

# PIE 5258 Automated Thermocouple & RTD Calibrator

### · Easy to use

With the PIE 525B you can check and calibrate all your thermocouple and RTD instruments and measure temperature sensors.

- Take it into the shop, plant or field Carry it without worry - it comes protected with a rubber boot and rugged, low profile switches. Easy to operate even in the dark areas of the plant with the backlit display.
- Calibrate thermocouple instruments to 0.1 & 0.01 °F & °C The PIE 525B works with the thermocouples you use including types J, K, T, E, R, S, B, N, G, C, D, L (J-DIN), U (T-DIN) and P (Platinel II). Or calibrate from -13.0000 to +80.0000 mV.
- Calibrate RTD instruments to 0.1 & 0.01 °F & °C

Stop carrying around a decade box and RTD resistance tables. The 525B works with the RTDs you use including Platinum 10, 50, 100, 200, 500 & 1000 Ohm (alpha = 3850), Platinum 100 Ohm (alpha = 3902, 3916, 3926), Copper 10 & 50 Ohm, and Nickel 120 Ohm. Or calibrate from 0.000 to 400.000 and 0.00 to 4000.00 Ohms. For RTDs the fixed or pulsed sensor current is measured by the calibrator.

Fast calibration with automatic output stepping

Easily set any value quickly to within 0.1° or 0.01° with the adjustable digital potentiometer "DIAL" plus store any three temperatures for instant recall with the EZ-CHECK<sup>™</sup> switch. Choose between 2, 3, 5, 11 steps and ramp to automatically increment the output in 100%, 50%, 25%, 10% or 5% of span. Select step time from 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 & 60 seconds.

### Compatible with ALL process instruments

No competitor's calibrator is compatible with as many process instruments! Connect directly to the temperature inputs of transmitters, PLCs, DCS & multichannel recorders to verify their outputs or displays. RTD simulation works with older instruments with fixed excitation currents and newer multichannel instruments that switch the excitation current between input channels.

### Measure thermocouple & RTD sensors

Trouble shoot sensor connections and find broken wires or corroded connections. The PIE 525B measures probes to 0.1 or 0.01 °C or °F.

Secondary display shows the millivolt or resistance value corresponding to the sensor temperature as well as the junction temperature measured by the calibrator. Trouble

shoot sensor connections and find broken wires with patented technology. Connect your two, three or four wire RTDs and the PIE 525B automatically detects the connections.

### Calibration Lab Accurate & Stable

The internal cold junction thermistor is accurate to  $\pm 0.05^{\circ}$ C and is traceable to NIST. The sensor is thermally bonded to an isothermal mass which includes brass blocks with screw terminals for connection of bare thermocouple wires along with a miniature thermocouple connector for fast connections. The circuitry uses an extremely stable voltage reference and low drift components which make the PIE 525B more accurate than most other handheld and benchtop thermocouple calibrators.

### • Perform Heat Treating Uniformity Surveys and System Accuracy Tests

The PIE 525B meets or exceeds the requirement of AMS 2750 as a Field Test Instrument.

### Evolutionary design

PIECAL Calibrators are designed and built by members of the same team that designed and built the calibrators manufactured by Fluke\* under the Altek\* label. The PIE 525B improves upon other brands by including a rubber boot, tilt stand, backlit display with larger digits, rugged switches & a battery compartment for fast battery changes.

\* PIECAL Calibrators are not manufactured or distributed by Fluke Corp or Altek Industries Inc, manufacturers of Altek Calibrators.

Practical Instrument Electronics 82 E. Main Street Suite 3.14 • Webster, NY 14580 Tel: 585.872.9350 • Fax: 585.872.2638 • sales@piecal.com • www.piecal.com



PRACTICAL INSTRUMENT ELECTRONICS

MODEL 525B

Automated RTD & Thermocouple Calibrator Pt 10, 50, 100, 200, 500 & 1000Ω Cu 10 & 50Ω - Ni 120Ω J-T-E-K-R-S-B-N-G-C-D-L-U-P-mW

MA)

READ

MIN

HI

SET

LO

EZ-CHECK

SOURCE

'F

OFF

VOLUTION

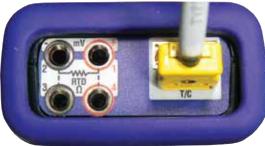
### **Thermocouple Connections**

Simulating or reading thermocouples requires the use of thermocouple or extension grade thermocouple wire.

