

Spec-Cal[®]

Eclipse II

PROCESS CALIBRATOR



3 modes of cold junction compensation-
internal, external and manual

LCD display indicating generated and
measured values simultaneously

20 selectable functions

Programme keys for ramp functions and
datalogging of calibration results

Switchable backlight

Separate measurement and generation
colour-coded terminals

24V integral DC supply

External cold junction probe socket

Features

- Accuracy 0.007% of reading.
- UKAS Certificate at no extra cost - mutually accepted in Europe through EAL*
- Simultaneous measurement and generation of mV, mA, V and Ω .
- Measures and simulates 12 different thermocouple types and 7 RTD signals to selectable international standards (BS/JIS/DIN/ANSI).
- Unique RTD emulation capability - precision RTD simulation whether used with DC, AC or pulsed waveform excitation currents.
- Automatic remote cold junction compensation.
- Multi-lingual - operates in 5 different selectable languages.
- Pressure Calibrator - plug-in modules available to measure pressures from -14.7 to 500 psi.
- Integral 24V DC supply.
- Spec-Link[®] Windows[®] - based calibration software with RS232 interface and data logging facility.
- Portable, bench and panel mounted versions available.

The Haven Spec-Cal[®] Eclipse II multi-function process calibrator represents a culmination of 30 years experience in calibrator design and manufacture.

The Spec-Cal[®] Eclipse II measures and simulates 12 thermocouple types to any of four selectable international standards (BS, JIS, DIN and ANSI) as well as simultaneously measuring or generating mV, mA or volts. In addition, the Spec-Cal[®] Eclipse II measures and generates ohms, and measures and simulates 7 different RTD types.

The hand-held, battery powered Spec-Cal[®] Eclipse II is protected by a tough, EMC shielded, aluminium case with a durable, splash-proof, polycarbonate keypad which has excellent tactile and audible feedback, a high contrast super twist LCD display and switchable backlight. It is also available as a bench or panel mounted version, mains powered with a permanent backlit display.

Used in conjunction with the Haven Multical Pressure Module, the Spec-Cal[®] Eclipse II offers the capability of measuring pressures from -14.7 up to 500psi. Spec-Link[®] Windows[®] - based software provides an automated calibration management facility to assist compliance with ISO9000 quality systems.



Haven Automation Limited

*EAL- European co-operation for Accreditation of Laboratories- International acceptance and mutual recognition agreements of UKAS calibration certificates throughout Denmark, Finland, France, Germany, Ireland, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, Australia, Hong Kong and New Zealand.

Simple To Operate Yet Powerful

The Spec-Cal® Eclipse II Calibrator is menu-driven for ease of use, the sequence of options is simple, logical and intuitive. The non-volatile memory will store up to 50 ramp programmes and 500 calibration values even when your Spec-Cal® Eclipse II is switched off or the batteries removed. For each ramp programme you can enter values for units, step time and increment and define high and low limits. The programme can be manually stepped or auto-cycled, it can even be controlled remotely from a PC or stopped by remote contact closure. Three modes of cold junction compensation are available, including Haven's patented external remote CJ measurement system, eliminating the need to use error inducing compensating cable.

The Spec-Cal® Eclipse II is supplied with a set of 6 high capacity NiMH batteries, which will power the instrument for up to ten hours. Alternatively, you can use disposable AA cells or power directly from the mains supply using the battery charger/ eliminator. A low battery indicator will tell you when your Spec-Cal® Eclipse II needs to be charged giving reasonable advance warning of instrument power down. To save power an automatic function is available to power down your instrument if a key has not been pressed for approximately 10 minutes. An isolated 24 Volt integral supply is provided for loop power.

Multi-Functional Combined with High Performance

Calibrate temperature, voltage, current, resistance and pressure instruments. Use either ITS-90 or IPTS-68 temperature scales, select between °C and °F, work in % of range, mA or Volts, display square root values of measured current, detect open-circuit thermocouples or even use your Spec-Cal® Eclipse II as a highly accurate digital thermometer.

The Spec-Cal® Eclipse II is multi-lingual, operating in English, French, German, Italian and Spanish. Other useful functions include password protection, preventing unauthorised use of your instrument, an owner details display and calibration date to remind you when your Spec-Cal® Eclipse II is itself due for recalibration.

The Spec-Cal® Eclipse II offers a basic accuracy of 0.007% of reading and each instrument is supplied with a UKAS calibration certificate as standard. This ensures full traceability through an unbroken chain to National Measurement Standards and so meet the requirements of ISO9000 quality management systems.

The Spec-Cal® Eclipse II is so accurate it is often used as a transfer laboratory standard. Due to increased customer demand, other models are now available; a free standing bench version ideal for laboratory use and a panel mounted bench version for inclusion in our range of custom-designed test benches.

Unique RTD Emulation

The Spec-Cal® Eclipse II uses an innovative circuit design providing precision RTD emulation whether used with DC, AC or pulsed waveform excitation currents. This is unlike other RTD simulators / process calibrators available on the market which are limited to simulating RTDs for instruments with restricted DC or low frequency AC excitation currents.

RTD simulators generate a voltage, the value of which is a function of the excitation current of the instrument under test and the resistance to be simulated. However, excessive variations in the value or rate of change of excitation current can cause the simulation to become unstable and/or inaccurate. This problem is eliminated in the Spec-Cal® Eclipse II by the use of our unique resistance emulation circuitry which uses an array of real, switchable resistors to provide the required resistance value. The Spec-Cal® Eclipse II is in effect an intelligent resistance emulator.

