THORLABS MCLS1-CUSTOM Multi Channel Fiber Coupled Laser Source User Guide

MCLS1-CUSTOM
Multi-Channel Fiber-Coupled Laser Sourcex
User Guide

Contents

Chapter 1 Introduction

Intended Use

This product is intended to be used as multi-channel fiber coupled laser source with up to four lasers installed for xuse in a laboratory environment. The part is designed to interface with modulating sources as inputs and fiberx patch cable outputs. It can be operated through the front panel and touchscreen or connected to a PC via USBx port for GUI or serial command control.

Explanation of Safety Warningsx

Warning Warning indicates a hazard with a medium level of risk that, if not avoided, could result inx death or serious injury.

Caution Caution indicates a hazard with a low level of risk that, if not avoided, could result in minorx or moderate injury.

Notice Indicates information considered important, but not hazard-related, such as possible xdamage to the product.

Danger, Warning, or Caution


Laser Radiation Warning


Shock Warning

CE The CE/UKCA markings on the product are the manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety, and environmental protection legislation.

UK CA The symbol on the product, the accessories or packaging indicates that this device must not be treated as unsorted municipal waste but must be collected separately.

Description

The Thorlabs 4-Channel Fiber Coupled Laser Sources provide easy coupling and simple control of laser diode driven fiber optics. Each system is equipped with up to four fiber output light sources with wavelength available from visible to IR. The laser sources come standard with FC/PC connectors, and each system can be made with single mode fiber or PM fiber and any combination of four lasers. A sample list of available wavelengths is found in Section 1.5.1; please visit our website for a full list of currently available options.

Each laser diode operates from an independent, high-precision, low-noise, constant-current source and temperature control unit. An intuitive LCD interface allows the user to view and set the parameters for each laser. The user can adjust the laser current and temperature control independently for each output. The display indicates the channel number selected, the output wavelength of the source, the operating power calculated from the laser diode monitor diode (if applicable), and the actual temperature the laser is set to.

This device includes a microcontroller to fully control the laser's optical power, temperature, and monitor the system for fault conditions. The laser source includes a USB connection that allows remote adjustment of power, temperature, and enabling. On the rear panel, analog inputs are available to modulate the lasers with an external signal. This is added to the internal set points. To prevent damage, the microcontroller will disable the output if the analog input plus the internal set point exceeds the laser limits.

While most output sources fall within the class 3R laser rating, the system was fully designed to meet 3B laser class requirements. There is an interlock located on the rear panel that must be shorted in order for any laser

output to be enabled. This can easily be configured to be triggered by doors to disable the lasers in unsafe conditions. The power switch is a keylock system to prevent accidental or unwanted use. Each source has its own enable button allowing the user to choose the light source or sources they wish to be active as well as a master enable which must also be set. Each channel includes a green LED indicator to easily determine its current state. There is a 3 second delay before the lasers turns on, and the user is warned by the LED rapidly blinking.
The MCLS1-CUSTOM includes a universal power supply allowing operation over 100 – 240 VAC without the need for selecting the line voltage. The fuse access is conveniently located on the rear panel. This unit is supplied with a region-specific U.S. or standard European line cord, the pre-configured laser source with all selected lasers installed, and the manual.

Technical Data

1.4.1 Specifications

General Specifications	
AC Input	100 – 240 VAC, 50 – 60 HZ
Input Power	35 VA Max
Fuse Ratings	250 mA
Fuse Type	IEC60127-2/111 (250 V, Slow Blow Type ‘T’)
Fuse Size	5 mm x 20 mm
Dimensions (W x H x D)	12.6″ x 2.5″ x 10.6″ (320 mm x 64 mm x 269 mm)
Weight	8.5 lbs
Operating Temperature	15 to 35 °C
Storage Temperature	0 to 50°C
Connections and Controls	
Interface Control	Optical Encoder with Push Button
Enable and Laser Select	Keypad Switch Enable with LED Indication
Power On	Key Switch
Fiber Ports	FC/PC
Display	LCD, 16×2 Alphanumeric Characters
Input Power Connection	IEC Connector
Modulation Input Connector	BNC (Referenced to Chassis)
Interlock	2.5 mm Mono Phono Jack (see Chapter 6)
Communications	
Communications Port	USB 2.0
Com Connection	USB Type B Connector
Required Cable	2 m USB Type A to Type B Cable (Replacement Item # USB-A-79)

Performance Specifications

Display Power Accuracy	±10%
Current Set Point Resolution	0.01 mA
Temperature Adjust Range	20.00 to 30.00 °C
Temp Set Point Resolution	±0.01 °C
Noise	<0.5% Typical (Source Dependent)
Rise Time / Fall Time	<5 [is
Modulation Input	0 – 5 V = 0 – Full Power
Modulation Bandwidth	80 kHz Full Depth of Modulation

For individual laser diode specs, please see that table on page 5.

