

## **TWL-4-B-MIC User's Manual**

**Four Channel C Band Narrow Linewidth Tunable Laser Benchtop**



**CAUTION –  
USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER  
THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION  
EXPOSURE.**



**THE USER MUST READ THIS MANUAL BEFORE OPERATING THE PRODUCT.  
OPERATIONS OTHER THAN THOSE DESCRIBED IN THIS MANUAL MAY RESULT IN  
PERSONAL INJURY AND DAMAGE TO THE PRODUCT.**

**Note that any attempt to open or fix the equipment without prior approval  
by Optilab, LLC voids the warranty.**

**Ver. 1.1  
Sept 2021**



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## 1. General Information



### 1.1 SAFETY PRECAUTIONS



This product emits medium laser radiation from the optical connector(s) that classifies it to be a **CLASS 1M** laser product accordingly to IEC 60825-1:2014. **The optical output is hazardous for eyes exposure. Avoid eye exposure to direct or scattered radiation.**



**The optical output must be disabled when swapping patch-cord connections.**



**Ensure the optical output is within the range specified in the test report.**

### 1.2 Introduction

This manual contains information on the operation of the TWL-4-B-MIC unit.

### 1.3 Product Overview

The Optilab TWL-4-B-MIC is a 4 channel C band narrow linewidth tunable laser benchtop. The laser unit contains four external cavity laser diodes each driven by its low noise laser driver. The TWL-4-B-MIC provides up to 20 mW CW optical power in the 1528 nm - 1565 nm wavelength region for each channel. The TWL-4-B-MIC can be set to work at low noise mode, and the laser linewidth width can be as narrow as sub-100 kHz. The laser output can be controlled through the LCD touch screen or remotely through a PC. Please contact Optilab for more information.

### 1.4 Features

- Four channel outputs
- External cavity laser diode
- Narrow linewidth
- 1528 nm to 1565 nm tunable laser wavelength
- 5 to 20 mW tunable laser output power
- LCD touch screen monitor and remote control

## 2. Operation

### 2.1 Introduction

This chapter describes how to operate the TWL-4-B-MIC unit and introduces the location and function of the controls and connectors.

### 2.2 Initial Inspection

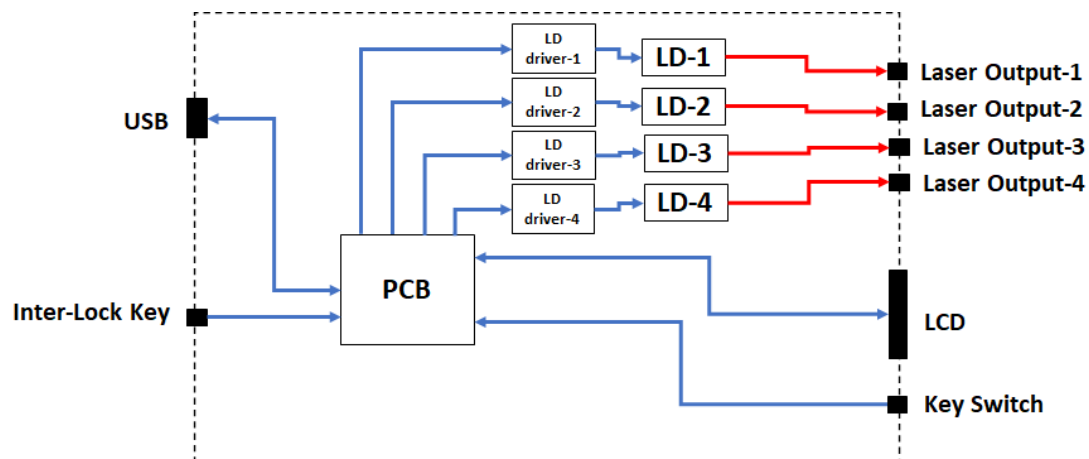
Your TWL-4-B-MIC benchtop was carefully inspected before it left the manufacturer. It should be in proper working order upon receipt. You should, however, inspect the unit for any damage that may have occurred in transit. If the shipping container or the packing material is damaged, keep it until the contents of the shipment have been checked to be free of mechanical and electrical damages. Notify Optilab, LLC promptly if any notable damage is found.