Plug thermocouple wires into the miniature thermocouple jack or place bare thermocouple wires onto the brass block under the screws.

The PIE 525B has two banana jacks (1 + & 2) mounted in the top end of the housing. These are not temperature compensated and are to be used only for millivolt signals.





Simulating or reading RTDs uses copper wire.

Plug 2, 3 or 4 wires into the corresponding jacks on the calibrator. For RTD source the PIE 525B simulates the (+) RTD from jacks 1 & 4 and the (-) RTD from jacks 2 & 3.

When reading an RTD sensor the PIE 525B uses patented circuitry to automatically detects if 2, 3 or 4 wires are connected. This is helpful to troubleshoot sensor connections.





# Flip out stand for bench use

### **RTD Connections**

PIE 525B Specifications Unless otherwise indicated all specifications (except Cold Junction) are rated from a nominal 23 °C, 70 % RH for 1 year from calibration

General			
Operating Temperature Range	-20 to 60 °C (-5 to 140 °F)		
Storage Temperature Range	-30 to 60 °C (-22 to 140 °F)		
Temperature effect	≤ ±25 ppm/°C of Range; Cold Junction Sensor: ≤ ±0.01% °/° from ambient temperature (°C or °F)		
Relative Humidity Range	10 % ≤RH ≤90 % (0 to 35 °C), Non-condensing		
	10 % ≤RH≤ 70 % (35 to 60 °C), Non-condensing		
Normal Mode Rejection	50/60 Hz, 50 dB		
Common Mode Rejection	50/60 Hz, 120 dB		
Size	5.63 x 3.00 x 1.60 in, 143 x 76 x 41mm (L x W x H)		
Weight	12.1 ounces, 0.34 kg with boot & batteries		
Batteries	Four "AA" Alkaline 1.5V (LR6)		
Optional NiMh Rechargeable battery kit	I 20 VAC for North America Only; charger, four NiMh batteries, AC & DC cords [Part # 020-0103]		
Battery Life	50 Hours		
Low Battery	Low battery indication with nominal I hour of operation left		
Protection against misconnection	Over-voltage protection to 60 vrms (rated for 30 seconds) Red LED indicates OVERLOAD or out of range conditions		
Display	High contrast graphic liquid crystal display. LED backlighting for use in low lit areas.		

AC & DC cords [Part # 020-0103]		Pulse: < 10 microamp
dication with nominal I hour of		
rotection to 60 vrms (rated for 30		
	<b>RTD and Ohms Source</b>	I.
tes OVERLOAD or out of range	3 Wire & 4 Wire Accuracy	
	From I to 10.2 mA	±(0.015% of Setting +
raphic liquid crystal display. LED	External Excitation Current	
use in low lit areas.	Below I mA of External	Add (0.025 mV
	Excitation Current	mA Excitation Cu
	2 Wire Accuracy	Add 0.1 Ohms to 3 Wi

Voltage Source				
Ranges and Resolution	-13.000 to 80.000 mV & -13.0000 to 80.0000 mV			
Accuracy ±(0.008% of Setting + 0.006 mV)				
Source Current	≥ 10 mA			
Output Impedance	< 0.3 Ohm			
RMS Noise $\leq \pm 0.0005$ mV from 0.1 to 10 Hz				
Short Circuit Duration	Infinite			

Voltage Read			
Range and Resolution Same as Voltage Source			
Accuracy ±(0.008% of Reading + 0.006 mV)			
Input resistance	≥ 10 MΩ		

RTD and Ohms Read	
Resistance Ranges	Same as RTD and Ohms Source
Accuracy	±(0.015% of Reading + 0.05 Ohms)
Excitation Current	0.9 mA to 401 Ohms, 0.4 mA to 4010 Ohms (nominal)

Thermocouple Source				
Accuracy	±(0.008% of Setting + 0.006 mV)			
Cold Junction Compensation	$\pm$ 0.09°F (±0.05 °C) - Thermistor traceable to NIST for 11 years			
Output Impedance	< 0.3 Ohms			
Source Current	> 10 mA (drives 80 mV into 10 Ohms)			
RMS Noise	$\leq$ ± 0.0005 mV from 0.1 to 10 Hz			