1.4.2 Mechanical Drawings

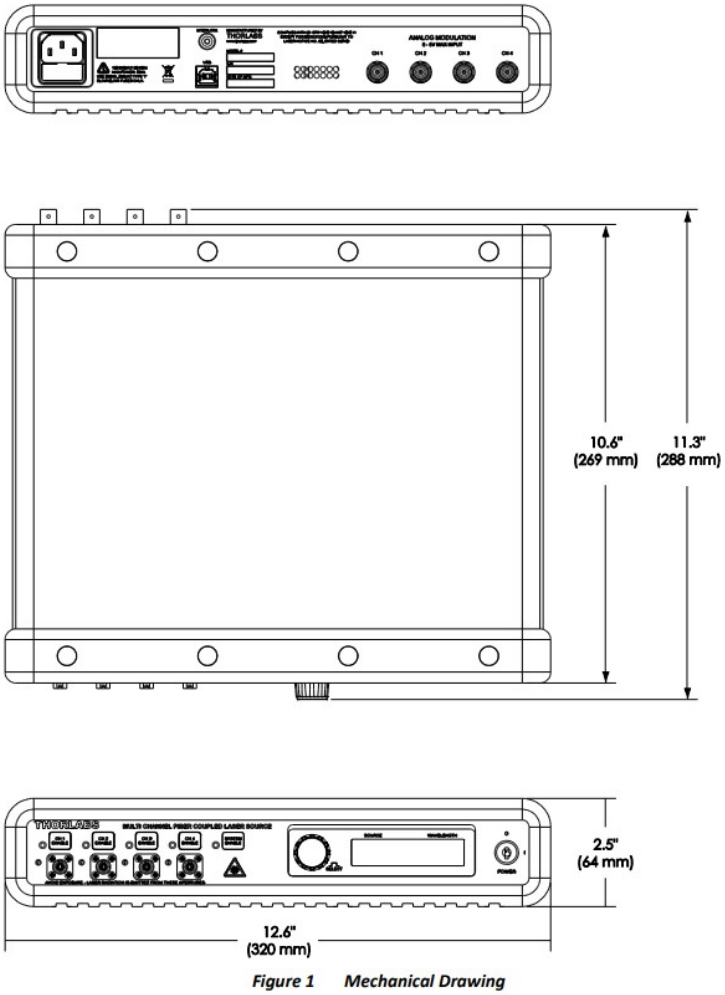

Figure 1 Mechanical Drawing

Components

1.5.1 List of Available Light Sources

The table below lists the standard available system light sources.

Laser Source Name	Typical A (nm)	A Range (nm)	Min Power'	Typical Power	Laser Type	Monitor PCP	Fiber
MCLS1-406	406	395 -415	4.0 mW	6.0 mW	Fabry-Perot	Yes	S405-XP
MCLS1-473-20	473	468 -478	15.0 mW	20 mW	Fabry-Perot	Yes	460HP
MCLS1-488	488	483 -493	18.0 mW	22 mW	Fabry-Perot	Yes	460HP
MCLS1-520A	520	510 – 530	10.0 mW	15.0 mW	Fabry-Perot	Yes	460HP
MCLS1-635	635	630 – 640	2.5 mW	3.5 mW	Fabry-Perot	Yes	SM600
MCLS1-638	638	628 – 648	10.0 mW	15.0 mW	Fabry-Perot	Yes	SM600
MCLS1-642	642	635 – 645	15.0 mW	20.0 mW	Fabry-Perot	Yes	SM600
MCLS1-658	658	648 – 668	9.5 mW	14.0 mW	Fabry-Perot	Yes	SM600
MCLS1-660	660	653 – 663	15.0 mW	17.0 mW	Fabry-Perot	No	SM600
MCLS1-670	670	660 – 680	1.5 mW	2.5 mW	Fabry-Perot	Yes	SM600
MCLS1-670-4	670	660 – 680	4.0 mW	5.0 mW	Fabry-Perot	Yes	SM600
MCLS1-685	685	675 – 695	10.0 mW	13.5 mW	Fabry-Perot	Yes	SM600
MCLS1-705	705	695 – 715	10.0 mW	15.0 mW	Fabry-Perot	Yes	SM600
MCLS1-730	730	720 – 740	12.5 mW	15.0 mW	Fabry-Perot	Yes	SM600
MCLS1-785	785	770 – 800	6.0 mW	7.5 mW	Fabry-Perot	Yes	780HP
MCLS1-785-25	785	780 – 790	20.0 mW	25.0 mW	Fabry-Perot	No	780HP
MCLS1-808-20	808	803 – 813	20.0 mW	25.0 mW	Fabry-Perot	Yes	SM800-5.6-125
MCLS1-830	830	820 – 840	8.0 mW	10.0 mW	Fabry-Perot	Yes	SM800-5.6-125
MCLS1-850	850	840 – 860	7.5 mW	10.5 mW	Fabry-Perot	Yes	SM800-5.6-125
MCLS1-850-MM	850	847 – 857	45.0 mW	50.0 mW	Fabry-Perot	Yes	GIF625
MCLS1-852	852	847 – 857	20.0 mW	25.0 mW	Fabry-Perot	Yes	SM800-5.6-125
MCLS1-915	915	910 – 920	30.0 mW	40.0 mW	Fabry-Perot	Yes	SM800-5.6-125
MCLS1-940	940	930 – 950	25.0 mW	30.0 mW	Fabry-Perot	Yes	SM800-5.6-125
MCLS1-980	980	965 – 995	6.0 mW	9.0 mW	Fabry-Perot	Yes	980HP
MCLS1-980-20	980	970 – 990	15 mW	20 mW	Fabry-Perot	Yes	SM800-5.6-125
MCLS1-1064	1064	1059-1069	20.0 mW	25.0 mW	Fabry-Perot	Yes	H11060

