

## PIE Process Calibrators

PIE (Practical Instrument Electronics) offers replacements for discontinued Altek models

### Loop Calibrators

- Source to 24mA, Read to 52mA
- Measure to  $\pm 99.99V$  DC
- Quickly Simulate 2-wire Transmitters
- Dial Knob for Easy Adjustment
- Large Backlit Display
- Tilt Stand & Protective Rubber Boot

The versatile **PIECAL 334** will check, calibrate and troubleshoot all the signals in a 4-20mA process loop. Simultaneously power and measure two-wire transmitters up to 24V. Simulate the transmitter in circuits from 2 to 100V. Overload protected to 135VAC.



**PIECAL 334**

The **PIECAL 334Plus** adds automatic output stepping and ramping. Patented loop diagnostic technology helps troubleshoot ground faults and current leakage. A built-in 250 $\Omega$  resistor can be used to power HART transmitters.

### Milliamp Calibrator

- Source and Read 0-24mA
- Simulate 2-wire Transmitters
- Bargraph Display 0-100%
- Hi/Lo Power Modes

Use the **PIECAL 134** to check, calibrate and measure all devices in a 4-20mA loop. Quickly dial-in the desired value with the large adjustment knob. Simultaneously power a 2-wire transmitter and measure its output. Use with existing loop power from 2 to 42VDC to check loop wiring and receivers.



**PIECAL 134**

### Voltage Calibrator

- Source to 20V, Measure to 60V DC
- Power Loops up to 24V & 1000 $\Omega$
- Check Live mA Loops
- Store 3 Output Settings
- Automatic Stepping & Ramping

The **PIE235** easily checks DC voltage instrumentation, even in live loops. Use the EZ-Chek switch to recall saved settings. Simulate pH probes from 0 to 14 pH ( $\pm 414.12mV$ ).



**PIECAL 235**

All models (except PIECAL134) include batteries, rubber boot, tilt stand, carrying case, Certificate of Calibration and 3 year warranty. Made in U.S.A.

### LOOP CALIBRATOR SPECIFICATIONS

<b>mA Read</b>	
Range:	0.00 to 52.00mA or -25.0 to 300.0% of 4-20mA
Accuracy:	$\pm 0.01mA$ below 24.01mA; $\pm 0.03mA$ above 24.01mA
Burden:	$< 2V$ at 50mA
<b>Voltage Read</b>	
Range:	-99.99 to 99.99VDC
Accuracy:	$\pm 0.05%$ of full span
Input Resistance:	$\geq 2M\Omega$
<b>Source/Measure 2-Wire Transmitter</b>	
Ranges:	0.00 to 24.00mA or -25.0 to 125.0% of 4-20mA
Accuracy:	$\pm 0.012mA$ (0-24mA)
EZ-Check Accuracy:	$\pm 0.005mA$ at 4mA & 20mA
Loop Compliance:	$\geq 24V$ at 20mA
Loop Drive:	1200 $\Omega$ at 20mA
<b>Transmitter Simulation</b>	
Accuracy:	Same as Source/Measure mode
Burden:	$< 2V$ at 20mA
Current Limit:	24mA nominal overload protection
Loop Voltage Limit:	2-100VDC (fuse-less protection from polarity reversal)
Overvoltage Protection:	135Vrms for 30 seconds; 240Vrms for 15 seconds
Display:	Backlit LCD with 0.315" digits
Operating Temperature:	-20 to 60°C ( $< 90\%$ RH up to 35°C)
Battery / Life (nominal):	4 AA alkaline / 125 hrs reading, 15 hours sourcing 20mA
Dimensions:	5.63" x 3.0" x 1.6" (143x76x41mm)
AC adapter & NiMH batteries/charger available.	