Cold Junction Compensation

Haven Automation invented thermocouple simulation techniques for use in portable calibrators over 20 years ago and the competition is still trying hard to catch up. Our remote cold junction sampling idea was so unique we took out a patent - no need to search around for the correct thermocouple cable to carry out your calibration, no chance of introducing massive errors by using compensation cable (a common mistake) - just copper conductors and no errors.



Haven Automation Limited

Supports ISO9000 Calibration

The Spec-Cal® Eclipse II can be used in the field to store up to 500 measured and generated values along with the identity of the instrument under test. Later, this data can be downloaded to your PC using an RS232C interface and Spec-Link™ software.

Spec-Link™ Windows™ supported software enables straightforward printing of calibration certificates with custom-designed header information and facilities to export your calibration information to other word-processing and spreadsheet applications.

Complete calibration management and analysis features are available when used with the Autocal Management Calibration Software (ask for our Autocal brochure).



Pressure Measurement

Haven Multical plug-in Pressure Modules turn your Spec-Cal® Eclipse II into a highly accurate pressure calibrator enabling direct pressure indication in up to 9 engineering units, and vacuum and pressure generation when used in conjunction with a Haven Hand Pump.

Haven Multicals are Rugged and Reliable - the silicon pressure sensor is protected by a stainless steel diaphragm and the sensor housing is teflon coated. The non-corrosive structure provides excellent resistance against contaminants when used in the field.

Haven Multicals are Universal - they can be used with any instrument that reads millivolts.

Haven Multicals are Pocket-Sized - with an overall length of 12.6cm and weight of 84g and powered by a single 9V battery giving over 400 hours of use.



Multical Specifications

Model	Ranges (Gauge Pressure)	Accuracy	Pressure units
A	0 to 30 psi 30 to 50 psi 0 to -14.7 psi Max Pressure	± (0.05% of reading + 0.01 psi) ± (0.25% of reading) ± (0.5% of reading + 0.02 psi) 100 psi	50 psi module: psi, in H ₂ O, cmH ₂ O, inHg, mmHg, kPa, mbar, bar and kg/cm ² (9 units)
B	0 to 500 psi 0 to -14.7 psi Max Pressure	± (0.1% of reading + 0.02 psi) ± (0.25% of reading + 0.02 psi) 1000 psi	500 psi module: psi, mH ₂ O, inHg, cmHg, kPa, MPa, bar and kg/cm ² (8 units)

General Specifications

24 V DC Supply:25mA maximum output
Terminal Type:4mm binding posts to accept wire or 4mm plug
Isolation:The MEASURE, GENERATE and 24V terminals are mutually isolated
Over Voltage Protection:30 Volt AC and DC

Cold Junction (int/ext):
Accuracy:±0.1°C at 23°C (±0.2°F at 73°F),
 0.1 degree resolution
Range:-50 to +136°C (-58 to +276°F)
Error:Add 0.01°C per degree difference from 23°C (0.02°F from 73°F)

Environmental:
Temperature:-5 to +50°C (23 to 122°F)
Relative Humidity:10 to 80% non condensing.
 <70% recommended.
Storage Temperature:-20 to 60°C (-4 to 140°F)
Int Reference Drift:<7 ppm per °C from 23°C (73°F)

Dimensions:
ProductSpec-Cal® Eclipse II
(L, W, H)246x105x57mm
Weight1kg
Free Standing Bench Version:292x530x110mm (6.5kg)

Ramp Specification
Ramp UNITS available:V, mV, mV%, mA, mA%, °C, °F
Min Ramp Increment:least significant digit of range
Ramp Step Time:5 sec to 9999.9 sec
Ramp Delay:1 sec to 5 min (before start of cycle)
Modes:auto single cycle, auto continuous cycle, manual



Supplied complete with carry case, battery charger, standard accessories, and UKAS Calibration Certificate issued by Haven Automation Ltd.

Laboratory No: 0295

Electrical Signals

Function	Range	Display Resolution	Internal Resolution	Accuracy
Measure	-100 to 100mV	1µV	0.19µV	0.007% Reading + 5µV
	-55 to 55mA	1µA	0.19µA	0.007% Reading + 5µA
	-30 to 30V	1mV	0.06mV	0.007% Reading + 3mV
	0 to 400Ω (lexc = 1mA)	10mΩ	1mΩ	0.007% Reading+ 20mΩ
	400 to 4000Ω (lexc=0.1mA)	100mΩ	10mΩ	0.007% Reading+200mΩ
Generate	-25 to 100mV	1µV	0.19µV	0.007% Reading + 5µV
	0 to 22 mA	1µA	0.04µA	0.007% Reading+5µA
	-2.5 to 10V	1mV	0.02mV	0.007 Reading +3mV
	18 to 400Ω*	10mΩ	1mΩ	0.007%Reading + 20mΩ
	400 to 4000Ω**	100mΩ	10mΩ	0.007% Reading+200mΩ

