

MENHIR-1550

Ultrafast Laser System

Manual

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Menhir Photonics AG
Thiersteinallee 71
CH-4053 Basel, Switzerland
Tel.: +41 61 331 45 45
email: contact@menhir-photonics.com
Web: <http://www.menhir-photonics.com>

This document aims to describe how a MENHIR-1550 from Menhir Photonics AG can be operated and controlled safely and in adequation to the intended usage.

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Safety Instructions and Warnings

The MENHIR-1550 is manufactured according to the Laser Safety Standard EN 60825-1:2014 and complies with US laws 21 CFR §1040.10 and §1040.11.



Before operating the MENHIR-1550 Laser System please read this manual carefully to prevent damage to the device and injury to persons. The following safety instructions must always be followed.

During installation, maintenance and service, all persons in the room must wear appropriate laser safety goggles while the laser is in operation. The recommended protection stage is dependent on the laser system. Use appropriate eyewear and other protective means in order to keep radiation exposure below the maximum permissible levels allowed by applicable regulations.

The MENHIR-1550 laser system is **NOT** intended to be used in medical related applications or in link with bio-medical applications.

The MENHIR-1550 laser system should be **ONLY** operated by a person having received the adequate laser safety training and having the required skills to operate such laser system with appropriated safety measures.

Description of the system

All control elements to be operated by the user are located on the front panel of the laser. All connections except the main optical output fiber are located on the back panel of the laser system.

Front Panel

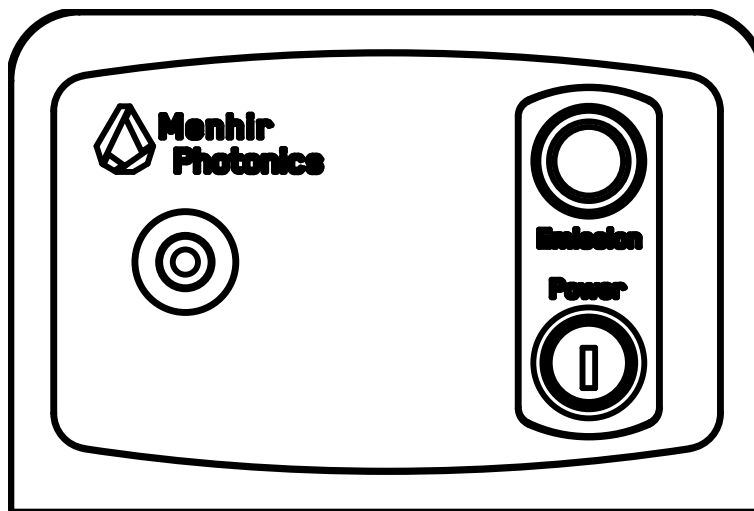


Figure 1: Front View

Key switch ("Power"): The key switch completely disconnects the laser from the power supply. After switching on the power supply and turning the key switch, the laser performs a self-test, which takes about 10 seconds. During this time the laser cannot be switched on. (see chapter 3). After a successful self-test, the laser goes into standby mode and waits to be switched on.

Emission button: This button has two functions. It switches on the laser emission and displays the status of the laser by the integrated color ring light.

- 1) Push button function: Press it one time and it will turn the laser emission on. Press again, laser switches off again.
- 2) Display of the laser status: Three status are displayed via the color of the ring of the ring light.
 - Green flashing: Laser is in standby mode and can be switched on.
 - Permanent blue light: Laser is running (laser light is emitted).
 - Permanent red light: Critical error has occurred. Laser cannot be switched on.

Back Panel

The back panel has all the connectors needed to control and monitor the laser. It comprises a “multiport” connector, a USB connector, a SMA connector, two BNC connectors for the PZTs and the optical monitor output (APC/FC connector).

