HongKe 虹科 doric

激光二极管光纤光源

用户手册

Version 2.2.1

Contents

1

Safety Information

1.1 Laser Safety Information

If you are not familiar with laser light sources, ask for advice from qualified personnel **BEFORE FIRST USE** and **READ CAREFULLY** the application note ***Important Laser Safety Information*** that can be found on the USB key. You can also contact directly Doric Lenses by email (sales@doriclenses.com) to obtain a copy of this application note.

DANGER!

The *Laser Fiber Light Source* is a Class 3B laser product.
Read the application note *Important Laser Safety Information* BEFORE FIRST USE.

The *Laser Diode Fiber Light Source* is a Class 3B laser emitting visible light at sufficiently high power levels to **PERMANENTLY DAMAGE THE EYES. NEVER LOOK** directly into the laser beam exiting from the FC/APC receptacle or from any optical fiber connected to the FC/APC receptacle. **NEVER LOOK** directly specular or diffuse reflections of the output laser beam.

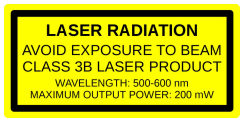
It is important to **WEAR LASER SAFETY GLASSES** (goggles) certified for the wavelength and power level of the laser. Also follow all safety procedures to protect anyone working in the laser area. Even when wearing laser safety glasses, **NEVER LOOK** directly into the laser beam or any specular reflection of the laser beam exiting from the *Laser Diode Fiber Light Source* or from any optical fiber connected to its output FC/APC receptacle.

Figure 1.1: *Laser Diode Module Driver rear panel interlock connector (green) shown with a temporary black shorting electric wire*

The *Laser Diode Fiber Light Source* is provided with a (green) safety interlock connector on its rear panel (Fig. 1.1). When the interlock circuit connector is shorted, the driver is enabled. When the interlock circuit connector is open, the driver is disabled. For a safe use of the *Laser Diode Fiber Light Source*, the red shorting electric wire should be removed and replaced by a proper connection to the laser safety interlock circuit of the laboratory. You should contact the laser safety officer (LSO) of your institution to set a proper safety interlock circuit for your specific application and laboratory installation.

1.2 Safety Labels

The laser class labels are provided with the system and the laser aperture is clearly identified by laser warning label and/or the text *LASER APERTURE*.



(a) *Laser Classification Label Example*

(b) *Laser Warning Label*

(c) *Laser Aperture Identification*

Figure 1.2: *Safety Labels*

1.3 Activation Safety Features

The drivers for all Doric Lenses light sources come with a number of safety features. These are built into the driver circuits, as shown in the block diagram (Fig. 1.3).

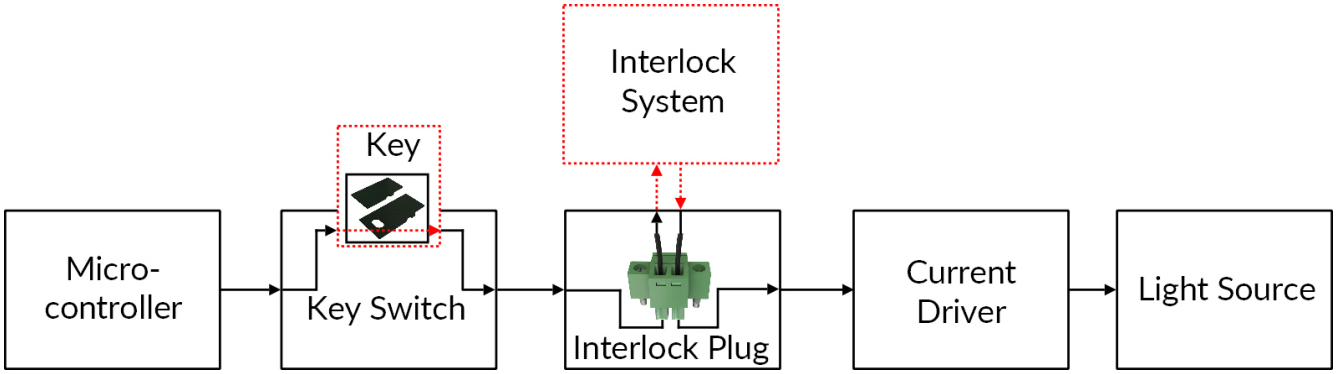
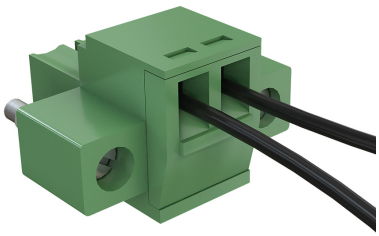


Figure 1.3: *Safety feature block diagram*

- The **Micro-controller**, **Key Switch**, **Interlock Plug** and **Current Driver** are connected in series. This means that if any single safety feature is not properly in place, the light source cannot be activated.
- The **Micro-controller** is used to control the light source driver.

(a) *Key Switch*



(b) *Interlock Plug*

Figure 1.4: *Safety Feature Elements*

- The **Key Switch** (Safety feature 1) (Fig. 1.4a), located on the left side of the driver, is required to activate any light source. If removed, no data can be sent from the micro-controller to the **Current Driver**.
- The **Interlock plug** (Safety feature 2) (Fig. 1.4b) is used to integrate the driver into an **Interlock Circuit**.
  - The **Interlock Plug** comes with a small wire short-circuiting it. This wire must be removed before integrating it into an **Interlock Circuit**.

  - Connect the **Interlock circuit** in series with the **Interlock Plug** so the circuit may function properly.

- The **Current Driver** sends current to any connected light source. If the **Key** is absent or the **Interlock Plug** has an open circuit, it cannot receive signals from the micro-controller, preventing it from sending out current.

1.4 Emission Indicator

For light sources emitting invisible laser radiation, a dedicated LED indicator is ON when the driver is outputting an electrical current. When the driver is outputting current, the light source will emit light from the aperture.

2

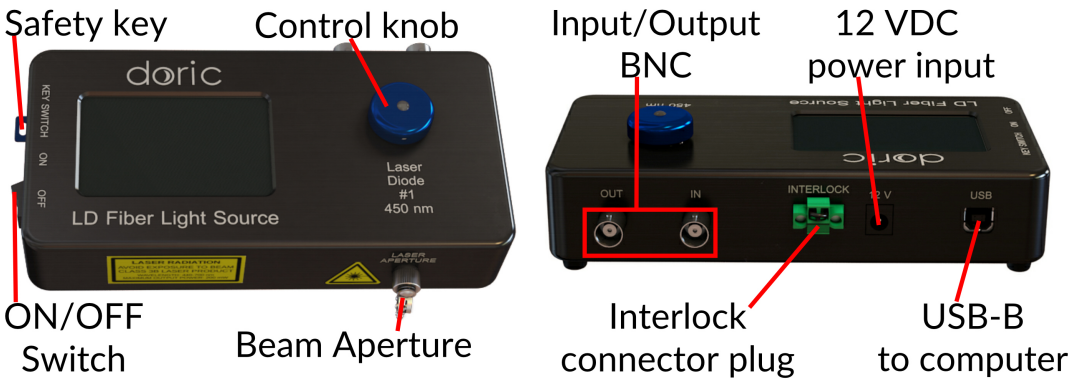
Overview

2.1 Laser Diode Fiber Light Source

Figure 2.1: *Laser Diode Fiber Light source, 1, 2 & 4-channel (from top to bottom)*

The Doric *Laser Diode Fiber Light Sources* (Fig. 2.1) are a compact multiple-source laser system, available with 1, 2 or 4 channels.

