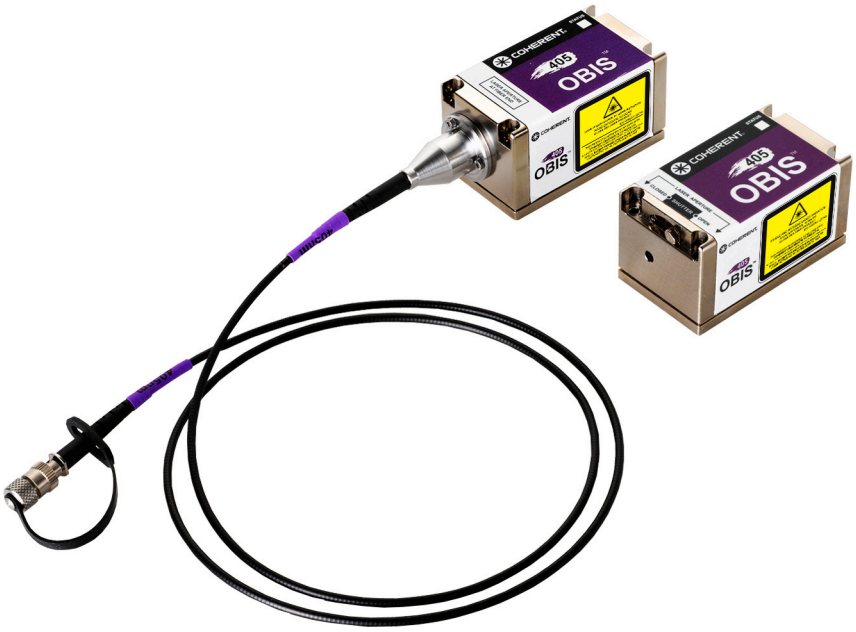
OBIS LX/LS Lasers Description & Operation Part 2 of 3

Operator's Manual



COHERENT®
Superior Reliability & Performance

Operator's Manual
OBIS LX/LS Lasers Description & Operation
Part 2 of 3 - Accessories

Coherent, Inc.
26750 SW 95th Ave.
Wilsonville, Oregon 97070
USA

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Should you experience any difficulties with your laser or need product or technical information, contact Coherent as follows:

- By email: customer.support@coherent.com
- Visit our website: www.Coherent.com
- By phone: +**1-(734)-456-3100**

See "Appendix - Service & Support" (p. 193) for more information and detailed instructions.

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1 PREFACE

The Operator's Manual presents the following information for OBIS LX and OBIS LS laser systems:

- **Part 1** — Description of the laser, installation instructions, operations, and information related directly to the laser module
- **Part 2** — Descriptions of the components, controllers, and accessories for the OBIS LX/LS laser systems
- **Part 3** — Supporting information about the interface protocol and host commands for OBIS LX/LS laser systems

NOTE: Information about the Coherent OBIS LG laser is ***not*** included in this manual. For information about that product, see the *OBIS LG Operator's Manual* (P/N 1263430).

WARNING!
Use all controls, adjustments, and procedures as specified in this manual. Failure to do so can cause dangerous radiation exposure.

This user information reported in this manual is in compliance with the following standards for Light-Emitting Products EN/IEC 60825-1 *"Safety of laser products – Part 1: Equipment classification and requirements"* 21 CFR Title 21 Chapter 1, Sub-chapter J, Part 1040 *"Performance standards for light-emitting products"*.

1.1 Safety Warnings

Anyone setting up or operating the an OBIS laser must first read and understand safety information prior to beginning any tasks.

CAUTION!
Read this manual before operating the laser for the first time. Pay special attention to the material in "Appendix - Laser Safety and Compliance" (p. 157), which describes the safety features of the laser.

This section provides information about signal words and safety symbols that you need to know before you begin.

This documentation may contain sections in which particular hazards are defined or special attention is drawn to particular conditions. These sections are indicated with signal words in accordance with ANSI Z-535.6 and safety symbols (pictorial hazard alerts) in accordance with ANSI Z-535.3 and ISO 7010.

1.1.1 Signal Words

Four signal words are used in this documentation: **DANGER**, **WARNING**, **CAUTION** and **NOTICE**. These signal words designate the degree or level of hazard when there is the risk of injury, as described in Table 1:

Preface Table-1. Signal Words

Signal Word	Description
DANGER	Indicates a hazardous situation that, if not avoided, WILL result in ***death or serious injury***. This signal word is to be limited to the most extreme situations.
WARNING	Indicates a hazardous situation that, if not avoided, COULD result in ***death or serious injury***.
CAUTION	Indicates a hazardous situation that, if not avoided, could result in ***minor or moderate injury***.
NOTICE	Indicates information considered important, but not hazard-related. The signal word "NOTICE" is used when there is the ***risk of property damage***.

Messages relating to hazards that could result in both personal injury and property damage are considered safety messages and not property damage messages.

1.1.2 Symbols

The signal words are always emphasized with a safety symbol that indicates a special hazard, regardless of the hazard level. The icons are intended to alert the operator as described in Table 2:

Preface Table-2. Safety Symbols

Icon	Alerts the operator to…
	This symbol is intended to alert the operator to important operating and maintenance instructions.
	Important notes or instructions for operation and maintenance.

Preface Table-2. Safety Symbols

Icon	Alerts the operator to…
	Danger of exposure to hazardous visible and invisible laser radiation.
	Danger of susceptibility to Electro-Static Discharge (ESD).
	Dangerous voltages within the product enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

1.2 Export Control Laws

It is the policy of Coherent® to comply strictly with export control laws of the United States of America (USA).

Export and re-export of lasers manufactured by Coherent are subject to U.S. Export Administration Regulations, which are administered by the Commerce Department. In addition, shipments of certain components are regulated by the State Department under the International Traffic in Arms Regulations (ITAR).

The applicable restrictions vary depending on the specific product involved and its destination. In some cases, U.S. law requires that U.S. Government approval be obtained prior to resale, export or re-export of certain articles. When there is uncertainty about the obligations imposed by laws in the USA, clarification must be obtained from Coherent or an appropriate agency of the U.S. Government.

For products manufactured in the European Union, Singapore, Malaysia, Thailand: These commodities, technology, or software are subject to local export regulations and local laws. Diversion contrary to local law is prohibited. The use, sale, re-export, or re-transfer directly or indirectly in any prohibited activities are strictly prohibited.

Declaration of Conformity certificates are available upon request.

1.3 Receiving and Inspection

Inspect all shipping boxes for any indication of damage, and document these discrepancies on the packing list. If damage is seen, immediately contact the shipping carrier. Also contact either the Coherent Order Administration Department at 1.800.367.7890 (outside the U.S.: 1.408.764.4557) or an authorized Coherent representative.

NOTICE

After unpacking the system, save the shipping boxes for potential later shipments—see repacking instructions specific to each remote.

1 INTRODUCTION TO ACCESSORIES

This section introduces the accessories you can use with the OBIS laser system. Figure 1-1 shows each of these devices.

Figure 1-1. OBIS LX/LS Laser Accessories

For more complete information, see the following sections:

- OBIS 6-Laser Remote (p. 2-21)
- OBIS Scientific Laser Remote (p. 3-37)
- OBIS Laser Box (p. 4-75)
- OBIS Galaxy Beam Combiner (p. 5-99)
- OBIS SDR Breakout Board (p. 6-121)
- OBIS SDR-SMB Modulation Adapter (p. 7-135

For information about the OBIS Single-Laser Remote and the OBIS Heat Sink, see Part 1 of the *OBIS LX/LS Operator's Manual* (P/N 1184163).

For information about the Coherent Connection software for the OBIS family of lasers, see "Coherent Connection" (p. 145).

For a summary of all parts and accessories plus ordering information, see "Appendix - Parts & Accessories" (p. 187).

Coherent product information and related software is now available in one easily accessible location on the Coherent website. Filter your search by product type, document category, or both. To download manuals and software, go to:

https://www.coherent.com/resources

To contact Coherent Technical Support, see "Appendix - Service & Support" (p. 193).

2 OBIS 6-LASER REMOTE

This section describes the OBIS 6-Laser Remote and includes:

- Overview of the 6-Laser Remote installation procedure (p. 2-30)
- Dimensions (p. 2-32)
- Specifications (p. 2-33)
- Troubleshooting procedures (p. 2-34)

Coherent product information and related software is available in one easily accessible location on the Coherent website. To download product information or a copy of the complete *OBIS LX/LS Operator's Manual* (P/N 1184163), go to:

https://www.coherent.com/resources

2.1 Components and Accessories

Figure 2-1 shows the components and accessories for the OBIS 6-Laser System.

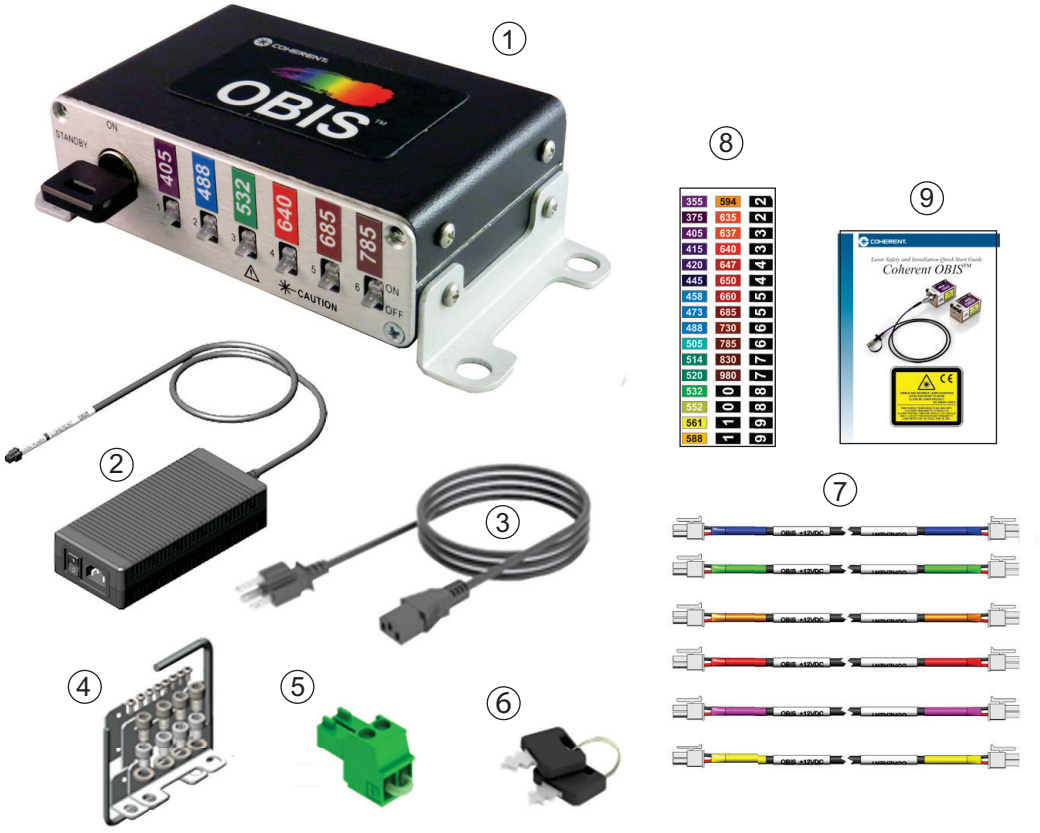


Figure 2-1. OBIS 6-Laser System Components and Accessories

Table 2-1 lists the components and accessories for the OBIS 6-Laser System.

Table 2-1. OBIS 6-Laser System Components and Accessories

Item	Description	Part Number
1	OBIS 6-Laser Remote	1203909
2	Power supply, 100 to 240 VAC, 12 VDC, 10.8A, IEC-320	1211389
3	Power cord, USA to IEC-320	1106344
4	Mounting brackets/hardware for OBIS Remote	1211976
5	Keys for OBIS Remote (2 each)	Included
6	Interlock, shorted, for OBIS Remote	
7	Cable, 2-pin, power for OBIS 6-Laser Remote (1 meter), (6 each)	
8	Wavelength labels	
9	OBIS Laser Safety and Installation Quick Start Guide	1185449

For additional details about parts and accessories, see “Introduction to Accessories” (p. 19).

2.2 Description

OBIS LX (Direct Diode) and OBIS LS (OPSL) laser products come with many accessories to support your application needs.

The OBIS 6-Laser Remote for OBIS LX/LS offers a convenient CDRH-compliant interface.

As with all OBIS LX/LS lasers, the laser itself is a stand-alone all-in-one laser solution. The OBIS Laser comes with a Power In connector, USB connector, Fan connector and a SDR-type connector for laser control I/O. All of these connectors are on the back panel of each OBIS LX/LS laser.

To simplify integration, the OBIS 6-Laser Remote connects to the 12 VDC Power Input on the back panel of the OBIS Laser. This feature lets the OBIS 6-Laser Remote provide power On/Off to the laser.

For applications requiring laser status and control, the USB on the back panel of each OBIS Laser can be used to communicate directly with the laser.

NOTICE
The OBIS 6-Laser Remote is not recommended for applications that require analog or digital modulation.

OBIS 6-Laser Remote comes with mounting brackets and hardware to either mount the remote to a table or stack remotes.

2.2.1 Front Panel

Figure 2-2 shows the front panel of the OBIS 6-Laser Remote.

Figure 2-2. OBIS 6-Laser Remote Front Panel

2.2.1.1 Keyswitch

The OBIS 6-Laser Remote has a keyswitch, shown in Figure 2-3. This keyswitch prevents generation of laser radiation when the keyswitch is in the STANDBY position. Laser radiation can occur when the key is in the ON position. The key is removable in the STANDBY position, but not in the ON position.

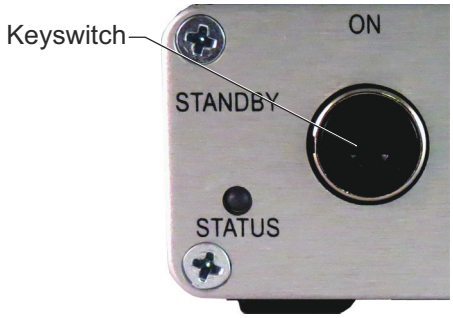


Figure 2-3. OBIS 6-Laser Remote Keyswitch

The keyswitch is the CDRH Manual Reset feature: After an interlock fault or power interruption, the laser will not auto restart unless the keyswitch is first reset to STANDBY, then returned to ON.

Figure 2-4 shows the keyswitch in the STANDBY and ON positions.

Figure 2-4. OBIS 6-Laser Remote Keyswitch STANDBY and ON Positions

2.2.1.2 Status LED Indicator

The Status LED indicator is located on the front panel, shown in Figure 2-5. The LED indicator displays green, blue or red. The state of the OBIS 6-Laser Remote determines the color.

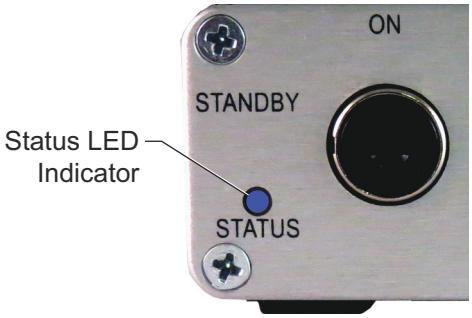


Figure 2-5. OBIS 6-Laser Remote Status LED Indicator

Table 2-2 lists the states for the LED indicator on the OBIS 6-Laser Remote.

Table 2-2. OBIS 6-Laser Remote Status LED States

Mode	LED Status	Internal Auto Start Jumper	Keyswitch Position	Interlock Status
1	**Blue**	Out	STANDBY	X
2	**Blinking Blue**	Out	Fault - keyswitch in ON position at power-up	X
3	**Green**	Out	Cycle STANDBY to ON	Closed
4	**Blue**	In	STANDBY	X
5	**Green**	In	ON	Closed
6	**Red**	X	ON	Open

2.2.2 Modes for the OBIS Remote

The conditions described above are at power ON. It is recommended that the keyswitch be in STANDBY position and the internal Auto Start jumper not be installed. Doing so places the OBIS Remote in **Mode 1**.

Table 2-3 lists the modes for the OBIS Remote:

Table 2-3. Modes for the OBIS Remote

Mode	Description
Mode 1	A blue LED without the internal Auto Start jumper installed and with the keyswitch in the STANDBY position. The interlock can be either in or out because the OBIS 6-Laser Remote is not looking for the interlock plug
Mode 2	A blinking blue LED that displays when you have the keyswitch in the ON position and you power-up the OBIS 6-Laser Remote. To clear this condition, turn the keyswitch to STANDBY, then back to ON.
	NOTE: With the internal Auto Start jumper inserted, this fault mode is bypassed and defeats the laser safety feature.
Mode 3	This green LED appears when you have correctly powered up the OBIS 6-Laser Remote, cycled to the ON position, there is no internal Auto Start jumper, and the interlock plug is in position.
Mode 4	This is the first of the configurations that includes the Auto Start jumper. When you power-up the OBIS 6-Laser Remote and have the keyswitch in STANDBY, the LED will be blue.
Mode 5	This is the correct sequence for the OBIS 6-Laser Remote when the internal Auto Start jumper is in position. The LED will be green when you power the OBIS 6-Laser Remote with the keyswitch ON and the internal Auto Start jumper on the interlock plug is connected.
Mode 6	This red LED indicates that the interlock was opened with the keyswitch in the ON position.

WARNING!
When the keyswitch is in the ON position, the interlock plug is connected, and the laser power switches are in the ON position and illuminated, laser emission is possible.

2.2.2.1 Power ON/OFF Switches

The power switches for each laser are shown in Figure 2-6. Applies power to each laser. Each power switch illuminates green when power is applied.

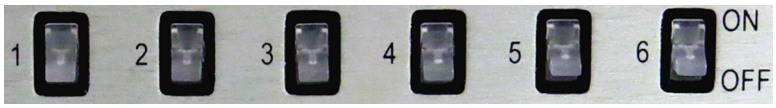


Figure 2-6. OBIS 6-Laser Remote Power ON/OFF Switches

2.2.3 Back Panel

The back panel of the OBIS 6-Laser Remote (shown in Figure 2-7) has the following connectors: Main Power In, (six) Power Out and the Interlock. These connectors are described in the sections that follow.

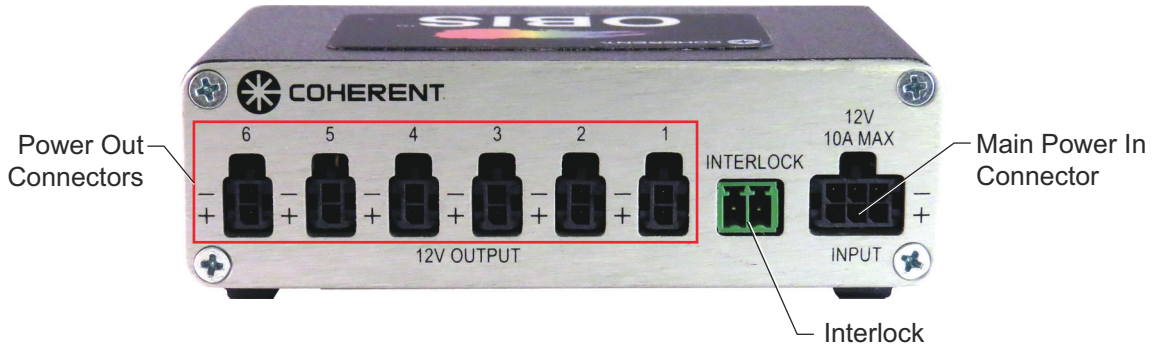


Figure 2-7. OBIS 6-Laser Remote Back Panel

2.2.3.1 Main Power In Connector

The Main Power-In Connector is shown in Figure 2-8.

A 6-pin Molex connector supplies power to the OBIS 6-Laser Remote. The Astrodyne power supply also has an ON/OFF switch to power the device.

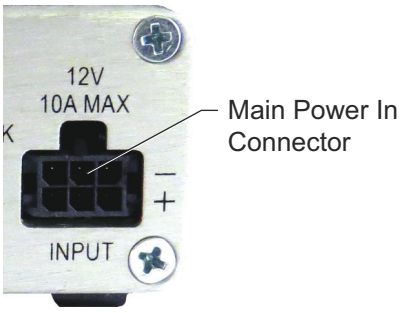


Figure 2-8. OBIS 6-Laser Remote Main Power In Connector

2.2.3.2 Power Out Connectors

Power is supplied to the lasers through six 5.5 mm 2-pin connectors: (Molex SDA43025-0200), shown in Figure 2-9. Two crimp-style contact pins are also needed (Molex 43030-0009). The cable is 1 meter.

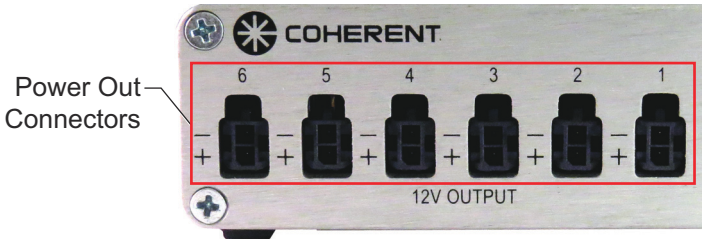
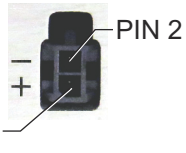


Figure 2-9. OBIS 6-Laser Remote Power Out Connectors

Table 2-4 lists the pin-outs for the Power Out connector on the OBIS 6-layer system.

Table 2-4. OBIS 6-Laser Power Out Connector Pin-out Specifications

Signal Name	Pin Number	Pin Locations
Positive (+)	1	
Ground	2	

2.2.3.3 Interlock

The interlock has terminal-style connections that permit connection to an external control device.The mechanical-style jumper for the CDRH interlock, shown in Figure 2-10, is included.

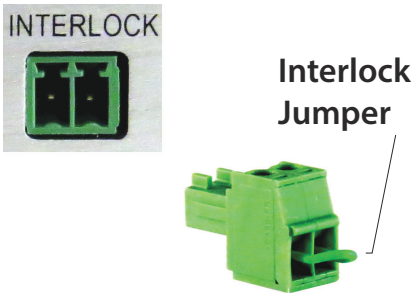


Figure 2-10. OBIS 6-Laser Remote Interlock and Interlock Jumper

2.2.3.4 Auto Start Jumper and Fuse Replacement

The Auto Start feature lets the operator start the OBIS when the laser completes its warm up and automatically starts the laser without toggling the keyswitch.

WARNING!
Enabling the Auto Start function defeats CDRH compliance.

The Auto Start jumper is inside the OBIS 6-Laser Remote. To access the jumper, remove the top four screws on the front and back covers and then remove the top cover (see Figure 2-11).

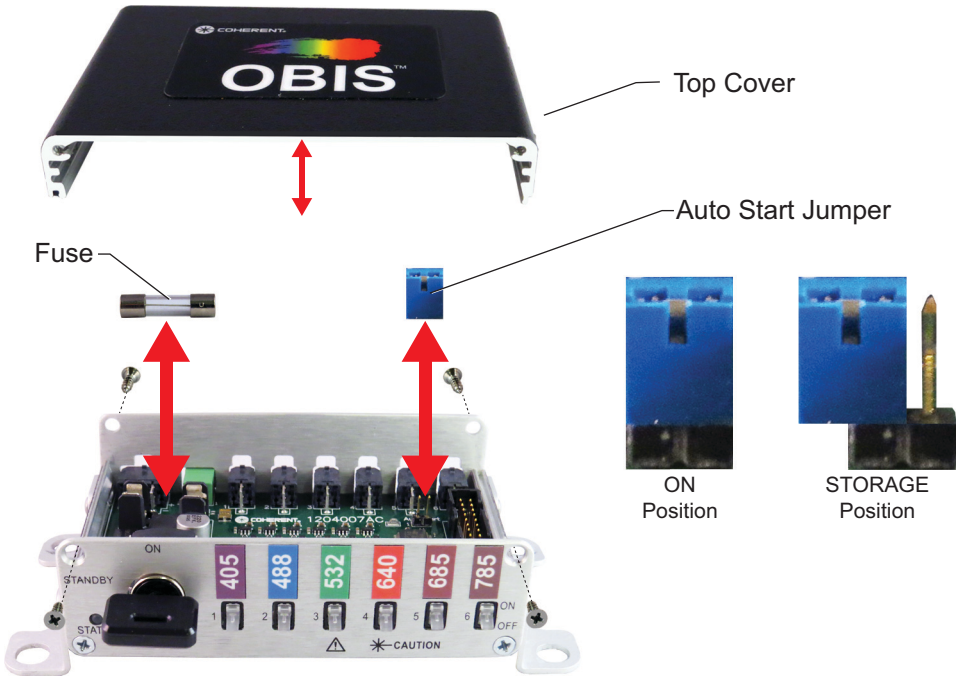


Figure 2-11. OBIS 6-Laser Remote – Exploded View

The remote jumper is at the back of the OBIS 6-Laser Remote, near the corner. The Auto Start jumper is a 100 mil shunt. To store the jumper in the OBIS 6-Laser Remote, attach the jumper to only one of the pins.

To access the 10A fuse, remove the four screws holding the front or back cover. The fuse is in the opposite corner from the Auto Start jumper. The fuse is a 10 amp, 250V, 5 x 20 mm, slo-blo fuse (Catalog #218010P).

NOTICE
Removing the OBIS 6-Laser Remote cover to replace the fuse or set the Auto Start jumper does *not* void the unit warranty.

2.2.3.5 Remote Interlock

The OBIS 6-Laser Remote has an interlock circuit that prevents the generation of laser radiation. For more information, refer to "Appendix - Laser Safety and Compliance" (p. 157).

2.2.4 Interlock Control

Connect the OBIS 6-Laser Remote to a remote switch to disable the system if a door or panel is opened. The interlock switch must be wired in series with the interlock RCA connector. The user has the option of connecting an external LED in series with the interlock circuit, which supplies a current source with 20 mA and up to 9V.

Table 2-5lists laser behavior if the interlock circuit is opened during laser operation.

Table 2-5. OBIS 6-Laser Behavior during Laser Operation

Key switch	Interlock Circuit Opened	Interlock Circuit Opened and Closed Again While Laser System is Powered
OFF	No failure displayed.	No failure displayed.
ON	Failure displayed by red LED status on front panel. Need to close interlock circuit to clear failure status.	Red LED displayed. Keyswitch must be cycled to STANDBY and then back to ON for lasers to start lasing again.

WARNING!
The interlock is a fused (12VDC) line. DO NOT ground the interlock or apply any outside power to the circuit.

2.3 Installation of the 6-Laser Remote

The procedure in this section describes how to connect the OBIS Laser and OBIS 6-Laser Remote. For information about installing the laser and using the USB connection on the laser back panel for control, refer to "Coherent Connection" (p. 145) and Advanced Procedures in Part 1 of the *OBIS LX/LS Operator's Manual*.

NOTICE

Operating the laser without the OBIS 6-Laser Remote is non-CDRH compliant.

The installation procedure has the following steps:

1. Install the optional heatsink.
2. Mount the laser.
3. Connect power to the OBIS 6-Laser Remote.
4. Add optional fan power to the laser.
5. Connect the interlock to the OBIS 6-Laser Remote.
6. Connect the optional USB cable (sold separately) to the laser back panel.

2.3.1 Procedure

To connect the OBIS Laser and OBIS 6-Laser Remote:

1. Install the optional heatsink (see Part 1 of the *OBIS LX/LS Operator's Manual*).
2. Mount the laser (see Part 1 of the *OBIS LX/LS Operator's Manual*).
3. Connect the power cord to the OBIS 6-Laser Remote, as shown in Figure 2-12.

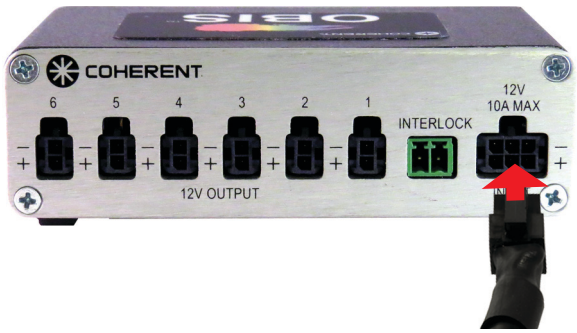


Figure 2-12. OBIS 6-Laser Remote Connecting Power

The Coherent OBIS Laser System includes a power supply (that has a Power ON indicator).

4. Add optional fan power to the laser (see Part 1 of the *OBIS LX/LS Operator's Manual*).
5. Connect the Interlock jumper to the OBIS 6-Laser Remote, as shown in Figure 2-13. For interlock details and specifications, refer to "Interlock Control" (p. 30).

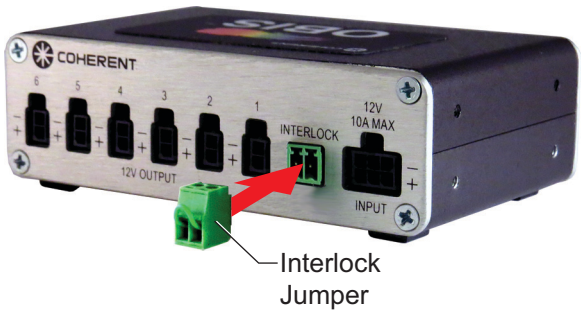


Figure 2-13. OBIS 6-Laser Remote Connecting the Interlock Jumper

6. Connect the optional USB cable (sold separately) to the laser back panel.

2.4 Dimensions

Figure 2-14 shows the dimensions for an OBIS 6-Laser Remote.

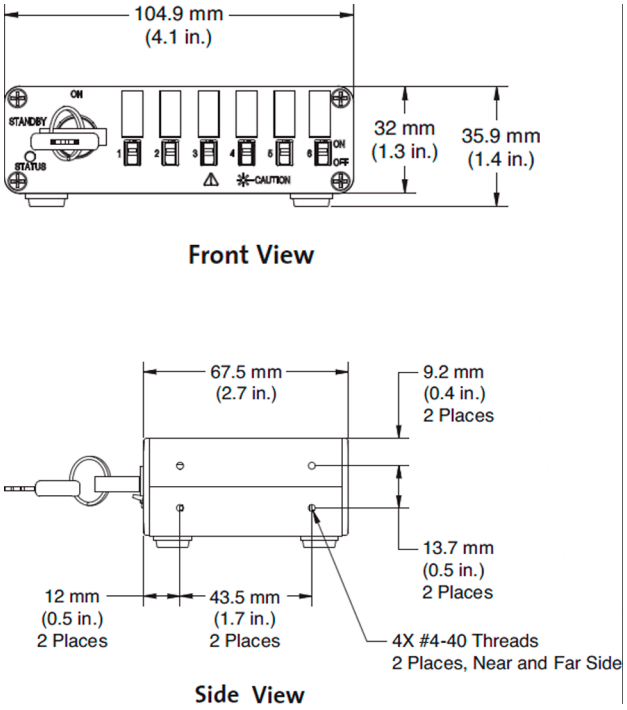


Figure 2-14. OBIS 6-Laser Remote Dimensions

Figure 2-15 shows the dimensions for a Power Supply for the OBIS 6-Laser Remote.

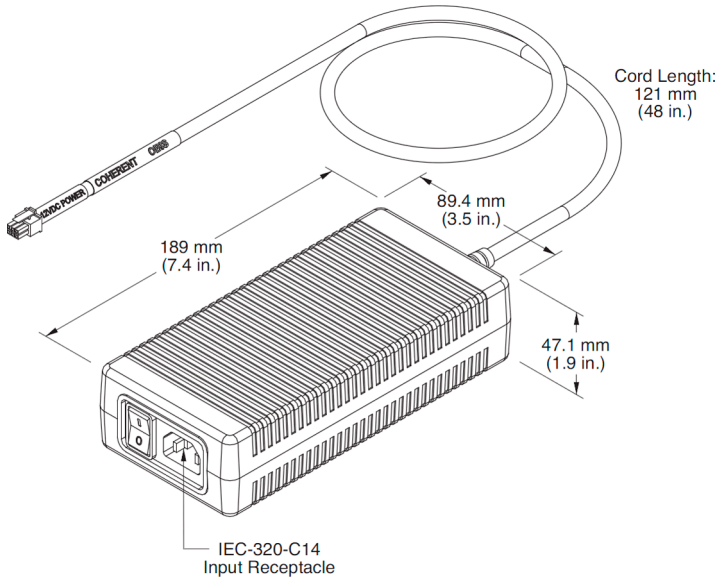


Figure 2-15. OBIS 6-Laser Remote Power Supply Dimensions

For current drawings and product details, go to:
https://www.coherent.com/resources

2.5 Specifications

Table 2-6 lists the specifications for the OBIS 6-Laser Remote.

Table 2-6. OBIS 6-Laser Remote Specifications

Parameter	Specification
Remote dimensions	68 x 105 x 33 mm
Laser Out connectors	Six @ 12VDC 1.5A
Operating temperature range	0 to 50°C
Operating humidity range (non-condensing)	30 to 85%
Storage temperature range	-20 to 70°C
Storage humidity range (non-condensing)	30 to 95%
Interlock(s)	One keyswitch One dual pin
Power input	12V ± 2V DC @ 10A
Mechanical expandability	Yes

For the most current specifications, go to:
https://www.coherent.com/resources

2.6 Troubleshooting Procedures

Table 2-7 lists possible problems, with a reference to the related troubleshooting checklist.

Table 2-7. OBIS 6-Laser Remote Troubleshooting Procedures

Problem	Reference
There is no output power from the laser.	Checklist 1 (p. 2-34)

2.6.1 Checklist 1: There is no output power from the laser.

If there is no output power from the laser, do the following steps in the order shown.

[ ] Confirm the Power Supply connector is securely fastened to the OBIS 6-Laser Remote.

[ ] Verify the green, two-pin interlock is firmly seated and is not loose.

[ ] Check that each power cord connection between the OBIS Laser and the 6-Laser Remote Power Out connectors is securely fastened.

[ ] Cycle laser power ON/OFF by toggling the power switch to the OFF position and then back to the ON position. When in the ON position, the toggle switch will be green.
Note: There are six independent ON/OFF toggle switches—confirm the correct power switch is in the ON position and illuminated for the correct OBIS Laser channel.

[ ] Toggle the Keyswitch to the STANDBY position and then back to the ON position. The Keyswitch acts as the CDRH Manual Reset. After an interlock fault or power interruption, the laser will not auto restart until the Keyswitch is set to the STANDBY position and then back to the ON position—refer to Figure 2-3 (p. 2-24).

[ ] Refer to Table 2-2 (p. 2-25) for a description of the LED Status indicator Modes. Also refer to Table 2-5 (p. 2-30) for the OBIS 6-Laser Remote behavior during laser operation.

[ ] Check the operating mode of the laser by using the Coherent Connection application software or the remote command SOUR:AM:SOUR? For normal CW mode, the laser must be in the "CW Power" mode from Coherent Connection or should reply with "CWP" when you send a query for the set operating mode of the laser.

[ ] Remove the OBIS 6-Laser Remote cover and check the fuse. If the fuse needs replacement, use a 10 amp, 250V, 5 x 20 mm, slow-blow fuse (Catalog #218010P). Refer to Figure 2-11 (p. 2-29) for location of the fuse and the cover screws.

[ ] Contact Coherent Technical Support—see “Appendix - Service & Support” (p. 193)

3 OBIS SCIENTIFIC REMOTE

This section describes the OBIS Scientific Remote, and includes:

- Overview of the Scientific Remote installation procedure (p. 3-51)
- Computer control (p. 3-54)
- Device selection syntax (p. 3-68)
- Advanced procedures (p. 3-68)
- Dimensions (p. 3-68)
- Specifications (p. 3-69)
- Repacking procedure (p. 3-69)
- Troubleshooting procedures (p. 3-71)

For additional details about parts and accessories, see “Appendix - Parts & Accessories” (p. III-187).

Figure 3-1 shows the components and accessories included with the OBIS Scientific Remote system.

Figure 3-1. OBIS Scientific Remote: Components and Accessories

Table 3-1 lists the components and accessories for the OBIS Scientific Remote system.

Table 3-1. OBIS Scientific Remote System Components and Accessories

Item	Description	Part Number
1	OBIS Scientific Remote: OBIS Scientific Remote OBIS Scientific Remote with six Laser-to-Remote SDR cables included (1 meter each)	1234465 1234466
2	Cable, SDR, laser to OBIS Scientific Remote (1 meter) (6 each)	1179451
3	Keys for OBIS Scientific Remote (2 each)	See P/N 1190348 in "Appendix - Parts & Accessories" (p. III-187)
4	Interlock, shorted, for OBIS Scientific Remote	
5	Wavelength labels for OBIS Scientific Remote	
6	OBIS Laser Safety and Installation Quick Start Guide	1185449

Coherent product information and related software is available in one easily accessible location on the Coherent website. To download product information or a copy of the complete *OBIS LX/LS Operator's Manual* (P/N 1184163), go to:

https://www.coherent.com/resources

3.1 Description

OBIS LX (Direct Diode) and OBIS LS (OPSL) laser products come with many accessories to support your application needs.

The OBIS Scientific Remote for OBIS LX/LS offers all the features from the laser in a convenient CDRH-compliant interface with a touch-screen and internal power supply for up to six lasers.

