

# Digitimer

## MultiPulse Stimulator D185 - Mk.IIa

### For the Intraoperative Monitoring of Motor Evoked Potentials

Transcranial stimulation with trains of electric shocks permits rapid assessment of the functional continuity of the motor pathways. The use of MultiPulse stimulation results in much larger amplitude MEPs whilst using standard anaesthetic protocols allowing easier qualitative assessment of evoked responses. This technique complements the continuous monitoring of sensory evoked potentials (SEPs) during spinal and aortic surgery. The D185 is easily interfaced with neuro-monitoring equipment, allowing you to add MEPs to your monitoring protocols without replacing your existing equipment.



By listening to users, we have incorporated their requests into the "Mark IIa". This features front panel selection of output polarity, multiturn control of output stimulus and external, rear panel selection of trigger characteristics. Special circuitry has also been added to reduce the stray mains frequency pickup below perceptible levels.

In response to a manual or external trigger pulse, a stimulus output is produced characterised by the 'Number of Pulses' switch (1 to 9 pulses) and the InterStimulus Interval (ISI) switch (variable between 1.0 and 9.9 milliseconds). The output pulse is a transformer isolated square wave of 50 microsecond duration, adjustable up to 1000 volts with a rated maximum current of 1.5 amps and a rate of current rise of 0.1 amp per microsecond.

Although a high voltage can be produced at the output, the short pulse duration ensures that the total energy is within a safe level. An automatic trip system guards against excessive repetition rates by monitoring the integrated stimulus charge and shutting down the output if it exceeds a preset level.



A restricted access 'special' mode is also provided to allow conventional peripheral nerve stimulation and special stimulus timings.

Stimulus pulses can be initiated by either front panel manual push button, foot switch or by a suitable electrical trigger signal. An electrical trigger output signal is available for external synchronisation of recording equipment.

Digital displays show the set stimulus level (volts) and peak current (mA) achieved in the first pulse of the train.

An output signal (isolated from the patient) is available for recording or monitoring of the stimulus current waveform.

**The Benefits of MEP Monitoring without Replacing Your IOM System**

**The Only FDA Cleared Standalone Stimulator for TceMEPs**

**>10,000 Documented Cases Demonstrate Safety and Efficacy**

# MultiPulse Stimulator - model D185 - Mk.IIa

## SPECIFICATIONS

### Stimulus Output

Voltage range	: 0 - 1000 volts with 1k load impedance, adjustable with 10-turn control.
Pulse duration	: 50 microseconds square wave.
Output impedance	: 120 ohms.
Maximum current	: 1.5 amps peak.
Current rise time	: 0.1 amps per microsecond maximum.
Polarity	: Normal (Red socket positive) / Reverse (Black socket positive).

### Stimulus Pulse Rates

Permitted Repetition	: 1 per second max.; 'Special' mode - 1000pps max (SPECIAL illuminated)
Train selections	: Number of Pulses - 1 to 9; InterStimulus Interval - 1.0 to 9.9ms in 0.1ms increments.

### Output Indication

Stimulus pulse	: Amber LED when triggered (i.e. TRIGGER illuminated).
Stimulus value	: Set voltage - continuous 3½ digit display, 1999 volts FS Peak pulse current achieved - stored reading 3½ digit display, 1999 mA FS.
Stimulus waveform	: Pulse current (isolated from patient) signal for external monitor.

### Trigger Facilities

Input options	: Manual front panel mounted push button. Foot switch via rear panel 3.5mm mono socket (D185-FS1, available as option). Logic signal (+3 to 15V) +ve edge, TTL compatible (-ve edge by external change).
Output	: Positive TTL compatible signal 1ms wide for recorder synchronisation. (100µs and/or active low by external change).

### Protection System

Operation	: An automatic circuit inhibits output pulses when voltage/rate integral is too high.
Indication	: An amber 'Error' LED (i.e. ERROR illuminated) and (switchable) audible signal indicates that output is inhibited.
Reset	: Automatic after 2 seconds.
Error Examples	: Pulse bursts at 1 burst/sec.: >2 pulses at 900V; >5 pulses at 650V. : 'Special' mode: >2pps at 900V; >10pps at 500V; >20pps at 300V.

### Other

Mechanical	: 225 x 100 x 253mm, tilt feet and controls	Weight : 3kg (approx.)
Power	: 100 - 120V or 200 - 240V @ 47-63Hz	Rating : <30VA

### REFERENCES

**Calancie, B., Harris, W., Brindle, G.F., Green, B.A., Landy, H.J.** (2001) Threshold-level repetitive transcranial electrical stimulation for intraoperative monitoring of central motor conduction. *J. Neurosurg.* **95**: 161-168.

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**Jones, S.J., Harrison, R., Koh, K.F., Mendoza, N., Crockard, H.A.** (1996) Motor evoked potential monitoring during spinal surgery: Responses of distal limb muscles to transcranial electrical stimulation with pulse trains. *Electroenceph. Clin. Neurophysiol.* **100** (5).

**Kalkman, C.J., Ubags, L.H., Been, H.D., Swaan, A., Drummond, J.C.** (1995) Improved amplitude of myogenic motor evoked responses after paired transcranial electrical stimulation during Sufentanil/Nitrous Oxide anesthesia. *Anesthesiology* **83**: 270-276.

Manufactured by: **Digitimer Ltd**

37 Hydeway  
Welwyn Garden City  
Hertfordshire  
AL7 3BE  
England

Tel: +44 1707 328347

Fax: +44 1707 373153

E-mail: sales@digitimer.com