

OM2012
nLaser Tunable C-, L-Band Laser Source
User Manual



071-3154-02

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User Manual

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USA

For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

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Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

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Table of Contents

Important safety information	iv
General safety summary	iv
Service safety summary	vi
Terms in this manual	vii
Symbols and terms on the product	vii
Compliance information	x
EMC compliance	x
Safety compliance	xi
Environmental considerations	xiii
Preface	xv
Supported products	xv
About this manual	xv

Getting Started

Getting started	1-1
Product description	1-1
Accessories	1-2
Options	1-2
Initial product inspection	1-3
Environmental operating requirements	1-4
Power requirements	1-4
PC requirements	1-5
Software installation	1-6
Set the instrument IP address	1-7

Operating Basics

Operating basics	2-1
OM2012 controls and connectors	2-1
Equipment setup	2-2
The Laser Receiver Control Panel (LRCP) user interface	2-3

Reference

LRCP remote interface	3-1
LRCP ATE interface	3-1
ATE functionality in MATLAB	3-7

Appendices

Appendix A: Cleaning and Maintenance	A-1
Cleaning	A-1
Maintenance	A-1

Index

Index	
-------	--

List of Tables

Table 1-1: Standard accessories.....	1-2
Table 1-2: OM2012 options.....	1-2
Table 1-3: OM2012 environmental requirements.....	1-4
Table 1-4: AC line power requirements.....	1-4
Table 1-5: Software install: controller PC.....	1-6

Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, additional information is provided at the end of this section. (See page vi, *Service safety summary*.)

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Use proper power cord. Use only the power cord specified for this product and certified for the country of use.

Do not use the provided power cord for other products.

Ground the product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, make sure that the product is properly grounded.

Do not disable the power cord grounding connection.

Power disconnect. The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it

is difficult to disconnect the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do not float the common terminal above the rated voltage for that terminal.

The measuring terminals on this product are not rated for connection to mains or Category II, III, or IV circuits.

Do not operate without covers. Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Replace batteries properly. Replace batteries only with the specified type and rating.

Use proper fuse. Use only the fuse type and rating specified for this product.

Wear eye protection. Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry. Remove the input signals before you clean the product.

Provide proper ventilation. Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment. Always place the product in a location convenient for viewing the display and indicators.

Avoid improper or prolonged use of keyboards, pointers, and button pads. Improper or prolonged keyboard or pointer use may result in serious injury.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use care when lifting and carrying the product.

Warning- Use correct controls and procedures. Use of controls, adjustments, or procedures other than those listed in this document may result in hazardous radiation exposure.

Do not directly view laser output. Under no circumstances should you use any optical instruments to view the laser output directly.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock. Do not touch exposed connections.

Do not service alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power. To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair. Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in this manual

These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbol(s) may appear on the product:



CAUTION
Refer to Manual



Protective Ground
(Earth) Terminal



Mains Disconnected
OFF (Power)

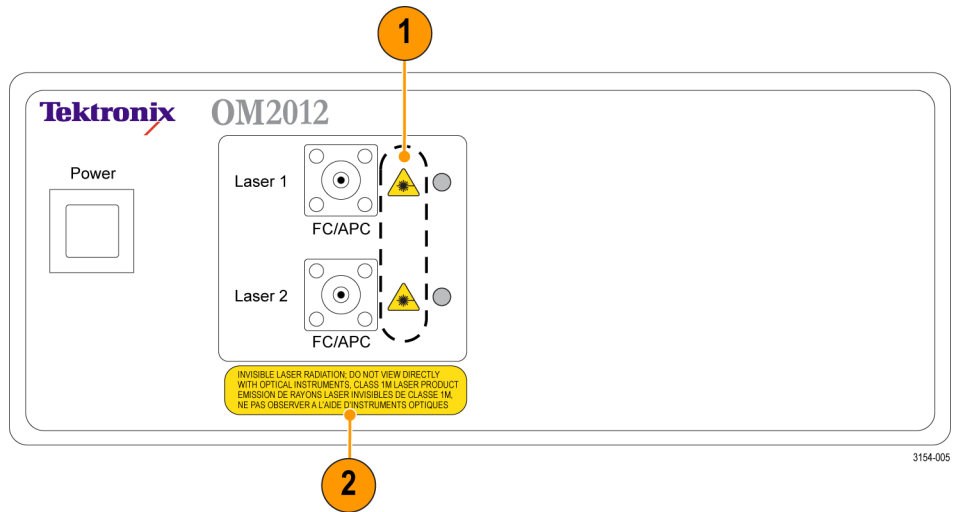



Mains Connected
ON (Power)



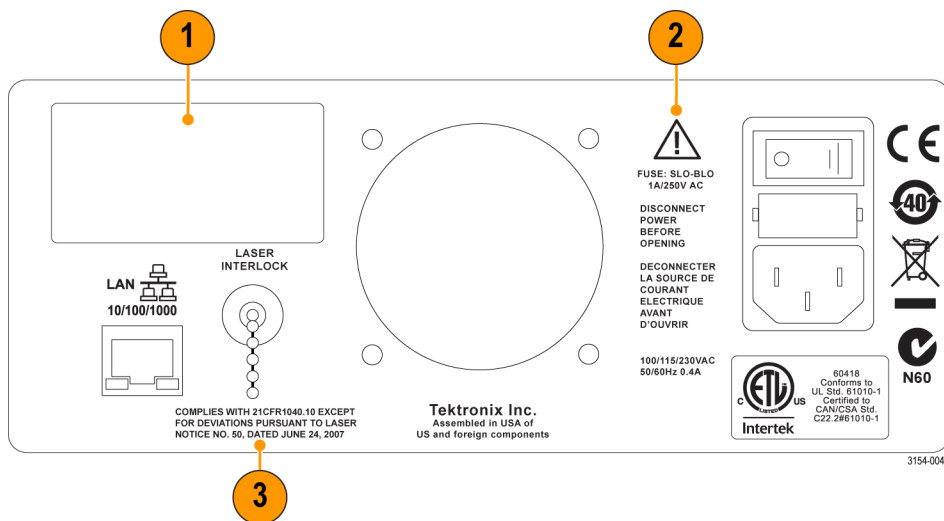
Invisible Laser
Radiation

Front panel labels



Item	Description
1	 Indicates the location of laser apertures
2	<div style="border: 1px solid black; border-radius: 15px; background-color: yellow; padding: 5px; text-align: center;">INVISIBLE LASER RADIATION; DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS, CLASS 1M LASER PRODUCT EMISSION DE RAYONS LASER INVISIBLES DE CLASSE 1M, NE PAS OBSERVER A L'AIDE D'INSTRUMENTS OPTIQUES</div>

Rear panel labels



Item	Description
1	Instrument model and serial number label
2	Fuse safety information
3	COMPLIES WITH 21CFR1040.10 EXCEPT FOR DEVIATIONS PURSUANT TO LASER NOTICE NO. 50, DATED JUNE 24, 2007

Compliance information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies.