As with all OBIS LX/LS lasers, the laser itself offers a stand-alone all-in-one laser solution. The OBIS Laser comes with a Power Connection, USB Connection, Fan Connection and a SDR-type Connection for laser control I/O. All of these connectors are on the back panel of every OBIS LX/LS laser.

To simplify integration the OBIS Scientific Remote connects to the single SDR-type connector for power, signals and communication. The OBIS Scientific Remote then brings all of these features to controls and connectors on the front panel of the Remote.

OBIS Scientific Remote has a convenient handle to angle the unit for easier display.

3.1.1 Front Panel

Features on the OBIS Scientific Remote front panel are shown in Figure 3-2. Each feature is described in the following subsections.

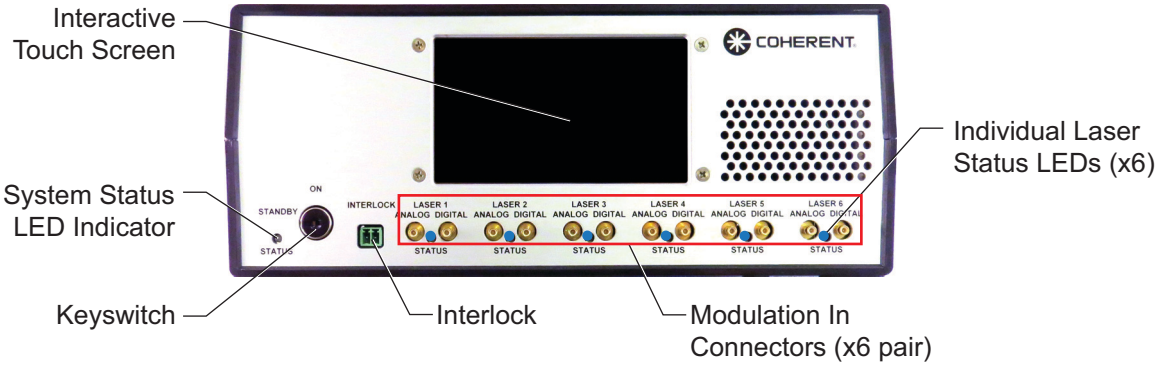


Figure 3-2. OBIS Scientific Remote: Front Panel

3.1.1.1 Interactive Touch Screen

Use the touch screen to set up, monitor and control all lasers that are attached to the OBIS Scientific Remote.

3.1.1.2 System Status LED Indicator

The System Status LED indicator is located on the front panel, as shown in Figure 3-3. This LED indicator displays yellow, green, blue or red. The state of the OBIS Scientific Remote calculates the color and is described, below.

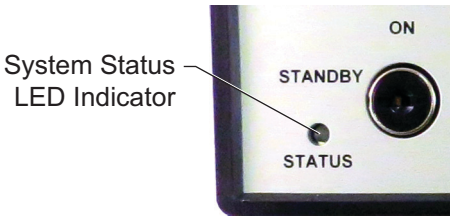


Figure 3-3. OBIS Scientific Remote System Status LED Indicator

Table 3-2 lists the states for the LED indicator on the OBIS Scientific Remote.

Table 3-2. OBIS Scientific Remote Status LED States (Sheet 1 of 2)

Mode	LED Status	Auto Start	Keyswitch Position	Interlock Status
1	Blue	Disabled	STANDBY	X
2	Blinking Blue	Disabled	ON at power-up	X
3	Green	Disabled	Cycle STANDBY to ON	Closed
4	Blue	Enabled	STANDBY	X

Table 3-2. OBIS Scientific Remote Status LED States (Sheet 2 of 2)

Mode	LED Status	Auto Start	Keyswitch Position	Interlock Status
5	Green	Enabled	ON	Closed
6	Red	X	ON	Open

The conditions described above are at power ON. Table 3-3 lists the modes for the OBIS Scientific Remote:

Table 3-3. Modes for the OBIS Remote

Mode	Description
Mode 1	A blue LED with Auto Start disabled and the keyswitch in the STANDBY position. The interlock can be either in or out because the OBIS Scientific Remote is not looking for the interlock plug.
Mode 2	A blinking blue LED that displays when you have the keyswitch in the ON position and you power-up the OBIS Scientific Remote. To clear this condition, turn the keyswitch to STANDBY, then back to ON.
	NOTE: With the internal Auto Start jumper inserted, this fault mode is bypassed and defeats the laser safety feature.
Mode 3	This green LED appears when you have correctly powered up the OBIS Scientific Remote, cycled to the ON position, Auto Start is disabled, and the interlock plug is in position.
Mode 4	This is the first of the configurations that includes Auto Start. When you power-up the OBIS Scientific Remote and have the keyswitch in STANDBY, the LED will be blue.
Mode 5	This is the correct sequence for the OBIS Scientific Remote when Auto Start is enabled. The LED will be green when you power the OBIS Scientific Remote with the keyswitch ON and the Auto Start is enabled.
Mode 6	This red LED indicates that the interlock was opened with the keyswitch in the ON position.

3.1.1.3 Keyswitch

The OBIS Scientific Remote has a keyswitch (see Figure 3-4).

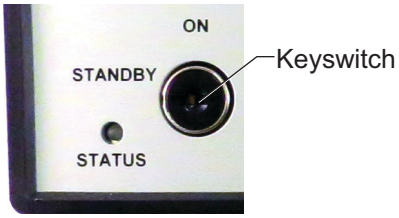


Figure 3-4. OBIS Scientific Remote: Keyswitch

This keyswitch prevents the generation of laser radiation when in the STANDBY position. The keyswitch is the CDRH Manual Reset feature.

WARNING!
Laser emission can occur when the keyswitch is in the ON position, the interlock plug is connected, and the laser Start/Stop button is enabled.

The key is removable in the STANDBY position, but not in the ON position.

After an interlock fault or power interruption, the laser does not automatically restart unless the keyswitch is first reset to the STANDBY position, then returned to the ON position, as shown in Figure 3-5.

Figure 3-5. OBIS Scientific Remote: Keyswitch STANDBY and ON Positions

3.1.1.4 Interlock

The interlock has terminal-style connector, shown in Figure 3-6, that permits integration with an external control device or interlock circuit. The mechanical-style jumper for CDRH interlock is included.

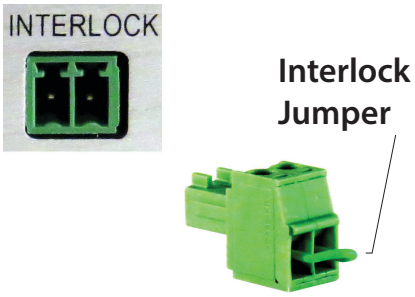


Figure 3-6. OBIS Scientific Remote: Interlock

3.1.1.5 Modulation In Connectors

There are six sets of SMB connectors (one digital and one analog per set), as shown in Figure 3-7.

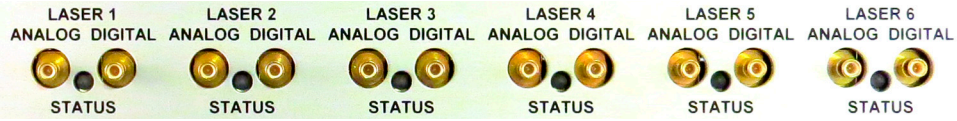


Figure 3-7. OBIS Scientific Remote: Modulation In Connectors

These connectors connect to buffer amplifiers within the OBIS Scientific Remote and are converted to differential signals to pass through the SDR cables to the lasers. The input impedance of the digital input is 50 ohms and the analog input impedance is 2000 ohms.

3.1.1.6 Individual Laser Status LEDs

Each of the six Status LED indicators displays the status of one laser that is connected to a specific Modulation In connector. The LED colors for the various states are listed in Table 3-4.

Table 3-4. OBIS Scientific Remote Individual Laser Status LED States

State	LED Color
Standby	**Blue**
Warm Up	**Blinking Green**
Emitting	**White**
Fault	**Red**

3.1.2 Back Panel

The back panel of the OBIS Scientific Remote is shown in Figure 3-8:

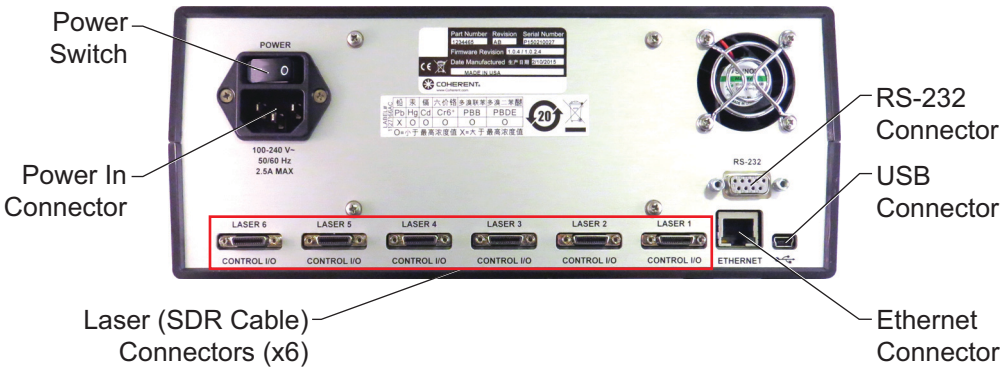


Figure 3-8. OBIS Scientific Remote: Back Panel

This panel includes the following switches and connectors. These switches and connectors are described next.

- Power switch
- Power In connector
- Laser (SDR cable) connectors
- Ethernet connector

- USB connector
- RS-232 connector

3.1.2.1 Power Switch

Toggle power between OFF and ON to the OBIS Scientific Remote.

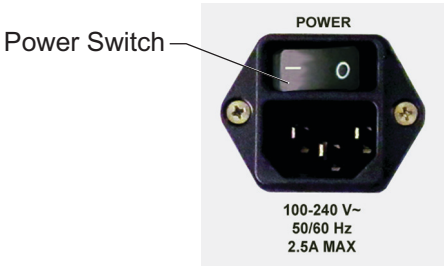


Figure 3-9. OBIS Scientific Remote: Power Switch

3.1.2.2 Power In Connector

Power is supplied to the OBIS Scientific Remote through an IEC-320 AC connector.

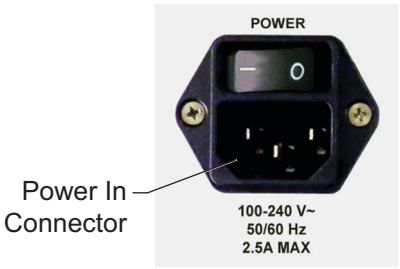


Figure 3-10. OBIS Scientific Remote: Power-In Connector

3.1.2.3 Laser (SDR Cable) Connectors

Use these connectors to connect a SDR cable between the laser and the OBIS Scientific Remote. Type: 3M 12226-8250-00FR.

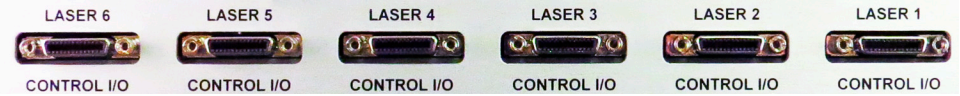


Figure 3-11. OBIS Scientific Remote: Laser (SDR Cable) Connectors

Refer to “Appendix - Parts & Accessories” (p. III-187) for a complete list of cable part numbers.

3.1.2.4 USB Connector

This is a standard Mini-B connector, shown in Figure 3-12, used to make connection to a PC for remote control of the laser. For more information about setting up an USB connection, see Part 1 of the *OBIS LX/LS Operator's Manual*

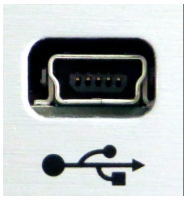


Figure 3-12. OBIS Scientific Remote: USB Connector

Figure 3-13 shows the location of the connector for the USB cable.

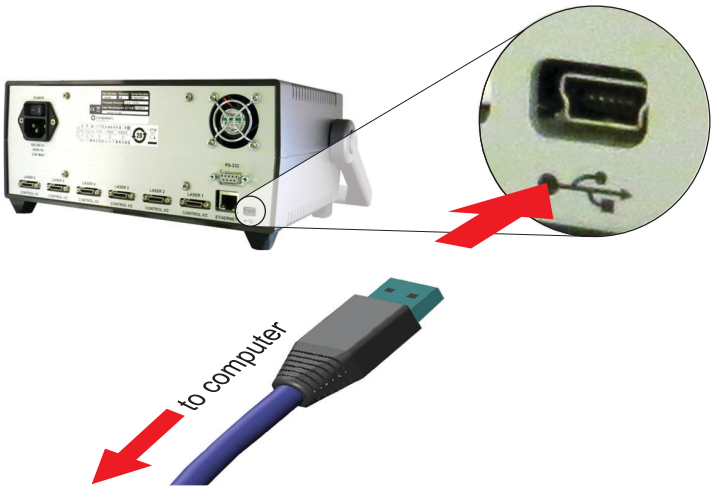


Figure 3-13. OBIS Scientific Remote: USB Connector Location

3.1.2.5 RS-232 Connector

Attach an RS-232 cable between this DB9F RS-232 connector and the RS-232 connector on a host computer to send commands through a SDR connector. For more information about setting up a RS-232 connection, see "OBIS Communications through a Terminal Program" in Part 1 of the *OBIS LX/LS Operator's Manual*.

Figure 3-14. OBIS Scientific Remote: RS-232 Connector

Figure 3-15 shows the location of the connector for the RS-232 cable.

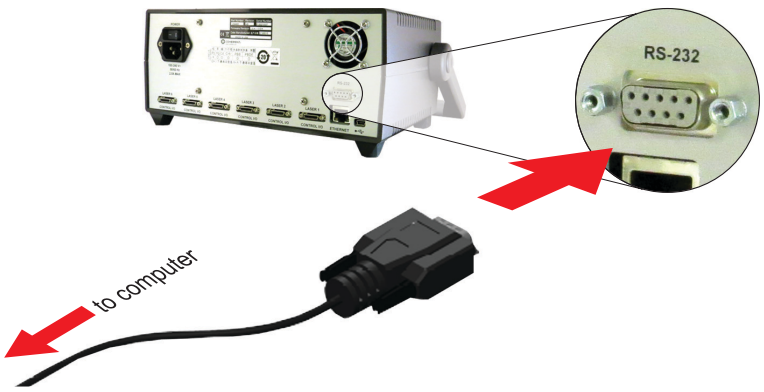


Figure 3-15. OBIS Scientific Remote: RS-232 Connector Location

Table 3-5 lists the RS-232 communication settings for the OBIS Scientific Remote.

Table 3-5. OBIS Scientific Remote RS-232 Communication Settings

Setting	Value
Baud	115200
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	None

Table 3-6 on page 3-45 lists the RS-232 pin-outs for the OBIS Scientific Remote.

Table 3-6. OBIS Scientific Remote RS-232 Pin Connections

Pin	Signal	Pin	Signal
1	DCD (Data Carrier Detect)	6	DSR (Data Set Ready)
2	Rx (Receive)	7	RTS (Request to Send)
3	Tx (Transmit)	8	CTS (Clear to Send)
4	DTR (Data Terminal Ready)	9	Unused
5	GND (Ground)		

3.1.2.6 Ethernet Connector

Figure 3-16 shows the RJ-45 Ethernet connector. Use this to make connection between the OBIS Scientific Remote and a network or a hub on a network for remote control of the laser.

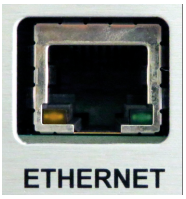


Figure 3-16. OBIS Scientific Remote: Ethernet Connector

Figure 3-17 shows the location of the Ethernet connection for a network cable.

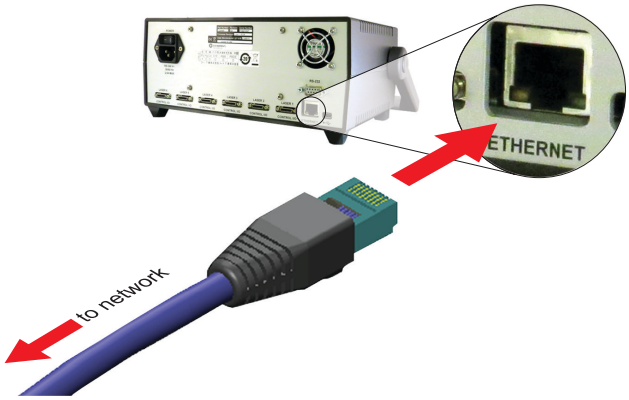


Figure 3-17. Ethernet Cable from the OBIS Scientific Remote to the Network

After connecting the Scientific Remote to a PC, use the following procedure to configure Ethernet network communication.

3.1.2.6.1 Establish Ethernet Communication with the OBIS Scientific Remote

After connecting the Scientific Remote to a PC (see Figure 3-17), use Coherent Connection to configure Ethernet network communication.

1. Configure the Scientific Remote, as shown in Figure 3-18.

   A Scientific Remote may be configured to accept or refuse remote connections via Ethernet. This is controlled via the Network tab from the Settings button.

   In the above example, the Scientific Remote is configured for network access. The following items are necessary for the Scientific Remote to accept remote connections via Ethernet:

   - The *Connect to a network* check box must be checked.
   - The *Device Name* must be unique on your LAN. Note that since devices are shipped from the factory with a unique name that incorporates a serial number, you should never have to change it.
   - One of the two radio buttons must be selected
     - *DHCP* is the simplest to configure.

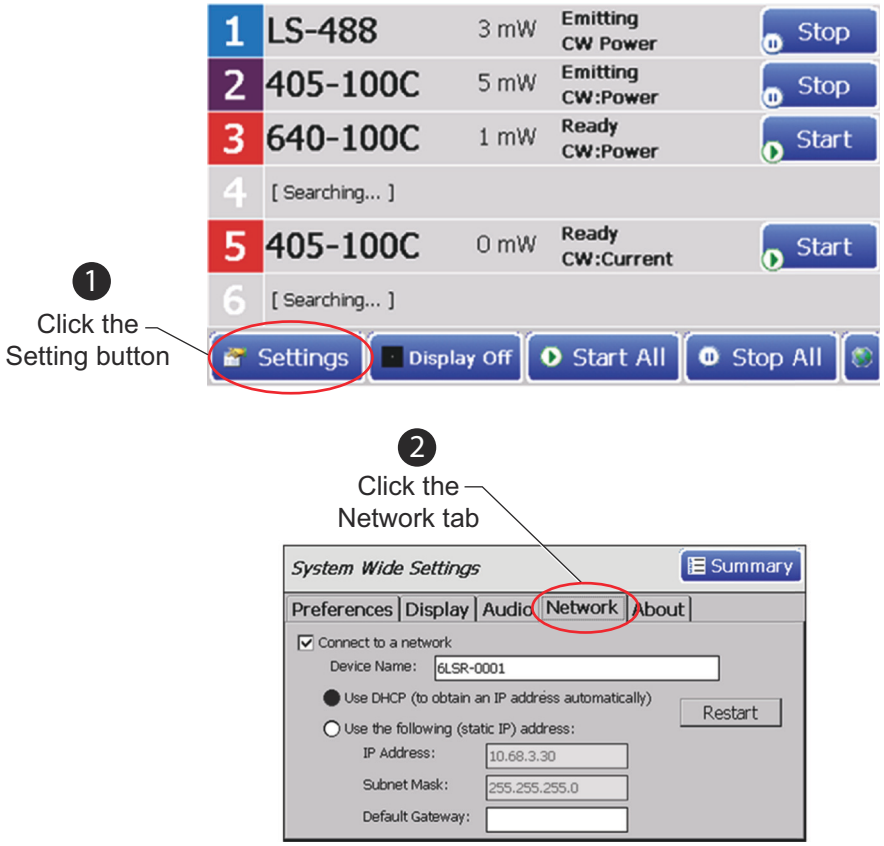


Figure 3-18. Configure the OBIS Scientific Remote

- If *Static IP Address* is selected, make sure to fill in the three fields (*IP Address*, *Subnet Mask*, and *Default Gateway*). Contact your system administrator to obtain a valid static IP address.

2. Connect the Scientific Remote to the same local area network (LAN) as the computer running the Coherent Connection software.

   Generally this means connecting the remote to a suitable network hub via an Ethernet cable. ***Remote control only works between devices on the same LAN***.

3. Launch Coherent Connection on your computer.

4. Open the Manage Network Devices dialog from the Main menu, shown in Figure 3-19.

5. Press the **Search For New Devices** button, shown in Figure 3-20.

The OBIS Scientific Remote should appear in the *Network Devices* list, which verifies that the Ethernet connection is established. If the OBIS Scientific Remote does not appear in the list, use the following instructions to manually establish a network connection.

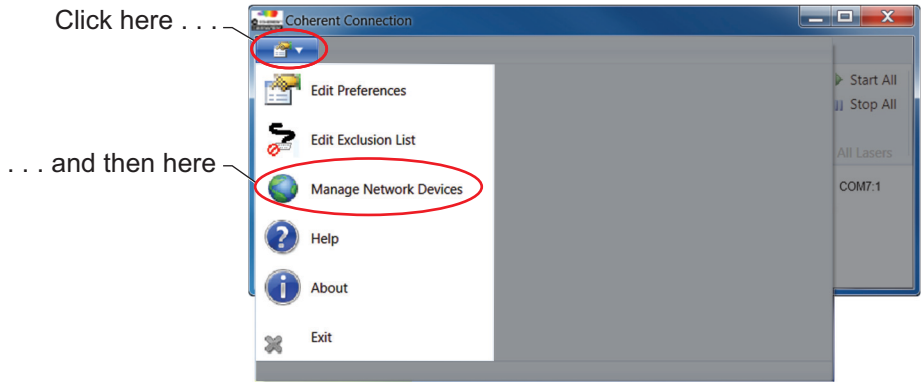


Figure 3-19. Manage Network Devices Option

Figure 3-20. Search for New Devices Option

3.1.2.6.2 Manually Add a Scientific Remote to Network Devices

Figure 3-21 shows the steps to manually add an OBIS Scientific Remote to the list of Network Devices.

3.1.2.6.3 Remove a Scientific Remote from Network Devices List

Use the instructions shown in Figure 3-22 to remove an OBIS Scientific Remote from the Network Devices list.

Figure 3-21. Manually Add an OBIS Scientific Remote to Network Devices

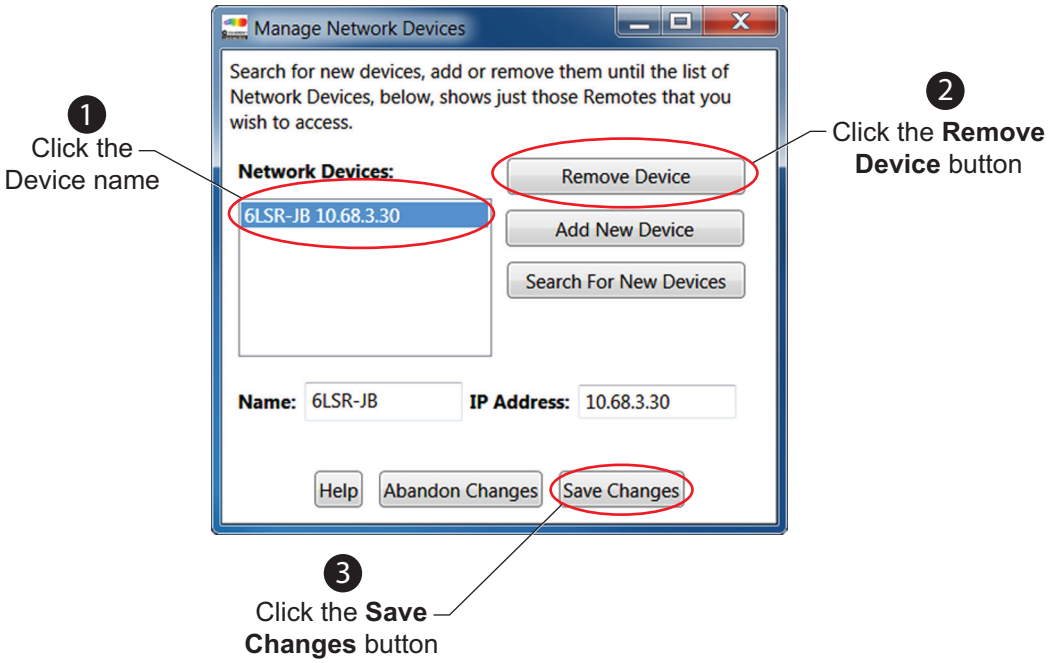


Figure 3-22. Remove an OBIS Scientific Remote from Network Devices List

NOTES:

- While the dialog is open, you can freely add or remove devices until the list includes all the Remotes you want to access.
- Other Remotes may also appear, and, as a courtesy to their intended users, you should remove them from your list. Note that after you remove an item, the item name and address are left in the text boxes. That allows

you to edit an existing entry by removing it, changing the name or address, and then adding it back in with new parameters.

- Once you click the **Save Changes** button, any Remotes that were added will appear in the main window. Likewise, any Remotes that were removed will disappear (if they were active before launching the dialog).
- Pressing the **Abandon Changes** button (rather than the **Save Changes** button) will discard any pending changes and return to whatever device list was in effect when you opened the dialog.

3.1.2.6.4 Device Exclusion List

The Coherent Connection software continually examines all possible ports (serial, USB, and Ethernet) for the presence of compatible Coherent devices (including a Scientific Remote). When a device is found, it is added to the *Included Ports* list. A device is automatically removed from the list when it is disconnected.

There are circumstances when a user might not want the software to communicate with a certain port. Set that up using the Device Exclusion List, shown in Figure 3-23.

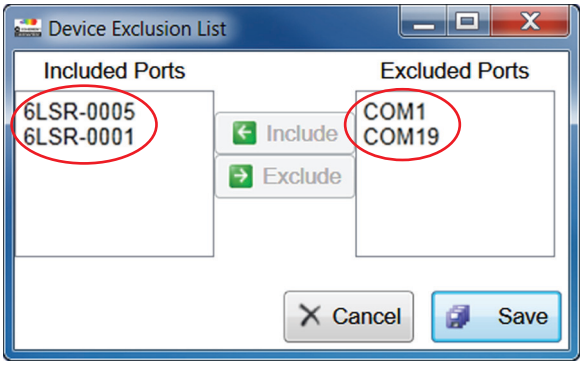


Figure 3-23. Device Exclusion List

This menu lists all ports in the user's system and allows them to be designated as *Included* or *Excluded*. Excluded ports are ignored by the software.

- The names for Ethernet-capable Remotes match the "network name" assigned to them. This is the same as the "Device Name" in the Network Settings dialog box.
- The names for USB and RS-232 devices start with "COM".

3.1.3 Interlock Control

Connect the OBIS Scientific Remote to a remote switch to disable the system if a door or panel is opened. *Wire the interlock switch in series with the interlock connector*. The user has the option of connecting an external LED in series with the interlock circuit (which supplies a current source with 20 mA and a maximum of 9V).

Table 3-7 lists the laser behavior during laser operation, when:

- The interlock circuit is opened during laser operation.
- Te interlock circuit opens and closes again while the laser system is powered.

Table 3-7. OBIS Scientific Remote Behavior During Laser Operation

	KEY SWITCH	
	OFF	**ON**
Interlock Circuit Opened		
	No failure displayed.	Failure displayed by red LED status on front panel. Close interlock circuit to clear failure status.
Interlock Circuit Opened and Closed Again While Laser System is Powered		
	No failure displayed.	Red LED displayed. Keyswitch must be cycled to STANDBY and then back to ON for lasers to start lasing again.

WARNING!
The interlock is a fused (12VDC) line. DO NOT ground the interlock or apply any outside power to the circuit.

3.2 Install the Scientific Remote

The procedure in this section describes how to connect the OBIS Laser and OBIS Scientific Remote. For information about installing the laser *without* the OBIS Scientific Remote, see “OBIS Communications through a Terminal Program” in Part 1 of the *OBIS LX/LS Operator’s Manual*.

NOTICE
Operating the laser without the OBIS Scientific Remote is non-CDRH compliant.

The installation procedure has the following steps:

1. Install the optional heatsink.
2. Mount the laser.
3. Connect the SDR cable between the laser and the OBIS Scientific Remote.
4. Connect power to the OBIS Scientific Remote.
5. Add optional fan power to the laser.
6. Connect the interlock jumper to the OBIS Scientific Remote.
7. Connect optional USB/RS-232/Ethernet cables (for remote control).

3.2.1 Procedure

To install the OBIS Scientific Remote:

1. Install the optional heatsink (see Part 1 of the *OBIS LX/LS Operator's Manual*).
2. Mount the laser (see Part 1 of the *OBIS LX/LS Operator's Manual*).
3. Connect the 26-pin SDR connector to the laser and the OBIS Scientific Remote, as shown in Figure 3-24. See "OBIS Laser SDR Connector Pin-Outs" in Part 1 of the *OBIS LX/LS Operator's Manual* for pin assignment and functions.

Figure 3-24. OBIS Scientific Remote: Connect the SDR Cable

4. Connect the power cord to the OBIS Scientific Remote, as shown in Figure 3-25.

The OBIS Scientific Remote includes an internal power supply which provides power for up to six OBIS lasers through the SDR cable connection. The input voltage to the OBIS Scientific Remote is 264 VAC, 47 to 63 Hz.

Figure 3-25. OBIS Scientific Remote: Connect Power

5. Add optional fan power to the laser (see Part 1 of the *OBIS LX/LS Operator's Manual*).

6. Connect the interlock jumper to the OBIS Scientific Remote, as shown in Figure 3-26. For interlock details and specifications, refer to "Interlock Control" (p. 3-51).

Figure 3-26. OBIS Scientific Remote: Connect Interlock Jumper

7. Connect optional USB/RS-232/Ethernet cables (for remote control), as shown in Figure 3-27.

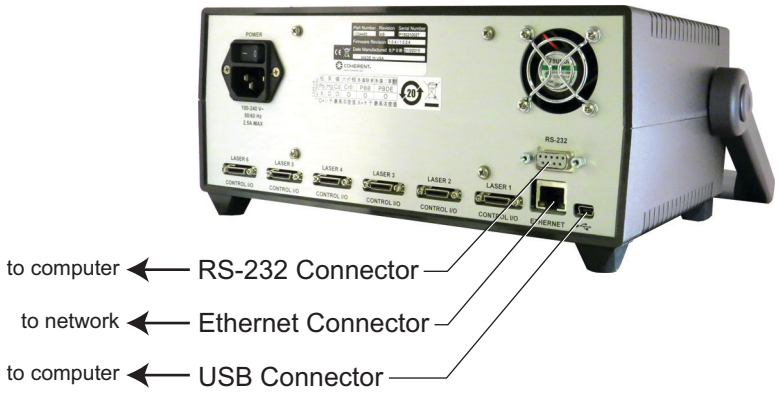


Figure 3-27. OBIS Scientific Remote: Connect Cables

3.3 Computer Control

This section describes the OBIS Scientific Remote user interface (a touch screen).

3.3.1 Principal User Interface Modes

The principal user interface modes are shown in Figure 3-28.

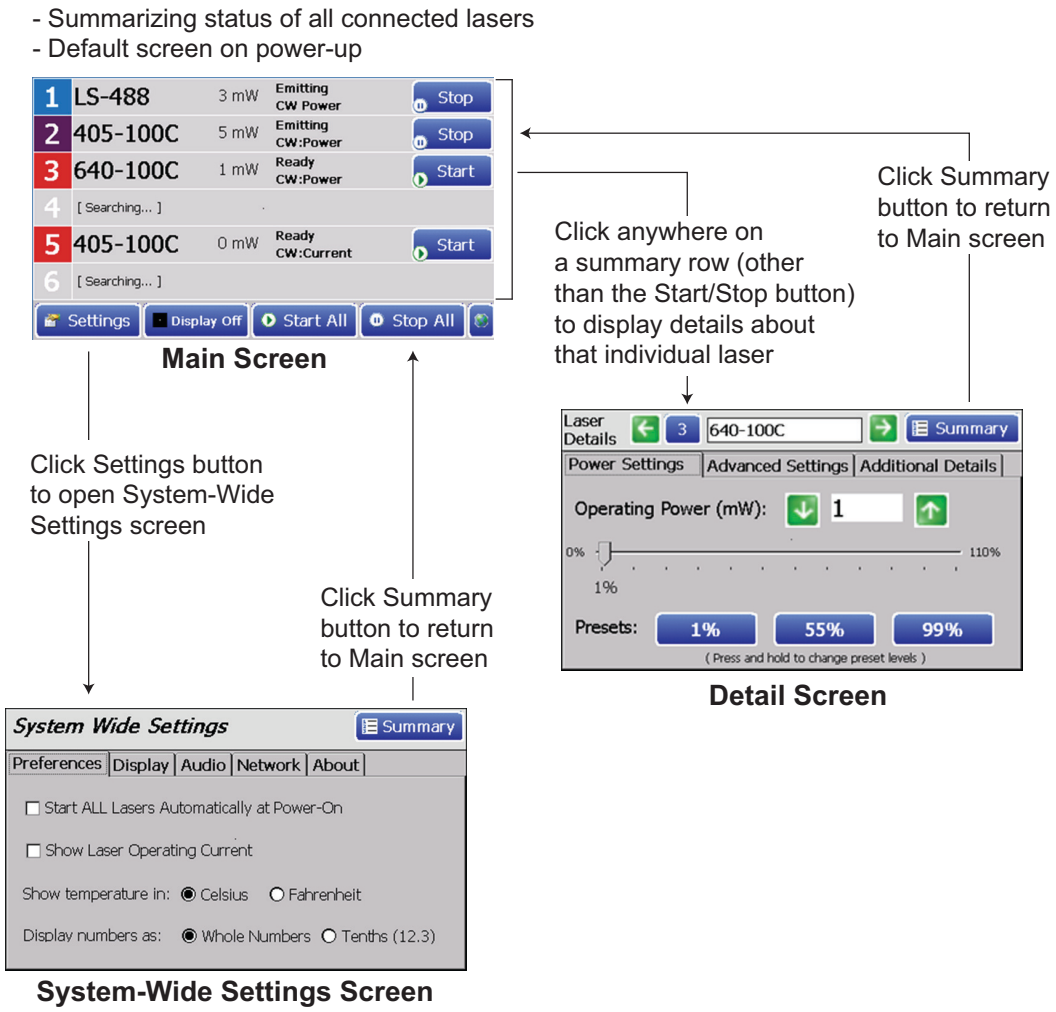


Figure 3-28. OBIS Scientific Remote: Interface Modes

3.3.2 Toggle Keyswitch Reminder

The dialog box shown in Figure 3-29 is displayed at system start-up if:

- Auto Start is enabled, AND
- The keyswitch is in the ON position (not in STANDBY)

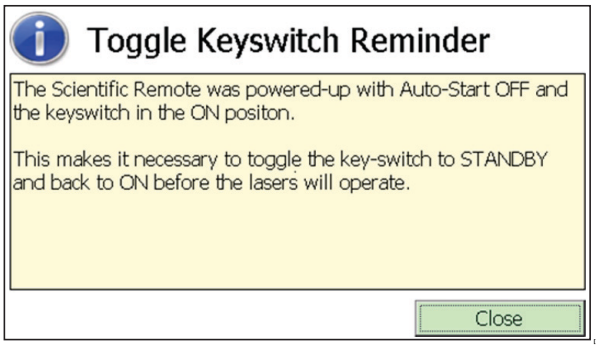


Figure 3-29. OBIS Scientific Remote: Toggle Keyswitch Reminder

To remove the dialog box:

- Press the **Close** button, or
- Turn the keyswitch to STANDBY

To bypass the safety:

- Toggle the keyswitch (which turns on all lasers) OR
- Manually turn on each laser

3.3.3 Main Screen

The Main Screen for the OBIS Scientific Remote user interface is shown in Figure 3-30.

