Voltage Controlled Current Source

CS580— Current source

CS580 Current Source

- AC and DC current source
- Sources/sinks current - true four-quadrant operation
- Current from 100 fA to 100mA
- ±50 V compliance voltage
- 1 nA/V to 50 mA/V gain
- Up to 200 kHz bandwidth
- Low thermal drift
- RS-232 and optical fiber interfaces
- CS580 ... $2995 (U.S. list)

The Model CS580 Voltage Controlled Current Source creates a new capability for researchers needing ultra-low current noise in a flexible, easy to use instrument. The CS580 is a natural companion product for use with sensitive AC instruments such as lock-in amplifiers, providing a straightforward method for generating precision low-noise currents directly from an AC or DC control voltage. Current is both sourced and sinked with adjustable compliance voltage up to ±50 V, giving full "four-quadrant" performance. The CS580 is a welcome addition to any research lab studying semiconductors and transport phenomena, superconductivity, and nanotechnology, to name just a few.

Ultra-Low Noise Design

With up to ±50 V compliance voltage, the CS580 can source and sink precision AC and DC currents from 100 fA to 100 mA. The CS580's ultra-low noise design takes advantage of the best transistors, op-amps, and discrete components available combined with careful high impedance board layout to achieve the highest performance possible. The design even features linear power supplies rather than switching power supplies, so switching frequency interference can never be a problem.

An actively driven guard provides the greatest bandwidth (up to 200 kHz) and lowest possible leakage current. There's also a buffered monitor output for high impedance voltage measurements.

CPU Clock Stopping Architecture

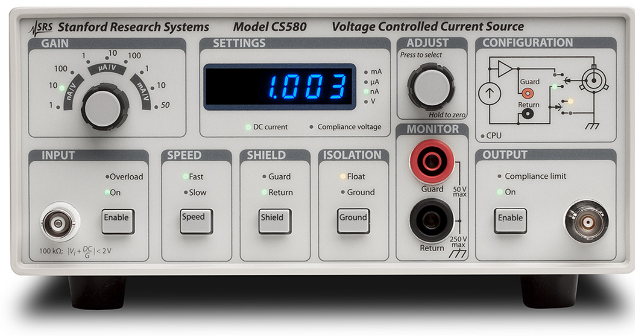
Front-panel instrument configuration is managed by a microcontroller whose system clock only oscillates during the brief moments needed to change instrument settings. The drive electronics are completely static, with no "scanning" or refresh to generate the slightest interference.

Whenever the microcontroller becomes active, the "CPU Activity" indicator illuminates, clearly showing when the digital clock is running. This occurs in response to front-panel button presses or remote computer commands. But when the microcontroller is not active, there is absolutely no digital interference at all.

RS-232 and Optical Fiber Interfaces

There is an RS-232 computer interface on the rear panel of the CS580. All functions of the instrument can be set or read via the interface. When sending commands to the instrument, the CS580's microcontroller will be activated, and digital noise may be present.

For remote interfacing with complete electrical isolation, the CS580 also has a rear-panel fiber optic interface. When connected to the SX199 Remote Computer Interface Unit, a path for controlling the CS580 via GPIB, Ethernet, and RS-232 is provided.



CS580 front panel

CS580 rear panel

Ordering Information

CS580	Voltage controlled current source	$2995
SX199	Remote computer interface unit	$1495

CS580 Specifications

Output

Compliance voltage	0 to 50 V (bipolar)
Compliance error	0.5 % + 50 mV
DC output resistance	10^{12} Ω (1 nA/V gain)
Output capacitance	<12 pF (filter off), <500 pF (filter on)
Guard output	–50 V to +50 V, 5 kΩ internal resistance
Output power	5 W (four quadrant sourcing/sinking)
THD	0.01 % typ.
Output connector	3-lug Triax for current output. Banana jacks for load voltage monitoring
CM voltage	250 Vrms (DC to 60 Hz)
CM isolation	>1 GΩ, <1 nF

Input

Input range	–2 V to +2 V
Input impedance	100 kΩ
Input connector	BNC

Remote Interfaces

RS-232	DB-9 connector, 9600 baud
Optical fiber	Connection to SX199 Optical Interface Controller. Provides connectivity to GPIB, RS-232 and Ethernet

General

Operating temperature	0 °C to 40 °C, non-condensing
Power	<30 W, 100/120/220/240 VAC, 50 Hz or 60 Hz
Dimensions	8.3" × 3.5" × 13" (WHD)
Weight	15 lbs.
Warranty	One year parts and labor on defects in materials and workmanship

BNC analog input (AC & DC)

Gain	Max Output	Gain accuracy	Bandwidth (0 Ω load, typ.)
1 nA/V	2.2 nA	1.2 %	5 kHz
10 nA/V	22 nA	1.2 %	10 kHz
100 nA/V	220 nA	1.2 %	20 kHz
1 µA/V	2.2 µA	0.5 %	75 kHz
10 µA/V	22 µA	0.5 %	150 kHz
100 µA/V	220 µA	0.5 %	150 kHz
1 mA/V	2.2 mA	0.5 %	150 kHz
10 mA/V	22 mA	0.5 %	200 kHz
50 mA/V	110 mA	1 %	150 kHz

Gain drift 200 ppm/°C
Offset 3 mV (referred to input)
Offset drift 1 mV/°C (referred to input)

Internal DC current source

Gain	Max Output	DC accuracy	Resolution	Drift (typ.)
1 nA/V	2 nA	0.5 % + 10 pA	100 fA	100 ppm/°C + 100 fA/°C
10 nA/V	20 nA	0.5 % + 10 pA	1 pA	100 ppm/°C + 200 fA/°C
100 nA/V	200 nA	0.5 % + 100 pA	10 pA	100 ppm/°C + 2 pA/°C
1 µA/V	2 µA	0.1 % + 1 nA	100 pA	50 ppm/°C + 20 pA/°C
10 µA/V	20 µA	0.1 % + 10 nA	1 nA	50 ppm/°C + 200 pA/°C
100 µA/V	200 µA	0.1 % + 100 nA	10 nA	50 ppm/°C + 2 nA/°C
1 mA/V	2 mA	0.1 % + 1 µA	100 nA	50 ppm/°C + 20 nA/°C
10 mA/V	20 mA	0.1 % + 10 µA	1 µA	50 ppm/°C + 200 nA/°C
50 mA/V	100 mA	0.1 % + 50 µA	10 µA	50 ppm/°C + 1 µA/°C

Noise

Gain	Noise density Input off	Noise density Input on	Noise (rms, input off) (0.1 Hz to 10 Hz)	Noise (rms, input off) >10 Hz
1 nA/V	10 fA/√Hz	10 fA/√Hz	20 fA	50 pA
10 nA/V	20 fA/√Hz	20 fA/√Hz	80 fA	50 pA
100 nA/V	60 fA/√Hz	60 fA/√Hz	400 fA	300 pA
1 µA/V	300 fA/√Hz	400 fA/√Hz	4 pA	1 nA
10 µA/V	3 pA/√Hz	4 pA/√Hz	40 pA	5 nA
100 µA/V	30 pA/√Hz	40 pA/√Hz	400 pA	40 nA
1 mA/V	300 pA/√Hz	400 pA/√Hz	4 nA	400 nA
10 mA/V	3 nA/√Hz	4 nA/√Hz	40 nA	4 µA
50 mA/V	15 nA/√Hz	20 nA/√Hz	200 nA	20 µA