EMC compliance

EC Declaration of Conformity – EMC

Meets intent of Directive 2004/108/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326-1 2006. EMC requirements for electrical equipment for measurement, control, and laboratory use. ^{1 2 3}

- CISPR 11:2003. Radiated and conducted emissions, Group 1, Class A
- IEC 61000-4-2:2001. Electrostatic discharge immunity
- IEC 61000-4-3:2002. RF electromagnetic field immunity
- IEC 61000-4-4:2004. Electrical fast transient / burst immunity
- IEC 61000-4-5:2001. Power line surge immunity
- IEC 61000-4-6:2003. Conducted RF immunity
- IEC 61000-4-11:2004. Voltage dips and interruptions immunity

EN 61000-3-2:2006. AC power line harmonic emissions

EN 61000-3-3:1995. Voltage changes, fluctuations, and flicker

European contact.

Tektronix UK, Ltd.
Western Peninsula
Western Road
Bracknell, RG12 1RF
United Kingdom

¹ This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

² Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

³ For compliance with the EMC standards listed here, high quality shielded interface cables should be used.

**Australia / New Zealand
Declaration of
Conformity – EMC**

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- CISPR 11:2003. Radiated and Conducted Emissions, Group 1, Class A, in accordance with EN 61326-1:2006.

Australia / New Zealand contact.

Baker & McKenzie
Level 27, AMP Centre
50 Bridge Street
Sydney NSW 2000, Australia

Safety compliance

This section lists the safety standards with which the product complies and other safety compliance information.

**EU declaration of
conformity – low voltage**

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:

Low Voltage Directive 2006/95/EC.

- EN 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.
- EN 60825-1. Safety of Laser Products - Part 1: Equipment classification and requirements.

**U.S. nationally recognized
testing laboratory listing**

- UL 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Canadian certification

- CAN/CSA-C22.2 No. 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.

Additional compliances

- IEC 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.
- IEC 60825-1. Safety of Laser Products - Part 1: Equipment classification and requirements.
- This laser product complies with 21CFR1040.10 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Equipment type

Test and measuring equipment.

Safety class	Class 1 – grounded product.
Pollution degree descriptions	<p>A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.</p> <ul style="list-style-type: none"> ■ Pollution degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms. ■ Pollution degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service. ■ Pollution degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind. ■ Pollution degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.
Pollution degree rating	Pollution degree 2 (as defined in IEC 61010-1). Rated for indoor, dry location use only.
IP rating	IP20 (as defined in IEC 60529).
Measurement and overvoltage category descriptions	<p>Measurement terminals on this product may be rated for measuring mains voltages from one or more of the following categories (see specific ratings marked on the product and in the manual).</p> <ul style="list-style-type: none"> ■ Category II. Circuits directly connected to the building wiring at utilization points (socket outlets and similar points). ■ Category III. In the building wiring and distribution system. ■ Category IV. At the source of the electrical supply to the building. <hr/> <p>NOTE. Only mains power supply circuits have an overvoltage category rating. Only measurement circuits have a measurement category rating. Other circuits within the product do not have either rating.</p> <hr/>
Mains overvoltage category rating	Overvoltage category II (as defined in IEC 61010-1).

Environmental considerations

This section provides information about the environmental impact of the product.

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Equipment recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2002/96/EC and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Perchlorate materials. This product contains one or more type CR lithium batteries. According to the state of California, CR lithium batteries are classified as perchlorate materials and require special handling. See www.dtsc.ca.gov/hazardouswaste/perchlorate for additional information.

Restriction of hazardous substances

This product is classified as an industrial monitoring and control instrument, and is not required to comply with the substance restrictions of the recast RoHS Directive 2011/65/EU until July 22, 2017.

Preface

This manual describes how to install and operate the OM2012 Coherent Receiver Calibration Source.

Supported products

The information in this manual applies to the following Tektronix products:

- OM2012 Tunable Laser Source
- OM4000D Coherent Lightwave Signal Analyzers
- OM1106 Coherent Lightwave Signal Analyzer stand-alone software (OUI) (included with OM4000 instruments)

About this manual

This manual contains the following sections:

- *Getting started* shows you how to install and configure the OM2012 instrument.
- *Operating basics* provides an overview of the front- and rear-panel controls and connections, and basic operations.
- *Reference* provides a MATLAB® function listing.

Getting Started

Getting started

This section contains the following information to get you started using the OM2012:

- Product description
- List of instrument accessories and options
- Initial product inspection
- Operating requirements (environmental, power)
- Software, network, and hardware setup

Product description

The OM2012 provides two tunable C-band or L-band laser sources for use in laboratory or industrial facilities for a variety of fiber optic system applications. The OM2012 is controlled using the LRCP software over an Ethernet connection.

NOTE. *A password is required to turn on the lasers. The default password is 1234.*

A remote interlock for the laser, located on the rear of the unit, allows for remote locking of laser output.

You can use the OM2012 along with the Tektronix OM4000 Analyzer and OM2210 Calibration Source for a complete optical calibration and testing setup.

Key features

- Full C-band and/or L-band Tunable continuous wave laser
- Integrated wavelength locker to support 50 GHz ITU Wavelength grid
- Settable Grid down to 10 GHz
- Off-grid Tuning for Custom wavelength applications
- User-adjustable Transmit power output (+6 to +14.5 dBm) and Wavelength adjustment during operation
- Supports Advanced features for DWDM networks such as SBS Dither and TxTrace Tone
- RoHS Compliant class 1M Laser

- Applications** Tunable Lasers for Design and Manufacturing Test of 2.5, 10, 40, 100 Gb/s Optical Networking Equipment, including the following:
- Multi-service provisioning platform (MSSP)
 - Cross connects
 - Optical switches
 - Optical Add/Drop multiplexers
 - Dense wavelength division multiplex (DWDM) terminals
 - Other wavelength division multiplex (WDM) metro system equipment

Accessories

The following table lists the standard accessories provided with the OM2012.

Table 1-1: Standard accessories

Accessory	Tektronix part number
OM2012 Tunable Laser Source instrument	Varies by option
OM2012 Tunable Laser Source User Manual (this manual)	071-3154-xx
HRC and LRCP software flash drive	650-5661-00
Ethernet cable, 7 ft.	174-6230-00
Shorting cap for BNC interlock connector	131-8925-00
Power cord (See page 1-3, <i>International power cord options.</i>)	Varies by option

Options

The following table lists the options that can be ordered with the OM2012.

Table 1-2: OM2012 options

Option	Description
CC	Two C-band lasers
CL	One C-band and one L-band laser
LL	Two L-band lasers

International power cord options

All of the available power cord options listed below include a lock mechanism except as otherwise noted.

- Opt. A0 – North America power (standard)
- Opt. A1 – Universal EURO power
- Opt. A2 – United Kingdom power
- Opt. A3 – Australia power
- Opt. A4 – North America power (240 V)
- Opt. A5 – Switzerland power
- Opt. A6 – Japan power
- Opt. A10 – China power
- Opt. A11 – India power (no locking cable)
- Opt. A12 – Brazil power (no locking cable)

Initial product inspection

Do the following when you receive your instrument:

1. Inspect the shipping carton for external damage, which may indicate damage to the instrument.
2. Remove the OM2012 from the shipping carton and check that the instrument has not been damaged in transit. Prior to shipment the instrument is thoroughly inspected for mechanical defects. The exterior should not have any scratches or impact marks.