Each TWL-4-B-MIC shipment should include the following:

- TWL-4-B-MIC Laser Benchtop Unit
- Test Datasheet
- User Manual
- AC Power Cord
- USB Cable
- Interlock
- Key Switch

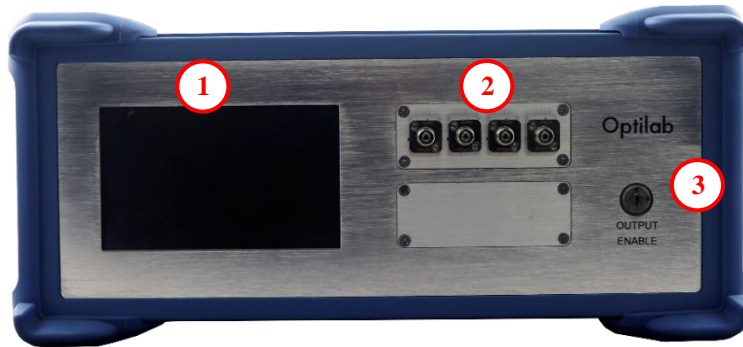
### 2.3 Function Diagram

The function diagram of the TWL-4-B-MIC is shown below:



**2.4 Panel Control Interface**

*TWL-4-B-MIC Front Panel*



*TWL-4-B-MIC Real Panel*



Feature	Function
① Touch LCD Screen	This LCD display and control the system setting and status. Refer to Sec. 2.6 for operation instruction.
② Optical Outputs	Four channel Optical output ports. The output pigtail uses a FC/APC connector with endcap fiber. Mate this connector to a FC/APC fiber connector.
③ Key Switch	Enable and disable the optical power. Vertical direction: OFF; Horizontal direction: ON
④ Cooling Fan	The cooling fan is used to cool the unit.
⑤ Interlock	This BNC connector is a safety interlock. It must be shorted for the pump lasers to enable. Use the provided accessory to short this port or connect it to a compatible interlock device. If the interlock is open during normal operation, the pump lasers will be turned off. To re-enable the pump laser output, turn the key switch in the front panel to "OFF" position first and start over.
⑥ RJ-45 connector	Not used.
⑦ USB	This USB port provides remote control feature. Refer to Sec. 2.7 for communication instruction.
⑧ AC Power Switch	This switch enables the electrical power to the SWL-15XX-MC module.
⑨ AC Power Socket	The AC power socket is the input for the AC power source. A three-pin standard power cord should be used to connect this equipment to any 110 or 220 V main supply.

## 2.5 Turn On and OFF Operation Instructions



### **CAUTION!**

**Read and follow the SAFETY PRECAUTIONS in this manual before operation. Failing to follow the instruction voids the warranty.**

### 2.5.1 Turn on instruction

1. Provide proper placement of the benchtop to ensure the safety of the device and the surrounding environment during operation. Wear proper Personal Protective Equipment (PPE), such as gloves and goggles rated for Class 1M Laser operation.
2. Launch the optical output pigtail. It can be connected to a fiber collimator with FC/APC coupler, or mate to a matching end cap fiber connector using a FC/APC adapter. In either case, thoroughly clean and inspect the end fiber for any dust or contaminants that may ignite upon operation.
3. Once all proper optical connections are made, plug in the AC power cord into the rear panel. Ensure the front panel Main Laser Enable Key is OFF, and the interlock on the back panel is connected properly.
4. Flip the rear panel AC Power Switch to the ON position to enable power to the unit, which should enable the front panel LCD display.

**Note:** The Unit recalls the parameters that were set in the previous run.

5. Turn on the key switch on the front panel. Turn on the LD, adjust the wavelength and power level as needed on the touch screen. For narrow linewidth application, turn on the low noise mode (see section 2.6).

### 2.5.2 Turn off Instruction

Turn off the laser of each channel using the LCD touch screen or a computer in remote mode. Turn off the switch on the front panel. Flip the rear panel AC Power Switch to the OFF position.

