

Model 121

Programmable DC Current Source





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Overview

The Model 121 programmable DC current source is a precision instrument suitable for benchtop use or panel-mounted operation in labs, test facilities, and manufacturing environments. It provides a low-noise, highly stable source of current up to 100 mA, with convenient manual selection through 13 pre-set output levels, each representing a ten-fold change in power when attached to a resistive load. A “user” setting allows the current output to be defined anywhere within the operating range of the unit, from 100 nA to 100 mA.

Programmable operation is also possible via the instrument’s USB computer interface, through which the Model 121 can be commanded to output any desired current at any time. Thus, application-specific test currents can be driven from an external PC.

The instrument operates at 5 VDC, and power is supplied by the external AC wall-mount supply provided with the standard Model 121. The supply will automatically conform to any AC line voltage ranging from 100 VAC to 240 VAC, 50 or 60 Hz.

Applications

The Model 121 current source is ideally suited for testing, measuring, and operating resistive and semiconductor devices, such as:

- Lake Shore Cernox® temperature sensors
- Other resistance temperature detectors (RTDs) such as platinum sensors
- Diode temperature sensors, including Lake Shore DT-670s
- LED devices
- Hall sensors used for magnetic field measurement

An accurate, stable source of current is key to ensuring consistent operation of these devices, where the voltage drop across the device can be dependent upon temperature, magnetic field, and other parameters. The instrument’s wide output range is of great value when used with RTD-type sensors whose resistance can vary with temperature by as much as 6 orders of magnitude. The current reversal feature enables compensation for thermal EMF, important for accurately measuring resistors at very low excitation levels. Example applications include:

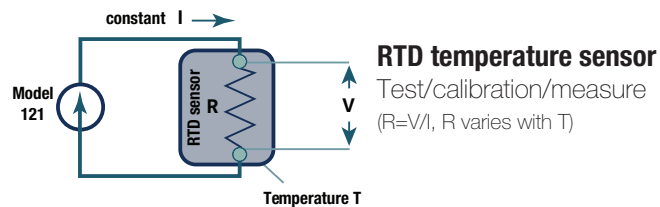
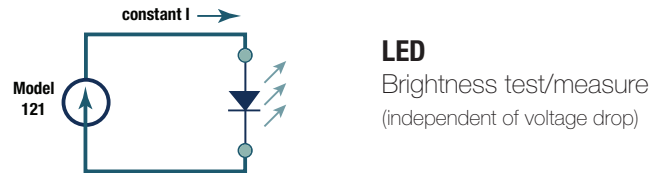
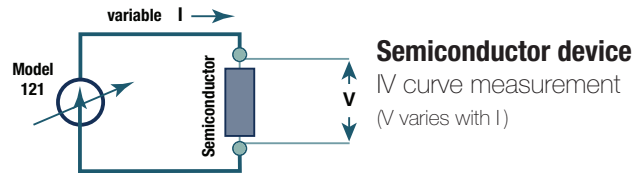
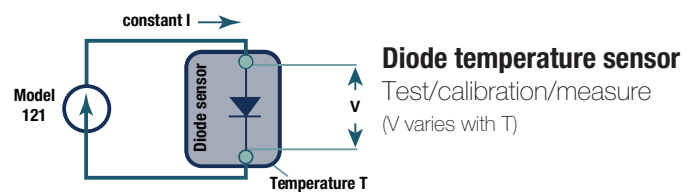
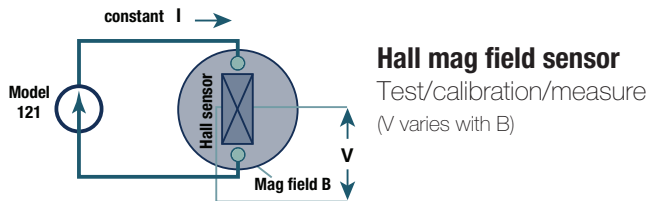
- Basic device QC (“good/bad” verification)
- LED brightness testing (constant device current)
- Temperature sensor calibration (determine resistance at fixed calibration points)
- Temperature measurement (using a voltmeter readout)
- Magnetic sensor calibration and measurement
- Semiconductor device measurements (IV curves for diodes, transistors, etc.)
- Circuit prototyping (fixed current source)
- Small scale electro-chemical applications

Whether operating over a wide range of environmental conditions, establishing precise sensor calibrations or simply testing devices for conformance, the Model 121 provides a convenient and reliable alternative to simple voltage-based circuits and a very affordable alternative to more expensive multi-function current sources. It can be readily integrated into automated test systems using its built-in USB computer interface and offers a highly readable, simple-to-use operator display.

