

Teleopt^α

WIRELESS OPTOGENETIC STIMULATOR





Best Solution in Optogenetic Stimulation for Freely Moving Animals!

In optogenetics experiments, an optic fiber connected to the head of an animal restricts animal behavior, specially in test cages with high walls, gates or other obstacles. Teleopto breaks this wall by enabling complete wireless environment for optogenetic stimulation, using very light receivers sitting perched on the animal's head.



High brightness LED and optic fibers are coupled to achieve mW order light power at the tip. Colors can be changed just by swapping the LED optic fiber component.



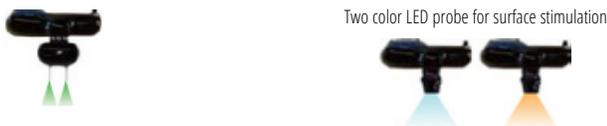
Remote controller accepts trigger signals from a stimulator, and sends the signals to the receiver. Synchronized light pulses are generated from the tip of the LED optic fiber (in pulse mode).



Receiver has two types, pulse and continuous, each for high frequency and continuous stimulation. The remote controller is compatible for both receivers, by switching the mode switch. Pulse receiver flashes at the same timing with trigger pulses, whereas continuous receiver alternates on and off upon a new pulse.



Receiver can be charged and re-used repeatedly, by a dedicated charger.



Bilateral Stimulation is possible. If you want to stimulate both hemispheres simultaneously please use 1 ch receiver. If you want to stimulate each hemisphere one by one, please use 2ch receiver.



Some opsins are activated by blue light and inactivated by yellow light. Together with the two channel receiver and two color LED optic fibers, you can stimulate by two different colors at the same position. The remote controller accepts two independent triggers.

Teleopto Standard Set

E00.200.00

- › 1x Teleopto remote controller
- › 1x Teleopto receiver 2 g/pulse
- › 3x LED optic fibers
- › 1x Infrared emitter
- › 1x Teleopto charger
- › 1x Optic fiber insertion tool
- › 1x Dummy receiver
- › 1x Trigger Cable





Receivers



Receiver 1 g/Pulse

TeleR-1-P

size: 13 x 18 x 7 mm
weight (approx.): 1.4 g
standby time: 17 h



Receiver 2 g/Pulse

TeleR-2-P

size: 17 x 19 x 7 mm
weight (approx.): 2.0 g
standby time: 28 h



Receiver 3 g/Pulse

TeleR-3-P

size: 18 x 22 x 8 mm
weight (approx.): 3.0 g
standby time: 49 h



Receiver 1 g/2ch Pulse

TeleR-1-2P

size: 13 x 18 x 7 mm
weight (approx.): 1.5 g
standby time: 17 h



Receiver 2 g/2ch Pulse

TeleR-2-2P

size: 17 x 19 x 7 mm
weight (approx.): 2.1 g
standby time: 28 h



Receiver 3 g/2ch Pulse

TeleR-3-2P

size: 18 x 22 x 8 mm
weight (approx.): 3.1 g
standby time: 49 h



Receiver 1 g/Continuous

TeleR-1-C

size: 13 x 18 x 7 mm
weight (approx.): 1.4 g
standby time: 17 h



Receiver 2 g/Continuous

TeleR-2-C

size: 17 x 19 x 7 mm
weight (approx.): 2.0 g
standby time: 28 h



Receiver 3 g/Continuous

TeleR-3-C

size: 18 x 22 x 8 mm
weight (approx.): 3.0 g
standby time: 49 h



Receiver 2 g/2ch
Continuous

TeleR-2-2C

size: 17 x 19 x 7 mm
weight (approx.): 2.1 g
standby time: 28 h

Tested w/TeleR-2-P, TeleLC, LPM-100

Typical Power		Typical Power		Typical Power		Typical Power	
Blue/ ø250 µm	4.5 mW (≈99.5 mW/mm ²)	Green/ ø250 µm	1.4 mW (≈31.1 mW/mm ²)	Yellow/ ø250 µm	1.0 mW (≈22.2 mW/mm ²)	Red/ ø250 µm	6.5 mW (≈144.3 mW/mm ²)
Blue/ ø500 µm	13.0 mW (≈71.8 mW/mm ²)	Green/ ø500 µm	3.0 mW (≈16.6 mW/mm ²)	Yellow/ ø500 µm	2.8 mW (≈15.5 mW/mm ²)	Red/ ø500 µm	16.0 mW (≈88.4 mW/mm ²)

LED Optic Fibers

Ordering Information: See price sheet for product codes



LED optic fiber
TeleLC-c-l-d

Single optic fiber. Hard
enough for insertion
without a guide.



Bilateral LED
optic fiber
TeleLCD-c-l-d-i

For bilateral
stimulation



Two color LED optic fiber
TeleLCT-c/c-l

Two 250 µm fiber optics are
bundled like one fiber optic.



