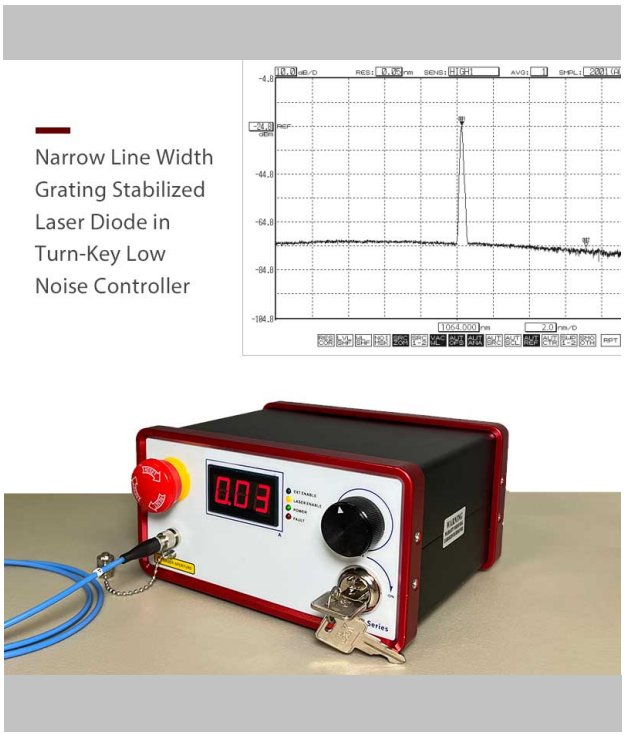

NLM Series Narrow Line Width Benchtop Laser Diode Source System

Applied model: NLM Series

Version: V 1.0

Date: July, 2020

As products are constantly being updated, the right of final interpretation of technical specifications or illustrations in this manual belongs to RealLight.

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1 Safety Instructions

1.1 Safety Symbols

The following symbols can be marked on the unit or used in this document. To ensure safe operation, please follow all safety instructions that are associated with the symbols.

CAUCTION!

Refers to a hazard. Ensure correct operation, or, could result in damage of the unit. Do not proceed beyond an attention until the indicated conditions are fully understood.

WARNING!

This symbol indicates that users should take care of the damage which is easily caused by visible and invisible laser radiation.

CAUCTION ESD!

This symbol indicates that users should pay attention to the operation failure caused by ESD. Users should take actions for ESD protection.

1.2 Laser Safety

Laser poses safety hazards different than light from other sources, all laser users and persons near the laser must be aware of the hazards involved in laser operation.

In order to ensure the safe operation and optimal performance of the product, please follow these warnings and cautions in addition to the other information contained elsewhere in this document.

Warning:

*** Visible and/or invisible laser radiation is emitted from the aperture of this product**

Warning：

*** This is a Class 3B laser product**

*** Avoid exposure to the beam**

*** Follow safety instructions**

LASER SAFETY NOTES:

1. Do not allow untrained or inexperienced personnel to handle this laser.
2. **NEVER LOOK DIRECTLY INTO THE LASER FC/PC OUTPUT PORT OR CONNCTING CABLE!**
3. DO NOT REFLECT THE BEAM BACK INTO THE LASER LIGHT SOURCE!
4. **Always avoid placing reflective objects into the laser beam path.**
5. **Laser light scattered from a reflective surface can be as damaging as the original beam.**
6. Turn the laser power to the lowest current level to minimize intensity of accidental stray reflections or refractions when aligning the optical system.
7. Ensure that the laser beam output is not at eye level.
8. Post warning signs when the laser is in operation, limit access to the laser area.
9. **Use appropriate laser safety eye wear when operating this laser instrument.**

1.3 Electrical Safety

1.3.1 Notes for electrical safety:

Although this laser system includes safety features in its design, the users still have to follow the safety precautions below:

1. Ensure that the fiber is connected well to the fiber connector of laser system before laser operation.
2. For the sake of safety, make sure that all power is off before working on electrical connections of the laser system. Do not depend on the electrical safety device or interlock.
3. No electrical maintenance on the laser is allowed by anyone.
4. The DC Power Adapter connector may be used to disconnect the laser controller from the mains / AC.
5. The mains cord must be plugged in a socket comprising the earth connection. Disconnection of the earth is forbidden as it may impair the electrical protection and renders the equipment dangerous.