NOTE. *Save the shipping carton and packaging materials for instrument repackaging in case shipment becomes necessary.*

3. Verify that the shipping carton contains the basic instrument, the standard accessories and any optional accessories that you ordered listed in the table. (See Table 1-1.)

Contact your local Tektronix Field Office or representative if there is a problem with your instrument or if your shipment is incomplete.

Environmental operating requirements

Check that the location of your installation has the proper operating environment. (See Table 1-3.)



CAUTION. *Damage to the instrument can occur if this instrument is powered on at temperatures outside the specified temperature range.*

Table 1-3: OM2012 environmental requirements

Parameter		Description
Temperature	Operating	+10 °C to +35 °C
	Nonoperating	-20 °C to +70 °C
Relative Humidity	Operating	15% to 80% (No condensation)
Altitude	Operating	To 2,000 m (6,560 feet) Maximum operating temperature decreases 1 °C each 300 m above 1.5 km.
	Nonoperating	To 15,000 m (49,212 feet)

Do not obstruct the fan so that there is an adequate flow of cooling air to the electronics compartment whenever the unit is operating. Leave space for cooling by providing at least 2 inches (5.1 cm) at rear of instrument for benchtop use. Also, provide sufficient rear clearance (approximately 2 inches) so that any cables are not damaged by sharp bends.

Power requirements

Table 1-4: AC line power requirements

Parameter	Description
Line Voltage Range	100/115 VAC single phase 230 VAC single phase
Line frequency	50/60 Hz
Maximum current	0.4 A



WARNING. *To reduce the risk of fire and shock, ensure that the AC supply voltage fluctuations do not exceed 10% of the operating voltage range.*



WARNING. *Always connect the unit directly to a grounded power outlet. Operating the OM2012 without connection to a grounded power source could result in serious electrical shock.*

Connecting the power cable. Connect the power cable to the instrument first, and then connect the power cable to the AC power source. Install or position the OM2012 so that you can easily access the rear-panel power switch.

Power on the instrument (rear-panel power switch and front-panel standby power switch). After powering on, make sure that the fan on the rear panel is working. If the fan is not working, turn off the power by disconnecting the power cable from the AC power source, and then contact your local Tektronix Field Office or representative.

PC requirements

The equipment and DUT used with the OM2012 determine the controller PC requirements.

If you are using the OM2012 as a stand-alone instrument, the LRCP software used with the OM2012 requires Windows 7 or Windows XP (32-bit or 64-bit) operating systems with NET 4.0.

The following are the requirements to use the OM2012 with the Tektronix OM4000 series Optical Modulation Analyzers and the OM2210 Coherent Receiver Calibration Source:

Item	Description
Operating system	U.S.A. Microsoft Windows 7 64-bit U.S.A. Microsoft Windows XP Service Pack 3 32-bit (.NET 4.0 required)
Processor	Intel i7, i5 or equivalent; min clock speed 2 GHz Minimum: Intel Pentium 4 or equivalent
RAM	Minimum: 4 GB 64-bit releases benefit from as much memory as is available
Hard Drive Space	At least 300 GB recommended for large data sets. Minimum: 20 GB
Video Card	nVidia dedicated graphics board w/ 512+ MB minimum. graphics memory NOTE. <i>The color grade display is not available when running the application on an oscilloscope or PC that does not use an nVidia graphics card</i>
Networking	Gigabit Ethernet (1 Gb/s) or Fast Ethernet (100Mb/s)
Display	20" minimum, flat screen recommended for displaying multiple graph types when using with the OM4000 Software
Other Hardware	DVD Optical drive Two USB 2.0 ports

Item	Description
MATLAB Software (for use with OM4000 OUI software only)	For Windows 7 (64-bit): MATLAB version 2011b (64-bit) For Windows XP (32-bit): MATLAB version 2009a (32-bit), .NET version 4 or later. See the <i>OM4006D and OM4106D User Manual</i> for more information
Other Software	Adobe PDF Reader is required for viewing the product manuals, installation instructions, and product release notes.

Software installation

Install the program listed in the following table. The program is on the OM2012 software USB flashdrive.

NOTE. Read the installation notes or instructions that are in each application installation folder before installing each item of software. Only install the software that is appropriate for your OM instrument, PC, and oscilloscope configuration.

NOTE. If you are going to use the OM2012 as part of a test/calibration system including OM4000 and OM2210 instruments and measurement oscilloscopes, do not install the software listed in the following table. Instead, use the software installation instructions that are in the “OM4006D and OM4106D Coherent Lightwave Signal Analyzer User Manual.” Those instructions include loading the LRCP software.

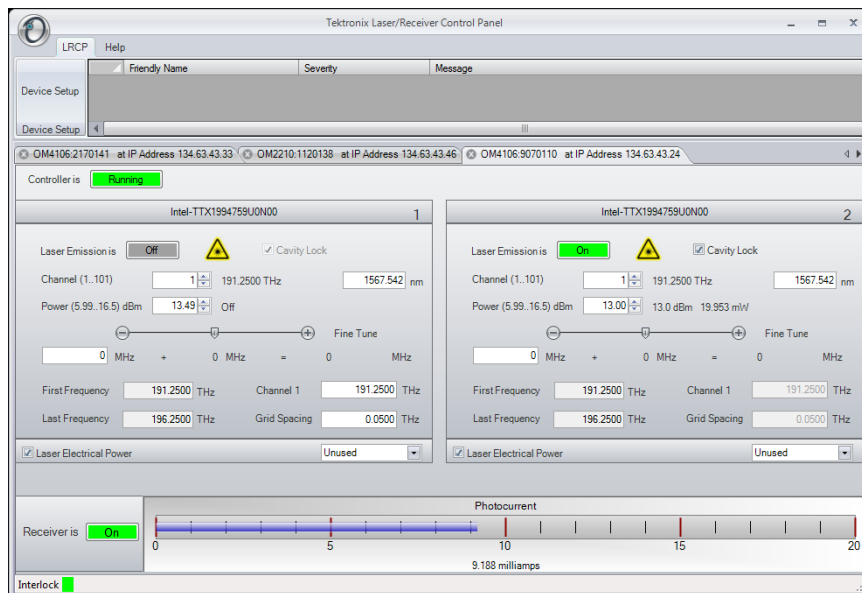
Install software on the controller PC

Table 1-5: Software install: controller PC

Program	Description	Path (from root directory of USB drive)
LRCP	Laser Receiver Control Panel. Detects OM instruments on a network, controls laser settings.	LRCP\LRCPSetup x.x.x.x.msi

Set the instrument IP address

Use the Laser Receiver Control Panel (LRCP) application to verify and/or set the IP address of OM instruments (OM2210, OM2012, OM4000) if required for your network test setup. All OM instruments must be set to the same network subnet (DHCP-enabled networks do this automatically) to communicate with each other using the LRCP and other OM instrument software.