3.3.4 Laser Status Icon Summary

The icons shown in Figure 3-31 can be displayed on each laser **Start/Stop** button:

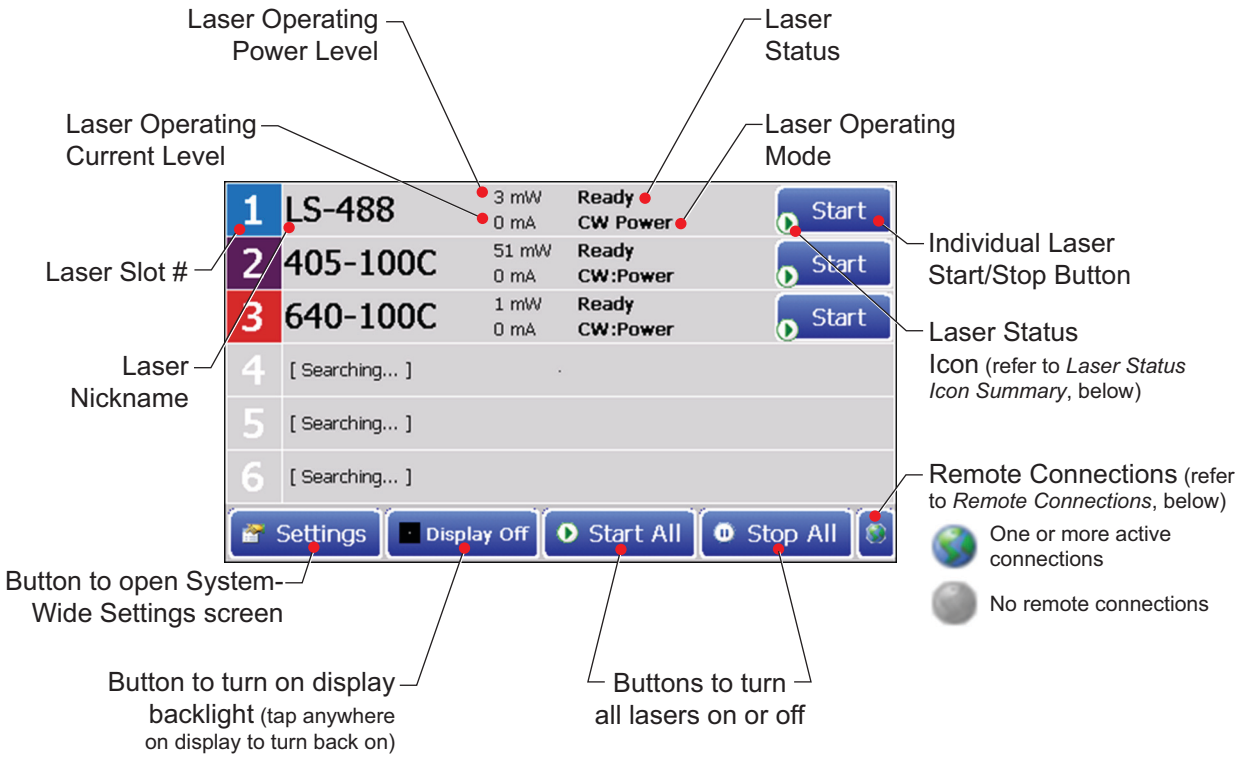


Figure 3-30. OBIS Scientific Remote: Main Screen

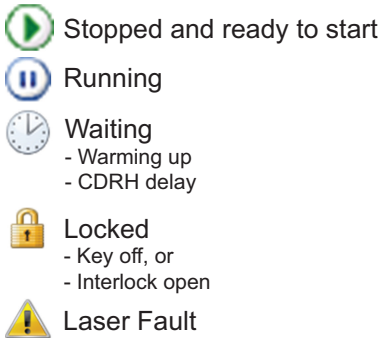


Figure 3-31. OBIS Scientific Remote: Laser Status Icon Summary

3.3.5 Remote Connections

Press the **Remote Connection** button on the Main Screen to access the dialog box shown in Figure 3-32:

3.3.6 System-Wide Settings: Preferences Tab

Press the **Settings** button on the Main screen and then click the **Preferences** tab to access the menu shown in Figure 3-33.

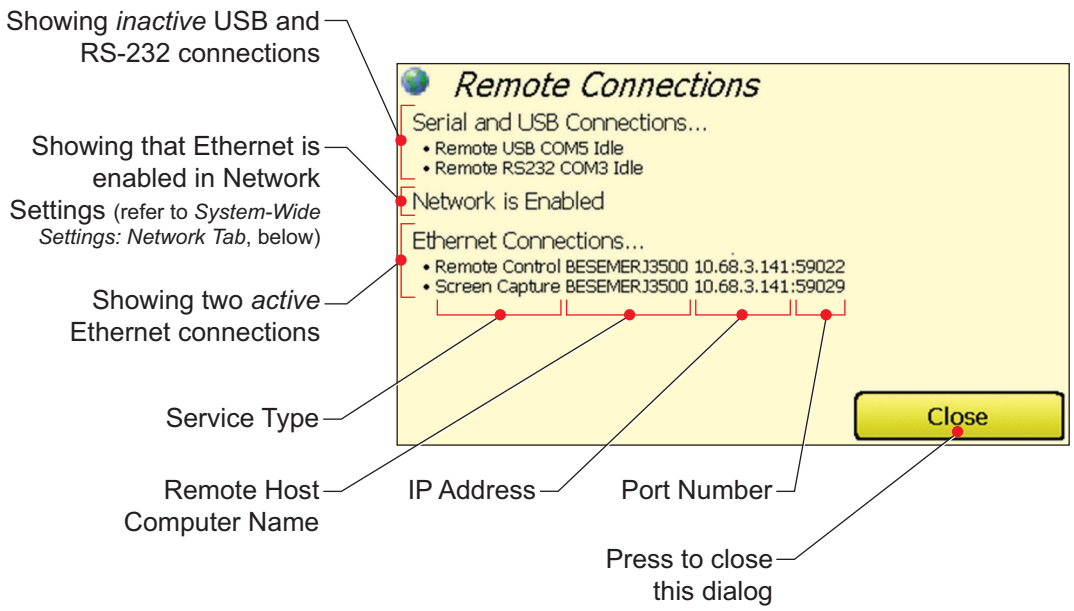


Figure 3-32. OBIS Scientific Remote: Button for Remote Connections

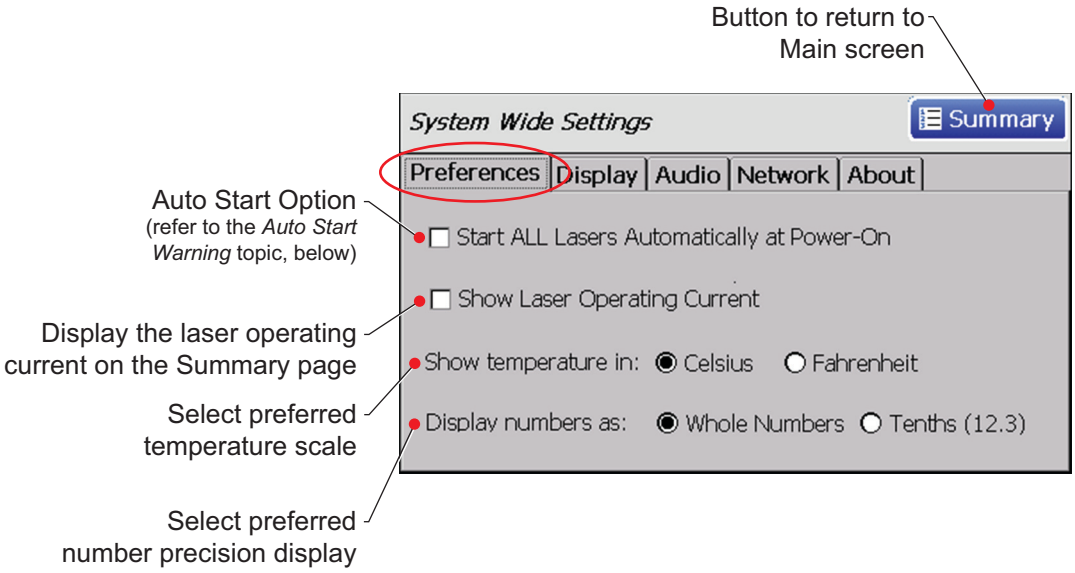


Figure 3-33. OBIS Scientific Remote: System-Wide Settings Preferences Tab

3.3.7 Auto Start Warning

The dialog box shown in Figure 3-34 is displayed when you select the Auto Start option on the Preferences tab of the System-Wide Settings screen:

- Click the No Change button to maintain current laser start-up settings.
- Click the Enable Auto Start button to enable Auto-Start.

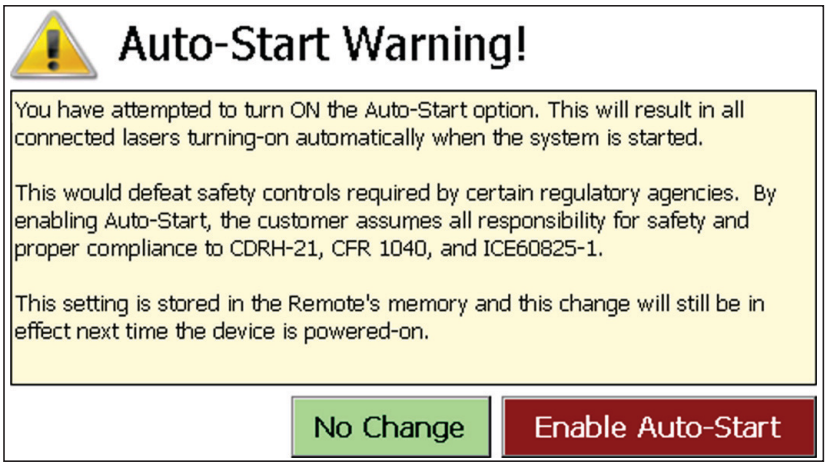


Figure 3-34. OBIS Scientific Remote: Auto Start Warning

CAUTION!
Enabling Auto Start defeats safety controls. Take the necessary precautions to avoid laser emissions.

3.3.8 System-Wide Settings: Display Tab

Press the **Settings** button on the Main screen, and then click the **Display** tab to access the menu shown in Figure 3-35.

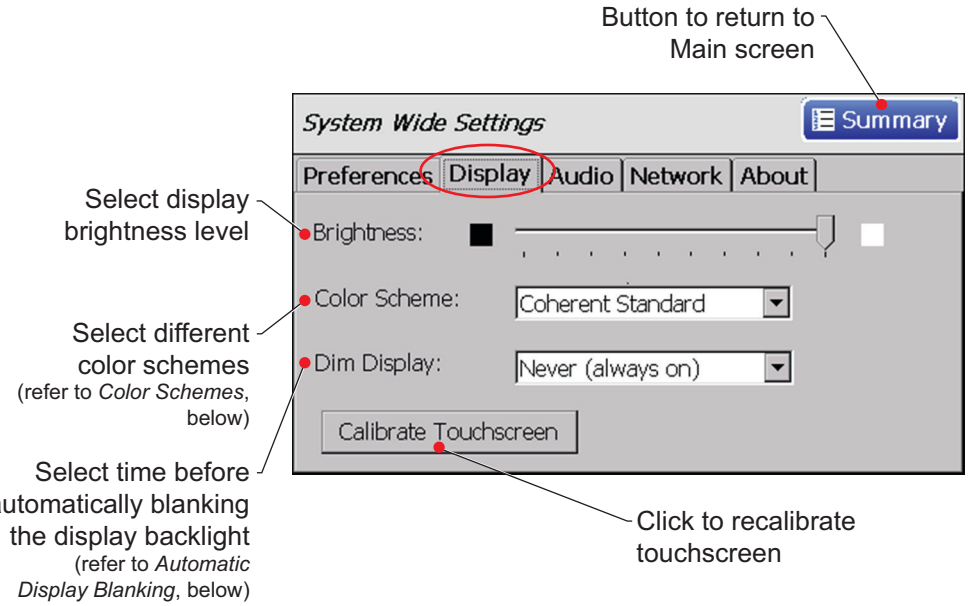


Figure 3-35. OBIS Scientific Remote: System-Wide Settings: Display Tab

3.3.8.1 Color Schemes

Color schemes for the OBIS Scientific Remote System are shown in Figure 3-36:

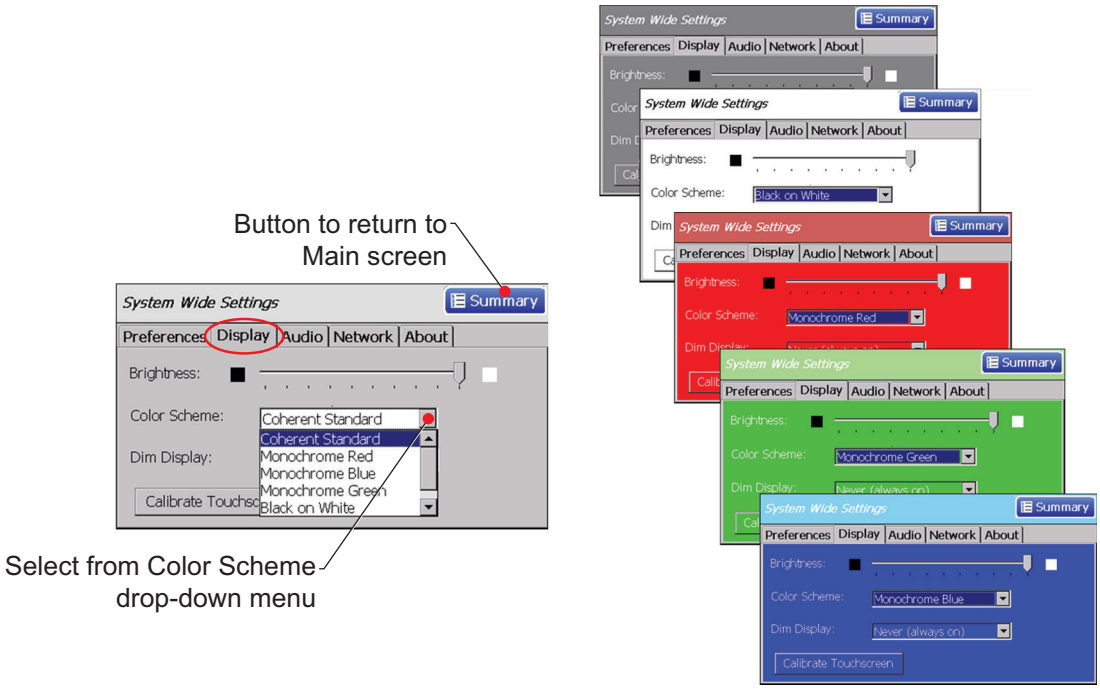


Figure 3-36. OBIS Scientific Remote: Color Schemes

3.3.8.2 Automatic Display Blanking

Settings for Blanking are shown in Figure 3-37:

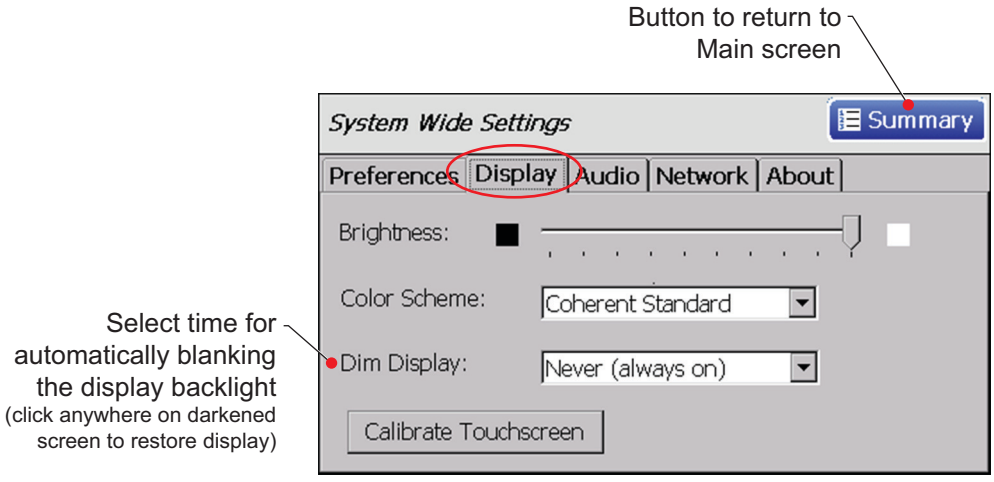


Figure 3-37. OBIS Scientific Remote: Automatic Display Blanking

3.3.9 System-Wide Settings: Audio Tab

Press the **Settings** button on the Main screen and then click the **Audio** tab to access this menu, shown in Figure 3-38.

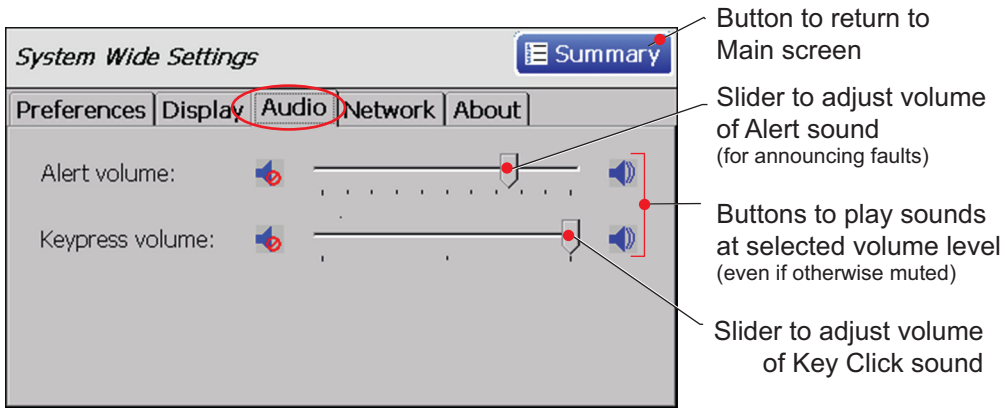


Figure 3-38. OBIS Scientific Remote: Audio Tab

3.3.10 System-Wide Settings: Network Tab

Press the **Settings** button on the Main screen and then click the **Network** tab to access this menu, shown in Figure 3-39.

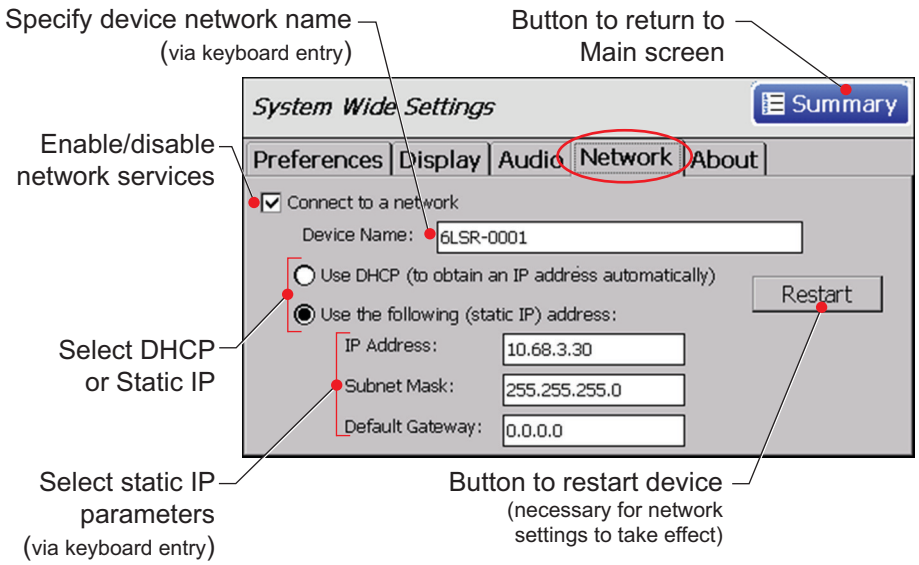


Figure 3-39. OBIS Scientific Remote: System-Wide Settings Network Tab

3.3.11 System-Wide Settings: About Tab

Press the **Settings** button on the Main screen and then click the **About** tab to access the menu shown in Figure 3-40. This screen displays other system information. Click the Summary button to return to the Main screen.

Figure 3-40. OBIS Scientific Remote: System-Wide Settings About Tab

3.3.12 Laser Operating Properties: Navigation Controls

Figure 3-41 shows the navigation controls in the Laser Operating Properties dialog box.

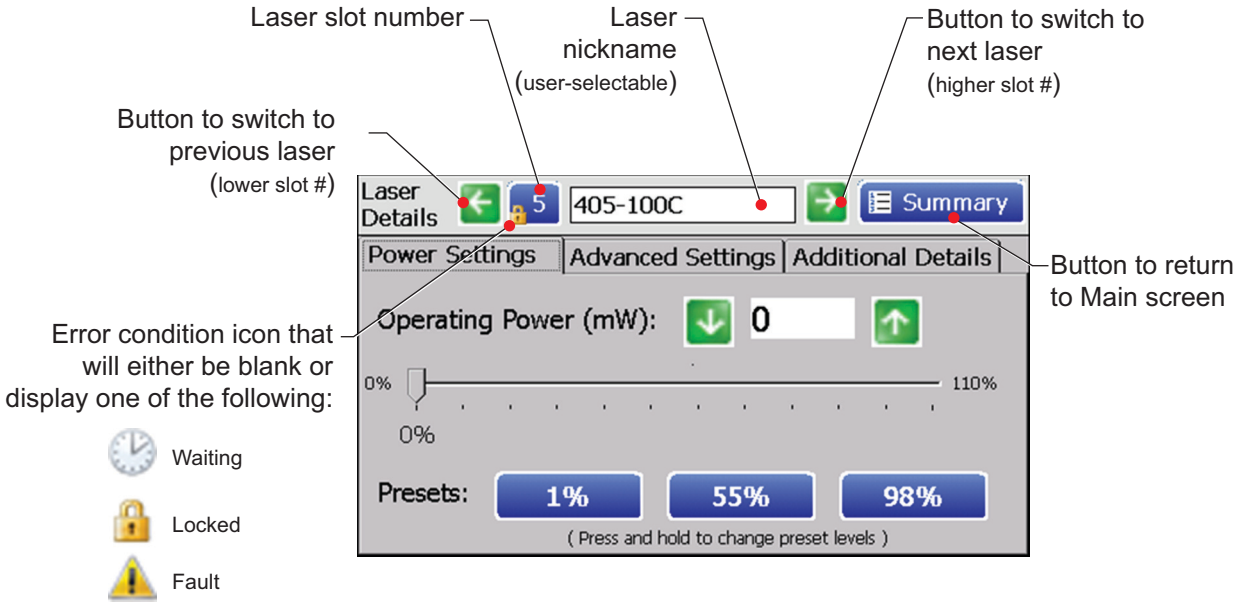


Figure 3-41. OBIS Scientific Remote: Laser Operating Properties, Navigation Controls

3.3.13 Laser Operating Properties: Power Settings Tab

Figure 3-42 shows the Power Settings tab in the Laser Operating Properties dialog box.

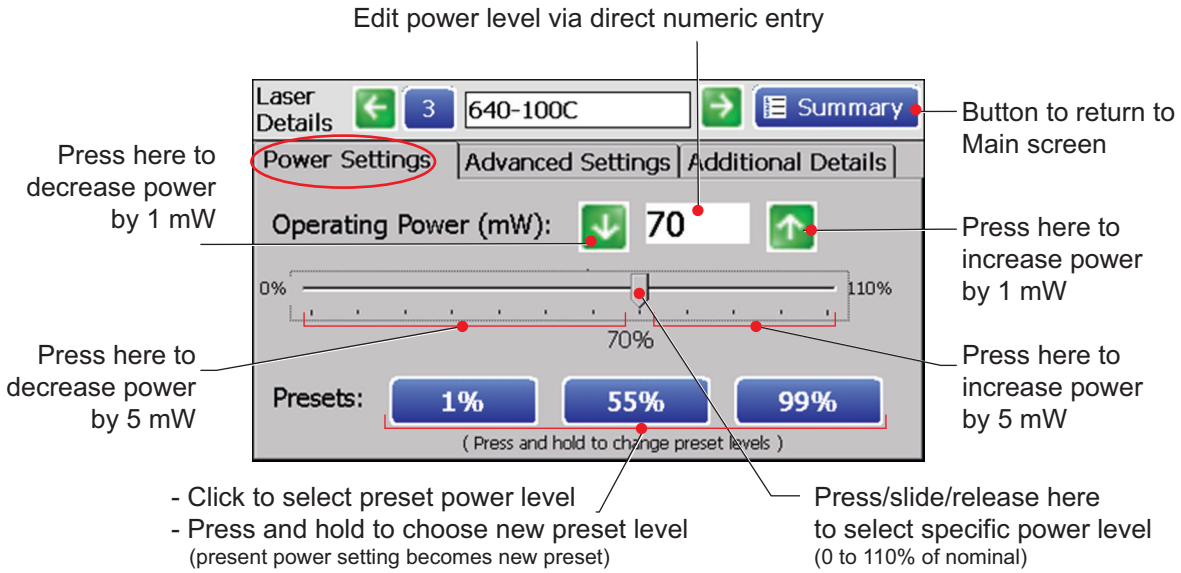


Figure 3-42. OBIS Scientific Remote: Power Settings Tab

Set power levels either via direct entry or using the keypad (shown in Figure 3-43).

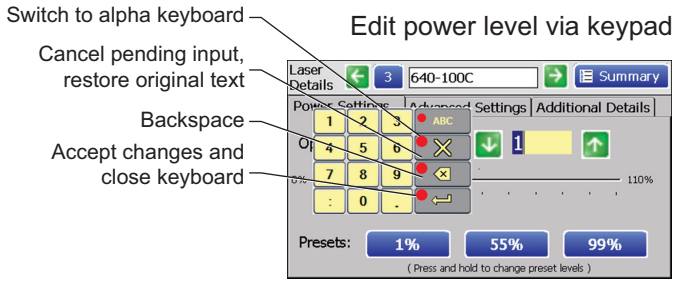


Figure 3-43. OBIS Scientific Remote: Set Power Level via Keypad

3.3.14 Laser Operating Properties: Advanced Settings Tab

Figure 3-44 shows the Advanced Settings tab in the Laser Operating Properties dialog box.

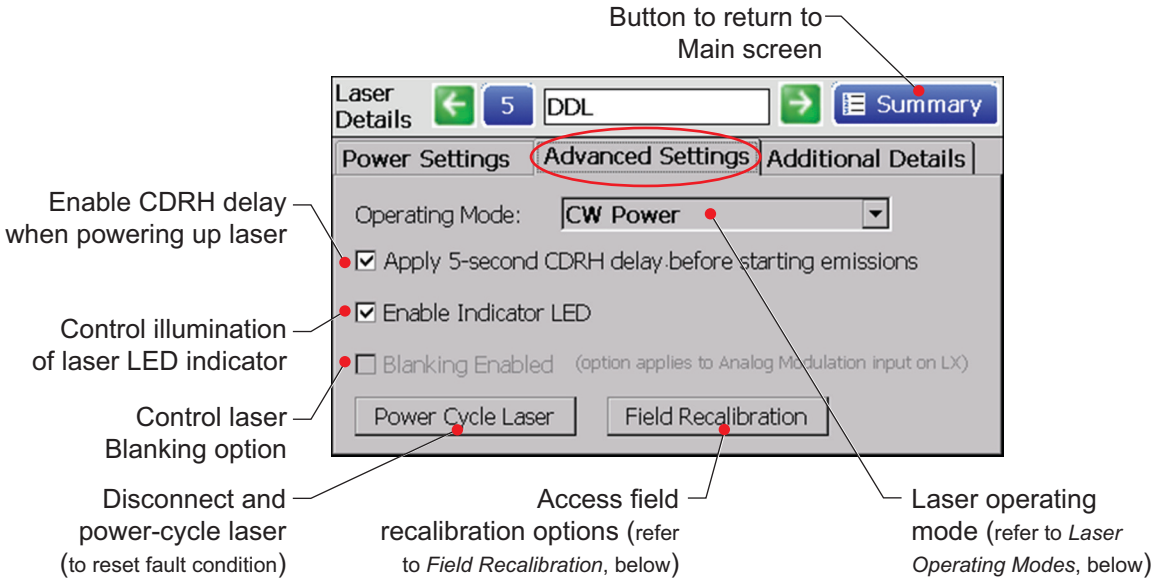


Figure 3-44. OBIS Scientific Remote: Advanced Settings Tab

3.3.15 Field Recalibration

Figure 3-45 shows the options for Field Recalibration. This applies only to OBIS 2.x lasers.

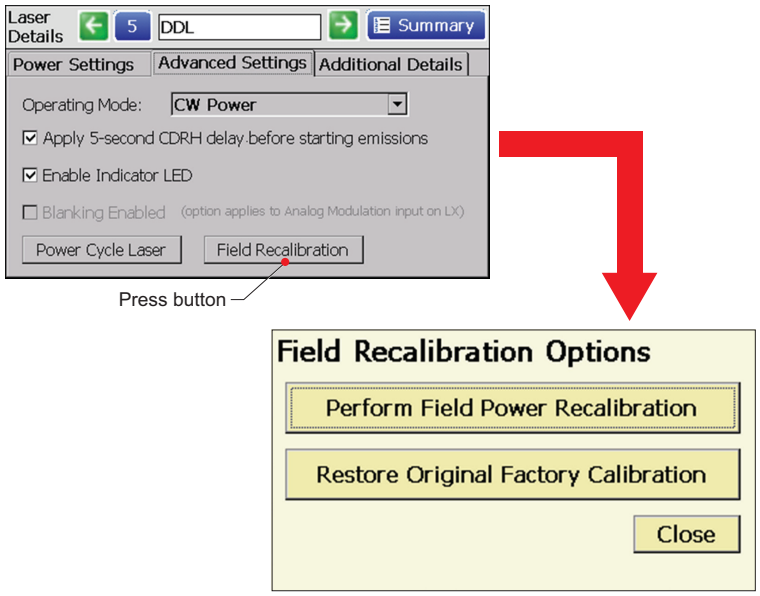


Figure 3-45. OBIS Scientific Remote: Field Recalibration

3.3.16 Perform Field Power Recalibration

To perform field recalibration for power, see instructions in Figure 3-46:

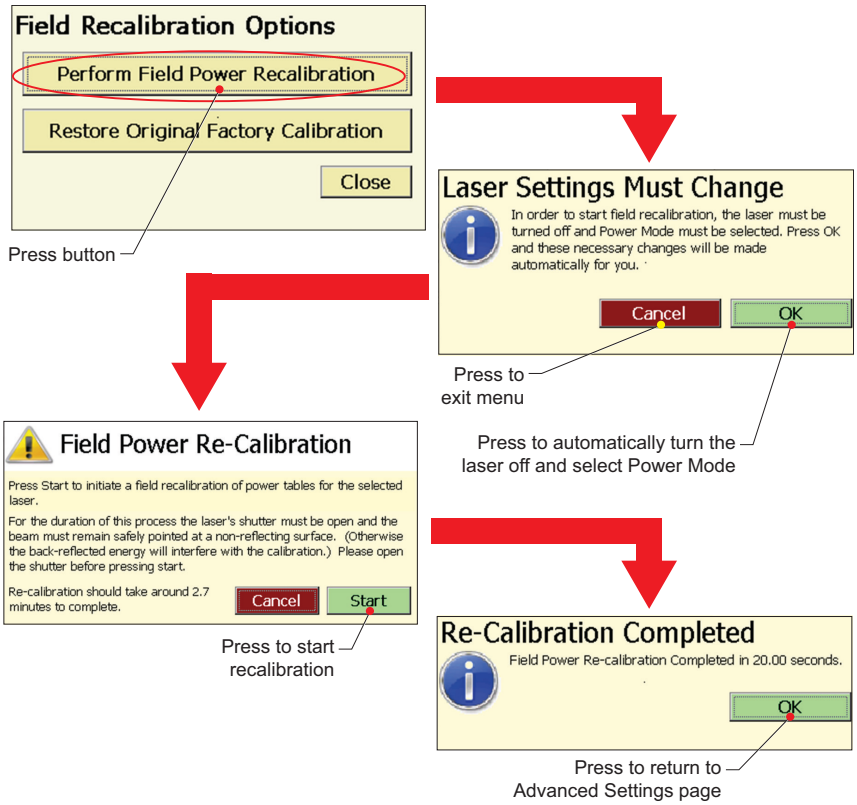


Figure 3-46. OBIS Scientific Remote: Perform Field Power Recalibration

3.3.17 Restore Original Factory Recalibration

To restore the original factory settings using field recalibration, see instructions in Figure 3-47:

3.3.18 Laser Operating Modes

Figure 3-48 shows the various operating modes for the lasers:

Table 3-8 lists the options for both OBIS LX and OBIS LS lasers:

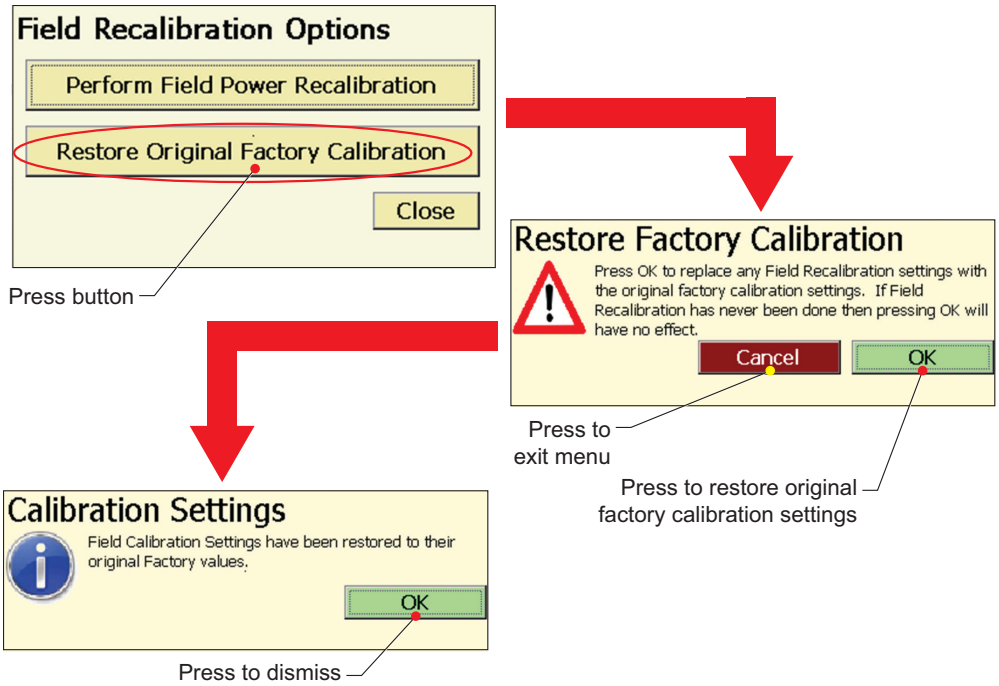


Figure 3-47. OBIS Scientific Remote: Restore Original Factory Recalibration

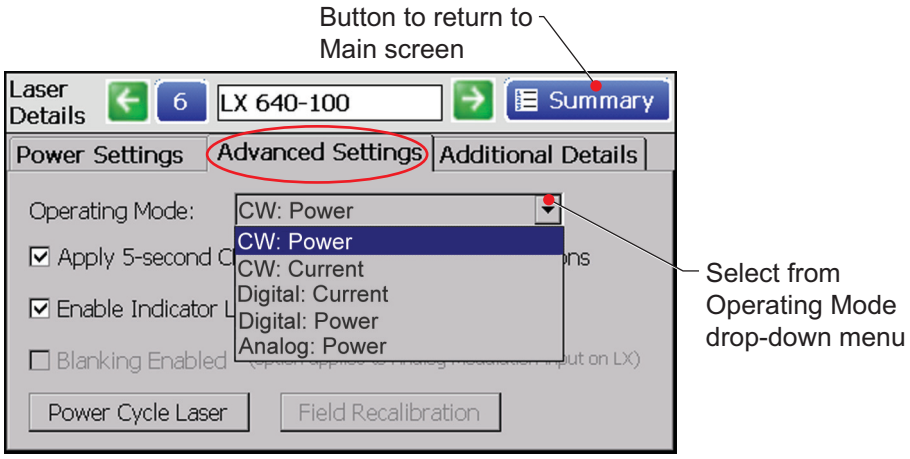


Figure 3-48. OBIS Scientific Remote: Laser Operating Modes

Table 3-8. Operating Mode Options

OBIS LX Lasers	OBIS LS Lasers
CW: Power	CW Power
CW: Current	Digital Modulation
Digital: Current	Analog Modulation
Digital: Power	Mixed Modulation
Analog: Power	
Mixed: Power	
Mixed: Current	

3.3.19 Laser Operating Properties: CDRH Delay Bypass Warning

Figure 3-49 shows the warning displayed if a person tries to disable the CDRH Delay option:

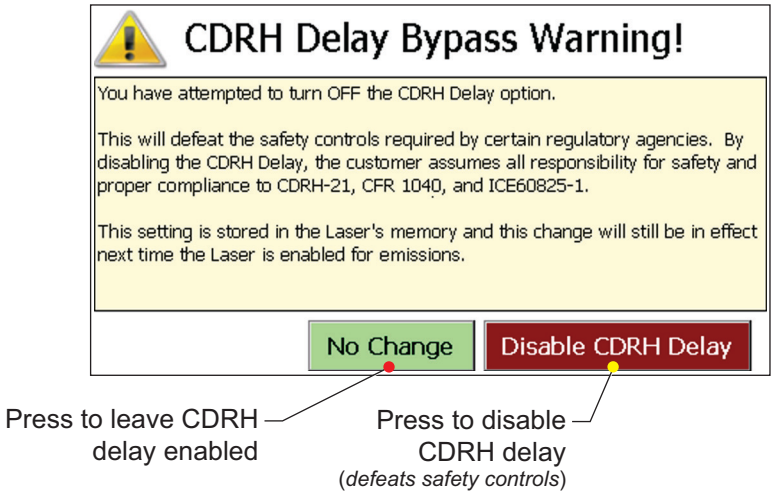


Figure 3-49. OBIS Scientific Remote: CDRH Delay Bypass Warning

3.3.20 Laser Operating Properties: Additional Details Tab

Figure 3-50 shows the dialog box displayed with statistics about the selected laser (details change, according to laser type):

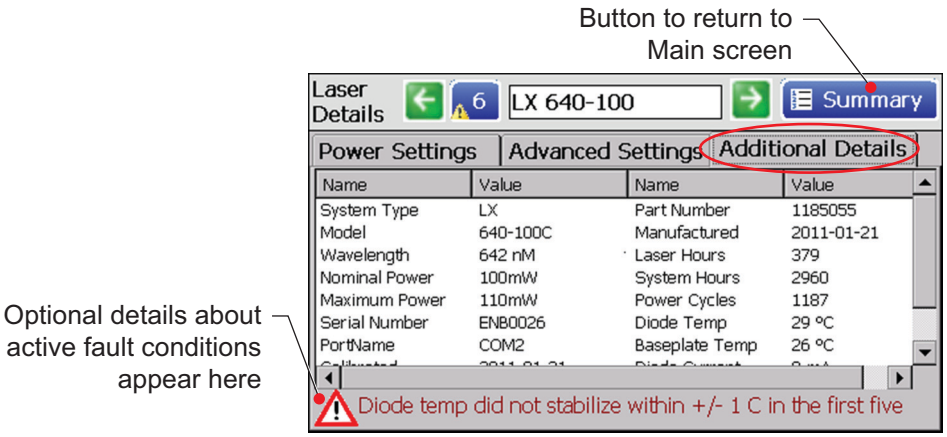


Figure 3-50. OBIS Scientific Remote: Laser Operating Properties, Additional Details Tab

3.3.21 Checksum Error Recovery

Figure 3-51 shows information displayed on-screen when a laser detects a checksum fault:

Figure 3-52 shows information displayed if there were errors during the recovery:

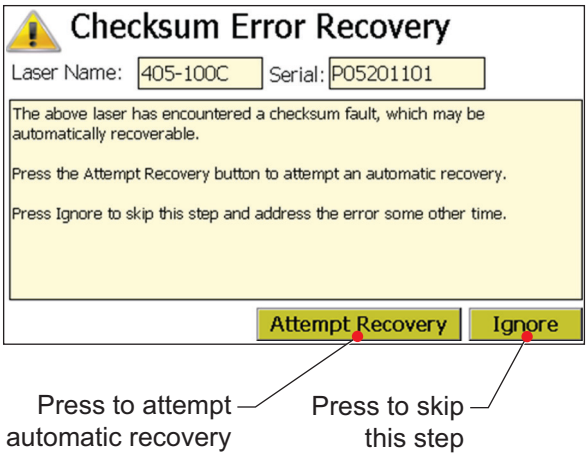


Figure 3-51. OBIS Scientific Remote: Checksum Error Recovery

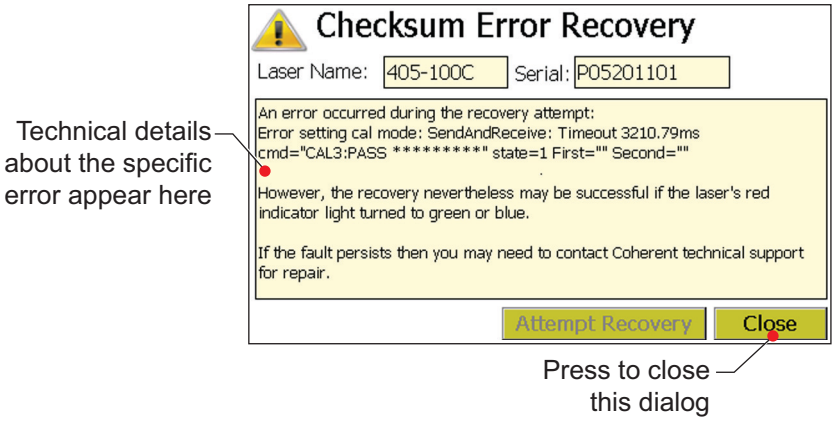


Figure 3-52. OBIS Scientific Remote: Checksum Error Recovery Details

The correct indication of a successful recovery is that the condition disappears.