1.3.2 Safety recommendations for using a laser

Please review the following precautions before operating the laser system:

1. Safety key switch: please remove the key from key switch when the laser system is not in operation but still accessible to untrained personnel.

2. Do not allow untrained or inexperienced personnel to handle this laser system.
3. Indicator light (LED): this is a safety feature. It must be clearly visible by operator when the laser system is operated.
4. NEVER LEAVE THE LASER SYSTEM ON, OPEN, AND UNATTENDED!

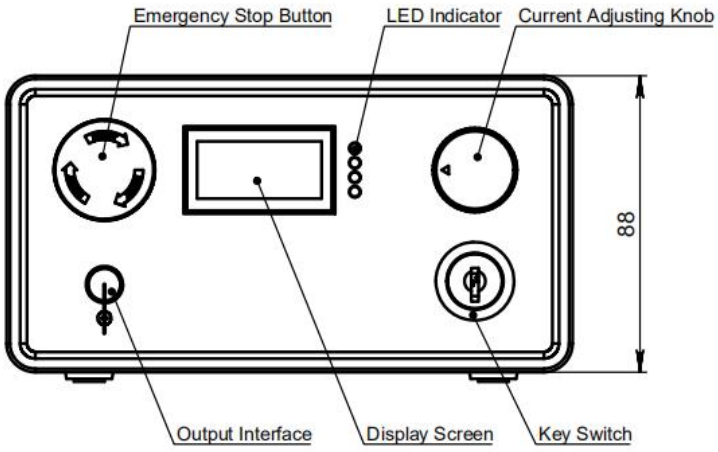
2 Electrical Instructions

2.1 Operating Modes

This system features two control modes.

1. Local mode: control the laser output power by using Current Adjusting Knob at the front panel.
2. Remote mode: control the laser output power remotely by PC or modulation signal through USB or BNC interface at the rear panel.

2.2 Operating Instructions for the Front Panel



a. Emergency Stop Button

Press this button to stop laser emission in the event of an emergency. Rotate it clockwise when the emergency is cleared, and the laser will return to its previous condition of operation before shut-down.

b. Display Screen

Operating current (A) is shown.

c. LED Indicators on Front Panel

Power→ this LED is ON when the laser source is supplied with power.

Fault→ this LED is ON when there is an error.

Laser Enable → this LED is ON when the key is switched to ON, indicating that the laser is enabled and emitting light.

Ext Enable→ this LED is lit when the Modulation Enable Button at the rear panel is pressed, indicating that the laser can be modulated through signal input via BNC interface.

d. Current Adjust Knob

When the laser is in operation, rotate this knob clockwise to increase the current and rotate it counter clockwise to decrease the current.

Notes:

- When the current is at its maximum, keep rotating this knob clockwise will not increase the current any more.
- For safety, always rotate this knob counter clockwise to the left stop before starting the laser.
- Rotate this knob counter clockwise to the left stop, then turn the key switch on, the drive current is lower than threshold current of the laser.

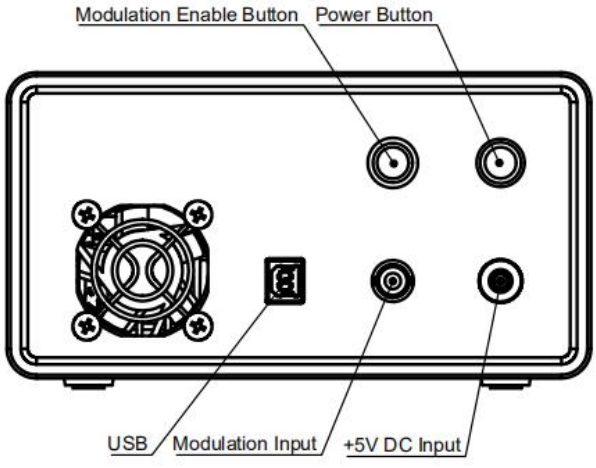
e. Key Switch

When the key switch is in “OFF” position, the laser is in stand by mode, current is zero. When the key switch is in “ON” position, laser is in the enabled status and the Laser Enable indicator LED is ON.

f. Output Interface

This interface is for connection with fiber, and is compatible with RealLight’s RL-RP Series Raman probes.

