DC Shocker

DCS-4 series
Part of the Modular Behavioral System

User Manual

SUPERTECH Instruments

General Description

DC Shocker DCS-4 is a research grade animal shocker. Its internal circuitry is based on a precision and fast feedback regulated constant current generator. This shocker equipment has three security isolation barriers. Its output is totally isolated (floating output) for the sake of the safety for the operator and the subject. Furthermore it has isolation from other electronic devices such as physiological stimulators that may be in use concurrently. Isolation is performed by using an isolated power supply transformer, an additional high voltage isolated floating power supply along with 4 kV optical isolation of the inputs from the control equipment.

The output current range (0 to 10.0 mA) is quite wide to cover nearly every research application. This output current range is suitable even from small mice to huge experimental animals (e.g. sheep, pigs). There is a precise 10-turn helical potentiometer to adjust the output current. It gives a great resolution to fine tune the level of the shocking current. The output circuit of the DC Shocker operates as a two-pole monopolar constant current square wave output.

DC Shocker DCS-4 is manufactured in two versions.

Modular version: as a part of the Modular Behavioral System. This version has no its own power supply. This version is powered by the Power Supply Module MBPS-3 of the Modular Behavioral System. In this arrangement (in the Modular Behavioral System) the time parameters are provided by the fully digital DC Shocker Controller PDC-x and the constant current source is implemented in the DC Shocker equipment.

Self-powered version: As stand-alone equipment. This version contains a built-in mains power supply. This version of the DC Shocker can be used as stand-alone equipment, connected to and controlled by any data acquisition system.

Accessories

Modular version of the DC Shocker DCS-4 is used together with the DC Shocker Controller PDC-x in the Modular Behavioral System. Certainly, the DC Shocker Controller equipment should be ordered independently. It is a functional, but not a free accessory.

40-wire cables in two different lengths.

Security Rules

The output of the DC Shocker is able to produce extremely large current and voltage in relation to biological objects. From this virtue comes its disadvantage (which is by the way valid for all professional shocker devices): DC Shocker equipment in the case of unprofessional, incautious, or negligent usage can cause life threatening electric shock on the subject, or the person making the experiment (henceforward: the

operator). Supertech Instruments manufactures all its products with the most modern protecting and security circuits. However these methods do not protect in the case of errors committed by the operator. Against human errors it is not possible to defend the user with the help of circuitry methods.

DC Shocker equipment is able to apply a maximum 120 V of pulsing DC voltage and 10 mA of pulsing DC current. These data far exceed the life threatening or lethal limit.

The shocking grids are big, free and accessible by hand. Never touch the shocking grid!

Only good quality, highly isolated output cables should be used. The security of the output wiring made by the user is not the responsibility of Supertech Instruments.

The security of the shocking grid made by another manufacturer is not the responsibility of Supertech Instruments.

The electrical security aspects of the DC Shocker during normal usage are under the sole responsibility of the user!

Please always keep in mind and take care:

1) The device must only be handled by a person educated in the rules below, by whom it should be signed beforehand, that he knows these regulations, and he is going to work by keeping them. By this the operator takes responsibility for the possible outcomes of the intervention conducted by him.

2) The device should be kept away from the moist areas developing during the experiment or treatment.

3) Such persons onto whose body an outer or inner pacemaker is attached, or who has any implanted metal, are not allowed to operate the device.

4) During the operation of the device the operator must not touch the subject.

5) Before starting the treatment both output connectors of the equipment must be connected to the subject or to the shocking grid.

6) The contacts of the electrodes should be well prepared before the experiment or the treatment. Electrodes are not allowed to be moved during the operation of the device.

7) Before starting the treatment it is important to create good conducting, tight contacts between the electrodes and the body of the subject, on the whole surface of the electrodes, because local current density peaks may cause burn.

8) The output current must not flow through the heart, brain, or spinal cord of the subject. The electrodes should be placed according to this.

9) The output current must not flow through the heart, brain, or spinal cord of the operator. The electrodes should be placed according to this. The operator may only use his right hand; he is forbidden to use his left hand.

10) The device must not be turned off or on, when the electrodes are attached onto the subject. The electrodes must be attached or got down only when the device is turned on, but the output pulses' emission is not working (i.e. the device is ready to work, but inactive).

11) It is forbidden to cause an abrupt current change on the subject, except for the working (operational) shocking pulse emission. The device when creating operational pulses naturally changes output current or voltage with high slew rate; as this is its basic function. The protection against abrupt changes of current must include the turning off the current. From this general restriction come the next two concrete rules:

11a) It is forbidden either to put on or off the cables of the device to the subject during an active output pulse.

11b) The front panel's potentiometer controlling the current may only be turned slowly either in a growing or a decreasing value.

12) Before beginning the treatment it should be determined (with the help of the front panel's current controlling potentiometer) with physiological salt solution on the electrodes the threshold of sensation or pain in the case of the subject for electric current. The output current must not be set higher than the pain threshold.