Before using LRCP, you must make sure that IP addresses of the OM series instruments are set correctly to communicate with LRCP on your network. The following sections describe how to set the OM instrument IP addresses for use on DHCP and non-DHCP networks.

Set IP address for DHCP-enabled network

The OM instrument is set with automatic IP assignment (DHCP) enabled by default. Therefore you do not need to specifically set the instrument IP address, as the DHCP server automatically assigns an IP address during instrument power-on.

The following procedure describes how to use LRCP software to verify connectivity of the OM instrument to a DHCP-enabled network.

Prerequisite: OM instrument, and a controller PC (with LRCP installed), both connected to the same DHCP-enabled network.

1. Connect the OM instrument to the DHCP-enabled network.
2. Power on the OM instrument with the rear power switch (set to **1**). The instrument queries the DHCP server to obtain an IP address. Wait until the front panel Power button light turns off.
3. On a PC connected to the same network as the OM instrument, start the **LRCP** program.

4. Enter password **1234** when requested.
5. When running LRCP for the first time after installation, click on the **Configuration/Device Setup** link on the application screen to open the Device Setup window. Otherwise click the **Device Setup** button (upper left of application window).
6. In the **Device Setup** dialog box, click the **Auto Configure** button. LRCP searches the network and lists any OM instruments that it detects. If no devices are detected, work with you IT resource to resolve the connection problem.
7. (optional) Use the **Friendly Name** field to create a custom label for each instrument. There is no limit to the size of the name you enter.
8. Click **OK** to close the configuration dialog box and return to the LRCP main window. The main LRCP window displays a tab for each instrument detected. Click on a tab to display the laser controls for that instrument.

Set IP address for a non-DHCP network

To connect the OM series instrument to a non-DHCP network, you must reset the default IP address and related settings on the OM instrument to match those of your non-DHCP network. All devices on this network (OM instruments, PCs and other remotely accessed instruments such as oscilloscopes) need the same subnet values (first three number groups of the IP address) to communicate, and a unique instrument identifier (the fourth number group of the IP address) to identify each instrument.

Work with your network administrator to obtain a unique IP address for each device. Your network administrator may need the MAC addresses of the computer, oscilloscope, and OM instrument. The MAC address for the OM instrument is located on the rear panel label.

NOTE. *Make sure to record the IP addresses used for each OM instrument, or attach a label to the instrument with the new IP address.*

If you are setting up a new isolated network just for controlling OM and associated instruments, Tektronix recommends using the OM instrument default IP subnet address of **172.17.200.XXX**, where XXX is any number between 0 and 255. Use the operating systems of the oscilloscope and computer to set their IP addresses.

NOTE. *If you need to change the default IP address of more than one OM instrument, you must connect each instrument separately to change the IP address.*

There are two ways to change the IP address of an OM series instrument:

- Use LRCP on a PC connected to a DHCP-enabled network (easiest)
- Use LRCP on a PC set to the same IP address as the OM instrument to change the OM instrument IP address

Use DHCP network to change IP address. To use a DHCP network to change the IP address of an OM instrument:

1. Do steps 1 through 6 of the *Set network access (DHCP network)* procedure.
2. Click the **Set IP** button in the instrument list.
3. Use the dialog box to enter the new IP address and related parameters for the OM instrument.
4. Click **OK** to close the dialog box and set the IP address.
5. Exit the LRCP program.
6. Power off the OM instrument and connect it to the non-DHCP network.
7. Run LRCP and use the **Auto Config** button in the Device Setup dialog box to verify that the instrument is listed.

Use direct PC connection to change IP address. To use a direct PC connection to change the default IP address of an OM series instrument, you need to:

- Install LRCP on the PC
- Use the Windows Network tools to get the IP address of the PC to match that of the current subnet setting of the OM series instrument whose IP address you need to change
- Connect the OM instrument directly to the PC (not over a network)
- Use LRCP to change the OM instrument IP address

Do the following steps to use a direct PC connection to change the IP address of an OM series instrument:

NOTE. *The following instructions are for Windows 7.*

NOTE. *If you need to change the default IP address of more than one OM instrument using this procedure, you must connect each instrument separately to change the IP address.*

1. On the PC with LRCP installed, click **Start > Control Panel**.
2. Open the **Network and Sharing Center** link.
3. Click the **Manage Network Connections** link to list connections for your PC

4. Right-click the **Local Area Connection** entry for the Ethernet connection and select **Properties** to open the Properties dialog box.
5. Select **Internet Protocol Version 4** and click **Properties**.
6. Enter a new IP address for your PC, using the same first three numbers as used by the OM instrument. For example, **172.17.200.200**. This sets your PC to the same subnet (first three number groups) as the default IP address setting for the OM series instruments.
7. Click **OK** to set the new IP address.
8. Click **OK** to exit the Local Area Connection dialog box.
9. Exit the **Control Panel** window.
10. Connect the OM instrument to the PC.
11. Power on the OM instrument with the rear power switch (set to **1**). Wait until front panel Power button light turns off.
12. On the PC connected to the same network as the OM instrument, start the **LRCP** program.
13. Enter password **1234** when requested.
14. Click **Device Setup** to open the Device Setup window.
15. Click the **Auto Configure** button. LRCP detects and lists all OM instruments connected to the PC or network. If LRCP does not list the connected instrument, verify that you entered a correct IP address into the PC and your Ethernet cable is good. If the IP address was entered correctly, you may need to connect the OM instrument to a DHCP network to determine if the IP address you used to set the computer was correct.
16. (optional) Use the **Friendly Name** field to create a custom label for each instrument. There is no limit to the size of the name you enter. Friendly Names are retained and are associated with the MAC address of each instrument.
17. Click the **IP address** button in the list.
18. Click **OK** to continue to the **Set IP Address** dialog box.
19. Set the address to an IP Address that is compatible with your network. For example, **172.17.200.040**
20. Edit the Gateway and Net Mask (obtain this information from your network support person).

21. Click **Set IP** to exit the IP address dialog and return to the LRCP main window.

NOTE. *If you change the instrument to an IP address that is different than the Subnet of the current PC, and click Set IP, the OM series instrument is no longer detectable or viewable to that PC and the LRCP application.*

