带光纤旋转接头的LED

用户手册

Version 2.1.4

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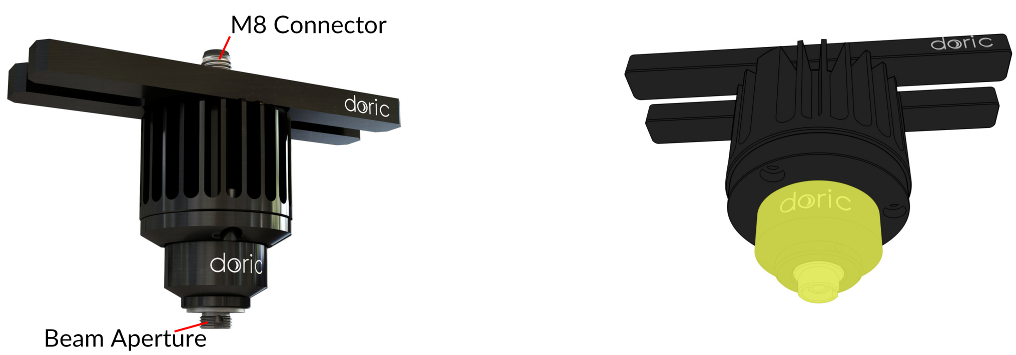
1

General Overview

1.1 LED + Fiber-optic Rotary Joint

The Doric *LED + Fiber-optic Rotary Joint* are rotary joints integrated with one or several LEDs. This allows higher throughput in comparison with conventional **Fiber-optic Rotary Joints** combined with a *Connectorized LED light source*.

1.1.1 Connectorized LED with Fiber-optic Rotary Joint



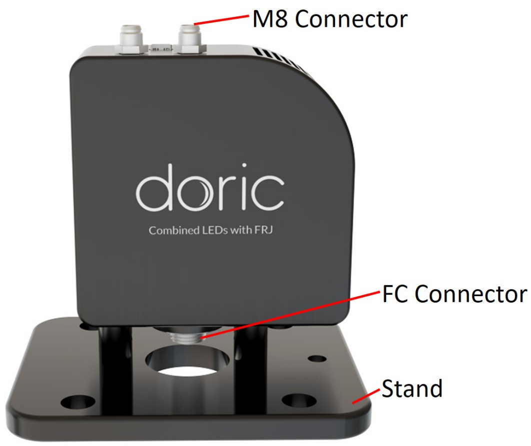
(a) *Standard mount* (b) *Rotor (Yellow) and stator (black)*

Figure 1.1: *Connectorized LED with Fiber-optic Rotary Joint*

The *Connectorized LED with Fiber-optic Rotary Joint* is a rotary joint with a single integrated LED. The light source is integrated into the **Stator (Black)**, with the light leaving through the **Rotor (Yellow)** (Fig. 1.1b). It has the following elements.

- The **M8 connector port** is used to provide power to the LED. The pinout can be found in Figure 4.1.
- The **Beam aperture** outputs light. The standard model uses an FC-type connector.

1.1.2 Combined LEDs with fiber-optic rotary joint



(a) *2-LED model*

(b) *3 or 4-LED model*

Figure 1.2: *Combined LEDs with fiber-optic rotary joint*

The *Combined LEDs with fiber-optic rotary joint* are composed of a standard *Combined LED* body where the **FC connector** has been replaced with a **Fiber-optic rotary joint**. The light sources are integrated into a **Stator**, with the light leaving through a **Rotor**. They contain the following elements.

- The **M8 connector ports** are used to provide power to the LEDs. There is a single port per LED. The pinout can be found in Figure 4.1.
- The **Beam aperture** outputs light. The standard model uses an FC-type connector.
- The **Fan grids** are found on the sides. They must be kept clear at all times to prevent overheating.
- The **Power Input 5VDC** is used to power the light source fans using a 5V power supply provided with the light source.
- The **Stand** is used to hold the LED vertically for easy use of the rotary joint.

1.2 LED Driver

The *LED driver* is used to provide power and control of various LED modules. The *Connectorized LED with Fiber-optic Rotary Joint* can be used with the *1, 2 or 4-channel LED driver*. The *Combined LEDs with fiber-optic rotary joints* can be used with any driver having at least as many channels as the number of combined LEDs. For more details on driver specifications and operation, see the LED Driver Manual.

Figure 1.3: *1,2 and 4-channel LED Driver*

2

Operations Guide

2.1 Getting Started

1. Installation depends on the specific source chosen.

   - If using the *Single-LED* model, the rotary joint must first be installed in its holder (*Holder_FRJ_large*, *GH_FRJ*). It can then be mounted into the setup using 1/4 or M6 nuts and screws.
   - If using a *Combined LED* model, the holder is already integrated. It can then be mounted into the setup using 1/4 or M6 nuts and screws.

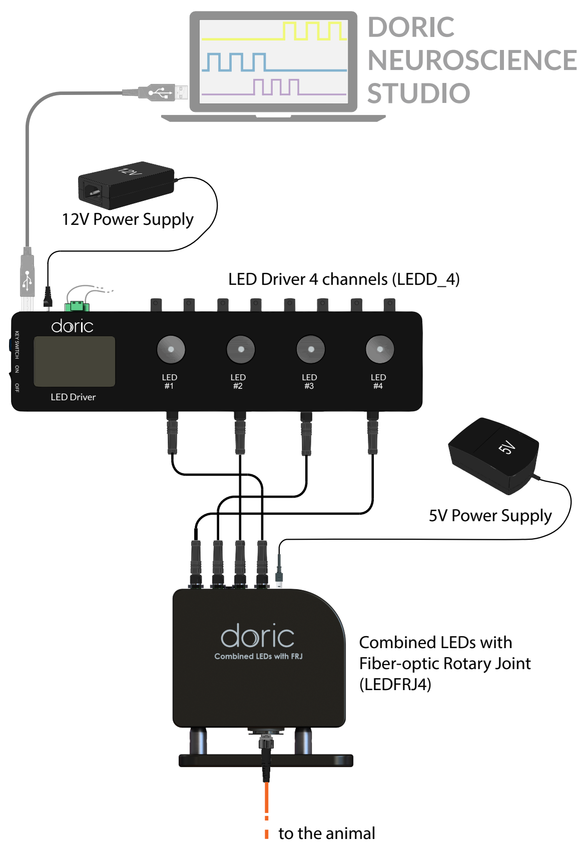


Figure 2.1: *LEDFRJ connection schema*

2. Connect the Doric *LED Driver* to the 12 V power supply and the LEDFRJ to the 5 V power supply (for the 2, 3, and 4 channels).
3. Connect each channel of the LED driver to the corresponding input connectors of the *LEDFRJ* using M8 cables.
4. Ensure the power key and the interlock plug are properly set in place.
5. Connect the LED Driver to a computer with Doric Neuroscience Studio Software with USB cable or to a triggering device on the LED Driver BNC Input to command the LEDs.
6. Apply current and voltage within the limits indicated in table 4.3.

