Prizmatix

Pulser – Programmable TTL Pulse Train Generator for Optogenetics Light Sources

Ver. 09

Introduction

The Pulser is a programmable TTL pulse train generator for pulsing LEDs, lasers and shutters used in Optogenetics activation in neurophysiology and behavioral research. The Pulser device comes with user friendly Windows® software that enables easy visual setup of numerous pulse train configurations.

The Pulser `TTL-Out` output can work smoothly to trigger Prizmatix LED light sources or lasers to produce light pulses for such application as opsin activation. The `Trigger-In` input enables synchronization of Optogenetics activation with various experimental events. The `Trigger-Out` output (PulserPlus only) enables further activation of additional devices after pulse train was completed.

Key Features

- Single or Bi-phasic pulse trains
- `Trigger-In` input enables synchronization with various experimental events.
- `Trigger-Out` output (PulserPlus only) enables activation of other devices after completion of pulse train sequence.
- Operation modes:
  - Mode (0): Execute pulse sequence after START
  - Mode (1): Execute pulse sequence once after trigger(s)
  - Mode (2): Execute pulse sequence each time after trigger(s)
  - Mode (3): Execute pulse sequence after trigger HIGH, then stop when LOW
- Pulser settings can be stored into a file to enable fast switch between various protocols.
- Log-File can be created to record experiment activities.
- No external power supply required (uses USB power for operation)
- Stand-alone operation mode enables Pulser to operate without computer. The power is supplied by USB power adaptor (PulserPlus only)
- Control up to 8 Prizmatix Optogenetics-LEDs with a single Pulser device using BNC-T connectors (PulserPlus only)
- Independent time base by internal microcontroller
- Easily control from LabVIEW, MATLAB or any HyperTerminal-like software capable of sending and receiving simple ASCII commands over serial COM port (API provided).
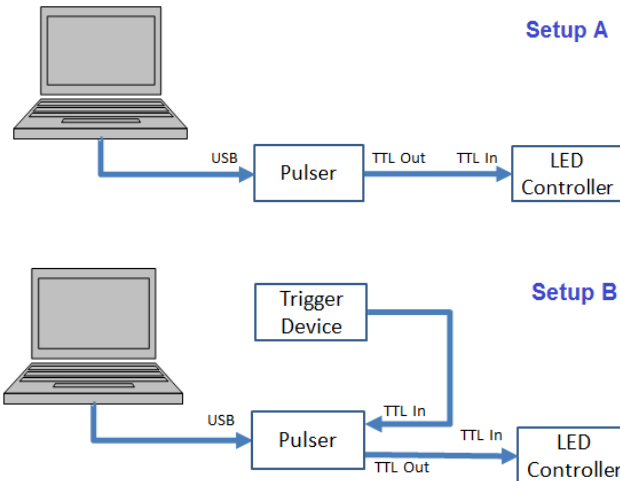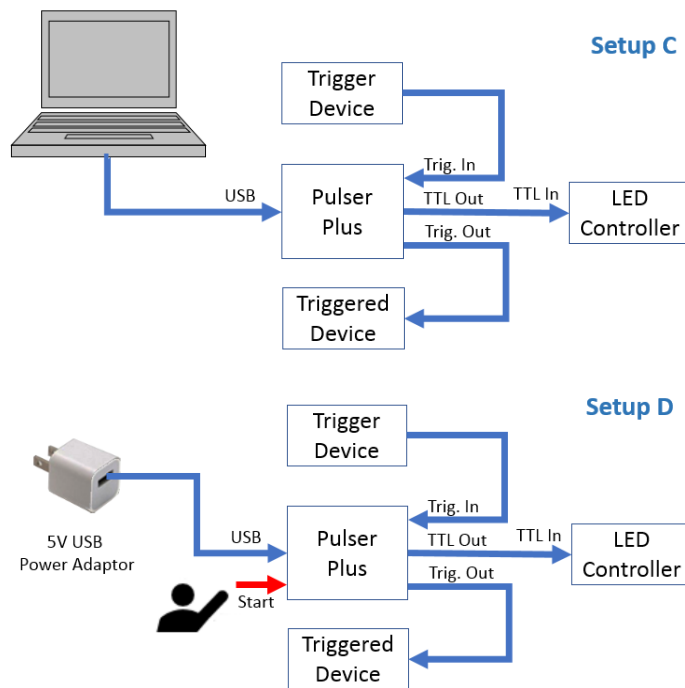
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Setups

Possible Pulser setups:
- (A) PC Control with direct connection to LED.
- (B) PC Control with external trigger device.