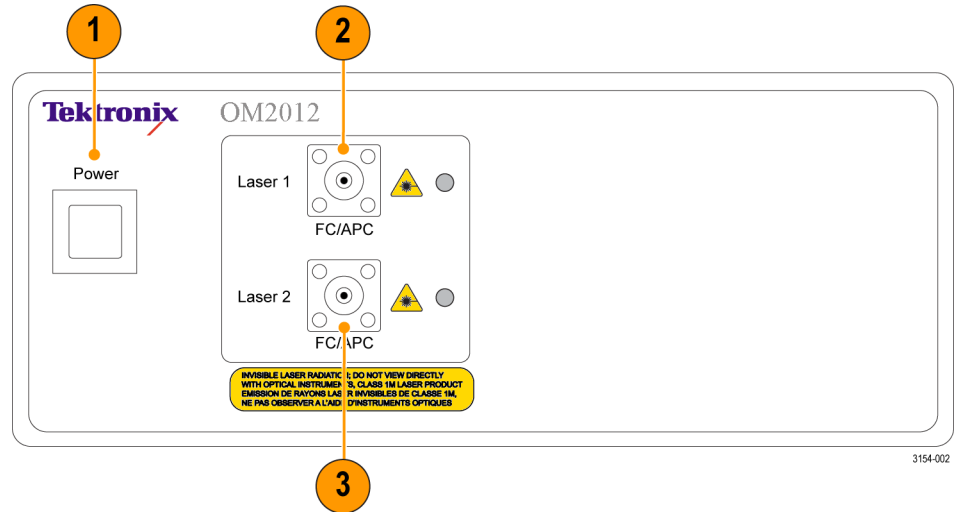
22. Exit the LRCP program.
23. Unplug the network cable from between the PC and the OM instrument.
24. Connect the OM instrument to the target network.
25. Run the LRCP software on the PC connected to the same network as the OM instrument.
26. Click **Device Setup**. Click **Auto Config** and verify that the instrument is detected and listed on the display.

Operating Basics

Operating basics

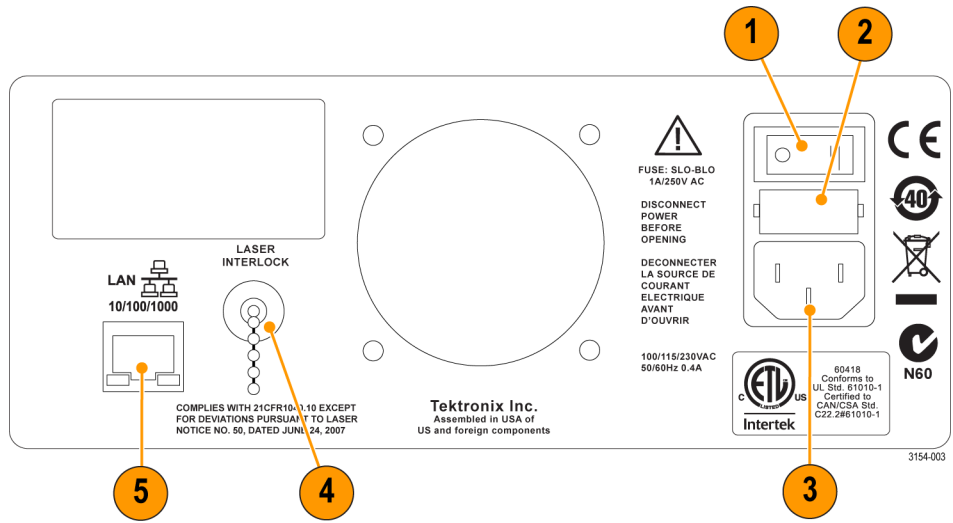
OM2012 controls and connectors

Front panel



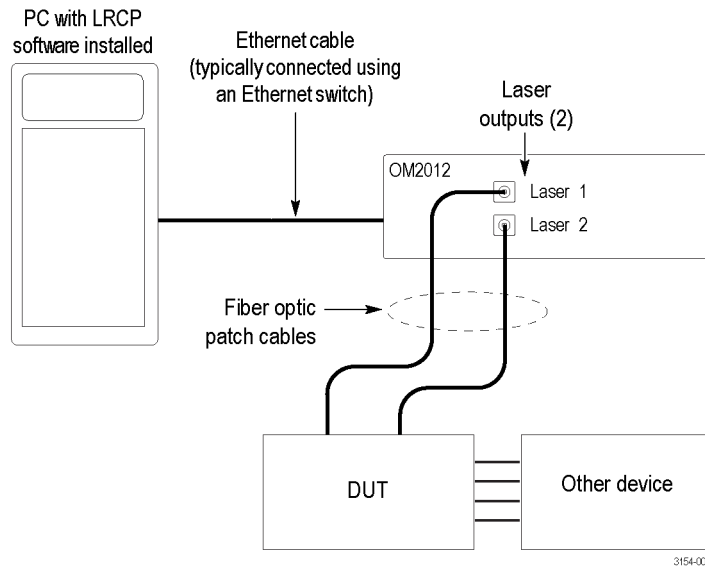
1. On/Off standby switch
2. Laser 1 output (with LED indicator)
3. Laser 2 output (with LED indicator)

Rear panel



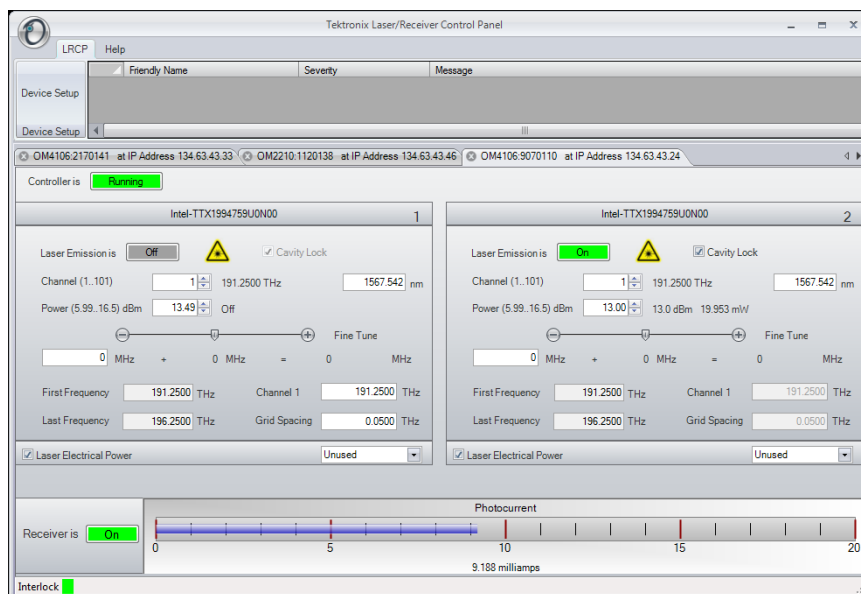
1. Main power switch
2. Fuse holder
3. Power cable connector
4. BNC shorting plug for optional laser remote interlock connector
5. 10/100/1000 Ethernet port

Equipment setup



The Laser Receiver Control Panel (LRCP) user interface

The Laser-Receiver Control Panel application (LRCP) is used to control a variety of Integratable Tunable Laser Assembly (ITLA) lasers. The LRCP interface simplifies the control of the lasers, eliminating the need to use low level ITLA commands. The interface automates locating and configuring all OM devices that are present on the local network. It also provides a Windows Communication Foundation (WCF) service interface, allowing Automated Test Equipment (ATE) to interact directly with the controllers and lasers while LRCP is running.



The main components of the LRCP user interface are:

- Menu tabs: Lists available application actions.
- Controller tabs: Each tab represents one physical Laser Control device (for example, an OM2012 or OM4000) on the network. The tab shows the controls for one or more lasers that are associated with the device.
- Status bar: provides important information about the overall state of the communications with the controllers. Each controller has a unique status bar.
- Receiver gauge: This gauge displays the total photocurrent output from an instrument. This readout is only functional on devices like the OM4000 instruments that have the appropriate hardware installed.

