DS8R

DS8R Bipolar Constant Current Stimulator

Introduction

The DS8R is an isolated, constant current stimulator for human research studies involving nerve and muscle stimulation via surface electrodes. It features a high compliance voltage and can be triggered and controlled by multiple external sources. The DS8R can deliver monophasic or biphasic current pulses of up to 2ms duration, with an output range of 2mA to 1000mA* (from 400V). Notably, the DS8R is the first of our stimulators to feature external "on the fly" control of stimulus pulse parameters, making it possible for stimulation protocols to be semi-automated.

*The actual current achieved will be restricted by a pulse energy limit of 300mJ per pulse and the skin/electrode resistance.

Optional Biphasic, Charge-balanced Output

The DS8R has two pulse modes, enabling stimulation using monophasic or biphasic rectangular pulses. Additionally, in biphasic mode the DS8R allows for both symmetric or asymmetric charge-balanced stimuli through implementation of an adjustable stimulus/recovery phase amplitude ratio. Symmetric biphasic stimulation is known to reduce the size of stimulus artefacts, while biphasic charge-balanced stimulation prevents the potentially harmful electrochemical changes which occur under stimulation sites during monophasic stimulation and is reported to be more comfortable for the subject during long stimulation protocols. In asymmetric mode, the recovery phase ratio can be adjusted from 10% to 100% in 1% increments. At a setting of 100% the +ve and -ve phases are identical in terms of duration and amplitude, but as the ratio is reduced from 100% the amplitude of the recovery phase decreases, while its duration is proportionately extended to preserve charge balancing.
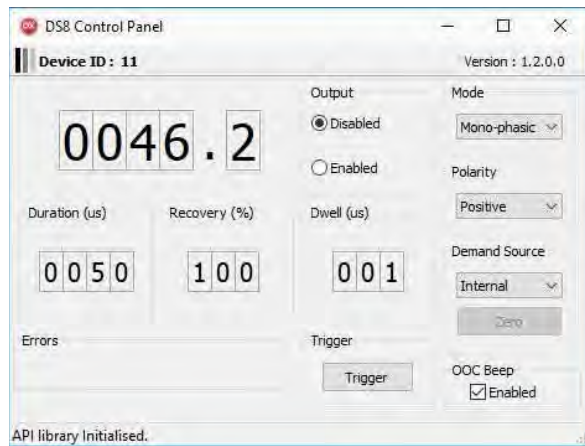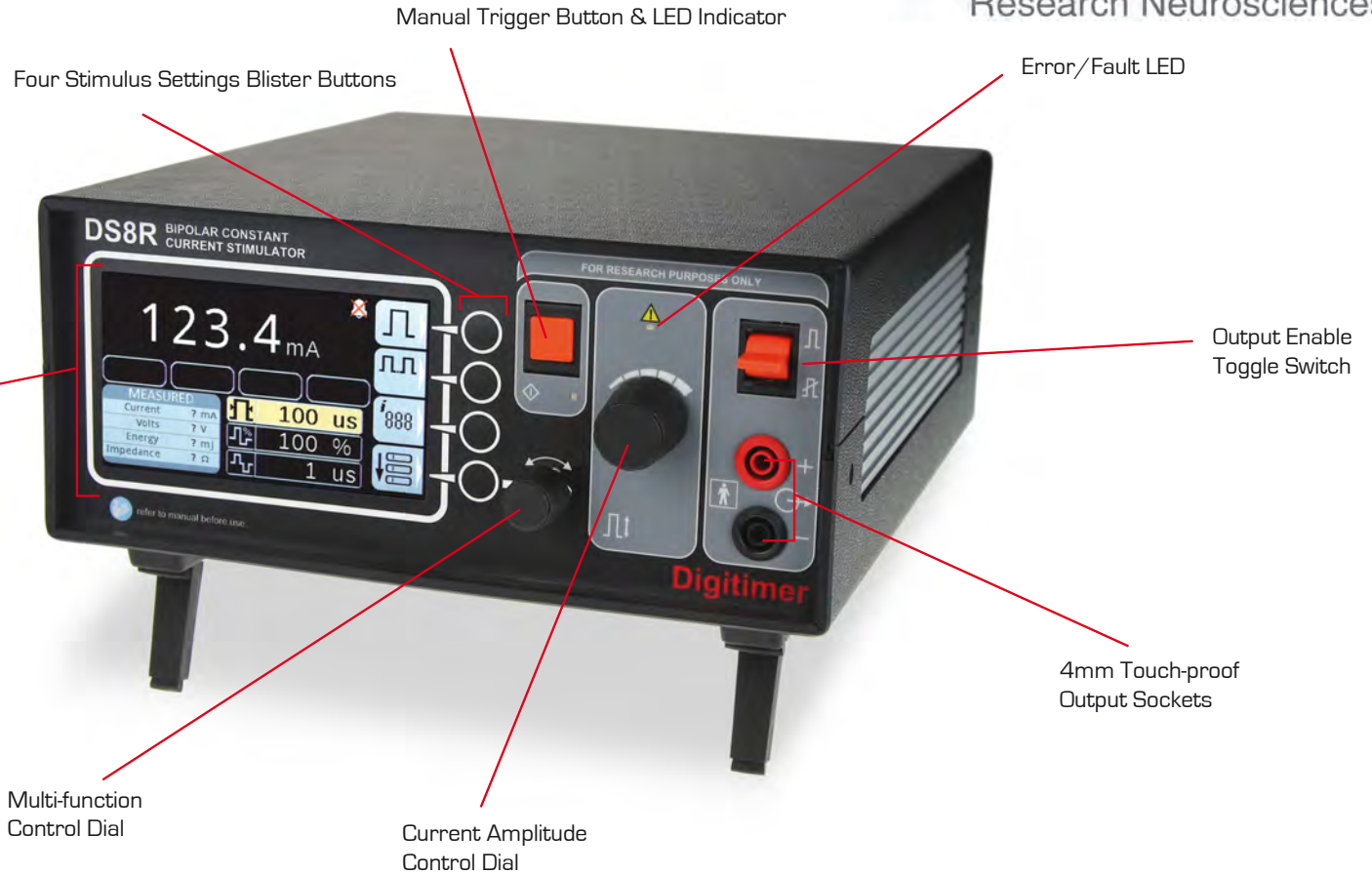
Multiple Stimulus Control Capabilities