Setup A

```
Laptop --USB--> Pulser --TTL Out-- --TTL In--> LED Controller
```

Setup B

```
Trigger Device
Laptop --USB--> Pulser --TTL In-- --TTL In--> LED Controller
                        --TTL Out-->
```

PulserPlus can be used in two additional setups:
- (C) PC Control with trigger in and trigger out to send pulses to additional triggered device.
- (D) SA -Stand Alone mode, triggered or manually activated, no PC needed during operation.

Setup C

```
Trigger Device
Laptop --USB--> Pulser Plus --Trig. In--
                            --TTL Out-- --TTL In--> LED Controller
                            --Trig. Out--
Triggered Device
```

Setup D

```
5V USB Power Adaptor
                     --USB--> Pulser Plus
Start -->                     --Trig. In--
                              --TTL Out-- --TTL In--> LED Controller
                              --Trig. Out--
Trigger Device
Triggered Device
```

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Software

The software enables easy visual design of the various pulse conditions. The pictures below show the Graphical User Interface (GUI). The upper right side of the GUI shows an example waveform with the legend of user definable parameters. The bottom pane shows the actual TTL waveform programmed with the user settings on the left side.
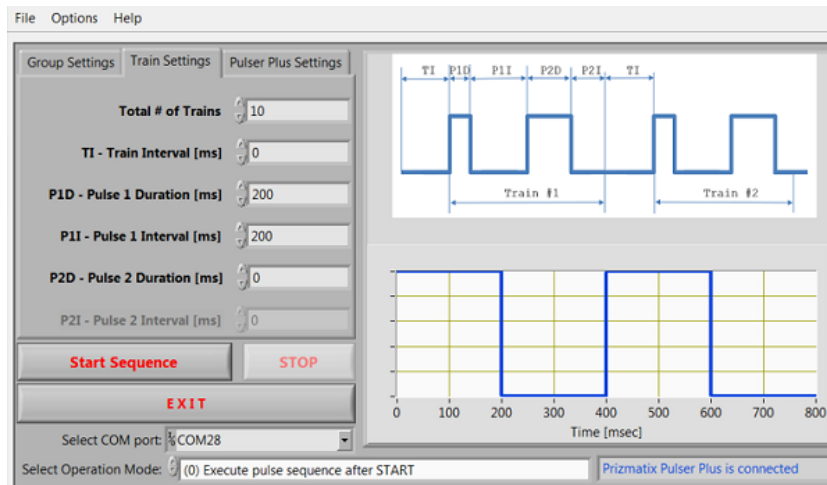
Train Settings Tab

The Train Settings tab allows setting of single or bi-phasic pulse timing and pulse repetition creating multiple pulse trains.
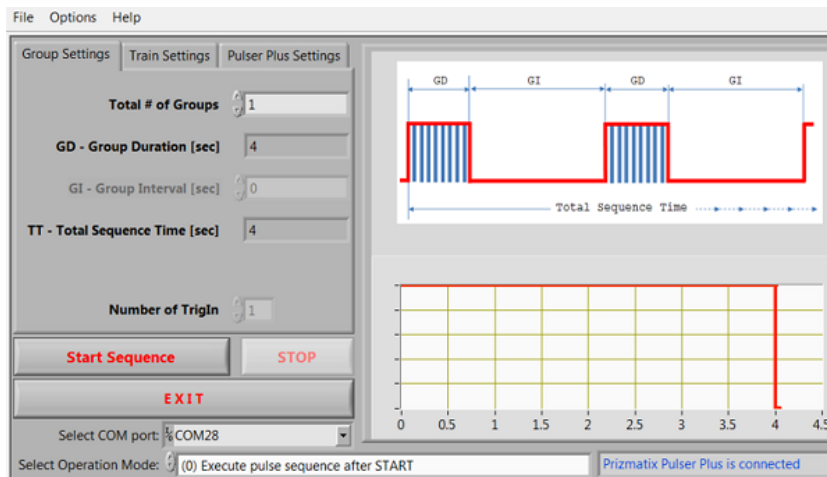
Group Settings Tab

The Group Settings tab allows creation of multiple Groups of Trains, comprising the sequence. The TrigIn parameter defines the number of triggers needed to start sequence if appropriate Operation Mode is chosen.

