

# TWL-CL-R SERIES RACKMOUNT USER'S MANUAL

**Tunable Wavelength Laser, C-Band and L-Band, Rackmount**

**Caution:** The user must read this manual before operating the TWL-CL-R unit. Operations other than those described in this manual may result in personal injury and/or damage to the unit.

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

**Ver. 2.2  
May 10<sup>th</sup>, 2019**



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# 1. General Information

## 1.1. Introduction

This manual contains information on the installation and operation of the TWL-CL-R C-band tunable wavelength laser source.

## 1.2. Product Overview

The Optilab TWL-CL-R is a high spectral purity and very stable tunable wavelength laser source. The TWL-CL-R features wide wavelength tuning range, narrow laser line width, high Side Mode Suppression Ratio (SMSR), excellent wavelength stability and optical output level exceeding 20mW. With the standard Polarization Maintaining (PM) fiber output, TWL-CL-R offers a linearly polarized output. These features make TWL-CL-R well-suited for many different applications, including DWDM device testing, optical sensing and laboratory measurement applications

## 1.3. Features

- Wide wavelength tuning range from 1529.16nm to 1607.04nm
- High optical output power of up to 30 mW
- Narrow laser linewidth <100 kHz
- Linewidth broadening to 750 MHz
- Excellent Side Mode Suppression Ratio of 55 dB
- Polarization Maintaining (PM) Output
- Intuitive and easy to use USB interface

## 1.4. User Safety

1. The TWL-CL-R unit uses high intensity invisible light from the optical output receptacle. Avoid direct exposure to skin and eyes.
2. The equipment case is fully certified for EMS protection. The user should never open the equipment case; any attempt will void the warranty and may result in electric shock and EMS attack to equipment in the vicinity.
3. The user should avoid using any solvent or vaporizing chemical to clean the equipment panel or case. It may result in damage to the surface and internal circuits.

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## 2. Operation

### 2.1. Introduction

This chapter describes how to operate the TWL-CL-R unit, and discusses the location and function of the controls and connectors.

### 2.2. Initial Inspection

Your TWL-CL-R unit 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-CL-R shipment should include the following:

- TWL-CL-R rackmount unit
- User Manual
- Test Datasheet
- AC Power Cord
- USB Cable and Software DVD
- Keys

### 2.3. Controls

#### TWL-CL-R Front and Rear Panel



FEATURE	FUNCTION
① OPTICAL OUTPUT PORT(S)	These receptacles accept the indicated fiber-optic connector for the tuned optical output, which is polarization-maintaining type (PM). This unit pictured has one multiplexed C+L Port, standard configuration is individual C and L band optical ports.
② USB COMMUNICATION PORT	This port is used to send the software commands for proper interface and control.
③ LED INDICATORS	These LED indicators provide the status of the TWL-CL-R. The 'Power' indicator will illuminate green when the device has received proper AC power connections and the rear panel AC switch is enabled. The individual LED indicators beneath each optical output port will illuminate when an active output is detected.
④ LASER ENABLE SWITCH	This key switch toggles the internal TWL-CL-R laser source On and Off
⑤ LCD DISPLAY	This LCD display shows the power level and wavelength of the internal C-band tunable laser.
⑥ FRONT PANEL CONTROL BUTTONS	These Buttons are used to control and edit the parameters displayed on the LCD.
⑦ AC POWER SOCKET	This receptacle accepts the electrical input for the 110/220VAC source
⑧ AC POWER SWITCH	Enables/disables the AC electrical power to the rackmount unit.

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## 2.4. Operation Instructions

### **Start-up Procedure**

1. Insert the AC power cord into an appropriate AC power supply source and the rear panel AC Power Socket on the TWL-CL-R unit.
2. Make the proper PC communication port connection using a USB cable between each respective port.
3. Once all proper communication and optical connections are made, enable the rear panel AC Power Switch to the ON position; the front panel Power LED should enable green.
4. Toggle the front panel Laser Enable Switch to the ON position then use the front panel buttons or remote command to enable the individual laser; the front panel optical output LED should enable.
5. The TWL-CL-R unit is now fully operational; please refer to the Software Interface and Control section for more adjustment and operation details.

