



Tech Note

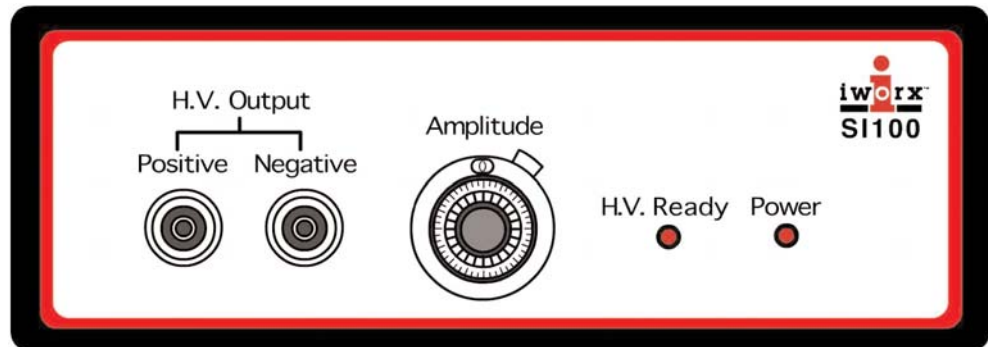
SI-100 Stimulus Isolator

Background

The SI-100 is an isolated constant current generator with 100 Volt compliance. It is specifically designed for safe transcutaneous stimulation of muscles and nerves.

Front Panel

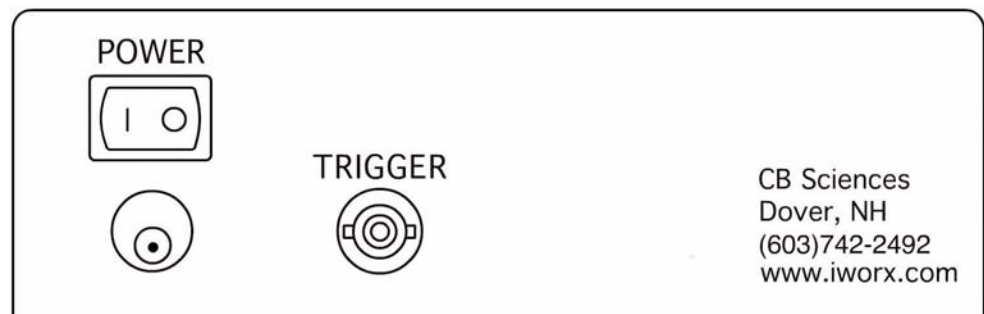
The amplitude of the stimulating pulse from the SI-100 is controlled by a single knob on the front of the unit. This control is a ten turn potentiometer which is attached to a dial counter (with integral lock) that shows the number of turns from 0.0 to 10.0. When turned fully clockwise, this Amplitude control can command a current output of 10 milliamps.



The front panel of the SI-100 also contains two status lights; Power, and H.V. Ready. A glowing Power light indicates that the SI-100 unit is properly powered up, and the H.V. Ready light indicates that the high voltage power supply is ready to deliver a stimulus. The last items on the front panel of the SI-100 are the positive and negative jacks of the H.V. (high voltage) Output. The stimulus electrodes are connected to these outputs.

Rear Panel

The rear panel of the SI-100 contains the Power on/off switch, the power receptacle, and the BNC connector of the Trigger input. The Trigger input is connected to a stimulator or a digital-to-analog converter (DAC), which can provide TTL level trigger pulses that drive the SI-100.



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Control of SI-100

The SI-100 is controlled by any stimulator or DAC that is capable of delivering TTL input pulses. TTL input pulses are nominally 5V in amplitude and at least 100 microseconds (μ s) in duration. The frequency and duration of the stimulus pulses from the SI-100 are designed by programming the TTL level pulses of the stimulator or DAC. When the output of the stimulator or DAC is connected to the Trigger input of the SI-100 and activated, the SI-100 will generate stimulus pulses of the same frequency and duration as the TTL level pulses from the stimulator or DAC. The amplitude of the stimulus pulses from SI-100 is still under the control of the single knob on the front of the SI-100.

Specifications

Output Current:	0-10 mA
Compliance Voltage:	100V
Isolation:	Rated to 5300V RMS
Power:	9-15VAC/VDC 1000mA
Trigger input:	External TTL signal
Frequency Range:	Externally driven 0.1-50Hz
Pulse Width Minimum:	100 μ s
Pulse Width Maximum:	10mS
Coupling Capacitance:	\leq 5pF

Power Setup

The SI-100 can draw power from either an AC or a DC output wall transformer with an output greater than 9 Volts and less than 15Volts, at 1000mA. A wall transformer with an output of 12VAC and 1000ma is supplied with the SI-100.

Stimulation

Electrical stimuli are delivered by the SI-100 to the preparation through a set of leads with either snaps or alligator clips. Each lead set connects to the SI-100 through high voltage safety connectors. The safety connectors on each lead are plugged into H.V. Output jacks on the front panel of the SI-100, so that the red lead is plugged into the red high voltage safety jack labeled Positive and the black lead is plugged into the black high voltage safety jack labeled Negative.

The stimulator or DAC driving the SI-100 determines the durations and the frequencies of the stimuli delivered to the preparation. However, the SI-100 limits the duration of its stimulus output pulses to a maximum of 10ms and their frequency to a maximum of 50 Hz.

The SI-100 is a constant current device, which means it will develop whatever voltage is necessary to maintain the current flow set from the knob on the front of the SI-100. The high voltage power supply in the SI-100 has a 100 Volt compliance. This means that 100 Volts is the maximum voltage that the SI-100 can develop while trying to deliver the set current. In constant current devices like the SI-100, more voltage is required to deliver the set current to the subject, if the electrical resistance increases where the stimulating electrodes connect to the subject.

Constant current devices differ from constant voltage devices. When presented with an increase in resistance, like dehydration of the gel under the electrodes, a constant current device increases its output voltage to maintain delivery of the set current to the subject. On the other hand, a constant voltage device still delivers the set voltage to the subject with an increase in the resistance at the electrodes, but the current delivered to the subject decreases if it is limited by the power supply of the constant voltage device.

Although the high voltage supply can deliver up to 100 V, it is at very low current and then only for very brief periods (fixed maximum of 10 milliseconds). The amount of power delivered to the subject is not sufficient to cause injury or tissue damage.