Notes:

- On the *Combined LED* models, it is critical not to block or insert objects into the grids as this could block airflow and reduce cooling efficiency.
- When not in use, place plastic caps on the connectors for protection and cleanness.

2.2 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. 2.2).

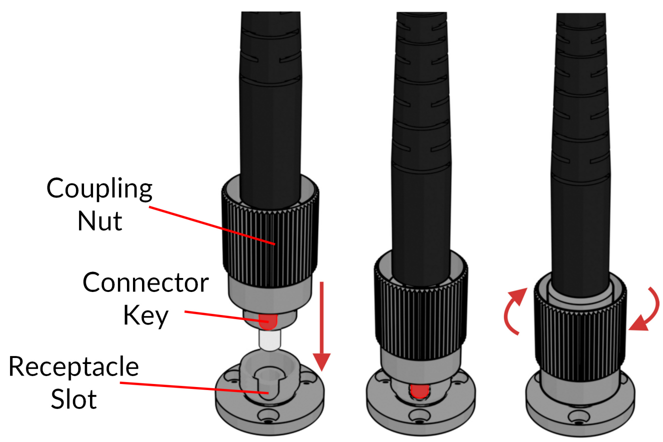


Figure 2.2: *FC connector, Fiber Installation*

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

2.3 Stand-alone mode (without Doric Neuroscience Studio Software)

The following sections details stand-alone operation of the *LED driver*. For installation of the *LEDFRJ* in stand-alone mode, see section 2.1.

2.3.1 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)

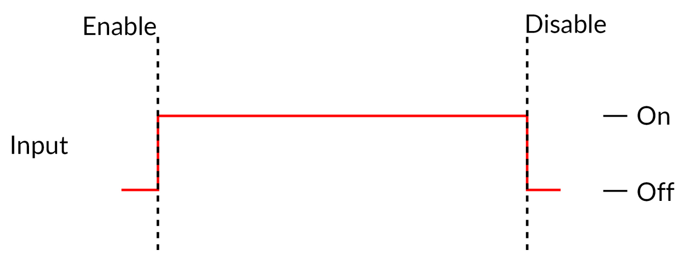


Figure 2.3: *Constant Current Mode Driver Signal*

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. 2.3).

External TTL (TTL)

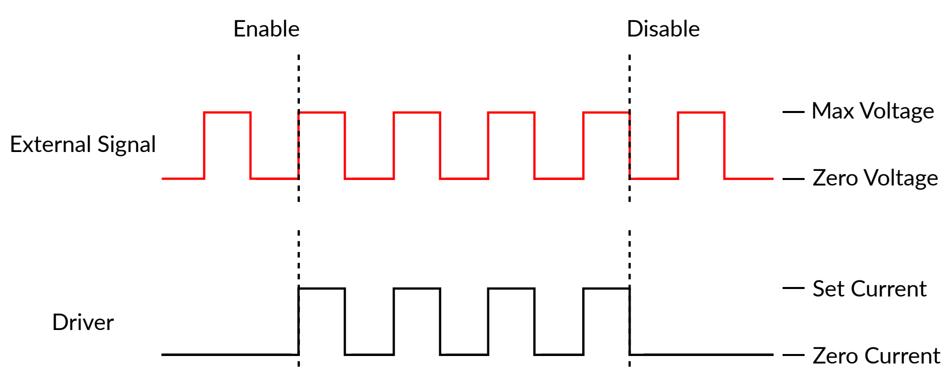


Figure 2.4: *Driver Signal Response to External Source in External TTL Mode*

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.

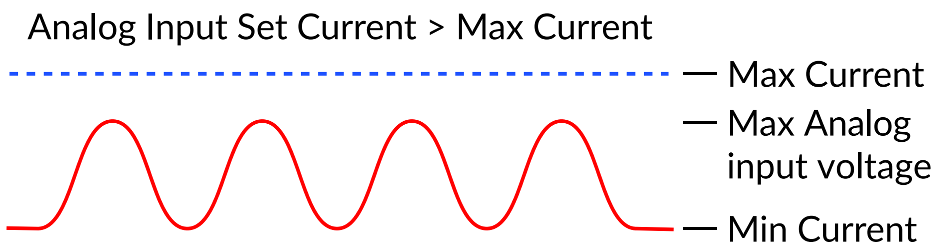


Figure 2.5: *External analog pulse sequence behavior*

External Analog (Ext. Ana.)

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. 2.5). On the input BNC, a maximum voltage signal corresponds to a maximum driver current.

2.4 Connected to Doric Neuroscience Studio Software

1. Connect the LED Driver to the power outlet with the included 12 V power adapter and turn the LED Driver switch ON. **Always power the LED Driver before connecting the USB cable to the computer for a proper driver installation.**
2. Install the Doric Neuroscience Studio Software on the computer. Double-click on the setup_DoricStudioX.X.exe file located on Doric USB memory stick supplied with the LED driver and follow the on-screen instructions.
3. Connect the **USB-A/USB-B cable** to the driver and the computer.
4. Connect each **M8 connector** of the **Combined LED** to the LED driver using an M8 electric cable.
5. With the system connected, the software can be used to control the device in **External TTL, External Analog, Internal TTL and Internal Complex** modes. See Chapter 3 for more details on using the software.

Doric Neuroscience Studio

Doric Light Sources can be controlled by the Doric Neuroscience Studio. These include *LED Modules*, *Laser Diode Modules* and *⋆LISER™ Light Source*[1]. 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** button, will be the first detailed.