*Excitation current (DC/AC/pulsed) from -10 to +10mA

**Excitation current (DC/AC/pulsed) from -1 to +1mA. All resistance specification are for 4 wire configuration only.

Thermocouple Measurement and Simulation

Simulation			
T/C Type	Range C	Worst Case Accuracy* +/- C	Best Case Accuracy** Mid Range +/- C
T	-250 to -200	1.1	0.2
	-200 to -140	0.3	
	-140 to 400	0.2	
E	-250 to -200	0.9	0.2
	-200 to 800	0.2	
	800 to 1000	0.3	
K	-250 to -180	1.7	0.2
	-180 to 550	0.3	
	550 to 1372	0.4	
R	-50 to 100	1.4	0.4
	100 to 1740	0.7	
	1740 to 1767	2.0	
J	-210 to -110	0.3	0.2
	-110 to 700	0.2	
	700 to 1200	0.3	
S	-50 to 0	1.3	0.5
	0 to 120	0.9	
	120 to 1740	0.7	
	1740 to 1767	1.9	
B	300 to 600	1.7	0.5
	600 to 1000	1.1	
	1000 to 1820	0.7	
N	-250 to -220	1.9	0.2
	-220 to -150	0.7	
	-150 to 1300	0.3	
PR (JIS)	0 to 250	1.9	0.6
	250 to 1600	0.8	
	1600 to 1770	0.7	
U (DIN)	-200 to -120	1.0	0.2
	-120 to 180	0.4	
	180 to 600	0.2	
L (DIN)	-200 to -120	0.6	0.2
	-120 to 900	0.3	
	NI (ANSI)	-18 to 1310	

Measurement			
T/C Type	Range C	Worst Case Accuracy* +/- C	Best Case Accuracy** Mid Range +/- C
T	-270 to -150	1.1	0.2
	-150 to -400	0.2	
E	-250 to -200	0.8	0.2
	-200 to 800	0.2	
	800 to 1000	0.3	
K	-250 to -180	1.8	0.2
	-180 to 1372	0.4	
	R	-50 to 100	
100 to 1700	0.7		
1700 to 1767	1.9		
J	-210 to -100	0.3	0.2
	-100 to 1200	0.2	
	S	-50 to 20	
20 to 160	0.9		
160 to 1720	0.7		
1720 to 1767	2.0		
B	300 to 750	1.5	0.5
	750 to 1020	0.8	
	1020 to 1820	0.6	
N	-250 to -160	1.9	0.2
	-160 to 150	0.5	
	150 to 1300	0.3	
PR (JIS)	0 to 250	1.9	0.6
	250 to 1600	0.8	
	1600 to 1770	0.7	
U (DIN)	-200 to -140	1.2	0.2
	-140 to 100	0.5	
	100 to 600	0.3	
L (DIN)	-200 to -120	0.9	0.2
	-120 to 900	0.5	
	NI (ANSI)	-18 to 1310	

* Worst case accuracy: calculated at 0°C manual CJ using worst case electrical accuracy and worst case linearization errors over specified range.

** Best case, mid range accuracy: calculated at 0°C manual CJ using worst case electrical accuracy and worst case linearization errors. Resolution for all ranges: 0.1°C.

RTD Measurement and Simulation

Simulation			
RTD Type	Range C	Worst Case Accuracy* +/- C	Best Case Accuracy** Mid Range +/- C
Pt50	-155 to 300	0.15	0.15
	300 to 850	0.23	
Pt100	-200 to 360	0.10	0.10
	360 to 850	0.16	
Pt200	-200 to 10	0.04	0.06
	10 to 260	0.07	
	260 to 850	0.43	
Pt500	-200 to -60	0.02	0.15
	-60 to 300	0.15	
	300 to 850	0.23	
Pt1000	-200 to 10	0.02	0.10
	10 to 260	0.09	
	260 to 850	0.16	
Ni100	-60 to 110	0.05	0.04
	110 to 180	0.04	
Ni120	-80 to 150	0.10	0.03
	150 to 260	0.07	

Measurement			
RTD Type	Range C	Worst Case Accuracy* +/- C	Best Case Accuracy** Mid Range +/- C
Pt50	-155 to 280	0.15	0.16
	280 to 850	0.26	
Pt100	-200 to 310	0.10	0.10
	310 to 850	0.19	
Pt200	-200 to 60	0.05	0.07
	60 to 260	0.07	
	260 to 850	0.46	
Pt500	-200 to -60	0.03	0.16
	-60 to 330	0.16	
	330 to 850	0.26	
Pt1000	-200 to -150	0.02	0.10
	-150 to 310	0.10	
	310 to 850	0.19	
Ni100	-60 to 150	0.06	0.04
	150 to 180	0.07	
Ni120	-80 to 120	0.12	0.04
	120 to 260	0.09	

* Worst case accuracy: calculated using worst case 4 wire electrical accuracy and worst-case linearization errors across specified range

** Best case, mid-range accuracy: calculated using worst case 4 wire electrical accuracy and worst-case linearization errors . Resolution for all ranges: 0.01°C

Spec-Cal[®] Eclipse II has been designed to maintain its specification over a period of 1 year.



Haven Automation Limited

Measurement House, Kingsway,
Fforestfach, SWANSEA SA5 4EX, UK.
Tel: +44 (0)1792 588722
Fax: +44 (0)1792 582624
e-Mail: sales@haven.co.uk
www.haven.co.uk

Authorised Representative:



Features

- **High accuracy and reliability**
- **Robust and hard-wearing**
- **Supplied complete with UKAS certificate**
- The Minical® IV is a high accuracy hand-held DC Current and Voltage Calibrator designed for the calibration of process control instrumentation including transmitters, transducers, recorders, controllers and indicators.
- The Minical® IV will calibrate from micro-volt and micro-amp levels to over 100mV/50mA in both read and generate modes, with the added ability to generate up to 12V DC and to read up to 20V DC. The Minical® IV also acts as a 4-20mA Transmitter Simulator, which will operate in powered or unpowered loops.
- Data entry is via a membrane keypad system with fast and slow increment/decrement keys providing rapid and precise output value settings. The membrane keypad is scratch resistant, splashproof and free of potentiometers and switches.



