

TWL-4-R SERIES RACKMOUNT USER'S MANUAL

Tunable Wavelength Laser, 4 Channels, Rackmount

Caution: The user must read this manual before operating the TWL-4-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. 1.0
Mar 09th, 2020

1. Table of Contents

- 2. GENERAL INFORMATION 1**
- 2.1. INTRODUCTION 1
- 2.2. PRODUCT OVERVIEW..... 1
- 2.3. FEATURES 1
- 2.4. USER SAFETY 1
- 3. OPERATION 2**
- 3.1. INTRODUCTION 2
- 3.2. INITIAL INSPECTION..... 2
- 3.3. PANELS AND CONTROLS..... 3
- 3.4. OPERATION INSTRUCTIONS 5
- 3.5. PC CONNECTION MODE 8
- 3.6. RS232 COMMAND SET..... 9
- 4. TROUBLESHOOTING..... 10**
- 5. TECHNICAL SPECIFICATIONS..... 11**
- 5.1. OPTICAL SPECIFICATIONS..... 11
- 5.2. MECHANICAL SPECIFICATIONS..... 11
- 6. SERVICE AND SUPPORT..... 12**
- 6.1. WARRANTY..... 12
- 6.2. SERVICE AND CALIBRATION..... 12
- 6.3. CARE OF FIBER-OPTIC CONNECTORS 13

2. General Information

2.1. Introduction

This manual contains information on the installation and operation of the TWL-4-R C-band tunable wavelength laser source.

2.2. Product Overview

The Optilab TWL-4-R is a high spectral purity and very stable 4channel tunable wavelength laser source. The TWL-4-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-4-R offers a linearly polarized output. These features make TWL-4-R well-suited for many different applications, including DWDM device testing, optical sensing and laboratory measurement applications.

2.3. Features

- Wide wavelength tuning range
- High optical output power of up to 28 mW
- Narrow laser linewidth <100 kHz
- Linewidth broadening to 750 MHz
- Excellent Side Mode Suppression Ratio of 55 dB
- Polarization Maintaining (PM) Output
- 5" touch screen for intuitive and easy control

2.4. User Safety

1. The TWL-4-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.

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: (602) 343-1496, Fax: (602) 343-1489, Email: sales@oequest.com

3. Operation

3.1. Introduction

This chapter describes how to operate the TWL-4-R unit, and discusses the location and function of the controls and connectors.

3.2. Initial Inspection

Your TWL-4-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-4-R shipment should include the following:

- TWL-4-R rackmount unit
- User Manual
- Test Datasheet
- AC Power Cord
- USB Cable
- Enable Keys
- Interlock

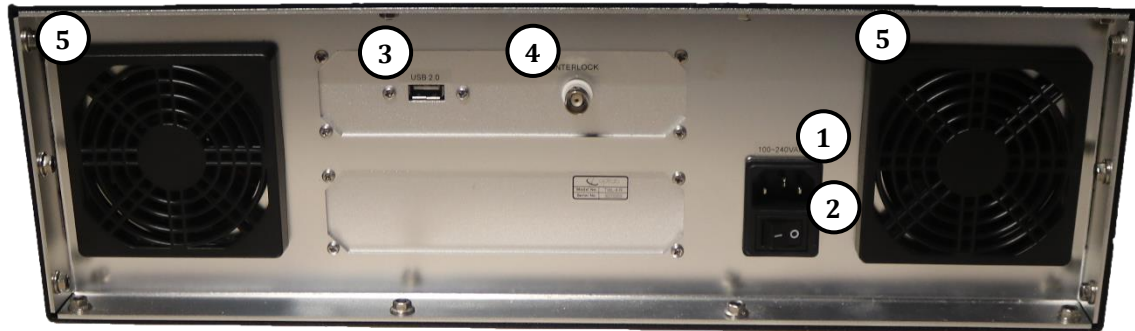
3.3. Panels and Controls

TWL-4-R Front Panel



FEATURE	FUNCTION
① MAIN TOUCH DISPLAY	The Touch LCD display shows the parameters and optical settings of the TWL-4-R unit. This is a touchscreen-type display (see section 2.4 for more information).
② OPTICAL OUTPUT PORTS	This receptacle accepts the indicated fiber-optic connector for the tuned optical output, which is polarization-maintaining type (PM). TWL-4-R has 4 channels, which user can choose different bands on each channel. Please refer to test report for details of each port information.
③ LASER ENABLE SWITCH	This key switch toggles the internal TWL-4-R laser source On and Off. When key is off, all four channels are off. To enable individual channels, turn on the key and then enable the laser software switch on the screen or through the USB command.