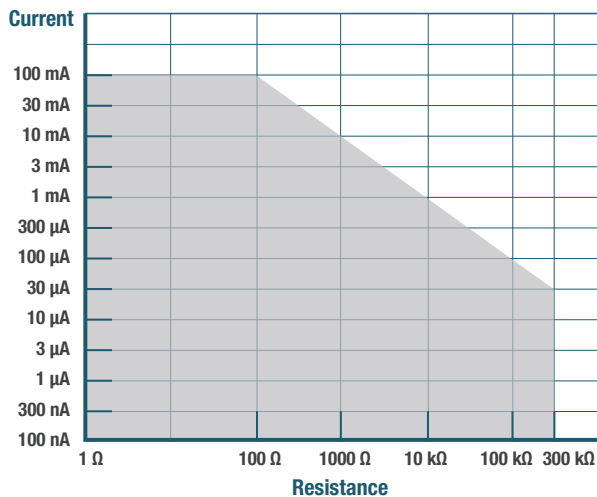
Key features

- 7 decades of output current, selectable in 13 steps
- Programmable current output, 100 nA to 100 mA
- Low-noise output
- Large 3-digit LED display
- Simple user interface
- Current reversal feature
- USB interface enables integration with automated test systems
- DIN panel-mountable package
- Detachable output terminal block
- CE mark certification