MINICAL™ IV

DC CURRENT AND
VOLTAGE CALIBRATOR



Haven Automation Limited

Calibration Solutions for Industry

MINICAL™ IV

DC CURRENT AND VOLTAGE CALIBRATOR



Specifications

Accuracy	+/-0.025% F.S.D.
Resolution	+/- 1 digit
Maximum Ambient Operating Temperature	40°C
Voltage Measurement	
mV range	0-199.99mV
V range	0-19.999V
Current Measurement	0-199.99mA
Voltage Generation	
mV range	0-199.99mV
V range	0-11.999V
Current Generation	0-50mA
Voltage Input Impedance	> 1MΩ
Current Input Impedance	< 11Ω
Maximum Input Voltage	+/- 60V DC
Maximum Input Current	+/- 300mA
Maximum Voltage across Current Generator	+200V
24V DC Supply	50mA max
Estimated battery life	
No load	25 hours
With 50mA load using The internal 24V supply	7.5 hours
LED Display	4½ digit display
Dimensions with Case	140mm x 115mm x 245mm
Weight with Case	1.5Kg

Accessories

Carry case, test leads, charger unit, instruction manual and UKAS Calibration Certificate issued by Haven Automation Ltd.

Laboratory No. 0295



Haven Automation Limited

Measurement House, Kingsway,
Forestfach, SWANSEA SA5 4EX, UK.
Tel: +44 (0)1792 588722
Fax: +44 (0)1792 582624
e-Mail: sales@haven.co.uk
www.haven.co.uk

Authorised Representative:





The Practical Instrument Electronics Models 510 and 511 RTD Simulators simulate standard RTD curves over the entire industrial temperature range. Choose between seven standard RTD curves. The Model 510 can also be supplied with a custom curve for your specific application such as Pt 200, 500, 1000 with up to 0.1 resolution.

The Model 510/511 will simulate RTD resistances into all types of instruments such as transmitters, recorders, controllers, alarms, data acquisition, and computer systems. Rest easy knowing these calibrators are 100% compatible with pulsed systems and transmitters like the Rosemount 3144 Transmitter.

The Model 510/511 is a superior replacement for decade boxes, so there is no need to lug a decade box around or be prone to error by reading RTD tables incorrectly. The Models 510 and 511 have better accuracy, functions and compatibility than many higher priced RTD calibrators.

The EZ-Check function allows the user to store three output temperatures for ease of use. This will save time for repetitive calibrations by instantly recalling the three stored temperature values. Three output settings can be stored, and all settings are saved, even with the power off.

MODEL 510/511

RTD SIMULATORS

Features

- **Simulate RTD Temperature Outputs**
Calibrate directly in temperature for your RTD curve. Adjustable output for full temperature range.
- **Several Manufacturers' RTD Curves Available**
Platinum, Copper & Nickel.
Accurate to $\pm 0.25^{\circ}\text{C}$ ($\pm 0.5^{\circ}\text{F}$) with up to 0.1° Resolution available on the Model 511.
- **Works with a wide variety of transmitters including popular Rosemount and Honeywell Models**
Compatible with devices using pulsed excitation currents including PLCs, DCS, recorders, and all others.
- **EZ-Dial Knob**
Easily adjust output by 0.1° (Model 511) or 1°F (Model 510). Pressing down and turning will select a faster dialing speed.
- **EZ-Check Switch**
User settable EZ-Check™ for 0% and 100% span adjustments. Store new EZ-Check™ values by pressing the EZ-Dial Knob.
- **Uses a standard 9V Alkaline Battery**
Superior battery life of 45 hours under typical continuous usage.
Easy access to battery compartment.
- **Lightweight, Rugged and Reliable**
Small, tough and protected to 60V.

Models pictured above left:

Model 510: Single curve, 1° resolution, selectable °C or °F
 Model 511: Multi type 7 curves, 0.1° resolution with selectable °C or °F and Ω with 0.01 Ω resolution
 (Pt 100: α = 1.3850, 1.3902, 1.3916, 1.3926 and
 Cu10, Ni110, Ni120, Ω)



Haven Automation Limited

General Specifications

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

Operating Temperature Range	-25 to 60°C (-10 to 140°F)
Storage 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	4.9 X 3.15 X 1.82 inches (125.5 X 80 X 46.2 mm)
Weight	9.1 oz (258g)
Battery	9V Alkaline provides 45 hours of continuous use
Miscellaneous	Low battery indication with nominal 1 hour of operation left Protection to 60V DC or AC peak up to 30 seconds in duration High contrast graphic liquid crystal display with 0.357" (9.07 mm) high digits

RTD Curve Simulation Specifications (ITS-90 Curves)

Accuracy	±(0.015% of Setting in Ω + 0.05Ω)
<i>Typical accuracies for RTD curves are:</i>	
Pt100	±0.25°C (±0.5°F)
Cu10Ω	±1.5°C (±3°F)
Ni110Ω, Ni 120Ω	±0.25°C (±0.5°F)
Allowable Excitation Current	100 μA to 10.2 mA, steady or pulsed/intermittent/smart
For Accuracies Below 100μA add	±10μV/Excitation Current (units are in Ω)
Pulsed Excitation	DC to 0.01 second pulse widths
Current Compatibility	
Output Dial Adjustment	0.1°F or 0.1°C Adjustment
Resolution	Resolution for Model 511 1°C or 1°F Adjustment Resolution for Model 510
Temperature Coefficient	±0.05Ω/°C Ambient

Available Options

Option:	Part Number:
Carrying Case	020-0201
UKAS Calibration Certificate	

Authorised Representative:

Due to our policy of continual product development we reserve the right to amend this specification without notice. © Haven Automation Ltd 2003

ORDERING INFORMATION

Model 510 RTD Source (Single Type/1 resolution)

Order Code:	Model 510-Pt100-1 (α =1.3850)
	Model 510-Pt100-2 (α =1.3902)
	Model 510-Pt100-3 (α =1.3916)
	Model 510-Pt100-4 (α =1.3926)
	Model 510-Cu10
	Model 510-Ni110
	Model 510-Ni120

Model 511 Multi type RTD Source (7 Types, Ω / 0.1 resolution)

Order Code:	Model 511
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Warranty

Practical Instrument Electronics (PIE) equipment is guaranteed against defective material and workmanship (excluding batteries) for a period of three years from the date of shipment. Claims under guarantee can be made by returning the equipment prepaid to Haven Automation Ltd. The equipment will be repaired, replaced or adjusted at our option. The liability of Practical Instrument Electronics (PIE) is restricted to that given under their guarantee. 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. or Haven Automation Ltd. be liable for any special, incidental or consequential damage.



Haven Automation Limited

Measurement House, Kingsway,
Fforestfach, SWANSEA SA5 4EX, UK.
Tel: +44 (0)1792 588722
Fax: +44 (0)1792 582624
e-Mail: sales@haven.co.uk
www.haven.co.uk





The Practical Instrument Electronics' Model 520/521 Thermocouple Simulators simulate a standard thermocouple curve over the entire industrial temperature range. Choose between eight standard T/C types or millivolts. The Model 520 can also be supplied with a custom thermocouple curve and range for your specific application.

The Model 520/521 sources precise temperatures for inputs to all types of instruments such as transmitters, recorders, controllers, alarms, data acquisition, and computer systems. The Model 521 provides a miniature T/C connector and the Model 520 provides 18" extension wire. Both are internally cold-junction compensated for changes in ambient temperature. The PIE Model 520/521 offers the highest performance and functions in its class by exceeding the accuracy and functions of many higher priced thermocouple calibrators.

The EZ-Check^o function allows the user to store three output temperatures for ease of use. This will save time for repetitive calibrations by instantly recalling the three stored temperature values. Three output settings can be stored, and all settings are saved, even with the power off.

The low cost PIE Model 520/521 is an "easy as PIE" to use thermocouple source for checkout and calibration of all thermocouple instruments in the field, shop or control room.

MODEL 520/521

THERMOCOUPLE SIMULATORS

Features

- **Direct Temperature Output**
Calibrate in temperature for your T/C type. Adjust temperature output in 0.1° or 1°.
- **8 Standard T/C Types Available**
Types J, K, E, T, R, S, B, N and mV. Custom types and ranges are available. Ranges from -148°F to F.S. for most types. °C & °F Cold Junction Compensated.
- **High Accuracy**
±(0.015% of mV Setting + 0.009mV). Typical accuracy of ±0.35°C (0.6°F) for Type K.
- **EZ-Dial^o Knob**
Easily adjust output by 0.1° (Model 521) or 1° (Model 520). Pressing down and turning will select a faster dialing speed
- **EZ-Check^o Switch**
User selectable EZ-Check™ for 0% and 100% span adjustments. Store new EZ-Check™ values by pressing the EZ-Dial™ knob.
- **Uses a standard 9V Alkaline Battery**
Superior battery life of 45 hours under typical continuous usage. Easy access to battery compartment.
- **Lightweight and Rugged with a Solid Feel**
Small, tough and protected to 60V.

Models pictured above left:

Model 520: 1° resolution, Single Type or Custom Type.

Model 521: Selectable 8 Types, 0.1° resolution with selectable °C or °F and 0.001 mV resolution (J, K, E, T, R, S, B, N and mV).



Haven Automation Limited

General Specifications

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

Operating Temperature Range	-25 to 60°C (-10 to 140°F)
Storage 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	4.9 X 3.15 X 1.82 inches (125.5 X 80 X 46.2 mm)
Weight	7.2 oz (204 g)
Battery	9V Alkaline provides 45 hours of continuous use
Miscellaneous	Low battery indication with nominal 1 hour of operation left Overload Protected to 60V for 30 seconds or less High contrast graphic liquid crystal display with 0.357" (9.07 mm) high digits

Source Thermocouple Specifications (ITS-90 Curves)

Millivolt Uncertainty	±(0.015% of mV Setting + 0.009mV)
Temperature Coefficient of mV Source	±0.005mV/°C Ambient
Output Noise	±5µVpp from 0.1 Hz to 10 Hz
Output Impedance	0.2Ω
Cold Junction Uncertainty	±0.5°C (0.5°F)
Cold Junction Sensor	±0.05°/° in ambient temperature
Temperature Coefficient	(°C or °F)
General Temperature Accuracy	±(0.015% of mV setting + 0.009mV) ± 0.5°C (0.5°F)
Output Dial Adjustment	0.1°C or 0.1°F for Model 521
Resolution	1°C or 1°F for Model 520
Span	-13.000 - 80.000 mV
T/C Type B	594 - 1820°C (1101.2 - 3308.0°F)
T/C Type E	-260 - 1000°C (-436.0 - 1832.0°F)
T/C Type J	-210 - 1200°C (-346.0 - 2192.0 °F)
T/C Type K	-245 - 1372°C (-409.0 - 2501.6°F)
T/C Type N	-229 - 1300°C (-380.2 - 2372.0°F)
T/C Type R	24 - 1768°C (75.2 - 3214.4°F)
T/C Type S	21 - 1768°C (69.8 - 3214.4°F)
T/C Type T	-251 - 400°C (-419.8 - 752.0°F)