TWL-4-R Rear Panel



FEATURE	FUNCTION
① AC POWER SOCKET	This receptacle accepts the electrical power from 100 to 240 VAC.
② AC POWER SWITCH	This switch enables/disables the AC electrical power to the rackmount unit.
③ USB 2.0 FEMALE SOCKET	Using a USB cable, this port allows for remote control and monitoring through a PC workstation.
④ INTERLOCK	This BNC female 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 output switch on the front panel to "OFF" position first and start over.
⑤ VENTILATION FANS	The ventilation fans ensure proper ventilation inside the unit. The back panel of this equipment should be placed at least 3 inches from the wall to dissipate heat effectively.

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: (602) 343-1496, Fax: (602) 343-1489, Email: sales@oequest.com

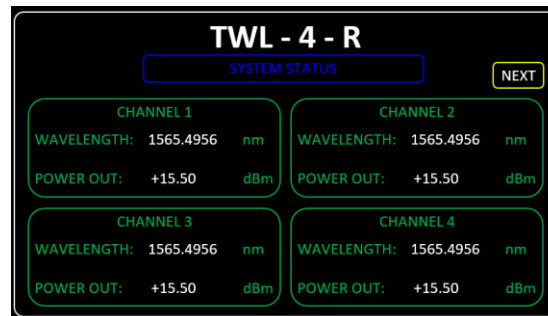
3.4. Operation Instructions

Start-up Procedure

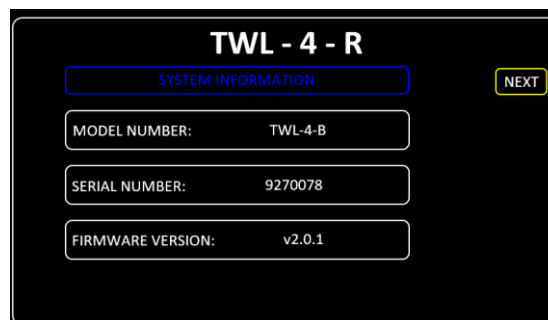
1. Insert the AC power cord into an appropriate AC power supply source and the rear panel AC Power Socket on the TWL-4-R unit.
2. Make the proper PC communication port connection using a USB cable between each respective port.
3. Once all proper communication and optical connections are made, enable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

Change Front Panel Setting

After plugging in the appropriate power plug into the AC Power Socket, flip the rear panel Main AC Power Switch to the On position to enable electrical power to the unit. The LED Main Display will turn on (as shown below).



Pressing 'NEXT' button leads to information page

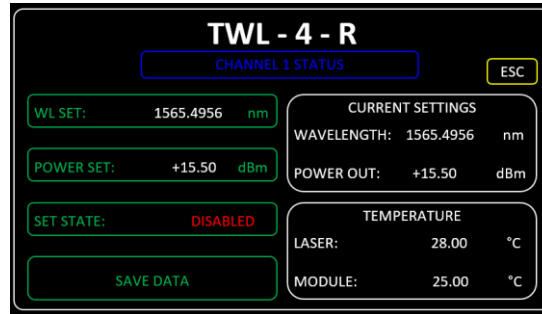


Optilab, LLC

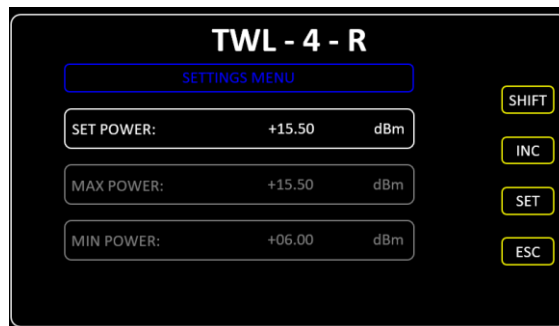
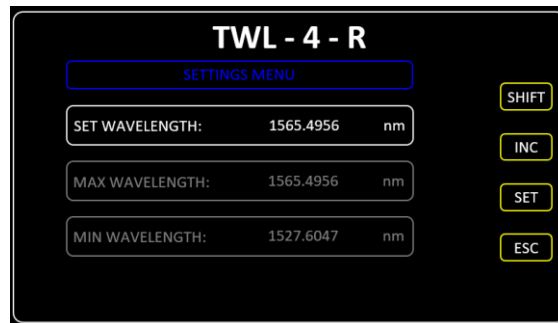
600 E. Camelback Road, Phoenix, AZ 85012