Specifications

DC constant current generator at the output

Output waveform: monopolar square wave

Range of the output current: 0 to 10.0 mA

Accuracy of the output current: 1 %

Output load range: 0 Ohm (shortcut) to open circuit (any load condition is allowed)

Compliance (open circuit) voltage of the output current generator: 120 V DC

Working (shocking) frequency: 0.0001 Hz to 5 kHz

Minimal output pulse width: 100 microseconds

Maximal output pulse width: unlimited

Supply voltage: 13.5 V +/- 5%. Modular version of the DC Shocker DCS-x is supplied from the MBPS-x Power Supply unit of the Modular Behavioral System.

Manual output current adjustment with a 10-turn helical potentiometer

External TTL control or computer-controlled activity from the Modular Behavioral System (the two control sources may be used together, independently of each other)

Control input: TTL active level is High (overvoltage protected, from 2 V to 40 V)

Double security insulation from mains

Double security insulation of output

4 kV opto-isolated TTL control input

First Time Installation and Setup

Please connect all the cables:

- Mains cable of the MBPS-x Power Supply unit
- 40-wire bus cables of the Modular Behavioral System (Modular version)
- TTL control cable from the DC Shocker Controller or from the PC-based data acquisition system to the TTL Input BNC jack
- Output cables of the DC Shocker to the shocking grid

In the Modular Behavioral System the 40-wire cables are used to connect the functional units (in other word modules) of the system together. These cables provide the supply voltages and the bidirectional control signals for the operation of the units. Since the 40-pin cables form a system bus, there are three basic rules for the interconnection of the system. These rules assure that every module gets supply voltages and has access to the control signals:

1) Power Supply MBPS-x and the 12-bit USB System Controller units should be connected together by a 40-wire cable.

2) The system bus (formed by the 40-cables) should start from either the Power Supply MBPS-x or the 12-bit USB System Controller module.

3) Every unit of the system should be connected to at least one more module.

After the cabling switch on the Power Supply MBPS-x and the system is ready to use.

Front Panel Controls

Floating Output: these 4 mm female banana jacks are the output connectors of the DC Shocker. The polarity of the connectors (Positive and Negative) is labeled.

Amplitude: 10-turn helical potentiometer to set the output current

TTL Input: optically isolated external control input. The external control input is TTL-compatible, with extended tolerance. The shocker can be activated with High level applied to this input. The internal circuit is designed to accept control voltage in the range from 2 V to 40 V. This feature gives the possibility to connect our shocker directly to the generally used behavioral measuring systems using not only TTL, but higher control voltages, as well.

Active LED: it indicates the presence of the TTL high level at the TTL Input (the activity of the Shocker)

+13.5V LED: it indicates the proper supply voltage condition

Connectors on the Back Side

TTL Input: external control input

40-pin Berg socket: the system bus of the Modular Behavioral System. Every equipment in the system must be interconnected. The sequence of the interconnections is not important; the cabling should be done on the least messy way with the 40-pin cables.

GND connector: 4 mm female banana jack to be connected to the common signal ground point of the lab

Calibration

DC Shocker equipment is calibrated by the factory. You can check its calibration any time using a 4.5 digit multimeter in DC current meter mode and applying a suitably long (5 sec at least) TTL control pulse at the control input.

Warranty

Supertech Instruments gives you 5 years of full warranty for electronic products and 3 years of full warranty for mechanical products by default. Longer warranty periods can also be defined and agreed (the actual conditions should be discussed before placing the order).

Supertech Instruments gives you full warranty for its products against defects in materials or workmanship as long as the equipment has been subjected to normal and proper use. During the warranty period, faulty products will be repaired or replaced free of charge provided they are returned to our workshop. Postage of the warranty repair actions is paid by the Customer. The exceptions are the Vibration Isolation

Tables. There are special conditions introduced for repairing of Vibration Isolation Tables (see the appropriate User Manual). Supertech Instruments will undertake the servicing and calibration after the expiration of the warranty period for a nominal fee.

The warranty does not cover the faults made by the user.

The measuring equipments manufactured by Supertech Instruments are for experimental and/or lab animal purposes only and are not intended for human use.

Electrical safety measurements of proper operation of the 115 / 230 V AC mains electric system (from the equipments have been supplied) is the sole responsibility of the user.

You can find the general commercial and warranty conditions in the beginning of the Price List page of our website.

For every component of the Modular Behavioral System an additional warranty limitation is introduced. These equipments require very accurate supply voltages with precise load and noise regulation. MBPS-x Power Supply unit of the Modular Behavioral System is able to meet these requirements. Supertech Instruments provides 5 years of warranty for the components of the Modular Behavioral System (e.g. for the DC Shocker) only in that case if they are supplied from a MBPS-x Power Supply unit.

Further Information Sources

As the first step for further technical information please visit our website(s). On the website of Supertech Instruments you can find related products and further information.

On the Download page of our website you can find many more useful documents to support our products. Please check the list of the available documents.

Technical hotline via email (all of them work):

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International technical hotline on the phone: +36 20 9234 386

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