LED Probe

TeleLP-c

LED without optic fiber
for brain surface
stimulation.



Two color LED Probe

TeleLPD-c/c

Two-color version of the
LED probe.

Note: how to identify specifications from the model number.

c: color. **B** (Blue 470 nm) **G** (Green 525 nm) **Y** (Yellow 590 nm) **R** (Red 630 nm)
For other colors please contact us.

l: Length. Specify the length of the optic fiber in mm.

d: Fiber diameter. Specify 250, 500, or 750 µm

i: Distance: Specify the distance between optic fibers for the Bilateral LED in mm.

Glass: Glass fiber instead of the regular plastic fiber. Only available for ø250 µm fiber.

Accessories



Teleopto Charger (1 & 4ch)
E00.130.00

Additional chargers useful if
using several receivers.



Infrared Emitter
E00.110.00

Longer transmission, 3 m.



Infrared Emitter (Clip type)
E00.120.00

1 m transmission.



Stereotaxic Adapter
E00.140.00

For use with a stereotaxic
for insertion ø1.3 mm.



Dummy Receiver
E.00.150.00

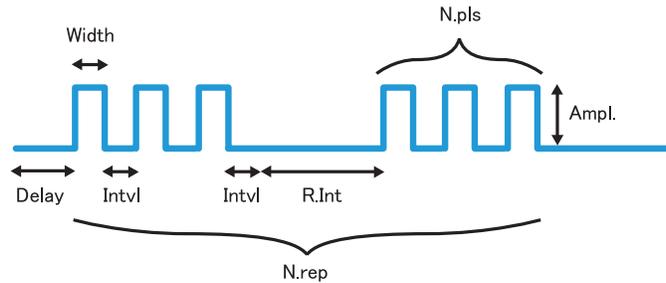
For habituation.



Stimulator for Optogenetics E00.160.00



STO mk-II is a pulse generator developed for optogenetics. By connecting STO mk-II to TRG port on the Teleopto Remote Controller via a trigger cable, you can control the timing of light stimulation by TTL pulses. Pulses are defined by the parameters illustrated below.



Specification	
Stim Channel	2ch (Independent)
Trigger In parameter	2ch (Independent)
Delay	100 μ s - 999 s
Width	100 μ s - 999 s
Interval	100 μ s - 999 s
Pulse Number	1-999
Repeat Interval	100 μ s - 999 s
Repeat Number	1-999
Amplitude	0.1 - 5.0 V
Memory	Yes
Endless Repeat	Yes
Power	DC5V

Light Power Meter E00.170.00



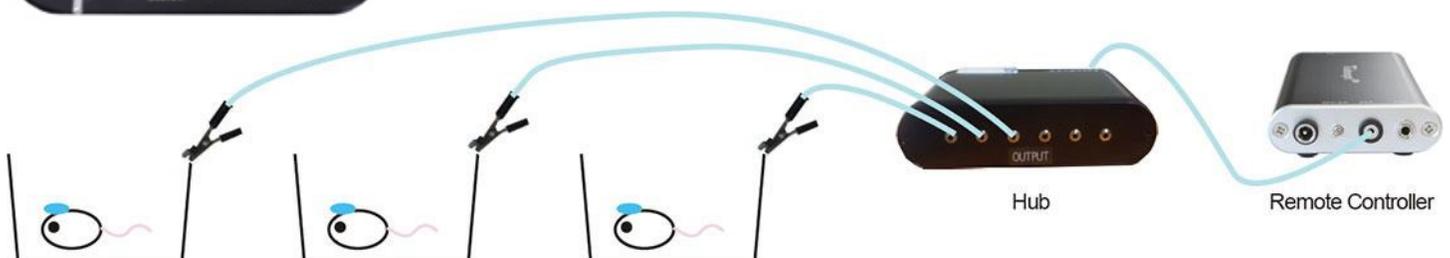
In optogenetics, it is important to measure the light power at the tip of the optic fiber, and the LPM-100 covers four colors, blue, green, yellow and red, which are commonly used in optogenetics. Easy to use, hand-held and battery-powered.