### MILLIAMP CALIBRATOR SPECIFICATIONS

Ranges:	0.00 to 24.00mA or -25.0 to 125.0% of 4-20mA
Accuracy:	$\pm 0.05%$ of reading $\pm 0.01mA$
Burden @ 20mA:	$< 1V$ when reading mA; $< 2V$ for transmitter simulation
Loop Compliance:	Hi Power: $\geq 24V@20mA$ , Lo Power: $\geq 15V@20mA$
Loop Drive:	Hi Power: 1200 $\Omega$ @20mA (950W with Hart resistor enabled) Lo Power: 600 $\Omega$ @20mA (350W with Hart resistor enabled)
Overvoltage Protection:	135Vrms for 30 seconds
Display:	Graphic LCD with 0.45" digits and 100 segment bar
Operating Temperature:	-20 to 60°C ( $< 90\%$ RH up to 35°C)
Battery Life (nominal):	220 hrs reading mA, 8 hours sourcing 20mA at hi power
Dimensions:	4.75" x 2.6" x 1.5" (120x66x38mm)
Carry case & NiMH batteries/charger available.	

### VOLTAGE CALIBRATOR SPECIFICATIONS

Range/Accuracy:	-500.00 to 999.00mV / $\pm 0.02%$ of reading $\pm 0.01%$ of FS (source & read) 1.000 to 5.000V / $\pm 0.02%$ of reading $\pm 0.002V$ 0.000 to 20.000V / $\pm 0.02%$ of reading $\pm 0.01%$ of FS -25.0 to 125.0% of 1-5V / $\pm 0.1%$ Read only: 0.00 to 60.00V / $\pm 0.02%$ of reading $\pm 0.02V$
Impedance:	Input: $> 1M\Omega$ ; Output: $< 0.3\Omega$ at 20mA load
Source/Sink:	$\geq 20mA$ / $> 16mA$
Protection:	Overvoltage to 60Vrms for 30 seconds (audible & flashing alarm)
Display:	Backlit LCD with 0.35" digits (0.2" digits for mA display)
Operating Temperature:	-20 to 60°C ( $< 90\%$ RH up to 35°C)
Battery Life (nominal):	$> 50$ hours from 4 AA alkaline batteries
Dimensions:	5.63" x 3.0" x 1.6" (143x76x41mm)
NiMH batteries/charger available.	

### ORDERING INFORMATION

PIECAL334	Milliamp Loop Calibrator
PIECAL334plus	Automated Milliamp Loop Calibrator
PIECAL134	PocketMate Milliamp Calibrator (no boot or carrying case)
PIECAL235	Process Voltage Calibrator

## PIE Temperature Calibrators

PIE (Practical Instrument Electronics) offers replacements for discontinued Altek models

### RTD Calibrators

- Simulate and Read 9 RTD Types Plus Ohms
- 0.1° and 0.01Ω Resolution
- Calibrate Directly in °C/°F
- Easy Dial Setting
- Automatic Output Stepping
- Automatic Configuration Detection
- Backlit Graphical LCD



**PIECAL 311**

PIECAL RTD Calibrators handle 9 RTD types. Calibrate directly in temperature (°C/°F) or use like a decade box to 410.00 or 2001.0 ohms. Connect a 2, 3 or 4 wire RTD and the calibrator automatically detects the configuration and measures the RTD. For automatic verification, choose 2, 3, 5, 11 or 21 steps and select a step time of 5-60 seconds to match the system response.

Choose the **PIECAL 211** for ±0.25% basic accuracy or the **PIECAL 311** for ±0.15% basic accuracy.

### Thermocouple Calibrators

- Source and Read Modes
- 0.1° and 0.001mV Resolution
- Calibrate Directly in °C/°F
- Automatic Output Stepping
- Easy Dial Setting
- Large Backlit LCD

Simulate and measure the most popular thermocouple types with the **PIECAL 322**. Use the **PIECAL 422** with 14 different types. Each model accepts miniature thermocouple connectors and direct thermocouple wires.

Use automatic output stepping to speed tests. Choose 2, 3, 5, 11 or 21 steps and a step time of 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 or 60 seconds

The **PIECAL 422plus** adds the functions of a diagnostic mA calibrator in one compact unit. Source and measure to 24mA with 1mA resolution. Quickly diagnose ground faults and current leakage.