- Visually confirm that the laser operating LED has changed from red to blue or green.
- The remote should not report the fault condition.
- If the fault continues, contact your Coherent Service representative for assistance.

If the recovery is successful, the screen shown in Figure 3-53 is displayed:

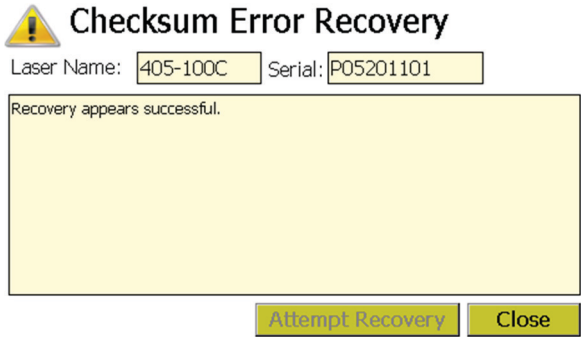


Figure 3-53. Checksum Error Recovery

- There were no errors during the recovery and the remote senses that the laser fault was removed.

Any results except those listed above means the recovery was unsuccessful. Contact Coherent Technical Support for assistance; see "Appendix - Service & Support" (p. V-193).

3.4 Device Selection Syntax

For information about how to send host computer commands to each OBIS Laser installed inside of the OBIS Scientific Remote, refer to "Device Selection Syntax" in Part 3 of the *OBIS LX/LS Operator's Manual*.

3.5 Dimensions

Figure 3-54 shows the dimensions for the OBIS Scientific Remote.

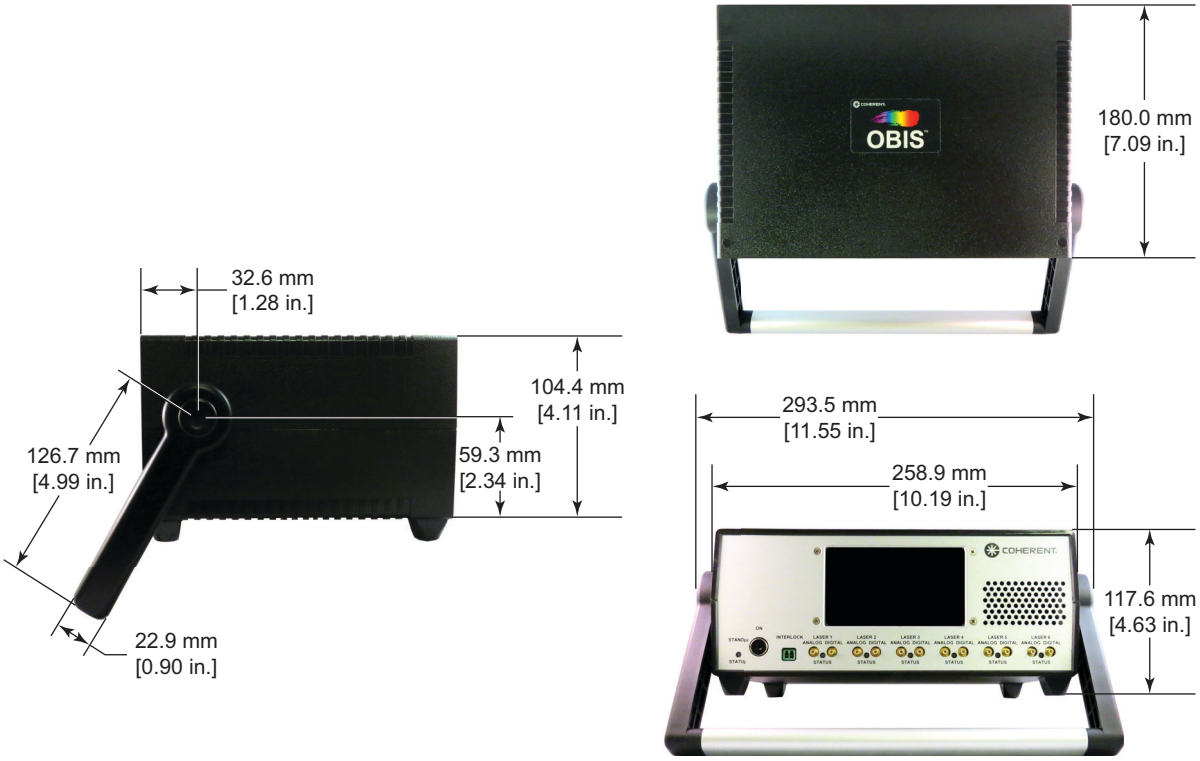


Figure 3-54. OBIS Scientific Remote: Dimensions

For the most current drawing dimensions and product details, https://www.coherent.com/resources

3.6 Specifications

Table 3-9 lists the specifications for the OBIS Scientific Remote.

Table 3-9. OBIS Scientific Remote Specifications

Parameter	Specification
Remote dimensions	183 x 294 x 110 mm
Laser Out connectors	Six @ 12VDC 1.5A
Operating temperature range	0 to 40°C
Operating humidity range (non-condensing)	30 to 85%
Storage temperature range	-20 to 70°C
Storage humidity range (non-condensing)	30 to 95%
Interlock(s)	One keyswitch One dual pin
Power input	90 to 264 VAC, 47 to 63 Hz @ 2.5A max

For the latest specifications, see:
https://www.coherent.com/lasers/laser/obis-accessories/obis-scientific-remote

3.7 Repacking Procedure

To repack the OBIS Scientific Remote:

1. Place the six cables and the power cable in the bottom of the shipping box, then place a “trampoline” frame on top of the cables with the film side up, as shown in Figure 3-55.

Figure 3-55. OBIS Scientific Remote: Repacking Step 1

2. Put the OBIS Scientific Remote unit in the pink ESD bag, then place the unit on top of the bottom packaging, as shown in Figure 3-56. Make sure the unit is positioned above the “trampoline” frame.

Figure 3-56. OBIS Scientific Remote: Repacking Step 2

3. Put the second 'trampoline' frame on top the Scientific Remote. Put the interlock keys in a small zip bag and tape the bag to the top of the "trampoline" frame, as shown in Figure 3-57.

Figure 3-57. OBIS Scientific Remote: Repacking Step 3

4. Close the shipping box and secure the box with tape, as shown in Figure 3-58.
5. *If returning the system to Coherent for service*:
   - Contact Coherent Customer Service at **+1-(734) 456-3100** to get an RMA number.
   - Include the RMA number on the shipping label.

Figure 3-58. OBIS Scientific Remote: Repacking Step 4

3.8 Troubleshooting Procedures

NOTICE

OBIS Lasers are designed to be operated as assembled. There are no user-serviceable parts inside. DO NOT remove covers!
The Coherent Warranty is VOID if the enclosure is disassembled.

Table 3-10 lists possible problems, with a reference to the related troubleshooting checklist.

Table 3-10. OBIS Scientific Remote Troubleshooting Procedures

Problem	Reference
The Scientific Remote touch screen is dark.	Checklist 1
The Scientific Remote does not power on.	Checklist 2
The Scientific Remote touch screen is not responsive.	Checklist 3
A laser is not listed on the Scientific Remote touch screen.	Checklist 4
The Scientific Remote or lasers attached to the unit are not being accessed by Coherent Connection on the host PC.	Checklist 5

Instructions for each of these checklists are provided in the following sub-sections.

3.8.1 Checklist 1: The Scientific Remote touch screen is dark.

If the touch screen is dark, do the following steps in the order shown:

[ ] Tap anywhere on the screen to suspend Automatic Display Blanking (in case the blanking option is enabled).

[ ] Power cycle the unit and wait for the Coherent Splash screen to confirm that the touch screen is working properly.

[ ] Contact Coherent Technical Support—see "Appendix - Service & Support" (p. V-193).

3.8.2 Checklist 2: The Scientific Remote does not power on.

If the unit does not power on, do the following steps in the order shown:

[ ] Power cycle the Scientific Remote and wait for the Coherent Splash screen to confirm that the unit is powered.

[ ] Check the power cable connection at the unit and the connection at the wall socket.

[ ] Turn on the power switch and listen for fan noise. If there is no fan noise, the power supply fuse may be blown. Replace the fuse, if necessary.

[ ] Contact Coherent Technical Support——see "Appendix - Service & Support" (p. V-193).

3.8.3 Checklist 3: The Scientific Remote touch screen is not responsive.

If the touch screen is responding erratically to touches, do the following steps in the order shown:

[ ] Run the touch screen calibration function.

[ ] Contact Coherent Technical Support——see "Appendix - Service & Support" (p. V-193).

3.8.4 Checklist 4: A laser is not listed on the Scientific Remote touch screen.

If the touch screen does not list a laser, do the following steps in the order shown:

[ ] Check the SDR cable connections to the laser.

[ ] Disconnect and then reconnect the SDR cable to the laser.

[ ] Power cycle the Scientific Remote.

[ ] Contact Coherent Technical Support——see "Appendix - Service & Support" (p. V-193).

3.8.5 Checklist 5: The Scientific Remote or lasers attached to the unit are not being accessed by Coherent Connection on the host PC.

If the Coherent Connection software does not access the unit or does not access the attached lasers, do the following steps in the order shown:

[ ] Check the following connections between the host PC and the Scientific Remote:

- RS-232 connections on both ends.
- USB connections on both ends.
- RJ-45 connections on both ends.

[ ] Test the desired connection by itself; disconnect all other connections to the host PC.

[ ] If using a LAN connection, check the Network Connection settings on the Scientific Remote. Contact your IT department if you have questions about your local network. After changing the settings, restart the Scientific Remote for the changes to take effect.

[ ] Restart the Coherent Connection software on the host PC.

[ ] Contact Coherent Technical Support——see “Appendix - Service & Support” (p. V-193).

4 OBIS LASER BOX

This section describes the OBIS Laser Box and includes:

- Overview of the Laser Box installation procedure (p. 4-84)
- Computer control (p. 4-88)
- Interface cable (p. 4-88)
- Device selection syntax (p. 4-89)
- Advanced procedures (p. 4-89)
- Dimensions (p. 4-92)
- Repacking procedure (p. 4-93)
- Troubleshooting procedures (p. 4-98)

Coherent product information and related software is available in one easily accessible location on the Coherent website. To download product information or a copy of the complete *OBIS LX/LS Operator's Manual* (P/N 1184163), go to:

https://www.coherent.com/resources

Figure 4-1 shows the components and accessories for the OBIS Laser Box:

Figure 4-1. OBIS Laser Box: System Components and Accessories

Table 4-1 lists the components and accessories for the OBIS Laser Box.

For more information and to see additional accessories, refer to "Appendix - Parts & Accessories" (p. III-187).

Table 4-1. OBIS Laser Box Components and Accessories

Item	Description	Part Number
1	OBIS Laser Box (w/mounting brackets)	1228877
2	Interlock, shorted, for OBIS Laser Box	See P/N 1190348 in "Appendix - Parts & Accessories" (p. III-187)
3	Keys for OBIS Laser Box (2 each)	
4	USB cable, Type A to Type Mini-B (1.8 meters)	1108906
5	Power cord, 10A, 125V, NEMA5-15P/IEC-320-C13	1106344
6	Power supply, 110/220V AC, 12V DC, IEC-320	1211389

4.1 Description

The OBIS Laser Box for OBIS LX/LS offers all the features from the laser in a convenient CDRH-compliant interface with convection cooling.

As with all OBIS LX/LS lasers, the laser itself offers a stand-alone all-in-one laser solution. The OBIS Laser comes with a Power Connection, USB Connection, Fan Connection and a SDR-type Connection for laser control I/O. All of these are on the back panel of every OBIS LX/LS laser.

To simplify integration, the OBIS Laser Box connects to the single SDR-type connector for power, I/O signals, and communication. The OBIS Laser Box then brings all of these features to front panel controls and connectors.

OBIS Laser Box offers conduction cooling for the laser baseplate and cooling fans to maintain the convection cooling for stability across a wide temperature range.

OBIS Laser Box comes with a separate 12 VDC power supply that has enough capacity to drive up to five lasers, interface and cooling.

4.1.1 Front Panel

Features on the OBIS Laser Box front panel are shown in Figure 4-2 and described in the sections that follow.

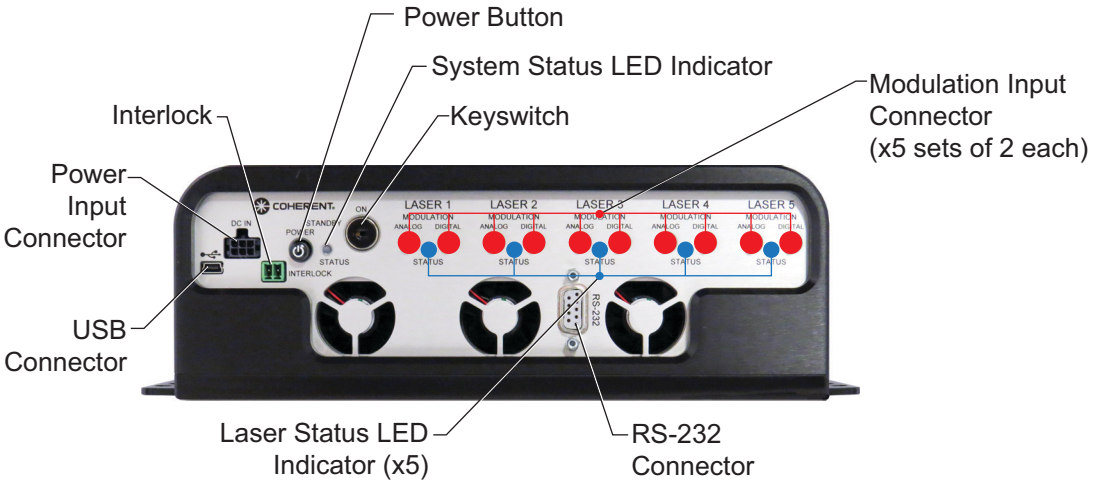


Figure 4-2. OBIS Laser Box: Front Panel

4.1.1.1 Keyswitch

The OBIS Laser Box has a keyswitch, shown in Figure 4-3, that prevents laser radiation in the STANDBY position. Laser radiation can occur while the key is in the ON position. The key is removable in the STANDBY position but not in the ON position.

Figure 4-3. OBIS Laser Box: Keyswitch

The keyswitch is the CDRH Manual Reset feature. Following an interlock fault or power interruption, the laser does not auto restart unless the keyswitch is first reset to STANDBY and then back to ON.

Figure 4-4 shows the keyswitch in the STANDBY and ON positions.

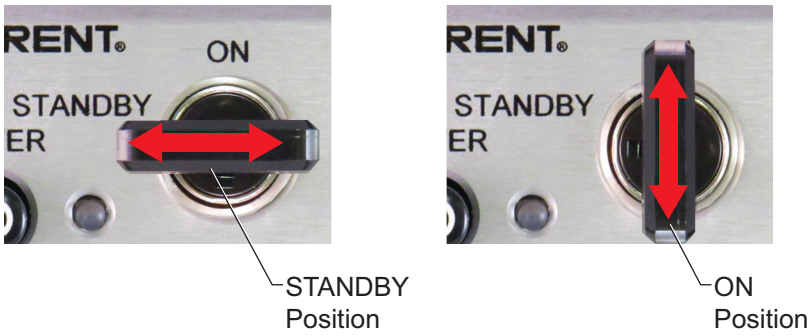


Figure 4-4. OBIS Laser Box: Keyswitch STANDBY and ON Positions

4.1.1.2 Power Button

The push-style power button shown in Figure 4-5 switches power between OFF and ON to the OBIS Laser Box.

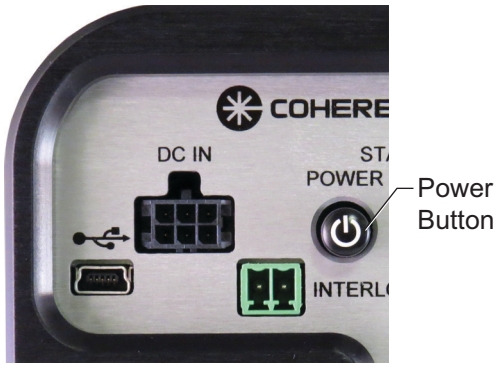


Figure 4-5. OBIS Laser Box: Power Button

4.1.1.3 Power Input Connector

Power is supplied to the OBIS Laser Box through a 6-pin Molex connector, shown in Figure 4-6. The power supply has an ON/OFF switch to power the device. A green LED illuminates when the power is ON. There is no illumination when the power supply is OFF.

For information about the ON/OFF switch on the power supply, refer to "Power Supply" (p. 4-83)

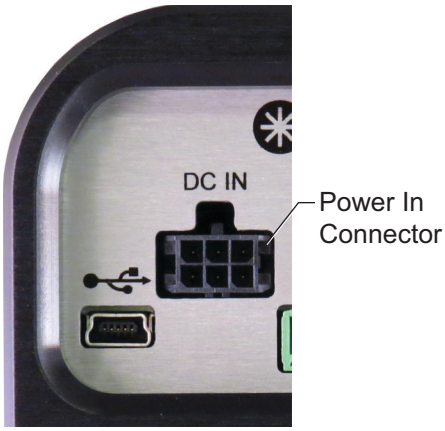


Figure 4-6. OBIS Laser Box: Power-In Connector

4.1.1.4 USB Connector

This Mini-B connector lets you connect a host computer to the OBIS Laser Box for communications, shown in Figure 4-7.

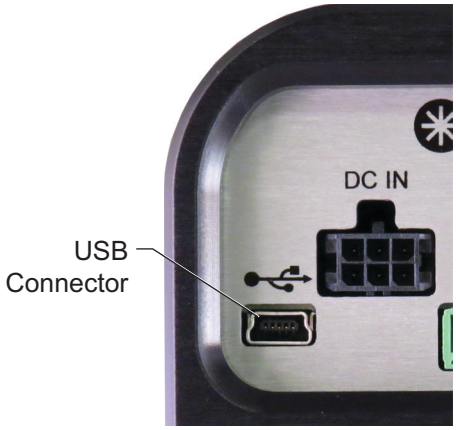


Figure 4-7. OBIS Laser Box: USB Connector

The host computer and each OBIS LX/LS laser installed is recognized as a COM device. Communications pass through the SDR connector to the laser.

Coherent Connection software communicates with the OBIS Laser Box and each OBIS LX/LS laser. To download software, go to:
https://www.coherent.com/resources

Host commands and queries can be sent to the OBIS Laser Box and each OBIS LX/LS laser using Coherent Connection or a terminal program, such as HTerm or HyperTerminal. For additional information, see Part 3 of the *OBIS LX/LS Operator's Manual*.

4.1.1.5 RS-232 Connector

Attach an RS-232 cable between the DB9F RS-232 connector shown in Figure 4-8 and the RS-232 connector on a personal computer. This connection sends commands through the SDR connector.

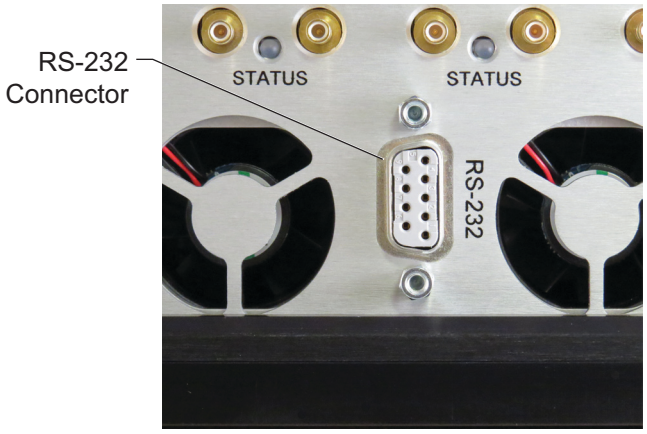


Figure 4-8. OBIS Laser Box: RS-232 Connector

Table 4-2 lists the Communication Settings for the RS-232 connector.

Table 4-2. OBIS Laser Box RS-232 Communication Settings

Setting	Value
Baud	115200
Parity	None
Data Bits	8
Stop Bits	1
Flow Control	None

Table 4-3 lists the Pin settings for the RS-232 connector.

Table 4-3. OBIS Laser Box RS-232 Pin Connections

Pin	Signal
1	DCD (Data Carrier Detect)
2	Rx (Receive)
3	Tx (Transmit)
4	DTR (Data Terminal Ready)
5	GND (Ground)

Pin	Signal
6	DSR (Data Set Ready)
7	RTS (Request to Send)
8	CTS (Clear to Send)
9	Unused

4.1.1.6 System Status LED Indicator

The System Status LED indicator on the front panel (shown in Figure 4-9) displays yellow, green, blue, or red. The state of the OBIS Laser Box determines the color.

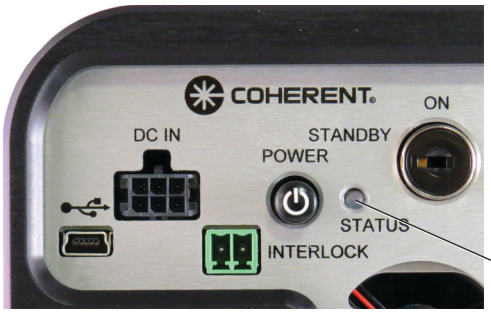


Figure 4-9. OBIS Laser Box: System Status LED Indicator

Table 4-4 lists states for the LED indicator on the OBIS Laser Box.

Table 4-4. OBIS Laser Box Status LED States

Mode	LED Status	Auto Start	Keyswitch Position	Interlock Status
1	**Blue**	Disabled	STANDBY	X
2	**Blinking Blue**	Disabled	ON at power-up	X
3	**Green**	Disabled	Cycle STANDBY to ON	Closed
4	**Blue**	Enabled	STANDBY	X
5	**Green**	Enabled	ON	Closed
6	**Red**	X	ON	Open

The conditions described are displayed at power ON. Table 4-5 lists the modes for the OBIS Laser Box:

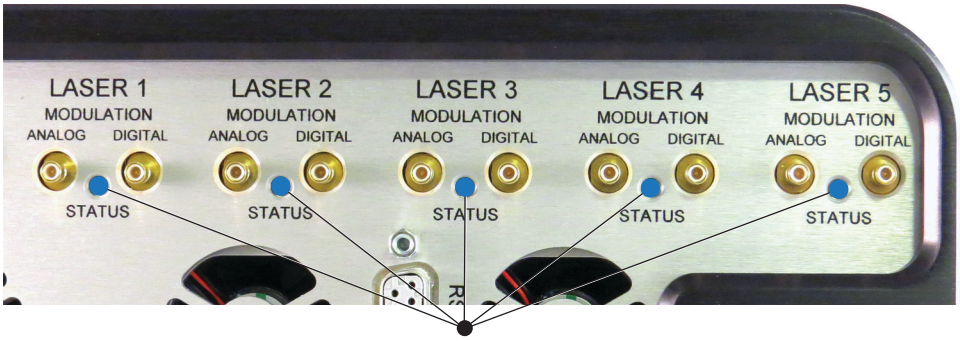
Table 4-5. Modes for the OBIS Remote

Mode	Description
Mode 1	A blue LED with Auto Start disabled and the keyswitch in the STANDBY position. The interlock can be either in or out at this time, as the OBIS Laser Box is not looking for the interlock plug
Mode 2	A blinking blue LED that displays when you have the keyswitch in the ON position when you power-up the OBIS Laser Box. You must cycle the keyswitch to STANDBY, then ON, to clear this condition.
Mode 3	A green LED appears when you have correctly powered up the OBIS Laser Box, cycled to the ON position, disabled Auto Start, and inserted the interlock plug.
Mode 4	The first configuration that includes Auto Start. When you power-up the OBIS Laser Box and the keyswitch is on STANDBY, the LED will be blue.
Mode 5	The correct sequence for the OBIS Laser Box if Auto Start is enabled. The LED is green when you power the OBIS Laser Box with the keyswitch ON and Auto Start is enabled.
Mode 6	This red LED indicates that the interlock was opened with the keyswitch in the ON position.

WARNING!
When the keyswitch is ON, the interlock plug is connected, and the laser power switches are ON and illuminated, there can be laser emission.

4.1.1.7 Laser Status LED Indicator

Each of the five Status LED indicators displays the status of one laser that is connected to a specified Modulation In connector.



Laser Status LED Indicators

Figure 4-10. OBIS Laser Box: Laser Status LED Indicators

Table 4-6 lists the states for the LED Status indicator.

Table 4-6. OBIS Laser Box Individual Laser Status LED States

State	LED Color
STANDBY	**Blue**
WARM UP	**Blinking Green**
EMITTING	**White**
FAULT	**Red**

4.1.1.8 Interlock

The interlock has terminal-style connections that allow connecting to an external control device. A mechanical-style jumper for CDRH interlock is included.

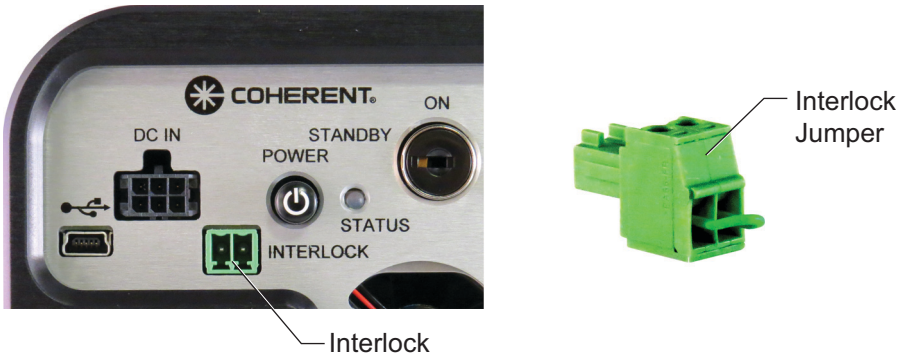


Figure 4-11. OBIS Laser Box: Interlock

4.1.1.9 Modulation Input Connector

There are five sets of SMB connectors (one Digital connector and one Analog connector in each set). These sets connect to buffer amplifiers within the OBIS Laser Box and are converted to differential signals to the lasers. The input impedance of the digital input is 50 ohms and the analog input impedance is 2000 ohms.

For more information about analog modulation, refer to “Analog Modulation (OBIS Remote)” in Part 1 of the *OBIS LX/LS Operator’s Manual.*

4.1.2 Back Panel

The back panel of the OBIS Laser Box has two air intakes, shown in Figure 4-12. These air intakes include removable air filters for easy cleaning.

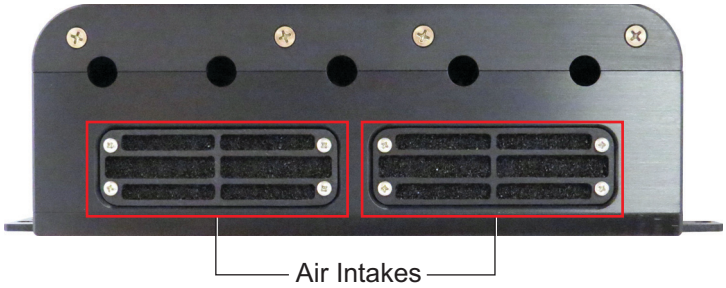


Figure 4-12. OBIS Laser Box: Back Panel

4.1.3 Power Supply

Figure 4-13 shows the Power Supply for the OBIS Laser Box.

Figure 4-13. OBIS Laser Box: Power Supply

4.2 Installation Overview

The procedure given in this section describes how to install an OBIS LX/LS fiber-pigtailed laser into the Laser Box.

NOTICE
Operating the laser without the Laser Box is non-CDRH compliant.

The installation procedure includes these steps. Each of these are described in more detail in the following subsections.

1. Remove the fiber and the laser from the shipping tray.
2. Remove the lid from the Laser Box.
3. Remove the strain relief back plate.
4. Connect the OBIS LX/LS FP Laser into an available laser bay by connecting the mating SDR connectors.
5. Attach the OBIS Laser to the heatsink by using the four M3 x 35 mm screws and washers provided with the laser.
6. Reinstall the strain relief back plate.
7. Reinstall the Laser Box lid.

4.2.1 Installation Procedure

To unpack and install the laser:

1. Loosen the removable zip ties to release the fiber and then remove the four screws that anchor the laser to the tray, as shown in Figure 4-14.

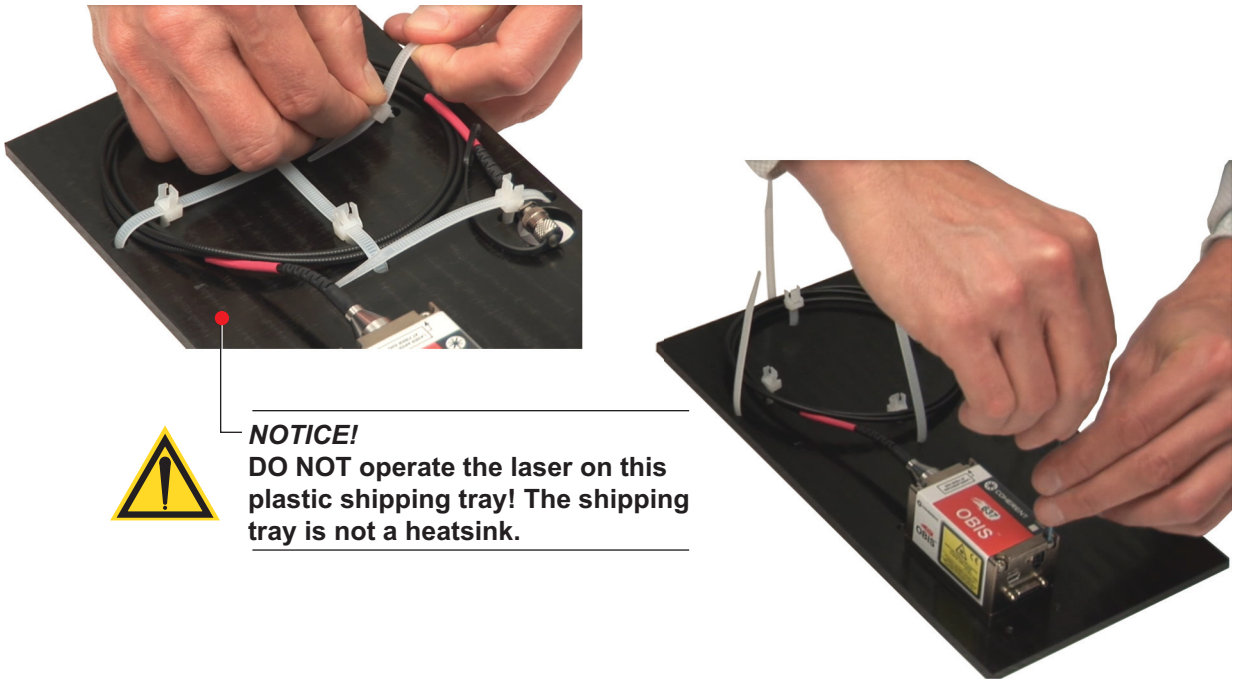


Figure 4-14. OBIS Laser Box: Remove Fiber and Laser from the Shipping Tray

2. Remove the eight lid screws shown in Figure 4-15 and take off the lid.

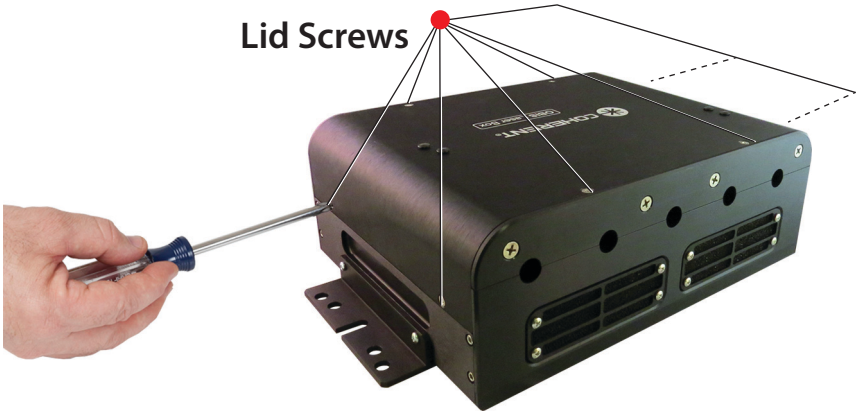


Figure 4-15. OBIS Laser Box: Remove the Laser Box Lid

3. Remove the four back plate screws and set aside the plate, as shown in Figure 4-16.
4. Insert the OBIS Laser by connecting the mating SDR connectors, as shown in Figure 4-17.

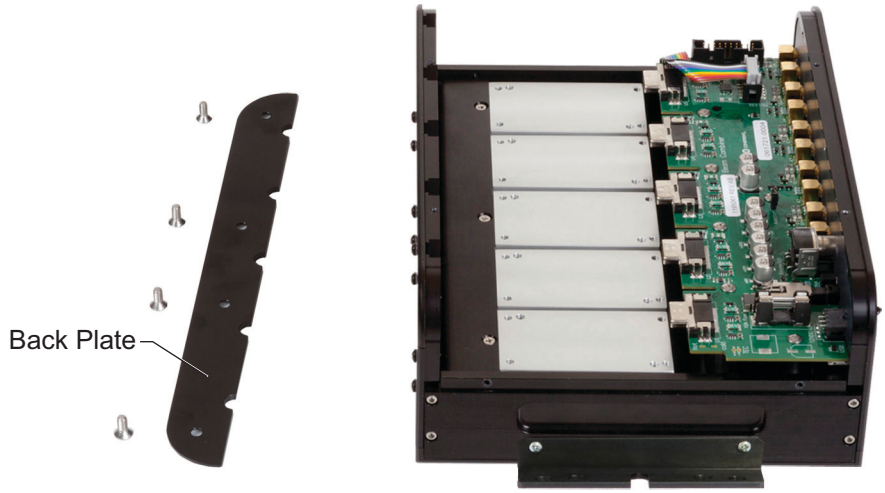


Figure 4-16. OBIS Laser Box: Remove the Back Plate

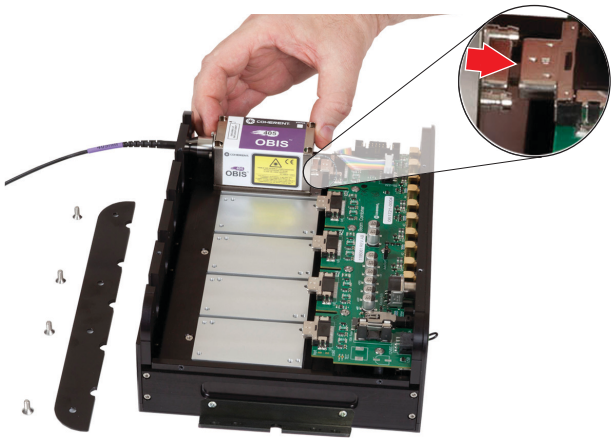


Figure 4-17. OBIS Laser Box: Insert OBIS LX/LS Lasers

NOTICE

Installing multiple OBIS LX/LS lasers in ascending or descending order of wavelength may help you identify which OBIS laser is installed in a particular bay after the lid is re-attached.