3.1 Channel Configuration

3.1.1 Channel Configuration Window Overview

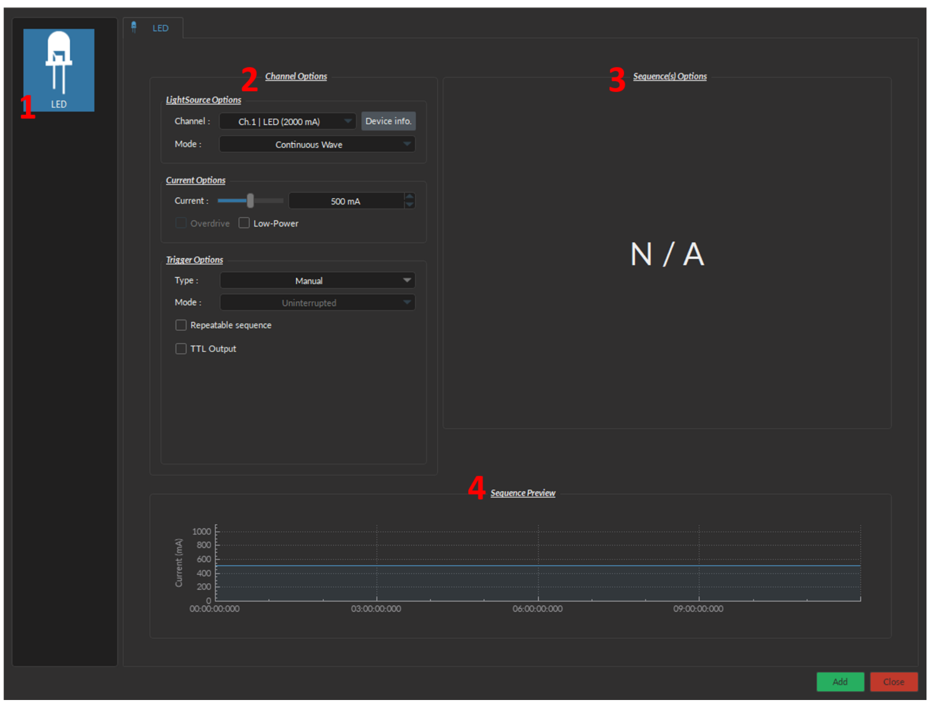


Figure 3.1: *Channels Configuration Main Interface*

The **Channels configuration** window is used to configure each channel. The window can be accessed by using either the **Add Channel** or **Edit** buttons. This window is separated into multiple sections shown in Figure 3.1 that are defined below.

1. The **Channel Types** are displayed on the left side of the window. These include the **⋆LISER™** light sources, the **LED** light sources and the **Laser Diode** light sources.

[1] The ⋆LISER™ Light Source are also known in older models as Ce:YAG Fiber Light Source.

2. The **Channel Options** section allows you to define the Light Source Option, the Current options and the Triggering Options. The different fields of this section are explained in more detail in section 3.1.2.
3. The **Sequence Options** defines the parameters of each pulse sequence for the channel. These parameters are different for each Channel Mode. The different fields for the different Channel Mode are explained in more detail in section 3.1.3.
4. The **Sequence Preview** section shows a visualization of the output sequence that will be generated by the current configuration.
5. The **Add** button will save the current channel configuration and enables a new channel to be configured. The **Close** button will close the window without saving the current channel configuration.

3.1.2 Channel Options Section

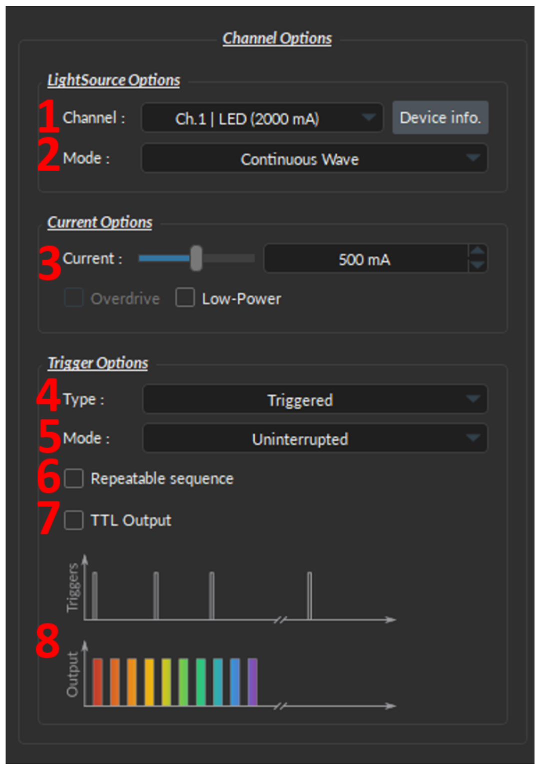


Figure 3.2: *Channel Options of the Channel Configuration Window*

The Channel Option section (Fig. 3.2) is separated in 3 sub-sections, the **LightSource Options** section that defines the channel and its mode, the **Current Options** and the **Trigger Options** section that control the trigger method of the selected channel.

LightSource Options

1. The **Channel** field identifies which of the available channels is currently being modified. The Light Source can be changed by selecting a new one from the drop-down list.
2. The **Mode** field identifies the mode used to generate the light. Five modes are available, **Continuous Wave** (fix current), **External TTL** (external digital command), **External Analog** (external analog command), **Square Sequence(s)** (internal digital command), and **Complex Sequences(s)** mode (internal analog command). Each mode enables different options of the Sequence Option section that are explained in more detail in section 3.1.3.

Current Options

3. The **Current Options** includes the slider used to control the current sent to the light source.

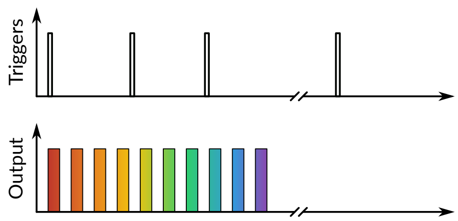
   - When using some *LED* module, the **Overdrive** checkbox will appear. When selected, this allows the system to exceed the normal safe current limit of the light source. **THIS SHOULD ONLY BE USED WITH PULSED SIGNALS, AS IT CAN OTHERWISE DAMAGE THE LIGHT SOURCE.**
   - When using a *CLED* module, the **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 to monitor the LED power, its output voltage 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) in low power mode. The **BNC output** of the driver will still relate LED current with a 400 mA/V conversion factor.

Trigger Options

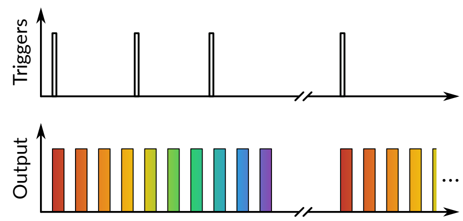
4. The **Type** defines the type of trigger that is used to start/stop a sequence. The **Triggered** type can starts and stops a sequence at a rising edge while the **Gated** type can starts the sequence at a rising edge and stops it at a falling edge. A more refined interaction of the trigger with the defined sequence can be set up using the **Mode** field. Not all Trigger Type are available for each combination of Trigger Mode and Repeatability. The different combinations are shown in Figure 3.7.