a. This is the minimum guaranteed output power of the laser when the adjustment knob is set at the maximum.
b. When no photodiode is present, the display will show the current instead of the power and will display a message “NO PD”.

Laser Source Name	Typical A (nm)	A Range (nm)	Min Powera	Typical Power	Laser Type	Monitor PDb	Fiber
MCLS1-1310	1310	1290-1330	2.5 mW	3.0 mW	Fabry-Perot	Yes	SMF-28e+
MCLS1-1310-15	1310	1290-1330	13.0 mW	15.0 mW	Fabry-Perot	No	SMF-28e+
MCLS1-1310DFB	1310	1290-1330	1.5 mW	2.0 mW	DFB	Yes	SMF-28e+
MCLS1-1550	1550	1520-1580	1.5 mW	2.0 mW	Fabry-Perot	Yes	SMF-28e+
MCLS1-1550-10	1550	1530-1570	8.0 mW	10.0 mW	Fabry-Perot	No	SMF-28e+
MCLS1-1550DFB	1550	1540-1560	1.5 mW	2.0 mW	DFB	Yes	SMF-28e+
MCLS1-1625	1625	1605-1645	10 mW	15 mW	Fabry-Perot	No	SMF-28e+

c. This is the minimum guaranteed output power of the laser when the adjustment knob is set at the maximum.
d. When no photodiode is present, the display will show the current instead of the power and will display a message “NO PD”.