Increasingly, researchers want to adjust stimulus settings (current and duration) during a stimulation protocol and with the arrival of the Digitimer DS8R, such control becomes a reality. While the DS8R can operate as a standalone isolated stimulator with full control via the front panel, settings can also be modified using Windows PC control software (supplied) via a USB interface. This software not only provides a Virtual Front Panel for the stimulator, but more importantly incorporates an API allowing the operator to implement control from custom or commercially available acquisition and stimulus control software packages.

Pulse current amplitude can also be controlled using an analogue voltage signal via BNC socket on the rear of the DS8R. The DS8R monitors the voltage applied at this input (0-10V) and adjusts the current amplitude as this voltage varies. Each time the DS8R recieves a valid trigger, the actual stimulus current will be determined by the amplitude of this analogue voltage signal. Note that the analogue voltage signal does not define the shape of the output pulse, as all stimuli are rectangular in shape; it is merely used as a proportional representation of the output stimulus current.
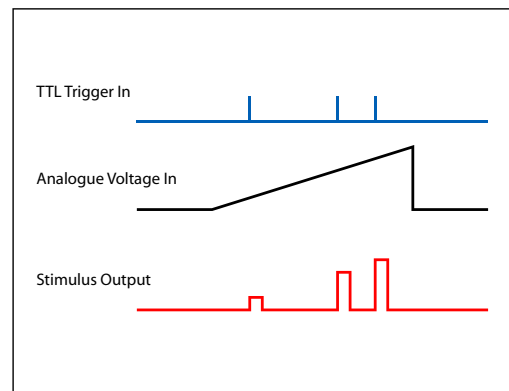
Enhanced 300mJ Pulse Energy Limit for Demanding Research Applications

In order to make the DS8R stimulator suitable for as many applications as possible, we have set a maximum pulse energy limit of 300mJ, which is the same as the limit imposed on therapeutic muscle stimulators, rather than the 50mJ limit for evoked potential stimulators, such as our DS7A/AH. Because the DS8R is designed for human research rather than diagnosis or therapy, we are not seeking medical device certification for it, but if you have a requirement for a medically certified equivalent of the DS8R, please contact us to express your interest.