- The **Beam Aperture** (Fig. 2.2a) outputs the laser beam.
  - The output is an FC/APC optical fiber receptacle. The related connector is identified by its green strain relief.
  - It is important to leave the cap screwed onto the output when not in use.
- The **Control Knob** allows the user to change the diode current, shown on the **LCD Display** (Fig. 2.2a).
- The **Safety Key** (Fig. 2.2a), when removed, prevents the activation of the laser.
- The **On/Off Switch** (Fig. 2.2a) activates/deactivates the fiber light source.
- Each channel has an **Input BNC** (Fig. 2.2b). These allow the control of the diode current using an outside source.



(a) *Fiber Light Source Top* (b) *Fiber Light Source Rear*

Figure 2.2: *Laser Diode Fiber Light Source Views*

- Each channel has an **Output BNC** (Fig. 2.2b). This allows the monitoring of the diode current.
- The green **Interlock Connector Plug**(Fig. 2.2a, short circuited on figure) allows the device to be attached to a laboratory interlock system.
- The light source has a **12 VDC** (Fig. 2.2b) power input to which the user connects the power supply provided with the system.
- The **USB-B** port (Fig. 2.2b) connects the system to a computer and allows the device to be controlled by the *Doric Neuroscience Studio*.

3

Operations Guide

3.1 Getting Started

The procedure below should be followed carefully.

Warning!
The *Laser Fiber Light Source* is sensitive to electrostatic discharges.
Wear a properly grounded ESD wrist strap when handling.

1. Unpack the *Laser Diode Fiber Light Source*.
    - Allow sufficient time for the *Laser Diode Fiber Light Source* to reach ambient temperature.
    - Remove the *Laser Diode Fiber Light Source* from the ESD protective bag.
2. Connect the interlock circuit to the current driver.
    - The current driver CAN NOT be operational if the safety interlock circuit is open.
    - When unpacking, a temporarily shorted interlock connector plug is already secured in the rear panel green interlock connector.
    - It is highly recommended to remove the shorting black electric wire and connect the interlock connector to a proper interlock circuit of the laboratory.
    - See the *Safety Information* section (Chapter 1) for more information.

Warning!
Be aware that a shorted interlock plug DISABLES this safety feature
AT YOUR OWN RISKS. A safety interlock circuit is highly recommended

3. Verify that the main power switch is set to OFF.
4. Using the proper adapter, connect the electrical plug of the power supply to the wall outlet.
5. Connect the power supply to the current driver.

DANGER!
DO NOT OPEN the enclosure. Electrical hazards may result.
The driver contains no user-serviceable components.

6. Remove the metal cap from the output FC/APC receptacle of the *Laser Diode Fiber Light Source*.

7. Connect a compatible optical fiber patch cord to the FC/APC receptacle. For laser sources, the FC/APC connector must be connected to the source to eliminate back-reflection. The FC/APC connecter is identified by a green strain relief.
8. Ensure that a proper laser beam block is used at the other end of the optical fiber.
9. Connect the optical fiber to the *Laser Diode Fiber Light Source*

DANGER!
The laser beam exiting the *Laser Fiber Light Source* or any connected optical fiber should be confined BEFORE turning ON the driver.

10. Ensure that all laser safety procedures are followed.
11. Insert the safety key in the left panel key switch.
12. Set the power switch to ON (left-hand side panel).
13. The system is ready for stand-alone operation or software installation.
14. For stand-alone operation, see the section (Section 3.3).
15. For software installation, see the *Doric Neuroscience Studio* manual. See chapter 4 for details on using the *Doric Neuroscience Studio* software.

3.2 FC Connector Installation

1. Clean the optical fiber connector before insertion. Use isopropanol and a lint-free wipe.
2. With an FC connector, the connector key must be oriented to enter within the receptacle slot to ensure proper connection (Fig. 3.1).

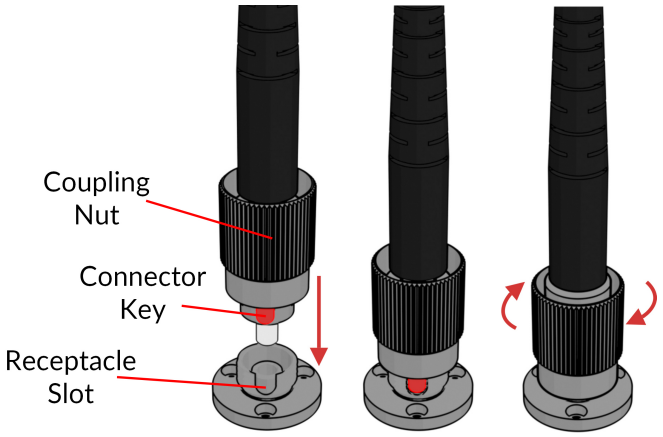


Figure 3.1: *FC connector, Fiber Installation*

⚠ To reduce the risk of eye injury, **it is sound practice to NOT CONNECT/DISCONNECT OPTICAL FIBERS when the light source is turned on**.

3.3 Stand-alone Operating Instructions

The following sections details stand-alone operation of the *LD driver*. For installation of the *LDFLS* in stand-alone mode, see section 3.1.

3.3.1 Driver operation modes with the stand-alone device

If the light source driver is used as a stand-alone device, 3 modes are available: constant current (CW), external TTL (Ext. TTL), and external Analog (Ext. Ana). The operating mode is changed by pressing the **Control knob**. The maximal driving current is set by turning **Control knob**. Use a fast/slow rotation for coarse/fine adjustment. The operating mode and the maximum driving current setting are independently adjusted for each channel.

Constant current (CW)

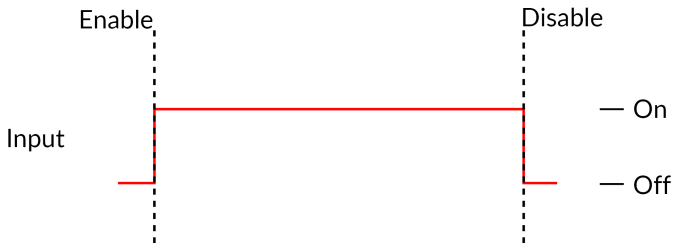


Figure 3.2: *Constant Current Mode Driver Signal*

When using the CW mode, the user simply sets the driving current applied to the light source. The light source is activated and an output beam will be visible as long as the driving current is above the minimum driving current (Fig. 3.2).

