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 80.00 mV
  - Read to 24.00 mA, 60.00 V dc and -10.00 to 80.00 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 (°C & °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), 999.99 Hz, 9999.9 Hz & 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.

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

• Read DC volts
The PIECAL 820 can measure from 0 to 10.25 V, -10.00 to 80.00 mV and 0.0 to 60.0 VDC. Use it to check loop power supplies, I/V converters, 1 to 5 Volt signals, and other voltages.

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 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.
• 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 0.0 to 401.0 and from 0 to 4001 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
Troubleshoot sensor connections and find broken wires with patented technology. Connect your two, three or four wire RTDs and the PIECAL 820 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 Ranges & Accuracies

<table>
<thead>
<tr>
<th>T/C</th>
<th>Degrees C Range</th>
<th>°C</th>
<th>Degrees F Range</th>
<th>°F</th>
<th>T/C Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>-200.0 to -150.0</td>
<td>±1.2°</td>
<td>-328.0 to -238.0</td>
<td>±2.0°</td>
<td>+Iron</td>
</tr>
<tr>
<td></td>
<td>-150.0 to -50.0</td>
<td>±0.7°</td>
<td>-238.0 to -58.0</td>
<td>±1.3°</td>
<td>+Constatan</td>
</tr>
<tr>
<td></td>
<td>-50.0 to 100.0</td>
<td>±0.5°</td>
<td>-58.0 to 212.0</td>
<td>±0.9°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100.0 to 1200.0</td>
<td>±0.4°</td>
<td>212.0 to 2192.0</td>
<td>±0.8°</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>-230.0 to -150.0</td>
<td>±2.6°</td>
<td>-382.0 to -238.0</td>
<td>±4.7°</td>
<td>+Chromel®</td>
</tr>
<tr>
<td></td>
<td>-150.0 to 0.0</td>
<td>±1.0°</td>
<td>-238.0 to 32.0</td>
<td>±1.8°</td>
<td>+Alumel®</td>
</tr>
<tr>
<td></td>
<td>0.0 to 1100.0</td>
<td>±0.6°</td>
<td>32.0 to 120.0</td>
<td>±1.1°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1100.0 to 1371.1</td>
<td>±0.7°</td>
<td>2012.0 to 2500.0</td>
<td>±1.2°</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>-260.0 to -230.0</td>
<td>±6.1°</td>
<td>-436.0 to -382.0</td>
<td>±11.0°</td>
<td>+Copper</td>
</tr>
<tr>
<td></td>
<td>-230.0 to -150.0</td>
<td>±2.2°</td>
<td>-382.0 to -238.0</td>
<td>±4.0°</td>
<td>+Constatan</td>
</tr>
<tr>
<td></td>
<td>-150.0 to -50.0</td>
<td>±1.1°</td>
<td>-238.0 to -122.0</td>
<td>±2.0°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50.0 to 300.0</td>
<td>±0.5°</td>
<td>122.0 to 572.0</td>
<td>±1.0°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300.0 to 400.0</td>
<td>±0.4°</td>
<td>572.0 to 752.0</td>
<td>±0.7°</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-240.0 to -150.0</td>
<td>±2.5°</td>
<td>-400.0 to -238.0</td>
<td>±4.5°</td>
<td>+Chromel®</td>
</tr>
<tr>
<td></td>
<td>-150.0 to -50.0</td>
<td>±0.7°</td>
<td>-238.0 to -58.0</td>
<td>±1.1°</td>
<td>+Constatan</td>
</tr>
<tr>
<td></td>
<td>-50.0 to 150.0</td>
<td>±0.4°</td>
<td>-58.0 to 302.0</td>
<td>±0.8°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150.0 to 1000.0</td>
<td>±0.3°</td>
<td>302.0 to 1832.0</td>
<td>±0.6°</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>-18.3 to 50.0</td>
<td>±6.5°</td>
<td>-1.0 to 122.0</td>
<td>±11.7°</td>
<td>+Pt/13Rh</td>
</tr>
<tr>
<td></td>
<td>50.0 to 500.0</td>
<td>±3.7°</td>
<td>482.0 to 932.0</td>
<td>±6.6°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>500.0 to 800.0</td>
<td>±2.2°</td>
<td>932.0 to 1472.0</td>
<td>±4.0°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>800.0 to 1767.8</td>
<td>±2.0°</td>
<td>1472.0 to 3214.0</td>
<td>±3.5°</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>-18.3 to 50.0</td>
<td>±6.1°</td>
<td>-1.0 to 122.0</td>
<td>±10.9°</td>
<td>+Pt/10Rh</td>
</tr>
<tr>
<td></td>
<td>50.0 to 300.0</td>
<td>±3.7°</td>
<td>122.0 to 572.0</td>
<td>±6.6°</td>
<td>+Platinum</td>
</tr>
<tr>
<td></td>
<td>300.0 to 600.0</td>
<td>±2.6°</td>
<td>572.0 to 1112.0</td>
<td>±4.7°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600.0 to 1767.8</td>
<td>±2.3°</td>
<td>1112.0 to 3214.0</td>
<td>±4.2°</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>315.6 to 600.0</td>
<td>±7.9°</td>
<td>600.0 to 1122.0</td>
<td>±14.2°</td>
<td>+Pt/30Rh</td>
</tr>
<tr>
<td></td>
<td>600.0 to 1050.0</td>
<td>±4.0°</td>
<td>1122.0 to 1922.0</td>
<td>±7.3°</td>
<td>+Pt/6Rh</td>
</tr>
<tr>
<td></td>
<td>1050.0 to 1400.0</td>
<td>±2.5°</td>
<td>1922.0 to 2552.0</td>
<td>±4.6°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1400.0 to 1820.0</td>
<td>±2.1°</td>
<td>2552.0 to 3308.0</td>
<td>±3.8°</td>
<td></td>
</tr>
</tbody>
</table>