5. The **Mode** field defines how the trigger activates a sequence. Each mode are not compatible with each combination of trigger type and repeatability. Figure 3.7 shows the different available combinations for the different Trigger Modes. Four Modes are available and are the following:

   - **Uninterrupted**: This mode activates the channel sequence when an input greater than 3.3 V is detected by the BNC input. Following input pulses will be ignored while the sequence is running (Fig. 3.3). When the **Repeatable sequence** checkbox is checked, the sequence will restart with the arrival of the first input pulse after the sequence has finished (Fig. 3.3b). This mode is available for *Triggered* pulse only.
   - **Pause**: This mode activates the channel sequence when a rising edge greater than 3.3 V is detected on the BNC input (Fig. 3.4). Following input pulses (when *Triggered*, Fig. 3.4a) or falling edge (when *Gated*, Fig. 3.4c) will pause the sequence and the sequence will continue when the next rising edge is received. When the **Repeatable sequence** checkbox is checked, the sequence will restart with the arrival of the first input pulse after the sequence has finished (Figs. 3.4b and 3.4d).
   - **Continue**: This mode activates the channel sequence when a rising edge greater than 3.3 V is detected on the BNC input (Fig. 3.5). The following input pulse (when *Triggered*, Fig. 3.5a) or a falling edge (when *Gated*, Fig. 3.5c) will turn off the output, but the sequence will continue. The output will be turned back on at the reception of the following rising edge. Triggers only affect the output voltage value. When the **Repeatable sequence** checkbox is checked, the sequence will restart with the arrival of the first input pulse after the sequence has finished (Figs. 3.5b and 3.5d).
   - **Restart**: This mode activates the channel sequence when a rising edge higher than 3.3 V is detected on the BNC input. The following input pulse (when *Triggered*, Fig. 3.6a) or falling edge (when *Gated*, Fig. 3.6b) will stop the sequence and the sequence will restart from the beginning when the next rising edge is received. When the sequence is completed, it will restart with the next input pulse.

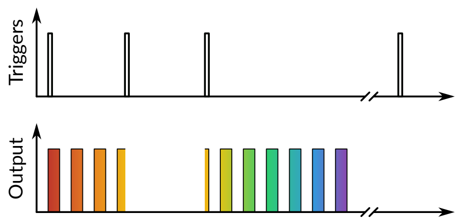


(a) *Triggered Non-Repeatable Sequence*

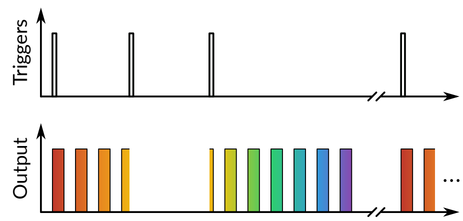


(b) *Triggered Repeatable Sequence*

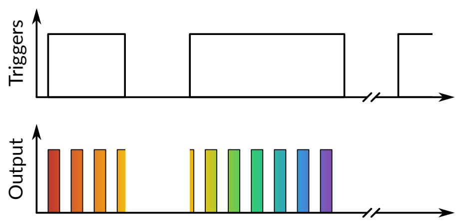
Figure 3.3: *Uninterrupted Sequence Mode*



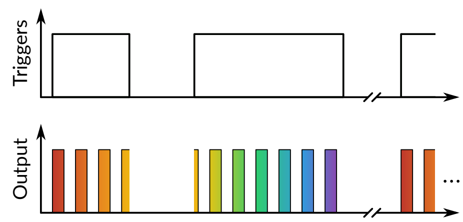
(a) *Triggered Non-Repeatable Sequence*



(b) *Triggered Repeatable Sequence*

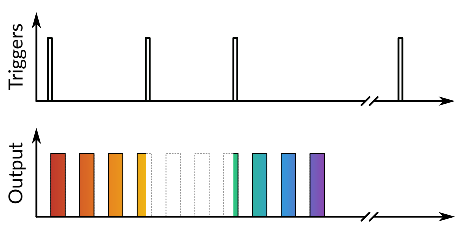


(c) *Gated Non-Repeatable Sequence*

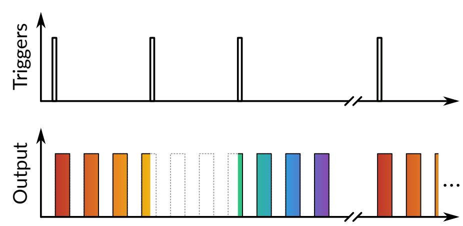


(d) *Gated Repeatable Sequence*

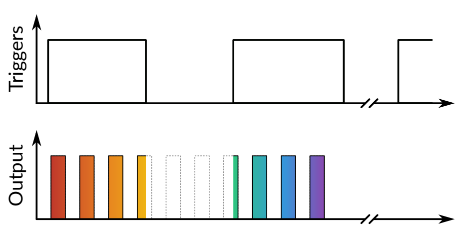
Figure 3.4: *Pause Sequence Mode*



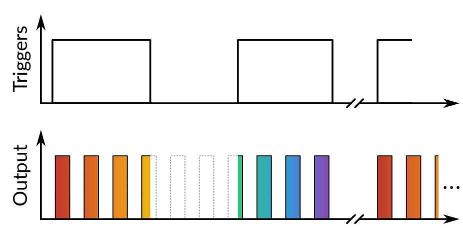
(a) *Triggered Non-Repeatable Sequence*



(b) *Triggered Repeatable Sequence*

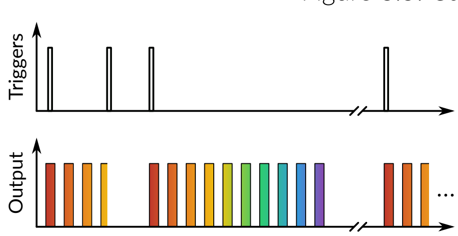


(c) *Gated Non-Repeatable Sequence*

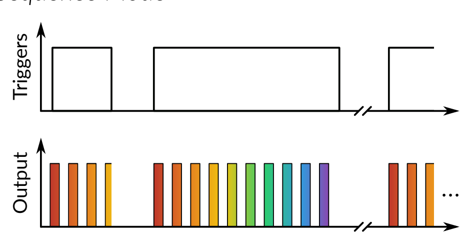


(d) *Gated Repeatable Sequence*

Figure 3.5: *Continue Sequence Mode*



(a) *Triggered Repeatable Sequence*



(b) *Triggered Gated Sequence*

Figure 3.6: *Restart Sequence Mode*

6. The **Repeatable sequence** checkbox, when selected, allows a sequence to be repeated. Not all modes and trigger types can be repeated. Please refer to the Figure 3.7 to know the repeatable sequence combinations.

7. The **TTL Output** checkbox, when selected, allows the output BNC channel to 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.

8. The **Sequence Visualisation** shows a graphical representation of the behavior of the selected Trigger Option Type, Mode and Repeatability.

	Triggered		Gated	
	Non-repeatable sequence	Repeatable sequence	Non-repeatable sequence	Repeatable sequence
Uninterrupted	✓	✓		
Pause	✓	✓	✓	✓
Continue	✓	✓	✓	✓
Restart		✓		✓

Figure 3.7: *Trigger options possibilities*

3.1.3 Sequence(s) Options Section

Continuous Wave

The **Continuous Wave** mode is used to set the Light Source to a chosen intensity without variations during experiments.