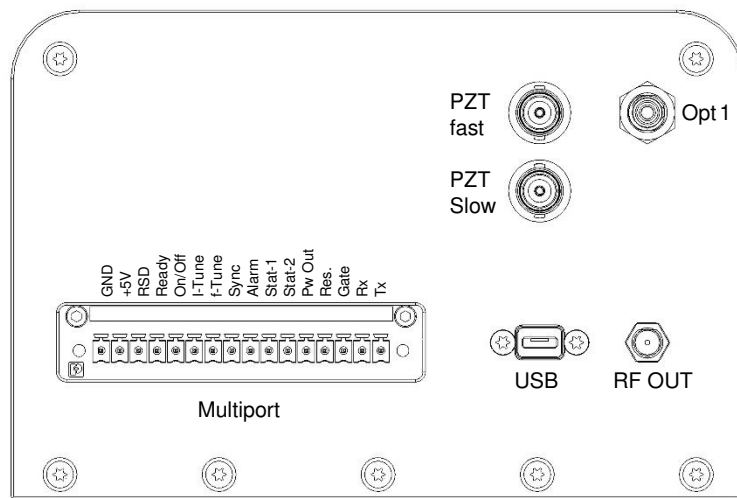


Figure 2: Rear view (Version B)

Multiport connector

This connector is a DFK-MC 1,5/16-GF-3,81 – 1829471 from Phoenix contact ([link](#)). It is an industrial-grade connector made to simplify the integration of the MENHIR-1550 into a system. 3 types of adaptors can be used to connect easily to the laser (Phoenix Contact Nbr. 1852503 (Crimp connection), 1851371 (Push-in spring connection) or 1850990 (Front screw connection)). Available from worldwide distributors such as Digikey, Mouser, Farnell.

Name	Description
GND	(INPUT) 0 V, reference potential for power, all inputs and outputs including the interfaces. Not connected to the housing
+5 V	(INPUT) System supply voltage. 5 Vdc +/-5%, max. 2 A (typically 1000-1100 mA is enough)
RSD	(INPUT) Remote shut down. Used for the interlock function. This input must be open or connected to a voltage higher than 2 V and less than or equal to 5 V (74HCTXX logic level). If this input is connected to GND, the following happens:

	<ul style="list-style-type: none"> The laser light is switched off immediately and can no longer be switched on as long as the error persists. The "Ready" output goes to 0 V. The "Alarm" line and the "Status1" line go to 5 V. <p>If the "Interlock" function is reset, the "Ready" output goes back to 5 V, "Alarm" and "Status1" are 0 V again. The laser must be started by the user, either with the push button on the front panel, the On/Off input or via software/digital commands.</p>
Ready	(OUTPUT) The "Ready" line always goes to 5 V if the laser emission can be switched on or if it is switched on.
On/Off	(INPUT) A rising edge on this input starts the laser emission, a falling edge switches the laser light off. The function of the On/Off signal corresponds to the push button on the front panel.
I-Tune	<p>(INPUT) Voltage input to modulate the pump current (>10 kHz). Maximum allowable amplitude: +/-5 V. The modulation depth is factory set according to the customer's needs. The default setting is 10% pump current change per volt. The input impedance is 50 Ohm.</p> <p>This input allows to modulate the pump power of the laser or to ensure long-term power stability of the laser output.</p> <p>By default, this input is deactivated in factory.</p>
f-Tune	Not connected. Reserved for future use.
Sync	<p>(INPUT) The sync input is used to read an external control signal via the laser control software.</p> <p>Example: The laser and an external clock are synchronized via an external electronics. As soon as the laser and the clock run synchronously, a Sync signal is set to logic 1 by the synchronization electronics. This signal is connected to the Sync input and can be read-out by the user without the need of an additional interface. Use 74HCTXX logic levels.</p>
Alarm	<p>(OUTPUT) The alarm signal goes to logic 1 if a monitored parameter of the laser exceeds or falls below a certain value. Monitored parameters are:</p> <ul style="list-style-type: none"> Temperature of main board, microcontroller and heat sink Laser output power (if this option is installed). Back-facet monitor signal of the pump diodes.

