temperature is on the display. Press and hold the EZ-Dial knob until **STORED** appears to store the value. Release the EZ-Dial knob.
- 2) Store your low (ZERO) output temperature by moving the EZ-CHECK switch to the **LO** position and turn the ③ EZ-Dial knob until the desired temperature is on the display. Press and hold the EZ-Dial knob until **STORED** appears to store the value. Release the EZ-Dial knob.
- 3) Instantly output your SPAN and ZERO temperature outputs by moving the EZ-CHECK switch between HI and LO. You may also select any third temperature output (such as mid-range) using the SET position on the EZ-CHECK switch.

## Connections

### Two, Three and Four Wire connections

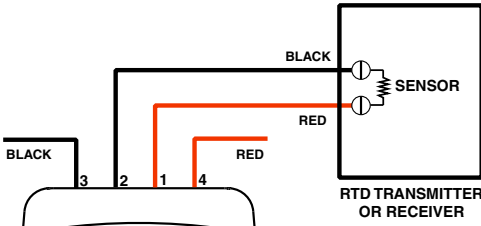
Two red and two black leads are included with the calibrator. Each lead has a retractable shield banana plug on the calibrator end and a spade lug on the end which will connect to the RTD input of the device being calibrated.



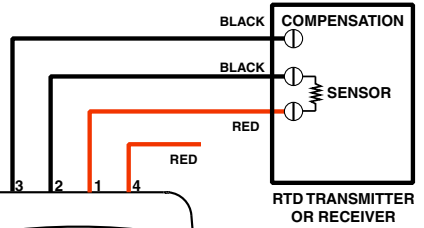
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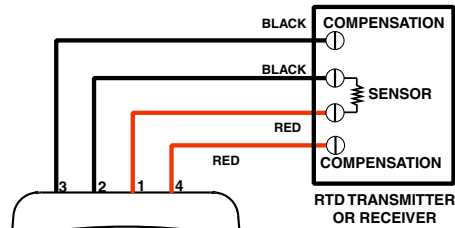
# Hookups



**Two Wire Connection**



**Three Wire Connection**



**Four Wire Connection**

## PIECAL 510B/511B Specifications

(Unless otherwise indicated all specifications are rated from a nominal 23 °C, 70 % RH for 1 year from calibration)

<b>General</b>	
Accuracy	±(0.015% of Setting in Ohms + 0.05 Ohms)
Temperature Drift	± 0.05 Ohms/°C
Operating Temperature Range	-25 to 60 °C (-10 to 140 °F)
Relative Humidity Range	10 % ≤RH ≤90 % (0 to 35 °C), Non-condensing
	10 % ≤RH ≤ 70 % (35 to 60 °C), Non-condensing
Size With Boot	4.96 x 2.73 x 1.79 inches, 126 x 69 x 45 mm (L x W x H)
	5.67 x 3.06 x 2.05 inches, 144 x 78 x 52 mm (L x W x H)
Weight With Boot	8.4 ounces, 0.24 kg (including batteries)
	11 ounces, 0.32 kg (including batteries)
Batteries	Four "AA" Alkaline 1.5V (LR6)
Battery Life	50 Hours
Optional NiMh Rechargeable battery kit	120 VAC for North America Only; charger, four NiMh batteries, AC & DC cords [Part # 020-0103]
Low Battery	Low battery indication with nominal 1 hour of operation left
Protection against misconnection	Over-voltage protection to 60V dc (rated for 30 seconds)
Display	High contrast graphic liquid crystal display. LED backlighting for use in low lit areas.

<b>Source</b>	
Accuracy From 1 to 10.2 mA External Excitation Current	±(0.015% of Setting + 0.05 Ohms)
	Below 1 mA of External Excitation Current $\pm(0.015\% \text{ of Setting} + \frac{0.01 \text{ mV}}{\text{mA Excitation Current}} + 0.05 \text{ Ohms})$
Resistance Ranges	0.00 to 410.00, 410.1 to 4001.0 Ohms
Allowable Excitation Current Range	<410 Ohms: 10.2 mA max; steady or pulsed/intermittent 410 to 4001 Ohms: 1 mA max; steady or pulsed/intermittent
Pulsed Excitation Current Compatibility	DC to 0.01 second pulse width