Specification	
Wavelength	470 nm (blue) 525 nm (green) 590 nm (Yellow) 630 nm (red)
Display	Liquid Crystal
Resolution	0.01 mW
Analog Out	0 - 5 V
Power	2x AA batteries

6 Channel Hub E00.125.00



By connecting the TeleHub6 to the EXT port on the Teleopto Remote Controller, you can use up to 6 infrared emitters at the same time so that you increase the throughput of your experiment. This device is also useful if you use a maze with many branches or high walls which block infrared signal and prevent a good transmission. By putting several infrared emitters at several positions, it ensures more stable light stimulation. *Note: All infrared emitters send a signal at the same time.*





Video Tracking Stimulator

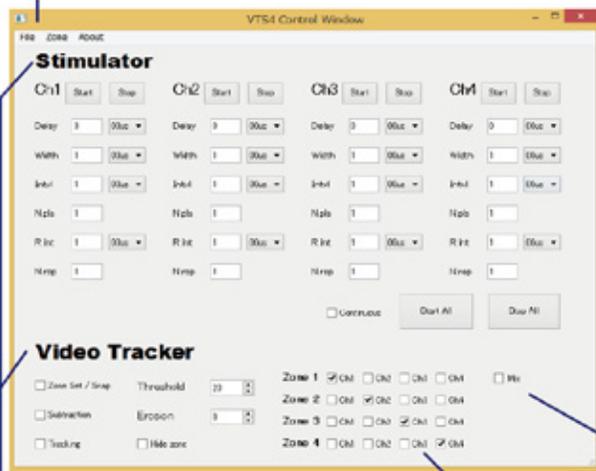
VTS-4 Video Tracking Stimulator is literally a USB stimulator equipped with a video tracking function, developed for optogenetic experiments. By defining zones on the video image from a general USB camera, it tracks an animal and outputs pulse trains defined by a dedicated software. Pulse trains can be easily designed by manipulating the stimulation parameters (Delay, Width, Interval, Number of Pulses, etc.)

This also can be used as PC controlled universal 4 channel stimulator. You can establish a closed-loop optogenetic stimulation system by combining Teleopto or wired optogenetics system from any third parties.

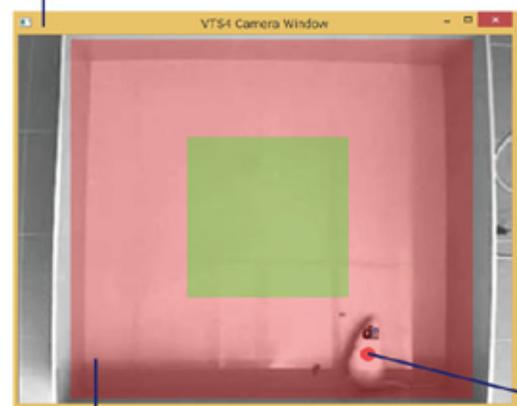


Software

Control Window: Controls for stimulation and video tracking

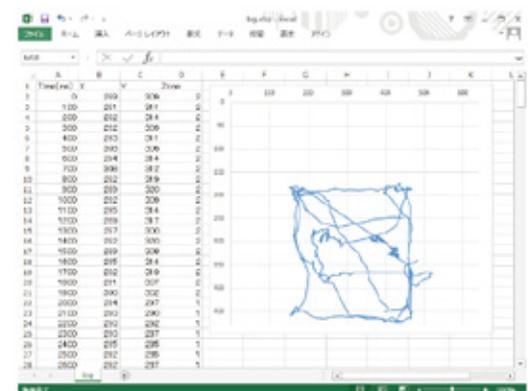


Camera Window: Display for camera images and zones.



Zones: Up to 4 zones can be defined as polygon by clicking the Camera Window

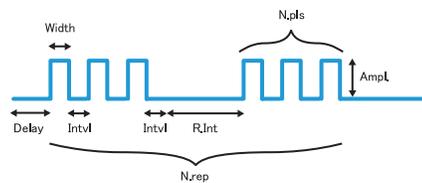
Track Mark: A red dot is put on the center of the animal detected by background subtraction.



Elapsed time, X & Y axis, Zone date can be recorded by ASCII. Tracks can be visualized by XY plot in Excel etc.

Stimulator Panel: Defines stimulation parameters.

Stimulation Assignment: Assign stimulation for each zone.



Video Tracker Panel: Zone, snapshot, detection threshold and erosion settings, tracking on/off etc.

Mix Mode: Uses only one output port for stimulation, and stimulations will be switched in each zone by referring the stimulation parameters from the same number of channels.



4ch Teleopto

Teleopto-4 is newly designed wireless optogenetics platform utilizing 2.4 GHz RF. The receiver is capable of controlling 4ch optogenetic stimulation independently, whereas the size and weight are comparable to the regular Teleopto receivers. PC Software defines stimulation parameters which are sent to the receiver via a transmitter box connected to the PC by USB. You can trigger the stimulation by software, 4 triggers in BNCs on the transmitter box.

The typical application of this device is for controlling bilateral two color stimulation in completely independent manner. We can provide any probe/cannula holding 4 LED sources on request.



Receiver
Weight: 3g
Size: 18 x 20 x 8 mm

Transmitter Box

**Quad LED Probe
TeleLPQ**

**Bilateral two color LED fiber optic
TeleLCDT**



Teleopto 4 Software

Selected publications using **Teleopto**



Top-down cortical input during NREM sleep consolidates perceptual memory.

