

Warner Instruments, Inc.
Bipolar Stimulation Isolation Unit
Model SIU-102



Warner Instruments, Inc
1125 Dixwell Avenue, Hamden, CT 06514
(800) 599-4203 / (203) 776-0664
(203) 776-1278 - fax

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The **SIU-102** is an isolated Bipolar Stimulator primarily designed for use with imaging chambers having field stimulation electrodes. Bipolar, unipolar positive, unipolar negative, positive DC and negative DC stimulations are easily programmed using the front panel controls. Constant current and constant voltage delivery modes are also possible.

The **SIU-102** features optical isolation at the input and transformer isolation at the output terminals. Timing pulses can be controlled by any device capable of generating a TTL level positive pulse (e.g., a computer with data acquisition).

Output amplitude for all pulse types is set using a ten-turn potentiometer in conjunction with a range mode switch and duration is set using an external TTL signal.

Features include:

- ✓ Constant current and constant voltage modes
- ✓ Bipolar, pulse and DC modes
- ✓ Optical coupling isolates the stimulator from pulse source
- ✓ Current to 100 mA
- ✓ Voltage to 100 V

**THIS EQUIPMENT IS NOT DESIGNED NOR INTENDED
FOR USE ON HUMAN SUBJECTS**

NOMENCLATURE

Text conventions

This manual refers to amplifier controls at three functional levels; control blocks, specific controls within a block, and settings of specific controls. To minimize the potential for confusion, we have employed several text conventions which are specified below. Since our goal is to provide clarity rather than complexity, we welcome any feedback you may wish to provide.

- Warner Instrument product numbers are presented using **bold type**.
- References to specific controls are specified using NON-UNDERLINED SMALL CAPS.
- References to individual control settings are specified in *italic type*.
- Special comments and warnings are presented in highlighted text.

Any other formatting should be apparent from context.

CONTROL DESCRIPTION

The instrument front panel contains all the controls for selecting voltage and current modes and for setting the amplitude, polarity and type of pulse.

Pulse Mode Switch

The PULSE MODE SWITCH is used to set the desired pulse shape. Options include *positive (+) pulse*, *negative (-) pulse*, *bipolar*, *positive (+) DC* and *negative (-) DC*.

In bipolar mode, a positive pulse is applied during the initial phase, immediately followed by a negative pulse of equal duration and amplitude. The pulse amplitude is set by the controls in the next section (see below) and the duration is set by the TTL signal applied to the PULSE IN BNC.



Bipolar pulse widths are user adjustable from 100 μ s to 100 s and are *per* polarity. A red LED indicates when pulse length exceeds 100 s. The initial polarity of the pulse can be inverted by reversing the connections to the PULSE OUT JACKS.

Output Control Switches

Two controls are used to select constant current or constant voltage modes and to set the pulse amplitude or DC holding level. These controls are the 10-turn OUTPUT SET potentiometer and the OUTPUT RANGE switch.

The OUTPUT RANGE is a 5-position switch selecting constant current modes in the first 3 positions and constant voltage modes in the last 2 positions.



Constant current modes are 0–1 mA, 0–10 mA and 0–100 mA. The desired current is set using the lockable 10-turn OUTPUT SET potentiometer. A red COMPLIANCE LED indicates when the external resistance is too high, preventing the instrument from maintaining the set current value.

Constant voltage modes are 0–10 V and 0–100 V. As above, the desired clamped voltage is set using lockable 10-turn OUTPUT SET potentiometer.

Pulse In

The PULSE IN BNC is used in conjunction with the OUTPUT CONTROL switches and is used to define the duration of the applied pulse. It is disabled, however, in *positive (+) DC* and *negative (-) DC* modes.

In *positive (+) pulse* or *negative (-) pulse* modes, the length of a TTL high signal (3–5 V), applied to the PULSE IN BNC, will specify the duration of output pulse.



In *bipolar* mode the pulse length of the TTL *high* signal defines the duration of the initial phase of the bipolar pulse. As is expected from a bipolar pulse, the second component of the pulse will have equal duration, but opposite amplitude. If a second TTL *high* signal is applied during the second phase of the bipolar pulse, the first pulse will continue to completion before the instrument accepts the new, incoming signal.

NOTE: The length of the second PULSE IN signal may be shortened due to overlap with the currently executing bipolar pulse. However, the symmetry of the second bipolar pulse will be maintained.

Pulse Out

CAUTION: Dangerous voltages and currents are presented at the PULSE OUT connections. Extreme care must be taken to avoid serious personal injury.

Output signals are delivered to the sample or chamber via the RED and BLACK PULSE OUT banana jacks. The RED and BLACK BANANA JACKS connect to the *positive and negative* side of the preparation, respectively.



An OUTPUT TOGGLE SWITCH is provided to turn the pulse output *on* or *off* without need to access user settings. In the *off* position, the RED and BLACK OUTPUT JACKS are shorted together.

As a safety measure, the LIGHTNING SYMBOL between the banana jacks lights *red* when the output voltage exceeds 30 V.

Connecting Cable

A special cable (*not supplied*), the **CC-102**, is available to facilitate connection from the PULSE OUT banana jacks and Warner's field stimulation chambers.



SPECIFICATIONS

| | |
|-------------------------------|--|
| Output Waveform | DC, Current Pulse or Voltage Pulse |
| Output Current Ranges | 1, 10 and 100 mA |
| Output Voltage Ranges | 10 and 100 V |
| Output Impedance Voltage Mode | 10 V Range: 1K Ω 100 V Range: 10K Ω |
| Output Compliance | 100 V |
| Output Polarity | Selected by Mode Switch Red connector is positive in any positive mode Red connector is negative in any negative mode |
| Amplitude Control | Multi-turn dial |
| Input Pulse Requirements | TTL level, positive pulse 3 volt, 1 mA minimum Minimum Pulse Width: 100 μ s Maximum Pulse Width 100s (bipolar mode only) |
| Input Connector | BNC |
| Output Connector | Banana Jacks |
| Power Requirements | 90 to 270 VAC, 50/60 Hz, 10 VA |
| Physical Size, H x W x D | 8.9 x 20 x 25.4 cm |
| Shipping Weight | 3 kg |

WARRANTY

The **SIU-102** is warranted to be free from defects for a period of two years from date of shipment. Warner Instruments will repair or replace at its option any parts that fail under normal use with the exception of the electrodes.

NOTE: Repairs are performed at the factory. Shipping charges for the return to the factory are the responsibility of the customer. Warner will return the repaired item FOB destination.