**PIECAL 322**



**PIECAL 422plus**

All models include batteries, tilt stand, rubber boot, hands-free carrying case, test leads, Certificate of Calibration and 3 year warranty. Made in U.S.A.

### SPECIFICATIONS

RTD Type	Alpha	Range
Pt100 (ITS-90)	3850	-200.0 to 850.0°C (-328.0 to 1562.0°F)
Pt100 (Burns)	3902	-195.6 to 648.9°C (-320.0 to 1200.0°F)
Pt100 (JIS 1981)	3916	-200.0 to 648.9°C (-328.0 to 1200.0°F)
Pt100 (US lab)	3926	-200.0 to 850.0°C (-328.0 to 1584.0°F)
Pt1000 (DIN/IEC/JIC)	3850	-200.0 to 850.0°C (-328.0 to 1562.0°F)
Pt1000 (HVAC)	3750	-184 to 275°C (-300 to 527°F)
Cu10 (Minco)	4274	-200 to 260°C (-328 to 500°F)
Cu50	4280	-50.0 to 150°C (-58 to 302°F)
Ni120	6720	-80.0 to 273.0°C (-112.0 to 524.0°F)
Ohms		0.00 to 410.00, 0.0 to 2010.0
Basic Accuracy		<b>PIECAL 211</b> <b>PIECAL 311</b>
	Pt100	±0.2°C (±0.4°F)      ±0.1°C (±0.2°F)
	Pt1000 (1989)	±0.1°C (±0.3°F)      ±0.1°C (±0.2°F)
	Pt1000 (HVAC), Cu50	±0.3°C (±0.6°F)      ±0.2°C (±0.4°F)
	Cu10	±1.2°C (±2.2°F)      ±1.2°C (±2.2°F)
	Ni120	±0.1°C (±0.2°F)      ±0.1°C (±0.2°F)
	Ohms (3 or 4 wire)	±0.025% rdg ±0.05Ω      ±0.015% rdg ±0.05Ω
		Add 0.1Ω for 2 wire configuration
Read Current:	0.9mA to 401Ω, 0.4mA to 2010Ω. nominal	
External Excitation (max):	400Ω range: 10.2mA, 2000Ω range: 1mA (steady or pulsed)	
Pulsed Excitation:	DC to 0.01 second pulse width	
Overvoltage Protection:	60VDC for 30 seconds	
Operating Temperature:	-25 to 60°C (<90% RH up to 35°C)	
Battery / Life (nominal):	4 AA alkaline / 50 hrs (NiMH batteries & charger available)	
Dimensions:	5.63" x 3.0" x 1.6" (143x76x41mm)	

### SPECIFICATIONS

Input/Output (PIE 322):	Type J, K, T, E and mV	
Input/Output (PIE 422):	Type J, K, T, E, R, S, B, N, G, C, P, L, U, D and mV	
Range:		Best Accuracy
J	-210.0 to 1200.0°C (-328.0 to 2192.0°F)	±0.1°C (±0.2°F)
K	-230.0 to 1371.1°C (-382.0 to 2500.0°F)	±0.2°C (±0.4°F)
T	-260.0 to 400.0°C (-436.0 to 752.0°F)	±0.1°C (±0.2°F)
E	-240.0 to 1000.0°C (-400.0 to 1832.0°F)	±0.1°C (±0.2°F)
R, S	-18.3 to 1767.8°C (-1.0 to 3214.0°F)	±0.6°C (±1.1°F)
B	315.6 to 1820.0°C (600.0 to 3308.0°F)	±0.6°C (±1.1°F)
N	-230.0 to 1300.0°C (-382.0 to 2372.0°F)	±0.2°C (±0.4°F)
G	100.0 to 2320.0°C (212.0 to 4208.0°F)	±0.4°C (±0.7°F)
C, D	-1.1 to 2320.0°C (30.0 to 4208.0°F)	±0.5°C (±0.9°F)
P	0.0 to 1395.0°C (32.0 to 2543.0°F)	±0.2°C (±0.4°F)
L	-200.0 to 900.0°C (-328.0 to 1652.0°F)	±0.1°C (±0.2°F)
U	-200.0 to 600.0°C (-328.0 to 1112.0°F)	±0.1°C (±0.2°F)
mV	-13.000 to 80.000mV	±0.008% rdg ±0.006mV
Cold Junction Error:	±0.1°C for PIECAL 311, ±0.05°C for PIECAL 422	
Impedance:	Input Read >10MΩ, Output Source <0.3Ω	
Open Thermocouple:	10kΩ threshold, pulse <10μA for 400msec	
Source Current:	>20mA (drives 80mV into 10Ω)	
Overvoltage Protection:	60VDC for 30 seconds	
Operating Temperature:	-25 to 60°C (<90% RH up to 35°C)	
Battery / Life (nominal):	4 AA alkaline / 50 hrs (NiMH batteries & charger available)	
Dimensions:	5.63" x 3.0" x 1.6" (143x76x41mm)	