External TTL (TTL)

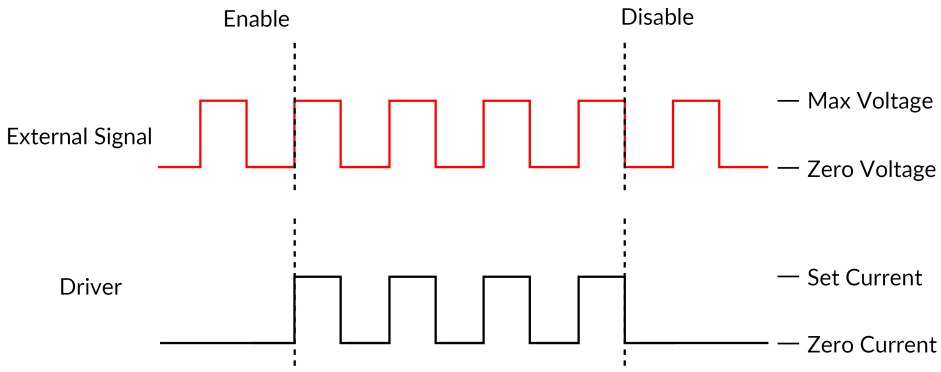


Figure 3.3: *Driver Signal Response to External Source in External TTL Mode*

In the External TTL mode, the driver is activated by an input TTL signal coming from an external device. This activation will follow the TTL pulse waveform. The driving current is set with the control knob, and is constant during each TTL activation pulse.

External Analog (Ext. Ana.)

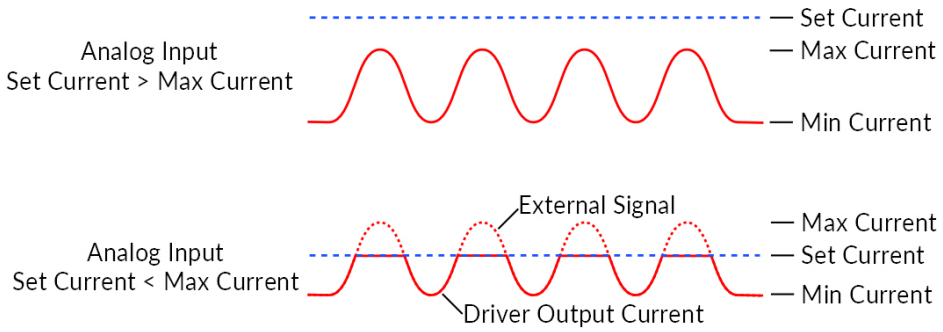


Figure 3.4: *External analog pulse sequence behavior*

The External Analog mode is similar to the External TTL, except that the driving current is proportional to the voltage applied on the BNC input connector (Fig. 3.4, top). On the input BNC, a maximum voltage signal corresponds to a maximum driver current. Should the current set on the light source be less than the maximum current, any voltage corresponding to a higher current will clip the output waveform (Fig. 3.4, bottom). To avoid any clipping of the output waveform, the maximum current setting must be equal to or greater than the corresponding maximum analog input voltage.

4

Doric Neuroscience Studio

4.1 Light Sources

Doric Light Sources can be controlled by the Doric Neuroscience Studio. These include *LED Modules*, *Laser Diode Modules* and *Ce:YAG Fiber Light Source*. The interface is separated into two main sections, **Control & settings** and the **Acquisition View**. Each light source driver has a number of **Channels**, each one controlling a light source of its given type. These channels, accessible using the **Add Channel** will be the first detailed.

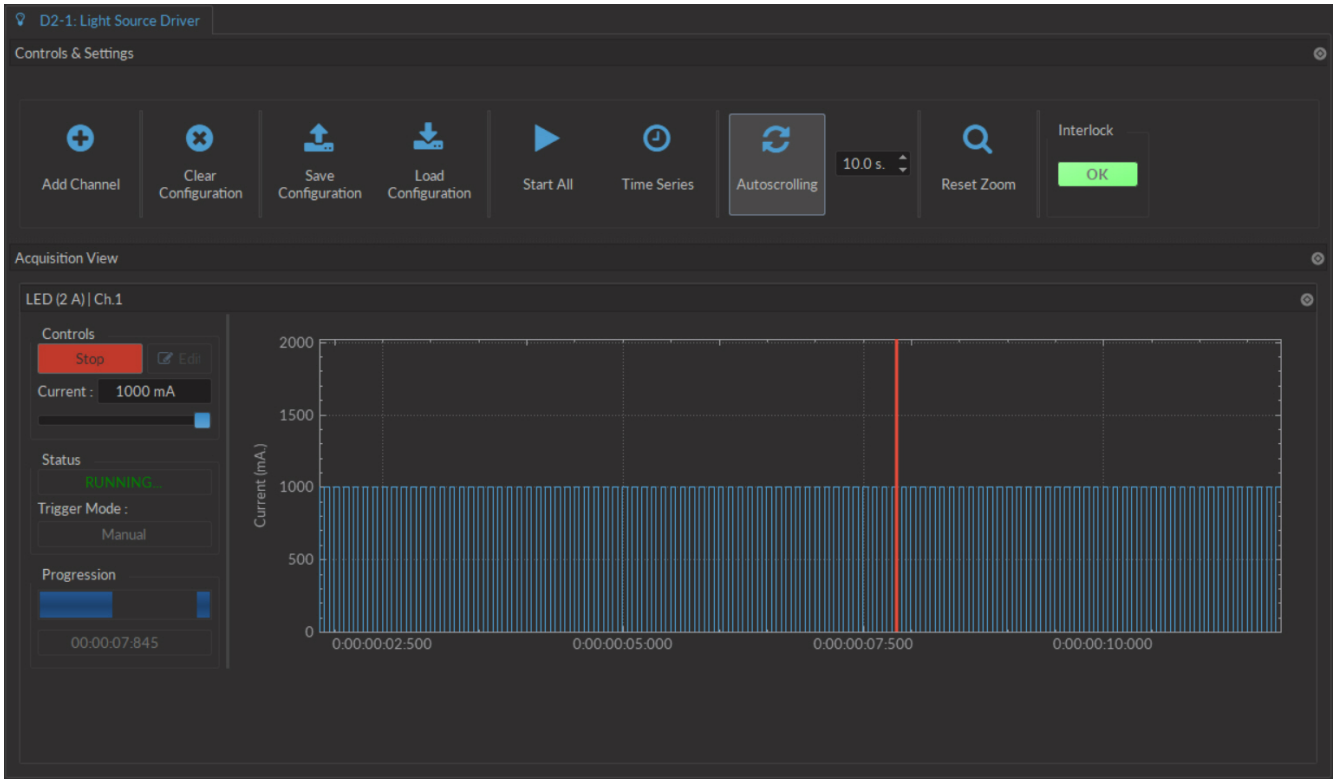


Figure 4.1: *Light Source Driver Tab*

4.1.1 Channels

Each light source driver is separated into a number of **Channels**. Each channel controls a single light source. While each channel can be controlled in **Stand-alone** mode by the driver, additional functions can be accessed for these channels when the driver is connected to the Doric Neuroscience Studio. These function are used through the **Channel Configuration** window (Fig. 4.2).