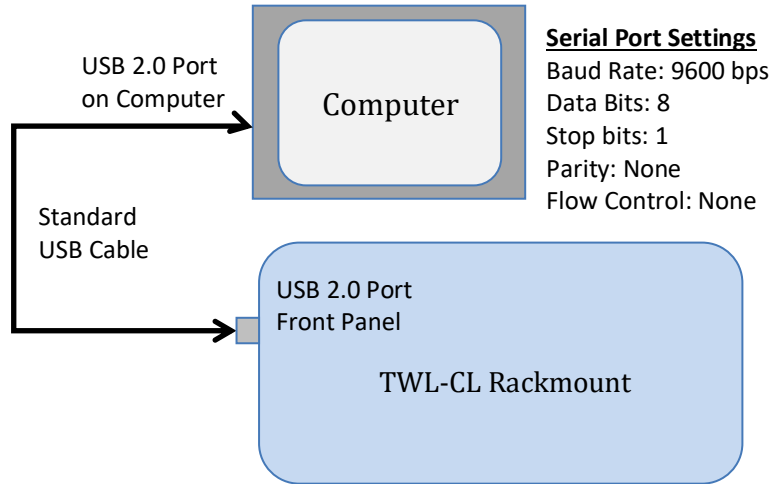
### **Patch Cord Swapping Procedure**

1. Toggle the front panel Laser Enable Switch to the OFF position to disable the TWL-CL-R module output.
2. Swap patchcords as desired. Only connect the indicated connector patchcords to the optical input/output receptacles, cleaning them as necessary.
3. Toggle the front panel Laser Enable Switch to the ON position then use the front panel buttons or remote command to enable the individual laser; normal operation will resume after a few seconds.

## 2.5. Software Interface and Control

For the standard TWL-CL-R, connecting the rackmount unit to an external PC will allow for parameter monitoring and power and wavelength adjustments.

Using the front panel USB 2.0 port and an appropriate serial terminal communication program (such as Termit), connect the TWL-CL-R to a PC using the following connection diagram and serial port settings:





## 2.1. Remote Command Set

When the electrical connections have been made, and the software settings for serial port transmission are set correctly, you are now able to send commands to the unit.

COMMAND	DESCRIPTION	EXAMPLE
<b>READALLx</b>	Reads the equipment information. Replace 'x' with the channel number: C-Band = 1 L-Band = 2 Returned data includes: Model Number, Serial Number, Firmware Version, Laser Status, Optical Power, Wavelength, Laser Temperature, Module Temperature, Power Range, Wavelength Range	READALL1{CR,LF}
<b>SETxL:y</b>	Enable or Disable the laser output for the selected channel. Replace 'x' with the channel number: C-Band = 1 L-Band = 2 Replace 'y' with the desired operation: ON = 1 OFF = 0	SET1L:1{CR,LF}
<b>SETxP:+yy.yy</b>	Set the laser output power for the selected channel. Replace 'x' with the channel number: C-Band = 1 L-Band = 2 Replace 'yy.yy' with the desired optical power. Preceding '0' is required for values below 10dBm and trailing zeros are required for two decimal places. Refer to the units test datasheet for optical power range for each channel.	SET1P:+07.50{CR,LF}
<b>SETxW:yyyy.yyyy</b>	Set the laser optical wavelength for the selected channel. Replace 'x' with the channel number: C-Band = 1 L-Band = 2 Replace 'yyyy.yyyy' with the desired wavelength. Trailing zeros are required for four decimal places. Refer to the units test datasheet for optical wavelength range for each channel.	SET1W:1557.5000{CR,LF}
<b>SETxS</b>	Saves the current parameters to memory for the selected channel. Replace 'x' with the channel number: C-Band = 1 L-Band = 2	SET1S{CR,LF}

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## 2.2. LCD Front Panel Controls

The Optilab TWL-CL-R device allows user to adjust the lasers by using 5 buttons on the front panel directly, as shown below next to the display:



Once the TWL-CL-R device has been powered on and the key switch has been turned to the ON position, the device is ready for operating, even without PC communication.