2.3 Operating Instructions for the Rear Panel



a. Modulation Enable Button: Release this button to disable the modulation input interface; press it to enable the modulation input interface.

b. Rear Panel Main Power Button: Press to active AC power to the unit; release this button to stop power

c. +5V DC Input Interface: Supply power to the laser through the +5V DC adapter.

d. Modulation Input Interface: When the laser is in Local Mode, press the Modulation Enable Button, input analog signal rangeing from 0-5V to control the laser power via this BNC interface.

- Apply a 0V signal, the corresponding output power is 0mW.
- Apply a 5V signal, the corresponding output power is the maximum rated power.
- The bandwidth of this BNC interface is 1kHz.

Notes:

- The input signal must not exceed 0-5V.
- When this interface is enabled, the Current Adjust Knob on the front panel is disabled.
- Input sinusoidal signal or pulse modulation signal through BNC interface, the average value of drive current is shown on the display screen at front panel.

- **USB Interface**

This USB interface is for connection between laser and a control PC. RealLight provides software for laser control, for details please see section 4 in this document.

3 Operating Instructions

3.1 Preparation Procedures

Connect the +5V DC adapter (included) to the laser unit, make sure the connection is secure.

- **Before connecting to the AC power, please check and confirm the system is in the following status.**

A. Key switch is in the Position “OFF”.
B. Emergency Stop button is released (out).
C. Modulation Enable button is released (out).
D. Power button is released (out).
E. The main AC cord must be plugged in a socket with an earth GND connection.
F. Take off the laser output interface cap and connect firmly into the fiber patch cord.
G. Do not point the patch cable at people or flammable materials

Attention: Make sure to keep the fiber tip clean and avoid contamination. Otherwise, power loss or damage can occur.

3.2 Operating Steps for Local Control Mode

A. Connect the terminal of the DC power adapter to the corresponding port on the rear panel, press the Power button on the rear panel, then start adjusting driver current to the laser by adjusting the knob on the front panel. Current level is shown (in amperes) on the display screen. At the same time, the Power indicator is lit and the cooling fan starts working.

B. After approximately one minute, the internal temperature control of the laser diode is stable. At this point, turn on the key switch to enable the laser then the LD ENABLE indicator is ON. The laser diode is now emitting light.

C. Rotate the Current Adjust Knob clockwise to increase the drive current.

D. The laser should now be operating in a stable condition.

3.3 Operating Steps for Remote Mode

A. Connect the USB interface or BNC interface to the rear panel.

B. Press the rear panel Power button. Drive current will be shown on the display (front panel). At the same time, the Power indicator will be ON and the cooling fan will start working.

C. Press the Modulation Enable button on the rear panel, the EXT ENABLE indicator is ON

D. The Laser is now active and emitting and operated by external control signal.

3.4 Laser Off

A. Before shutting down the laser, set the current to 0 or disconnect external control signal.

B. Place the key switch in “OFF” position.

C. Release the Power button, disconnect the power supply.

D. Remove the fiber patch cord, put the protection cap on the laser output port.

4 Laser Control Software and Remote Mode

This laser can be set to Local Mode or Remote Mode via software. Factory default setting is Local Mode.

【Local Mode】Enable/Disable laser emission and adjust output power via settings on front panel.

【Remote Mode】Enable/Disable laser emission and adjust output power by PC software through USB interface on rear panel.