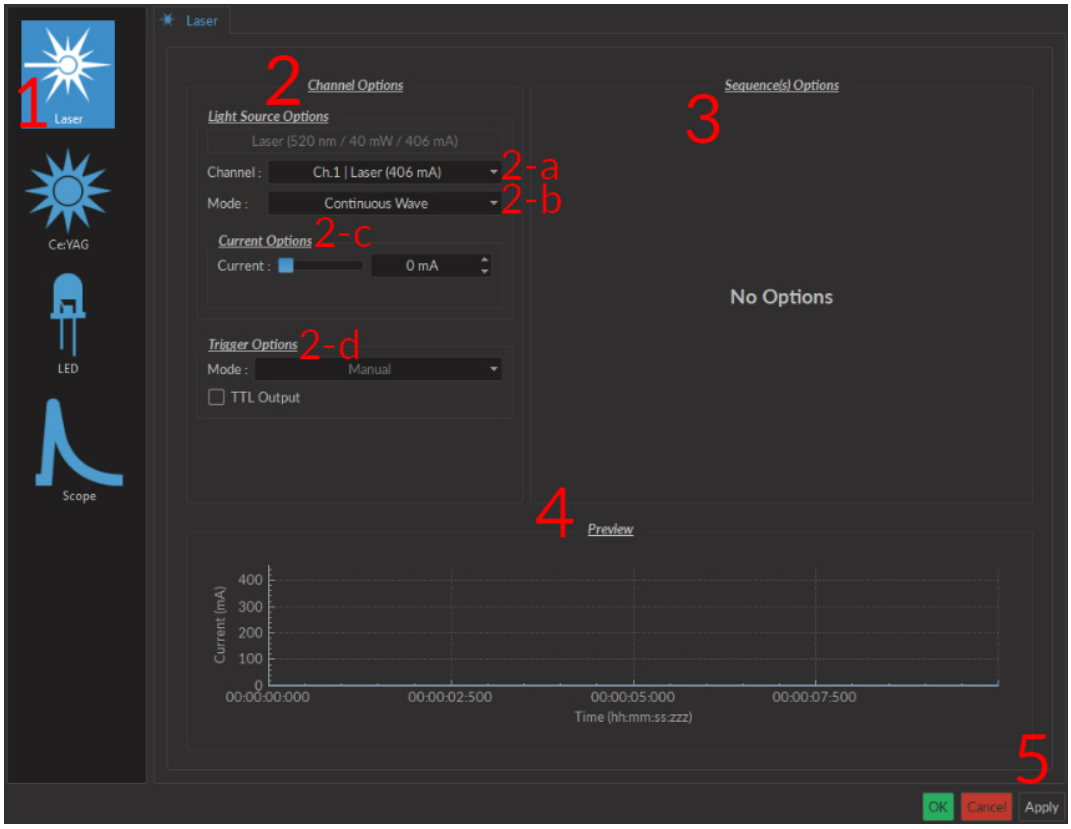


Figure 4.2: *Light Source Channel Configuration Window*

1. The **Channel Types** (Fig. 4.2) are displayed on the left side of the window. These include **Laser** light sources, **Ce:YAG** light sources and **LED** light sources, as well as the **Scope** to measure signal using the driver.

2. The **Channel Options** box (Fig. 4.2) includes **Light Source Options** and **Trigger Options** for the given channel.

    a) The **Channel** (Fig. 4.2) drop-down list identifies which driver channel is currently being edited, assuming a driver with multiple channels.

    b) The **Mode** (Fig. 4.2) drop-down list includes each possible driver mode. These are used to control the pulse sequences emitted by the light source. The options related to this mode are detailed with the **Sequence Options**.

    c) The **Current Options** (Fig. 4.2) includes the slider used to control the current sent to the light source.

    - When using a *LED Driver* module, the **Overdrive** checkbox will appear. When selected, this allows the system to exceed the normal safe current limit of the light source. **THIS SHOULD ONLY BE USED WITH PULSED SIGNALS, AS IT CAN OTHERWISE DAMAGE THE LIGHT SOURCE.**
    - When using a *LEDD*, the **Low-Power** checkbox will appear. When selected, this allows reduced-power signaling for the same voltage. This mode is only available for *CLED* modules. This allows low-power signals to be more stable in time. The maximal current is reduced to one tenth of light source's normal maximal current. If the **BNC Output** is used, the voltage of the signal is proportional to the current passing through the light source, and not the voltage sent to it. For example, a driver with a normal maximum current of 2000 mA for a 5 V signal (400 mA/V) will have a maximum current of 200 mA for a 5 V signal (40 mA/V). The **BNC output** of the driver will still relate LED current with a 400 mA/V conversion factor.

    d) The **Trigger Options** (Fig. 4.2) allow the selection of a number of trigger modes to activate a pulse sequence.

    - The **Manual** trigger mode is standard, and allows direction activation by the user.
    - The **Triggered** trigger mode is active when an input greater than 4 V is detected on the BNC input. Following input pulses will be ignored while the sequence is running. The sequence will restart with the arrival of the first input pulse after the sequence has finished.

- The **Gated** trigger mode is active as long as there is a high TTL signal (4 V or more) on the input modulation BNC. This signal comes from a different light source or device driver. When the TTL signal is low (0.4 V or less), the sequence stops and waits for another high TTL signal to continue.
- If the **TTL Output** option is checked, the output BNC channel can be used as a TTL generator. The monitoring signal will provide a TTL signal instead of an analog voltage output proportional to the LED current. The output will send out a 5 V signal whenever the input current is >0 mA. This can be used even if a light source is not connected.

3. The **Sequence options** box (Fig. 4.2) is where sequence options are defined depending on the mode. The **Continuous wave, External TTL** and **External Analog** modes have no additional sequence options.

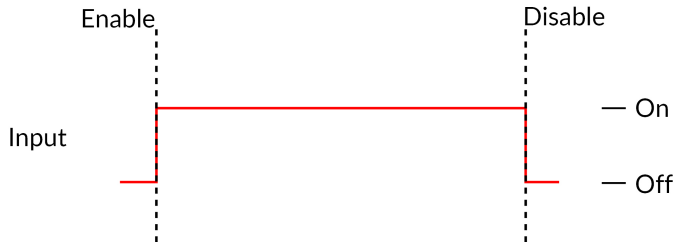


Figure 4.3: *Constant Current Mode Driver Signal*

a) The **Continuous Wave** mode (Fig. 4.3) produces a continuous signal at the chosen current. This mode can only be triggered manually. When this mode is active, the driver channel will show **CW** under **MODE**. This mode has no additional sequence options.