## RTD Ranges & Accuracies

<table>
<thead>
<tr>
<th>RTD Type</th>
<th>Alpha</th>
<th>Degrees C Range</th>
<th>°C</th>
<th>Degrees F Range</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt 100 Ohm DIN/IEC/JIS 1989 Based on ITS-90</td>
<td>1.3850 (0.00385)</td>
<td>-200.0 to 120.0</td>
<td>±0.5°</td>
<td>-328.0 to 248.0</td>
<td>±0.9°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120.0 to 430.0</td>
<td>±0.6°</td>
<td>248.0 to 806.0</td>
<td>±1.0°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>430.0 to 850.0</td>
<td>±0.7°</td>
<td>806.0 to 1562.0</td>
<td>±1.2°</td>
</tr>
<tr>
<td>Pt 100 Ohm (Burns)</td>
<td>1.3902 (0.003902)</td>
<td>-195.6 to 160.0</td>
<td>±0.5°</td>
<td>-320.0 to 320.0</td>
<td>±0.9°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>160.0 to 460.0</td>
<td>±0.6°</td>
<td>320.0 to 660.0</td>
<td>±1.0°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>460.0 to 648.9</td>
<td>±0.7°</td>
<td>660.0 to 1200.0</td>
<td>±1.2°</td>
</tr>
<tr>
<td>Pt 100 Ohm (Old JIS 1981)</td>
<td>1.3916 (0.003916)</td>
<td>-200.0 to 170.0</td>
<td>±0.5°</td>
<td>-328.0 to 338.0</td>
<td>±0.9°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>170.0 to 480.0</td>
<td>±0.6°</td>
<td>338.0 to 896.0</td>
<td>±1.0°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>480.0 to 648.9</td>
<td>±0.7°</td>
<td>896.0 to 1200.0</td>
<td>±1.2°</td>
</tr>
<tr>
<td>Pt 100 Ohm (US Lab)</td>
<td>1.3926 (0.003926)</td>
<td>-200.0 to 180.0</td>
<td>±0.5°</td>
<td>-328.0 to 356.0</td>
<td>±0.9°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>180.0 to 490.0</td>
<td>±0.6°</td>
<td>356.0 to 914.0</td>
<td>±1.0°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>490.0 to 850.0</td>
<td>±0.7°</td>
<td>914.0 to 1562.0</td>
<td>±1.2°</td>
</tr>
</tbody>
</table>

