

STMISO Stimulus isolation adapters (C/D/E)

BIOPAC offers three STMISO stimulus isolation adapters:

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|----------------|--|
| STMISOC | constant current <u>or</u> constant voltage (5X / 10X) stimulation; see below. |
| STMISOD | multiplies STM100C voltage by 5; see page 169. |
| STMISOE | multiplies STM100C voltage by 10; see page 169. |

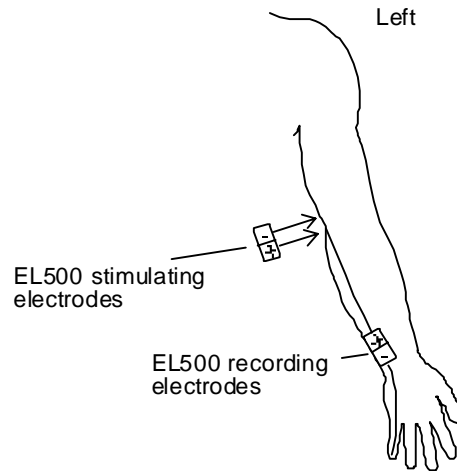
IMPORTANT SAFETY NOTE!

When using the STMISOC, STMISOD, or STMISOE, it is possible to generate voltages as high as 200 v p-p. These voltages are potentially dangerous, especially if the stimulator's high voltage outputs are connected across the subject's heart. Across the heart means that the heart is potentially in the electrical path from lead to lead. This situation occurs when the stimulation electrodes are placed on opposite sides of the subject's body.

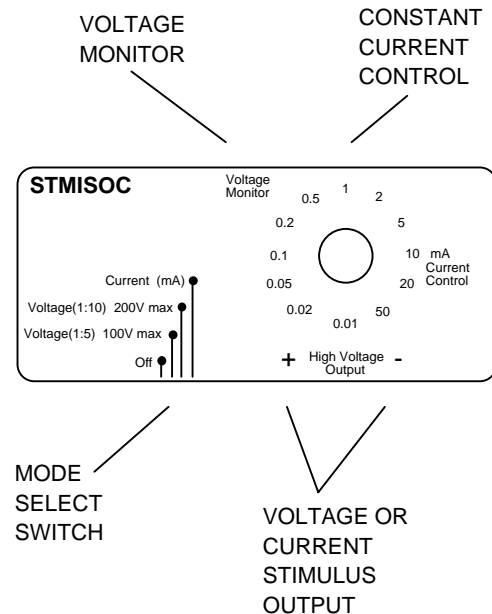
NEVER PLACE STIMULATION ELECTRODES ON OPPOSITE SIDES OF THE SUBJECT'S BODY!

Always use the stimulator with the leads placed in relatively close proximity to each other and relatively far from the heart, and with the leads placed only on the **SAME** side of the body. The figure to the right illustrates correct connection techniques when using the STMISOC/D/E.

Example of correct stimulation electrode placement:



STMISOC Constant voltage or constant current stimulus isolation adapter



To use the STMISOC, you need an MP System with, minimally, one STM100C Stimulator module.

Plug the STMISOC directly into the EXT STIM jack on the STM100C module.

Use two LEAD110 electrode leads to connect the stimulus output to the subject. The LEAD110 electrode leads are required because they have the proper plug type for the new safety lead standard used on the STMISOC module. (1.6mm pin connectors)

In the Voltage mode, the STMISOC can be used with bipolar stimulation and with different waveform types (square, sine, triangle).

| STMISOC Mode | Signal output if LEVEL control is set to 100% |
|----------------------------|--|
| OFF | No signal will be output from the STMISOC. |
| Voltage (1:5) 100V Max | Signal output will be 5x the values shown in the Stimulator Setup dialog (acts like a STMISOD). |
| Voltage (1:10) 200V Max | Signal output will be 10x the values shown in the Stimulator Setup dialog (acts like a STMISOE). |
| Current | Signal output will be positive constant current output; set signal value with the Current Control rotary switch. It's important to output positive pulses only. Pulses should have a height of at least 10v because pulse height output determines the voltage compliance of the current stimulation signal. The compliance of the current stimulation signal is determined by multiplying the pulse voltage amplitude by 10. For a 10v pulse the compliance would be 100v. This means that the STMISOC can output a current of up to 100V/R load. If R load = 5 k ohms, in this case the maximum output current would be 100v/5k = 20ma. The maximum pulse height can be as much as 20v, so it's possible to have a compliance as high as 200v. |

The **Voltage Monitor Output** provides a proportional output of the exact voltage used to stimulate the subject. Use a CBL100 to connect the Voltage Monitor Output to an unused channel on the UIM100C. If the Current mode is selected, the Voltage Monitor Output will be disabled. The Voltage Monitor output provides output as follows:

Voltage (1:5) 100V Max setting: 1/10 proportional output

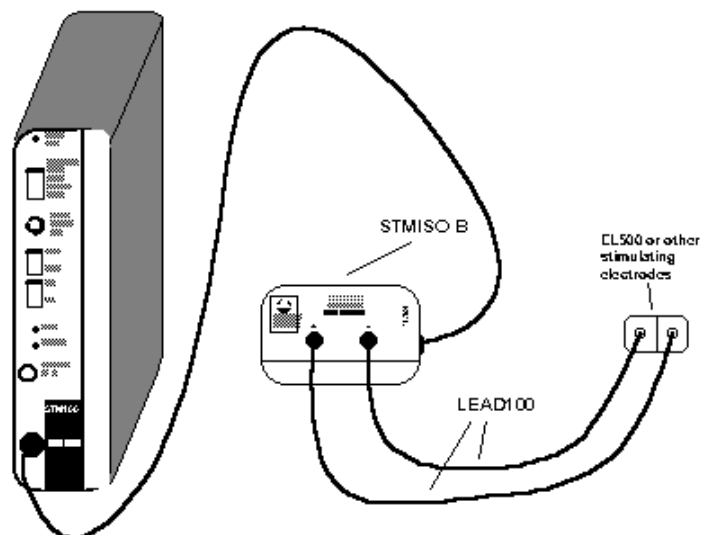
Voltage (1:10) 200V Max setting: 1/20 proportional output

For example, if the mode is set to Voltage (1:10) 200V Max setting, then the Voltage Monitor Output will output a voltage that is 1/20 of the actual stimulation voltage.

STMISOC Specifications

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|----------------------------------|--|
| Stimulus Pulse Width: | 50µsec to 2msec (voltage and current) |
| Stimulus Sine Wave Range: | 100Hz to 5kHz (voltage only) |
| Step Up Voltage Ratio: | Selectable: (1:5) or (1:10) |
| Maximum Output Voltage: | (1:5) mode 100v (p-p); (1:10) mode 200v (p-p) into 5k ± load |
| Constant Current Range: | 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10.0, 20.0, 50.0 ma (unipolar only) |
| Current Source Compliance: | 200V maximum |
| Current stimulation mode: | Positive current only |
| Isolation Capacitance: | 150 pf |
| Isolation Voltage: | 1500 VDC (from amplifier ground) |
| Cable Length: | 1.8 meters |
| Weight: | 190 grams |
| Dimensions: | 10cm (wide) x 5cm (deep) x 4.5cm (high) |
| Interface: | STM100C |
| Off mode | Turns off Voltage or Current stimulation to subject. |
| Voltage Monitor output | |
| Output via | 3.5mm mono phono jack |
| (1:5) mode | 1:10 of stimulation voltage |
| (1:10) mode | 1:20 of stimulation voltage |
| Current mode | disabled |
| OFF | Reports a signal of approximately 50% of the voltage indicated in the stimulator setup window. |

STMISOD/STMISOE



STMISOD/E setup for EL500 electrodes

The STMISOD/E plugs into the STM100C external stimulus output to provide an isolated voltage stimulus for response studies requiring a voltage stimulus (nerve conduction, somatosensory, etc.).

The **STMISOD** adapter boosts the voltage of the STM100C by a multiple of **5x** to provide a stimulus of up to $\pm 50V$ (or 100V pk-pk).

The **STMISOE** adapter boosts the voltage of the STM100C by a multiple of **10x** to provide a stimulus of up to $\pm 100V$ (or 200V pk-pk).

The STMISOD/E comes with an attached 2-meter cable that has a 1/4" phone plug on the end. This end connects to the EXT STIM output on the STM100C. The front of the STMISOD/E has two 2mm pin plugs that accept any of BIOPAC's electrode leads, including bar electrodes, needle electrodes, and reusable electrodes.

The STMISOD/E has standard 2mm pin plug outputs so you can connect most needle or stimulating electrodes. For voltage stimulus applications, the EL500 bar electrode or the EL500 electrodes with two of the LEAD110 electrode leads are recommended.

STMISOD/E Calibration

To use the STMISOD/E, simply set up the stimulator in the software as you normally would, and hook the STMISOD/E adapter as shown in the figure above. Then, hook the stimulating electrodes of your choice to the two 2mm pin plugs.

The STMISOD/E provides an additional barrier of galvanic isolation between the MP150 and the stimulating electrodes. When using the STMISOD/E to create a pulsed voltage stimulus output, the pulse width must be between 10 μsec and 300 μsec .

If the pulse is narrower than 10 μsec , the STMISOD/E will not reproduce the pulse well, due to rise-time constraints.

If the pulse is greater than 300 μsec , the pulse output will sag after 300 μsec , due to lower frequency response limits.

When using the STMISOD/E for voltage stimulus applications, turn the level control to 0% on the STM100C, then, after stimulation has begun, turn the level control up slowly. This approach will help you determine the appropriate voltage level for stimulating the subject.

STMISOD/E Specifications

| | |
|---------------------------|--|
| Stimulus Pulse Width: | 50 μ sec to 2msec (voltage only) |
| Stimulus Sine Wave Range: | 100Hz to 5kHz (voltage only) |
| Step Up Voltage Ratio: | STMISOD (1:5) STMISOE (1:10) |
| Maximum Output Voltage: | STMISOD 100V (p-p) into 5k ohm load STMISOE 200V (p-p) into 5k ohm load |
| Isolation Capacitance: | 120pf |
| Isolation Voltage: | 1500 VDC (from amplifier ground) |
| Cable Length: | 1.8 meters |
| Weight: | 140 grams |
| Dimensions: | 6.5cm (wide) x 5cm (deep) x 4.8cm (high) |
| Interface: | STM100C—see page 164 |