Device setup and auto configure

Click the Device Setup button to open the Device Setup dialog box. Use this dialog box on initial setup of the controllers and anytime network configuration changes and devices are moved to a new IP address. Click the Auto Configure button to have LRCP search for and list detected OM devices.

An important setting on the Device Setup screen that users will want to adjust is the Friendly Name. Setting this value for each device will aid in the identification of the physical location of the controllers as Friendly Names are retained and are tied to the corresponding MAC Address. Make sure to exit the form by clicking the OK button to save changes.

The Set button is used to modify the addressing as described in the next section. It is not necessary to use the Set button to change the Friendly Name.

Each device must be assigned an IP address in order to communicate with the device. How you manage IP addresses in your network, namely with or without DHCP, will determine the method in which you connect to the devices on your network.

Connecting to your OM devices

Once configured and detected, devices are listed as tabs on the main LRCP screen. They are listed with the friendly name and IP address to allow for easy identification. Up to four lasers are displayed in a 2x2 grid. Lasers are numbered and once the controller is brought online the laser panels will populate with the laser manufacturer and model number.

Once the user presses the button that reads Offline the button will change colors as the control panel attaches to the OM instrument. First, the button will turn yellow and read “Connecting...” indicating that a physical network connection is being established over a socket. Second, the button will turn teal and read “Connected...”. This indicates that a session is established between the device and Control Panel. Commands will be sent to initialize the communications with the laser and identify their capabilities. Finally, the button will turn bright green when the controller and lasers are ready for action.

NOTE. *The button color scheme of bright green meaning running or active, grey meaning off line or inactive and red indicating a warning or error state is consistent throughout the application.*

Once the controller tab is active and the laser panels have populated with the corresponding laser information the user is free to put change the laser settings and/or turn the lasers on. When the controller is first turned on the current state of the hardware is read to pre-populate the laser panel. Any time you exit application, the current state of the lasers is preserved, including the emission state.

If the lasers are used in conjunction with the OM instrument and OUI, the laser usage type needs to be set using the dialog on the lower right corner of each laser panel. The OUI uses the setting to determine from which laser frequency information is retrieved. A usage type can only be selected once between all of the controllers but you can have one usage type on one controller and another usage type on a second controller.

Once laser emission is “On” the channel 1 and grid spacing settings become read only and cavity lock becomes editable. Also the power goes from “off” to the actual power being read from the laser. Readings are taken from the laser once per second.

The receiver gauge (shown at the bottom of the LRCP window) is only active for equipment that have the appropriate hardware present (such as the OM instruments). The receiver gauge, when active, displays the total photocurrent.

Setting laser parameters

NOTE. For all text field entries it is necessary to click away from the field, or press the Tab key, for the value entered to be accepted by the application.



CAUTION. The LRCP saves all laser parameter settings, including the emission output value, when you exit the application, including the emission state. Make sure to verify laser emission parameters before running tests on a new test setup.

- **Channel:** Type a number or use the up/down arrows to choose a channel. The range of channels available will depend on the type of laser, the First Frequency, and the Grid. The finer the Grid, the more channels are available for a given laser. The channel range is indicated next to the word Channel. The laser channel can also be set by entering a wavelength in the text box to the right of the channel entry. The laser will tune to the nearest grid frequency.
- **Cavity Lock:** The Intel/Emcore ITLA laser that is included in the OM4000 instruments has the ability to toggle its channel lock function. Ordinarily, Cavity Lock should be checked so that the laser is able to tune and lock on to its frequency reference. However, once tuning is complete and the laser has stabilized, this box can be unchecked to turn off the frequency dither needed for locking the laser to its reference. The laser can hold its frequency for days without the benefit of the frequency dither. The OM software will work equally well with the Cavity Lock dither on or off.
- **Power:** The allowed power range for the laser. Type or use the up/down arrows to choose the desired laser power level.
- **Fine Tune:** The Intel/Emcore lasers can be tuned off grid up to 12 GHz. This can be done by typing a number in the text box or by dragging the slider. The sum of the text box and slider values will be sent to the laser. Once the laser has accepted the new value it will be displayed after the ‘=’ sign.
- **First Frequency:** Not settable. This is the lowest frequency that can be reached by the laser.
- **Last Frequency:** Not settable. This is the highest frequency that can be reached by the laser.
- **Channel 1:** Settable when emission is off. This is the definition of Channel 1.

- **Grid Spacing:** Settable when emission is off. 0.1, 0.05 or 0.01 THz are typical choices. Use 0.01 THz if tuning to arbitrary (non-ITU-grid) frequencies. Using this grid plus Fine Tune, any frequency in the laser band is accessible.
- **Laser Electrical Power:** This should normally be checked. Clearing this box turns off electrical power to the laser module. This should only be needed to reset the laser to its power-on state, or to save electrical power if a particular laser is never used.
- **Emission:** Click to turn on or off front panel laser emission.

Channel setting within the ITLA grid gives the corresponding frequency (in THz) and wavelength (in nm). Power is set within the range allowed by the laser. It is best to set the Signal and Reference lasers to within 1 GHz of each other. This is simple if using the internal OM instrument lasers: just type in the same channel number for each.

If using an external transmitter laser, you can type in its wavelength and the controller selects the nearest channel. If this is not close enough, try choosing a finer WDM grid or use the fine tuning feature. If available, fine tuning of the laser is done with the Fine Tune slider bar, and typically works over a range of ± 10 GHz from the center frequency of the channel selected.

Certain laser models have a cavity lock feature that increases their frequency accuracy at the expense of dithering the frequency; this feature can be toggled with the Cavity Lock button. Cavity Lock is necessary to tune the laser, but can be unchecked to suppress the dither.



Once the channel and power for each laser is set, turn on laser emission for each laser by clicking on its Laser Emission button; the emission status is indicated both by the orange background of the button and by the corresponding green LED on the OM instrument front panel.

Reference

LRCP remote interface

The LRCP allows the user to control the OMA Series instruments and communicates status to the user interface. The LRCP has two types of Windows Communication Foundation (WCF) interfaces to allow control from a user application. Both types are provided to achieve full functionality and compatibility with simple interfaces such as MATLAB and via a client application program.

LRCP ATE interface

The Automated Test Equipment (ATE) interface exposes the LRCP functionality through a WCF service. As the LRCP is used with all OM instrument laser controllers, the LRCP interface exposes more commands than those used by the OM4000 OUI.

Basic/advanced WCF service interface for the LRCP

The WCF services (basic and advanced) are available on port 9000 in the machine that is running the LRCP. The service (basic and advanced) interface was developed for incorporation into an ATE client application that can be developed in your choice of .NET language, typically C# or VB.NET. Both services expose most of the functionality that is available through the LRCP's user interface.