### Note
- °C Degrees C Range, °F Degrees F Range
- The tables provide the temperature ranges in °C and °F for various types of RTDs, including Pt 100 Ohm, Copper 100 Ohm, and Ni 120 Ohm.
### 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**: ≤ ± 0.01 %/°C of Full Scale
- **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 41 mm (L x W x H)
- **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 # 021-0103]
- **Battery Life**:
  - Read Functions: ≥ 20 hours
  - Source mA: ≥ 14 hours @ 12 mA into 250Ω
  - Pwr/Meas mA: ≥ 12 hours at 20 mA
  - Source V, Ω, T/C, RTD & Hz: ≥ 20 hours
- **Low Battery**: Low battery indication with nominal 1 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 with 0.315” (8.0 mm) high digits. LED backlighting for use in low lit areas.

### Source 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

### 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)
- **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

### 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)

### Voltage Read
- **Range and Resolution**: 0.00 to 80.00 mV, 0 to 10.25 V, 0.0 to 60.0V DC
- **Accuracy**: ≤ ± 0.03 % of Full Scale
- **Input resistance**: ≥ 1 MΩ

### Source V dc
- **Ranges and Resolution**: -10.00 to 80.00 mV, 0 to 10.25 V
- **Accuracy**: ≤ ± (0.03 % of Full Scale)
- **Source Current**: ≥ 24 mA
- **Sink Current**: > 16 mA
- **Output Impedance**: < 1 Ohm
- **Short Circuit Duration**: Infinite

### Thermocouple Source
- **Accuracy**: ±(0.03% of Full Scale) [Note: Full Scale is 80.00 mV]
- **Cold Junction Compensation**: Included in accuracy
- **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; <5 µamp pulse for 300 milliseconds (nominal)

### RTD, OHMS and Continuity Read
- **Resistance Ranges**: 0.0 to 401.0, 0 to 4010 Ohms
- **Accuracy**: ±(0.03% of Full Scale + 0.075 Ohms)
- **Excitation Current**: 1.0 mA to 401 Ohms, 0.6 mA to 4010 Ohms (nominal)
- **Continuity**: 0.0 to 401.0 Ohms; Beeps from 0.0 to 100.0 Ohms

### RTD and OHMS Source
- **Accuracy**: From 1 to 10.2 mA
  - External Excitation Current: ±(0.03% of Full Scale + 0.075 Ohms)
  - Below 1 mA of External Excitation Current: ±(0.03% of Full Scale +0.075 Ohms + 0.025 mV/mA Excitation Current)
- **Resistance Ranges**: 0.0 to 410.0, 0 to 4001 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, 0.001 to 20.000 kHz
- **Accuracy**: ±(0.03% of Full Scale)
- **Output Waveform**: Square Wave, Zero Crossing -1.0 to +5 V peak-to-peak ±10%
- **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

Specifications subject to change without notice.
**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.

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**Accessories**

**INCLUDED:**
- Four “AA” Alkaline batteries, Certificate of Calibration
- Blue Rubber Boot
- Evolution Hands Free Carrying Case
- Test Leads - one pair: 1 meter (3’) long with retractable shield banana plug & alligator clips
- Evolution RTD Wire Kit
  - Part No. 020-0212
  - Part No. 020-0211
  - Part No. 020-0207
  - 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
  - Part No. 020-0103
  - (100-120 V AC input for North America Only)

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**Flip out stand for bench use**

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**Practical Instrument Electronics**

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