### ORDERING INFORMATION

PIECAL211	RTD Calibrator (9 types)
PIECAL311	High Accuracy RTD Calibrator (9 types)
PIECAL322	Thermocouple Calibrator (Type J, K, T, E)
PIECAL422	Automated Thermocouple Calibrator (14 types)
PIECAL422plus	Automated Thermocouple & mA Calibrator (14 types)

## PIE Multifunction Calibrators

PIE (Practical Instrument Electronics) offers replacements for discontinued Altek models



PIECAL 820

### Multifunction Calibrator

- 6 Functions: Milliamps, Volts, Frequency, Thermocouples, RTDs, Ohms
- Calibrate Directly in °C/°F
- Power Transmitters & Loops
- Check Loop & Wiring Continuity
- Calibrate Flow Meters & Speed Sensors
- Simulate 2-Wire Transmitters
- 3 Saved Settings + MIN/MAX Recall
- Automatic Step & Ramp
- Easy Dial Operation & Backlit LCD



PIECAL 830

### High Accuracy Calibrator

- 8 Functions
- 0.02% Basic Accuracy
- Diagnose Ground Faults & Current Leakage
- Simulate pH Probes
- Check Pressure with Optional Modules

### Two Channel Calibrator

- 8 Functions + 5 Troubleshooting Tools
- Diagnose Ground Faults & Current Leakage
- Simultaneously Display Loop Current, Voltage & Resistance
- Isolated Transmitter for Millivolts, Temperature, Frequency, or Pressure
- 3 Saved Settings plus Step & Ramp

The rugged **PIECAL 820** combines the functions of RTD, thermocouple, process voltage & loop calibrators in one handheld instrument. It will also source and measure resistance to 4kohms and frequency to 20kHz. Continuity check and DC voltage measurements aid system troubleshooting. The intuitive EZ-DIAL Double Click Menu makes it simple to setup. Icons on the display indicate where to plug in the test leads. 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 a step/ramp time of 5-60sec to match the system response. HART™ resistor included.

The **PIECAL 820Elite** adds pH sourcing and pressure calibration to the PIECAL 820 capabilities. It features an extra decade of resolution on mA, Volts & ohms, plus tighter accuracies on all functions. Loop problems are easier to troubleshoot with patented diagnostics for ground fault and current leakage detection.

The deluxe **PIECAL 830** expands the capabilities of the 820Elite by adding sophisticated troubleshooting tools. It displays the condition of a live loop by showing current, voltage & resistance on one screen. The isolated universal transmitter channel can substitute for a faulty transmitter to verify loop operation. The 830 will simultaneously simulate the temperature, frequency, pH or pressure input to a transmitter while outputting 24V DC to power the transmitter & displaying the 2 Wire Transmitter output.

