



PIECAL 820

Multifunction Process Calibrator

Carry six single function calibrators in the palm of your hand with the PIECAL 820

- **Lighten up your toolbox**

Pocket sized calibrator replaces toolbox of single function devices

*Milliamp • Voltage • Frequency
Thermocouples • RTDs • Check Continuity*

- **Technician friendly operation**

Intuitive *EZ-DIAL Double Click Menu* makes it easier to setup than other multifunction calibrators. Uses the same menus as the single function PIECAL Evolution Calibrators.

- **Use it as a milliamp and voltage calibrator**

Source 0 to 24.00 mA, 0 to 10.25 V dc and -10.00 to 110.00 mV

Read to 24.00 mA, ± 60.00 V dc and -10.00 to 110.00 mV

Simulate 2-Wire Transmitters

Power up transmitters & loops with the built-in 24 V power supply.

Simplify HART hookups with built-in 250 Ohm resistor

- **Calibrate directly in temperature ($^{\circ}\text{C}$ & $^{\circ}\text{F}$)**

The PIECAL 820 works with the instruments you use.

Types J, K, T, E, R, S, B, N, G, C, D, L (J DIN), U (T DIN) and P (Platinel II)

Pt 100 Ohm (3850, 3902, 3916, 3926) & 1000 Ohm (3850)

Copper 10 & 50 Ohm, Nickel 100 and 120 Ohm

- **Checkout flow and vibration systems**

Source & read frequency to 2000 CPM (Counts-Per-Minute), 999.00

Hz, 9999.9 Hz, 9.9999 kHz & to 20.000 kHz.

- **Troubleshoot loop & wiring problems**

'Beep' out connections with the built-in continuity checker.

- **Easy to read**

Turn on the backlight & easily see the display in dark areas of the plant.

- **Quickly set any three outputs plus automatic stepping & ramping**

Easily set any value quickly with the adjustable "DIAL" plus store any three output settings for instant recall with the *EZ-CHECK™* switch. Choose between 2, 3, 5 & 11 steps to automatically increment the output in 100%, 50%, 25% or 10% of span. Select RAMP to smoothly increase and decrease the output between Zero and Span. Set step/ramp time to match your system from 5, 6, 7, 8, 10, 15, 20, 25, 30 and 60 seconds.

- **Measure temperature sensors, frequency pickups, loop currents and voltage levels**

Check the values of your process sensors. Instantly recall MAX and MIN values to see process variability.

- **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 PIECAL 820 improves upon other brands by including a rubber boot, a backlit display with larger digits, higher accuracy and more ranges for greater flexibility.



Actual Size

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

Practical Instrument Electronics

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Milliamp Calibrator

- **Easy to use**

With the PIECAL 820 you can check, calibrate and measure all your current signal instruments in a 4 to 20 milliamp DC loop. It can be used at any access point in your loop.



Source & Read 0.00 to 24.00 mA, Simulate a 2 Wire Transmitter or use the PIECAL 820 to simultaneously power your 2 Wire Transmitter and measure its output.

- **Source milliamps**

Calibrate recorders, digital indicators, stroke valves or any instruments that get their input from a 4 to 20 mA loop. Easily set any value quickly to within 0.01 mA with the adjustable digital potentiometer "EZ-DIAL" or use preset **4.00 mA (0.0%)** and **20.00 mA (100.0%)** EZ-CHECK™ settings.

- **Calibrate using loop power**

Check loop wiring and receivers by using the PIECAL 820 in place of a 2 Wire transmitter. Uses any loop power from 2 to 60 V DC.

- **Read loop current**

Check controller outputs or measure the milliamp signal anywhere in the loop. The PIECAL 820 measures 0.00 to 24.00 mA (-25.0 to 125.0%) signals with greater accuracy than a typical multimeter.

- **Power & measure 2 wire transmitters**

The PIECAL 820 can simultaneously output 24V DC to power any and all devices in a process loop using the internal batteries and internal switching power supply, while measuring the output of a 2 Wire Transmitter and any other loop devices. Powers HART™ transmitters with built-in 250 ohm resistor simplifying hookups with HART communicators.