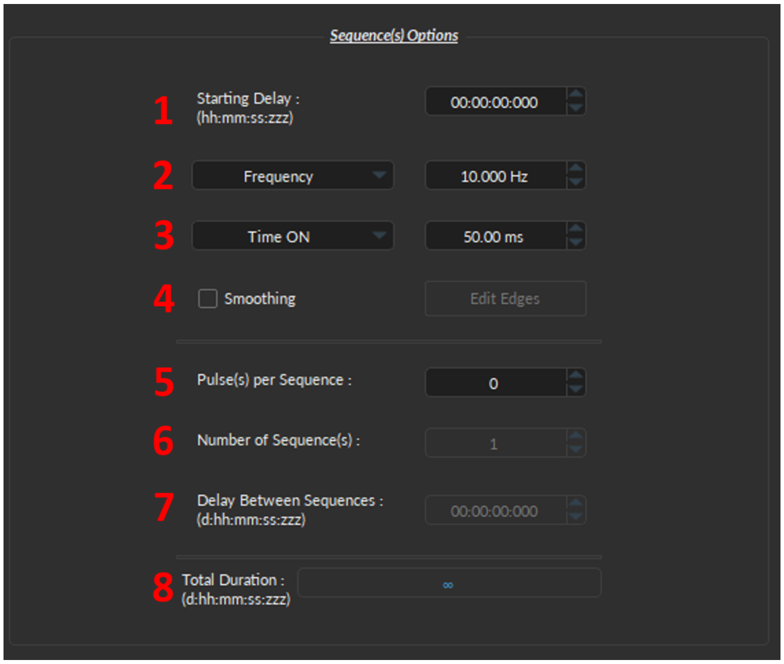
External TTL

The **External TTL** mode is used to drive the Light Source to a chosen intensity when the External TTL signal is high. When the External TTL signal is low, the Light Source is turned OFF.

External analog

The **External Analog** mode is used to drive the Light Source in function of the analog voltage used as input. The input voltage may varies between 0 V and 5 V and the intensity will follow the variations between 0 mA and the maximum current.

Square Sequence(s)



(a) *Square Sequence(s) Mode Interface*

(b) *Exemple of Error*

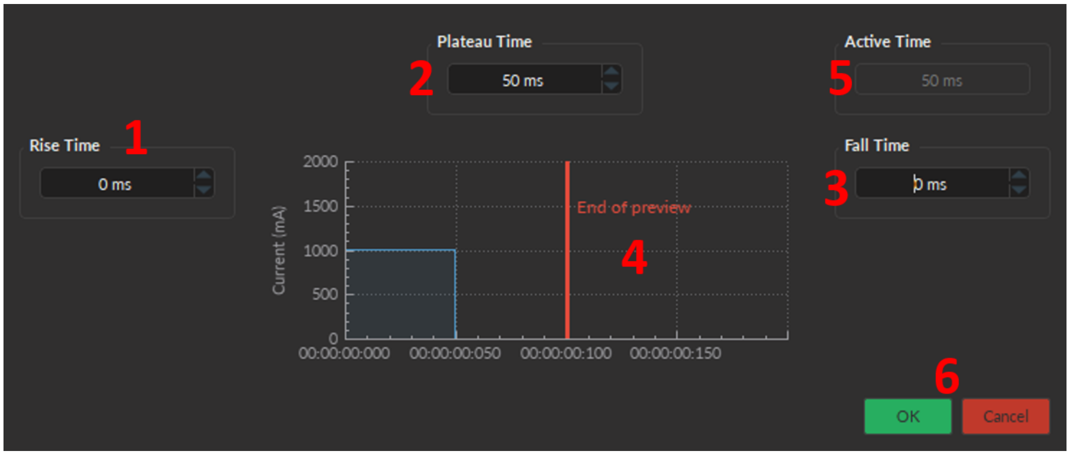
Figure 3.8: *Sequence Options of the Square Sequence(s) Mode.*

The **Square Sequence(s)** mode allows the creation of a square TTL pulse sequence. The Sequence(s) Options of this mode are shown in Figure 3.8a and are explained below.

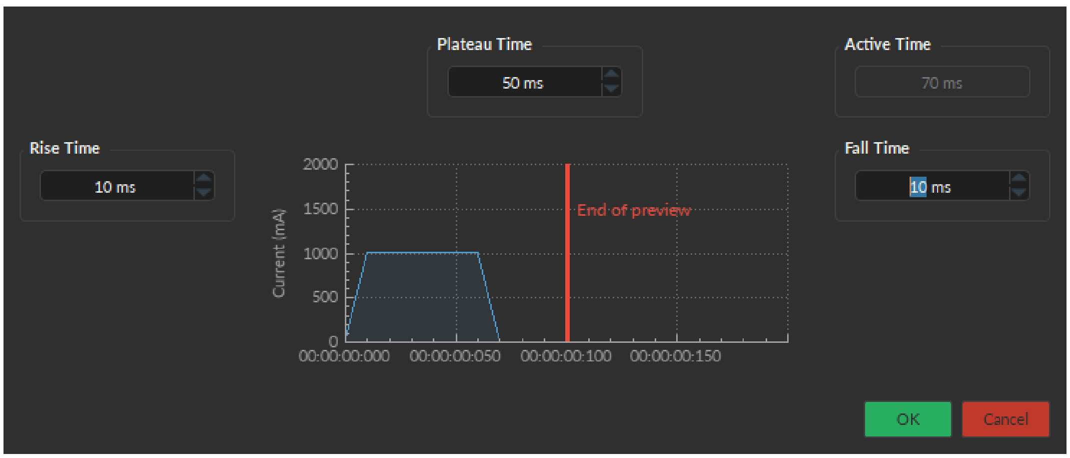
1. The **Starting Delay** defines the time between the activation of the pulse sequence and the beginning of the first light illumination.
2. The **Frequency** sets the frequency (in Hz), which is the number of pulses per second. The frequency can also be changed to the **Period**. For example, a light illumination at 10 Hz (frequency) will output one pulse every 100 ms (period), whereas a light illumination at 0.5 Hz (frequency) will output one pulse every 2 seconds (period).
3. The **Time ON** defines the length of a single pulse. This time can also be converted to a **Duty Cycle**, which represents the % of the period the pulse duration corresponds to.
4. The **Smoothing** check box allows to change the pulse slope in square pulse sequences. The **Edit Edges** button opens the **Smoothing Edge(s)** window. An overview of the window opened by **Edit Edges** will be done in the next subsection.
5. The **Pulse(s) per sequence** set the number of pulses per sequence. If it is set to 0, the number of pulses will be infinite.
6. The **Number of sequence(s)** sets the number of times that the sequence will be repeated.
7. The **Delay between sequences** sets the delay between each sequence.
8. The **Total Duration** shows the total expected duration of the pulse sequence. Should the duration be infinite, the box will display ∞. If there is an error in parameter selection, this box will turn red and display what is the error (see Figure 3.8b).