Miyamoto D, Hirai D, Fung CCA, Inutsuka A, Odagawa M, Suzuki T, Boehringer R, Adaiikkan C, Matsubara C, Matsuki N, Fukai T, McHugh TJ, Yamanaka A, Murayama M
Science (2016) DOI: 10.1126



Htr2a-Expressing Cells in the Central Amygdala Control the Hierarchy between Innate and Learned Fear.

Isozaka T, Matsuo T, Yamaguchi T, Funabiki K, Nakanishi S, Kobayakawa R, Kobayakawa K
Cell (2015) 163(5):1153-64



A Top-Down Cortical Circuit for Accurate Sensory Perception.

Manita S, Suzuki T, Homma C, Matsumoto T, Odagawara M, Yamada K, Ota K, Matsubara C, Inutsuka A, Sato M, Ohkura M, Yamanaka A, Yanagawa Y, Nakai J, Hayashi Y, Larkum ME, Murayama M
Neuron (2015) 86:1304-16



Molecular Brain

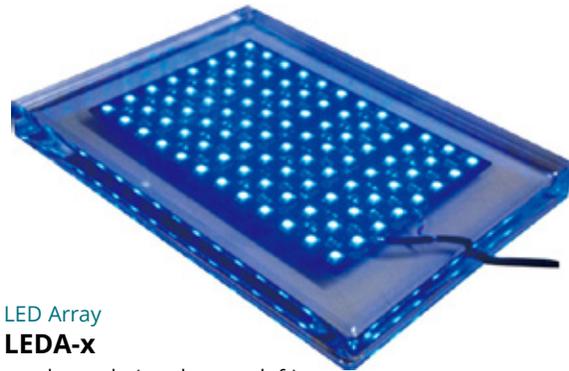
The lateral parabrachial nucleus is actively involved in the acquisition of fear memory in mice.

Sato M, Ito M, Nagase M, Sugimura YK, Takahashi Y, Watabe AM, Kato F
Molecular Brain (2015) 8:22



LED Array System

Optogenetics has become explosively popular for controlling animal behavior in-vivo, now this technology is also being applied to in-vitro cells and tissues for controlling gene expression. For this purpose, long-term and time-controlled light stimulation in a culture incubator is required. This incubator-compatible LED array fulfills all the requirements for in-vitro optogenetics experiments.

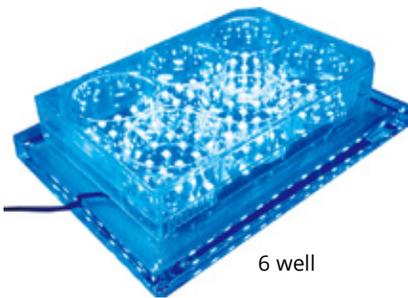


LED Array LEDA-x
x: color code (see bottom left)

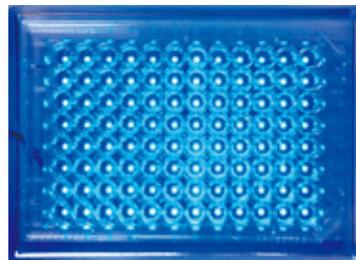
LED Array Driver LAD-1



Fits Perfectly for multi-well plates



6 well



Upper view with 96 well plate

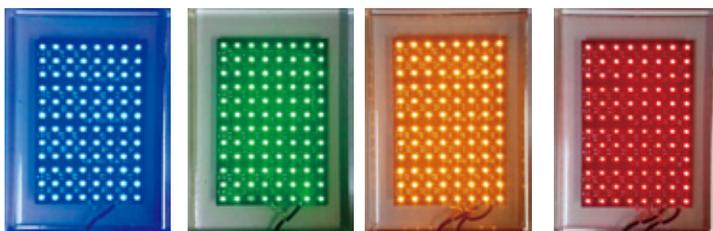
It is designed for any commercial multi-well plate. It can be used with 6, 12, 24, 48 and 96 well plates. Specially perfect fit for 96 well plate because each LED element comes just under each well.

Trigger Input



By the mode switch of LAD-1 LED Array Driver you can choose constant mode or trigger mode. In trigger mode, the Trg In BNC on the back panel is used for receiving trigger TTL pulses from a stimulator so that it enables time-controlled pulsed stimulation in-vitro.

Many color options



470 nm

530 nm

590 nm

630 nm

Color code:

B (Blue 470 nm) **G** (Green 525 nm) **Y** (Yellow 590 nm) **R** (Red 630 nm) **I** (Infrared 940 nm)

For other colors please contact us.

Two color LED Array (LEDA2-BY)



It emits 470 nm and 590 nm lights from the same LED element. Two LAD-1 are required