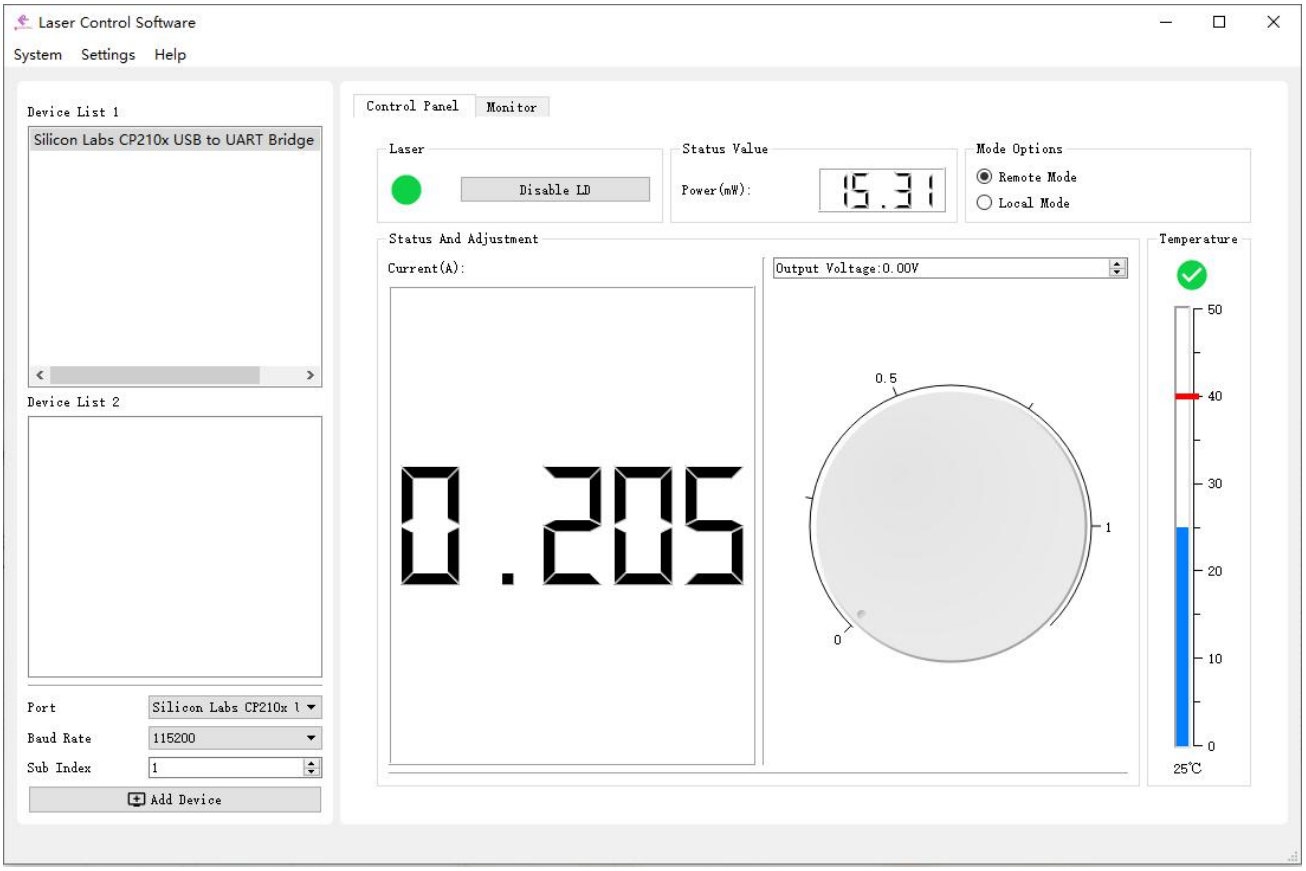
4.1 Driver Installation

This laser system uses a highly-integrated USB-UART bridge chip CP2102, which can support different versions of operating systems. You will need to install the driver on your OS before the laser system can communicate with a PC. Please download the driver from the link below.

https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

The power for communication part is supplied via a USB interface. Users can identify serial ports by connecting the laser system to a PC via a USB cable. When the driver is installed, the [Device Manager] [Ports-COM-LPT] and the Windows' operating system can detect the corresponding ports, then the installation is complete.

4.2 Interface Presentation



Software Interface

4.3 Software Details

Add Device：when the serial device is detected by a PC, choose the corresponding serial number in "Port". Click "Add Device", PC software will display the control interface for NLM series laser, and you can find the port number of device in Device List.

Control Panel：click Enable LD or Disable LD to turn the laser on or off. Monitor the output power by the

internal power sensor of laser.

Monitor：click here to switch the display interface, and to see the monitoring curves of working temperature and current.

Mode Options：select Local Mode or Remote Mode here. System will save the previous control mode when the software shuts down.

Status and Adjustment：monitor and display real-time working current value of the laser. Control the output power (0-100%) by setting output voltage (0-1.2V) or adjusting the spin control.

Temperature：the detected temperature of the internal laser diode is displayed here.

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