5. Align the laser to the heatsink.
6. Locate the M3x35 mm screw kit supplied with the OBIS Laser (shown in Figure 4-18).

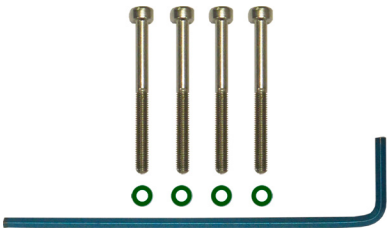


Figure 4-18. Screw Kit

7. Use the screw kit to secure the laser to the heatsink, as shown in Figure 4-19. Use the washers to spread the tightening force.

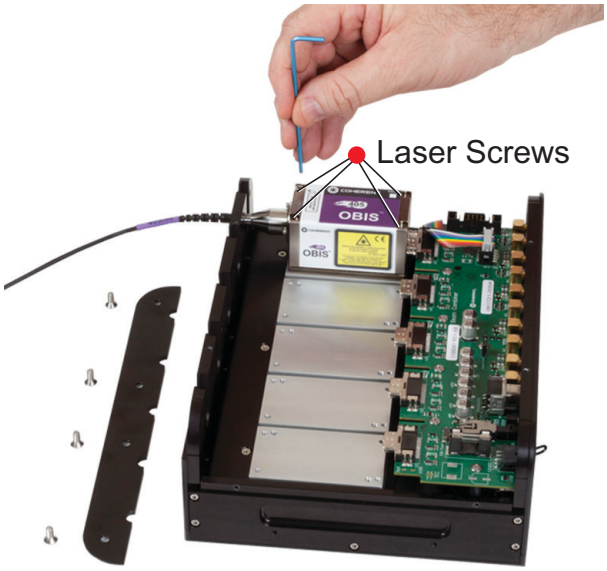


Figure 4-19. OBIS Laser Box: Attach the Laser to the Heatsink

8. Tighten the screws in a diagonal pattern shown in Figure 4-20 for best results in pointing stability. Torque the mounting screws to 0.25 N·m (35.4 oz·in.) in the following sequence: 1-2-3-4. Use the same diagonal pattern for the last torque setting of 1 N·m (141.6 oz·in.).

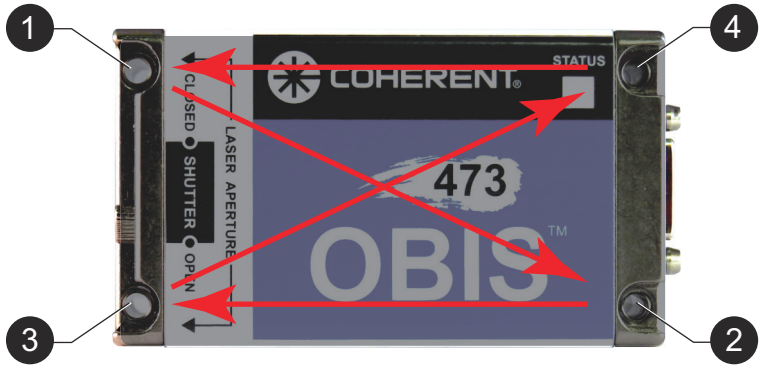


Figure 4-20. Tightening Pattern for Mounting the OBIS Laser

9. Reinstall the back plate using the four screws previously removed, as shown in Figure 4-21.

10. Reinstall the lid as shown in Figure 4-22, using the eight screws previously removed.

Figure 4-21. OBIS Laser Box: Reinstall the Back Plate

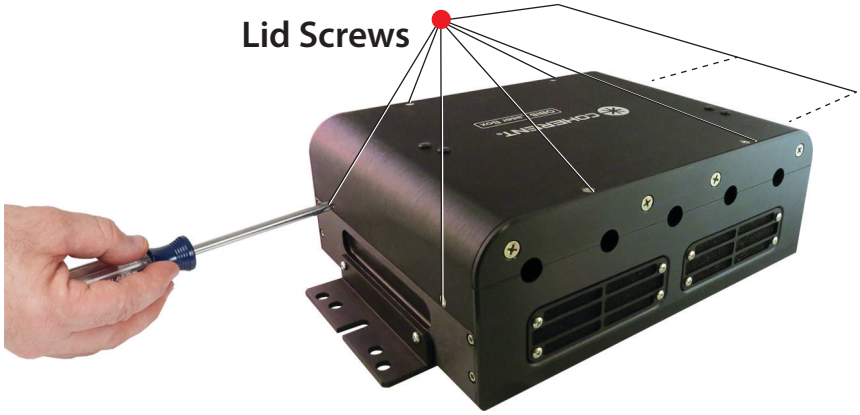


Figure 4-22. OBIS Laser Box: Reinstall the Laser Box Lid

4.3 Computer Control

See "Coherent Connection" (p. 8-145) for information about using Coherent Connection software. Also refer to Part 3 of the *OBIS LX/LS Operator's Manual* for a detailed description of available host commands and queries.

4.4 Interface Cable

The OBIS Laser System includes a Coherent 1-meter SDR-style cable connection between the laser and the OBIS Laser Box.

NOTICE
Use only a Coherent OBIS Laser-to-Remote SDR cable—DO NOT use a Camera Link cable.

4.5 Device Selection Syntax

For information on how to send host computer commands to each OBIS Laser installed inside of the OBIS Laser Box, see “Device Selection Syntax” in Part 3 of the *OBIS LX/LS Operator’s Manual*.

4.6 Advanced Procedures

See “OBIS Communications through a Terminal Program” in Part 1 of the *OBIS LX/LS Operator’s Manual*.

4.6.1 CDRH Delay

The OBIS Laser System ships as a CDRH-compliant configuration. The CDRH-required delay of five seconds or more occurs between a laser-ready condition and emission of laser light.

- For an OBIS LX the CDRH delay is five seconds.
- For an OBIS LS the CDRH delay is 10 seconds.

This delay lets the user take appropriate safety precautions before laser emission. When the laser is turned OFF (or to STANDBY), the delay is applied to the next time the laser is turned ON. The CDRH setting is stored in laser memory.

The ability to change the state of the CDRH-required delay requires remote communication to the OBIS Laser System through a USB or RS-232 connection.

WARNING!
The following steps to remove the 5-second delay defeat the safety controls required by the applicable regulatory agencies. With the use of these commands, the customer takes all responsibility for safety and compliance to CDRH 21 CFR 1040 and IEC60825-1.

Enable or disable the CDRH Delay using the Advanced tab of the Coherent Connection software, shown in Figure 4-23.

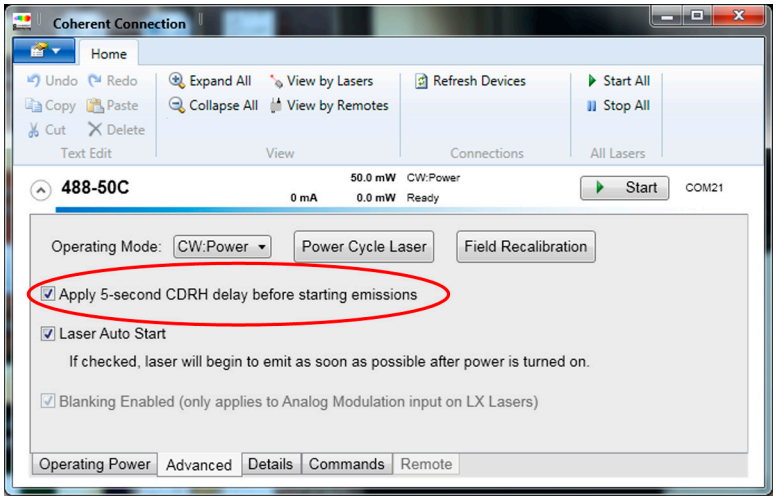


Figure 4-23. Enable/Disable CDRH Delay

Without Coherent Connection, this procedure requires the user to remotely control the OBIS system. To control this setting from a host computer, send the following commands:

1. Use the "SYSTem:CDRH OFF" command to override the CDRH-required delay.
2. Interrogate the current CDRH-required delay status by sending with the "SYSTem:CDRH?" command.
3. Restore the CDRH-required delay feature by using the "SYSTem:CDRH ON" command.

See Part 3 of the *OBIS LX/LS Operator's Manual* for a list of commands to communicate with the laser.

4.6.2 Enabling Auto Start with the OBIS Laser Box

The OBIS Laser Box is configured with the laser Auto Start feature disabled. In this configuration, the OBIS Laser System is a CDRH-compliant laser system consisting of a Keyswitch, Interlock, and a Power button/switch.

WARNING!
With Auto Start enabled on the OBIS Laser Box, the laser *immediately* begins emission at the next power cycle (with the keyswitch ON), even if the laser was previously turned OFF (0) through a USB or RS-232 command.

- The Shunt Jumper is installed on only one pin of the jumper header, J7. (This is the factory default.)

- To enable Auto Start, install the shunt jumper on both headers pins of J7.

For information about units shipped before April 2017, see Field Service Bulletin (FSB) #822:*OBIS LaserBox Auto Start — Disable and Enable Shunt Jumper.*

4.6.3 Fuse Replacement

NOTICE

Removing the OBIS Laser Box cover to replace the fuse does *not* void the unit warranty.

If the fuse needs replacement, use a 10 amp, 250 V, 5 x 20 mm, glass tube cartridge (catalog number 218 010P).

1. To access the fuse, remove the eight lid screws and take off the lid, as shown in Figure 4-24.

Figure 4-24. OBIS Laser Box: Access the Fuse

2. Remove the old fuse and install the new fuse, as shown in Figure 4-25.

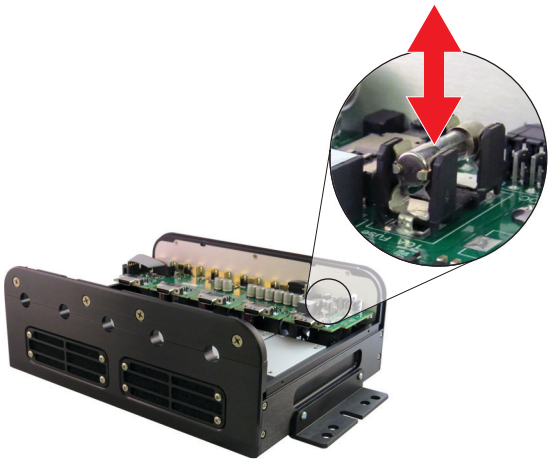


Figure 4-25. OBIS Laser Box: Fuse Location

3. Reinstall the lid using the eight screws previously removed.

4.7 Dimensions

Figure 4-26 provides dimensions for the OBIS Laser Box.

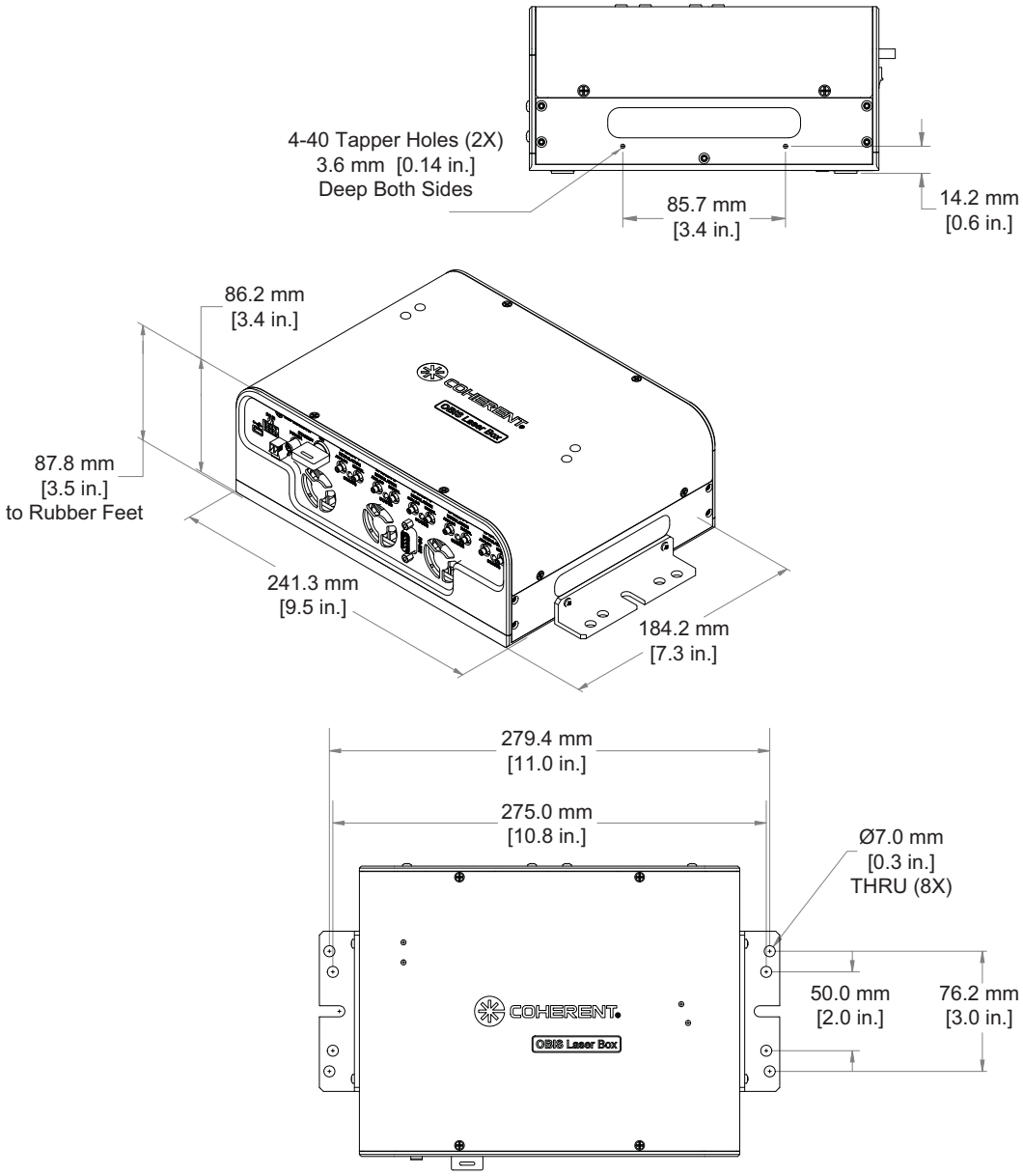


Figure 4-26. OBIS Laser Box: Dimensions

Figure 4-27 shows the dimensions for the OBIS Laser Box Power Supply.

For current specifications and power supply drawing dimensions for the OBIS Laser Box, go to:

https://www.coherent.com/resources

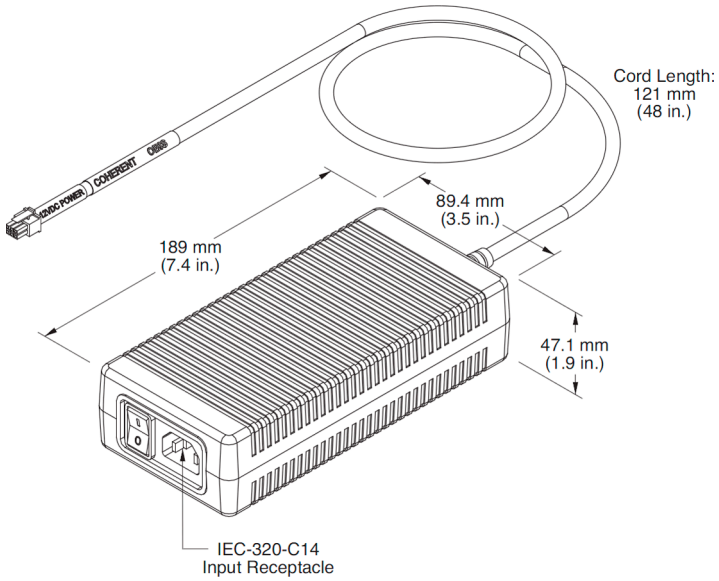


Figure 4-27. OBIS Laser Box: Power Supply Dimensions

4.8 Repacking Procedure

Follow these steps to package and ship the OBIS Laser Box:

1. Put the OBIS Laser Box in an anti-static foil bag.

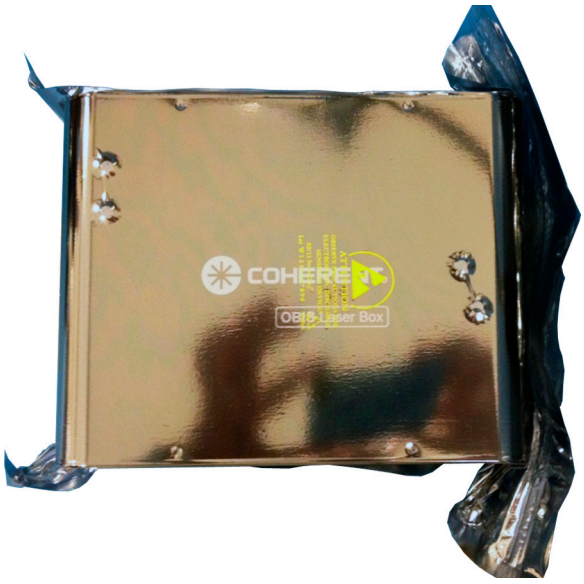


Figure 4-28. Insert OBIS Laser Box into Anti-Static Foil Bag

2. Place the anti-static foil bag in the right side of the shipping box.

Figure 4-29. Insert Bagged Laser Box into Shipping Box

3. Place the keys and laser interlock into the ESD pink poly accessories bag.

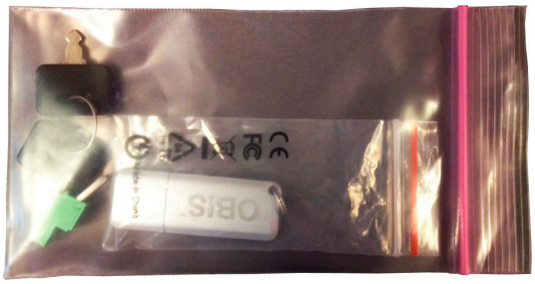


Figure 4-30. Add Components to Poly Bag

4. Place the power supply in the left side of the shipping box. Fold the bottom egg-crate foam upward to create a pad between the power supply and the OBIS Laser Box.

Figure 4-31. Fold Egg-Crate Foam

5. Put the accessories bag, USB cord, and power cord into the left chamber of the shipping box.

Figure 4-32. Place Components in Box

6. Position the smaller foam panel, egg-crate side down.

Figure 4-33. Add Smaller Foam Insert

7. Position the larger foam panel.

Figure 4-34. Add Top Foam in the Box

8. Close the shipping box and secure the box with tape.

Figure 4-35. Close Shipping Box

9. If you are returning the system to Coherent for service:
   - Contact Coherent Customer Service (1.800.343.4912) for an RMA number.
   - Add the RMA number to the shipping label.

4.9 Troubleshooting Procedures

Shown below are possible issues, with a reference to the related troubleshooting checklist.

Table 4-7. OBIS Laser Box Troubleshooting Procedures

Problem	Reference
No output power from the laser	Checklist 1 (this page)

4.9.1 Checklist 1: No output power from the laser

If there is no output power from the laser, do the following steps in the order shown.

[ ] Confirm the power supply connector is securely fastened to the OBIS Laser Box.

[ ] Check that the green LED power indicator is illuminated on the top of the OBIS Laser Box power supply.

[ ] Verify the green, two-pin interlock is firmly seated and is not loose.

[ ] Cycle the power ON/OFF by pushing the Power button to the OFF position and then pushing the button again to the ON position. When the Power button is in the ON position, the SYSTEM STATUS LED Indicator should be illuminated; refer to Table 4-4 on page 4-81 .

[ ] Toggle the Keyswitch to the STANDBY position and then back to the ON position. The Keyswitch acts as the CDRH Manual Reset. After an interlock fault or power interruption, the laser will not auto restart until the Keyswitch is first reset to the STANDBY position and then back to the ON position; refer to Table 4-4 on page 4-81 .

[ ] Check the operating mode of the laser by using Coherent Connection software or the remote command **SOUR:AM:SOUR?** For normal CW mode, the laser should be in the "CW Power" mode (from Coherent Connection) or should reply with "CWP" (when sending a query for the set operating mode of the laser).

[ ] If a modulation operating mode is selected, confirm that the proper input signal is being applied to the correct modulation input SMB connector. If operating in Digital modulation, confirm that the voltage source can drive a 50 Ohm load. Many data acquisition boards/cards do not provide enough current to drive a 50 Ohm impedance load.

[ ] Remove the Laser Box cover and check the fuse. For fuse specifications and details on how to replace the fuse, refer to "Fuse Replacement" (p. 4-91).

[ ] Contact Coherent Technical Support—see "Appendix - Service & Support" (p. V-193)

5 OBIS GALAXY BEAM COMBINER

This section describes the OBIS Galaxy Beam Combiner and includes:

- Install a laser in the OBIS Galaxy (p. 5-100)
- Remove a laser from the OBIS Galaxy (p. 5-109)
- Dimensions (p. 5-115)
- Specifications (p. 5-116)
- OBIS Galaxy tutorial (p. 5-116)
- Repacking procedure (p. 5-117)
- Troubleshooting procedures (p. 5-119)

Coherent product information and related software is available in one easily accessible location on the Coherent website. To download product information or a copy of the complete *OBIS LX/LS Operator's Manual* (P/N 1184163), go to:

https://www.coherent.com/resources

Figure 5-1 shows the components and accessories for the OBIS Galaxy Beam Combiner.

Figure 5-1. OBIS Galaxy System: Components and Accessories

Table 13-1 lists the components and accessories for the OBIS Galaxy System.

For additional accessories, refer to "Appendix - Parts & Accessories" (p. 187).

Table 5-1. OBIS Galaxy Components and Accessories

Item	Description	Part Number
1	Optional configurations for the OBIS Galaxy Beam Combiner: 405, **445**, 488, 514, 532, **552**, 590, 640 405, **458**, 488, 514, 532, **552**, 590, 640 405, **445**, 488, 514, 532, **561**, 590, 640 405, **458**, 488, 514, 532, **561**, 590, 640	 1253553 1253554 1253555 1253556
2	Desiccant packet	1233443

5.1 Description

OBIS Galaxy is a revolutionary plug-and-play design for laser beam combining. With eight FC fiber inputs, the OBIS Galaxy easily accepts a laser with plug-and-play integration.

- Each input is optimized to accept the fiber with a FC/UFC (ultra-flat contact) connection with patented beam combining of all eight inputs.
- The output of the combined eight lasers is a single-mode polarization-maintaining fiber, two meters in length, with a FC/APC connector for your application.

Built with Coherent's rigorous standards using advanced stress-testing techniques, the OBIS Galaxy is both plug-and-play as well as robust, providing superior performance and reliability.

5.2 Install a Laser in the OBIS Galaxy

This section describes how to install a Coherent fiber pigtailed FC/UFC laser in the OBIS Galaxy Beam Combiner. Throughout this procedure the OBIS LX laser is used as an example.

NOTICE

This procedure must be done in a clean environment (flow bench or clean room) in normal humidity and temperature conditions.
Do not loosen, adjust, or remove the output fiber. This connector is factory aligned and is not intended to be adjusted in any manner. Adjusting the output fiber voids the Coherent warranty and reduces performance of the OBIS Galaxy Beam Combiner.

NOTICE

The OBIS FP/UFC laser has a FC/UFC connector. To prevent permanently destroying the OBIS Galaxy fiber-coupling alignment, DO NOT plug any other type of fiber connector into the OBIS Galaxy.

NOTICE

If using a Galaxy output fiber to couple a free space non-Galaxy OBIS or non-Galaxy Sapphire laser into the OBIS Galaxy, the center wavelength MUST meet the required input wavelength requirement with a tolerance of ± 1 nm.

5.2.1 Tools and Supplies Needed

The following tools and supplies are needed to install a laser in the OBIS Galaxy Beam Combiner:

- 5/64” hex wrench
- 7/64” hex wrench
- Tweezers
- Specialized swabs for optics cleaning (example: CleanTips Swabs TX759B)
- 4 desiccant packets, Coherent P/N 1233443 (Tri-Sorb®, 2 g)
- Clean room gloves (example: TechNiGlove International TechNitrile)
- Optics grade methanol/isopropanol
- Torque wrench (optional—not shown in Figure 5-2)
- Laser power meter. See “Appendix - OBIS Power Measurement” (p. 193) for recommended products.

Figure 5-2 shows the tools and supplies needed to install a laser in the OBIS Galaxy Beam Combiner.

Figure 5-2. Tools and Supplies for Installation

5.2.2 Installation Procedure

To install a laser into the OBIS Galaxy Beam Combiner:

1. Using the 7/64" hex wrench, remove the six top cover screws and lift off the cover, as shown in Figure 5-3.

Figure 5-3. Remove Cover

NOTICE

The Galaxy box cover must not be open for more than a few hours in normal humidity and temperature conditions.

The interior of the OBIS Galaxy Beam Combiner is shown in Figure 5-4, with the locations of channels for the various wavelengths of lasers:

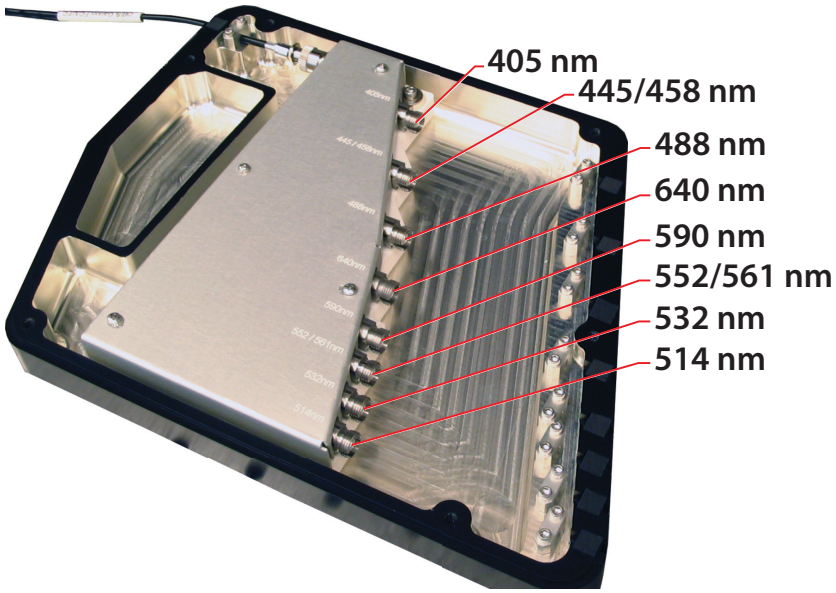


Figure 5-4. OBIS Galaxy System: Wavelength Channels

NOTICE

Always plug the laser into the correct wavelength channel in the OBIS Galaxy, shown in Figure 5-4.

2. Discard the desiccant packets, as shown in Figure 5-5.
3. Using the 5/64” hex wrench, remove the two strain relief screws (shown in Figure 5-6) for the appropriate wavelength channel and set the strain relief aside. The wavelength channel shown in this procedure uses the OBIS FP/UFC 488 nm laser as an example.
4. Using the tweezers, remove the rubber seal from the fiber channel and set aside

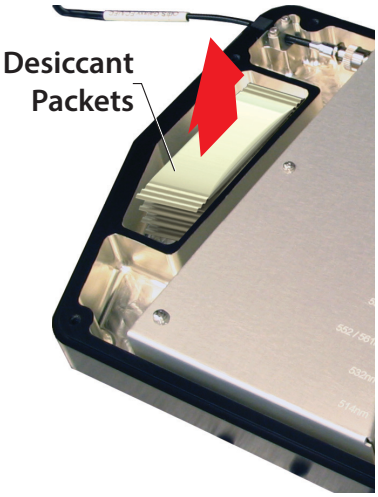


Figure 5-5. Discard Desiccant Packets

Figure 5-6. Remove Strain Relief Screws

NOTICE

Store the rubber seal in a clean, air-tight bag. This seal will be needed later if you remove a laser from the OBIS Galaxy.

5. Apply 2 to 3 drops of methanol or isopropanol to the tip of a swab, as shown in Figure 5-7. Shake off the excess liquid.

Figure 5-7. Apply Drops to Swab

NOTICE

Always clean the sleeve and connector completely *before* plugging in the fiber. Coupling visible light into a single-mode fiber is very sensitive to the cleanliness of all parts.

6. Insert the swab into the fiber sleeve of the OBIS Galaxy, as shown in Figure 5-8. Rotate the swab one full turn and then remove the swab from the sleeve.

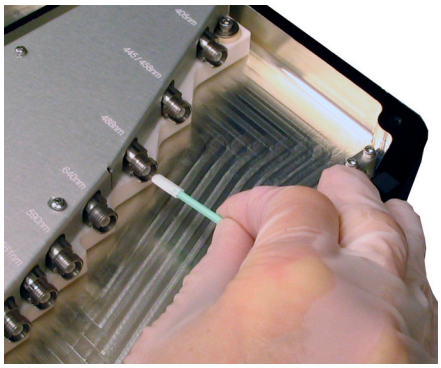


Figure 5-8. Insert Swab into Fiber Sleeve

7. Dry the sleeve by either using a clean air gun (preferred method) or air drying for 30 seconds.
8. Repeat steps 5 through 7 a second time.
9. Apply 1 or 2 drops of methanol or isopropanol to the tip of a swab. Shake off the excess liquid.

10. As shown in Figure 5-9, carefully clean the tip of the ferrule by running the swab over the tip in a continuous motion and in one direction only, *one time*.

Figure 5-9. Clean Tip of Ferrule

11. Dry the tip by either using either a clean air gun (preferred method) or air drying for 30 seconds.
12. Repeat steps 9 through 11 a second time.
13. *Carefully* slide the ferrule into the sleeve while aligning the FC connector key with the sleeve keyway.

NOTICE

Improper alignment and installation of the FC connector key results in low power from the output fiber.

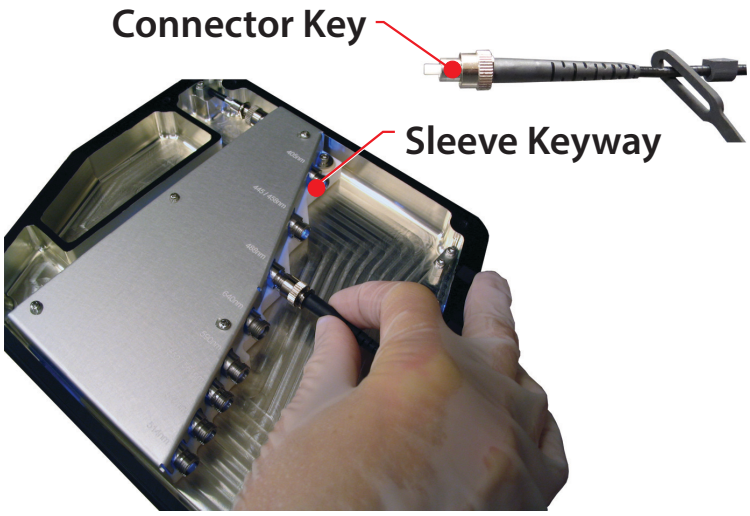


Figure 5-10. Slide the Ferrule Into the Connector key

5.2.3 Monitor Power of the Output Fiber

NOTICE

During the next step of the installation process, you must monitor the power of the output fiber.

1. First, connect a power meter and sensor to monitor power of the output fiber, as shown in Figure 5-11. See “Appendix - OBIS Power Measurement” (p. 193) for recommended Coherent equipment.

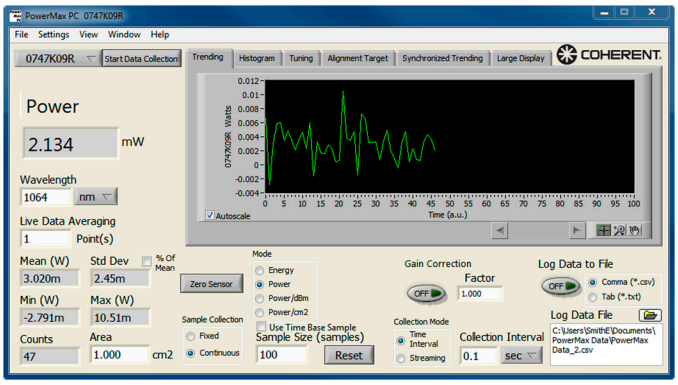


Figure 5-11. Monitor Power of the Output Fiber

2. Maximize the throughput of the new OBIS Laser by biasing the FC connector key (putting a slight rotational pressure on the back part of the connector) clockwise or counter-clockwise in the keyway while tightening the collar.

3. Push the rubber seal back into the fiber channel in the OBIS Galaxy, as shown in Figure 5-12.

Figure 5-12. Reinstall Rubber Seal

4. Using the 5/64” hex wrench, secure the strain relief using the two screws that were previously removed, as shown in Figure 5-13. Torque the

screws to 1 in-lb.

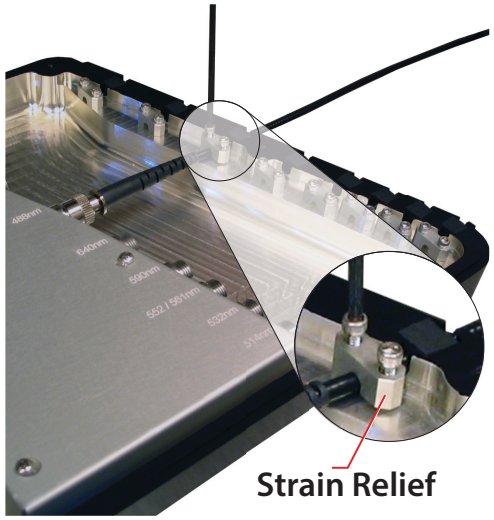


Figure 5-13. Secure the Strain Relief Screws

5. Add four new desiccant packets, as shown in Figure 5-14.

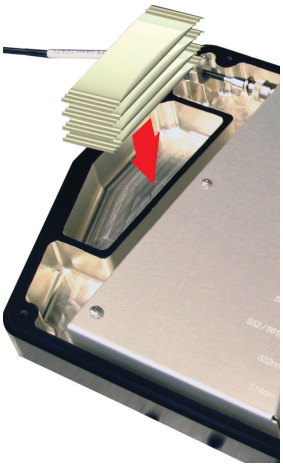


Figure 5-14. Add NEW Desiccant Packets

It is recommended that you change the desiccant packets when:

- The OBIS Galaxy cover has been removed for longer than 2 to 4 hours at one time. (Typically this will be at the time of initial installation of OBIS laser(s) into the OBIS Galaxy Beam Combiner.)
- After 12 to 24 months of use, depending on relative humidity, temperature, and number of times the cover has been removed.

6. Using the 7/64" hex wrench, secure the OBIS Galaxy box cover by firmly tightening the six top cover screws ***in the sequence shown in*** Figure 5-15.

   The following torquing specifications are RECOMMENDED:

   - FIRST, torque <u>all</u> the screws to 5 in-lb.

- SECOND, torque all the screws to 9in-lb.

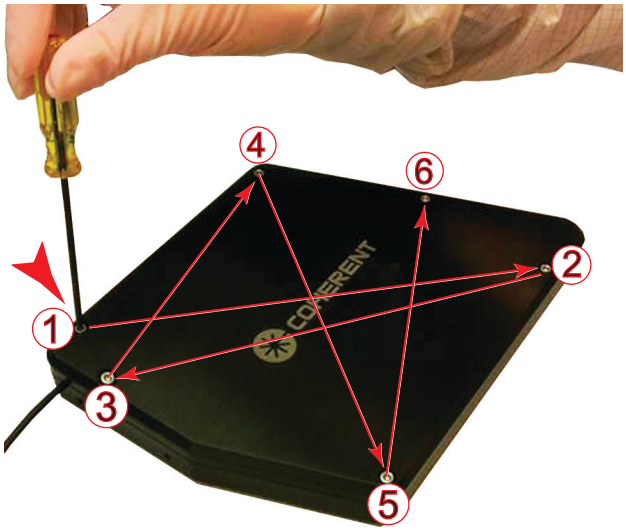


Figure 5-15. Tightening Pattern to Secure Cover

5.3 Remove a Laser from the OBIS Galaxy

This section describes how to remove a laser from the OBIS Galaxy. Throughout this procedure the OBIS LX laser is used as an example.

WARNING!
Set all lasers to OFF before starting this procedure.

NOTICE
Only turn on laser power when the fiber is connected. Cleaning the fiber connector while the laser is on can damage the connector.

NOTICE
This procedure must be done in a clean environment (flow bench or clean room) in normal humidity and temperature conditions

NOTICE

The OBIS FP/UFC laser has a FC/UFC connector. To prevent permanently destroying the OBIS Galaxy fiber-coupling alignment, DO NOT plug any other type of fiber connector into the OBIS Galaxy.

