56 Sparta Avenue • Newton, New Jersey 07860
(973) 300-3000 Sales • (973) 300-3600 Fax
www.thorlabs.com

THORLABS

MCLS1-808-20 - April 04, 2018

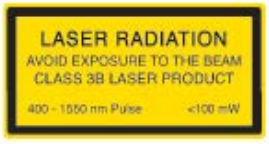
Item # MCLS1-808-20 was discontinued on April 04, 2018. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

4-CHANNEL FIBER-COUPLED LASER SOURCE

- 4 Laser Output Channels with FC/PC Connectors
- TEC and Controller for Each Channel
- Stable, Low Noise Output
- 30 Power/Wavelength Options Available

View of Back Panel

MCLS1



OVERVIEW

Features

- 4 Laser Output Channels with FC/PC Connectors
- Independent Temperature Control Gives High Temperature Stability
- Low Noise Output
- USB Interface
- Low-Profile Package, 2.5" (64 mm) Tall
- 23 Wavelengths Available (See Table Below for Details)

Item #	MCLS1
Display Power Accuracy	±10%
Current Set Point Resolution	0.01 mA
Temperature Adjust Range	20.00 to 30.00 °C
Temperature Set Point Resolution	±0.01 °C
Noise	<0.5% Typical (Source Dependent)
Rise/Fall Time	<5 µs
Support Documents	

Thorlabs' 4-Channel, Fiber-Coupled, Customizable Laser Source provides easy coupling and simple control of laser-diode-driven fiber optics. The laser source is configured to accept a wide range of fiber-pigtailed laser diodes with discrete wavelengths in the spectral range from 406 - 1550 nm, in any combination. The laser source allows more than one channel to be turned on simultaneously; however, it is only possible to adjust the power output of one at a time from the front panel.

Each laser diode is operated 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 laser current and temperature independently for each laser. The display indicates the channel number selected, the output wavelength of the source, the operating power calculated from the laser diode monitor diode, and the actual temperature the laser is set to.

This device incorporates a microcontroller to fully control the laser's optical power and temperature as well as to monitor the system for fault conditions. The laser source includes a USB connection that allows remote enabling, power adjustment, and temperature adjustment. On the rear panel, analog inputs are

available to modulate the laser diodes' outputs with an externally generated waveform. To prevent damage, the microcontroller will disable the output if the sum of the analog input and internal set point exceeds the laser limits.

Safety

While most output sources fall within the class 3R laser rating, the system was fully designed to meet laser class 3B 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 he wishes to be active, as well as a master enable that 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 turn on, and the user is warned by the LED rapidly blinking. The laser must be turned off before connecting or disconnecting a fiber to the output ports, particularly for powers above 10 mW.

In the Box

The MCLS 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 U.S. line cord as well as a standard European line cord, the pre-configured MCLS1 with all selected lasers installed, and the manual.

Below is a list of available lasers listed by wavelength and showing the corresponding minimum output power and pigtail fiber type. To discuss potential custom wavelengths and configurations not available below, please contact Tech Support. Please use the configurator below to select the pigtails and locations you would like.

Note: An MCLS1 unit must be purchased with at least one pigtail installed, and the channels of the MCLS1 unit must be filled in order. In other words, a laser for Channel 1 must be selected before a laser for Channel 2, Channel 2 before Channel 3, and Channel 3 before Channel 4. If you leave a subsequent channel blank, then the unit will be shipped without a laser in that channel. Subsequent empty channels can be filled by Thorlabs at a later date. Please contact Tech Support prior to sending your unit back to us.