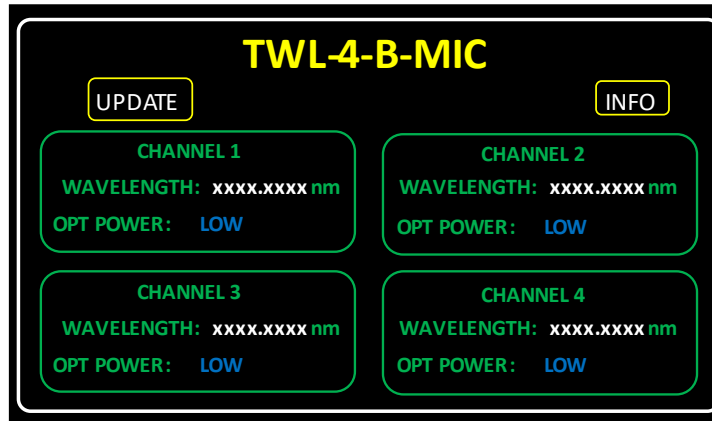
**Note:** Do not hot-plug any optical patch cord or electrical cables. Permanent damage may occur to the unit!

## 2.6 LCD Touch Screen Operation

The benchtop unit uses the LCD touch screen for status monitoring and system setting controls. Laser Status Page shows up when the unit is powered on. Flip the Key in the front panel to the ON position before setting the laser parameters.

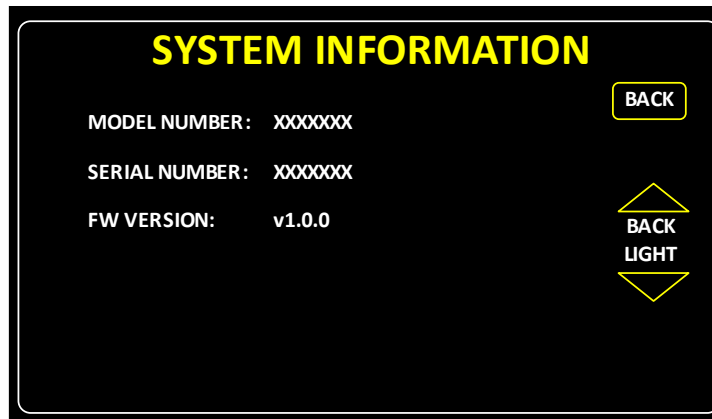
Laser Status Page:

This page displays the status of the laser. Click the **UPDATE** to update the displayed parameters. Click the **INFO** button to enter the system information page. Click the center of each channel window to enter the Laser Setting Page of each channel.



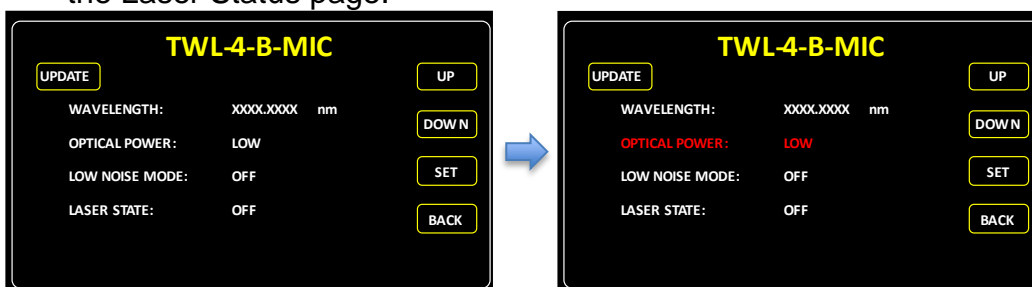
System Information Page

This page displays the information of the system. Use the triangle button to turn on or off the back light, use the **BACK** button to return to the Laser Status Page.