NOTICE

Always **clean the sleeve and connector completely *before* plugging in the fiber. Coupling visible light into a single-mode fiber is very sensitive to part cleanliness.**

NOTICE

Do not loosen, adjust, or remove the output fiber. This connector is factory aligned and is not intended to be adjusted in any manner. Adjusting the output fiber will void the warranty and reduce performance of the OBIS Galaxy Beam Combiner.

5.3.1 Tools and Supplies Needed

The tools and supplies shown in Figure 5-16 are needed to remove a laser from the OBIS Galaxy Beam Combiner.

Figure 5-16. Tools & Supplies to Remove Laser from OBIS Galaxy

- 5/64" hex wrench
- 7/64" hex wrench
- Tweezers

- Specialized swabs for optics cleaning (example: CleanTips Swabs TX759B)
- 4 desiccant packets, Coherent P/N 1233443 (Tri-Sorb®, 2 g)
- Clean room gloves (example: TechNitrile from TechNiGlove International)
- Optics grade methanol/isopropanol
- Torque wrench (optional—not shown in Figure 5-16)

5.3.2 Removal Procedure

To remove a laser from the OBIS Galaxy Beam Combiner:

1. Using the 7/64” hex wrench, take out the six top cover screws and remove the cover, as shown in Figure 5-17.

Figure 5-17. Remove cover

NOTICE

The Galaxy box cover must not be open for more than a few hours in normal humidity and temperature conditions.

2. Discard the desiccant packets, as shown in Figure 5-18.

Figure 5-18. Discard Desiccant Packets

3. Using the 5/64" hex wrench, take out the two strain relief screws and remove the strain relief, as shown in Figure 5-19.

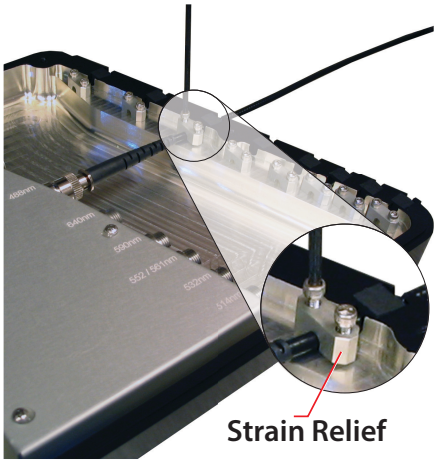


Figure 5-19. Remove Strain Relief Screws

Using the tweezers, carefully lift the rubber seal from the fiber channel, as shown in Figure 5-20.

4. Loosen the FC connector and *carefully* slide the fiber out of the sleeve, as shown in Figure 5-21.

5. Using the tweezers, replace the rubber seal in the empty fiber channel, as shown in Figure 5-22.

6. Using the 5/64" hex wrench, secure the strain relief using the two screws previously removed, as shown in Figure 5-23.

7. Add four new desiccant packets, as shown in Figure 5-24.

It is recommended to change the desiccant packets when:

- The OBIS Galaxy cover has been removed for longer than 2 to 4 hours at one time. (Typically this will be at the time of initial installation of OBIS laser(s) into the OBIS Galaxy Beam Combiner.)

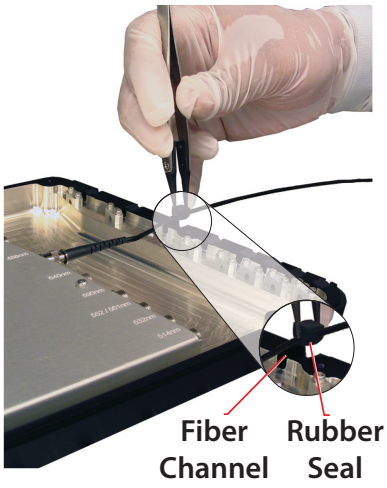


Figure 5-20. Remove Rubber Seal

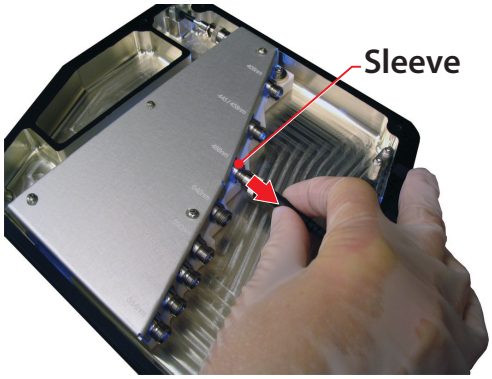


Figure 5-21. Slide Fiber Out of the Sleeve

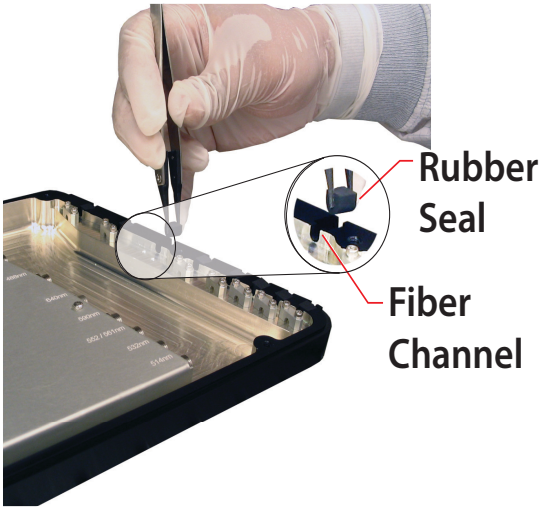


Figure 5-22. Replace Rubber Seal

- After 12 to 24 months of use, depending on relative humidity, temperature, and number of times the cover has been removed.

Figure 5-23. Replace Strain Relief Screws

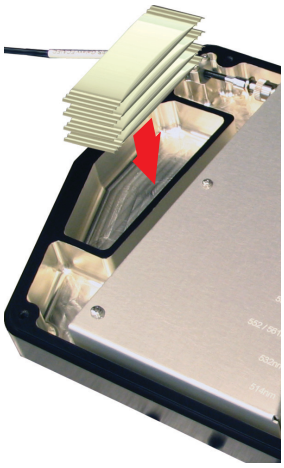


Figure 5-24. Replace Desiccant Packets

8. Using the 7/64" hex wrench, secure the OBIS Galaxy box cover by firmly tightening the six top cover screws ***in the sequence shown in*** Figure 5-25.

   The following torquing specifications are RECOMMENDED:

   - FIRST, torque all the screws to 5 in-lb.
   - SECOND, torque all the screws to 9 in-lb.

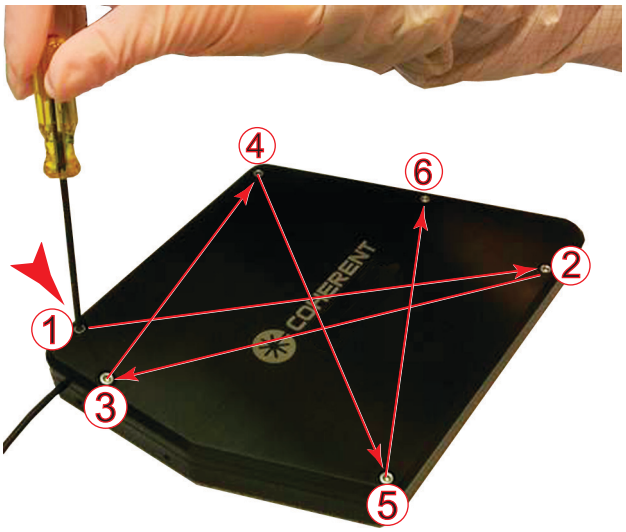


Figure 5-25. Tightening Pattern for Cover

5.4 Dimensions

Figure 5-26 shows the dimensions for the OBIS Galaxy Beam Combiner.

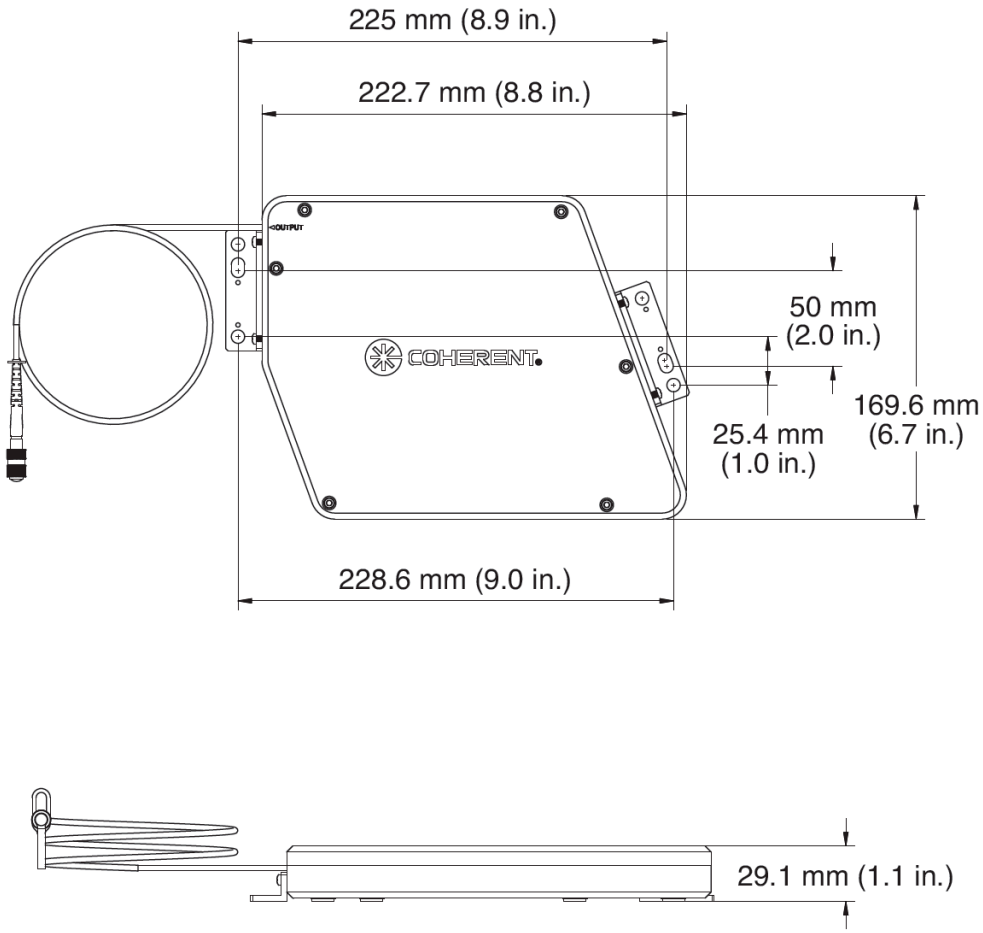


Figure 5-26. OBIS Galaxy System: Dimensions

5.5 Specifications

For current specifications for the OBIS Galaxy Beam Combiner, go to:
https://www.coherent.com/resources

5.6 OBIS Galaxy Tutorial

A short video tutorial is available to show how to set up an OBIS Galaxy Beam Combiner, which enables up to eight multi-wavelength OBIS LX/LS FP and Sapphire FP lasers. To view this tutorial, go to:

https://www.youtube.com/watch?v=vepaOw8d_qk

5.7 Repacking Procedure

1. Attach the OBIS Galaxy to the shipping plate using the three socket head cap screws, as shown in Figure 5-27.

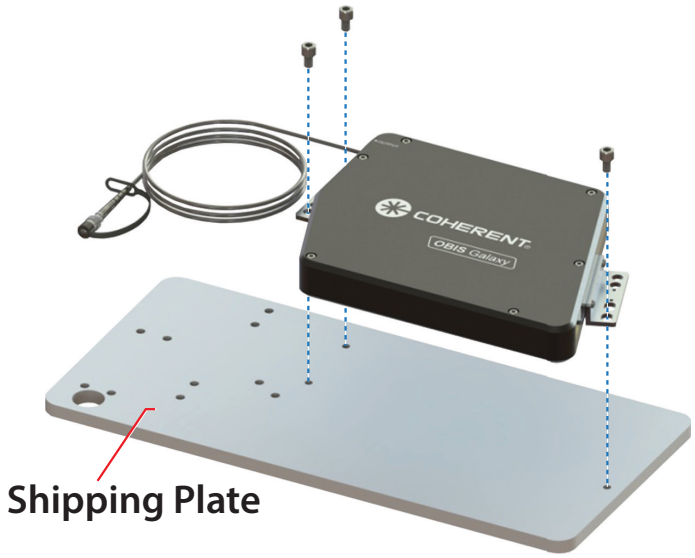


Figure 5-27. Secure OBIS Galaxy to Shipping Plate

2. Coil the output fiber to the correct diameter to fit the plate (about seven coils) and attach it to the shipping plate with five zip ties, as shown in the example in Figure 5-28.

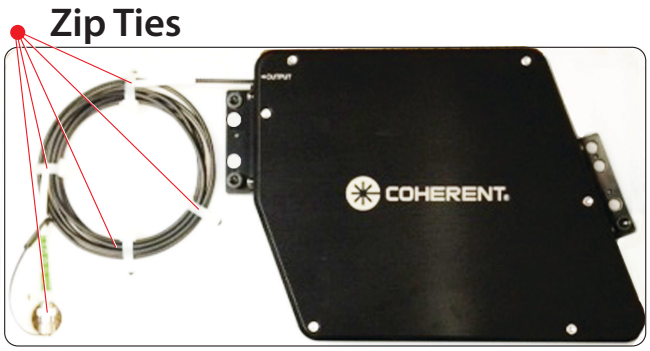


Figure 5-28. Attach Fiber with Zip Ties

3. Place the shipping plate with the attached Galaxy into the ESD bag, as shown in Figure 5-29.

Figure 5-29. Place OBIS Galaxy in ESD Bag

4. If applicable, place the accessories and the manual into the lower insert. Place the insert into the bottom of the shipping box on top of those pieces, as shown in Figure 5-30.

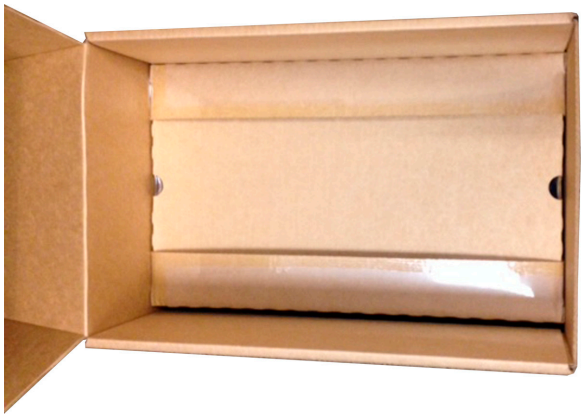


Figure 5-30. Place Lower Insert into Shipping Box

5. Place the OBIS Galaxy unit into the other insert and fold the side flaps down to tighten the film, as shown in Figure 5-31.

Figure 5-31. Place OBIS Galaxy into the Shipping Box

6. Place the upper insert with the OBIS Galaxy into the shipping box, as shown in Figure 5-32.

Figure 5-32. Place Upper Insert into Shipping Box

7. Close the shipping box and secure the box with tape, as shown in Figure 5-33.

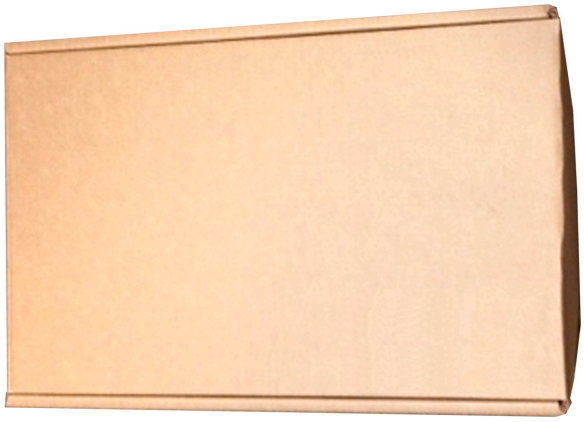


Figure 5-33. Close and Secure Shipping Box

8. *If you are returning the system to Coherent for service*:
   - Contact Coherent Customer Service via phone +**1-(734) 456-3100** to get an RMA number.
   - Include the RMA number on the shipping label.

5.8 Troubleshooting Procedures

Shown below are possible problems, with a reference to the related troubleshooting checklist.

Table 5-2. OBIS Galaxy Beam Combiner Troubleshooting Procedures

Problem	Reference
Low power throughput (%)	Checklist 1 (this page)

5.8.1 Checklist 1: Low power throughput (%)

If the OBIS LX/LS FP Galaxy or Sapphire FP Galaxy laser output power—Power Throughput (%)—is below specifications, do the following steps in the order shown prior to sending the OBIS Galaxy Beam Combiner back for service evaluation.

[ ] Make sure to install a laser into the OBIS Galaxy Beam Combiner in a clean environment (such as a clean room or under a flow bench).

Optical cleanliness is essential to achieving and maintaining maximum output power throughput. It is important to use clean room-grade Nitrile gloves, optics-grade methanol/isopropanol, and optical swabs designed for fiber optic cleaning.

[ ] Confirm the OBIS Galaxy laser FC connector key is properly aligned to the mating connectors sleeve keyway. Carefully slide the fiber ferrule into the mating sleeve using a gentle clockwise and counter-clockwise rotation until the fiber is fully inserted while tightening the collar on the FC connector.

[ ] Ensure that a proper power measurement instrument is used to monitor and measure the output power and stability of both the laser output and the OBIS Galaxy Output Fiber.

Coherent recommends that you use a fast responding power sensor/meter system—such as a PowerMax-USB UV/VIS Quantum Power Sensor—to monitor and measure the output power of both a Coherent Galaxy laser and the OBIS Galaxy Output Fiber Power. For more information, see "Appendix - OBIS Power Measurement" (p. 193).

[ ] Inspect the output fiber tip to ensure it is clean and free of damage. Properly inspecting the fiber tip requires a desktop fiber optic microscope or a hand-held fiber optic microscope. For further details, see Part 1 of the *OBIS LX/LS Operator's Manual*.

[ ] Contact Coherent Technical Support—see "Appendix - Service & Support" (p. 193).

6 OBIS SDR BREAKOUT BOARD

The SDR Breakout Board (P/N 1211797) is designed to speed up the development and bring-up cycles for our customers. The Board provides access to all the signals on the OBIS SDR connector and allows the user to connect to the Board through, either a standard 40-pin ribbon cable connection or through SMB connections. The Board also provides an area to prototype desired custom circuitry.

Coherent product information and related software is available in one easily accessible location on the Coherent website. To download product information or a copy of the complete *OBIS LX/LS Operator's Manual* (P/N 1184163), go to:

https://www.coherent.com/resources

6.1 Features

Figure 6-1 shows the features of the SDR Breakout Board:

The SDR Breakout Board includes the following features:

- 12 VDC power input using standard OBIS power supply
- Single-ended 50 ohm 0 to 5V analog modulation input through a BNC connector
- Single-ended 50 ohm 0 to 0.3V digital modulation input through a BNC connector
- Adjustable potentiometer for the zero-offset voltage of the analog modulation input
- Adjustable potentiometer for the gain of the analog modulation input
- All SDR cable signals broken out on a 2x20, 40-pin ribbon cable connector
- Additional 40-pin break-out headers for direct and individual signal access
- RS-485 bus converted to 3.3V CMOS logic levels
- 100-mil grid prototyping area for custom circuitry
- Power disconnect jumper to turn off power to OBIS

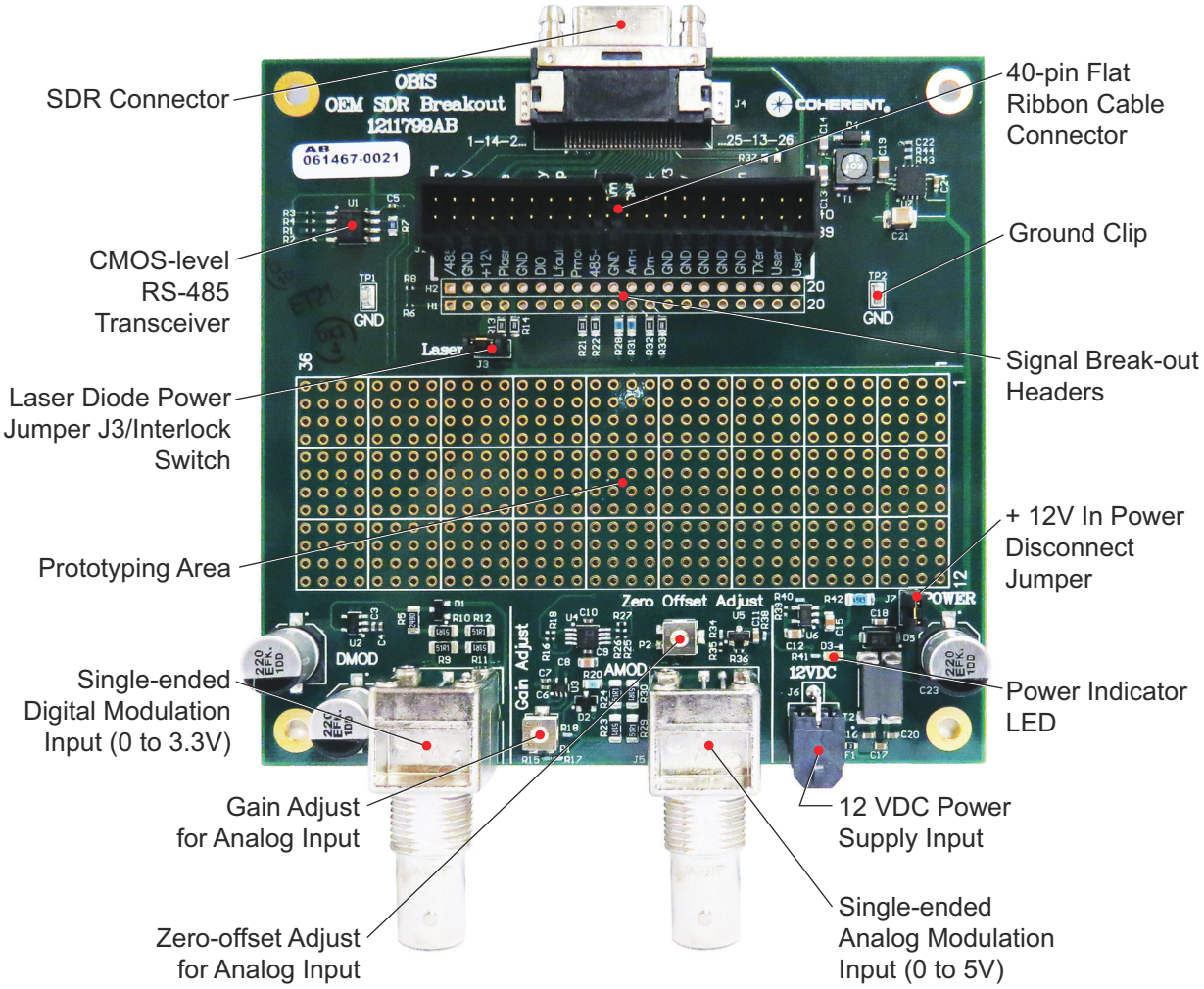


Figure 6-1. OBIS SDR Breakout Board

- Power Indicator LED
- Interlock jumper to control laser emission
- + 3.3V @ 400 mA and -3V @ 200 mA available for customer use

This Board contains all the functional blocks needed to drive an OBIS Laser at full analog and digital modulation bandwidth. Customers can very quickly observe their operation and modify or adapt them to their own needs by adding their own circuitry in the 100-mil grid through-hole.

6.2 Functional Guide

This section describes the various functions of the SDR Breakout Board.

6.2.1 Power

Power to the SDR Breakout Board and OBIS Laser is supplied through J6 (12 VDC), and can be controlled with jumper J7. Insertion of the jumper provides power to the Breakout Board and OBIS Laser; extraction of the jumper turns all power off.

6.2.2 Interlock

Jumper J3 provides power to the laser diode in the OBIS Laser and acts as an interlock. Removal of the jumper will turn off laser emission; insertion of the jumper will turn the laser back on.

6.2.3 Digital Modulation

The SDR Breakout Board has a single-ended BNC input (J1) for digital modulation (0 to 3.3V). The circuit on the Board converts the signal into the differential LVDS signal used by the OBIS Laser.

To disable the single-ended digital modulation input and use the differential LVDS inputs accessible from the flat ribbon cable connector or breakout header, remove R32 and R33 (0 ohm).

6.2.4 Analog Modulation

The SDR Breakout Board has a single-ended BNC input (J5) for analog modulation (0 to 5V). The circuit on the Board converts the signal into the differential signal (-0.93V to 0.93V) used by the OBIS Laser. To disable the single-ended analog modulation input and use the differential inputs accessible from the flat ribbon cable connector or breakout header, remove R28 and R31 (0 ohm).

6.2.5 Analog Modulation Zero-Offset Adjustment

The zero-offset voltage of the analog modulation signal can be adjusted by rotating the potentiometer P2 on the Board. Adjustment of the zero-offset voltage will increase or decrease the amount of current supplied to the laser diode when the laser is driven with a 0V input. A higher zero-offset voltage will allow for a shorter turn-on delay.

6.2.6 Analog Modulation Gain Adjustment

Similarly, the gain of the analog modulation amplifier can be adjusted by rotating the potentiometer P1 on the Board. Adjusting the gain will increase or decrease the maximum laser output power at the maximum analog input voltage (5V).

6.2.7 RS-485 to 3.3V CMOS Converter

The SDR Breakout Board houses a differential RS-485 to single-ended 3.3V CMOS transceiver for development convenience. The CMOS signals can be accessed through the flat ribbon cable connector J2 or through the breakout headers H1 and H2.

6.2.8 3.3V and -3V Supplies

3.3V @ 400 mA and - 3V @ 200mA are available through the flat ribbon cable connector J2 and through the breakout headers H1 and H2.

6.2.9 Prototyping Area

The prototyping area is a 0.1 inch through-hole grid for the user's convenience.

6.2.10 Ribbon Cable Connector and Breakout Header

The ribbon cable breakout headers provide local access to all the SDR signals and some additional signals. Table 6-1 describes the pin-outs.

Table 6-1. Ribbon Cable Connector Pin-outs

Pin Number Headers H1, H2	Pin Number Connector J2	Pin Name	Pin Description
H1-1	J2-1	RS485_INHIBIT	Pulled high in laser. Must be pulled low to enable RS-485 communication. See Part 3 of the *OBIS LX/LS Operator's Manual*.
H1-2	J2-2	GND	Ground
H1-3	J2-3	+12 Vin	12 VDC supply to the Breakout Board and to Plaser and Phouse. Can be powered off by removing J7.
H1-4	J2-4	Plaser	12 VDC supply to the laser diode. Also used as interlock. It can be powered down by removing J3 and it can be isolated from + 12 Vin by removing R15.

Table 6-1. Ribbon Cable Connector Pin-outs (continued)

Pin Number Headers H1, H2	Pin Number Connector J2	Pin Name	Pin Description
H1-5	J2-5	GND	Ground
H1-6	J2-6	DIO_CURR	Analog output. 0 to 2V = 0A - maximum allowed diode current.
H1-7	J2-7	LASER_FAULT	< 0.5V: laser OK > 2.5V laser shows error
H1-8	J2-8	PWRMON	Analog output driven by the photodiode amplifier. Scaled to 0 to 2V = 0 to 100% power.
H1-9	J2-9	RS485_P	Differential serial bus high side
H1-10	J2-10	GND	Ground
H1-11	J2-11	AMOD_P	Positive line for analog power modulation. 0 to 4V common mode. - 0.930 to + 0.930V differential scales to 0 to 110% output power.
H1-12	J2-12	DMOD_N	Differential digital modulation input low side. LVDS signal level.
H1-13	J2-13	GND	Ground
H1-14	J2-14	GND	Ground
H1-15	J2-15	GND	Ground
H1-16	J2-16	GND	Ground
H1-17	J2-17	GND	Ground
H1-18	J2-18	TXen	Enables the 3.3V CMOS version of RS-485 transmit signal. Active high to enable.
H1-19	J2-19	User1	Spare signal for the user. Not connected to the SDR connector.
H1-20	J2-20	User2	Spare signal for the user. Not connected to the SDR connector.
H2-1	J2-21	SDR_IN_USE#	Pulled high in the laser. This signal is looped back to pin 13 in the remote so a low on this pin signals to the laser the presence of a host.
H2-2	J2-22	+ 12 Vin	12 VDC supply to the Breakout Board and to Plaser and Phouse.
H2-3	J2-23	GND	Ground
H2-4	J2-24	Phouse	12 VDC supply to the OBIS Laser. It can be powered down by removing J7 and it can be isolated from + 12 Vin by removing R17.
H2-5	J2-25	NC	No connect
H2-6	J2-26	LASER_READY	> 2.5V when laser output active (only CW mode) and output power is within ± 2% set power; otherwise < 0.5V.
H2-7	J2-27	BP_TEMP	<0.5V: baseplate temp below (upper limit - 10°C). 1.2 to 2V: baseplate between (upper limit - 10°C) and upper limit. > 2.7V: baseplate above upper limit.
H2-8	J2-28	GND	Ground
H2-9	J2-29	RS485_N	Differential serial bus low side.

Table 6-1. Ribbon Cable Connector Pin-outs (continued)

Pin Number Headers H1, H2	Pin Number Connector J2	Pin Name	Pin Description
H2-10	J2-30	AMOD_N	Negative line for analog power modulation. 0 to 4V common mode. - 0.930 to + 0.930V differential scales to 0 to 110% output power.
H2-11	J2-31	GND	Ground
H2-12	J2-32	DMOD_P	Differential digital modulation input high side. LVDS signal level.
H2-13	J2-33	+ 3.3V	+ 3.3V at 400 mA output generated on the Breakout Board to power custom circuitry on the prototyping grid.
H2-14	J2-34	- 3V	- 3V at 200 mA output generated on the Breakout Board to power custom circuitry on the prototyping grid.
H2-15	J2-35	TX	3.3V CMOS version of the RS-485 transmit signal.
H2-16	J2-36	RX	3.3V CMOS version of the RS-485 receive signal.
H2-17	J2-37	RXen#	Enables the 3.3V CMOS version of RS-485 receive signal. Active low to enable.
H2-18	J2-38	GND	Ground
H2-19	J2-39	GND	Ground
H2-20	J2-40	GND	Ground

6.2.11 Schematics

The following figures present schematics for the SDR Breakout Board.

Figure 6-2 illustrates Fast Digital Modulation, with input protected to intermittent application of +/- 12 volts.