1.5.2 Front and Back Panel Overview

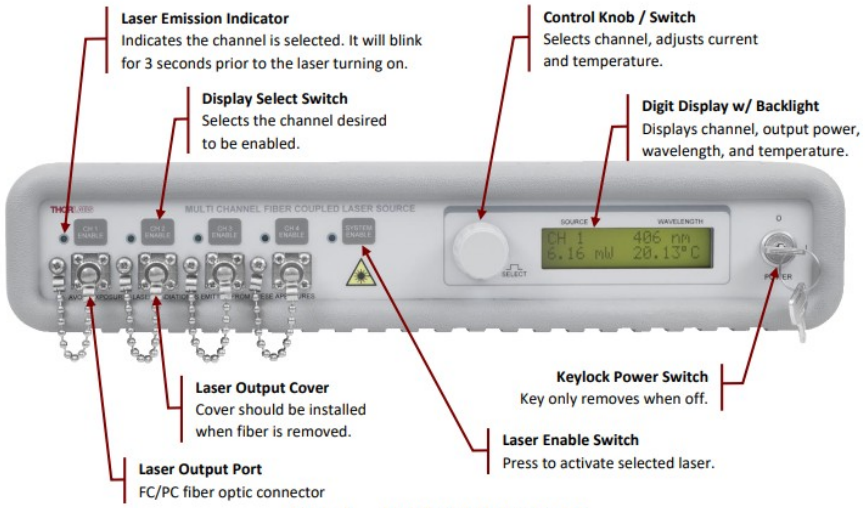

Figure 1 Front Panel of Laser Source

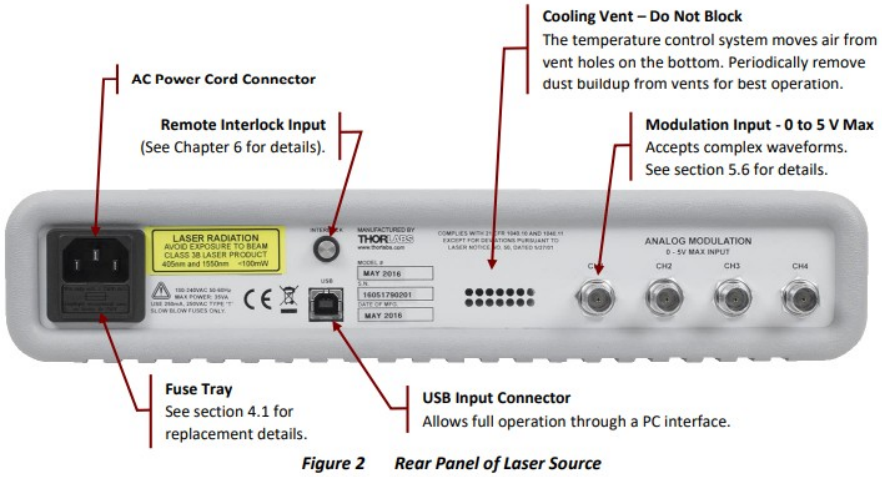

Figure 2 Rear Panel of Laser Source

1.6 Simplified Declaration of Conformity

Declaration of Conformity
Thorlabs Inc
435 Rt 206
Newton, NJ

USA
declares under it's own responsibility, that the product:
MCLS1
fulfills the requirements of the standard

2006/95 EC	Low Voltage Directive 12.Dec. 2006
EMC 2004/108/EC	Electromagnetic Compatibility Directive
EN 61010-1:2001	Safety of Test and Measurement Equipment
EN 61326-1:2006	EMC of Test and Measurement Equipment
CISPR 11 Edition 4:2003	Conducted Emissions
CISPR 11 Edition 4:2003	Radiated Emissions
IEC 61000-3-2,	Harmonics
IEC 61000-3-3	Voltage Fluctuation and Flicker
IEC 61000-4-2	Electrostatic Discharge
IEC 61000-4-3	Radiated Immunity
IEC 61000-4-4	Electrical Fast Transient/Burst, Power Leads
IEC 61000-4-4	Electrical Fast Transient/Burst, /O Leads
IEC 61000-4-5	Surge Immunity, Power Leads
JEC 61000-4-6	Conducted Immunity, Power Leads
1EC 61000-4-6	Conducted Immunity, I/O Leads
IEC 61000-4-11	Voltage Dips. Interrupts and Variations

and therefore corresponds to the regulations of the directive.
Dachau, 8. Juni 2011

Place and date of issue
Name and signature of authorized person

FCC Designation

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Chapter 2 Safety

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly.

⚠ WARNING

⚠ Risk of Electrical Shock

High voltage inside. To avoid electrical shock, before powering unit, make sure that the protective conductor of the 3-conductor power cord is correctly connected to the protective earth contact of the socket outlet. Improper

grounding can cause electric shock resulting in severe injury or even death. Do not operate without cover installed.

 **Warning**

This unit must not be operated in an explosive environment.

Avoid Exposure

Laser Radiation Emitted from Apertures

 **CAUTION**

Do not operate in wet or damp conditions. Do not obstruct the air-ventilation slots in the housing!

NOTICE

Mobile telephones, cellular phones, or other radio transmitters should not be used within the range of three meters of this unit since the electromagnetic field intensity may exceed the maximum allowed disturbance values according to EN50082-1.

The unit is supplied with a 115 V parallel blade line cord for North American use only.

For all other applications use an IEC 320 compatible line cord fitted with a plug appropriate for your particular AC wall socket.

Make sure that the line voltage rating marked on the rear panel agrees with your local supply and that the appropriate fuses are installed. Changing of the mains fuse can be done by the user (see Setting the AC Line Voltage and Installing Fuses). With the exception of the mains fuses, there are no user serviceable parts in this product.

This device can only be returned when packed into the complete original packaging, including all foam packing inserts. If necessary, ask for a replacement package.

Laser Safety

This device can only be returned when packed into the complete original packaging, including all packing inserts. If necessary, ask for a replacement package.

Per 21 C.F.R. §1040.10 and IEC 60825-1:2014+A11:2021, the MCLS2-CUSTOM series of lasers are rated in the 3B Laser Safety Class.

According to Laser Institute of America: “A Class 3B laser is hazardous if the eye is exposed directly, but diffuse reflection such as from paper or other matte surfaces are not harmful. Continuous lasers in the wavelength range from 315 nm to far infrared are limited to 0.5 W. For pulsed lasers between 400 and 700 nm, the limit is 30 mJ. Other limits apply to other wavelengths and to ultra-short, pulsed lasers. Protective eyewear is typically required where direct viewing of a class 3B laser beam may occur. Class-3B lasers must be equipped with a key switch and a safety interlock.”

According to the revised ANSI Z136.1 Safe Use of Lasers, laser area warning signs should be posted around Class 3 laser areas and are required to be posted around all Class 3B and 4 laser areas. NOTICE signs are required for Class 3B and Class 4 lasers during maintenance, servicing, and similar situations.

Safe practices and proper usage of safety equipment should be taken into consideration when operating lasers.