The basic service, implemented using a `wsBasicHTTPBinding`, exposes the same subset of commands as the advanced service. It was implemented using a simpler binding for compatibility with applications like MATLAB (See page 3-7, *ATE functionality in MATLAB.*) or Labview that only support the `wsBasicHTTPBinding`. The basic service is referenced at the following URL:

http://localhost:9000/LaserReceiverControlPanel/Laser_ReceiverServiceBasic



WARNING. *Turn off the front-panel power button to disable lasers. WCF services can turn lasers on and off. Verify that no one is physically working with lasers or fibre while running ATE applications.*

**LRCP service interface
function list**

The following are the available commands in both the basic and advanced service interfaces and demonstrate their functionality using the MATLAB syntax:

- **int AvailableLasers(classname);**
Description: Returns the count of available lasers on the active controller.
Controller Types: All
Example: `AvailableLasers(Obj);`
Returns: `ans = 2`
- **bool Connect(classname);**
Description: Connects to the active controller, starts controller running.
Controller Types: All
Example: `Connect(Obj);`
Returns: `ans = true`
- **bool Disconnect(classname);**
Description: Disconnects from the currently active controller, takes offline.
Controller Types: All
Example: `Connect(Obj);`
Returns: `ans = true`
- **bool GetActualCavityLock(classname);**
Description: Returns the actual cavity lock state for the active controller/laser.
Locked = True.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetActualCavity(Obj);`
Returns: `ans = true`
- **double GetActualChannel(classname);**
Description: Returns the actual channel number for the active controller/laser.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetActualChannel(Obj);`
Returns: `ans = 1`
- **double GetActualChannel1(classname);**
Description: Returns the actual channel 1 frequency (in THz) for the active laser.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetActualChannel1(Obj);`
Returns: `ans = 191.5`
- **bool GetActualEmitting(classname);**
Description: Returns the emission status of the active laser is emitting.
Emitting = True.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetActualEmitting(Obj);`
Returns: `ans = true`
- **short GetActualFineTuneFrequency(classname);**
Description: Returns the actual fine tune frequency (in MHz) of the active laser.

Controller Types: 4006, 4106, 2210, 2012

Example: `GetActualFineTuneFrequency(Obj)`;

Returns: `ans = 0`

- **double GetActualGridSpacing(classname);**
Description: Returns the actual grid spacing (in THz) of the active laser.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetActualFineTuneFrequency(Obj)`;
Returns: `ans = 0.05`
- **double GetActualPower(classname);**
Description: Returns the actual power (in dBm) of the active laser.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetActualPower(Obj)`;
Returns: `ans = 14.5`
- **double GetCalculatedFrequency(classname, laserusagetype);**
Description: Searches all of the connected controllers for the first laser of the specified laser usage type and returns the calculated frequency (in THz).
Valid usage types are: unused, signalx, signaly, signalxy, reference.
Controller Types: 4006, 4106, 2210, 2012, 5110
Example: `GetCalculatedFrequency(Obj, reference)`;
Returns: `ans = 191.5`
- **string[] GetControllers(classname);**
Description: Returns a list (array) of controller devices (strings) that are being controlled by the serving application.
Example: `Controllers = GetControllers(Obj)`;
Returns:
'OM2210:Prototype1'
'OM2210:8180123'
'OM4006:6300121'
- **double GetFirstFrequency(classname);**
Description: Returns the first frequency (in THz) of the active laser.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetFirstFrequency(Obj)`;
Returns: `ans = 191.5`
- **bool GetInterlock(classname);**
Description: Returns the current interlock state of the active controller. The normal, working state is TRUE. If the interlock is disconnected from the back of the instrument or if the instrument is powered off, this function returns FALSE.
Controller Types: All
Example: `GetInterlock(Obj)`;
Returns: `ans = true`
- **string GetIP(classname);**
Description: Returns the IP Address (as a string) for the active controller.
Controller Types: All

Example: `Address = GetIP(Obj);`
Returns: `Address = '172.17.200.114'`

- **double GetLastFrequency(classname);**
Description: Returns the last frequency (in THz) of the active laser.
Controller Types: 4006, 4106, 2210, 2012
Example: `GetLastFrequency(Obj);`
Returns: `ans = 196.25`
- **float GetPhotoCurrent(classname);**
Description: Returns the photocurrent (in mA) of the receiver in the active controller.
Controller Types: 4006, 4106
Example: `GetPhotoCurrent(Obj);`
Returns: `ans = 11.034`
- **polarization GetPolarization(classname);**
Description: Returns the polarization state.
Valid Polarization states: filter1, filter2, unknown, hardwarefailed.
Controller Types: 2210
Example: `GetPolarization(Obj);`
Returns: `ans = filter2`
- **bool InitializePolarization(classname);**
Description: Initializes the polarization state. Returning True = Successful.
Controller Types: 2210
Example: `InitializePolarization(Obj);`
Returns: `ans = true`
- **bool SetActiveControllerByIPAddress(classname, string_ipAddress);**
Description: Sets the active controller by IP Address. True = Successful.
Controller Types: All
Example: `SetActiveControllerByIPAddress(Obj, '172.17.200.112');`
Returns: `ans = true`
Returns (after `GetIP(Obj)`): `ans = '172.17.200.112'`
- **bool SetActiveControllerByName(classname, string_activeController);**
Description: Sets the active controller by name. True = Successful.
Controller Types: All
Example: `SetActiveControllerByName(Obj, 'OM4106:6300121');`
Returns: `ans = true`
- **bool SetActiveLaser(classname, byte_activeLaser);**
Description: Sets the active laser. Returning True = Successful.
Controller Types: 4106, 4006, 2210, 2012
Example: `SetActiveLaser(Obj, 2);`
Returns: `ans = true`

- **bool SetControllerAndLaserByUsageType(laserusagetype laserUsageType);**
Description: Searches the “running” controllers for a laser matching the requested usage type (usually reference) and selects that controller and laser.
Controller Types: 4006, 4106, 2210, 2012
Returns: ans = True - First laser for the specified usage type was selected
False - No lasers found on running controllers for the specified usage type
- **bool SetDesiredCavityLock(classname, bool_desiredCavityLock);**
Description: Sets the desired cavity lock state for the active laser. 1 (True) = Locked. Returning True = Successful.
Controller Types: 4006, 4106, 2210, 2012
Example: SetDesiredCavityLock(Obj, 1);
Returns: ans = true
- **bool SetDesiredChannel(classname, int_desiredChannel);**
Description: Sets the channel number for the active laser. Returning True = Successful.
Controller Types: 4006, 4106, 2210, 2012
Example: SetDesiredChannel(Obj, 45);
Returns: ans = true
- **bool SetDesiredChannel1(classname, double_desiredChannel1);**
Description: Sets the channel 1 frequency (in THz) for the active laser. Can only be set if the active laser is NOT emitting. Returning True = Successful.
Controller Types: 4006, 4106, 2210, 2012
Example: SetDesiredChannel1(Obj, 192.5);
Returns: ans = true
- **bool SetDesiredEmittingOff(classname);**
Description: Sets the Active Laser to Off (not emitting). Returning True = Successful.
Controller Types: 4006, 4106, 2210, 2012
Example: SetDesiredEmittingOff(Obj);
Returns: ans = true
- **bool SetDesiredEmittingOn(classname);**
Description: Sets the Active Laser to emitting. Returning True = Successful.
Controller Types: 4006, 4106, 2210, 2012
Example: SetDesiredEmittingOn(Obj);
Returns: ans = true
- **bool SetDesiredFineTuneFrequency(classname, short_desiredFineTuneFrequency);**
Description: Sets the desired fine tune frequency (in MHz) of the active laser.
Controller Types: 4006, 4106, 2210, 2012
Example: SetDesiredFineTuneFrequency(Obj, 300);
Returns: ans = true

