Dual Current Source

The TeachSpin SIM called 'Dual Current Source' is an electronic module with two identical sections, each designed to deliver steady currents to resistive loads. Each section acts like a constant-current source, passing positive current through its load to ground potential. Each section permits a choice of the size of the current that will be sent through the load.

Features:

This SIM requires power from a SIM mainframe or 'crate' (or from TeachSpin's substitute power supply), and it derives all its power from that supply.

Each section of this SIM provides for the excitation of a resistive load, one side of which it holds at ground potential.

Each section permits choices of current: 1.00, 10.0, or 100. μA.

The SIM has about +12 V of compliance; this limits the load resistances that can be used.

Each section of this SIM permits a real-time voltage monitor of the success of that compliance.

Layout:

Front panel features:

Two sections, A and B, identical in properties but entirely separate in operation.

In each section,

3-way toggle switch: permits selection of 10, 1, or 100 μA of output current

BNC voltage-monitor output: permits a view of a voltage, V_{mon}, given by $I_{out} \times 5\ k\Omega$. (Hence this output should show a d.c. output voltage of +5/50/500 mV for successful operation at settings of 1/10/100 μA.)

Rear panel features:

Two BNC connectors, A and B: each section's output current flows from the central pin, through the load, to the (grounded) shell of this connector. Note this enforces ground potential at one end of the load.

Operation:

This SIM provides two independent constant-current sources for use in (for example) 4-wire resistance measurement, or transdiode-based temperature measurement. Within limits, each section delivers its user-chosen current independent of the resistance of the load. The currents are positive-only, as conventional current flows out from the center-pin, and back to the outer shell, of the (back-panel) BNC output connection.

Connections:

This SIM derives all its power from the SIM crate (or substitute power supply) into which it is plugged. Connections to the two external loads are made via the *rear panel* BNC connectors.

Power:

This SIM delivers at most 0.1 mA of current at a potential difference of 12 V or less, so its power output is limited to about 1 mW. The SRS SIM crate makes available a total of 70 W to power all its SIMs, so there ought always to be enough power to operate the load of the Current Source SIM.

Settings:

The only settings possible on this SIM are via the 3-way toggle switches, permitting the (separate) choices of one (out of three) current settings in each section.

Activation:

The whole SIM is activated as you've as you've energized the SIM crate or equivalent that is powering it. For best results, you should connect some load to the rear-panel output connections *before* you energize the SIM, so that you will have provided a path for the flow of the current you are selecting on the rotary switch. A short circuit, or an ammeter without further resistance, is a perfectly acceptable load. By contrast, an open circuit will not work, as the device lacks the output-voltage capability to drive even 1 μA of current through an open circuit.

Load Resistances:

Given a +12-V compliance, a 1-μA current can be driven through a load of any resistance in the range 0 - 12 MΩ; and similarly, a 100-μA current can be driven through a load of any resistance in the range 0 - 120 kΩ.

So a short-circuit as load, or any load of resistance <100 kΩ, can be used on all three of the ranges of the Current Source. Loads of larger resistance can only be used successfully with the

smaller current settings; loads of resistance > 12 MΩ cannot be successfully used on *any* of the current settings.

The use of the Current Sources with excessively large load resistances (including open circuits) will fail to deliver the selected current, but will not damage the Current Source.