Typical λ	Wavelength Range	Minimum Power[a]	Typical Power	Laser Type	Fiber
406 nm	395 - 415 nm	4.0 mW	6 mW	Fabry-Perot	S405-XP
473 nm	468 - 478 nm	15.0 mW	20 mW	Fabry-Perot	460HP
488 nm	483 - 493 nm	18.0 mW	22 mW	Fabry-Perot	460HP
520 nm	515 - 530 nm	8.0 mW	10.0 mW	Fabry-Perot	460HP
635 nm	630 - 640 nm	2.5 mW	3.5 mW	Fabry-Perot	SM600
638 nm	628 - 648 nm	10.0 mW	15 mW	Fabry-Perot	SM600
642 nm	635 - 645 nm	15.0 mW	20 mW	Fabry-Perot	SM600
658 nm	648 - 668 nm	9.5 mW	14 mW	Fabry-Perot	SM600
660 nm	653 - 663 nm	15.0 mW	17 mW	Fabry-Perot	SM600
670 nm	660 - 680 nm	1.5 mW	2.5 mW	Fabry-Perot	SM600
670 nm	660 - 680 nm	4.0 mW	5 mW	Fabry-Perot	SM600
685 nm	675 - 695 nm	10.0 mW	13.5 mW	Fabry-Perot	SM600
705 nm	695 - 715 nm	10.0 mW	15 mW	Fabry-Perot	SM600
730 nm	720 - 740 nm	12.5 mW	15.0 mW	Fabry-Perot	SM600
785 nm	770 - 800 nm	6.0 mW	7.5 mW	Fabry-Perot	780HP
785 nm	780 - 790 nm	20.0 mW	25 mW	Fabry-Perot	780HP
808 nm	803 - 813 nm	20.0 mW	25 mW	Fabry-Perot	SM800-5.6-125
830 nm	820 - 840 nm	8.0 mW	10 mW	Fabry-Perot	SM800-5.6-125
850 nm	840 - 860 nm	7.5 mW	10.5 mW	Fabry-Perot	SM800-5.6-125
850 nm	847 - 857 nm	45.0 mW	50 mW	Fabry-Perot	GIF625
852 nm	847 - 857 nm	20.0 mW	25 mW	Fabry-Perot	SM800-5.6-125
940 nm	930 - 950 nm	25.0 mW	30 mW	Fabry-Perot	SM800-5.6-125
980 nm	965 - 995 nm	6.0 mW	9 mW	Fabry-Perot	980HP
1064 nm	1059 - 1069 nm	20.0 mW	25 mW	Fabry-Perot	HI1060
1310 nm	1290 - 1330 nm	2.5 mW	3 mW	Fabry-Perot	SMF-28e+
1310 nm	1290 - 1330 nm	13.0 mW	15.0 mW	Fabry-Perot	SMF-28e+
1310 nm	1290 - 1330 nm	1.5 mW	2 mW	DFB	SMF-28e+

1550 nm	1520 - 1580 nm	1.5 mW	2 mW	Fabry-Perot	SMF-28e+
1550 nm	1530 - 1570 nm	8.0 mW	10.0 mW	Fabry-Perot	SMF-28e+
1550 nm	1540 - 1560 nm	1.5 mW	2 mW	DFB	SMF-28e+

- a. This is the minimum guaranteed output power of the laser when the adjustment knob is set at the maximum.

SPECS

Performance Specifications	
Display Power Accuracy	±10%
Current Set Point Resolution	0.01 mA
Laser Drive Current per Channel (Max)	120 mA
Temperature Adjust Range	20.00 to 30.00 °C
Temp Set Point Resolution	±0.01 °C
Noise	<0.5% Typical (Source Dependent)
Rise/Fall Time	<5 µs
Modulation Input	0 - 5 V = 0 - Full Power
Modulation Bandwidth	80 kHz Full Depth of Modulation

General Specifications	
AC Input	100 - 240 VAC, 50 - 60 Hz
Input Power	35 VA Max
Fuse Ratings	250 mA
Fuse Type	IEC60127-2/III (250V, 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 (3.9 kg)
Operating Temperature	15 to 35 °C
Storage Temperature	0 to 50 °C
Connections and Controls	
Interface Control	Optical Encoder with Pushbutton
Enable and Laser Select	Keypad Switch Enable with LED Indication
Power On	Key Switch
Fiber Ports	FC/PC
Display	LCD, 16x2 Alphanumeric Characters
Input Power Connection	IEC Connector
Modulation Input Connector	BNC (Referenced to Chassis)
Interlock	2.5 mm Mono Phono Jack
Communications	
Communications Port	USB 2.0