Smoothing Edge(s)

The Smoothing Edge(s) window (Fig. 3.9) allows to change the pulse slopes of the square pulse sequences.



(a) *Overview of the Smoothing Edge(s) window*



(b) *Exemple of smoothing edges (10ms for rise and fall time)*

Figure 3.9: *Smoothing Edge(s) window*

1. The **Rise Time** box is used to define the duration to rise from 0 mA to the pulse maximum value.
2. The **Plateau Time** box is used to define the duration the pulse at its maximum value.
3. The **Fall Time** box is used to define the duration to descend from the pulse maximum value to 0 mA.
4. The **Pulse Graph** displays the pulse shape.
5. 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.
6. The **OK** button save the changes of the shape of the pulses. The **Cancel** button discard the changes. Both buttons close the window.

Complex Sequence(s)

If needed, it is possible to define a complex sequence to trigger the light source in the **Complex Sequence(s) Options** (Fig. 3.10).

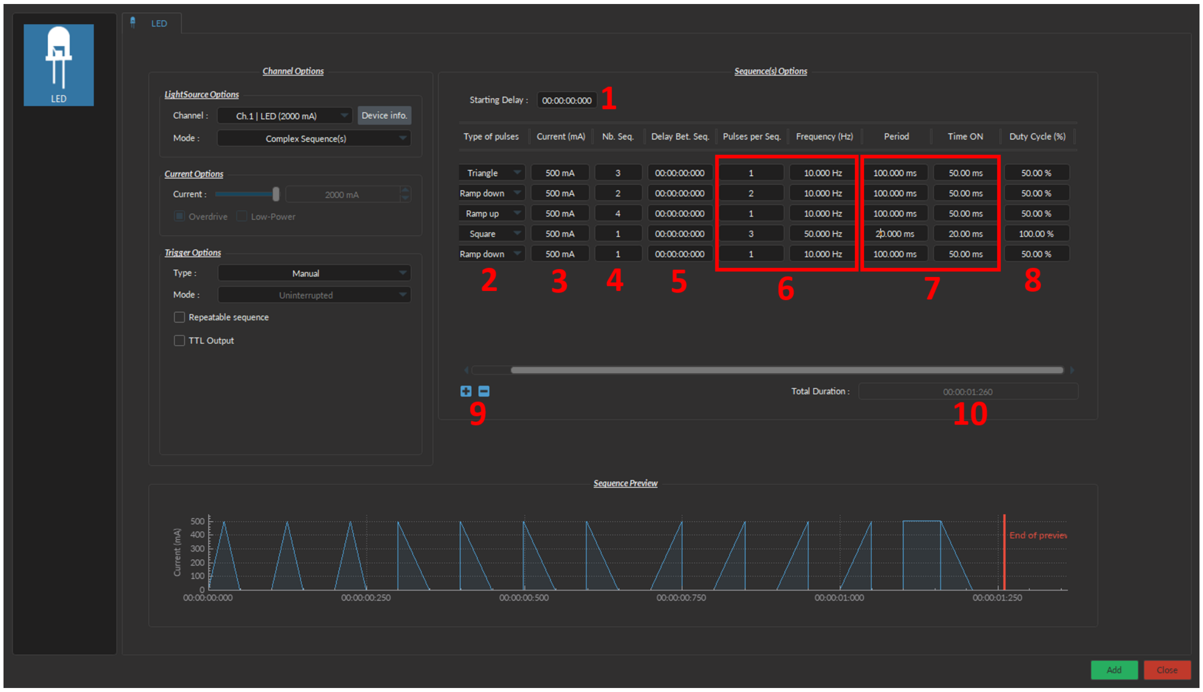


Figure 3.10: *Complex Sequences Window*

1. The **Starting Delay** sets the delay (in hh:mm:ss:zzz format) before the first light illumination.
2. The **Current** sets the maximum current (in mA) for the given sequence.
3. The **Nb. Seq.** sets the number of times that the sequence will be repeated, with a minimum of 1.
4. The **Delay between sequences** sets the delay (in hh:mm:ss:zzz format) between each sequence if **Nb.Seq.** is greater than 1.
5. The **Pulses per Seq.** sets the number of pulses per sequence, with a minimum of 1.
6. The **Frequency**/**Period** 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).
7. The **Time ON**/**Duty Cycle** 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 **Period**+0.005 ms, while the **Duty cycle** must be below 100 %.
8. The **Types of pulses** sets the pulse type. Pulses can be **Square**, triangular (**Triangle**), **Ramp up**, **Ramp down** or **Delay**. The **Delay** pulse type is used to create a delay between different sequence.
9. The **Sequence controls** allow the addition (**+**) or removal (**-**) of sequences to the spreadsheet.
10. The **Total Duration** 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 the **Period**.

3.2 Control ans Settings

The **Control and Settings** box is used to manage the different parts of the software. It contains three tabs, the **Acquisition**, **Configuration**, and **View** Tabs.

3.2.1 Acquisition Tab

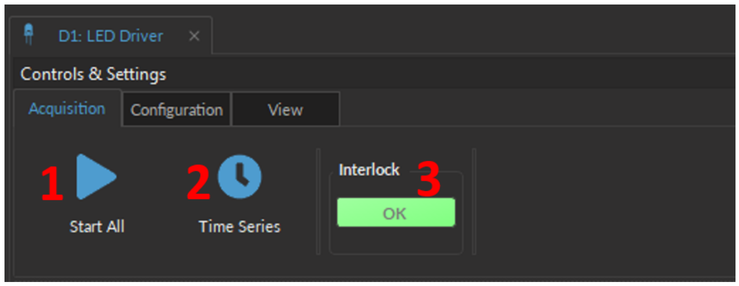


Figure 3.11: *Acquisition Tab*

The different buttons of the **Acquisition Tab** are shown in Figure 3.11 and their functions are explained below.

1. The **Start All** button starts all currently configured channels.
2. The **Time Series** button opens the Time Series window (Fig. 3.12). This tool allows all channels to share the same timing.
3. The **Interlock** indicator displays  when the interlock is correctly connected, and  when disconnected.

