# 1010
# DC Millivolt Calibrator Model 2003S

- **0.01uV to 10V**
- **0.02% Accuracy**
- **Battery / Mains operation**
- **20mA Output Current**
- **10 ppm/hr Stability**


## Introduction

The 1010 (Model 2003S) is a solid state battery powered instrument suitable for applications requiring a precision voltage source of low internal resistance. It has five ranges up to 10V with a resolution up to 0.01uV. Its small size, robust construction and independence of mains power make it easily portable and convenient for laboratory, field and industrial use.

Voltage outputs are set by selecting the range switch and dialling up the desired value on the thumbwheel switch. Output polarity may be selected using the normal/off/reverse switch

The calibrator's output resistance is typically 500mΩ on the top 3 ranges and the maximum output current that can be drawn on these ranges is limited to 30mA. This is to prevent damage to the internal circuitry in the event of accidental short circuit, etc. The lower ranges have an output resistance of 1 ohm and will supply current up to the short circuit value.

Operation is from battery or mains. When the calibrator is plugged into the mains supply, the internal batteries are automatically recharged. The internal batteries will operate the calibrator when unplugged from the mains. Battery condition can be monitored by the meter on the front panel.

A precision zener diode is used as a reference source that provides an input to a F.E.T. chopper amplifier system operating in a feedback stabilised mode. The gain value is determined by a set of precision metal film resistors, selected by the 5-decade thumbwheel switch on the front panel. The output voltage is variable from 0.01uV to 9.9999V in 5 ranges.

For complete reliability, the calibrator range switch employs two contacts in parallel for each position if a contact fails, the calibrator will still function correctly.

Applications include calibration, linearity and gains stability measurements on DC amplifiers, digital and electronic voltmeters, data loggers and chart recorders. It's high 10ppm per hour stability and very low noise levels are ideal for this type of application..

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## Specifications

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| **Output** | 0 – 9.9999V in 5 ranges<br>0 – 9.9999V in 100µV steps<br>0 – 999.99mV in 10µV steps<br>0 – 99.999mV in 1µV steps<br>0 – 9.9999mV in 0.1µV steps<br>0 – 999.99µV in 0.01µV steps |
| **Accuracy** | 10V & 1V ranges : ± 0.02% of setting + ± 0.005% of range.<br>100mV, 10mV & 1mV ranges: ± 0.05% of setting + ± 0.005% of range, ± 1 µV. |
| **Output Resistance** | 10V, 1V & 100mV ranges. Less than 0.1 ohm (typically 0.05 ohms). 10mV & 1mV ranges 1 ohm. |
| **Maximum Output Current** | 10V, 1V & 100mV ranges –30mA. 10mV & 1mV ranges – up to short circuit value although it should be noted that loads of greater than 1kohm will give greater than 0.1% error. |
| **Maximum Overload** | The instrument can withstand continuous short circuit on the output for all ranges. The 10V, 1V and 100mV ranges have an automatic output current limit set at approximately 30 mA. |
| **Output Voltage Stability** | Less than 30ppm per ºC (0 to +50ºC). Less than 5ppm per V variation in supply voltage. Less than 75ppm per year. Less than 10ppm per hour at constant temperature. |
| **Output Polarity** | Positive or negative switch selected. A centre 'off' position is provided. |
| **Output Noise Level** | 10V, 1V 100mV ranges – less than 10ppm of setting ± 2 µV (0-10Hz). 10mV & 1mV ranges – less than ± 0.05µV (0-10 Hz). |
| **Reference Sources** | Precision zener diode selected after a special ageing process for a temperature coefficient better than 5 ppm per ºC and stability better than 10ppm per month, non cumulative. |
| **Power Supply** | Time Electronics power unit type PU2 which is housed in the rear of the 2003. The PU2 will power the 2003 direct from the mains or an internal rechargeable battery. The battery is automatically charged when mains power is connected. Alternatively an optional battery unit taking ten 1.5V U2-size cells (60 x 33 mm dia) may be fitted in place of the PU2. Access to the battery compartment is from the instrument rear. |
| **Battery Level Indicator** | A front panel display provides a continuous indication of the battery state. |

## General Information

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| **Dimensions** | 215 x 175 x 190 mm (Overall width, depth, height). |
| **Weight** | 3.3kg |
| **Optional Extras** | Carrying Case<br>Calibration Certificate traceable to N.P.L<br>UKAS Calibration Certificate |
| **Country of Origin** | UK. |

## Ordering Information

| **Description** | **Order Code** |
|---|---|
| D.C. Millivolt Calibrator Model 2003S | **1010** |
| Carrying Case | **9021** |
| N.P.L. Traceable Calibration Certificate | **9151** |
| UKAS Calibration Certificate | **9102** |