Com Connection	USB Type B connector
Required Cable	2 m USB Type A to Type B Cable (Replacement Part Number USB-A-79)

OPERATION

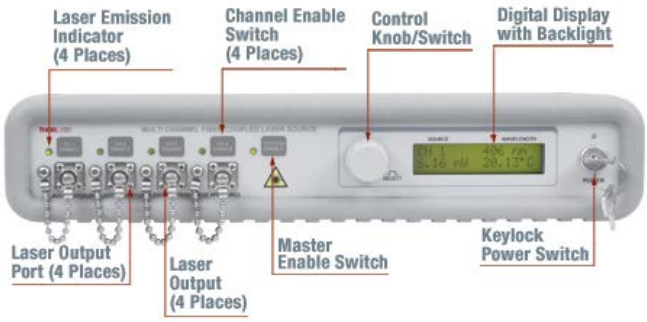
For in-depth operation instructions, please view the operating manual. A printed copy of this manual is included with each MCLS1 Laser Source.

Viewing Information

Thorlabs' Multi-Channel Laser Source (MCLS) uses a single four quadrant LCD display to access the information for each output channel (see photo to the right for details). Rotate the control knob to the left of the display to scroll through the channels until the desired channel is selected. The control knob is also a select switch that allows access to the laser current and temperature parameters (see below for more information).

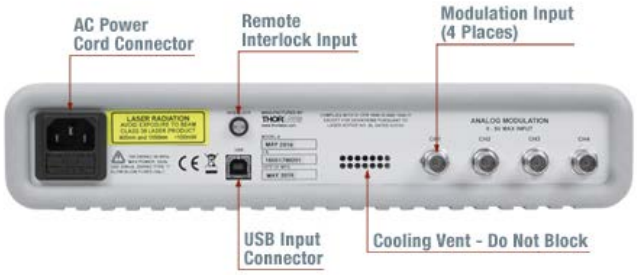
- Top Left: Indicates the selected channel.
- Top Right: Indicates the wavelength of the selected channel.
- Bottom Left: Indicates the power level of the laser diode output. If disabled, the power level will read "0.00 mW." If the selected diode does not include a monitor diode, this will read "No PD."
- Bottom Right: Indicates the actual temperature (in °C) that the laser is stabilized to. The default temperature is set to 25.00 °C and is user adjustable. The temperature control is always active and requires 5 to 10 minutes to properly stabilize.

Front Panel



Click to Enlarge

Back Panel



Click to Enlarge

Adjusting the Laser Output Power and Temperature

After selecting a channel, the output power and temperature of the selected laser can be adjusted. The control knob utilizes an intelligent speed control. Turning the knob slowly corresponds to fine adjustment while turning the knob quickly corresponds to coarse adjustment. The laser current adjustment translates to real-time adjustment of output power. The default setting upon first turning on the unit is output power fully off. Note that lasing occurs at the threshold current value, which is different for every source.

Once the desired channel is selected, the Laser Current and Temperature parameters can be adjusted by pressing the control knob in. Pressing in the knob once will select the Laser Current, pressing it a second time will select the Temperature Set Point, and pressing it a third time will revert back to the display mode and lock the selected parameters. The parameter to be adjusted is indicated with blinking text. The resolution is 0.1 mA for the current adjustment and 0.01 °C for the temperature adjustment.

Modulating the Laser Output

The Analog In input can be used to modulate the laser output or to set the laser output remotely using a 5 V power source. The 5 V maximum input corresponds to the maximum calibrated power of each channel. 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 0.0 mA (i.e., Standby mode). Therefore, there are two modes of modulation available. Setting the control to "Standby" first allows the analog modulation to utilize the full 0 to 5 V input range. The drawback to this modulation mode is that a minimum voltage is needed to operate above the threshold current. The second mode is to adjust the control knob so that the laser is at or above threshold. The analog modulation voltage will be limited to less than 5 V, but a DC offset will not be required. This DC offset should be kept in mind when using the modulation input since it will limit the actual input voltage range.