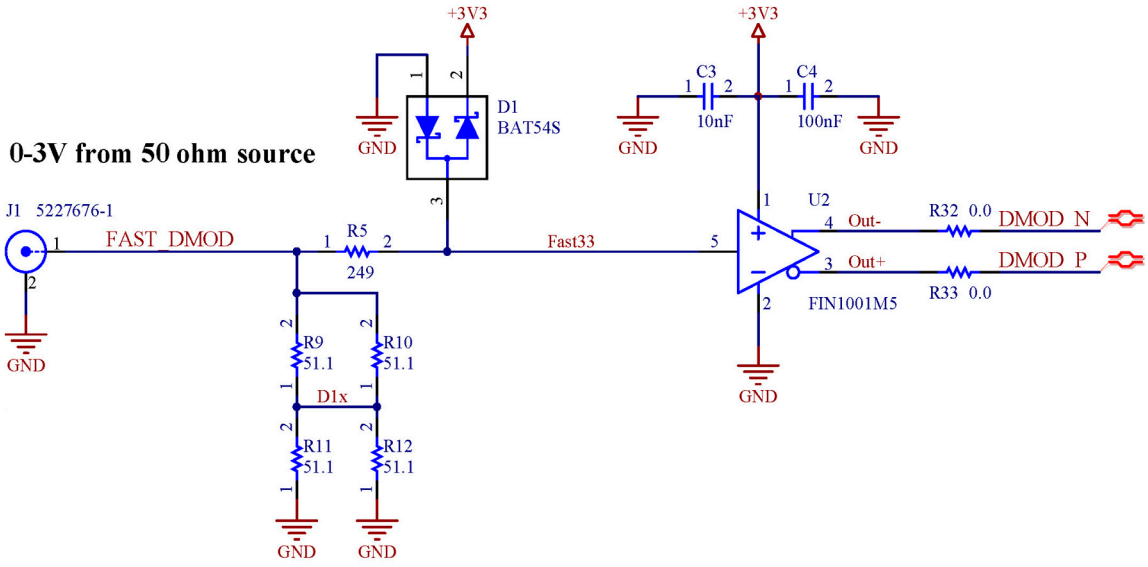


Figure 6-2. SDR Schematic — 1

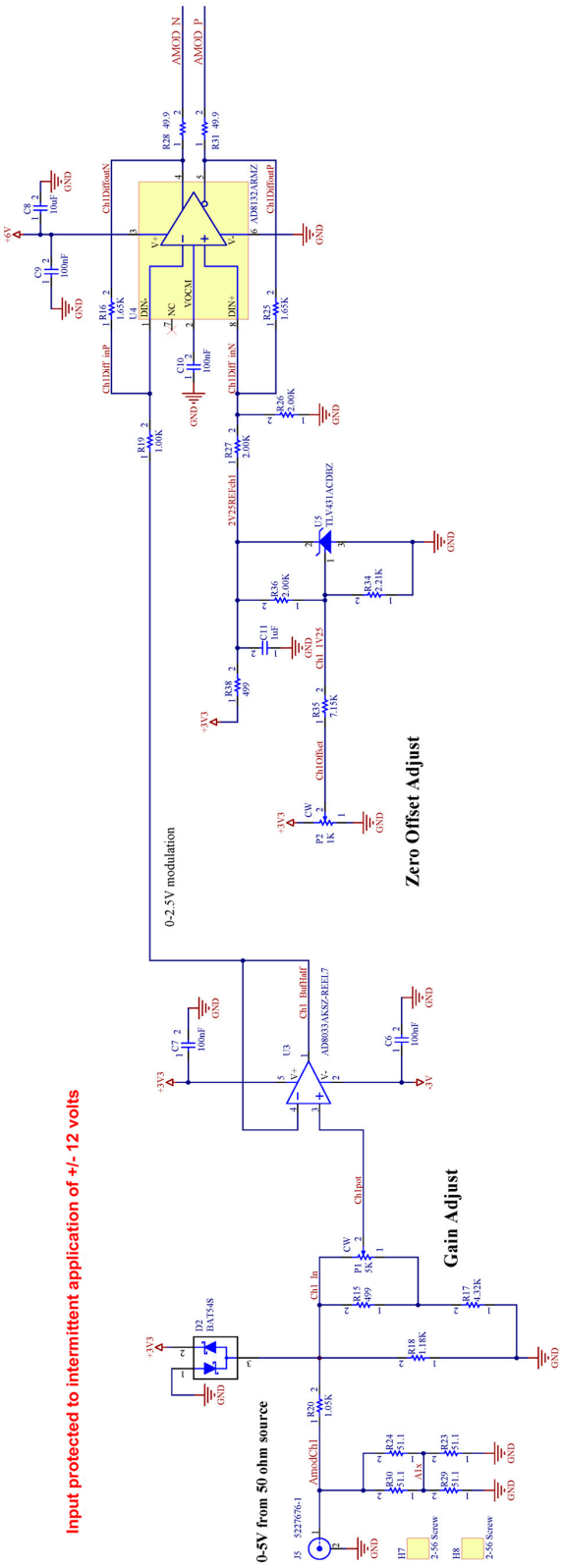


Figure 6-3. SDR Schematic — 2

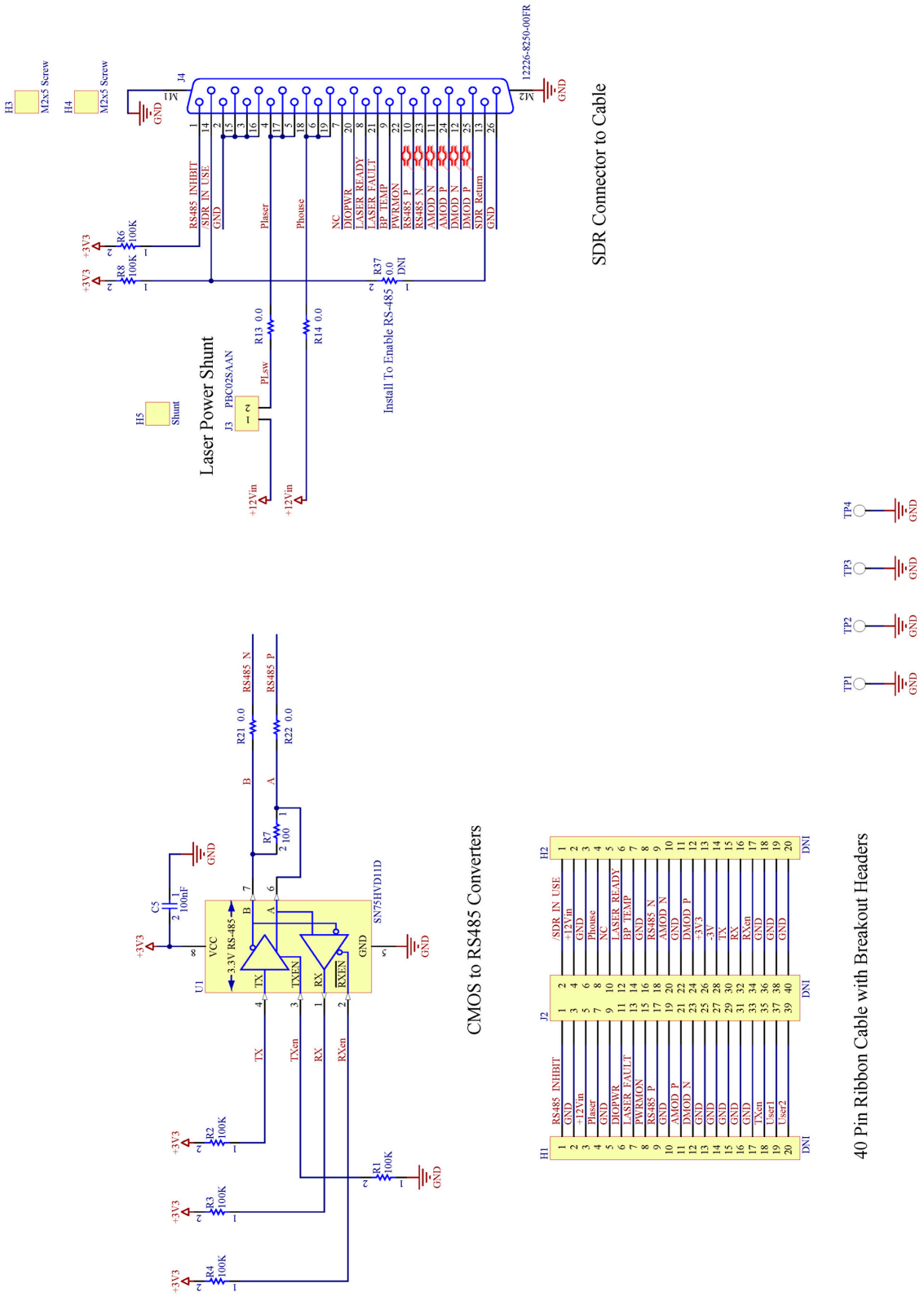


Figure 6-4. SDR Schematic — 3

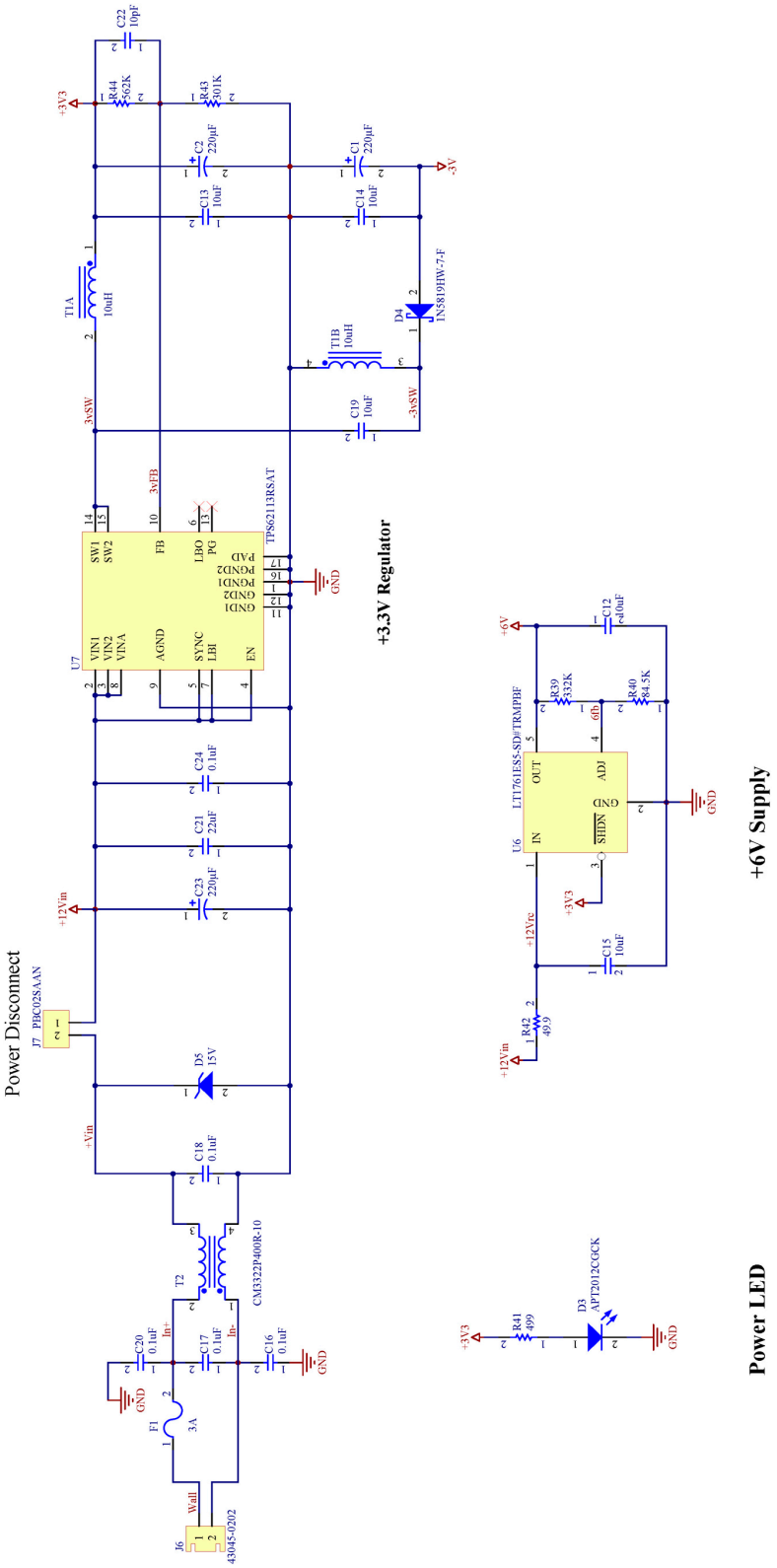


Figure 6-5. SDR Schematic — 4

6.3 Analog Modulation LVDS Voltage Adjustment

Adjustment of the Gain and Offset is required when operating in Analog modulation mode using the AMOD input (BNC, J5).

Figure 6-6 shows the various pins.

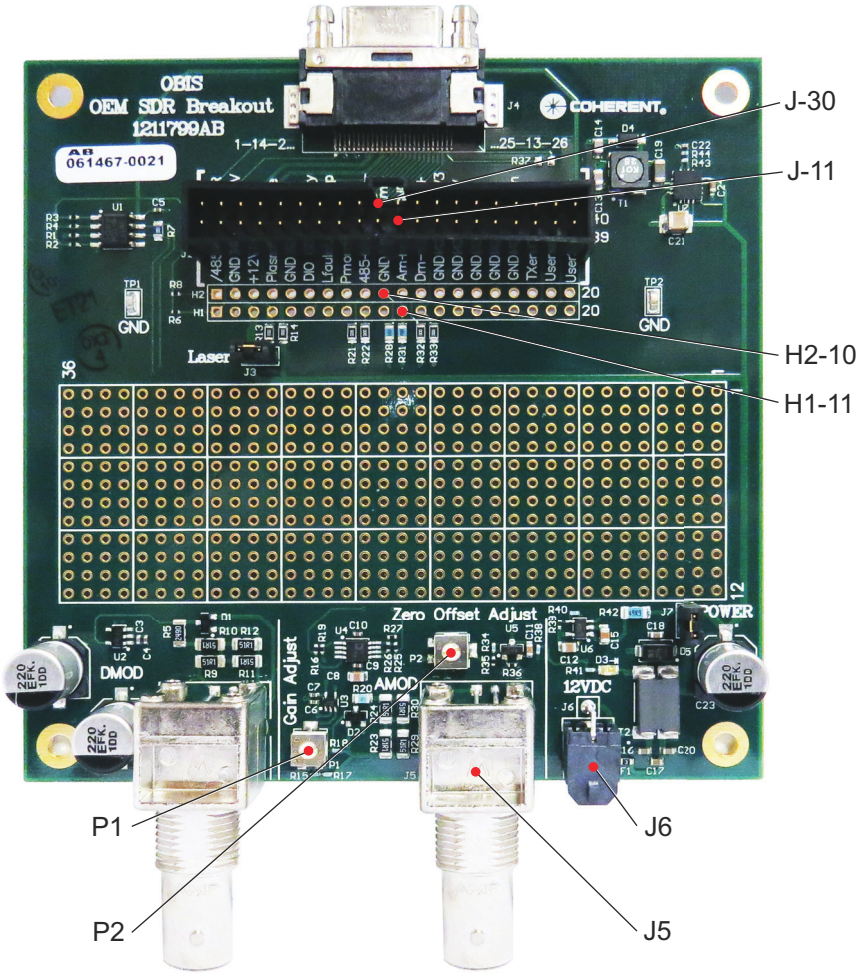


Figure 6-6. Pins to Adjust Analog Modulation

6.3.0.0.1 Adjustment Procedure

To adjust analog modulation:

1. Use a Coherent OBIS SDR cable to connect the OBIS Laser to the SDR Breakout Board.
2. Connect 12 VDC power to J6.
3. Connect a variable input voltage source (0 to 5.0V) to the single-ended Analog Modulation Input BNC connector (J5).
4. Connect a USB cable between the back panel of the OBIS Laser and a host computer to change the operating mode of the OBIS Laser. Use either Coherent Connection applications software 3.0.x or send host

commands and queries to communicate between the OBIS Laser and the host computer.

5. Switch the operating mode from CW to Analog Modulation.
6. Start the OBIS Laser by turning the laser ON and applying 4.55 VDC to the Analog Modulation input.
7. Using a voltage meter, measure the voltage between VMOD+ (Positive) and VMOD- (Negative) to confirm a **LVDS Voltage of 0.760V**. The measurement can be taken between pins H1-11 (AMOD+) and H2-10 (AMOD-), or between pins J-11 (AMOD+) and J-30 (AMOD-) on connector J2. See Table E-1 (p. E-3) for details about pin-outs.
   - If the LVDS voltage is not set at 0.760V with an analog input voltage level of 4.55 VDC, adjust the setting by turning the Gain Adjust potentiometer (P1) to obtain a LVDS voltage of 0.760V.
   - Increase the analog modulation input voltage to 5.0V and confirm the measured LVDS voltage of the OBIS Laser is 0.930V.
8. Decrease the analog modulation input voltage level to 0.0V and confirm the measured LVDS voltage between AMOD+ and AMOD- is -0.930V.

   If the LVDS voltage is not set at -0.930V, adjust the Zero Offset Adjustment potentiometer (P2) to obtain a LVDS voltage level of -0.930V. Table 6-2 lists input voltage levels.

Table 6-2. OBIS Modulation Input Voltage Levels

Description	Explanation	Voltage at the OBIS Remote SMB Input	LVDS Voltage at OBIS Laser SDR Input	Laser Output Power for a 405 nm LX 55 mW	Laser Output Power for a 561 nm LS 50 mW
Analog Modulation Maximum Power	110% of Nominal Power	5.0V	0.930V	60.5 mW	55 mW
Analog Modulation Nominal Power	100% of Nominal Power	4.55V	0.760V	55 mW	50 mW
Analog Modulation Threshold (OBIS LX only)	Threshold (Blanking) Level	≤ 0.0248 V	≤ -0.922V	≤ 0.3 mW	Not Applicable
Analog Modulation Minimum Power	Minimum Power	0.0V	-0.930V	0 mW with Blanking Enabled	< 1 mW

9. Using either Coherent Connection software or host commands, switch the operating mode from CW to Analog Modulation.
10. Return the input voltage to 4.55 VDC and confirm that the LVDS voltage is at 0.760V—the nominal output power of an OBIS Laser.
11. Confirm the OBIS Laser output level using an external power measurement instrument, Coherent Connection software, or a host interface query through a terminal program.

7 SDR-SMB MODULATION ADAPTER

The OBIS SDR-to-SMB Modulation Adapter (P/N 1319290) is designed for convenient access to the digital and Analog Modulation inputs of the OBIS laser. This Adapter converts single-ended modulation inputs to the LVDS voltage levels that the OBIS requires for modulation.

This section describes the features of the OBIS SDR-to-SMB Modulation Adapter, as well as provides instructions to set up and use the Adapter.

Coherent product information and related software is available in one easily accessible location on the Coherent website. To download product information or a copy of the complete *OBIS LX/LS Operator's Manual* (P/N 1184163), go to:

https://www.coherent.com/resources

7.1 Features

Figure 7-1 provides an overview of the OBIS SDR-to-SMB Modulation Adapter and its connectors:

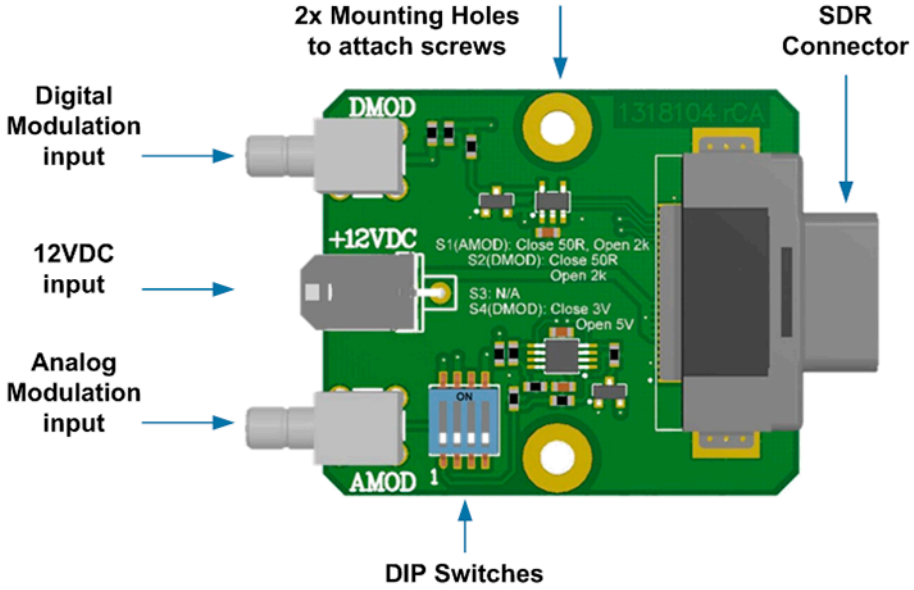


Figure 7-1. The OBIS SDR-to-SMB Modulation Adapter

The OBIS SDR-to-SMB Modulation Adapter includes the following features:

- 12VDC power input that supplies power to both the Adapter and the laser using a standard OBIS power supply (see Part 1 of the *OBIS LX/LS Operator's Manual*)
- Single-ended Digital Modulation input
  - Input impedance 2kΩ or 50Ω
  - Input range 0V-5V or 0V-3.3V
  - Impedance and voltage range selectable by a DIP switch
- Single-ended Analog Modulation input
  - Input impedance 2kΩ or 50Ω
  - Input range 0V-5V for minimum (**`min_Power`**) to maximum (**`max_Power`**) analog output power control
  - Impedance selectable by a DIP switch
- USB and fan connector accessible through the back panel of the OBIS laser
- SDR connector to directly plugs the Adapter into the OBIS laser (no separate SDR cable required)

The OBIS SDR-to-SMB Modulation Adapter is shipped as a Kit (P/N 1319290) with screws and a plastic tray to allow for easy mounting. (See "Ordering Information" on page 142.)

7.2 Functional Description

This section describes various functions of the OBIS SDR-to-SMB Modulation Adapter.

7.2.1 Power

Power to the Adapter is supplied through the 12VDC input connector on the board. This 12VDC connector supplies power through the SDR connector to both the Modulation Adapter and the OBIS laser that are connected.

The Adapter does not need a separate DC supply. Instead of powering the OBIS laser via the back panel, the DC supply connects directly into the Adapter.

The USB terminal and the fan supply outlet on the back panel of the OBIS Laser are still available.

CAUTION!
Do not add a second power connector to the OBIS laser. All power is provided through the Modulation Adapter.

For additional information, see “Electrical Set-Up” (p. 7-140).

7.2.2 Digital Modulation

The OBIS SDR-to-SMB Modulation Adapter provides a single-ended SMB input for Digital Modulation. The circuit on the board converts the modulation input signal into the differential LVDS signal used by the OBIS laser. Due to the pull-down resistor, laser emission goes to the OFF state when Digital Modulation is activated and the modulation input connector is not connected.

The input impedance and the voltage range of the Digital Modulation input connector can be selected by the DIP switch; see “DIP Switches” (p. 7-137).

7.2.3 Analog Modulation

The OBIS SDR-to-SMB Modulation Adapter provides a single-ended SMB input for Analog Modulation. The circuit on the board converts the modulation input signal into the differential LVDS signal used by the OBIS laser. Due to the pull-down resistor, the power goes to minimum output power when Analog Modulation is activated and the modulation input connector is not connected.

The input voltage range of the Analog Modulation input is:
0V to 5V = represents minimum to maximum output power

The input impedance of the Analog Modulation input connector can be selected by the DIP switch; see “DIP Switches” (p. 7-137).

7.2.4 DIP Switches

The DIP switches on the OBIS SDR-to-SMB Modulation Adapter allow you to set the input impedance of both modulation inputs and the voltage range of the Digital Modulation input.

Table 7-1 lists the selections available using the DIP switches:

Table 7-1. DIP Switches on the SDR-to-SMB Modulation Adapter

Switch	Description and Settings
S1	Selects input impedance for Analog Modulation input. The default setting is 2kΩ. • ON = 50Ω • OFF = 2kΩ
S2	Selects input impedance for Digital Modulation input. The default setting is 2kΩ. • ON = 50Ω • OFF = 2kΩ
S3	Reserved.
S4	Selects the input voltage range for the Digital Modulation input. Supports different TTL logic levels. The default setting is 0V/5V. • ON = Digital Modulation input is 0V/3.3V. • OFF = Digital Modulation input is 0V/5V.

7.2.5 SDR Connector

The SDR Connector plugs directly into the back panel of the OBIS laser. No head cable is required.

The connector is locked in place by mounting the OBIS SDR-to-SMB Modulation Adapter with the two screws and the plastic tray. See instructions in "Mechanical Set-Up" (p. 7-139) about how to secure the position of the SDR connection between the Modulation Adapter and the OBIS laser.

7.2.6 Mechanical Dimensions

All dimensions are stated in both metric (mm) and standard (inches).

Figure 7-2 shows the dimensions for the OBIS SDR-to-SMB Modulation Adapter when attached to a laser, from a top view:

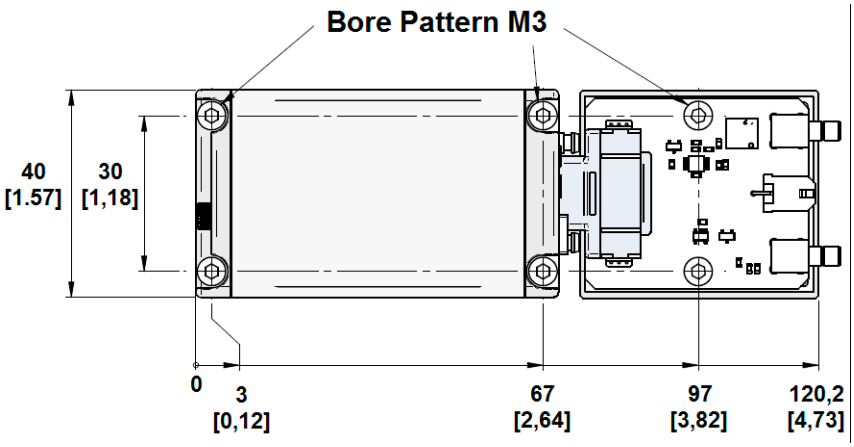


Figure 7-2. Adapter Dimensions—Top View

Figure 7-3 shows the dimensions for the OBIS SDR-to-SMB Modulation Adapter when attached to a laser, from a side view:

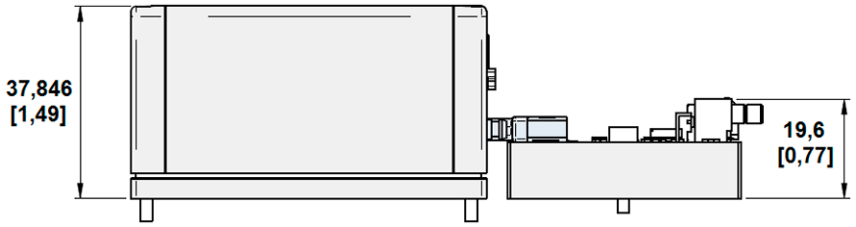


Figure 7-3. Adapter Dimensions—Side View

7.3 Installation

This section describes the procedures for both mechanical and electrical set-up to attach the OBIS SDR-to-SMB Modulation Adapter to an OBIS laser.

NOTICE
Read the precautions about laser safety and appropriate procedures as described in other sections in this manual.

7.3.1 Mechanical Set-Up

To physically connect the OBIS SDR-to-SMB Modulation Adapter to an OBIS laser:

1. If the OBIS laser is not already attached to a heat sink, set that up now. See Part 1 of the *OBIS LX/LS Operator's Manual* for detailed instructions.

IMPORTANT
Never use a thermal grease or compound between the OBIS laser and the heat sink. *The use of such materials voids the Coherent warranty!*

2. Tighten the M3x35 mm screws in the laser in a diagonal pattern shown in Part 1 of the *OBIS LX/LS Operator's Manual*. Torque the mounting screws to 0.25 N·m (35.4 oz·in.) in the following sequence: 1-2-3-4. Use the same diagonal pattern for the last torque setting of 1 N·m (141.6 oz·in.) Avoid using excessive force.

3. Insert the OBIS SDR-to-SMB Modulation Adapter PCB into the plastic tray to support the circuit board.
4. Attach the Adapter PCB to the tray using the two (2) M3 screws shipped with the Kit.
5. Align the SDR connector for the assembled Adapter with its SDR connector facing the SDR connector on the back panel of the OBIS laser.
6. Gently insert the SDR connector on the Adapter until it solidly connects with the mating SDR connector on the back of the OBIS laser.

NOTICE

Pins in the SDR connector on the Adapter can be shorted if the pins are inserted at an angle with the SDR mating connector. Use care when aligning the connecting parts.

7. Secure the Adapter to the laser using the M3x14 screws supplied in the Adapter Kit.

When finished, the set-up should look like the image shown in Figure 7-4:

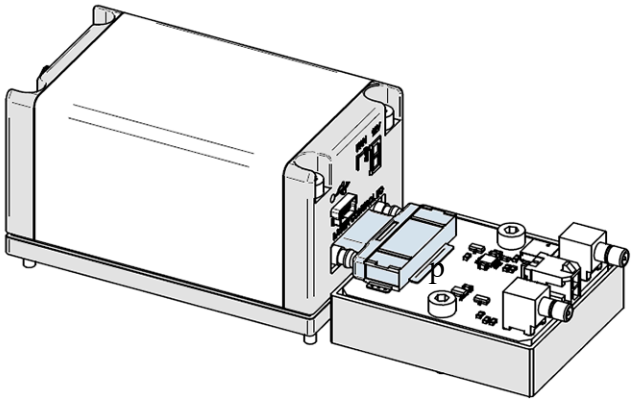


Figure 7-4. Adapter Attached to the Laser

7.3.2 Electrical Set-Up

This section describes how to set up the electrical connection between the OBIS SDR-to-SMB Modulation Adapter and the OBIS laser.

1. Set the DIP switches to the input impedances and input voltage range. In many cases, the jumpers can be left in the default "OFF" connection.

   For the explanation about DIP switch positions, see"DIP Switches" (p. 7-137).
2. Plug in the required modulation input connectors. If a connector is not used, it does not need to be connected.
3. Connect 12VDC to the 12V power connector at the Modulation Adapter.

CAUTION!
Do not plug another 12V connector into the OBIS laser. All DC power is provided through the Modulation Adapter.

Connecting another 12V power source into the OBIS laser back panel while the OBIS SDR-to-SMB Modulation Adapter is already connected to the OBIS may cause damage to both the laser and the Modulation Adapter. Such a connection may also defeat safe disabling of the 12V power supply line on the OBIS SDR-to-SMB Modulation Adapter.

If the modulation mode has not yet been selected, you must also connect the laser to a host workstation and install Coherent Connection software.

7.4 Select Modulation Mode

Through the USB connection and software control, a user can select the desired modulation mode (digital | analog | mixed mode)—see “Select Modulation Mode” (p. 7-141). After it is set, the modulation mode is stored in non-volatile memory. This connection is mandatory to initially set a modulation mode for the laser.

By default, the laser operates in Continuous Wave with constant Power (CWP) mode, with the modulation inputs disabled.

After the modulation mode is set, the setting is stored in a non-volatile memory.

CAUTION!
Remember to take all necessary precautions and follow warning messages in this manual when working with laser emission.

To enable the desired modulation input, the correct modulation mode must first be selected. To do so:

1. Establish the electrical connection to the host computer by connecting a mini-USB cable from the back panel of the OBIS laser.
2. Install the Coherent Connection software on the host workstation.
3. Run the software and ensure that it displays the OBIS laser.

   For details additional explanation about Coherent Connection and its features, see See “Coherent Connection” (p. 8-145).

If you prefer to use terminal commands, see "OBIS Communications through a Terminal Program" in Part 1 of the *OBIS LX/LS Operator's Manual*.

4. Make sure that laser emission is not activated. If the laser begins emitting, press the "Stop" button in the main window of the software.
5. Go to the "Advanced" tab.
6. In the drop-down menu for "Operating Mode", select the desired modulation mode. The modulation mode is stored in a non-volatile memory, and the OBIS laser automatically starts in the selected modulation mode after the next DC power cycle.

   For descriptions about each of these modes, see "Modulation Modes" in Part 1 of the *OBIS LX/LS Operator's Manual*.
7. To begin laser light emission, press the "Start" button in the software or send an equivalent command via a terminal interface.

If you want to activate the Auto Start function, first stop laser emission, then go to the "Advanced" tab and click the check box in the software. For instructions, see "Enable Auto Start Using the OBIS Remote" in Part 1 of the *OBIS LX/LS Operator's Manual*.

7.5 Compliance

To comply with the China RoHS (Restriction of Hazardous Substances) Directive, any hazardous substances found in the OBIS SDR-to-SMB Modulation Adapter are identified.

The example shown in Figure 7-5 lists Lead (Pb), as well as the environmental-friendly use period of 20 years (as indicated by the number "20" inside the circle).

Figure 7-5. Adapter Label for China RoHS

7.6 Ordering Information

The OBIS SDR-to-SMB Adapter Kit (P/N 1319290) includes the parts listed in Table 7-2:

Contact Coherent to order this Adapter or any OBIS laser, tools, or accessories:

Table 7-2. Parts in the SDR-to-SMB Adapter Kit

Quantity	Description
1	PCBA, OBIS-SMB-SDR Adapter, DIP-switch version
1	Plastic tray for circuit board support
2	M3x14 Cap Screw, Socket head, hex drive

- By email: customer.support@coherent.com
- By phone: +**1-(734) 456-3100**
- See www.Coherent.com for a list of local Coherent service representatives worldwide.

8 COHERENT CONNECTION

This section describes how to set up and install the Coherent Connection software and related drivers for the OBIS Laser system.

Coherent Connection software supports the following laser products: OBIS LX, OBIS LX-SF (Single-Frequency), OBIS LS, OBIS CORE LS, OBIS LG, OBIS XT, OBIS CellX, StingRay, and BioRay.

Coherent product information and related software is available in one easily accessible location on the Coherent website. To download, go to:
https://www.coherent.com/resources

Through this software, you can control laser power or other parameters directly through a USB or RS-232 connection.

For information about using a terminal program, see ‘OBIS Communications through a Terminal Program’ in Part 1 of the *OBIS LX/LS Operator’s Manual*.

8.1 Remote Control via USB or RS-232

Through the Coherent Connection software, you can control laser power or other parameters directly through a USB or RS-232 connection.

- USB and RS-232 use the same syntax, commands, and queries.
- When both USB and RS-232 are connected to the OBIS Remote, the USB overrides the RS-232.

To install Coherent Connection software, you must first connect the OBIS laser system to a workstation (personal computer or laptop) using a USB cable or a standard DB9F RS-232 connection.

- The USB cable is included in the OBIS Laser System.
- The RS-232 cable is a standard PC serial cable (not included with the laser).

For information about RS-232 pin-out or communication settings, see Part I of the *OBIS LX/LS Operator's Manual)*.

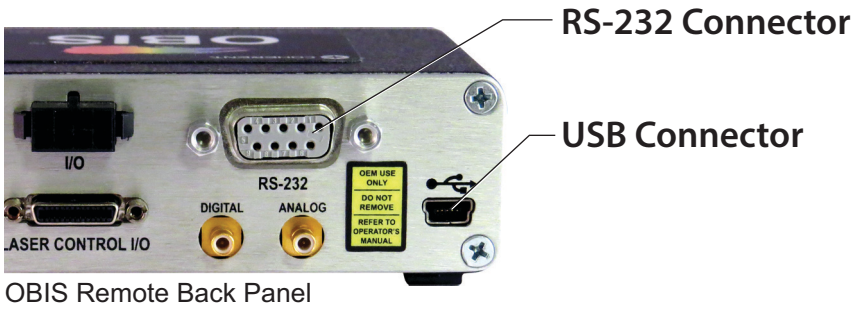
Using the OBIS USB driver allows communication with the OBIS using a terminal program or a custom-developed program. The driver creates a virtual OBIS COM device in the host computer that gives access to its controls.

NOTICE

When installing Coherent Connection software, drivers are automatically loaded onto the host computer as part of the installation process.

8.1.1 Connect USB/RS-232

Connectors for a USB or RS-232 cable are located on the back panel of an OBIS Remote, as shown in Figure 8-1.



OBIS Remote Back Panel

Figure 8-1. Connectors for a USB or RS-232 Cable

Connect a standard serial cable from he back of the OBIS Remote to the host workstation (PC or laptop).

8.1.2 Connect USB

Figure 8-2 shows the USB connector on the back panel of the OBIS laser. This is a standard Mini-B USB connector that supports USB 2.0 communications.

Connect the OBIS LX/LS laser from the back panel of the laser to a USB port on the host computer.

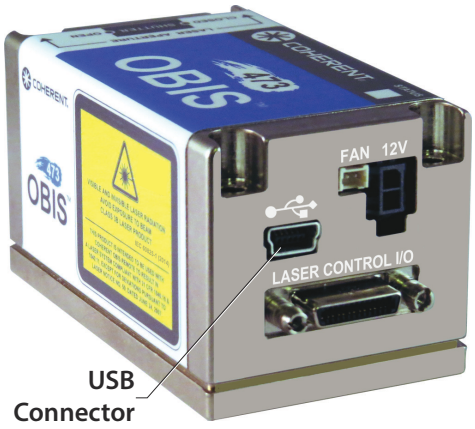


Figure 8-2. USB Connection at the Laser

IMPORTANT
DO NOT make a connection to the USB connector on the back panel of a OBIS Remote. Instead, the connection must be made to the USB connector on the OBIS *Laser*.

8.2 Coherent Connection Software

Coherent Connection provides an easy-to-use interface between a Coherent OBIS Laser or mini-controller and a PC.

Coherent Connection software lets a user set modes, change laser output power, and get laser status and information in its graphical user interface (GUI). The software supports both OBIS LS and OBIS LX lasers.

This section lists the system requirements, introduces the main tabs in the software, and provides instructions to install the software.

NOTICE
When installing Coherent Connection, drivers are automatically loaded onto the host computer as part of the installation process.

8.2.1 System Requirements

It is recommended that you use the most current and robust systems possible. Support for the OBIS laser system is provided on Windows v10 (32- and 64-bit) operating systems: In addition, the workstation must meet the following minimum requirements:

- 512 MB of RAM
- Microsoft .NET Framework 4.0 or higher. If no version (or an older version) is found on the workstation, then the installation program installs a version of Microsoft .NET Framework.
- USB or RS-232 port

8.2.2 Install Software

NOTICE

Before you install Coherent Connection software, it is recommended that you first close all other applications. The installation requires that you restart the workstation when installation is complete.

To install the Coherent Connection software and related drivers:

1. Coherent product information and related software is available in one easily accessible location on the Coherent website. Go to Coherent.com/Resources to search for and download the software:

   https://www.coherent.com/resources

2. Close all programs.
3. Double-click the following file to start the installation process. The last two digits represent the number for the current software build.

   `Coherent_Connection_Setup_v4.0.0.xx`

   The following message is displayed. Available languages include English, Italian, French, German, Hebrew, and Japanese. Note that the language selection applies only to software set-up instructions on-screen, and not to the Coherent Connection software itself (available in English only).
4. From the drop-down menu shown in Figure 8-3, select the language in which to display the software and click OK.

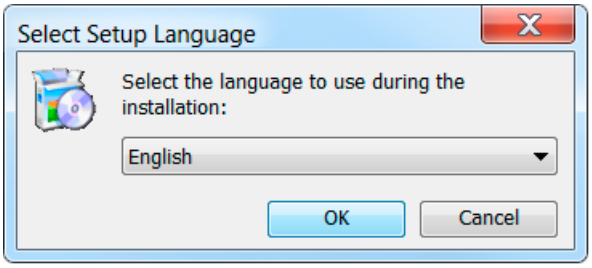


Figure 8-3. Select Language for Software

5. If you had previously installed the Coherent Connection software, the message shown in Figure 8-4 is displayed. Click Yes to proceed.

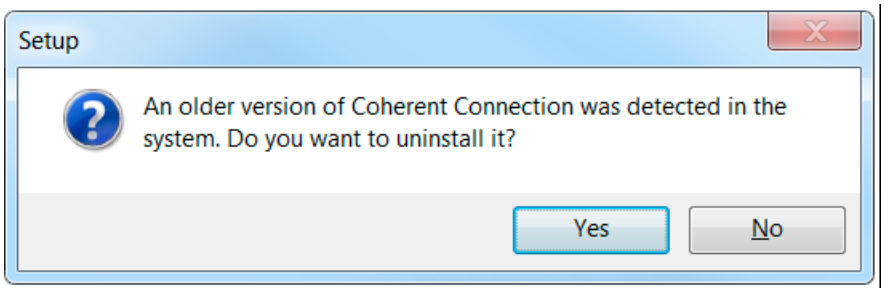


Figure 8-4. Uninstall Old Version of Software

6. The Welcome screen like the one shown in Figure 8-5 displays.

Figure 8-5. Welcome Screen for Installation

7. Read the instructions, then click Next. The License Agreement shown in Figure 8-6 is displayed.

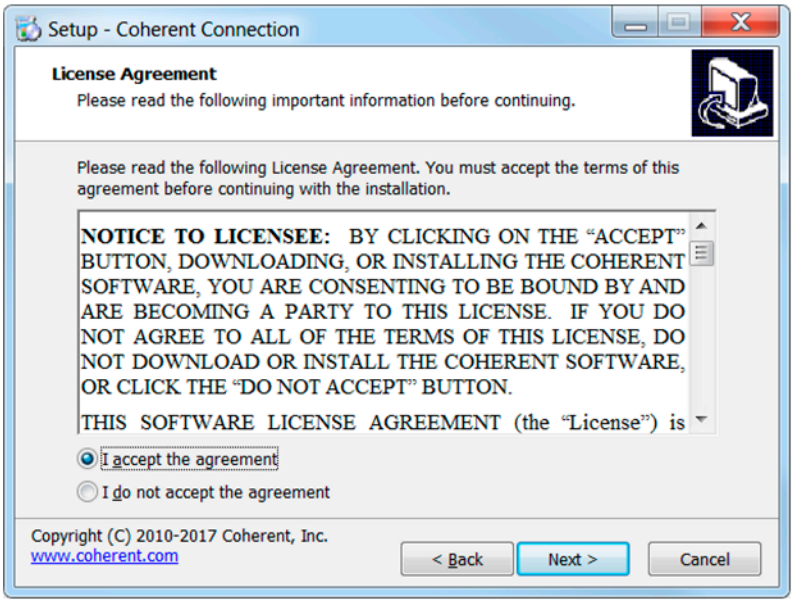


Figure 8-6. Coherent Connection 4 License Agreement

8. Scroll down to read the agreement. Note that the Next button is grayed out until you click the radio button to **Accept** the terms and conditions. When you do that, the button is activated; click Next.

9. The window shown in Figure 8-7 is displayed. Accept the selection, or browse to select the directory on the workstation where you want to install the software, and click Next.

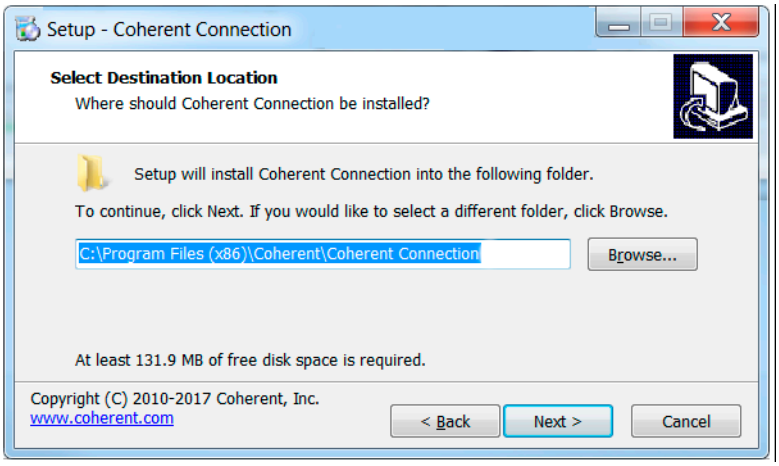


Figure 8-7. Select Directory to Install Software

10. You can create an icon for the software either on your desktop or for a Quick Launch (or both). As shown in Figure 8-8, click the appropriate check box, and then click Next.