Laser emission in the visible and near infrared spectral ranges has the greatest potential for retinal injury, as the cornea and lens are transparent to those wavelengths, and the lens can focus the laser energy onto the retina. Common laser safety precautions include:

- Follow all safety precautions in the operator’s manual.
- Never aim the laser at a person’s eyes, skin, or clothes.
- Always use proper laser safety eyewear. Because the MCLS2-CUSTOM is a configurable laser/SLD source, appropriate levels of attenuation depend on the details of the configuration being used. See the Resources section of this chapter for sources of laser safety information. The necessary information regarding power and wavelength can be found on the laser safety labels.
- Avoid wearing watches, jewelry, or other objects that may reflect or scatter the laser beam.
- Wear clothing to cover skin that might be inadvertently exposed to the beam.
- Keep the laser beam paths above or below eye level for both sitting and standing positions.
- Ensure that individuals do not look directly into a laser beam.
- Eliminate all unnecessary reflective surfaces from the vicinity of the laser beam path.
- Ensure that all individuals who operate Class 4 lasers are trained in laser safety and authorized to operate a laser. Do not leave a running laser unattended if there is a chance that an unauthorized user may attempt to

operate the laser. A key switch should be used if untrained persons may gain access to the laser. A warning light or buzzer should be used to indicate when the laser is operating.

- Use low power settings, beam shutters, and laser output filters to reduce the beam power to less hazardous levels when the full output power is not required.
- Make sure that spectators are not exposed to hazardous conditions.
- Operate the laser only in a well-controlled area (for example, within a closed room with covered or filtered windows and controlled access).
- Label laser area and room with appropriate Class 3B or Class 4 laser warning signs.
- Mount the laser on a firm support to ensure that the beam travels along the intended path.

Additionally, it is necessary to connect the fiber patch cable(s) you will be using to the MCLS2-CUSTOM fiber outputs ports before enabling the lasers, both for safety reasons and fiber care. Please see section Error! Reference source not found. regarding cleaning of fiber tips in order to prevent fiber damage and system degradation.

 VISIBLE AND INVISIBLE LASER RADIATION
AVOID EXPOSURE TO THE BEAM
CLASS 3B LASER PRODUCT
405 – 1550 nm <100 mW

Resources

Safety of laser products –
Part 1: Equipment classification and requirements
IEC 60825-1:2014+A11:2021
ISBN 978 0 539 21768 1
PERFORMANCE STANDARDS FOR LIGHT-EMITTING PRODUCTS
21 C.F.R. §1040
Laser Safety Guide
Laser Institute of America
ISBN 978-1-940168-03-6
www.lia.org/store/product/laser-safety-guide

Chapter 3 Installation

Warranty Information

This precision device is only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

Packing List

- MCLS1-CUSTOM Multi Channel Fiber Coupled Light Source
- Operating Manual
- 120 VAC US Power Supply Line Cord, when purchased in the US or 230 VAC Power Supply Line Cord for Europe
- 250 mA Fuse (Preinstalled)
- USB 2.0 Type A to Type B Cable
- Fiber Cleaning Card

Setting the AC Line Voltage and Installing Fuses

Your MCLS Series Laser Source has been shipped from Thorlabs configured for 100 to 240 VAC operation. There is no line switch adjustment to be made. However, it may be necessary to replace an open fuse. To do this you must perform the following procedure.

- Remove the AC power cord if it is connected to the unit.
- Locate the fuse tray directly below the AC power cord connection on the rear panel of the unit.
- Carefully use a flat blade screwdriver to open the fuse tray.
- Remove the existing fuse and install the appropriate 250 mA fuse. The replacement fuse must be a 5 mm x 20 mm, 250 VAC Type T Fuse (IEC 60127-2/III, low breaking capacity, slow blow). Push the fuse tray back into place making sure that it snaps and seats correctly.
- Connect the appropriate power cord into the AC receptacle and plug the unit in.

Initial Set-up

- Locate the unit on a dry, level working surface.
- Make sure the POWER key switch on the front of the unit is in the OFF position (key perpendicular to working surface).
- Plug the female end of the AC line cord provided into the AC Input Receptacle on the rear of the unit. Plug the male end into a properly grounded AC socket.
- Install the interlock key into the interlock connector located on the rear panel. See Error! Reference source not found. for details.
- Connect a Fiber Optic cable to the LASER APERTURE on the front panel of the unit and verify that the dust caps are installed onto all unused fiber connections.

Chapter 4 Operation Turning On the Source

- Turn the POWER key switch clockwise. The LCD display will scroll “Thorlabs MCLS” across the screen, followed by the Ch1 information.
- Make sure the Interlock Input is short-circuited; see Error! Reference source not found. for detailed instructions.
- Select the desired output channels by pressing and releasing the ENABLE switch located above the desired fiber output sources. An indicator located next to the switch will light up.
- Press and release the SYSTEM ENABLE switch to activate the lasers. There will be an approximately 3 second delay before the lasers power up. During this time the SYSTEM ENABLE indicator will light up and the selected channel indicator lights will blink rapidly.
- The default display mode is laser power (mW), however the thermo-electric cooler is activated when the unit turns on.