### MULTIFUNCTION CALIBRATOR SPECIFICATIONS

FUNCTION	RANGE	ACCURACY 820	820Elite & 830
mA Source/Read	0.00 to 24.00mA, -25.0 to 125.0% of 4-20mA *	±0.03% of FS	±0.02% of rdg ± 0.003mA
V Source DC	-10.00 to 80.00mV, 0.00 to 10.25V	±0.03% of FS	----
V Read	0.00 to 80.00mV, 0.00 to 10.25V, 0.0 to 60.0V	±0.03% of FS	----
V Source DC	-20.000 to 99.99mV, -500.00 to 999.99mV, 0.000 to 10.250V	----	±0.02% of rdg ± 0.01% of FS
V Read	±99.999mV, ±999.99mV, 0.000 to 10.250V, 0.00 to 60.00V	----	±0.02% of rdg ± 0.01% of FS
TC Source/Read	J, K, T, E, R, S, B, N, G, C, D, P, L, U (14 types)	Type J ±0.5°C	Type J ±0.2°C
Cold Junction		±0.1°C	±0.05°C
RTD Source/Read	Pt100, Pt1000, Cu10, Cu50, Ni120, Ni110 (9 types)	Pt100/385 ±0.5°C	Pt100/385 ±0.3°C
Ohms Source/Read	0.0 to 401.0Ω, 0 to 4010Ω *	±0.03% of FS ±0.075Ω	±0.025% of FS ±0.075Ω
Frequency Source/Read	1-2000 CPM, 0.01-999.99Hz, 0.1-9999.9Hz, 0.001-20.000kHz	±0.03% of FS	±0.02% of rdg ± 0.01% of FS
pH Source	0.000 to 14.000 pH (-414.12 to 414.12V)	----	±0.003 pH

\* Extra digit of resolution provided on 820Elite and 830 (24.000mA, 125.00%, 401.00Ω, 4010.0Ω)

mA Current Limit:	25mA nominal current limit protection
ma Compliance:	≥24VDC @20mA (max 2V burden at 24mA)
Loop Drive:	1200Ω @20mA (950Ω with Hart resistor or leak detect)
V Source Current:	≥20mA source / >16mA sink
Frequency Source:	Square wave, zero crossing, -1 to 5V p-p, >1mA rms @20kHz Optical coupling Green LED flashes at output frequency
Frequency Read:	Trigger Level 1V rms, DC coupled

Impedance:	Input Read >10MΩ, Output Source <1Ω
Open Thermocouple:	10kΩ threshold, pulse <5μA for 300msec
Isolation (830 only):	60Vrms from mA/Vread to Vsource/TC/RTD/Ω/freq/pressure
Overvoltage Protection:	60VDC for 30 seconds
Operating Temperature:	-20 to 60°C (<90% RH up to 35°C)
Battery / Life (nominal):	4 AA alkaline / 20 hrs (NiMH batteries & charger available)
Dimensions:	5.63" x 3.0" x 1.6" (143x76x41mm)

Model 820	Standard Accuracy	Single Channel	mA, V, TC, Ohms RTD, Hz
-----------	-------------------	----------------	-------------------------

Model 820-ELITE	High Accuracy	Single Channel	mA, V, TC, Ohms RTD, Hz	Loop & RTD Diagnostics	Read Pressure	Source pH
-----------------	---------------	----------------	-------------------------	------------------------	---------------	-----------

Model 830	High Accuracy	Isolated Dual Channel	mA, V, TC, Ohms RTD, Hz	Advanced Diagnostics	Read Pressure	Source pH	Power Xmtr while sourcing	Transmitter Replacement	Monitor Loop mA, V & Ohms
-----------	---------------	-----------------------	-------------------------	----------------------	---------------	-----------	---------------------------	-------------------------	---------------------------

### ORDERING INFORMATION

Includes batteries, rubber boot, tilt stand, carrying case, test leads, Certificate of Calibration, 3 year warranty. Made in U.S.A.

PIECAL820	Multifunction Process Calibrator
PIECAL820Elite	High Accuracy Multifunction Process Calibrator
PIECAL830	Two Channel Multifunction Process Calibrator