Phone: (602) 343-1496, Fax: (602) 343-1489, Email: sales@oequest.com

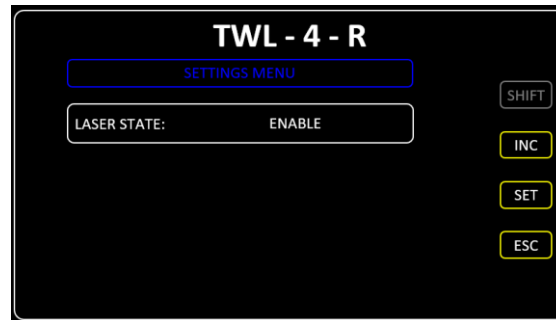
Pressing any of channels from main UI leads to CW setting page. Right side of page display information of unit. 'Module State' indicates current status of laser for 'Wavelength' and 'Optical power'. 'Temperature' shows Laser and Module's temperature in terms of Celsius. Left side of page provide CW setting of laser.



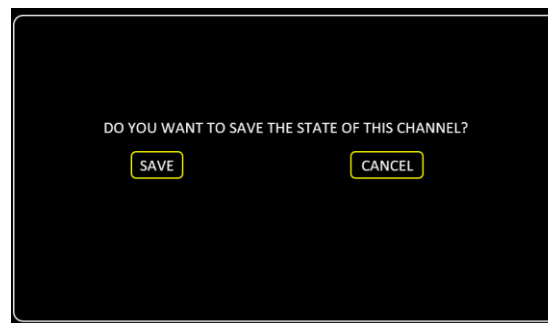
By selecting one of options take user to following pages. On 'Wavelength' and 'Power' setting page, user can enter desired values with buttons on the right. 'Shift' changes position of values. 'Inc' increases number of selected position value. 'Set' saves entered value then 'Return' take user to main CW setting page. Range of valid values for each setting can be found on two boxes under, where it says 'MAX WAVELENGTH/POWER' and 'MIN WAVELENGTH/POWER'



On 'Laser_Out' page, user can turn on/off laser. With 'Inc' button, 'Laser_Out:' states can be change to 'Enable/Disable'. In order to enable laser, following steps in order is required. Interlock from back panel should be shorted. Then key on front panel position to 'ON'. Lastly, 'Set' button has to be selected to enable each specific laser output channel.



From 'CHANNEL STATUS' page, 'Save' button lead user to following page and it saves all current CW setting as default when 'SAVE' button is pressed.



Note: The display takes up to 20 sec to update the system status. Once setting is changed, allow enough time for display to update.

Turn-Off Procedure

1. It is recommended to disable laser before turning off the system. This helps to reduce the risk of damage caused by system power if turned on accidentally.
2. Turn off the key switch first and then turn off the main AC power switch.

Patch Cord Swapping Procedure

1. Toggle the front panel Laser Enable Switch to the OFF position to disable the TWL-4-R module output.

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

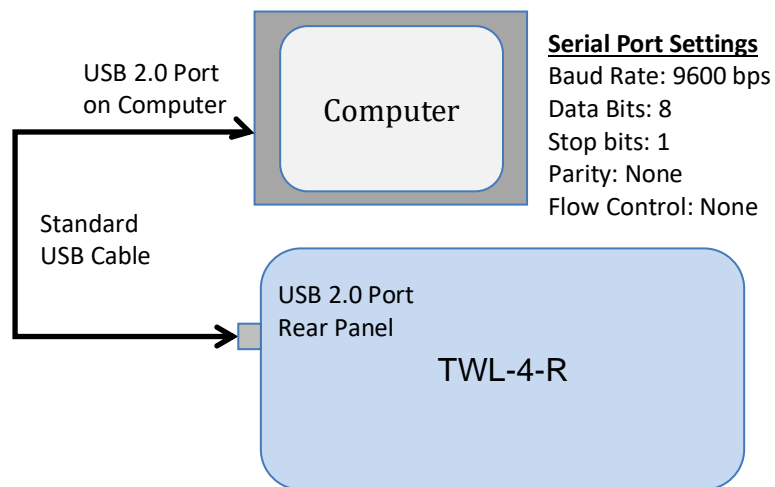
Phone: (602) 343-1496, Fax: (602) 343-1489, Email: sales@oequest.com

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.