Viewing Channel Information
The MCLS uses a single LCD display to access the information for each output channel. At any time, the display can be adjusted to view another channel by simply rotating the control knob located to the left of the display. The display will scroll through the channels until the desired channel is selected. The following information will be available:

- Top Left – Indicates the channel selected. As an additional indicator, the channel enable indicator selected will periodically blink on if disabled and off if enabled.
- Top Right – Indicates the wavelength of the selected channel. This is set at the factory when the lasers are installed.
- Bottom Left – Indicates the power level of the laser diode. If it is disabled this will read “0.00mW” and if the selected laser diode does not include a monitor diode this will read “No PD”. When enabled the current power

level determined from the monitor photodiode will indicate the approximate power level of the output.

NOTICE
The power shown on the display is the optical power at the laser aperture calibrated to the monitor photodiode. The actual power at the end of your fiber optic cable may be less, depending on the quality of the connection. All fiber optic cables installed should be cleaned first since dust and dirt particles in the connector will affect coupling efficiency and possibly damage the fiber connectors.

- Bottom Right – Indicates the actual temperature the laser is stabilized to and is displayed in ºC. The system defaults to a temperature of 25.00ºC until changed by the user. The temperature control is always active and requires 5 to 10 minutes to properly stabilize.

Adjusting the Laser Output Power and Temperature

- Rotate the control knob to select the appropriate channel. Clockwise rotation increases the channel while counterclockwise decreases the channel. The selected channel is indicated on the display as well as with a periodic blink of the channel indicator light.

Note: The adjustment knob utilizes an intelligent speed control. Adjusting the knob slowly will increment values at the maximum resolution while adjusting fast will make larger movements. This allows both a fine and course control.

- When the appropriate channel is selected, press the control knob in. The bottom left location will start blinking and will change to current. Ex: xx.xxmA. Adjust the control knob until the desired current is achieved. The power will adjust real-time. The first time default setting will be power full off. Adjusting the knob clockwise will immediately set the power to the laser threshold and then incrementally to the max operating current. Adjusting the knob counterclockwise will incrementally decrease the signal until it hits the threshold, and then immediately to laser off. On power down, the current setting will be remembered.

Note that there is a timeout on the display, after which the display will revert back to the viewing mode. This is to prevent accidental adjustment of the power.

- Press the knob again to switch to temperature adjustment. The set point temperature will be displayed and will be blinking; for example, 25.00ºC. Adjust the control knob to increase or decrease the temperature set point. The temperature default is 25.00 ºC but can be adjusted over a range of 20.00 to 30.00 ºC with a resolution of 0.01 ºC.
  Note: As above, there is a timeout where the display will revert to the viewing display and lock out adjustment to the temperature.
- Pressing the control knob again will exit the adjustment mode and revert back to the viewing mode, locking in the selected parameters. This can also be achieved by allowing the display to time out at any point in the process. Depending on the magnitude of the change in temperature set point, it will take anywhere from a few seconds to a few minutes for the system to settle into the new operating temperature.

Turning the Laser Off

- Standby Mode – By adjusting the control knob fully counterclockwise the power will adjust down to the

threshold current and then to off, or standby mode. The threshold current is the point at which the internal laser diode starts lasing. Below this it operates in a LED mode. For convenience the system is set up to adjust from the threshold to the max current. In addition, when adjusting below the threshold, the current will be set to almost 0 mA. Since the system utilizes a constant current control, there will always be a minimum current to maintain the current control loop. The output emission is typically very low, or nonexistent. The laser is still enabled and operating at the minimum possible current. This can be useful while using the external modulation. The full 5 V can be applied without compensating for the internal set point. However, the external signal will need to provide a DC offset to bias the laser above the threshold current for best results. Input signals will see clipping on their lower edges below threshold. Pulse response time may also be affected since there is typically a time delay during the LED to laser emission change.

- Disable/Enable Mode – The Laser output should be turned off by pressing and releasing the SYSTEM ENABLE switch. Outputs can be individually turned off at any time by pressing their ENABLE button. The laser temperature will be maintained even when the laser is disabled.
- Power Down – When completely powering down an enabled unit, first press and release the SYSTEM ENABLE switch and then turn the POWER key switch counterclockwise, which will turn OFF the entire unit.
  Anytime the unit is turned OFF and then turned back ON, the Laser will be disabled until the SYSTEM ENABLE switch is pressed and the desired channels are enabled.

