

Introduction

Particulars Lasers are set by a PC via USB connection by using Particulars laser control software. Currently the software runs only under Microsoft Windows operating systems and require .NET version 4 or higher to be installed.

Installation

The zip file with executable programs should be downloaded from the www.particulars.si/support/ page. The files can be extracted to any folder. To run the laser control program double click on *Particulars LASER Control.exe*.

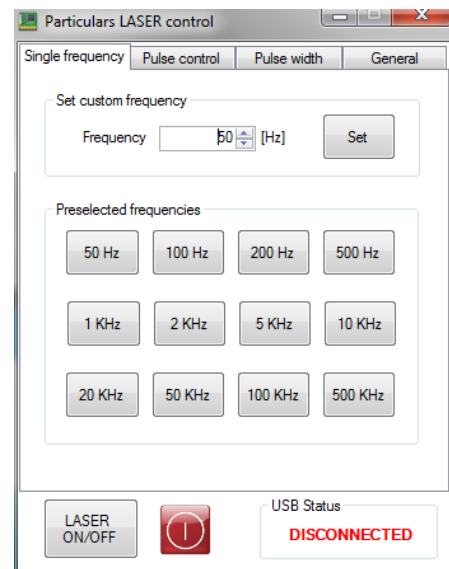
Laser status

Laser status is always given at the bottom of control program window. If the communication of the laser with PC is established the USB status should be **CONNECTED**. The laser can be switched ON/OFF by pressing the ON/OFF button. The indicator next to the button gives the state the laser is in.

Modes of operation

Single frequency

Running a laser with a single pulse of given frequency is the most common use of laser and it is a default mode of operation. The frequency can be set manually or a set of predefined frequencies can be selected (see part on configuration file to learn how). After the value is inserted the “Set” button should be pressed. The trigger connector used in this operation mode is “TRout (driver)”.



Pulse control

In this mode of operation the laser can be programmed to emit light in the preselected pattern of pulses. The pattern can be 1024 bits deep. The pattern should be prepared in the separate file. The config file (described later) also contains the default pattern, which can be modified. The execution of the sequence is controlled by several buttons:

Clear sequence – erases the pulse pattern in the buffer.

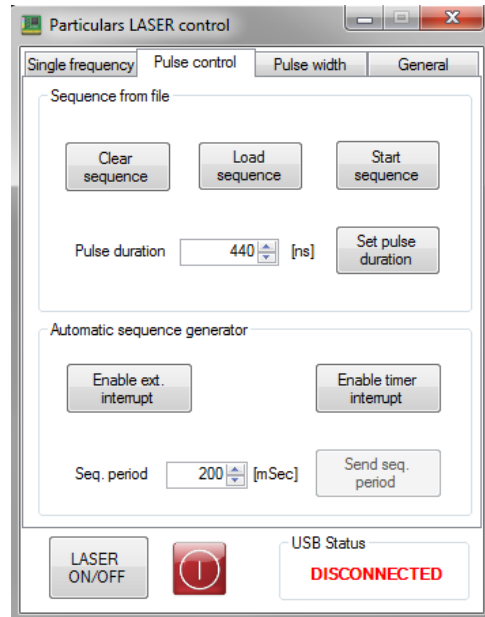
Load sequence – loads the sequence to the microcontroller

Start sequence – starts the sequence in the microcontroller

Set pulse duration – defines the duration of the individual pulse in the sequence i.e. the frequency of the individual pulse. The minimum increment is 140 ns.

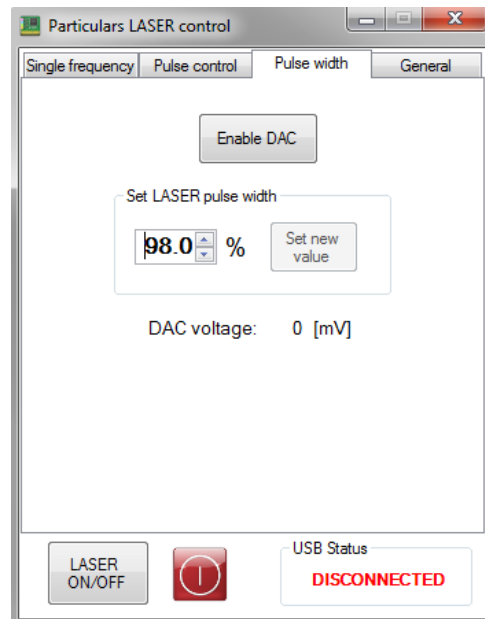
The sequence can be triggered either by the timer or externally by an outside trigger. If internal trigger is used, which is in most of the cases the button *Enable timer interrupt* should be pressed and the time interval selected by entering the value in *Seq. period*. The command is submitted by *Send seq. period*. It is recommended that the laser is disconnected (Laser ON/OFF) during this procedure.

The trigger in this mode of operation is on output “TRout (processor)” for the monitoring pulse.