Thermocouple Read					
Accuracy	±(0.008% of Reading + 0.006 mV)				
Cold Junction Compensation	$\pm$ 0.09°F (±0.05 °C) - Thermistor traceable to NIST for 11 years				
Input Impedance	> 10 Megohms				
Open Thermocouple	Threshold: 10,000 Ohms nominal Pulse: < 10 microamp pulse for 300 milliseconds				

RTD and Ohms Source					
<b>3 Wire &amp; 4 Wire Accuracy</b> From 1 to 10.2 mA External Excitation Current	±(0.015% of Setting + 0.05 Ohms)				
Below I mA of External Excitation Current	Add () Accuracy mA Excitation Current				
2 Wire Accuracy	Add 0.1 Ohms to 3 Wire & 4 Wire Accuracy				
Resistance Ranges	400 Ohm Range: 0.00 to 401.00 & 0.000 to 401.000 4000 Ohm Range: 0.0 to 4010.0 & 0.00 to 4010.00				
RMS Noise	400 Ohm Range: ≤ ± 0.005 Ohms from 0.1 to 10 Hz 4000 Ohm Range: ≤ ± 0.05 Ohms from 0.1 to 10 Hz				
Allowable Excitation Current Range	400 Ohm Range:10.2 mA max; steady or pulsed/intermittent 4000 Ohms Range: I mA max; steady or pulsed/intermittent				
Pulsed Excitation Current Compatibility	DC to 0.01 second pulse width				

RTD and Ohms Read				
Resistance Ranges	Same as RTD and Ohms Source			
Accuracy	±(0.015% of Reading + 0.05 Ohms)			
Excitation Current	0.9 mA to 401 Ohms, 0.4 mA to 4010 Ohms (nominal)			

# Thermocouple Ranges & Accuracies

#### Table based on Accuracy:

 $\leq \pm$  (0.008 % of Reading + 0.006 mV) Note: Doesn't include cold junction error of  $\pm 0.05^{\circ}C$ 

T/C	Degrees C	°C	Degrees F	°F	T/C
	Range		Range		Material
J	-200.00 to -150.00	±0.25°	-328.00 to -238.00	±0.55°	+Iron
	-150.00 to -50.00	±0.17°	-238.00 to -58.00	±0.35°	-Connstantan
	-50.00 to 300.00	±0.13°	-58.00 to 572.00	±0.24°	
	300.00 to 850.00	±0.15°	572.00 to 1562.00	±0.28°	
	850.00 to 1200.00	±0.20°	1562.00 to 2192.00	±0.36°	
K	-230.00 to -100.00	±0.70°	-382.00 to -148.00	±1.26°	+ Chromel® -Alumel®
	-100.00 to 600.00	±0.19°	-148.00 to 1112.00	±0.34°	-Alument
	600.00 to 1000.00	±0.24°	1112.00 to 1832.00	±0.43°	
	1000.00 to 1371.1	±0.31°	1832.00 to 2500.00	±0.55°	
т	-260.00 to -240.00	±1.66°	-436.00 to -400.00	±2.98°	+Copper
	-240.00 to -210.00	±0.60°	-400.00 to -346.00	±1.07°	-Constantan
	-210.00 to -100.00	±0.00	-346.00 to -148.00	±0.74°	
	-100.00 to 50.00	±0.18°	-148.00 to 122.00	±0.33°	
	50.00 to 400.00	±0.10°	122.00 to 752.00	±0.00	
	30.00 10 400.00	10.14	122.00 10 7 52.00	10.24	
E	-240.00 to -225.00	±0.51°	-400.00 to -373.00	±0.92°	+Chromel
	-225.00 to -100.00	±0.27°	-373.00 to -148.00	±0.48°	-Constantan
	-100.00 to 750.00	±0.13°	-148.00 to 1382.00	±0.24°	
	750.00 to 1000.00	±0.16°	1382.00 to 1832.00	±0.29°	
R	-18.30 to 250.00	±1.26°	-1.00 to 482.00	±2.27°	+Pt/13Rh
	250.00 to 750.00	±0.64°	482.00 to 1382.00	±1.14°	-Platinum
	750.00 to 1600.00	±0.54°	1382.00 to 2192.00	±0.97°	
	1600.00 to 1767.80	±0.63°	2192.00 to 3214.00	±1.13°	
	40.00 + 450.00	1 000		0.000	DI (LODI
S	-18.30 to 150.00	±1.22°	-1.00 to 302.00	±2.20°	+Pt/10Rh -Platinum
	150.00 to 500.00	±0.72°	302.00 to 932.00	±1.30°	riadinani
	500.00 to 1650.00	±0.63°	932.00 to 3002.00	±1.14°	
	1650.00 to 1767.80	±0.73°	3002.00 to 3214.00	±1.31°	
В	315.60 to 550.00	±1.88°	600.00 to 1022.00	±3.39°	+Pt/30Rh
	550.00 to 900.00	±1.03°	1022.00 to 1652.00	±1.86°	-Pt/6Rh
	900.00 to 1150.00	±0.72°	1652.00 to 2102.00	±1.30°	
	1150.00 to 1820.00	±0.63°	2102.00 to 3308.00	±1.14°	
	1.00.00 10 1020.00	1 -0.00	2102.00 10 0000.00	±1.17	