Voltage Calibrator

- **Source mV & V dc**

With the PIECAL 820 you can check, calibrate and measure all your voltage, millivolt and pH signal instruments in your plant. Source 0 to 10.25 V dc and -10.00 to +110.00 mV,



- **Read DC volts**

The PIECAL 820 can measure from 0 to 10.25 V, -10.00 to +110.00 mV and -60.00 to +60.00 VDC. Use it to check loop power supplies, I/V converters, 1 to 5 Volt signals, and other voltages making it unnecessary to carry a multimeter.

Frequency Calibrator

- **Calibrate flow meters and frequency instruments**

Generate zero crossing square waves to check, calibrate and measure all the frequency signal instruments in your plant. Source and read frequencies from 1 to 2000 CPM (Counts-Per-Minute), 0.01 to 999.00 Hz, 0.1 to 9999.9 Hz, 0.0001 to 2.0000 kHz and 0.001 to 20.000 kHz.



- **Checkout optical pickups**

The PIECAL 820 has a green LED that flashes in sync with the output frequency. Select a frequency and hold the calibrator up to the optical sensor.

Thermocouple Calibrator

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

Stop carrying around a millivolt source and thermocouple tables. The PIECAL 820 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). Easily set any value quickly to within 0.1° with the adjustable digital potentiometer "EZ-DIAL" plus recall any three temperatures for instant recall with the EZ-CHECK™ switch.



- **Measure thermocouple sensors**

Trouble shoot sensor connections and find broken wires or corroded connections. Connect your thermocouple with a miniature thermocouple connector and the PIECAL 820 measures the probe in degrees C or F.

RTD, Resistance Calibrator

- **Easy to use**

With the PIECAL 820 you can check & calibrate all your RTD instruments and measure RTD Sensors. Automatic indication of connections on the display for simple hookups.



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

Stop carrying around a decade box and RTD resistance tables. The PIECAL 820 works with the RTDs you use including Platinum 100 (alpha = 3850, 3902, 3916, 3926) & 1000 (alpha = 3850) Ohm, Copper 10 & 50 Ohm, Nickel 100 and 120 Ohm. Easily set any value quickly to within 0.1° with the adjustable digital potentiometer "EZ-DIAL" plus store any three temperatures for instant recall with the EZ-CHECK™ switch. Or use like a decade box from 0.00 to 410.00 and from 0.0 to 4001.0 Ohms.

- **Compatible with ALL process instruments**

No competitor's calibrator is compatible with as many 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.

- **Measure RTD sensors**

Trouble shoot sensor connections and find broken wires with patented technology. Connect your two, three or four wire RTDs and the PIECAL 820 automatically detects the connections and measures the RTD in degrees C or F.

Continuity Checker

- **Troubleshoot wiring and connection problems**

Use the built-in continuity checker to look at wiring and connections during installation or to locate shorts. Beeps from 0 to 10 Ohms.



Hang from your neck for hands free calibrating

Thermocouple Accuracies

T/C			
J	Accurate up to	±0.6°C	±1.0°F
K	Accurate up to	±0.8°C	±1.5°F
T	Accurate up to	±0.6°C	±1.1°F
E	Accurate up to	±0.4°C	±0.8°F
R	Accurate up to	±2.7°C	±4.9°F
S	Accurate up to	±3.2°C	±5.8°F
B	Accurate up to	±2.9°C	±5.3°F

T/C			
N	Accurate up to	±0.9°C	±1.6°F
G (W)	Accurate up to	±1.8°C	±3.1°F
C (W5)	Accurate up to	±1.8°C	±3.1°F
D	Accurate up to	±1.8°C	±3.2°F
P	Accurate up to	±0.8°C	±1.5°F
L (J-DIN)	Accurate up to	±0.5°C	±0.9°F
U (T-DIN)	Accurate up to	±0.6°C	±1.0°F