Laser Setting Page

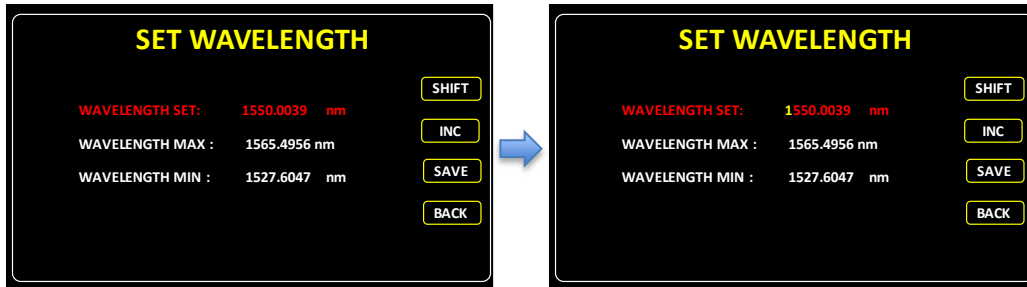
This page offers the function to enter the wavelength setting page, the optical power setting page, the laser noise mode setting page and the laser On/Off setting page. Use the **UP** and **DOWN** button to select the setting page (the selected item becomes red) and then use the **SET** button to enter the selected setting page. Use **BACK** button to return to the Laser Status page.





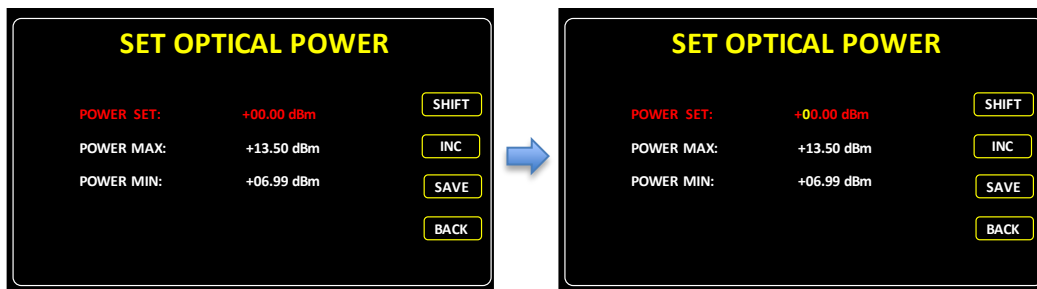
### Wavelength Setting Page

This page offers the function to set the wavelength of the laser. It also displays the minimum and maximum wavelength of the laser. The wavelength setting resolution is 0.001 nm. Use the **SHIFT** button to select the digit of interest (the selected digit becomes yellow), use the **INC** to change the value of the digit, and then use the **SAVE** button to save the setting. Wait 10 to 60 sec for the setting to be updated. Use the **BACK** button to return to the laser setting page.



### Optical Power Setting Page

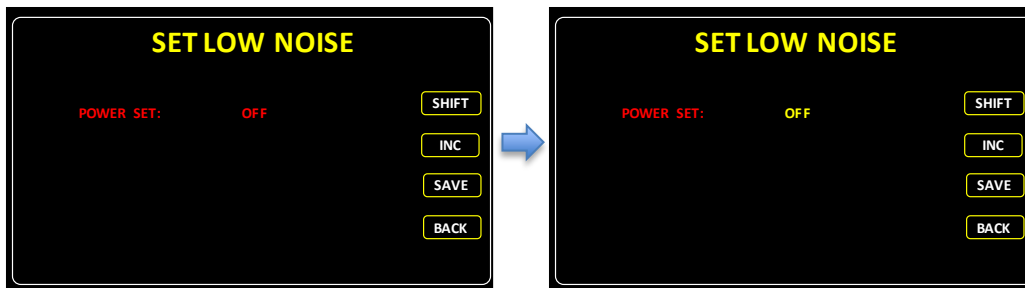
This page offers the function to set the laser power. It also displays the minimum and maximum optical power the laser can output. The optical power setting resolution is 0.01 dBm. Use the **SHIFT** button to select the digit of interest (the selected digit becomes yellow), use the **INC** to change the value of the digit, and then use the **SAVE** button to save the setting. Wait 10 to 60 sec for the setting to be updated. Use the **BACK** button to return to the laser setting page.