Available Options

Option:
UKAS Calibration Certificate

Authorised Representative:

ORDERING INFORMATION

T/C Source (Single Type/1 resolution)	with T/C extension wire: Model 520-* (*add choice of T/C type: B, E, J, K, N, R, S, T or mV) with miniature T/C connector: Model 520-M*
T/C Source (8 Types, mV/0.1 resolution)	Model 521



Warranty

Practical Instrument Electronics (PIE) equipment is guaranteed against defective material and workmanship (excluding batteries) for a period of three years from the date of shipment. Claims under guarantee can be made by returning the equipment prepaid to Haven Automation Ltd. The equipment will be repaired, replaced or adjusted at our option. The liability of Practical Instrument Electronics (PIE) is restricted to that given under their guarantee. 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. or Haven Automation Ltd. be liable for any special, incidental or consequential damage.



Haven Automation Limited

Measurement House, Kingsway,
Fforestfach, SWANSEA SA5 4EX, UK.
Tel: +44 (0)1792 588722
Fax: +44 (0)1792 582624
e-Mail: sales@haven.co.uk
www.haven.co.uk





The Practical Instrument Electronics' Model 522 is a complete source/read thermocouple calibrator providing direct temperature input to all types of instruments such as transmitters, recorders, controllers, alarms, data acquisition and computer systems. The Model 522 also reads thermocouple outputs and displays temperature, eliminating the need for cumbersome books of conversion tables. The Model 522 is equipped with a miniature T/C connector and slotted screws to connect to common thermocouple equipment or bare extension wire. Select from 8 T/C types to source/read in °C or °F with 0.1 resolution. Or, select mV for direct millivolt source/read capability. The Model 522 is internally cold-junction compensated for accuracy in any operating environment. Use the EZ-Check™ Switch to quickly switch between three stored temperature/mV outputs. It's easy to customise these values to your application. In read mode the EZ-Check™ Switch recalls minimum and maximum readings. Store or clear the memory with a press of the EZ-Check™ Knob. The Practical Instruments Electronics Model 522 offers the highest performance and functions in its class by exceeding the accuracy and functions of many higher priced thermocouple calibrators. It is a low cost solution for the checking and calibration of all thermocouple instruments in the field or laboratory.

MODEL 522

THERMOCOUPLE CALIBRATOR

Features

- **Direct Temperature Input/Output**
Read or Source in °C or °F for your T/C type
- **8 Standard T/C Types available**
Types J, K, E, T, R, S, B, N and mV
Custom types and ranges are available
Cold-junction compensated
- **High Accuracy**
± (0.008% of mV + 0.006 mV)
Cold-junction compensated
- **EZ-Dial™ Knob**
Easily adjust output by 0.1°
Pressing down and turning will select a faster dialling speed
- **EZ-Check™ Switch**
User selectable EZ Check™ for 0% and 100% span adjustment
Store new EZ Check™ values by pressing the EZ Dial™ Knob
Recall stored minimum and maximum readings
- **Uses a Standard 9V Alkaline Battery**
Superior battery life of 45 hours under typical continuous usage
Easy access to battery compartment
Lightweight and rugged with a solid feel
Small, tough and protected to 60V



Haven Automation Limited

General Specifications

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

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
Overall Size	125.5 x 80 x 46.2mm (4.9 x 3.15 x 1.82 inches)
Overall Weight	204 grams (7.2oz)
Battery	9V Alkaline provides 45 hours of continuous use
Miscellaneous	Low battery indication with nominal 1 hour of operation left Overload protected to 60 volts for 30 seconds or less High-contrast graphic liquid crystal display with 9.07mm (0.357") high digits
Accuracy:	
Millivolt Accuracy	± (0.008% of mV setting + 0.006 mV)
Temperature Coefficient of mV Source	± (0.008% of mV setting + 0.006 mV)
Cold Junction Calibration Accuracy	± 0.1°C (0.2°F)
Cold Junction Sensor Temperature Coefficient	± 0.025% in ambient temperature (°C or °F)
General Temperature Accuracy	± (0.008% of mV setting + 0.006 mV) ± 0.1°C or 0.1°F

Source Thermocouple Specifications

Output Range	-13.000 to +80.000 mV
Output Noise	± μV pp from 0.1Hz to 10Hz
Output Impedance	0.2 Ω (200 nV/uA)
Source Current	< 8 mA

Read Thermocouple Specifications

Input Noise	< ± 1 LSD from 0.1Hz to 10Hz
Input Impedance	> 1 M Ω
Open T/C Test Pulse	< 1μA for 300ms
Open T/C Response Time	< 3 seconds
Open T/C Threshold	10 k Ω nominal

Available Options

Option:	Part Number:
Carrying Case	020-0201
UKAS Calibration Certificate	

Authorised Representative:



Warranty

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The Practical Instrument Electronics Model 530 is the result of 30+ years of experience manufacturing and designing calibrators for the process control industry.

The Model 530 calibrator incorporates all of this knowledge and experience and combines it into one superior product. It has simple, easy to use controls, featuring a large high contrast display with easy visibility without the need for contrast adjustments.

The Model 530 is designed to be a tool with all the practical functions required to get the job done easily without the confusing extras or reading through a complicated manual.

The Model 530 can source and read current in the process loop, and simulate, power and measure 2-wire transmitters. It can read voltage to 60.00 VDC with over 2X over range ability.