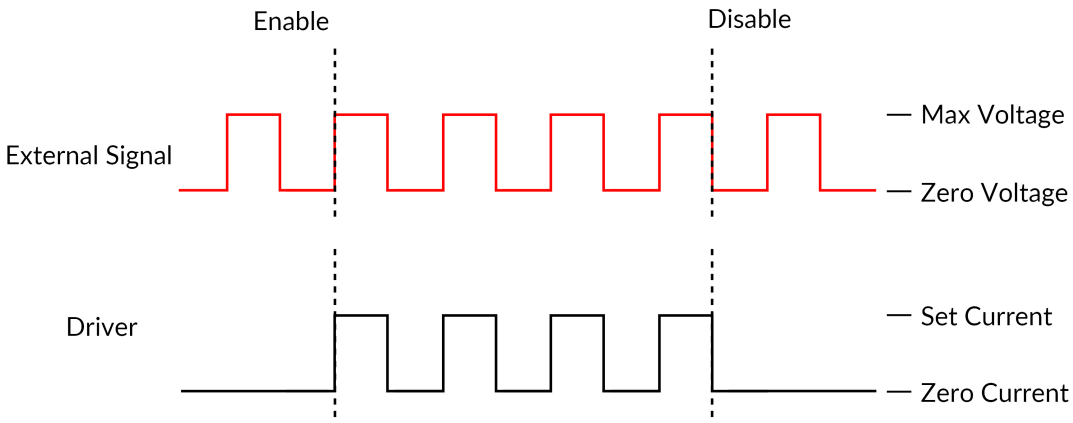


Figure 4.4: *Driver Signal Response to External Source in External TTL Mode*

b) The **External TTL** mode (Fig. 4.4) has the light source follow a TTL signal provided by an external source connected to the **BNC Input**. When this mode is active, the driver channel will show **TTL** under **MODE**. This mode has no additional sequence options.

c) The **External Analog** mode (Fig. 4.5) is similar to the External TTL, except that the current will be set by the voltage on the BNC input (Fig. 4.5, top). On the input BNC, a maximum voltage signal corresponds to a maximum driver current. Should the current set on the light source be less than the maximum current, any voltage corresponding to a higher current will clip the output waveform (Fig. 4.5, bottom). To avoid any clipping of the output waveform, the maximum current setting must be equal to or greater than the corresponding maximum analog input voltage. See the corresponding light source manual to find the voltage/current relationship. This mode has no additional sequence options.

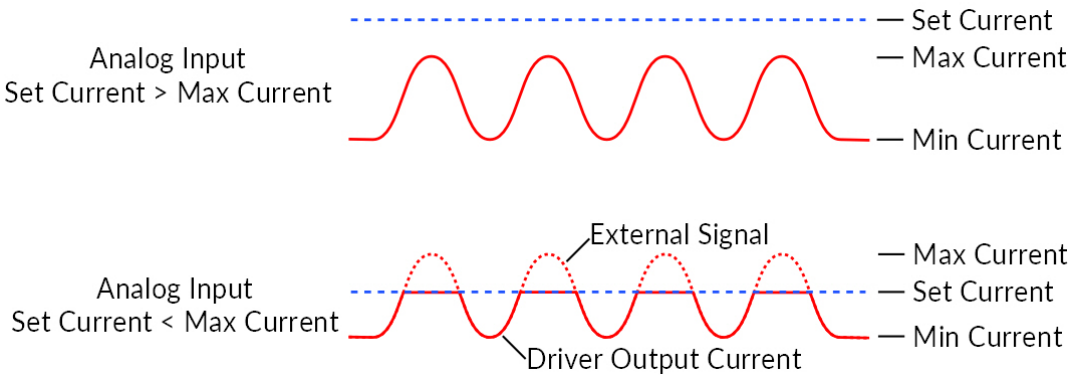


Figure 4.5: *Driver and Light Source in External Analog Mode*

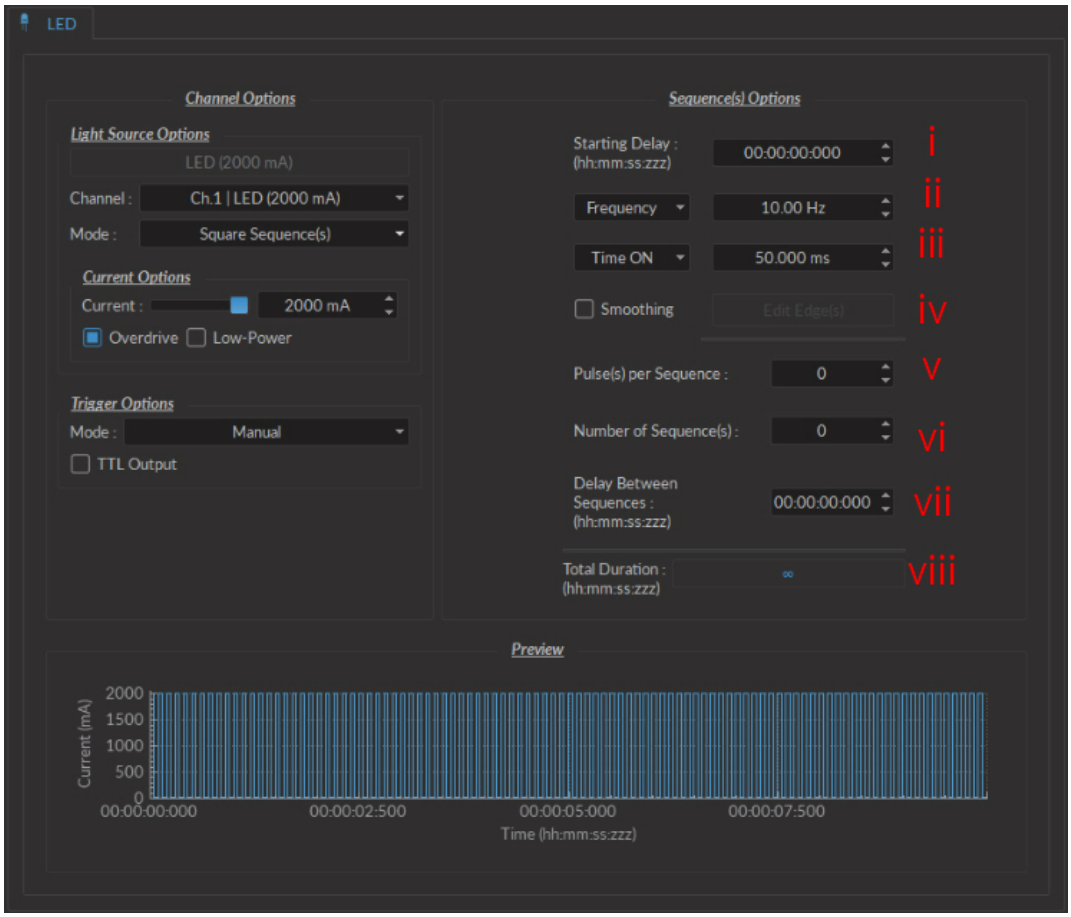


Figure 4.6: *Light Source Channel Configuration Window, square sequence options*

d) The **Square sequences** mode has the light source follow a square pulse sequence.
   i. The **Starting Delay** (Fig. 4.6) sets the delay (in hh:mm:ss:zzz format) before the first pulse.
   ii. The **Frequency/Period** (Fig. 4.6) sets the frequency (in Hz) or period (in ms) for the pulse sequence. For example, a signal at 10 Hz (frequency) will output one pulse every 100 ms (period), whereas a pulse sequence at 0.5 Hz (frequency) will output one pulse every 2000 ms (period).
   iii. The **Time ON/Duty Cycle** (Fig. 4.6) sets the time (in ms) or the duty cycle (in %) for each pulse. The **Time ON** must be lower than (1/frequency)+0.005 ms, while the **Duty cycle** must be below 100 %. These squares will appear red should an impossible **Frequency**/**time ON** be selected. Should the **Smoothing** option be selected, this feature becomes inaccessible.

iv. The **Smoothing** option is used to change the pulse slope in square pulse sequences. The **Edit Edges** button opens the **Smoothing Edge(s)** window (Fig. 4.7).