### Low Noise Mode Setting Page

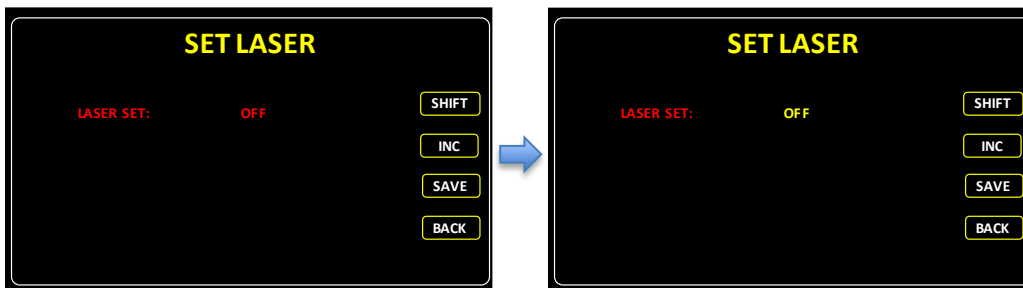
This page offers the function to set noise mode. Press **SHIFT** to activate the setting (the selected item becomes yellow), then use **INC** button to set the low noise mode ON or OFF, use the **SAVE** button to save the setting. Wait 10 to 60 sec for the setting to be updated. Use the **BACK** button to return to the laser setting page.

**Note:** The laser outputs narrow linewidth only when Low Noise Mode is ON.



### Laser Enable Setting Page

This page offers the function to set the laser ON or OFF. Use the **SHIFT** button to activate the setting (the selected item becomes yellow), use the **INC** to change the value of the digit, and then use the **SAVE** button to save the setting. Wait 10 to 60 sec for the setting to be updated. Use the **BACK** button to return to the laser setting page.



**Note:** The TWL-4-B-MIC may take 1 min to respond to the setting command and update the LCD display. After each setting, wait 10 to 60 sec for the unit to respond and use the **UPDATE** in the LCD to get the latest parameters' settings.

### 2.7 Remote Control

For the standard TWL-4-B-MIC, connecting the benchtop to an external PC (installed with RS232 Serial Terminal software, i.e., Termit) will allow for the parameter adjustment feature. Using a standard USB cable to connect the USB port on the real panel of the benchtop to the PC. Once the software is running, the benchtop unit will be recognized as a COM port device. Use the Device Manager or similar PC device tool to identify the COM port number.

Use the following RS232 settings:

Baud Rate = 9600

Data Bits: 8

Stop Bits:1

Parity: None

Flow Control: None

Append carriage return (CR) and line feed (LF) to each command, DO NOT type "{CR,LF}" into the command being sent.

The list below shows the available commands and actions.

COMMAND	DESCRIPTION	EXAMPLE	RESPONSE										
READ	Read the unit manufacturer information.	READ{CR,LF}	OPTILAB, LLC. Model Number: XXX Serial Number: XXX FW Version: v1.0.0										
READL+ADD	Read the status information for the channel specified by ADD. Note: ADD is the address of the LD. The four LDs and their address have been preset and are shown below: <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Channel</th> <th>Address</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> </tr> <tr> <td>2</td> <td>2</td> </tr> <tr> <td>3</td> <td>3</td> </tr> <tr> <td>4</td> <td>4</td> </tr> </tbody> </table>	Channel	Address	1	1	2	2	3	3	4	4	READL1{CR,LF}  This command reads the status information for channel-1.	CHANNEL1 STATUS: WAVELENGTH Set: XXXX.XXXX nm Max: XXXX.XXXX nm Min: XXXX.XXXX nm OPTICAL POWER Set: +XX.XX dBm Max: +XX.XX dBm Min: +XX.XX dBm LowNoise Mode: OFF LASER STATE: ON
Channel	Address												
1	1												
2	2												
3	3												
4	4												
SETL+ADD+L:OFF/ON	Turn on or off the LD in channel ADD (The LD starts or stops lasing).	SETL1L:ON{CR,LF}  This command turns on the LD in channel-1.	Successful										
SETL+ADD+N:OFF/ON	Turn on or turn off the Low noise mode of the LD in channel ADD.	SETL1N:ON{CR,LF}  This command turns on the low noise mode of the LD in channel-1.	Successful										
SETL+ADD+W:XXXX.XXX	Set the wavelength of the LD in channel ADD.	SETL1W:1555.5555{CR,LF}  This command sets the wavelength of the LD in channel-1 to be 1555.5555 nm.	Successful										
SETL+ADD+P:+XX.XX	Set the optical power of the LD in channel ADD.	SETL1P:+10.50{CR,LF}  This command sets the optical power of the LD in channel-1 to be +10.50 dBm.	Successful										