MODEL 530

4-20 MILLIAMP LOOP CALIBRATOR

Features

- **4 to 20 mA Loop Functions**
Source and Read 0.000-24.000 mA.
Simulate 2-Wire Transmitters.
Power 2-Wire Transmitters and Read 0.000-24.000 mA.
Display current in mA or -25.00-125.00 % of 4-20 mA.
- **Read Voltage Function**
Read 0.00 to ± 60.00 VDC with 2X over range ability.
- **Full 5 Digit Display**
True ±0.012% of reading accuracy.
Bar graph for quick reference of input and output levels.
High contrast graphic display viewable in all lighting conditions and angles.
- **EZ-Dial Knob**
Easily adjust output by 0.001 mA (0.01%) or 0.100 mA (1.00%).
- **EZ-Check Switch with EZ-Step Button**
3 position tactile switch with push button for true one handed calibrations. Push button for stepping through calibration points. 6 different step sizes.
Hands-free auto step and auto ramp modes.
- **Uses a standard 9V Alkaline Battery**
Superior battery life of 40 hours under typical continuous usage. Easy access to battery compartment.
- **240 VAC Tolerant**
Fuse-less protection from accidental misuse.
- **Lightweight and rugged with a solid feel**
Convenient Velcro® hand strap allows for a firm confident grip or attachment to pipes and ladders.
- **HART protocol compatibility mode**
User selectable 250Ω resistor in series with the output for compatibility with HART® protocol enabled devices.



Haven Automation Limited

General Specifications

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

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
Battery	9V Alkaline Optional 120 VAC 50 Hz AC adaptor available
Miscellaneous	Low battery indication with nominal 1 hour of operation left Over-voltage protection to 120 Vrms (rated for 30 seconds) or 240 Vrms (rated for 15 seconds) Bar graph display with 1% resolution of 4-20 mA signal scale High contrast graphic liquid crystal display with 0.45" (11.4 mm) high digits

Common Specifications for all Current Modes

Ranges	0.000 to 24.000 mA, -25.00 to 125.00% of 4-20 mA
Accuracy	± ± (0.012% of Reading + 0.004 mA)
Temperature Effect	± ± 50 ppm/°C of Range
Resolution(s)	0.001 mA and 0.01%

Source/Power and Measure 2-Wire Transmitter Specifications

Loop Compliance Voltage	≥ 24 Volts
Loop Drive Capability	1200 Ω at 20 mA for entire battery life
Miscellaneous	Open loop or out of compliance conditions are indicated by appropriate error display Battery life in: Source mode ≥ 18 hrs at 12mA typical (HART® disabled) Power measure ≥ 10 hrs at 12mA typical. HART® protocol mode is a selectable option at turn on. HART® protocol mode places a 250Ω resistor in series with the output. Selectable EZ-Step(s) for Source Mode/2-Wire Transmitter Simulation: In mA mode: 0.001, 0.010, 0.100, 1.000, 4.000(default), 8.000 mA % of 4-20 mA mode: 0.01, 0.10, 1.00, 10.00, 25.00(default), 50.00 %

Authorised Representative:

Read mA Specifications

Voltage Burden	≤ 2V at 20 mA
Overload/Current Limit Protection	nominal ≤ 24 mA
Battery Life	Typical ≥ 40 Hours

2-Wire Transmitter Simulation Specifications

Voltage Burden	≤ 2V at 20 mA
Overload/Current Limit Protection	nominal ≤ 24 mA
Loop Voltage Limits	2-60 VDC
Miscellaneous	Open loop or out of compliance conditions are indicated by appropriate error display Battery life ≥ 40 hour typical Selectable EZ-Step(s) for Source Mode/2-Wire Transmitter Simulation: In mA mode: 0.001, 0.010, 0.100, 1.000, 4.000(default), 8.000 mA % of 4-20 mA mode: 0.01, 0.10, 1.00, 10.00, 25.00(default), 50.00 %

Voltage Read Specifications

Range	0.00 to 60.00 VDC (with 2X over range)
Accuracy	± ± (0.1% of Reading ±0.1V)
Temperature Effect	± ± 200 ppm/°C of Reading
Resolution	0.01V
Input Resistance	≥ 1 MΩ Battery life > 40 hour typical Flashing indicator for over range

Available Options

Option:	Part Number:
AC Adaptor	020-0100
Carrying Case	020-0200
UKAS Calibration Certificate	
10-50 Milliamp Loop Calibrator	Model 535

Warranty

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www.haven.co.uk



MODEL 532

4-20 MILLIAMP/VOLTAGE LOOP CALIBRATOR WITH LOOP DIAGNOSTIC



Features

■ **4 to 20 mA Loop Functions**

Source and Read 0.000-24.000 mA.
Simulate 2-Wire Transmitters.
Power 2-Wire Transmitters and Read 0.000-24.000 mA.
Display current in mA or -25.00-125.00 % of 4-20 mA.

■ **Read & Source Voltage Function**

Read 0.00 to ± 30.00 VDC with 4X over range ability.
Source 0.000 to 24.000 VDC with up to 20mA output.
Direct calibration 1.000V to 5.000V.

■ **Full 5 Digit Display**

True ±0.012% of reading accuracy.
Bar graph for quick reference of input and output levels.
High contrast graphic display viewable in all lighting conditions and angles.

■ **Loop Diagnostic**

Displays loop current, voltage, resistance, AC voltage and mode of operation simultaneously eliminating multiple DMM connections. Make DYNAMIC loop readings under actual

DC mA	DC V	DC Ω
00.37	24.0	01423

leakage = 00.16mA
AC V = 00.0

POWER MEASURE DIAG

operating conditions. Included in the loop diagnostic features is its ability to measure ground current leakage from faulty wiring, flooded conduit, and corrosion bridges. This leakage subtracts from the signal current sensed by the receiving system (i.e. DCS), causing a measurement error.