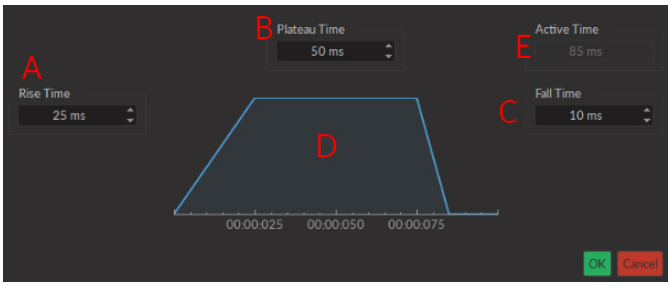


Figure 4.7: *Light Source Smoothing Edge(s) Window*

A. The **Rise Time** box is used to define the duration to rise from 0 to the pulse maximum.
B. The **Plateau Time** box is used to defined the duration the pulse is at its maximum value.
C. The **Fall Time** box is used to define the duration to descend from the pulse maximum to 0.
D. The **Pulse Graph** displays the pulse shape.
E. The **Active Time** box displays the total duration of the pulse. While the **Smoothing** option is active, the **Time ON** is fixed at this value.

v. The **Pulses per sequence** (Fig. 4.6) sets the number of pulses per sequence. If it is set to 0, the pulse will be repeated indefinitely.

vi. The **Number of sequences** (Fig. 4.6) sets the number of times that the sequence will be repeated. If it is set to 0, the sequence will be repeated indefinitely.

vii. The **Delay between sequences** (Fig. 4.6) sets the delay (in hh:mm:ss:zzz format) between each sequence if the **Number of Sequences** is greater than 1.

viii. The **Total Duration** (Fig. 4.6) displays the total time of the experiment. The different values can be *Inf* for infinite, a valid time value or *Err* if the **Time ON** value is greater than 1/frequency.

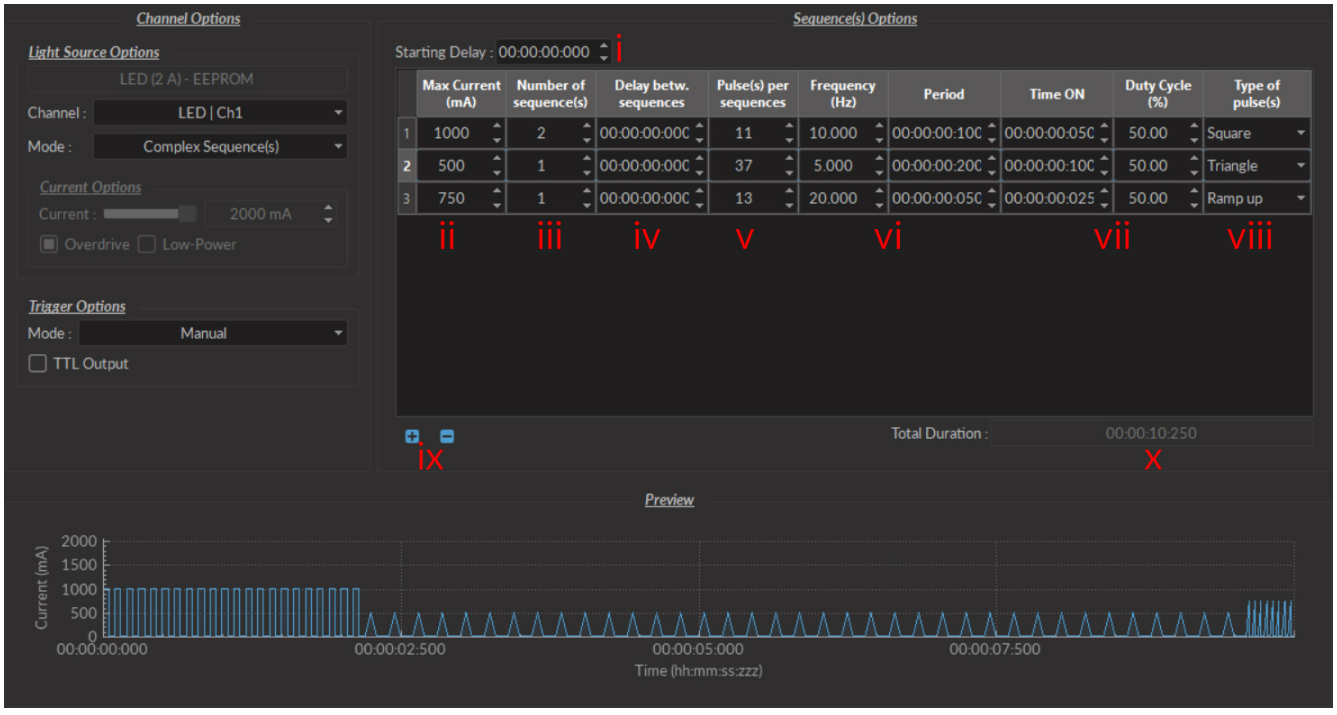


Figure 4.8: *Complex Sequences Window*

e) The **Complex Sequences** mode mode allows the design of complex pulse sequences. Multiple sequences can be combined to create a more elaborate pulse sequence. These are displayed in a spreadsheet format.

i. The **Starting Delay** (Fig. 4.8) sets the delay (in hh:mm:ss:zzz format) before the first pulse sequence.
ii. The **Max Current** (Fig. 4.8) sets the maximum current (in mA) for the given sequence.
iii. The **Number of sequences** (Fig. 4.8) sets the number of times that the sequence will be repeated, with a minimum of 1.
iv. The **Pulses per sequence** (Fig. 4.8) sets the number of pulses per sequence, with a minimum of 1.
v. The **Delay between sequences** (Fig. 4.8) sets the delay (in hh:mm:ss:zzz format) between each sequence if the **Number of Sequences** is greater than 1.
vi. The **Frequency/Period** (Fig. 4.8) sets the frequency (in Hz) or period (in ms) for the pulse sequence. These two values are linked, and when one is changed the other will adjust automatically. For example, a signal at 10 Hz (frequency) will output one pulse every 100 ms (period), whereas a pulse sequence at 0.5 Hz (frequency) will output one pulse every 2000 ms (period).
vii. The **Time ON/Duty Cycle** (Fig. 4.8) sets the time (in ms) or the duty cycle (in %) for each pulse. These two values are linked, and when one is changed the other will adjust automatically. The **Time ON** must be lower than (1/frequency)+0.005 ms, while the **Duty cycle** must be below 100 %.

