Current Source

The TeachSpin SIM called 'Current Source' is an electronic module designed to deliver steady currents to resistive loads. It acts like a constant-current source to a 'floating' load. It permits a choice of the size, and the sign, of the current that will be sent through the load. The current source can be operated in a 'local' or a 'remote' mode.

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.

This SIM provides for the excitation of a floating resistive load, represented by whatever is connected to its front-panel banana connectors.

This SIM permits choices of current, in decade steps, over the range ± 1.00 μA to $\pm 100.$ mA.

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

The SIM permits a real-time voltage monitor of the success of that compliance, and a real-time LED indication of its failure.

Layout:

Front panel features:

6-position rotary Current switch: this permits the choice of the constant current to be delivered to the load, with choices 1.00 μA to 100. mA by decade steps.

Polarity switch: this 3-way toggle switch permits turning the delivered current Off, or of selecting a positive (+) or negative (-) sign for it. Positive output current means conventional current will be leaving from the red, and returning to the black, output terminal.

Mode switch: this 2-way toggle switch, if set to Local, permits front-panel use of the Polarity switch. If set to Remote, those functions are transferred to back-panel digital control.

Compliance: these two tip-jacks for 2-mm probes will display a potential difference of 1.000 V if (and only if) the selected current is passing through the load. If the external current is less than what is selected, the potential difference here will be less than 1 Volt.

Fault: this red LED will light if the current source lacks the output-voltage capability for forcing the selected current through the load.

Current Output: these red and black banana terminals are the points to which the load is to be connected.

Rear panel features:

9-pin D-subminiature connector: this (female) connector permits digital control of the Polarity function of the Current Source. These logic inputs are inactive if the front-panel 3-way switch is set to Local.

If the Local/Remote switch is set to Remote, then the polarity control is transferred from the front-panel 3-way toggle switch to rear-panel digital inputs. The D-sub connector presents a +5-V utility logic source (pin 3) and a logic ground (pin 5).

Control of the presence of the output current (ie. the On vs. Off control) is via D-sub pin 1:

logic high here gives output On, while logic low (or open) gives output Off.

Control of the sign of the output current (ie. the + vs. – current control) is via D-sub pin 2:

logic high here gives output -, while logic low (or open) gives output +.

Operation:

This SIM provides a constant-current source of use in (for example) 4-wire resistance or Hall-effect measurements. It is useful for a 'floating' load, ie. a load connection which is not tied to ground potential. Within limits, the output current it delivers is independent of the resistance of the load, and is instead controlled by front-panel selection.

Connections:

This SIM derives all its power from the SIM crate (or substitute power supply) into which it is plugged. Connections to the load are via the front panel. It permits the use of two back-panel logic levels to control some of its functions.

Power:

This SIM delivers at most 0.1 A current at a potential difference of 12 V or less, so its power output is limited to about 1 Watt. 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:

If you're a first-time user of this SIM, you will want to set its Local/Remote mode to Local. If this switch is set to Remote, and nothing is connected to the back-panel 9-pin D-sub connector, the On/Off control will default to logic low = Off, and the Polarity control will default to logic low = +, and the front-panel Polarity switch will be rendered inactive.

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 TO LOAD 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 cause the compliance Fault LED to light up, 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-mA current can be driven through a load of any resistance in the range 0 - 120 Ω.

So a short-circuit as load, or any load of resistance <100 Ω, can be used on *all* 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.