NEUROSPEC
Research Neurosciences

DS8R

Manual Trigger Button & LED Indicator

Four Stimulus Settings Blister Buttons

Error/Fault LED

Colour LCD Display
showing stimulus settings,
pulse measurements and warnings

Output Enable
Toggle Switch

4mm Touch-proof
Output Sockets

Multi-function
Control Dial

Current Amplitude
Control Dial

Windows™ Compatible DS8R Virtual Front Panel

Each DS8R stimulator is suppled with Windows™ compatible software which enables all stimulator settings to be modified remotely from a PC. This software also allows the operator to turn off the audible out of compliance indicator. An API is embedded in this software, which has been provided for programmers wishing to control the stimulator via third party acquisition or stimulus control software.

TTL Trigger In

Analogue Voltage In

Stimulus Output

External Analogue Voltage Control

The rear panel of the DS8R features a BNC socket that accepts a 0-10V input, allowing an externally generated voltage signal to determine the current amplitude (2mA to 1000mA) each time the DS8R is triggered. The figure opposite illustrates how variations in level of this voltage will scale the stimulus output amplitude.

DS8R
Bipolar Stimulator

Features Overview

Stimulus Output
Current Output: 2mA to 1000.0mA, incrementing in 0.1mA steps; accuracy ±(5% +2). For example, a set current of 100.0mA will be 100mA ± 5.2mA and a set current of 10mA will be 10mA ± 0.7mA
Pulse Duration: 50-2000μs, incrementing by 10μs steps; accuracy ±2%.
Interphase Interval: 1μs – 990μs in 10μs steps; accuracy ±2%.
Recovery Phase Ratio: 10%-100% in 1% steps; accuracy ±2%.
Pulse Mode: Monophasic or Biphasic
Pulse Polarity: Positive/Negative/Alternating.
Compliance Limit: 400V
Energy Limit: 300mJ per pulse
Output Enable: On/Off Momentary action toggle switch
Connections: 4mm shrouded sockets (red and black) on 3/4" centres

Trigger
Maximum hardware trigger rate is 1,000 pps (1 kHz); ±1%
Maximum software (USB) trigger rate is 10pps (10Hz); ±1%
Front panel: Push button
Rear panel: 3.5mm mono jack socket for hand or foot switch (contact closure)
TRIGGER INPUT Electrical via Rear Panel BNC socket: Triggers: Logic signal (+3V to +15V) +ve edge, TTL compatible. Minimum Pulse Duration is 5 microseconds.
SYNC OUTPUT Rear panel BNC, positive TTL pulse, 100μs ± 20% duration.

External Amplitude Control
Working input range: +20mV to +10V (equivalent to 2mA to 1000mA). Voltages below 20mV will give the minimum output of 2mA.
Lag: 1ms (i.e. the DS8R will respond to amplitude changes at a maximum frequency of 1kHz)
Accuracy: ±1mA

Front Panel Indicators
TRIGGER LED - Amber, flashes for each trigger received
FAULT/ERROR LED – Steady Amber, indicating internal hardware fault. Flashing Amber, indicating firmware update in progress.
LCD Display Showing:-
Set Current, Set Pulse Duration, Set Recovery Phase Ratio, Set Interphase Interval, Pulse Mode, Polarity Mode, Amplitude Control Mode.
Pulse Measurements, including Current (mA), Energy (mJ), Impedance (Ohms), Voltage (V)
Stimulus Output Status Indicators
USB Communication Indicator
Audible Out of Compliance Warning (optional mute)

> **The Digitimer DS8R is NOT a medical device and use is limited to human research applications**