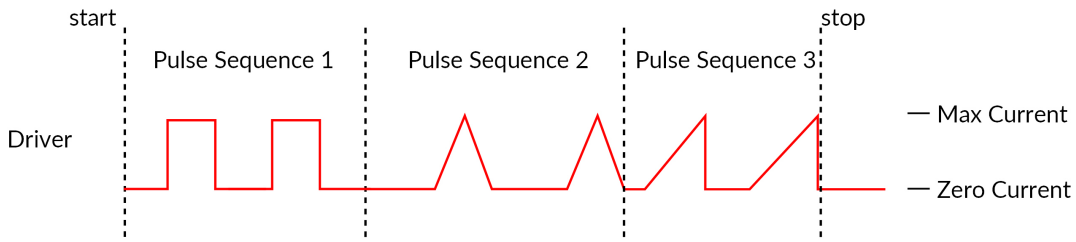


Figure 4.9: *Internal Complex Mode Pulse Sequences*

viii. The **Types of pulses** (Fig. 4.8) sets the pulse type. Pulses can be **Square**, triangular (**Triangle**), **Ramp up Ramp down** or **Delay** (Fig. 4.9). The **Delay** pulse type is used to create a delay between different sequence
ix. The **Sequence controls** (Fig. 4.8) allow the addition (**+**) or removal (**-**) of sequences to the spreadsheet.
x. The **Total Duration** (Fig. 4.8) displays the total time of the experiment. The different values can be *Inf* for infinite, a valid time value or *Err* if the **Time ON** value is greater than 1/frequency.

f) The **Scope** mode allows the measurement of electrical signal using the driver (Fig. 4.10). The signal is received by the Input BNC of the chosen channel on the light source driver.

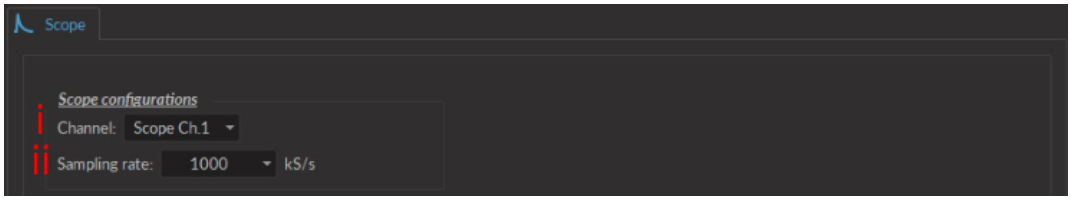


Figure 4.10: *Scope*

i. The **Channel** drop-down list indicated which driver channel will be used to receive signal. The chosen can be used to drive a light source while serving as a scope.
ii. The **Sampling Rate** drop-down list allows the selection of the rate (in kilosamples per second) at which measurements are taken.

4. The **Preview** box (Fig. 4.2) displays a preview of the chosen sequence while in the **Continuous Wave**, **Square Sequences** and **Complex Sequences** mode.

5. The **Apply** button (Fig. 4.2) will generate the defined channel OR update an already configured channel with any changes.

4.1.2 Control & Settings

The **Control & settings** sections is used to control the light source. It includes the following elements.

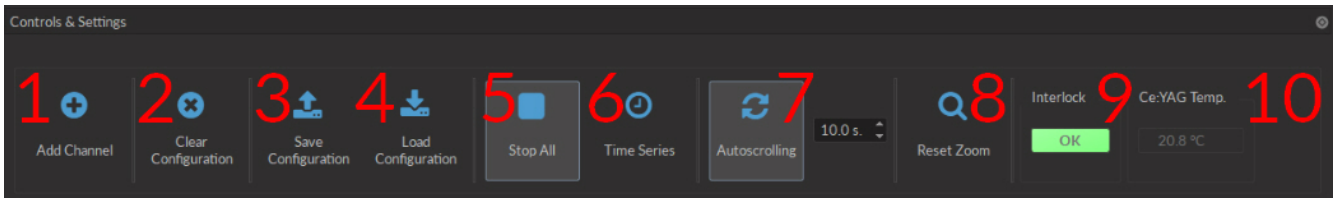


Figure 4.11: *Control & Settings*

1. The **Add channel** button (Fig. 4.11) opens the **Channel Configuration** window 4.2. See section 4.1.1 for more details.
2. The **Clear Configuration** button (Fig. 4.11) clears all configuration channels. Cleared channels cannot be recovered unless previously saved.
3. The **Save configuration** button saves all currently configured channels in **.doric** format.
4. The **Load configuration** button loads a file in **.doric** format that contains a previously saved set of configured channels.
5. The **Start All** button (Fig. 4.11) starts all currently configured channels.
6. The **Time Series** button opens the **Time Series** window. This tool allows all channels to share the same timing.

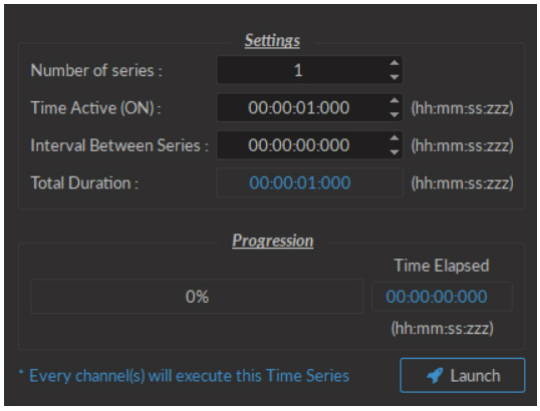


Figure 4.12: *Control & Settings, Time Series Window*

- The **Number of series** (Fig 4.12) sets the number of times that the sequence will be repeated, with a minimum of 1.
- The **Time Active** sets the duration of each series in hh:mm:ss:zzz format. If the **Time series** is used in combination with a sequence, the **Time Active** should be greater than the sequence **Total Time** If the **Time Active** is shorter, the sequence will be stopped after the **Time Active**.
- The **Interval between series** sets the duration between each series in hh:mm:ss:zzz format.
- The **Total Duration** displays the total duration of the sequence in hh:mm:ss:zzz format.
- The **Progression** bar displays the progression of the sequence in %, while the **Time Elapsed** counter displays the progression in hh:mm:ss:zzz format.
- The **Launch** button starts the sequence.

7. The **Autoscrolling** button activates the autoscroll function. When active, the **Graph** in the **Acquisition View** will follow a section as wide as the time defined beside the button.

8. The **Reset Zoom** button resets the axes in the **Graph** to their standard values.

9. The **Interlock** indicator displays OK when the interlock is correctly connected, and OPENED when disconnected.

10. The **Ce:YAG Temp** indicator displays the temperature of the *Ce:YAG source* in real time. This indicator will only appear when a *Ce:YAG driver* is connected to the computer. Should the temperature be too high the temperature will appear in red. Should the temperature be too low, the temperature will appear in blue.

4.1.3 Experiment View

The **Experiment View** box is used to display information related to the usage of each channel. This section allows limited control of the light source while it is active.