	or of ±0.05°C	°C	Degrees F	°F	T/C	
T/C	Degrees C Range	Range Range		F	Naterial	
N	-230.00 to -100.00	±1.10°	-382.00 to -148.00	±1.98°	+Nicrosil	
	-100.00 to 0.00	±0.30°	-148.00 to 32.00	±0.53°	-Nisil	
	0.00 to 1100.00	±0.24°	32.00 to 2012.00	±0.44°		
	1100.00 to 1300.00	±0.27°	2012.00 to 2372.00	±0.49°		
G	100.00 to 450.00	±1.14°	212.00 to 842.00	±2.05°	+Tungsten	
(W)	440.00 to 1700.00	±0.44°	842.00 to 3092.00	±0.79°	-W26/Re	
	1700.00 to 2000.00	±0.54°	3092.00 to 3632.00	±0.97°		
	2000.00 to 2320.00	±0.73°	3632.00 to 4208.00	±1.32°		
0		0.440		0.000	ME /D	
C (W5)	-1.10 to 1150.00	±0.44°	30.00 to 2102.00	±0.80°	+W5/Re -W26/Re	
(10)	1150.00 to 1750.00	±0.61°	2102.00 to 3182.00	±1.09°	-1120/116	
	1750.00 to 2050.00	±0.74°	3182.00 to 3722.00	±1.33°		
	2050.00 to 2320.00	±0.99°	3722.00 to 4208.00	±1.79°		
D	-1.00 to 150.00	±0.63°	30.00 to 302.00	±1.13°	+W3/Re	
(W3)	150.00 to 1200.00	±0.41°	302.00 to 2192.00	±0.73°	-W25/Re	
	1200.00 to 1700.00	±0.51°	2192.00 to 3092.00	±0.92°		
	1700.00 to 2320.00	±0.97°	3092.00 to 4208.00	±1.75°		
Р	0.00 to 950.00	±0.23°	32.00 to 1742.00	±0.41°	+Pd55/Pt31/ Au14	
	950.00 to 1395.00	±0.34°	1742.00 to 2543.00	±0.61°	-Au65/Pd35	
DIN Wire						
L	-200.00 to -100.00	±0.21°	-328.00 to -148.00	±0.38°	+Iron	
J-DIN	-100.00 to 350.00	±0.13°	-148.00 to 662.00	±0.24°	-Constantan	
	350.00 to 900.00	±0.15°	662.00 to 1652.00	±0.27°		
	000 00 to 150 00	.0.079	200 00 to . 020 00	.0.009	Connor	
U T-DIN	-200.00 to -150.00	±0.37°	-328.00 to -238.00	±0.66°	+Copper -Constantan	
	-150.00 to 100.00	±0.22°	-238.00 to 212.00	±0.40°	ounsianian	
	100.00 to 600.00	±0.15°	212.00 to 1112.00	±0.28°		

## **RTD Ranges & Accuracies**

Table based on 3 & 4 Wire RTD Accuracy:

 $\leq$  ± (0.015 % of Reading +0.05 Ohms)

[Read based on 1.0 mA of fixed excitation current]