1. Press the "UP" or "DOWN" button to select the desired channel and press the "CENTER" button to activate the setting function for the selected channel.
2. While the setting function is active, use the "LEFT" or "RIGHT" buttons to select the value to be changed the use the "UP" or "DOWN" buttons to change the value.
3. Once the parameter has been set to the desired value, press the "CENTER" button to set and save the parameter.
4. Once editing is completed and values have been set, holding the "RIGHT" button for > 2 seconds will take you to a save screen. Pressing the "UP" button on this screen will save the current parameter settings to memory and will load these values each time the unit is powered ON. Pressing the "DOWN" button will cancel the save and return you to the previous screen.

### 3. Troubleshooting

SYMPTOM	POSSIBLE CAUSE AND SOLUTION
OPTICAL OUTPUT POWER NOT HIGH ENOUGH	<p><b>C:</b> Optical input / output connector is dirty.  <b>S:</b> Disable optical output to seed laser and clean optical connectors.</p>
	<p><b>C:</b> Use of incorrect optical adapter or connector.  <b>S:</b> Use only the indicated optical adapter and connector. If measurement instruments accept different connector type, then use a hybrid patch cord.</p>
	<p><b>C:</b> Optical input / output connector damaged.  <b>S:</b> Measure optical output power with power meter and compare with original test data. Return to Optilab for repair if the difference is high (&gt;4 dB) and cannot be corrected by cleaning or replacing the optical connectors. Always apply dust cover plugs to unused optical receptacles to prevent the damage of internal optical connectors.</p>
OPTICAL OUTPUT POWER UNSTABLE	<p><b>C:</b> Insufficient optical output isolation.  <b>S:</b> Connect isolator of corresponding wavelength to optical output connector.</p>
UNIT DOES NOT POWER UP	<p><b>C:</b> Blown fuse.  <b>S:</b> Contact Optilab, LLC to replace fuse.</p>
	<p><b>C:</b> Insufficient electrical voltage.  <b>S:</b> Check that the electrical supply is 110 / 220 VAC.</p>
	<p><b>C:</b> Power cord is loose.  <b>S:</b> Plug power cord is firmly into the unit.</p>
UNIT RESETS OR BLINKS ON AND OFF	<p><b>C:</b> Insufficient electrical voltage.  <b>S:</b> Check that the electrical supply is at least 100 VAC.</p>

## 4. Technical Specifications

### 4.1. Optical Specifications

Operating Wavelength	1529.160nm ~1607.040nm
Wavelength Accuracy	± 1.5 GHz
Wavelength Stability	± 1pm over 24 hours
Output Power	40mW (+16 dBm) max. per channel
Output Stability	0.02 dB over 8 hours
Linewidth (FWHM)	< 100 kHz w/o SBS < 750 MHz w/ SBS
Carrier to Noise Ratio (CNR)	50 dB typ. @ -5 dBm
Side Mode Suppression Ratio	55 dB typ.
Relative Intensity Noise (RIN)	-145dB/Hz
Polarization Extinction Ratio	20 dB min.
Optical Isolation	30 dB min.
Fiber Type	Panda 1550 PM Fiber

### 4.2. Mechanical Specifications

Power Supply Requirement	100-240 VAC
Optical Connectors	PM Narrow Key FC/APC Standard, additional types available
Operating Temperature	0°C to +40°C
Storage Temperature	-40°C to +70°C
Control	Output Power Level, Wavelength
Communication Interface	RS232, via USB 2.0
Local Alarm	Over Temperature, Over Current
Dimensions	1U Rackmount: 19" x 16" x 1.75"

## 5. Service and Support

### 5.1. Warranty

Optilab, LLC guarantees its TWL-CL-R 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

### 5.2. Service and Calibration

Your TWL-CL-R 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:

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### 5.3. 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 blot 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 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 Receptacles, Adaptors with Swab and Alcohol**

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 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 counter-clockwise 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.