Modulating the Laser Output

The MOD IN input can be used to modulate the laser output or set the laser output remotely using a 5 V power source. The 5 V maximum inputs correspond to the maximum calibrated power of each channel, which operate using a constant current drive technique. The resulting actual output power is dependent on the set current and operating temperature. In addition, in order to eliminate a dead zone in the power control knob, the output of the unit is offset to the threshold current of the coupled laser diode. Adjusting the knob below threshold will immediately set the current to almost 0 mA, or Standby mode as described in section Error! Reference source not found.. Therefore, there are two modes of modulation available. First, setting the control to “Standby” allows the analog modulation to utilize the full 0 to 5 V input range. The drawback is that a minimum voltage will be required to operate above the threshold current but allows more flexibility by the user. The second mode is to adjust the control knob so that the laser is at threshold or above. The analog modulation voltage will be limited to less than 5 V, but a DC offset will not be required. This should be kept in mind when using the modulation input since it will limit the actual input voltage range.

- Connect a signal generator or 0 to 5 V power source to the unit using a BNC type connector.
- Set the PWR ADJ knob on the front panel to its full counterclockwise setting for standby mode, or increase slightly to the threshold current mode.
- Press the ENABLE switch to turn on the laser, wait for the safety delay to time out.
- For Threshold Offset – Apply the appropriate signal to the MOD IN input. If too much voltage is applied internal current limiting will prevent damage to the laser diode and the laser diodes will be immediately disabled. If an internal threshold is set the acceptable drive voltage range will be less than 5V. To calibrate your input apply a DC voltage to the MOD IN and slowly increase until the system disables. This will be the max voltage allowable for that channel.
- For Standby Operation – Apply and appropriate signal between 0 and 5 V to the MOD IN for the desired channel. Determine the DC offset by increasing the voltage slowly until a large power jump is seen on the output. An easier method it to apply a 1 Vpp sinusoid and adjust the DC offset until the sinusoid appears and then the bottom edge is no longer clipping. This method requires applying the laser output to a photodetector and monitoring with an oscilloscope. Next maximize the amplitude so that the peak is 5 V or less as desired.

Chapter 5 Making the Safety Interlock Connections

The MCLS series laser sources are equipped with a remote interlock connector located on the rear panel, see Error! Reference source not found.Figure 3. All units have this feature regardless of their FDA and IEC classifications. In order to enable the laser source, a short circuit must be applied across the terminals of the Remote Interlock connector. In practice this connection is made available to allow the user to connect a remote actuated switch to the connector (i.e. an open-door indicator). The switch (which must be normally open) has to be closed in order for the unit to be enabled. Once the switch is in an open state the laser source will automatically shut down. If the switch returns to a closed condition the laser source must be re-enabled at the unit by pressing the SYSTEM ENABLE switch.
All units shipped from Thorlabs are configured with a shorting device installed in the Interlock connector. If you are not going to use this feature, then you can leave the shorting device installed and the unit will operate normally as described in the procedures above.
If you wish to make use of the Interlock feature, you will need to acquire the appropriate connector mate and wire it to your remote interlock switch. Next, remove the shorting device by pulling it out with a pair of needle nose pliers and install the connector into the interlock input.
The interlock input only accepts a 2.5 mm mono phono jack. This connector is readily available at most electronics stores.
The electrical specifications for the interlock input are shown in the following table.

Specification	Value
Type of Mating Connector	2.5 mm Mono Phono Jack
Open Circuit Voltage	+5 VDC with Respect to Chassis Ground
Short Circuit Current	~8 mA DC
Connector Polarity	Tip is +5 V, Barrel is Ground
Interlock Switch Requirements	Must be N.O. Dry Contacts Under no circumstances should any external voltages be appli ed to the interlock input.

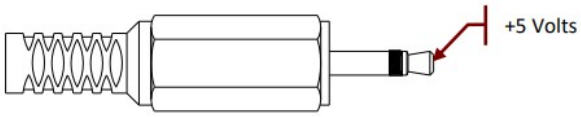

Figure 3 Remote Interlock Connector

Chapter 6 Remote Communications

Installing the USB Drivers
Prior to running the command line interface, the USB drivers must be installed. The MCLS Fiber-Coupled Laser Source must not be connected to the PC while installing the drivers. Refer to the link provided on the Download Card that was included with your unit, or by visiting **www.thorlabs.com/manuals** to download and install the latest software for the MCLS Series Fiber-Coupled Laser Source. From the dialog box that is displayed, select the Install Drivers button. Follow the onscreen prompts to install the driver. After the driver is installed, attach the MCLS Fiber-Coupled Laser Source to the PC and power it on. Your PC will then detect the new hardware and will prompt you when the installation is complete.
Command Line Interface
Once the USB drivers have been installed, the unit connected to the PC, and the power turned on, configure the terminal emulator as follows:

- Baud Rate = 115.2K Bits Per Second

- Data Bits = 8
- Parity = None
- Stop Bits = 1
- Flow Control = None

If the connection is correct, you will see the following after pressing the “Enter” key.
Command error CMD_NOT_DEFINED
Followed immediately by the prompt:
>
The basic structure of the interface is a keyword followed by either an equals sign “=” or a question mark “?”. The “=” or “?” will determine if the string is a command or a query. All strings (commands and queries) must be terminated by a carriage return (CR) or pressing the ENTER key on the computer.
The command structure is as follows:
Keyword = argument (CR)
The “keyword” defines the function and the question mark (?) indicates a query. The string is terminated with a carriage return (CR). See listing below.
There are a few exceptions to this which are noted below, also noted are unique shortcut keys.
The prompt symbol “>” will appear on power up and after a command is accepted by the system indicating it is ready to receive another command line.
Keywords (Commands and Queries)
The following list shows all the available commands and queries, and summarizes their functions:

Command	Syntaxa	Description
Get Commands	?	Lists the available commands.
Get ID	id?	Returns the model number and firmware version.
Get Channel	channel?	Returns the active channel.
Set Channel	channel=n	Select the channel specified by n.
Get Target Temp	target?	Returns the set temperature for the active channel (°C).
Set Target Temp	target=n	Sets the set temperature (n) for the active channel (°C).
Get Temp	temp?	Returns the actual temperature for the active channel (°C).
Get Current	current?	Returns the current for the active channel (mA).
Set Current	current=n	Sets the current (n) for the active channel (mA).
Get Power	power?	Returns the power for the active channel (mW).
Get Enable	enable?	Returns the current state of the active channels Enable button.
Set Enable	enable=n	Sets the state of the active channels Enable button. (0: disabled, 1: enabled)
Get System	system?	Returns the current state of the System Enable button.
Set System	system=n	Sets the state of the System Enable button. (0: disabled, 1: enabled)
Get Specs	specs?	Returns the Laser Diode Specifications for the active channel.
Get Step	step?	Returns the increment used to adjust the temperature and current when the arrow keys are pressed.
Set Step	step=n	Sets the increment (n) used to adjust the temperature and current when the arrow keys are pressed.
Save	save	Saves the current settings.
Get Status	statword	Returns a status word that indicates the state of all enable buttons.

a. All commands and queries are in lowercase letters.
If the keyword, format, or argument is incorrect or out of range, the unit will return an error string. The function is determined by the value set with the mode command in the above table.
In addition to the above commands there is also special functionality added to the arrow keys of the computer's keyboard.

- Up Arrow Key – Increments the current for the active channel by n.
- Down Arrow Key – Decrements the current for the active channel by n.
- Right Arrow Key – Increments the temperature for the active channel by n.
- Left Arrow Key – Decrements the Temperature for the active channel by n.

Where n is set by the command "Set Step".

Chapter 7 Maintenance and Cleaning

Aside from the AC Input fuse there are no user serviceable parts in this product. If you suspect something has failed on the unit, please contact Thorlabs for advice on returning the unit for evaluation. Always clean fiber optic connectors that will be inserted into the system and install the dust cap whenever the source is not being used. Allowing dust and dirt into the fiber ports will degrade coupling efficiency and possibly damage the fiber patch cords, both inside and outside. If you suspect this to be true, Thorlabs can clean and inspect the fiber connections, and repair if necessary.

Cleaning

The unit can be cleaned using a soft, slightly damp cloth. Avoid using any solvents on or near the unit. Keep the vent holes located on the bottom of the unit and on the rear panel free of dust buildup. Restricted airflow will cause the temperature controls to operate inefficiently and in extreme cases, lose temperature control.

Always clean the ferrule end of your fiber patch cable prior to inserting it into the output FC Adapter. Allowing dust and dirt into the fiber ports will degrade coupling efficiency and possibly damage the fiber patch cords, both inside and outside. If you suspect this to be true, Thorlabs can clean and inspect the fiber connections, and repair if necessary.

Chapter 8 Disposal

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return “end of life” Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out “wheelie bin” logo (see right), were sold to and are currently owned by a company or institute within the EC and
are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. “End of life” units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the user’s responsibility to delete all private data stored on the device prior to disposal.

Chapter 9 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at **www.thorlabs.com/contact** for our most up-to-date contact information.

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Documents / Resources

	THORLABS MCLS1-CUSTOM Multi Channel Fiber Coupled Laser Source [pdf] User Guide MCLS1-CUSTOM Multi Channel Fiber Coupled Laser Source, MCLS1-CUSTOM, Multi Channel Fiber Coupled Laser Source, Channel Fiber Coupled Laser Source, Fiber Coupled Laser Source, Coupled Laser Source, Laser Source

References

- Thorlabs, Inc. - Your Source for Fiber Optics, Laser Diodes, Optical Instrumentation and Polarization Measurement & Control
- Thorlabs - Your Source for Fiber Optics, Laser Diodes, Optical Instrumentation and Polarization Measurement & Control.
- Thorlabs - Your Source for Fiber Optics, Laser Diodes, Optical Instrumentation and Polarization Measurement & Control.
- User Manual