	An alarm does not affect the laser's operation but should be checked promptly. Use the "lac" command to do this. (See Software section)
Status1	<p>(OUTPUT) This signal goes to logic 1 whenever a critical error occurs.</p> <ul style="list-style-type: none"> • Temperature too high on the main board, uC or heat sink. • A malfunction of a temperature controller. • A trip of the interlock safeguard. <p>The laser light is switched off for safety reasons and cannot be switched on again until the fault has been corrected. The "lec" command can be used to identify the fault. (See Software section)</p>
Status2	(OUTPUT) "Emission on" signal. This signal indicates whether the pump diodes are switched on. However, it is not checked whether laser light is actually being emitted. The signal PwOut is intended for this purpose.
PwOut	<p>(OUTPUT) A DC signal proportional to the output power of the laser.</p> <p>This output is only functional together with the option "Internal Photodiode".</p>
Res.	(IOUTPUT) Connected to GND as standard. Can be used by the customer for the RS232 connector.
Gate	Not connected. Reserved for future use.
Rx	(INPUT) The Rx signal of the RS232 interface. Transfers the data from the PC to the laser. Connected by default to pin 3 (TXD) of the DSub9 connector of a standard RS232 port.
Tx	(OUTPUT) The Tx signal of the RS232 interface. Transfers the data from the laser to the PC. Connected by default to pin 2 (RXD) of the DSub9 connector of a standard RS232 port.

USB connector

Use a USB Micro B port to connect the laser to a computer.

Opt1 – Optical Monitor Output (APC/FC fiber connector)

If installed (option "Optical Monitor"): This is an optical output corresponding a few % of the actual laser output. In practice > 2 mW of optical power could be expected on this output.

The fiber connector is an APC/FC connector and it uses PM fiber. Please take the adequate precaution when connecting a fiber to this connector.

RF OUT – SMA connector

If installed (option “Internal Photodiode”): RF output signal from a photodiode with a bandwidth > 9 GHz using a small fraction of the laser output. Standard SMA connector.

PZTs connectors (Version B)

These connectors allow to drive the piezo actuators that can be installed in the laser as options (fast and slow/coarse).

Each PZT has dedicated BNC connector as described on Figure 2 : Rear View. Both PZTs are directly connected to the outside without using the laser internal electronics.



The operating voltage of the piezo actuators range from 0 to 100 V. Never change the polarity (or apply a negative voltage). The piezo actuators could be destroyed.

Connecting and starting up the system

The laser is already set up on delivery and can be put into operation without additional settings. Simply connect the provided power supply to the voltage supply inputs of the laser

The black cable (GND) of the power supply unit is connected at position 1, the white cable (+5 V) at position 2.



Figure 3: Power-supply of the laser

After the key switch has been turned the laser performs a self-test. This test takes about 10 s and is indicated by a slowly changing color of the "Emission" button. After a successful self-test, the laser goes into stand-by mode, which is indicated by a green flashing of the "Emission" button. Thereafter, the laser emission is ready to switch on.

Press the "Emission" button once to turn on the laser light, a second time to turn off the laser light again, and so forth.



The laser emission is switched on immediately. The laser light is dangerous, especially for the eyes. Please take the necessary steps to ensure that nobody is endangered.

The laser has various connections serving as control and monitor ports. These connections are described in detail in chapter 2 in the paragraph "Multiport".

The laser has 2 different PC interfaces. One USB interface and one RS232 interface. These communication ports allow to control the laser remotely and to check its condition in detail.

Description of the software and digital interface

The laser can currently be controlled and monitored via RS232 command.

1. USB connection setting

After the laser and PC are connected for the first time, Windows detects the laser and automatically installs a driver. This so-called CDC driver sets up a virtual COM port on the PC. This port is very easy to access. A simple terminal program such as Hyperterminal or Putty is enough.

The number of the installed Com Port can be found as follows:

- Press the "Windows key" together with the "r" key to open the "run" input window.
- Type `hdwwiz.cpl`.