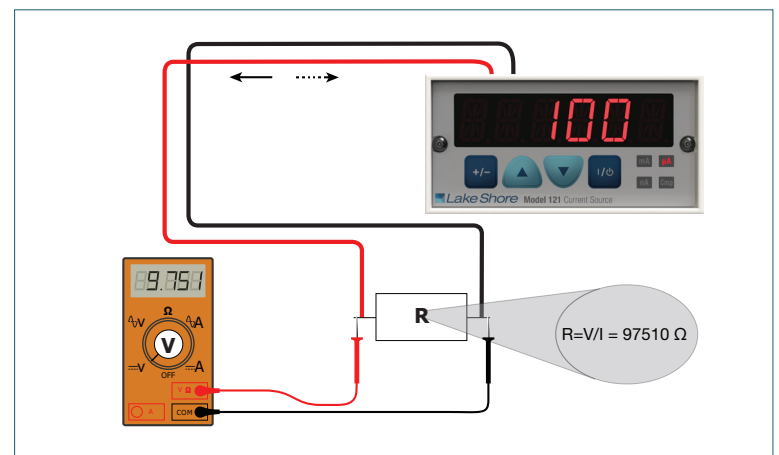
Model 121 Possible applications



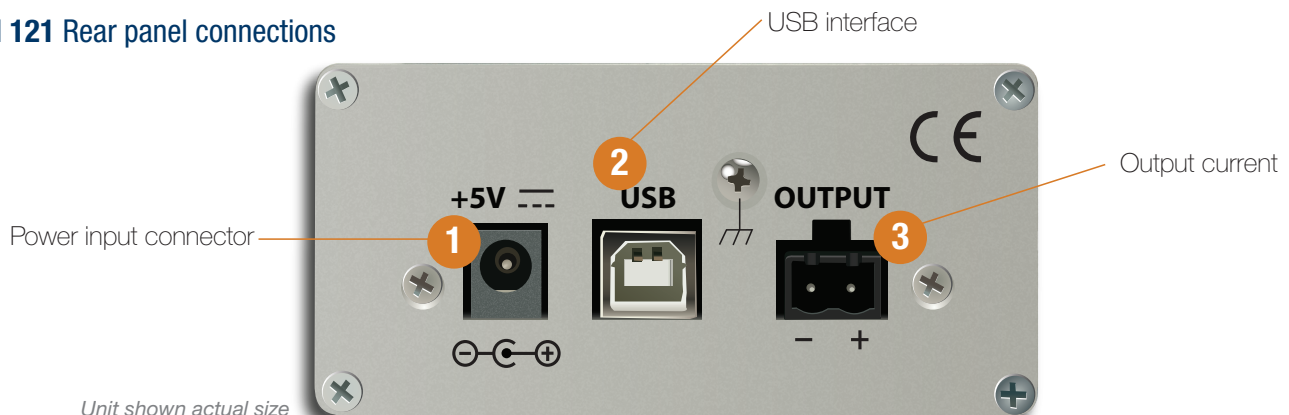
Model 121 Application range



Model 121 Used with a resistive device/sensor



Model 121 Rear panel connections



Output

Type:	Bipolar, DC current source
Current ranges:	13 fixed ranges of 100 nA, 300 nA, 1 μ A, 3 μ A, 10 μ A, 30 μ A, 100 μ A, 300 μ A, 1 mA, 3 mA, 10 mA, 30 mA, 100 mA, and a user-programmable range
Accuracy:	0.05% on 10 μ A range, 0.5% on 100 nA and 300 nA ranges, 0.1% on all other ranges
Compliance voltage:	± 11 V up to 30 mA, ± 10 V up to 100 mA
AC current ripple:	<0.1% on 100 nA and 300 nA ranges, <0.01% on all other ranges in a properly shielded system
Current ripple frequency:	Dominated by line frequency and its harmonics
Temperature coefficient:	0.03% of range/ $^{\circ}$ C for the 100 nA range, 0.01% of range/ $^{\circ}$ C for all other ranges
Line regulation:	<0.01% change in output for 5% change in the DC input voltage
Load regulation:	<0.01% change in output current over the full-scale range
Stability (24 h):	0.05% on 100 nA range, 0.01% per day on all other fixed ranges
Settling time:	<300 ms for full-scale change in current; <100 ms for 10% change in current
Connector:	Detachable terminal block
Maximum load:	300 k Ω

User setting

Programming

Operation:	Output current settable via computer interface
Resolution:	3 significant digits
Accuracy:	0.5% for currents <300 nA, 0.25% for all other currents
Maximum current:	100 mA
Minimum current:	100 nA


Front panel

Display:	6-digit LED display
Display units:	mA, μ A, and nA
Display update rate:	2 rdg/s
Display annunciators:	mA, μ A, nA, and compliance
Keypad:	4 full-travel keys
Keypad functions:	Range Up, Range Down, Current Polarity, Enable/Disable

Interface

USB Function:	Emulates an RS-232 serial port
Baud rate:	57,600
Connector:	B-type USB connector
Reading rate:	Up to 10 rdg/s
Software support:	LabVIEW™ driver (consult Lake Shore for availability)

General

Ambient temperature:	15 $^{\circ}$ C to 35 $^{\circ}$ C at rated accuracy; 5 $^{\circ}$ C to 40 $^{\circ}$ C at reduced accuracy
Power requirement:	+5 VDC $\pm 5\%$ at 250 mA, barrel plug 5.5 mm OD \times 2.1 mm ID \times 9.9 mm L 
Size:	96 mm W \times 48 mm H \times 166 mm D (3.8 in \times 1.9 in \times 6.5 in)
Mounting:	Panel mount into 91 mm W \times 44 mm H (3.6 in \times 1.7 in) cutout
Weight:	0.45 kg (1 lb)
Approval:	CE mark, RoHS

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Ordering information

Part number	Description
121	Programmable current source—includes one 2-pin terminal block (G-106-735), one power supply (109-132), calibration certificate, and user manual (MAN-121)
121N	Programmable current source (no power supply)—includes one 2-pin terminal block (106-735), calibration certificate and user manual (MAN-121)
CAL-102-CERT	Model 121 recalibration with certificate
MAN-121	Model 121 user's manual
G-106-735	Terminal block, 2-pin
109-132	100-240 VAC power supply with interchangeable plugs for US, UK, Europe, Australia, and China application

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The technical and pricing information contained herein is subject to change at any time. 062625