RTD	Alpha	Degrees C	°C	Degrees F	°F
Туре		Range	U	Range	F
Pt 100 Ohm	1.3850	-200.00 to -150.00	±0.13°	-328.0 to -238.00	±0.24°
DIN/IEC/JIS 1989	(0.00385)	-150.00 to 360.00	±0.24°	-238.00 to 660.00	±0.44°
ITS-90		360.00 to 740.00	±0.34°	660.00 to 1364.00	±0.61°
		740.00 to 850.00	±0.37°	1364.00 to 1562.00	±0.67°
Pt 10 Ohm	1.3850	-200.00 to -120.00	±1.24°	-328.00 to -184.00	±2.24°
DIN/IEC/JIS 1989	(0.00385)	-120.0 to 210.00	±1.44°	-184.00 to 410.00	±2.59°
Based on		210.00 to 370.00	±1.54°	410.00 to 698.00	±2.77°
ITS-90		370.00 to 650.00	±1.74°	698.00 to 1202.00	±3.14°
		650.00 to 850.00	±1.91°	1202.00 to 1562.00	±3.44°
Pt 50 Ohm	1.3850	-200.00 to 200.00	±0.34°	-328.00 to 392.00	±0.62°
DIN/IEC/JIS 1989	(0.00385)	200.00 to 550.00	±0.44°	392.00 to 1022.00	±0.80°
ITS-90		550.00 to 850.00	±0.54°	1022.00 to 1562.00	±0.98°
Pt 200 Ohm	1.3850	-200.00 to -120.00	±0.08°	-328.00 to -184.00	±0.14°
DIN/IEC/JIS 1989	(0.00385)	-120.00 to 180.00	±0.14°	-184.00 to 356.00	±0.24°
ITS-90		180.00 to 450.00	±0.19°	356.00 to 842.00	±0.34°
		450.00 to 680.00	±0.24°	842.00 to 1256.00	±0.44°
		680.00 to 850.00	±0.29°	1256.00 to 1562.00	±0.52°
Pt 500 Ohm	1.3850	-200.00 to -90.00	±0.08°	-328.00 to -194.00	±0.14°
DIN/IEC/JIS 1989	(0.00385)	-120.00 to 180.00	±0.14°	-184.00 to 356.00	±0.24°
ITS-90		180.00 to 450.00	±0.19°	356.00 to 842.00	±0.34°
		450.00 to 680.00	±0.24°	842.00 to 1256.00	±0.44°
		680.00 to 850.00	±0.29°	1256.00 to 1562.00	±0.52°
Pt 1000 Ohm	1.3850	-200.00 to 170.00	±0.08°	-328.00 to 338.00	±0.14°
DIN/IEC/JIS 1989	(0.00385)	170.00 to 470.00	±0.14°	338.00 to 878.00	±0.24°
ITS-90		470.00 to 730.00	±0.19°	878.00 to 1346.00	±0.34°
		730.00 to 850.00	±0.22°	1346.00 to 1562.00	±0.39°

BTD	Alpha	Degrees C		Degrees F	
Туре		Range	°C	Range	°F
Pt 100 Ohm	1.3902	-195.61 to -100.00	±0.14°	-320.10 to -148.00	±0.26°
(Burns)	(0.003902)	-100.00 to 370.00	±0.24°	-148.00 to 698.00	±0.44°
	· · · /	370.00 to 648.90	±0.31°	698.00 to 1200.00	±0.56°
Pt 100 Ohm	1.3916	-200.00 to -140.00	±0.13°	-328.00 to -220.00	±0.24°
(Old JIS	(0.003916)	-140.00 to 130.00	±0.19°	-220.00 to 266.00	±0.34°
1981)		130.00 to 370.00	±0.24°	266.00 to 698.00	±0.44°
		370.00 to 648.90	±0.31°	698.00 to 1200.00	±0.56°
Pt 100 Ohm	1.3926	-200.00 to -140.00	±0.13°	-328.00 to -220.00	±0.24°
(US Lab)	(0.003926)	-140.00 to 130.00	±0.19°	-220.00 to 266.00	±0.34°
		130.00 to 380.00	±0.24°	266.00 to 716.00	±0.44°
		380.00 to 610.00	±0.30°	716.00 to 1130.00	±0.54°
		610.00 to 850.00	±0.37°	1130.00 to 1562.00	±0.66°
Copper 10	1.4274	-200.00 to -150.00	±1.24°	-328.00 to -238.00	±2.24°
Ohm (Minco)	(0.004274)	-150.00 to 90.00	±1.34°	-238.00 to 194.00	±2.42°
	· · · /	90.00 to 260.00	±1.36°	194.00 to 500.00	±2.44°
Copper 50	1.4280	-50.00 to 150.00	±0.29°	-58.00 to 302.00	±0.52°
Ohm	(0.00428)				
Ni 120 Ohm	1.6720	-80.00 to 260.00	±0.10°	-112.00 to 500.00	±0.17°
(Pure)	(0.00672)				