- **bool SetDesiredGridSpacing(classname, double_desiredGridSpacing);**
Description: Sets the desired grid spacing (in THz) of the active laser. Can only be set if the active laser is NOT emitting. Returning true = Successful.
Controller Types: 4006, 4106, 2210, 2012
Example: `SetDesiredGridSpacing(Obj, 0.05,0);`
Returns: `ans = true`
- **bool SetDesiredPower(classname, double_desiredPower, bool_waitUntilFinished);**
Description: Sets the desired power (in dBm) of the active laser. For WaitUntilFinished, 0 (False) = don't wait. Returning True = Successful.
Controller Types: 4006, 4106, 2210, 2012
Example: `SetDesiredPower(Obj, 13, 0);`
Returns: `ans = true`
- **bool SetPolarizationIn(classname);**
Description: Puts both polarization filters in. Returning True = Successful.
Controller Types: 2210
Example: `SetPolarizationIn(Obj);`
Returns: `ans = true`
- **bool SetPolarizationOut(classname);**
Description: Puts both polarization filters out. Returning True = Successful.
Controller Types: 2210
Example: `SetPolarizationOut(Obj);`
Returns: `ans = true`
- **bool SetReceiverOff(classname);**
Description: Turns the receiver off in the active controller. Returning True = Successful.



CAUTION. *Ensure laser power is reduced to zero before running this command, otherwise the photoreceiver could be damaged.*

NOTE. *To turn off lasers, click the LRCP software Laser Emission button to **Off**, or press the OM2012 front-panel **Power** button to power off the instrument.*

Controller Types: 4006, 4106
Example: `SetReceiverOff(Obj);`
Returns: `ans = true`

- **bool SetReceiverOn(classname);**
Description: Turns the receiver on in the active controller. Returning True = Successful.
Controller Types: 4006, 4106
Example: `SetReceiverOn(Obj);`
Returns: `ans = true`

- **void SetDesiredFrequency(double desiredFrequency);**
Description: Sets the channel and fine tune frequency of the currently selected laser to the specified frequency.
Controller Types: 2210, 2012
- **void TogglePolarization(classname);**
Description: Toggles the polarization state by moving both filters to the opposite position.
Controller Types: 2210
Example: `TogglePolarization(Obj);`

ATE functionality in MATLAB

MATLAB supports a limited subset of the OM4000 Series services, namely the Basic service. This section describes how to create and address the functions from MATLAB.

The Laser/Receiver Control Panel communicates with other programs using port 9000 on the computer running the Control Panel software. MATLAB 2009a has a built-in capability that makes control from MATLAB easy if you are running the February 2010 or later release of the Laser/Receiver Control Panel.

NOTE. *Ensure that the LRCP is running before using this interface.*

Initialize the interface in the MATLAB desktop command window with the following commands:

```
url = 'http://localhost:9000/LaserReceiverControlPanel/
Laser_ReceiverServiceBasic/?wsdl';
createClassFromWsd1(url);
obj = Laser_ReceiverServiceBasic;
```

Where:

The first specifies the URL or path to a WSDL application programming interface (API) that defines the web service methods, arguments, transactions.

The second creates the new class based upon that API and builds a series of M-Files for accessing the Laser/Receiver Control Panel service.

The third instantiates the object class name and opens a connection to the service.

These commands only need to be run anytime the service interface (available methods) changes.

To get an up-to-date listing of methods for the service, type the following:

```
methods(obj)
```

MATLAB should return the same functions as given in Section *LRCP service interface function list* (See page 3-2.) and any new functions that have been added. These functions are self-documented when they are generated.

By enabling the MATLAB help window, you can find out the function's parameters by typing the function name followed by a "(" and waiting for the help to display.

Appendices

Appendix A: Cleaning and Maintenance

Cleaning

- To clean the outside of the OM2012 enclosure, use a dry, soft cotton cloth. Do not use any liquid cleaning agents or chemicals that could possibly infiltrate the enclosure, or that could damage markings or labels.
- If the dust filter on the underside of the unit becomes clogged, use a small vacuum or brush to clean the filter.
- From time to time it will be necessary to clean the optical input and output connectors on the front of the unit. Use square-ended swabs made for this purpose to clean each connector.
- Do not attempt to clean the inside of the instrument; cleaning of internal parts is not necessary.

Maintenance

- There are no user-serviceable components or subsystems within the OM2012. Attempting any internal repairs will void your warranty. Never remove the external lid on the unit.
- If it becomes necessary to replace the fuse in the power input module in the rear of the unit, use a 5X20 mm “slo-blo” fuse rated at 1 A, 250 VAC. Use a small screwdriver to gently pry open the fuse drawer.



WARNING. *Disconnect the unit from the power source when changing the fuse to ensure that line voltage is not present during the replacement.*

Index

Index

A

AC line voltage requirements, 1-4
Accessories
 standard, 1-2
ATE functionality in
 MATLAB, 3-7

C

Cleaning, A-1
Connecting to OM devices, 2-4

D

Description
 product overview, 1-1
Device setup and auto
 configure, 2-3

E

EMC compliance, x
Environmental
 considerations, xiii
Environmental operating
 requirements, 1-4
Equipment setup, 2-2

F

Features, 1-1
Front panel controls,
 connectors, 2-1
Front panel labels, viii
Function list, 3-2

G

General safety summary, iv
Getting started, 1-1

I

Important safety information, iv
Initial product inspection, 1-3

K

Key features, 1-1

L

Laser safety labels, viii, ix
LRCP
 ATE interface, 3-1
 remote interface, 3-1
 service interface function
 list, 3-2
 user interface, 2-3
 WCF service interface, 3-1

M

Maintenance, A-1
Manual description, xv

O

Options, 1-2
 international power cords, 1-3
Option CC (2 C-band
 lasers and polarization
 switch), 1-2
Option CL (coupled C-,
 L-band lasers and
 polarization switch), 1-2
Option LL(2 l-band lasers and
 polarization switch), 1-2

P

PC requirements, 1-5

Power cord option, 1-3
Power requirements, 1-4
Product description, 1-1

R

Rear panel controls,
 connectors, 2-2
Rear panel labels, ix
Requirements
 environmental, 1-4
 PC, 1-5
 power, 1-4

S

Safety compliance, xi
Service safety summary, vi
Set IP address
 DHCP network, 1-7
 non-DHCP network, 1-8
 overview, 1-7
Setting laser parameters, 2-5
Software installation, 1-6
Standard accessories, 1-2
Supported products, xv
Symbols and terms on the
 product, vii