### 3. Technical Specifications

<b>Optical Specifications</b>	
Operating Wavelength	1528 nm to 1565 nm tunable
Optical Output Level	5 to 20 mW adjustable
Laser linewidth (FWHM)	100 kHz (Under low noise mode)
<b>Electrical and Mechanical Specifications</b>	
Power Supply Requirements	100 to 240 VAC, 50/60 Hz
Optical Connectors	FC/APC
Output Fiber	Panda PM-15
Operating Temperature	10°C to +40°C (Standard)
Storage Temperature	-20°C to +70°C
Control	LCD touch screen, USB
Power Consumption	25 W (Max)

## 4. Service and Support

### 4.1 Warranty

Optilab, LLC guarantees its TWL-4-B-MIC unit to be free of defects for 1 year from the date of shipment. The guarantee does not cover any damages resulting from the misuse or improper handling of the equipment, or any incidental or consequential loss. Note that the warranty will be void upon any attempt to open or to fix the equipment by the user without prior approval of Optilab, LLC.

### 4.2 Service and Calibration

Your TWL-4-B-MIC unit has been designed to provide years of trouble-free operation. No internal maintenance is required provided that the equipment is properly handled, operated, and kept away from contamination. For any questions regarding the operation and performance of the unit, please contact Optilab, LLC at:

Optilab, LLC  
600 E. Camelback Road  
Phoenix, AZ 85012  
Phone: 1-602-343-1496  
Fax: (602) 343-1489  
Email: sales@oequest.com

### 4.3 Care of Fiber-optic Connectors

Damage to optical connectors account for more than 70 percent of equipment performance degradation. To avoid such damage, the user should use only industrial grade 99% pure isopropyl alcohol and follow the procedures below to keep the connectors, adaptors, and receptacles clean.

#### **Cleaning Optical Connector End-face with Wipe and Alcohol**

To properly clean optical connectors utilizing lens tissue grade wipes and alcohol follow the procedure below. The moist wipe removes dust particles, oil and contaminants that may damage or block the end-face of the connector during connection. The dry wipe removes residual alcohol that may be ignited by optical emission.

1. Disable the optical output and turn off unit to prevent accidental exposure or damage to the optical connector by optical emission.
2. Moisten a wipe with alcohol by placing on top of the alcohol dispenser and push down to saturate the wipe.
3. Place the moist wipe on a work surface and place a second dry wipe next to it.
4. Wipe the optical connector, end-face down on the moist wipe 3 times and then repeat on the dry wipe.
5. Visually inspect the end-face of the optical connector with an optical microscope to verify cleanliness. Repeat steps 2 to 5 as needed.

#### **Cleaning Optical Connector Sides, Receptacles, Adaptors with Swab and Alcohol**

#### *Optilab, LLC*

600 E. Camelback Road, Phoenix, AZ 85012  
Phone: 1-602-343-1496, Fax: (602) 343-1489, Email: sales@oequest.com

Dust or particles can adhere to the insides of receptacles and adaptors or the sides of the optical connector ferrule. Their presence can affect the alignment of the optical fiber connectors and increase connection loss. To properly clean optical connectors, receptacles, and adaptors utilizing a swab and alcohol follow the procedure below:

1. Disable the optical output and turn off unit to prevent accidental exposure or damage to the optical connector by optical emission.
2. Moisten the swab by placing it on top of the alcohol dispenser and push down to saturate the swab.
3. For receptacles, adapters, or other connection points, insert the moistened swab and rotate the tip 1/2 turn clockwise and counterclockwise 6 times while applying light but firm pressure.
4. For fiber connectors, rotate the tip of the moistened swab 5 revolutions around the connector while applying light but firm pressure.
5. Visually inspect the end face of the connector with an optical microscope to verify cleanliness. Clean end-face as needed.