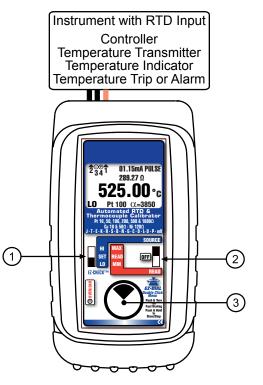
### **Troublshooting RTD Instruments**

When you are having an issue where an instrument won't read an RTD sensor or you don't know if the calibrator is connected properly the PIE 525B has a function to measure and display the fixed or pulsed sensor (excitation) current that the instrument uses to measure the resistance of the RTD sensor.

Disconnect all sensor wires from the devices to be calibrated and connect the PIE 525B to the inputs of the device using 2, 3 or 4 wires. The sensor current generated by the instrument will be indicated on the display followed by the word FIXED or PULSE. Older single channel RTD instruments used a constant (fixed) current source to measure an RTD sensor. Smart transmitters, multichannel recorders and PLC or DCS input cards switch the current source sequentially through the channels which is seen as an intermittent (pulsed) current.

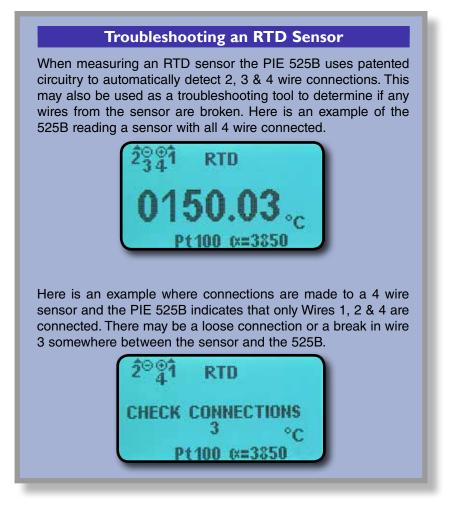








# Measure and troubleshoot RTD sensors





# Guaranteed compatible with smart transmitters, multichannel recorders as well as PLC and DCS input cards.



PIE 525B in Deluxe Carrying Case. Hangs from your neck freeing up both hands for calibration work.

#### Accessories

#### Included:

Four "AA" Alkaline batteries, Certificate of Calibration Card					
Rubber Boot	Part No. 020-0213				
Deluxe Hands Free Carrying Case	Part No. 020-0211				
Evolution mA/V Test Leads	Part No. 020-0207				
1 Red & 1 Black Lead with Banana Plugs & Alligator Clips					
Evolution RTD Wire Kit	Part No. 020-0208				
2 Red & 2 Black Leads with Banana Plugs & Spade Lugs					

#### **Optional:**

Certificate of Calibration with Test Data Part No. Certified Test Data 2 Ni-MH 1 Hour Charger with 4 Ni-MH AA Batteries Part No. 020-0103 (100-120 V AC input for North America Only)

T/C Wire Kit 1 for Types J, K, T & E Part No. 020-0202 T/C Wire Kit 2 for Types B, R/S & N Part No. 020-0203 Three feet (1 meter) of T/C extension wire, stripped on one end with a miniature T/C male connector on the other end.

#### 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.

#### Additional Information

PIE Calibrators are manufactured in the USA. 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.

**Practical Instrument Electronics** 82 East Main Street Suite 3.14 • Webster, NY 14580 Tel: 585.872.9350 • Fax: 585.872.2638 sales @ piecal.com • www.piecal.com

> Copyright © 2015 All rights reserved 525B-9001 - Rev C 20 April 2015



**NSW** 

VIC

www.pyrosales.com.au 1300 737 976