3.5. PC Connection Mode

For the standard TWL-4-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 Optilab TWL software (Provided by Optilab), connect the TWL-4-R to a PC using the following connection diagram and serial port settings:



3.6. RS232 Command Set

When the PC connections have been made, and the software settings for serial port transmission are set correctly, you are now able to send commands to the TWL-4-R rackmount.

COMMAND	DESCRIPTION	EXAMPLE	RESPONSE
READ	Read the SN and model number of the unit.	READ	Optilab,LLC Model Type:TWL-4-R SN:1234567 Version:V1.0.0
READALLX	Read the status and setting of output channel X (=1 to 4)	READALL1	Channel One: Wavelength: Current:1550.0037nm MAX:1565.4956nm MIN:1527.6047nm OPT_power: Current:N/A MAX:+14.50dBm MIN:+05.99dBm Temperature: Laser:32.01 Module:25.48 Laser_State:Disable
SETXW:AAAA.B BBB	Set the wavelength of channel X (=1 to 4) in the unit of nm	SET2W:1552.1230	Success!
SETXP:+AA.BB	Set the output power of channel X (=1 to 4) in the unit of dBm	SET3P:+07.35	Success!
SETXL:Y	Enable/Disable the output of channel X (=1 to 4). Y=1 for enable, Y=0 for disable.	SET1L:1	Success!
SETXS	Save the current wavelength and power setting for channel X (=1 to 4) to the default setting when power up.	SET4S	Success!

4. Troubleshooting

SYMPTOM	POSSIBLE CAUSE AND SOLUTION
OPTICAL OUTPUT POWER NOT HIGH ENOUGH	<p>C: Optical input / output connector is dirty. S: Disable optical output to seed laser and clean optical connectors.</p> <p>C: Use of incorrect optical adapter or connector. S: Use only the indicated optical adapter and connector. If measurement instruments accept different connector type, then use a hybrid patch cord.</p> <p>C: Optical input / output connector damaged. S: Measure optical output power with power meter and compare with original test data. Return to Optilab for repair if the difference is high (>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>
MAIN DISPLAY GOES BLANK	<p>C: Static electrical discharge. S: Wait 10 to 30 seconds for the display to refresh.</p> <p>C: Insufficient ventilation. S: Place unit in well ventilated area or supply additional fans for ventilation.</p> <p>C: Cold Oven Status Update. S: If front panel is interfaced without the proper 2-3 minute warm up time, the front display may go blank. Pressing the blank space next to the arrow indicator on the edge of the touch screen will revert the display to normal. This indicator arrow is on the bottom right edge of the touch screen display</p>
OPTICAL OUTPUT POWER UNSTABLE	<p>C: Insufficient optical output isolation. S: Connect isolator of corresponding wavelength to optical output connector.</p>
UNIT DOES NOT POWER UP	<p>C: Blown fuse. S: Contact Optilab, LLC to replace fuse.</p> <p>C: Insufficient electrical voltage. S: Check that the electrical supply is 110 / 220 VAC.</p> <p>C: Power cord is loose. S: Plug power cord is firmly into the unit.</p>
UNIT RESETS OR BLINKS ON AND OFF	<p>C: Insufficient electrical voltage. S: Check that the electrical supply is at least 100 VAC.</p>

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: (602) 343-1496, Fax: (602) 343-1489, Email: sales@oequest.com

5. Technical Specifications

5.1. Optical Specifications

Operating Wavelength	1527.6 nm ~1565.5 nm (C band)
Wavelength Accuracy	± 1.5 GHz
Wavelength Stability	± 1 pm over 24 hours
Output Power	28 mW (+14.5 dBm) max. per channel
Output Stability	0.02 dB over 8 hours
Linewidth (FWHM)	< 100 kHz w/o SBS < 750 MHz w/ SBS (requires FW support)
Carrier to Noise Ratio (CNR)	50 dB typ. @ -5 dBm
Side Mode Suppression Ratio	55 dB typ.
Relative Intensity Noise (RIN)	-145 dB/Hz
Polarization Extinction Ratio	20 dB min.
Optical Isolation	30 dB min.
Fiber Type	Panda 1550 PM Fiber

5.2. 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	3U Rackmount: 450mm x 615mm x 150mm

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: (602) 343-1496, Fax: (602) 343-1489, Email: sales@oequest.com

6. Service and Support

6.1. Warranty

Optilab, LLC guarantees its TWL-4-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

6.2. Service and Calibration

Your TWL-4-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:

Optilab, LLC
600 E. Camelback Road
Phoenix, AZ 85012

Phone: (602) 343-1496
Fax: (602) 343-1489
Email: sales@oequest.com

6.3. 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.