Time Series

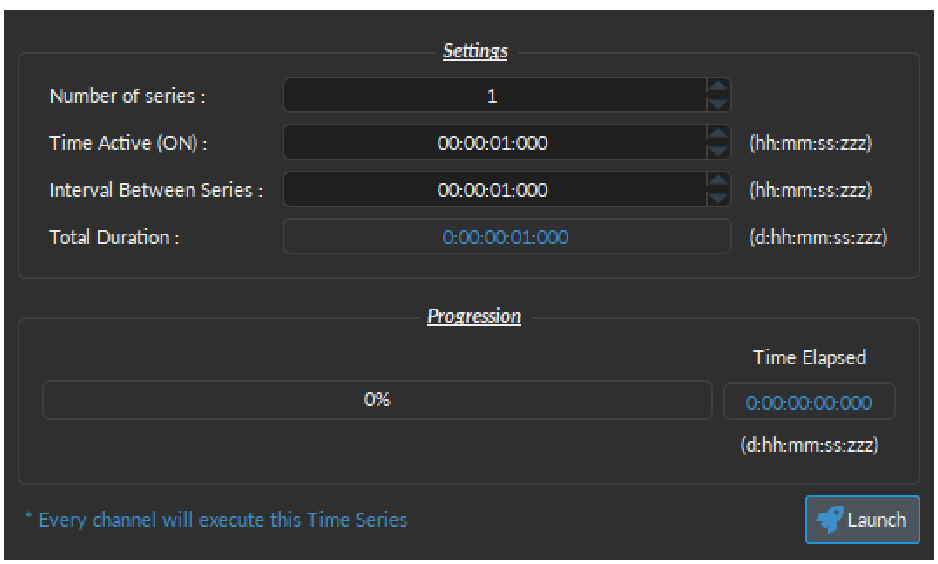


Figure 3.12: *Time Series Window*

- The **Number of series** 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. The **Time series** can be used in combination with a sequence such as the Square Sequence(s) or the Complex Sequence(s) Mode. If the **Time Active** duration is shorter than the sequence time length, the sequence will stop at the end of the **Time Active** time length.

- 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 d: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.

3.2.2 Configuration Tab

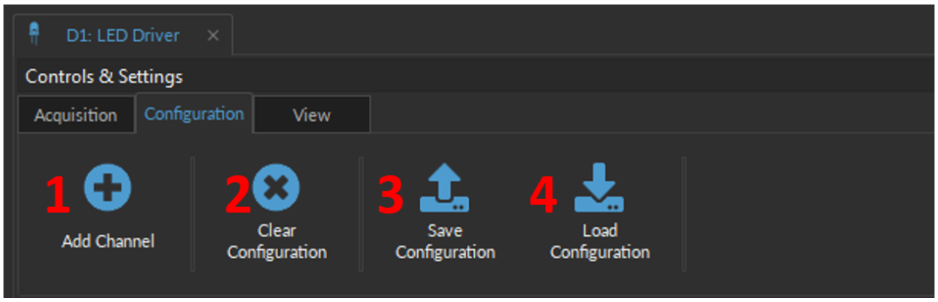


Figure 3.13: *Configuration Tab*

The different buttons of the **Configuration Tab** are shown in Figure 3.13 and their functions are explained below.

1. The **Add Channel** button opens the **Channels Configuration** window to setup the channels. This window is detailed in section 3.1.
2. The **Clear Configuration** button resets the acquisition view and all other parameters set. Any configurations already set will be lost.
3. The **Save Configuration** button is used to save the Light Source configuration in a **.doric** format.
4. The **Load Configuration** button allows a Light Source configuration in **.doric** format to be loaded. Recorded data files also contains the configuration used during the experiment and this configuration can be loaded using this button.

3.2.3 View Tab

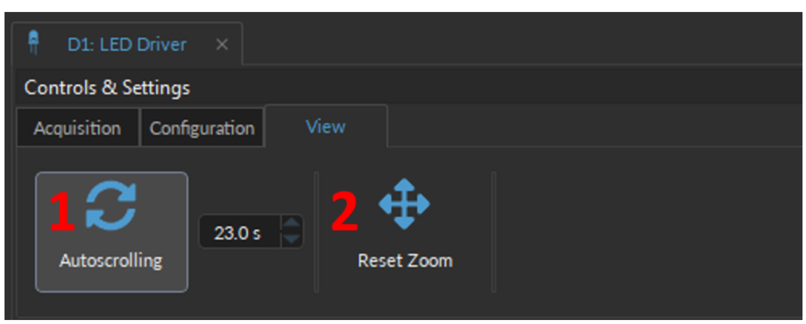


Figure 3.14: *View Tab*

The different buttons and fields of the **View Tab** are shown in Figure 3.14.

1. The **Autoscrolling** button, when clicked, makes the graphs scroll as new data appears. The duration (in seconds) kept on display is controlled by the field beside the button.
2. The **Reset Zoom** button resets the horizontal axis of all graphs displayed in the **Acquisition View** to the duration chosen in the **Autoscrolling** field.

3.3 Acquisition View

3.3.1 Acquisition View Overview

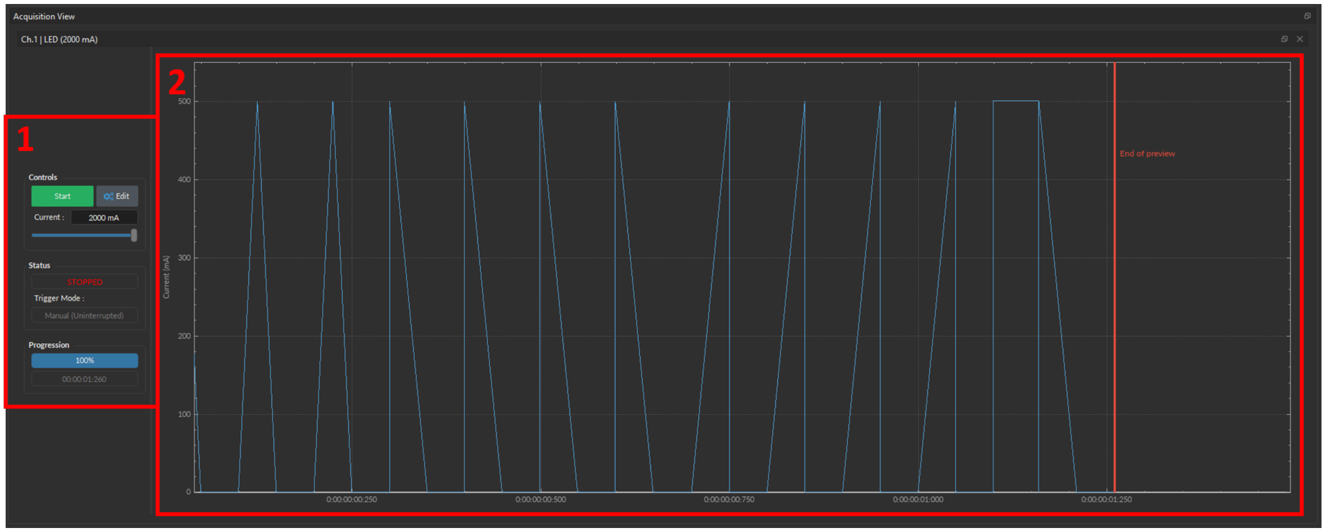


Figure 3.15: *Experiment View*

The Acquisition View (fig: 3.15) is composed of two sections:

1. The **Controls View** displays all elements to control/configure the channel. An overview this part will be done in section 3.3.2.
2. The **Graph View** displays a preview of the pulse sequence for Light Source Channels.