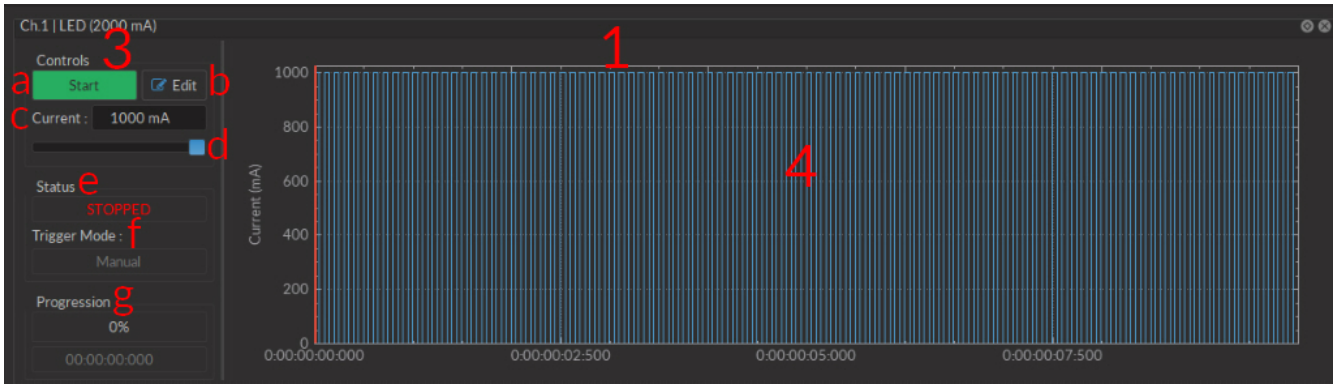


Figure 4.13: *Experiment View, Light Source Channel*

1. The **Light Source Channel** box (Fig. 4.13) contains all elements related to a single light source channel.

2. The **Scope Channel** box (Fig. 4.14) is used to control and configure an active **Scope**.

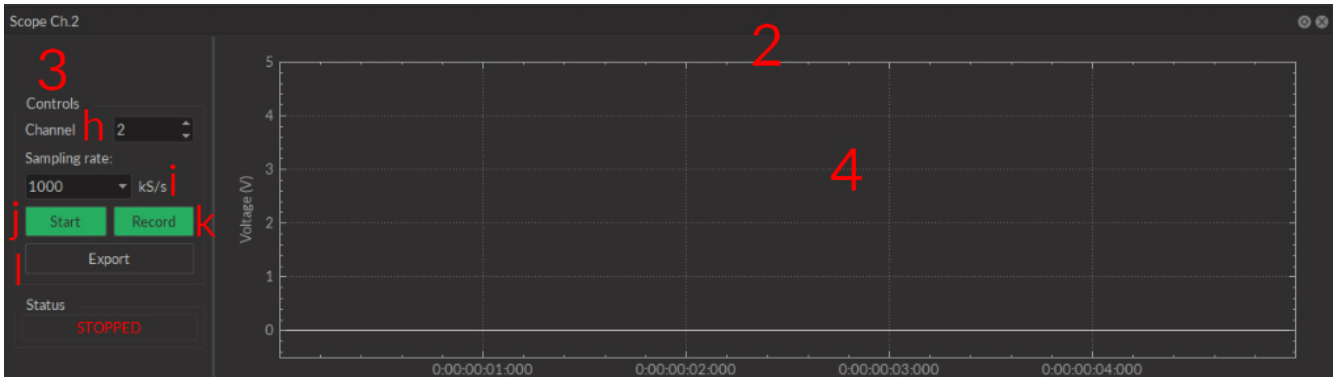


Figure 4.14: *Experiment View, Scope Channel*

3. The **Controls View** displays all elements to control/configure the channel.

   a) The **Start/Stop** button activates/deactivates the light source connected to the **Light Source Channel**.

   b) The **Edit** button opens the **Channel configuration** window to edit the pulse sequence. This button is only accessible when the channel is deactivated.

   c) The **Current Box** box allows the current to be changed exactly (in mA).

   d) The **Current Slider** allows the light source current to be adjusted.

   e) The **Status** box displays the status of the channel (**Light source** or **Scope**). The **Status** will display RUNNING... when active and STOPPED when deactivated.

f) The **Trigger Mode** of the light source is displayed in this box.

g) The **Progression** box displays the progression of the pulse sequence.The advancement of the sequence is displayed % on the **Progression bar**, and in hh:mm:ss:zzz format on the **Time Elapsed** box.

h) The **Channel** drop-down list is used to chose the channel used as a scope.

i) The **Sampling Rate** drop-down list allows the selection of the rate (in kilosamples per second) at which measurements are taken.

j) The **Start** scope channel button activates a live measurement sequence. Important measurements should not be made as a live measurement, as these only conserve a small amount (60 s) of data.

k) The **Record** scope channel button starts a recorded measurement sequence.

l) The **Export** scope channel button allows the recording of a live measurement sequence on the scope.

4. The **Graph View** displays either a preview of the pulse sequence for **Light Source Channels** or the received signal for the **Scope Channel**.

5

Specifications

Table 5.1: *General Specifications*

SPECIFICATIONS	VALUE	NOTES
Optical Receptacle	FC/APC	
Power supply	110 - 240 VAC; 50 - 60 Hz	Power supply adapter included
DC Power Supply		
1-channel model	12 VDC	20 W
2 & 4-channel model	12 VDC	60 W
Dimensions (L x H x D)		
1-channel model	17,5 x 5,0 x 10,5 cm^3	Including connectors
2-channel model	23,4 x 5,0 x 10,5 cm^3	Including connectors
4-channel model	3,5 x 5,0 x 10,5 cm^3	Including connectors

Table 5.2: *Electronic and Software Specifications*

SPECIFICATION	VALUE	NOTE
TTL input voltage	0 to +5 VDC	
Display Current Accuracy	2% @ maximum rated current	Error increases at lower current.
Analog input voltage	80 mA/V light source current	If applicable: see datasheet
BNC output voltage	12.5 V/A	If applicable: see datasheet
Maximum Output Current Range	LD Model dependent	Maximum 400 mA
Maximum Forward Voltage	10 V	-
Minimum output current	25 mA	Model dependent; see data sheet
Display Current Accuracy	2% @ maximum rated current	Error increases at lower current.
Rise/Fall time	<10 µs	Typical
Modulation Minimum Frequency	0.01 Hz[1]	Internal complex mode : 0.000054 Hz
Modulation Maximum Frequency	50 kHz	-3 dB attenuation
Minimum ON or OFF time	0.005 ms[1]	Internal complex mode : 2 ms
Maximum ON or OFF time	100 s[1]	Internal complex mode : 5 h
Maximum number of pulses per sequence	16.68 millions[1]	Internal complex mode : 65 535
Maximum number of sequences	4.2 billions[1]	Internal complex mode : 65 535
Minimum step increments	39 µsec	Internal complex mode only
Number of steps per period	128	Internal complex mode only
Scope Acquisition speed	10 kS/s	Single channel

[1] For all operation modes, except the internal complex mode

6

Support

6.1 Maintenance

The product does not require any maintenance. Do not open the enclosure. Contact Doric Lenses for return instructions if the unit does not work properly and needs to be repaired.

6.2 Warranty

This product is under warranty for a period of 12 months. Contact Doric Lenses for return instructions. This warranty will not be applicable if the unit is damaged or needs to be repaired as a result of improper use or operation outside the conditions stated in this manual. For more information, see our Website.

6.3 Contact us

For any questions or comments, do not hesitate to contact us by:

Phone 1-418-877-5600

Email sales@doriclenses.com

HongKe 虹科

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