Model 121 Programmable Current Source

Model 121 features

- 6 decades of output current, selectable in 13 ranges
- 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 certification
- Full 3 year standard warranty
Introduction

The Model 121 programmable current source is a precision instrument suitable for bench-top 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.

Fully automated 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 patterns can be created.

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 to 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.
Model 121 possible applications

- **Hall mag field sensor**
  - Test/calibration/measure
  - \( V \) varies with \( B \)

- **Semiconductor device**
  - IV curve measurement
  - \( V \) varies with \( I \)

- **RTD temperature sensor**
  - Test/calibration/measure
  - \( R = V/I \), \( R \) varies with \( T \)

- **Diode temperature sensor**
  - Test/calibration/measure
  - \( V \) varies with \( T \)

- **LED**
  - Brightness test/measure
  - Independent of voltage drop

- **Electrochemistry applications**
  - Plating, titration, potentiometry

**Application range of Model 121**

**Using the Model 121 with a resistive device/sensor**

- **Current**
  - 100 mA
  - 30 uA
  - 300 nA
  - 100 nA

- **Resistance**
  - 1 Ω
  - 100 Ω
  - 1000 Ω
  - 10 kΩ
  - 100 kΩ
  - 300 kΩ

- **R = V/I = 97510 Ω**

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Model 121 Programmable Current Source

Output
Type: Bipolar, DC current source
Current ranges: 13 fixed ranges of 100 nA, 300 nA, 1 µA, 3 µA, 10 µA, 30 µA, 100 µA, 300 µA, 1 mA, 3 mA, 10 mA, 30 mA, 100 mA, plus a user programmable range
Accuracy: 0.05% on 10 µA 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: Less than 0.1% on 100 nA and 300 nA ranges, Less than 0.01% on all other ranges
Current ripple frequency: Dominated by the switching power supply line frequency/ harmonics
Temperature coefficient: 0.03% of range/°C for the 100 nA range, 0.01% of range/°C for all other ranges
Line regulation: Less than 0.01% change in output for 5% change in the DC input voltage
Load regulation: Less than 0.01% change in output current over the full range scale
Stability (24 h): ±0.05% on 100 nA range, ±0.01% per day on all other fixed ranges
Connections: Detachable terminal block
Maximum load: 300 kΩ
Maximum lead length: 50 ft

Programming
Operation: Output current settable via computer interface
Resolution: 3 significant digits
Accuracy: ±0.5% of 100 nA and 300 nA ranges,
±0.25% of all other ranges
Maximum current: 100 mA
Minimum current: 100 nA

Front panel
Display: LED – 3 digits plus sign
Display units: mA, µA, and nA
Display update rate: 2 rdg/s
Display annunciators: mA, µA, nA, and compliance
Keypad: 4 full travel keys
Keypad functions: Range Up, Range Down, Current Polarity, Output Inhibit

Interface
USB
Function: Emulates a RS-232 serial port
Baud rate: 57,600
Connector: B-type USB connector
Reading rate: To 10 rdg/s
Software support: LabVIEW™ driver (see www.lakeshore.com)

General
Ambient temperature: 15 °C to 35 °C at rated accuracy; 5 °C to 40 °C at reduced accuracy
Power requirement: +5 VDC ±5% at 400 mA, barrel plug 5.5 mm OD × 2.1 mm ID × 9.9 mm L, center pin positive
Size: 96 mm W × 48 mm H × 166 mm D (3.8 in × 1.9 in × 6.5 in)
Mounting: Panel mount into 91 mm W × 44 mm H (3.6 in × 1.7 in) cutout
Weight: 0.45 kg (1 lb)
Approval: CE mark, RoHS

Ordering information
Part number Description
121 Programmable current source—including one 100 V to 240 V, 10 W power supply with universal input interchangeable input plugs (109-132), calibration certificate, and user manual
121N Programmable current source—no power supply. Includes calibration certificate and user manual
Accessories
109-132 100-240 VAC power supply with interchangeable plugs for US, UK, Europe, Australia, and China application
G-106-735 Terminal block, 2-pin
CAL-102-CERT Model 121 recalibration with certificate
119-061 Model 121 DC current source manual

All specifications are subject to change without notice