Pulse width

The width of the laser pulse is controlled by the DAC which sets the threshold on the output stage. The laser is shipped with the default configuration file where the DAC values are calibrated. In this way the width of the laser pulse should be given in [%] (the raw value of the internal DAC is given below the *Set LASER pulse width* field). The width of the pulse is correlated also with light intensity. To set a new value please first turn the laser off (button *LASER ON/OFF*), then press *Enable DAC* and enter the value with *Set new value*. Turn on the laser.



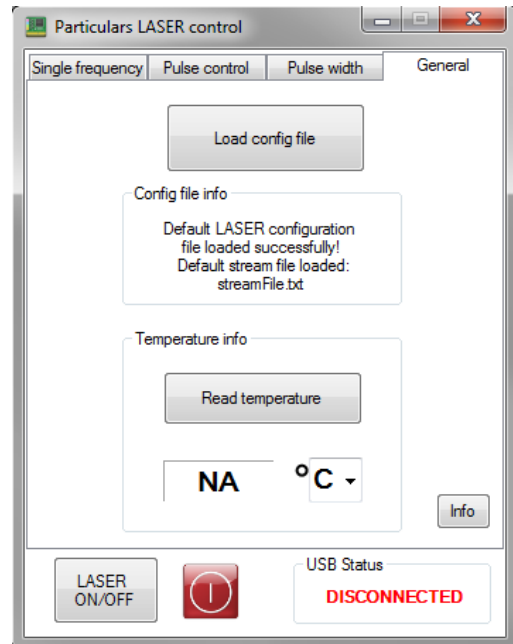


General settings

Configuration file

Configuration file can be loaded from the *General* pad by pressing the *Load config file*. The default configuration file has the name “*Default LASER config.cfg*” and resides in the same folder as the main program. The structure of the configuration file is given below. It has three sections: LASER config, default frequencies and default stream file.

The laser config is calibrated in such a way that 100% is when the threshold at the output stage is at the limit of operation. The scale is reversed, which means that 100% is narrowest possible pulse (also low intensity) while 10% is very wide and intense pulse.



Frequencies showing as buttons in *Single frequency* window are set in the *default frequencies* section. The frequency [Hz] follows the item name and the value shown in the button is in the [brackets].

The default sequence file is given in the *default stream file* section.

LASER config

10% 330[mV]
 20% 660[mV]
 30% 990[mV]
 40% 1320[mV]
 50% 1650[mV]
 60% 1980[mV]
 70% 2310[mV]
 80% 2640[mV]
 90% 2970[mV]
 100% 3300[mV]

default frequencies

frequency1 50 [50 Hz]
 frequency2 100 [100 Hz]
 frequency3 200 [200 Hz]
 frequency4 500 [500 Hz]
 frequency5 1000 [1 KHz]
 frequency6 2000 [2 KHz]
 frequency7 5000 [5 KHz]
 frequency8 10000 [10 KHz]



```
frequency9 20000 [20 KHz]
frequency10 50000 [50 KHz]
frequency11 100000 [100 KHz]
frequency12 500000 [500 KHz]
default stream file [streamFile.txt]
```

* end of config data

The laser box is equipped with a temperature sensor, which can be read by *Read temperature*. In a stable operation the temperature should not vary too much.

Sequence file

An example of the sequence file can be found below (starting after *****). The sequencer used for laser operations has two channels (CH number is always set to 2). They are: CH 1 = laser output ; i.e. each pulse appearing on CH1 produces a laser pulse. CH2 is used for triggering purposes.

The depth of the buffer is up to 1024 bits. The length is defined by the parameter *seqLength* . The pattern is defined by group of four bits which give a hexadecimal number (e.g. 0x1000 = 8; 0x1010 = A). In total 256 such numbers are needed to fill 1024 bit buffer. For a clearer visibility these 256 hexadecimal numbers are grouped into 16 per each line ending with “;”. If you don’t use all the bits set them to 0.

For example a sequence of 16 pulses like:

```
1111 1111 0000 0001
```

would translate to

```
FF 01
```

If you would like to trigger on the last pulse in the above sequence (bit 16) you should have a corresponding sequence in CH2

```
0000 0000 0000 0001
```

```
00 01
```

Depending on the duration of the pulse width the time scale is selected.

```
freq: 0
seqLength: 16
CH number: 2
CH1:
AA AA AA AA 00 00 00 00 00 00 00 00 00 00 00 00 ;
0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 ;
0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 ;
0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 0F 03 0F 3C ;
```



```
80 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ;  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ;  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ;  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ;
```

CH2:

```
AA AA 00 01 00 00 00 00 00 00 00 00 00 00 00 00 ;  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ;  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ;  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 03 ;  
AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA ;  
AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA ;  
AA AA AA FF FF FF FF 00 00 00 00 AA AA AA AA AA ;  
AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA ;
```

Temperature Info

The temperature of the laser diode can be read. The reading of the temperature requires the laser to be off. If the temperature of the laser is unstable over the course of the measurements this can lead to uncertainty in the laser pulse power and can affect the measurements.

Info

Information about the software version.