■ **EZ-Dial Knob**

Change the speed of dialing your test point by just pushing down on the knob.
Easily adjust output by 0.001 mA (0.01 %) or 0.100 mA (1.00 %).

■ **EZ-Check Switch with EZ-Step Button**

3 position tactile switch with push button for true one handed calibrations. Push button for stepping through calibration points. 16 different step sizes.

■ **Hands free auto step and auto ramp modes**

Selectable soak and step time for working with valves.

■ **Uses a standard 9V Alkaline Battery**

Superior battery life of 40 hours under typical continuous usage. Easy access to battery compartment.

■ **240 VAC Tolerant**

Fuse-less protection from accidental misuse.

■ **Lightweight and rugged with a solid feel**

Convenient Velcro® hand strap allows for a firm confident grip or attachment to pipes and ladders.

■ **HART protocol compatibility mode**

User selectable 250Ω resistor in series with the output for compatibility with HART® protocol enabled devices.

The Practical Instrument Electronics Model 532 is the best tool for calibration, test, and diagnosing process loops. The Model 532 brings all the features you would expect from a loop calibrator as well as timesaving new ones. Make adjustments with the EZ-Dial Knob or test limits with the dual action EZ-Check Switch. Powerful ramping functions are only a button away on the model 532. Save potentially hours of troubleshooting time on problem loops with the 532's unique Loop Diagnostic Mode. In Loop Diagnostic Mode, the loop current, voltage, resistances, AC voltage, and mode of operation are all displayed simultaneously; without the need of multiple DMM connections. Loop diagnostic is available in every mode of operation and truly is a diagnostic monitor, as parameters are continuously updated in real time. The smart diagnostic tool even indicates the most likely cause of loop failure!



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General Specifications

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

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
Size	7.00 x 3.30 x 2.21 inches (177.8 x 83.8 x 56.1mm)
Weight	12.0 oz (340g)
Battery	9V Alkaline Optional 120 VAC 50Hz AC adaptor available
Miscellaneous	Low battery indication with nominal 1 hour of operation left Over-voltage protection to 120 Vrms (rated for 30 seconds) or 240 Vrms (rated for 15 seconds) Bar graph display with 1% resolution of 4-20 mA signal scale High contrast graphic liquid crystal display with 0.45" (11.4 mm) high digits

Common Specifications for all Current Modes

Ranges	0.000 to 24.000 mA, -25.00 to 125.00% of 4-20 mA
Accuracy	≤ ± (0.012 % of Reading + 0.002 mA)
Temperature Effect Resolution(s)	≤ ± 50 ppm/°C of Range 0.001 mA and 0.01 %

Source/Power and Measure 2-Wire Transmitter Specifications

Loop Compliance Voltage	≥ 24 Volts
Loop Drive Capability	1200 Ω at 20 mA for entire battery life, 950 Ω W/HART® mode enabled
Miscellaneous	Open loop or out of compliance conditions are indicated by appropriate error display Battery life in: Source mode ≥ 18 hrs at 12mA typical (HART® disabled) Power measure ≥ 10 hrs at 12mA typical. HART® protocol mode is a selectable option at turn on. HART® protocol mode places a 250Ω resistor in series with the output. Selectable EZ-Step(s) for Source Mode/2-Wire Transmitter Simulation: 2 to 16 selectable step settings Step size is determined by the selected high and low ranges Selectable time settings for stepping and soak: STEP: 5 to 900 seconds SOAK: 0 to 900 seconds

Read mA Specifications

Voltage Burden	≤ 2V at 20 mA
Overload/Current Limit Protection	nominal ≤ 24 mA
Battery Life	Typical ≥ 40 Hours

Authorised Representative:

2-Wire Transmitter Simulation Specifications

Voltage Burden	≤ 2V at 20 mA
Overload/Current Limit Protection	nominal ≤ 24 mA
Loop Voltage Limits	2-60 VDC
Miscellaneous	Open loop or out of compliance conditions are indicated by appropriate error display Battery life ≥ 40 hour typical Selectable EZ-Step(s) for Source Mode/2-Wire Transmitter Simulation: 2 to 16 selectable step settings Step size is determined by the selected high and low ranges Selectable time settings for stepping and soak: STEP: 5 to 900 seconds SOAK: 0 to 900 seconds

Voltage Specifications (Read Range)

Read Range	0.000 to 24.000 VDC then 24.01 to 30.00 (with 4X over range)
Resolutions	Auto Ranging 0.001 V up to 24V, 0.01V up to 30.00V
Temperature Effect	≤ ± 100 ppm/°C of range
Input Resistance	≥ 1 MΩ
Accuracy	0.000 to 24.000 VDC ≤ ± (0.012% RDG + 0.004 V) 24.01 to 30.00 VDC ≤ ± (0.025% of reading ±0.04 V)

Voltage Specifications (Source Range)

Source Range	0.000 to 24.000 VDC
Output Resistance	≤ 0.3 Ω
Source Current	≥ 20.000 mA with flashing indicator for over range
Accuracy	≤ ± (0.012% RDG + 0.004 V) ±50ppm/°C of range
Battery Life	> 40 hour typical

Available Options

Option:	Part Number:
AC Adaptor	020-0101 - 50 HZ
Carrying Case	020-0200
UKAS Calibration Certificate	

Warranty

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