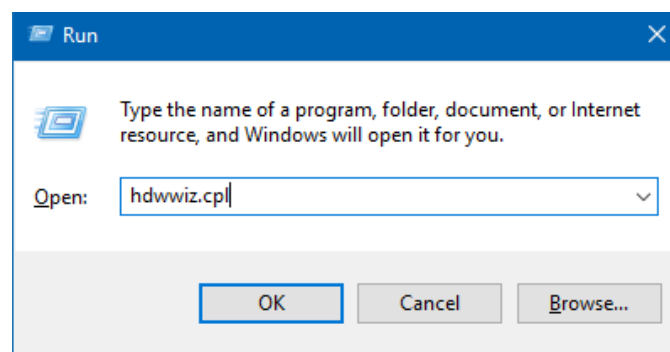


Figure 4: Start the device manager

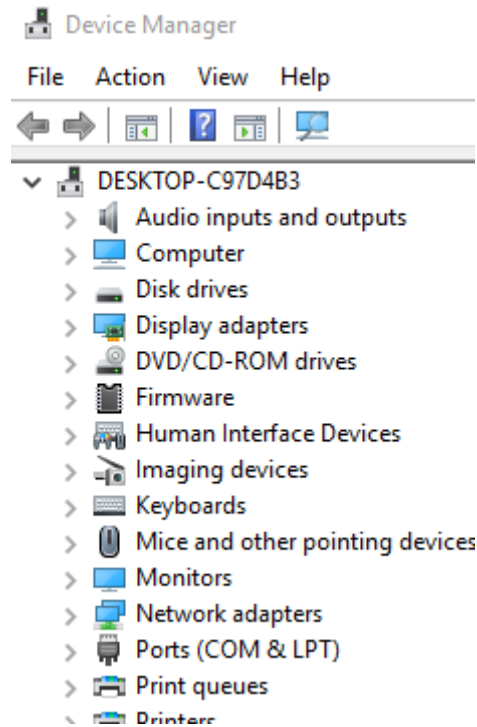


Figure 5: device manager

- This opens the Device Manager. Look for "Ports (COM & LPT)".
- Open "Ports (COM & LPT)".

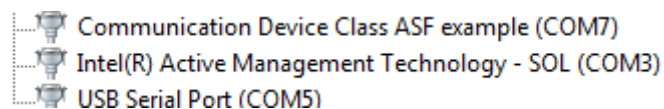


Figure 6: New com port

- Look for "Communication Device Class ASF example", in this case COM7. Remember the number.

2. Data connection via USB

The H-Term program is used to illustrate the communication in this manual. This is freeware and can be downloaded from "<http://www.der-hammer.info/terminal/hterm.zip>". It is one of the best and most versatile terminal programs.



Figure 7: H-Term

Here are the commands for setting the “H-terminal” correctly (as displayed on figure 7)

1. Set Com Port
2. Check settings 38400 Baud, 8 data, 1 stop bit, no parity
3. and 4. Set the line delimiter to CR+LF
5. Press “Connect”
6. Enter command here (terminate with enter)

3. Data connection via RS232

Almost the same procedure as connecting to USB. Only the com port will most likely have a different number and the baud rate is set to 38400 symbols/sec.

4. Commands

All commands are 3 digits long and written in lowercase letters. Some have additional parameters, some not.

Please note that the command line must be terminated correctly. This is done either with a line feed (= chr10, \n), a carriage return (= chr13, \r) or both characters. All replies from laser to the PC are terminated with CR and LF.

Commands without parameters (values accessible by the user)

ver Displays the actual firmware version

Answer:

Version number: V2.0

bte Displays the actual temperature of the main board

Answer:

Temperature of the main board is 25.5 degC

sen Return the atmospheric conditions inside the system enclosure (not the inside the optical module). It allows to access every 10s, the temperature, atmospheric pressure and humidity of the environment.

Answer:

23.24 degC; 961.15 mbar; 20.01 HT

Commands with parameters (values accessible by the user)

las=0 Switches off laser light

Answer:

Laser switched OFF

las=1 Switches on laser light

Answer:

Laser switched ON

id0=XXXXX Sets the current of pump diode #0. Step size is 1/50 mA.
e.g.: XXXX=30000 -> current=600 mA
(Leading zeros do not have to be written)

Answer:

Current of LD0 was set to: 600.0 mA

id1=XXXXX Sets the current of pump diode #1. Step size is 1/50 mA.
e.g.: XXXX=34567 -> current=691.34 mA

(Leading zeros do not have to be written)

Answer:

Current of LDO was set to: 691.34 mA

Note: A higher value than i_{max} or a lower value than i_{min} is prevented from being programmed.

Service

In case you wish to have a technical support on your product, please contact your local distributor or contact Menhir Photonics AG at :

Email: service@menhir-photonics.com

Phone: +41 61 331 45 45

In case you wish to return a product for diagnosis and/or repair, please contact us prior to sending it, so we can issue a Return Material Authorization (RMA) number for you. You can contact us in the following ways:

Email: service@menhir-photonics.com

Phone: +41 61 331 45 45