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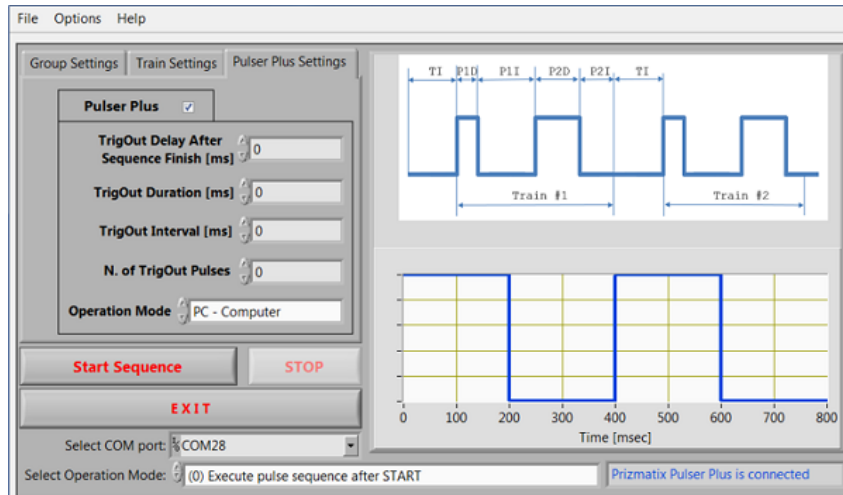
PulserPlus Settings Tab

The Pulser-Plus is an enhanced TTL Pulser that adds stand-alone operation and TTL Trigger-Out.

The PulserPlus tab in GUI allows the user to define all the trigger-out parameters as well as switch between Stand-Alone programming mode and PC Run mode.

The Operation mode selector at the bottom of GUI provides four operation modes (see key features above).

Pulser vis. PulserPlus Comparison

Feature	Pulser	PulserPlus
Independent time base by internal microcontroller	♦	♦
Sequence Settings	♦	♦
Train Settings	♦	♦
Group Settings	♦	♦
Trigger In Settings	♦	♦
Trigger Out Setting	-	♦
Stand-Alone Operation	-	♦
Settings Files	♦	♦
Log File	♦	♦

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USB connector		Standard USB Type B
Signal connectors		BNC
Output voltage level		TTL
Minimum pulse width	msec	1
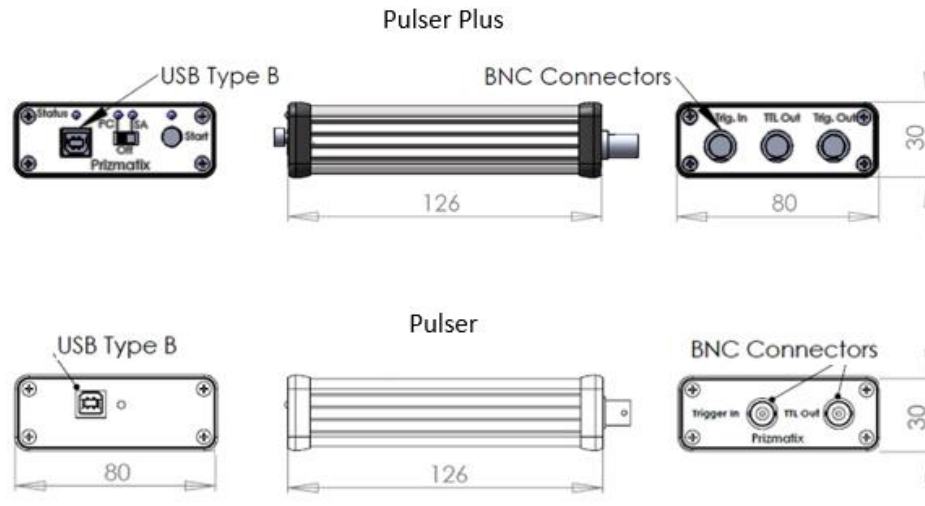
Dimensions in mm

Ordering Information

Item Description	P/N
Programmable pulse train generator for use with Optogenetics-LED or other light sources. Connectors: USB, TTL Out, Trigger In Included: 1 x USB Type A cable 1 x BNC-BNC cable	Pulser
Programmable pulse train generator for use with Optogenetics-LED or other light sources. Connectors: USB, TTL Out, Trigger In, Trigger Out Included: 1 x USB Type A cable 1 x BNC-BNC cable Not included: Power adaptor for Stand-Alone operation. Any USB power adaptor can be used	PulserPlus