3.3.2 Acquisition View Control

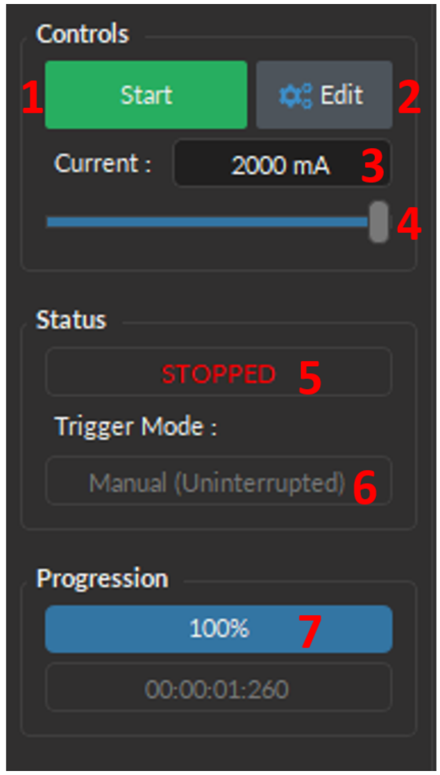


Figure 3.16: *Control of the Acquisition View*

The different buttons of the **Control of the Acquisition View** are shown in Figure 3.16 and their functions are explained below.

1. The **Start/Stop** button activates/deactivates the light source connected to the **Light Source Channel**.
2. The **Edit** button opens the **Channel configuration** window to edit the pulse sequence. This button is only accessible when the channel is deactivated and an overview of the **Channel Configuration** window is done in section 3.1.
3. The **Current Box** allows the current to be changed exactly (in mA).
4. The **Current Slider** allows the light source current to be adjusted.
5. The **Status** box displays the status **Light source**. The **Status** will display RUNNING... when active and STOPPED when deactivated.
6. The **Trigger Mode** of the light source is displayed in this box. For more information on the different Trigger options, see section 3.1.2.
7. The **Progression** box displays the progression of the pulse sequence. The advancement of the sequence is displayed in % on the **Progression Bar**, and in hh:mm:ss:zzz format on the **Time Elapsed** box.

4

Specifications

Table 4.1: *Typical Connectorized LEDFRJ1 Output Power vs Optical Fiber Core Diameter*

LED		**TYPICAL OUTPUT POWER @1000 mA (mW)**[1]			**Overdrive @2000 mA (pulsed)**
Central Wavelength (nm)	**Bandwidth FWHM (nm)**	**Core 200 µm 0.53 NA**	**Core 400 µm 0.53 NA**	**Core 960 µm 0.63 NA**	
365	∼12	6.0	23	100	1
385	∼12	6.0	23	100	1
405	∼15	5.0	20	100	1
420	∼15	5.5	23	100	1
450	∼25	8.0	23	100	x1.7
465	∼25	8.5	30	140	x1.7
505	∼30	3.0	12	50	x1.6
515	∼40	3.0	9.5	40	x1.5
560	∼100	2.0	8.5	40	-
595	∼20	2.0	8.5	40	x1.2
625	∼20	3.5	14	70	x1.6
635	∼20	6.5	25	100	x1.6
850	∼35	6.0	22	40	-
940	∼35	2.0	10	40	-
5500K	-	4.5	17	80	-

[1] All power values taken at a maximum current of 1000 mA, except for 365, 385, 405 and 420 nm LEDs (500 mA).

Table 4.2: *Typical Connectorized 2,3 and 4 Output Power vs Optical Fiber Core Diameter*

LED			TYPICAL OUTPUT POWER at max current (mW)		
Central Wavelength (nm)	**Bandwidth FWHM (nm)**	**Maximum Current (mA)**	**Core 200 µm 0.53 NA**	**Core 400 µm 0.53 NA**	**Core 960 µm 0.63 NA**
365	~12	500	4.0	16	40
385	~12	500	5.0	20	80
405	~15	500	3.2	14	35
420	~15	500	4.5	18	45
450	~25	1000	6.0	24	70
465	~25	1000	6.0	24	70
505	~30	1000	2.5	10	35
515	~40	1000	2.5	10	35
560	~100	1000	1.5	6.0	20
595	~20	1000	1.3	5.0	13
625	~20	1000	2.8	10	50
635	~20	1000	5.0	20	50
850	~35	1000	5.0	18	30
940	~35	1000	1.6	8.0	30

Table 4.3: *General Specifications*

SPECIFICATIONS	VALUE	NOTES
Input Current	0-1000 mA	700 mA recommended
Forward Voltage	3.0-4.0 V typical	-
Emission Power	See test sheet	-
Emission wavelength	See test sheet	-
NA	0.5	-
Start-Up Torque (*Single LED*)	<10 µN·m	-
Start-Up Torque (*Multiple LED*)	<30 µN·m	-
Electrical connector	M8-4 pins-male	-
Dimensions		
Single LED model	70 x 39 x 39 mm^3	without holder
2-LED model	62 x 84 x 119 mm^3	including holder
3- and 4-LED model	62 x 93 x 144 mm^3	including holder
Mass		
Single LED model	90 g	without holder
2-LED model	287 g	including holder
3-LED model	403 g	including holder
4-LED model	418 g	including holder
Output NA	0.5	-
Output optical fibre core diameter	<960 µm	

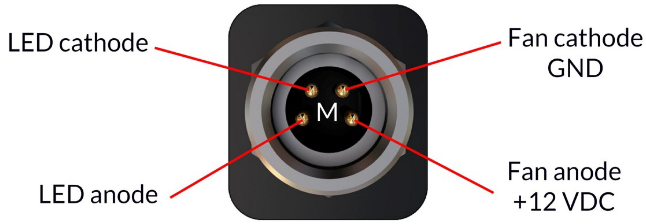


Figure 4.1: *M8 Connector Pinout*

5

Support

5.1 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.

5.2 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.

5.3 Disposition

Figure 5.1: *WEEE directive logo*

According with the directive 2012/19/EU of the European Parliament and the Council of the European Union regarding Waste Electrical and Electronic Equipment (WEEE), when the product will reach its end-of-life phase, it must not be disposed with regular waste. Make sure to dispose of it with regards of your local regulations. For more information about how and where to dispose of the product, please contact Doric Lenses.

5.4 Contact us

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

Phone 1-418-877-5600

Email sales@doriclenses.com

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