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## Ranges & Accuracies

RTD Type	Alpha	Degrees C Range	Accuracy °C	Degrees F Range	Accuracy °F
Pt 100 Ohm (DIN/IEC/JIS 1989) Based on ITS-90	1.3850 (0.00385)	-200.0 to 200.0 200.0 to 600.0 600.0 to 850.0	±0.2° ±0.3° ±0.4°	-328.0 to 392.0 392.0 to 1112.0 1112.0 to 1562.0	±0.4° ±0.6° ±0.7°
Pt 100 Ohm (Burns)	1.3902 (0.003902)	-195.6 to 200.0 200.0 to 648.9	±0.2° ±0.3°	-320.0 to 392.0 392.0 to 1200	±0.4° ±0.6°
Pt 100 Ohm (Old JIS 1981)	1.3916 (0.003916)	-200.0 to 200.0 200.0 to 648.9	±0.2° ±0.3°	-328.0 to 392.0 392.0 to 1200	±0.4° ±0.6°
Pt 100 Ohm (US Lab)	1.3926 (0.003926)	-200.0 to 100.0 100.0 to 700.0 700.0 to 850.0	±0.2° ±0.3° ±0.4°	-328.0 to 212.0 212.0 to 1292.0 1292.0 to 1562.0	±0.4° ±0.6° ±0.7°
Pt 1000 Ohm (DIN/IEC/JIS 1989)	1.3850 (0.00385)	-200.0 to 200.0 200.0 to 600.0 600.0 to 850.0	±0.2° ±0.3° ±0.4°	-328.0 to 392.0 392.0 to 1112.0 1112.0 to 1562.0	±0.4° ±0.6° ±0.7°
Pt 1000 Ohm Hy-Cal HVAC	1.3750 (0.00375)	-200.0 to 200.0 200.0 to 600.0 600.0 to 850.0	±0.2° ±0.3° ±0.4°	-328.0 to 392.0 392.0 to 1112.0 1112.0 to 1562.0	±0.4° ±0.6° ±0.7°
Copper 10 Ohm (Minco)	1.4274 (0.004274)	-200.0 to 260.0	±2.0°	-328.0 to 500.0	±4.0°
Copper 50 Ohm	1.4280 (0.00428)	-50.0 to 150.0	±1.0°	-58.0 to 302.0	±1.6°
Ni 120 Ohm (Pure)	1.6720 (0.00672)	-80.0 to 260.0	±0.1°	-112.0 to 500.0	±0.2°
Ni 110 (Bristol 7 NA)	1.5801 (0.005801)	-100.0 to 260.0	±0.2°	-148.0 to 500.0	±0.3°

## Additional Information

This product is calibrated on equipment traceable to NIST and includes a Certificate of Calibration. Test Data is available for an additional charge.

Practical Instrument Electronics recommends a calibration interval of one year. Contact your local representative for recalibration and repair services.

## Warranty

Our equipment is warranted against defective material and workmanship (excluding batteries) for a period of three years from the date of shipment. Claims under warranty can be made by returning the equipment prepaid to our factory. The equipment will be repaired, replaced or adjusted at our option. The liability of Practical Instrument Electronics (PIE) is restricted to that given under our warranty. No responsibility is accepted for damage, loss or other expense incurred through sale or use of our equipment. Under no condition shall Practical Instrument Electronics, Inc. be liable for any special, incidental or consequential damage.

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## Ordering Information

**PIECAL 510B** (Choose one of the ordering codes below):

PIECAL 510B-Pt-100-1 ( $\alpha=1.3850$ )

PIECAL 510B-Pt-1000-6 ( $\alpha=1.375$ )

PIECAL 510B-Pt-100-2 ( $\alpha=1.3902$ )

PIECAL 510B-Cu-10

PIECAL 510B-Pt-100-3 ( $\alpha=1.3916$ )

PIECAL 510B-Cu-50

PIECAL 510B-Pt-100-4 ( $\alpha=1.3926$ )

PIECAL 510B-Ni-110

PIECAL 510B-Pt-1000-5 ( $\alpha=1.3850$ )

PIECAL 510B-Ni-120

**PIECAL 511B:**

Includes all ten RTD Types listed above

## Accessories

### Included:

Four "AA" Alkaline batteries, Certificate of Calibration

Evolution RTD Wire Kit

2 Red & 2 Black Leads with Retractable Shield Banana Plugs & Spade Lugs

### Part Number

020-0208

### Optional:

Rubber Boot

Small Carrying Case with PIE Logo (fits unit with or without boot)

Ni-MH 1 Hour Charger with 4 Ni-MH AA Batteries

(100-120 V AC input for North America Only)

### Part Number

020-0209

020-0205

020-0103



### More Than a Simple Boot

The optional boot provides more than just protection. Flip out the tilt stand and free up both hands for calibration adjustments.

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