RTD Ranges & Accuracies

RTD Type	Alpha	Degrees C Range	°C	Degrees F Range	°F
Pt 100 Ohm DIN/IEC/JIS 1989 Based on ITS-90	1.3850 (0.00385)	-200.0 to 120.0	±0.5°	-328.0 to 248.0	±0.9°
		120.0 to 430.0	±0.6°	248.0 to 806.0	±1.0°
		430.0 to 850.0	±0.7°	806.0 to 1562.0	±1.2°
Pt 100 Ohm (Burns)	1.3902 (0.003902)	-195.6 to 160.0	±0.5°	-320.0 to 320.0	±0.9°
		160.0 to 460.0	±0.6°	320.0 to 860.0	±1.0°
		460.0 to 648.9	±0.7°	860.0 to 1200	±1.2°
Pt 100 Ohm (Old JIS 1981)	1.3916 (0.003916)	-200.0 to 170.0	±0.5°	-328.0 to 338.0	±0.9°
		170.0 to 480.0	±0.6°	338.0 to 896.0	±1.0°
		480.0 to 648.9	±0.7°	896.0 to 1200.0	±1.2°
Pt 100 Ohm (US Lab)	1.3926 (0.003926)	-200.0 to 180.0	±0.5°	-328.0 to 356.0	±0.9°
		180.0 to 490.0	±0.6°	356.0 to 914.0	±1.0°
		490.0 to 850.0	±0.7°	914.0 to 1562.0	±1.2°

Pt 1000 Ohm DIN/IEC/JIS 1989	1.3850 (0.00385)	-200.0 to 120.0	±0.5°	-328.0 to 248.0	±0.9°
		120.0 to 430.0	±0.6°	248.0 to 806.0	±1.0°
		430.0 to 850.0	±0.7°	806.0 to 1562.0	±1.2°
Copper 10 Ohm (Minco)	1.4274 (0.004274)	-200.0 to 260.0	±5.1°	-328.0 to 500.0	±9.2°
		Copper 50 Ohm	1.4280 (0.00428)	-50.0 to 150.0	±0.9°
Ni 120 Ohm (Pure)	1.6720 (0.00672)	-80.0 to 260.0	±0.3°	-112.0 to 500.0	±0.5°
Ni 110 (Bristol 7 NA)	1.5801 (0.005801)	-100.0 to 260.0	±0.3°	-148.0 to 500.0	±0.5°

PIECAL 820 Specifications

(Unless otherwise indicated all specifications 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)
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
Noise	≤ ± ½ Least Significant Digit from 0.1 to 10 Hz
Size	5.63 x 3.00 x 1.60 in, 143 x 76 x 41mm (LxWxH)
Weight	12.1 ounces, 0.34 kg (including boot & batteries)
Batteries	Four "AA" Alkaline 1.5V (LR6)
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 135 vrms (rated for 30 seconds) or 240 vrms (rated for 15 seconds) Red LED indicates OVERLOAD or out of range conditions
Display	High contrast graphic liquid crystal display with 0.315" (8.0 mm) high digits. LED backlighting for use in low lit areas.

Read mA	
Ranges and Resolution	0.00 to 24.00 mA or -25.0 to 125.0% of 4-20 mA
Accuracy	≤ ± (0.03 % of Full Scale)
Voltage burden	≤ 2V at 24 mA
Overload/Current limit protection	25 mA nominal
Battery life	≥ 125 hours nominal; ≥ 100 hrs with backlight on

Source mA / Power & Measure Two Wire Transmitters	
Ranges and Resolution	0.00 to 24.00 mA or -25.0 to 125.0% of 4-20 mA
Accuracy	≤ ± (0.03 % of Full Scale)
Temperature effect	≤ ± 0.01 %/°C of Full Scale
Loop compliance voltage	≥ 24 DCV @ 20.00mA
Loop drive capability	1200 Ω at 20 mA for 15 hours nominal; 950 Ω with Hart Resistor enabled
Battery life	≥ 30 hrs at 12 mA nominal; ≥ 25 hrs with backlight on

mA 2-Wire Transmitter Simulation	
Accuracy	Same as Source/Power & Measure
Voltage burden	≤ 2V at 20 mA
Overload/Current limit protection	24 mA nominal
Loop voltage limits	2 to 60 VDC (fuse-less protected from reverse polarity connections)
Battery life	≥ 125 hours nominal; ≥ 100 hrs with backlight on