Making the Safety Interlock Connections

The MCLS series of laser sources are equipped with a remote interlock connector located on the rear panel. All units have this feature regardless of their FDA and IEC classifications. In order to enable the MCLS 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 MCLS source will automatically shut down. If the switch returns to a closed condition, the MCLS source must be re-enabled at the unit by pressing the "Master Enable" switch.

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 Requirement[a]	Must be Normally Open Dry Contacts

Interlock Mating Connector

- a. Under no circumstances should any external voltages be applied to the Interlock input

SOFTWARE

Software

Version 2.0.1

Software package to operate Thorlabs' MCLS1 4-Channel Laser Source, including a GUI, drivers, and LabVIEW/C++ SDK for secondary development.

Software

LASER SAFETY

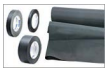
Laser Safety and Classification

Safe practices and proper usage of safety equipment should be taken into consideration when operating lasers. The eye is susceptible to injury, even from very low levels of laser light. Thorlabs offers a range of laser safety accessories that can be used to reduce the risk of accidents or injuries. 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.

Safe Practices and Light Safety Accessories

- Thorlabs recommends the use of safety eyewear whenever working with laser beams with non-negligible powers (i.e., > Class 1) since metallic tools such as screwdrivers can accidentally redirect a beam.
- Laser goggles designed for specific wavelengths should be clearly available near laser setups to protect the wearer from unintentional laser reflections.
- Goggles are marked with the wavelength range over which protection is afforded and the minimum optical density within that range.
- Laser Safety Curtains and Blackout Materials

can prevent direct or reflected light from leaving the experimental setup area.
- Thorlabs' Enclosure Systems can be used to contain optical setups to isolate or minimize laser hazards.
- A fiber-pigtailed laser should always be turned off before connecting it to or disconnecting it from another fiber, especially when the laser is at power levels above 10 mW.



- All beams should be terminated at the edge of the table, and laboratory doors should be closed whenever a laser is in use.
- Do not place laser beams at eye level.
- Carry out experiments on an optical table such that all laser beams travel horizontally.
- Remove unnecessary reflective items such as reflective jewelry (e.g., rings, watches, etc.) while working near the beam path.
- Be aware that lenses and other optical devices may reflect a portion of the incident beam from the front or rear surface.
- Operate a laser at the minimum power necessary for any operation.
- If possible, reduce the output power of a laser during alignment procedures.
- Use beam shutters and filters to reduce the beam power.
- Post appropriate warning signs or labels near laser setups or rooms.
- Use a laser sign with a lightbox if operating Class 3R or 4 lasers (i.e., lasers requiring the use of a safety interlock).
- Do not use Laser Viewing Cards in place of a proper Beam Trap.

Laser Classification

Lasers are categorized into different classes according to their ability to cause eye and other damage. The International Electrotechnical Commission (IEC) is a global organization that prepares and publishes international standards for all electrical, electronic, and related technologies. The IEC document 60825-1 outlines the safety of laser products. A description of each class of laser is given below:

Class	Description	Warning Label
1	This class of laser is safe under all conditions of normal use, including use with optical instruments for intrabeam viewing. Lasers in this class do not emit radiation at levels that may cause injury during normal operation, and therefore the maximum permissible exposure (MPE) cannot be exceeded. Class 1 lasers can also include enclosed, high-power lasers where exposure to the radiation is not possible without opening or shutting down the laser.	
1M	Class 1M lasers are safe except when used in conjunction with optical components such as telescopes and microscopes. Lasers belonging to this class emit large-diameter or divergent beams, and the MPE cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. However, if the beam is refocused, the hazard may be increased and the class may be changed accordingly.	
2	Class 2 lasers, which are limited to 1 mW of visible continuous-wave radiation, are safe because the blink reflex will limit the exposure in the eye to 0.25 seconds. This category only applies to visible radiation (400 - 700 nm).	
2M	Because of the blink reflex, this class of laser is classified as safe as long as the beam is not viewed through optical instruments. This laser class also applies to larger-diameter or diverging laser beams.	
3R	Lasers in this class are considered safe as long as they are handled with restricted beam viewing. The MPE can be exceeded with this class of laser, however, this presents a low risk level to injury. Visible, continuous-wave lasers are limited to 5 mW of output power in this class.	
3B	Class 3B lasers are hazardous to the eye if exposed directly. However, diffuse reflections are not harmful. Safe handling of devices in this class includes wearing protective eyewear where direct viewing of the laser beam may occur. In addition, laser safety signs lightboxes should be used with lasers that require a safety interlock so that the laser cannot be used without the safety light turning on. Class-3B lasers must be equipped with a key switch and a safety interlock.	
4	This class of laser may cause damage to the skin, and also to the eye, even from the viewing of diffuse reflections. These hazards may also apply to indirect or non-specular reflections of the beam, even from apparently matte surfaces. Great care must be taken when handling these lasers. They also represent a fire risk, because they may ignite combustible material. Class 4 lasers must be equipped with a key switch and a safety interlock.	
All class 2 lasers (and higher) must display, in addition to the corresponding sign above, this triangular warning sign		

Part Number	Description	Price	Availability
MCLS1	4-Channel Laser Source, TEC Stabilized, USB, Controller Only	$3,869.88	Lead Time
MCLS1-1310-15	1310 nm, 13.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$892.50	Lead Time
MCLS1-1550-10	1550 nm, 8.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$892.50	Lead Time
MCLS1-520	520 nm, 8 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$938.40	Lead Time
MCLS1-660	660 nm, 15 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$360.06	Lead Time
MCLS1-670-4	670 nm, 4.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$493.68	Lead Time
MCLS1-685	685 nm, 10.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$370.26	Lead Time
MCLS1-730	730 nm, 12.5 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$634.44	Lead Time
MCLS1-830	830 nm, 8.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$453.90	Lead Time
MCLS1-850-MM	850 nm, 45.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$460.02	Lead Time
MCLS1-940	940 nm, 25.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$436.56	Lead Time
MCLS1-406	406 nm, 4 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$695.64	Lead Time
MCLS1-473-20	473 nm, 15.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$5,599.80	Lead Time
MCLS1-488	488 nm, 18.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$5,161.20	Lead Time
MCLS1-635	635 nm, 2.5 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$439.62	Lead Time
MCLS1-638	638 nm, 10.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$493.68	Lead Time
MCLS1-642	642 nm, 15.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$697.68	Lead Time
MCLS1-658	658 nm, 9.5 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$328.44	Lead Time
MCLS1-670	670 nm, 1.5 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$367.20	Lead Time
MCLS1-705	705 nm, 10.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$814.98	Lead Time
MCLS1-785	785 nm, 6.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$343.74	Lead Time
MCLS1-785-25	785 nm, 20.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$616.08	Lead Time
MCLS1-808-20	808 nm, 20.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$483.48	Lead Time
MCLS1-850	850 nm, 7.5 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$413.10	Lead Time
MCLS1-852	852 nm, 20.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$503.88	Lead Time
MCLS1-980	980 nm, 6.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$406.98	Lead Time
MCLS1-1064	1064 nm, 20.0 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$1,168.92	Lead Time
MCLS1-1310	1310 nm, 2.5 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$327.42	Lead Time
MCLS1-1310DFB	1310 nm, 1.5 mW (Min) DFB SM Fiber-Pigtailed Laser Diodefor MCLS1	$825.18	Lead Time
MCLS1-1550	1550 nm, 1.5 mW (Min), FP SM Fiber-Pigtailed Laser Diode for MCLS1	$343.74	Lead Time
MCLS1-1550DFB	1550 nm, 1.5 mW (Min), DFB SM Fiber-Pigtailed Laser Diode for MCLS1	$945.54	Lead Time