Voltage Read	
Range and Resolution	-10.00 to 110.00 mV, ±10.25 V, ±60.0 VDC
Accuracy	≤ ± 0.03 % of Full Scale
Temperature effect	≤ ± 100 ppm/°C of Full Scale
Input resistance	≥ 2 MΩ
Battery life	≥ 125 hours nominal; ≥ 100 hrs with backlight on

Source V dc	
Ranges and Resolution	-10.00 to 110.00 mV, ±10.25 V, ±60.0 VDC
Accuracy	≤ ± (0.03 % of Full Scale)
Temperature effect	≤ ± 0.01 %/°C of Full Scale
Source Current	≥ 24 mA
Sink Current	> 16 mA
Output Impedance	< 1 Ohm
Short Circuit Duration	Infinite
Battery life	≥ 30 hrs at 12 mA nominal; ≥ 25 hrs with backlight on

Thermocouple Source	
Accuracy	±(0.03% of Full Scale) [Note: Full Scale is 110.0 mV]
Cold Junction Compensation	± 0.36°F (±0.2 °C)
Output Impedance	< 1 Ohm
Source Current	> 20 mA (drives 80 mV into 10 Ohms)

Thermocouple Read	
Accuracy & Cold Junction Compensation	Same as Thermocouple Source
Input Impedance	> 1 Megohms
Open TC Threshold; Pulse	10K Ohms nominal ; <10 μamp pulse for 300 milliseconds

RTD, OHMS and Continuity Read	
Resistance Ranges	0.0 to 410.0, 0 to 4001 Ohms
Accuracy	±(0.03% of Full Scale + 0.075 Ohms)
Excitation Current	0.5 mA nominal
Continuity	0.0 to 410.0 Ohms; Beeps from 0.0 to 10.0 Ohms

RTD and OHMS Source	
Accuracy	From 1 to 10.2 mA ±(0.03% of Full Scale + 0.075 Ohms)
External Excitation Current	Below 1 mA of External Excitation Current ±(0.03% of Full Scale+0.075 Ohms + $\frac{0.025 \text{ mV}}{\text{mA Excitation Current}}$)
Resistance Ranges	0.0 to 410.0, 0.0 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

Frequency Source	
Ranges	1 to 2000 CPM, 0.01 to 999.99 Hz, 0.1 to 9999.9 Hz, 0.0001 to 9.9999 kHz, 0.001 to 20.000 kHz
Accuracy	±(0.03% of Full Scale)
Output Waveform	Square Wave, Zero Crossing -1.0 to +5 V peak-to-peak
Risetime (10 to 90% of amplitude)	< 10 microseconds
Output Impedance	< 1 Ohm
Source Current	> 1 mA rms at 20 kHz
Short Circuit Duration	Infinite
Optical Coupling	Green LED (HZ SYNC) flashes at output frequency

Frequency Read	
Ranges & Accuracy	Same as Frequency Source
Accuracy	±(0.03% of Full Scale)
Trigger Level	1 V rms, dc coupled
Input Impedance	> 1 Meg Ohm + 60 pF

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.

Accessories

INCLUDED:

Blue Rubber Boot, Four "AA" Alkaline batteries, Certificate of Calibration
Evolution Hands Free Carrying Case Part No. 020-0211
Test Leads - one pair: 1 meter (3') long with retractable shield banana plug & alligator clips Part No. 020-0207
Evolution RTD Wire Kit Part No. 020-0208
2 Red & 2 Black Leads with Retractable Shield Banana Plugs & Spade Lugs

OPTIONAL:

Ni-MH 1 Hour Charger with 4 Ni-MH AA Batteries Part No. 020-0103
(100-120 V AC input for North America Only)
(100-120 V AC input for North America Only)



Flip out stand for bench use



Available From:

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