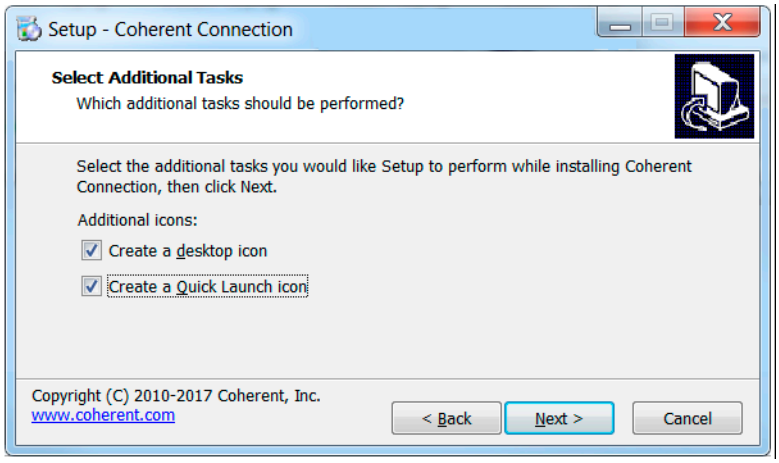


Figure 8-8. Set Desktop or Quick Launch Icon

11. The set-up utility is now ready to begin installing Coherent Connection 4 software on your workstation. Review the location and icons, as shown in the example in Figure 8-9, and then click Next.

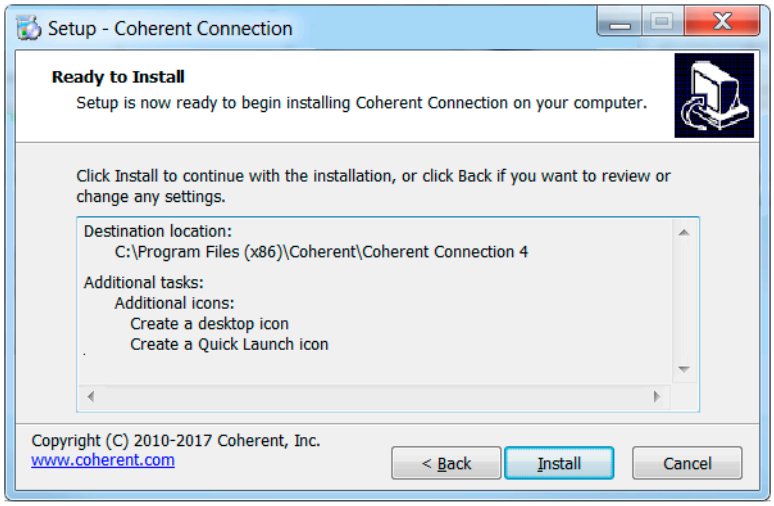


Figure 8-9. Review Set-Up before Installation Begins

A progress bar displays, as shown in Figure 8-10.

12. During the installation process, some files are extracted, as shown in the example in Figure 8-11.

13. After all files are extracted, click Finish. The screen shown in Figure 8-12 closes and the software is ready to be launched.

The software and USB driver are now installed.

If you selected a short-cut (icon) to be set up during installation, that is now displayed on the desktop of your workstation and/or in the Quick Launch menu, as shown in Figure 8-13:

To access complete operating instructions, open the Coherent Connection software and click **Help**.

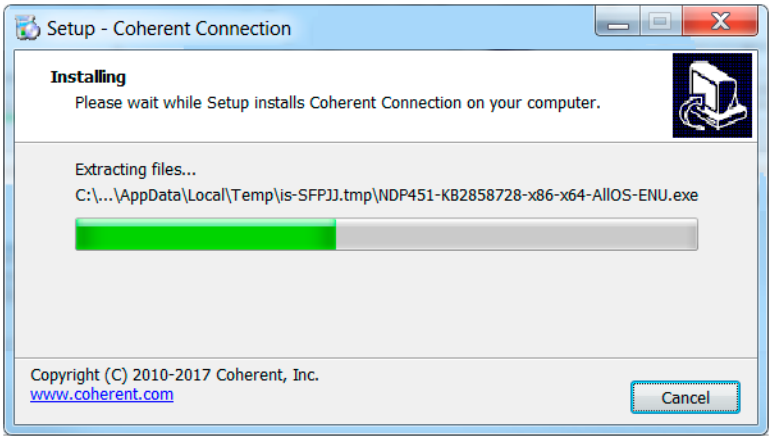


Figure 8-10. Progress of Installation

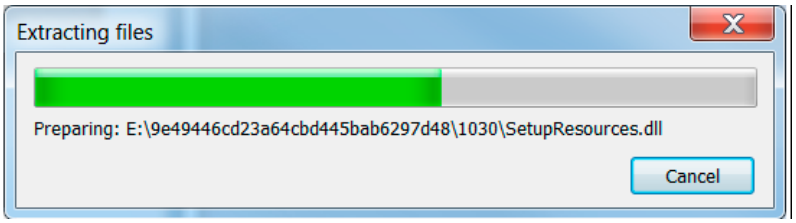


Figure 8-11. Extracting Files

Figure 8-12. Finish the Software Installation

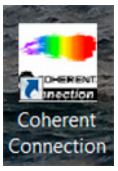


Figure 8-13. Desktop Icon for Coherent Connection Software

- Click on the icon for the Main menu to display the options in the drop-down menu.
- Click the Help icon to display the embedded Help file.

The Help menu option is shown in Figure 8-14.

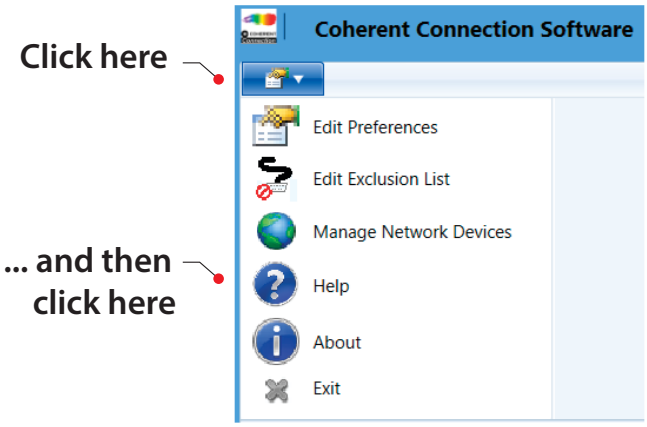


Figure 8-14. Coherent Connection HELP Menu Option

8.3 Overview of the Main Tabs

This section provides a brief description of each of the tabs in the Coherent Connection Software.

Figure 8-15 shows the Operating Power tab. On this page of the software, you can set power levels.

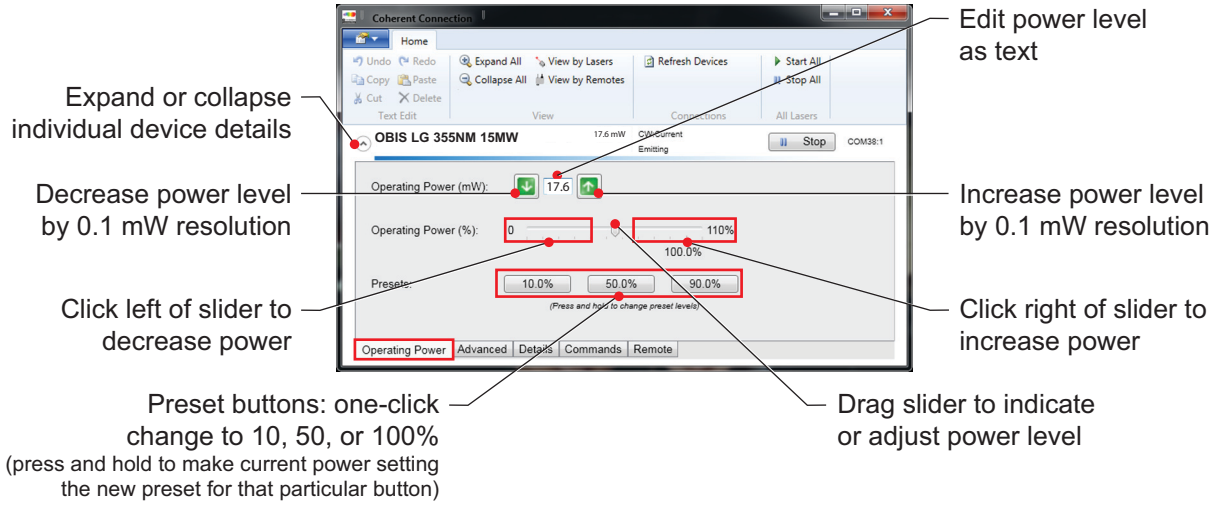


Figure 8-15. Coherent Connection - Operating Power Tab

Figure 8-16 shows the Advanced tab. On this page of the software, you can select the Operating mode, enable or disable the CDRH delay, Auto Start, Blanking, as well as reset the laser or factory calibration settings,

Note that recalibration requires the laser to be updated to the most current firmware.

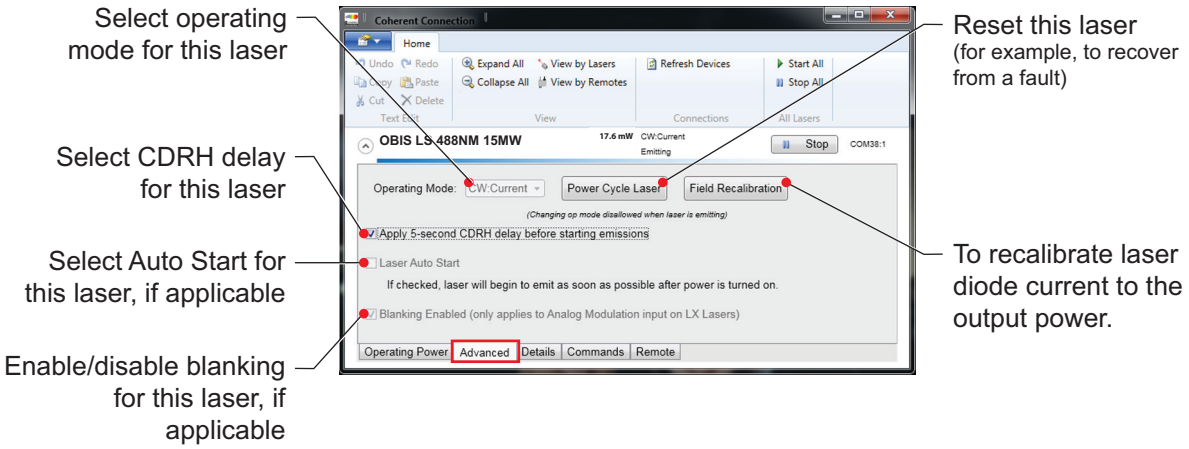


Figure 8-16. Coherent Connection - Advanced Tab

Figure 8-17 shows the Details tab. On this page of the software, you can view the model, serial number, and other information specific to the laser.

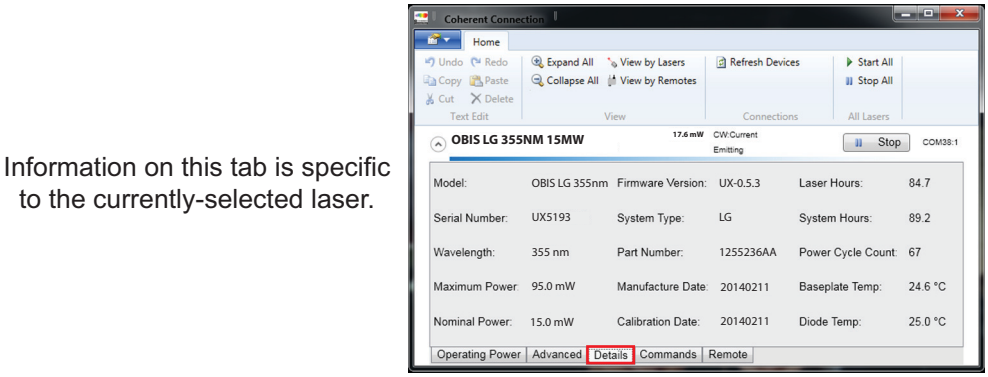


Figure 8-17. Coherent Connection - Details Tab

Figure 8-18 shows the Commands tab. You can view commands and responses, or enter commands to control the laser.

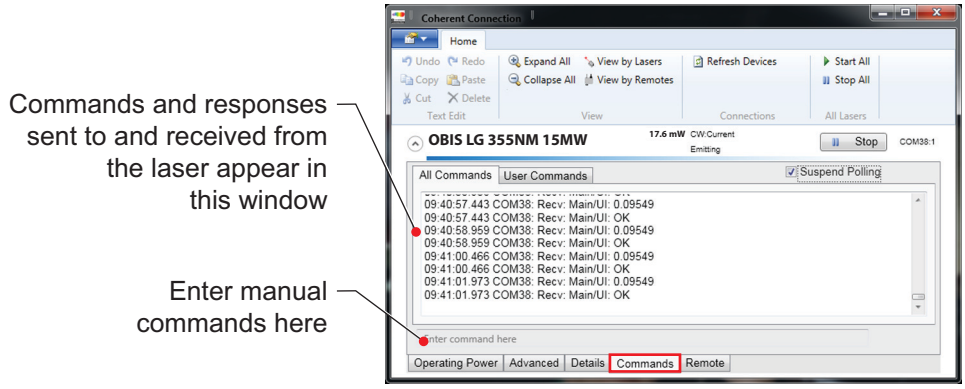


Figure 8-18. Coherent Connection - Commands Tab

Figure 8-19 shows the Remote tab. On this page of the software, you can enable settings to start all lasers on power-up, as well as select the input impedance for Analog Modulation mode.

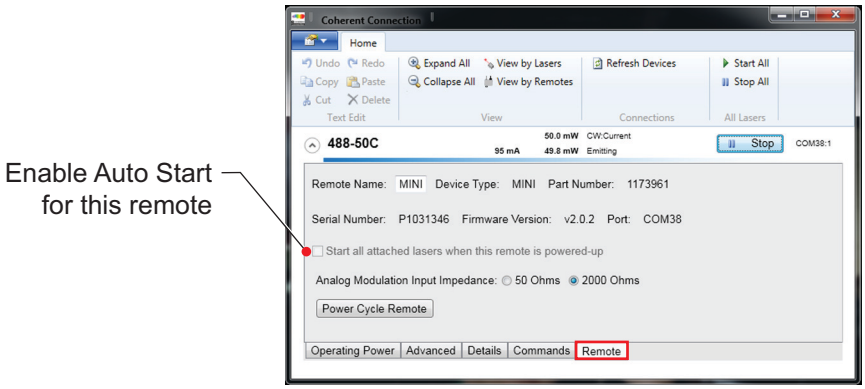


Figure 8-19. Coherent Connection - Remote Tab

8.3.1 OBIS LX Single-Frequency and Coherent Connection

To fine-tune the wavelength of the OBIS LX-SF (Single-Frequency) laser, use the Power tab to:

- Adjust the diode temperature
- Adjust the diode current by adjusting the operating power
- Or a combination of both

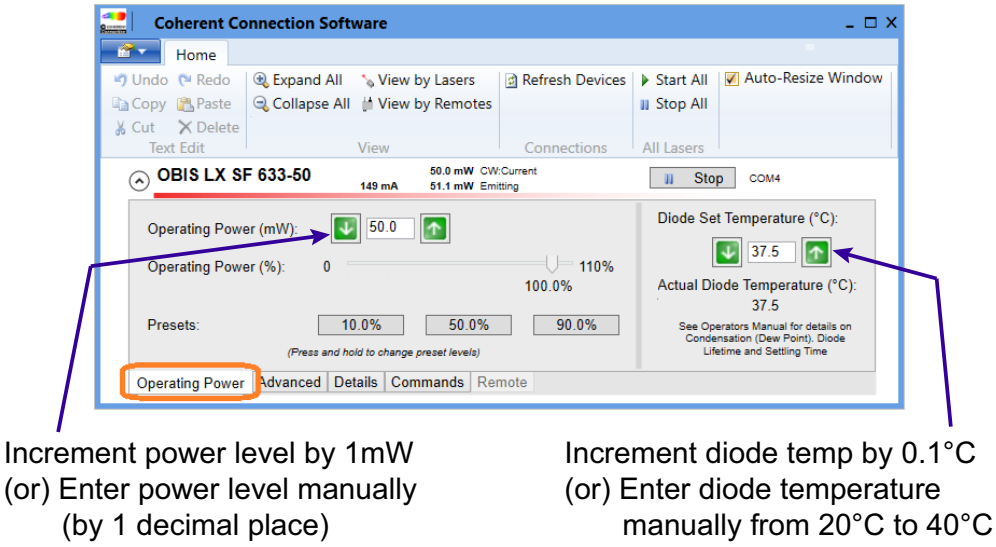


Figure 8-20. OBIS LX-SF Tune Wavelength

NOTICE

Ensure that the laser is running in 'CW:Current' (constant current mode).

Figure 8-21 shows the emission status of the laser.

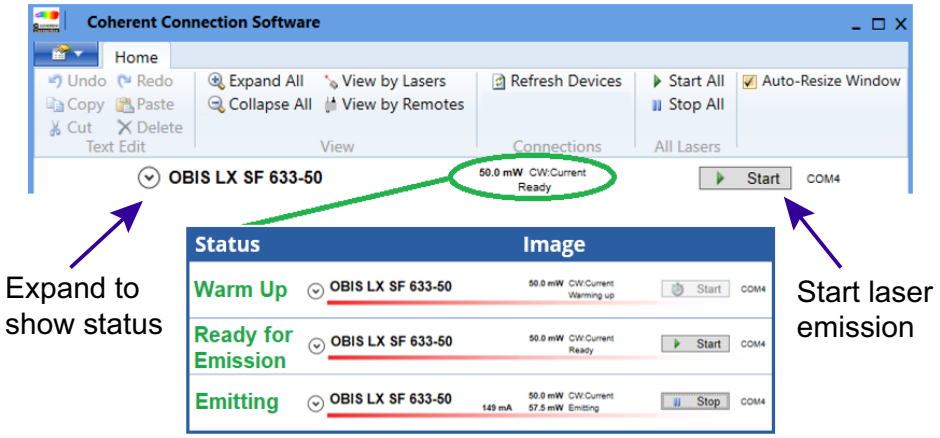


Figure 8-21. OBIS LS-SF Emission Status

I APPENDIX - LASER SAFETY AND COMPLIANCE

This section describes critical safety information about:

- Hazards (this page)
- Optical Safety (p. 158)
- Electrical Safety (p. 164)
- Compliance with Government Requirements (p. 170)
- Location of Safety Labels (p. 176)

Review this section thoroughly prior to operating any Coherent laser. carefully follow any safety instructions presented throughout this manual.

WARNING!
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

This user information is in compliance with the following standards for Light-Emitting Products IEC 60825-1 / EN 60825-1 *"Safety of laser products - Part 1: Equipment classification and requirements"* 21 CFR Title 21 Chapter 1, Subchapter J, Part 1040 *"Performance standards for light-emitting products"*.

WARNING!
LASER RADIATION - AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION CLASS 3B LASER PRODUCT!

I.1 Hazards

Hazards associated with lasers generally fall into the following categories:

- Biological hazards from exposure to laser radiation that may damage the eyes or skin

- Electrical hazards generated in the laser power supply or associated circuits
- Chemical hazards resulting from contact of the laser beam with volatile or flammable substances, or released as a result of laser material processing

The above list is not intended to be exhaustive. Anyone operating the laser must consider the interaction of the laser system with its specific working environment to identify potential hazards.

I.2 Optical Safety

Laser light, because of its optical qualities, poses safety hazards not associated with light from conventional light sources. The safe use of lasers requires all operators, and everyone near the laser system, to be aware of the dangers involved. Users must be familiar with the instrument and the properties of coherent, intense beams of light.

The safety precautions listed below are to be read and observed by anyone working with or near the laser. At all times, ensure that all personnel who operate, maintain or service the laser are protected from accidental or unnecessary exposure to laser radiation exceeding the accessible emission limits defined in the laser safety standards.

WARNING!
Direct eye contact with the output beam from the laser may cause serious eye injury and possible blindness.

The greatest concern when using a laser is eye safety. In addition to the main beam, there are often many smaller beams present at various angles near the laser system. These beams are formed by specular reflections of the main beam at polished surfaces such as lenses or beam splitters. While weaker than the main beam, such beams may still be sufficiently intense to cause eye damage.

Laser beams are powerful enough to burn skin, clothing, or combustible materials, even at some distance. They can ignite volatile substances such as alcohol, gasoline, ether, and other solvents, and can damage light-sensitive elements in video cameras, photomultipliers, and photodiodes. Follow the control measures described in the sections that follow.

I.2.0.1 Recommended Precautions and Guidelines

Following are recommended precautions and guidelines:

1. Observe all safety precautions in the pre-installation and operator's manuals.
2. Always wear appropriate eyewear for protection against the specific wavelengths and laser energy being generated. See "Laser Safety Eyewear" (p. 160) for additional information.
3. Avoid wearing watches, jewelry, or other objects that may reflect or scatter the laser beam.
4. Stay aware of the laser beam path, particularly when external optics are used to steer the beam. See "Appendix - Laser Back Reflection" (p. 147) for more detailed information about Laser Back Reflection.
5. Provide enclosures for beam paths whenever possible.
6. Use appropriate energy-absorbing targets for beam blocking.
7. Block the beam before applying tools such as Allen wrenches or ball drivers to external optics.
8. Limit access to the laser to trained and qualified users who are familiar with laser safety practices. When not in use, lasers should be shut down completely and made off-limits to unauthorized personnel.
9. Terminate the laser beam with a light-absorbing material. Laser light can remain collimated over long distances and therefore presents a potential hazard if not confined. It is good practice to operate the laser in an enclosed room.
10. Post laser warning signs in the area of the laser beam to alert those present.
11. Exercise extreme caution when using solvents in the area of the laser.
12. Never look directly into the laser light source or at scattered laser light from any reflective surface, even when wearing laser safety eyewear. Never sight down the beam.
13. Set up the laser so that the beam height is either well below or well above eye level.
14. Avoid direct exposure to the laser light. Laser beams can easily cause flesh burns or ignite clothing.
15. Advise all those working with or near the laser of these precautions.

I.2.1 Laser Safety Eyewear

Always wear appropriate laser safety eyewear for protection against the specific wavelengths and laser energy being generated. The appropriate eye protection can be calculated as defined in the "EN 207 Personal eye protection equipment—Filters and eye-protectors against laser radiation (laser eye-protectors)", in other national or international standards (such as ANSI, ACGIH, or OSHA) or as defined in national safety requirements.

CAUTION!

Laser safety eyewear protects the user from accidental exposure to laser radiation by blocking light at the laser wavelengths. However, laser safety eyewear may also prevent the operator from seeing the beam or the beam spot. Exercise extreme caution even while wearing safety glasses.

I.2.2 Viewing Distance

The OBIS Laser produces optical power levels that are dangerous to the eyes and skin if exposed directly or indirectly. This product must be operated only when using proper eye and skin protection at all times. Never view directly emitted or scattered radiation with unprotected eyes.

Table I-1 summarizes the Maximum Permissible Exposure (MPE) levels as specified in IEC 60825-1 at a 100 second time base for the nominal wavelength (respectively, the nominal fundamental wavelength).

This applies to OBIS LX (Diode) and OBIS LX FP (Diode, Pigtailed) Laser***s.***

Table I-1. Maximum Emission of OBIS LX Lasers

Wave-length Class	Power Class	Wavelength	Max. Power
375 nm	≤ 50 mW	0.36 – 0.39 µm	≤ 100 mW
405 nm	≤ 400 mW	0.39 – 0.42 µm	≤ 490 mW
422 nm	≤ 100 mW	0.40 – 0.44 µm	≤ 200 mW
445 nm	≤ 400 mW	0.43 – 0.46 µm	≤ 490 mW

Table I-1. Maximum Emission of OBIS LX Lasers

Wave-length Class	Power Class	Wavelength	Max. Power
458 nm	≤ 400 mW	0.44 – 0.47 µm	≤ 490 mW
473 nm	≤ 200 mW	0.46 – 0.49 µm	≤ 300 mW
488 nm	≤ 200 mW	0.47 – 0.50 µm	≤ 300 mW
505 nm	≤ 100 mW	0.49 – 0.52 µm	≤ 200 mW
514 nm	≤ 50 mW	0.50 – 0.53 µm	≤ 100 mW
522 nm	≤ 50 mW	0.51 – 0.54 µm	≤ 100 mW
637 nm	≤ 200 mW	0.63 – 0.65 µm	≤ 300 mW
640 nm	≤ 200 mW	0.63 – 0.65 µm	≤ 300 mW
647 nm	≤ 100 mW	0.63 – 0.66 µm	≤ 200 mW
660 nm	≤ 100 mW	0.64 – 0.68 µm	≤ 200 mW
685 nm	≤ 100 mW	0.67 – 0.70 µm	≤ 200 mW
730 nm	≤ 100 mW	0.71 – 0.75 µm	≤ 200 mW
785 nm	≤ 100 mW	0.77 – 0.80 µm	≤ 200 mW
808 nm	≤ 150 mW	0.79 – 0.82 µm	≤ 250 mW
980 nm	≤ 150 mW	0.97 – 0.99 µm	≤ 250 mW

With the maximum power according to Table I-1 with an M^2 of 1 and a nominal beam diameter of 0.7 mm, the direct beam of the listed models can result in Nominal Ocular Hazard Distances (NOHDs). These distances can be up to 600 meters for the unaided eye (7 mm pupil diameter).

If the view is aided by magnifying tools with an entrance aperture of 50 mm diameter, the resulting Extended Ocular Hazard Distance (EOHD) reaches up to 4 km. The excess of the skin's MPE can occur within distances of up to 30 m.

Any modification of the beam's properties with external optics has direct influence on these distances and can result in even longer ranges. For these reasons, it is strongly recommended that you confine the beam and operate it only in enclosed rooms, using appropriate laser safety precautions.

I.2.3 Maximum Accessible Radiation Level

The OBIS System may emit VISIBLE or INVISIBLE LASER RADIATION over wavelengths of 0.45 to 1.2 mm from the aperture in the front of the laser, with a maximum of 480 mW continuous wave power. The potentially accessible emissions depend on the specific model.

Table I-2 lists the applicable emission parameters for OBIS LS (OPSL) and OBIS LS FP (OPSL, Pigtailed) Lasers.

Table I-2. Maximum Emission of OBIS LS Lasers

Wavelength	Power Class	Range	Max. Power
488 nm	15, 20 mW	0.45 - 0.50 µm	< 350 mW
		0.90 - 1.00 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
	40 mW… 200 mW	0.45 - 0.50 µm	< 480 mW
		0.90 - 1.00 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
505 nm	15, 30 mW	0.49 - 0.52 µm	< 350 mW
		0.96 - 1.06 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
	40 mW… 150 mW	0.49 - 0.52 µm	< 480 mW
		0.96 - 1.06 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
514 nm	15, 20 mW	0.50 - 0.53 µm	< 350 mW
		1.00 - 1.10 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
	40 mW … 150 mW	0.50 - 0.53 µm	< 480 mW
		1.00 - 1.10 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW

Table I-2. Maximum Emission of OBIS LS Lasers (Continued)

Wavelength	Power Class	Range	Max. Power
532 nm	15, 20 mW	0.52 - 0.55 µm	< 350 mW
		1.00 - 1.10 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
	40 mW … 200 mW	0.52 - 0.55 µm	< 480 mW
		1.00 - 1.10 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
552 nm	15, 20 mW	0.53 - 0.57 µm	< 350 mW
		1.00 - 1.20 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
	40 mW… 200 mW	0.53 - 0.57 µm	< 480 mW
		1.10 - 1.20 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
561 nm	15, 20 mW	0.53 - 0.57 µm	< 350 mW
		1.10 - 1.20 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
	40 mW… 200 mW	0.53 - 0.57 µm	< 480 mW
		1.10 - 1.20 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
594 nm	15, 20 mW	0.58 - 0.61 µm	< 350 mW
		1.15 - 1.21 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW
	40 mW … 100 mW	0.58 - 0.61 µm	< 480 mW
		1.15 - 1.21 µm	< 50 mW
		0.79 - 0.82 µm	< 20 mW

I.3 Electrical Safety

The OBIS Lasers do not have dangerous voltages.

DO NOT disassemble the enclosure. There are no user serviceable components in the controller or laser head. All units are designed to be operated as assembled. ***The Warranty will be voided if the laser head, the controller, or the cable is disassembled.***

CAUTION!

Electrostatic charges as high as 4000 volts easily collect on the human body and equipment and can discharge without detection.

Although the electronics features have input protection, permanent damage can occur on devices subjected to high-energy electrostatic discharges. You must take correct ESD precautions to prevent damage or performance degradation.

The most common ESD damage occurs when handling a device during installation or use. Take the necessary measures to protect the system from ESD.

Dry air and carpet also create a higher potential for ESD. Remember to take precautions or shielding not only for operations, but for demonstrations or trade show exhibitions.

I.3.1 Precautions and Guidelines

The following precautions must be observed by everyone when working with potentially hazardous electrical circuitry:

DANGER!

When working with electrical power systems, the rules for electrical safety must be strictly followed. Failure to do so could result in the exposure to lethal levels of electricity.

1. Disconnect power before working on any electrical equipment when it is not necessary for the equipment to be operating.
2. Do not short or ground the power supply output. Protection against possible hazards requires proper connection of the ground terminal on the power cable, and an adequate external ground. Check these connections at the time of installation, and periodically thereafter.

3. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment, and who is competent to administer first aid.
4. When possible, keep one hand away from the equipment to reduce the danger of current flowing through the body if a live circuit is touched accidentally.
5. Always use approved, insulated tools.

I.3.2 Safety Features

The OBIS family of products has been certified by an outside testing lab to be in compliance with the environmental and safety directives listed in this section.

NOTICE

Use of the system in a manner other than that described herein may impair the protection provided by the system. *Do not use the OBIS Laser or Controller if they are damaged*.

I.3.3 Laser Emission and Classification

Governmental standards and requirements specify that the laser must be classified according to the output power or energy and the laser wavelength.

The OBIS Laser is classified by the United States National Center for Device and Radiological Health (CDRH) as Class 3B based on 21 CFR, Subchapter J, Part 1040, section 1040.10 (c) and/or IEC/EN 60825-1, Clause 5. In this manual, the classification will be referred to as Class 3B.

It may emit VISIBLE or INVISIBLE LASER RADIATION wavelengths of 0.3 to 1.0 µm from the aperture in the front of the laser.

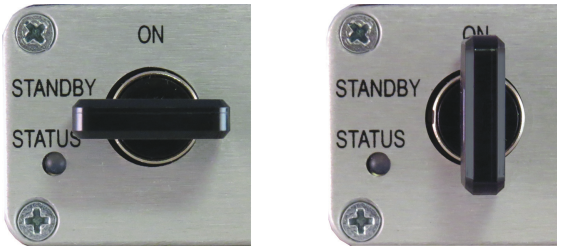
I.3.4 Protective Housing

Laser radiation is fully contained within a protective housing, other than for the laser beam aperture (OBIS without fiber) or the fiber exit (OBIS with fiber). ***Never open the protective housing***.

WARNING!
Use of controls or adjustments or performance of procedures other than those specified in the manual may result in hazardous radiation exposure.

I.3.5 Key Control

The OBIS 6-Laser Remote has a keyswitch that, in STANDBY position, prevents the generation of laser radiation. Laser radiation can occur when the key is in the ON position. The key is removable when in the STANDBY position, but *not* in the ON position, as shown in Figure I-1.



STANDBY Position *ON Position*

Figure I-1. OBIS Remote Keyswitch

The keyswitch acts as the CDRH Manual Reset feature. After an interlock fault or power interruption, the laser will not auto restart (the Status LED indicator will be blinking blue), unless the keyswitch is first reset to STANDBY and then set back to ON. Figure I-6 shows the keyswitch circuit information.

WARNING!
When the keyswitch is in the ON position and the interlock plug is connected, there can be laser emission.

The Status light emitting diode (LED) indicator on the front panel displays green, blue, or red, as determined by the state of the OBIS Remote. For additional information about laser status LEDs, see "OBIS Laser and Remote Status Indicators" (p. 17).

Table I-3 lists the LED indicator on the OBIS 6-Laser Remote. For more information about operation of this Remote, see Part 2 of the *OBIS LX/LS Operator's Manual*.

Table I-3. OBIS Remote Keyswitch Status LED Indicator

LED Color	Keyswitch Position	Interlock Status
Yellow	Not Applicable - Initialization	Not Applicable
Blinking Blue	Error: Keyswitch was ON at power-up. Toggle keyswitch back to STANDBY to clear the error.	Not Applicable
Blue	STANDBY	Not Applicable
Green	ON	Closed
Red	ON	Interlock Open, causing a Fault

NOTE:
OBIS Single-Laser Remote units shipped before 2012 may not have the Status LED indicator that has been incorporated into the latest design.

I.3.6 Laser Emission Indicator

The laser system OBIS 1-Laser Remote includes a laser emission indicator as shown in Figure I-2. This is labeled ‘CAUTION’ on the front panel.

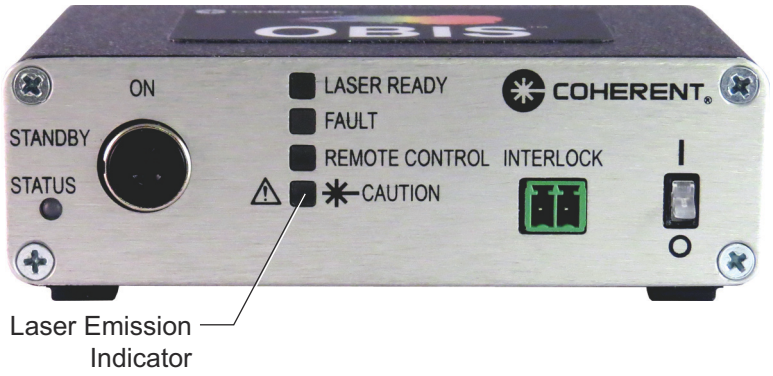


Figure I-2. Laser Emission Indicator

- When the white LED emission indicator is not illuminated, laser radiation is not possible.
- When the indicator is illuminated, consider the laser dangerous. A laser beam can be created at any moment (by computer control, for example).

After the illumination of the white LED emission indicator, there is a delay until actual laser emission. This delay gives time to take action to prevent exposure to the laser beam. The delay is at least five seconds.

NOTICE

The LED indicator on the front panel of the OBIS 6-Laser Remote is NOT a laser emission indicator, but an indicator for the status of the Remote.

For the OBIS 6-Laser Remote, the laser emission indicators are the illuminated Power ON/OFF switches that indicate there is power and possible laser emission for each channel. Each laser has its own indicator, as shown in Figure I-3.

Figure I-3. OBIS 6-Laser Remote Power ON/OFF Switches

I.3.7 Shutter

The OBIS Laser has a manually-operated shutter at the beam exit aperture on the front of the laser, as shown in Figure I-4.

When the shutter is closed, there is no laser radiation sent from the laser.

The OBIS fiber-pigtailed laser has a metal shutter cap (rather than a mechanical shutter), as shown in Figure I-5. When the shutter cap is closed, there is no laser radiation sent from the laser.

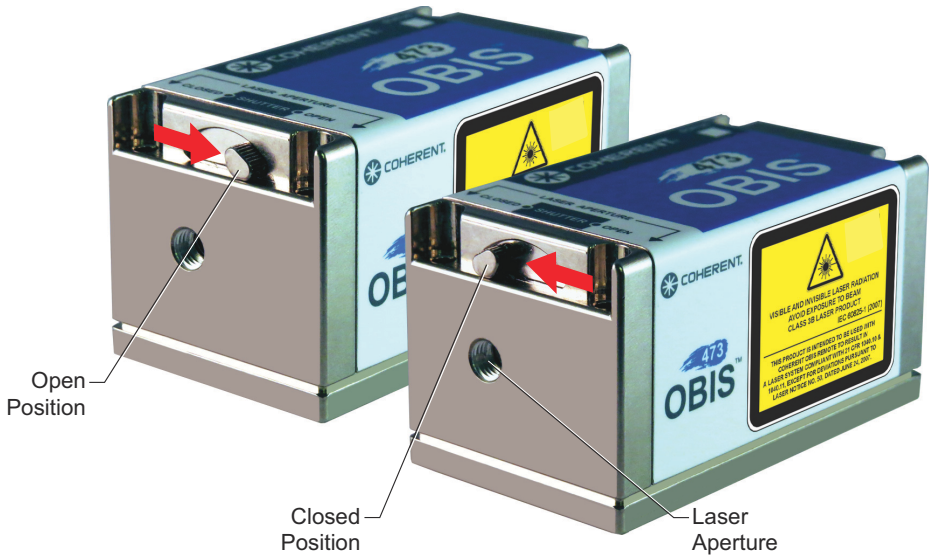


Figure I-4. Shutter in Open and Closed Positions

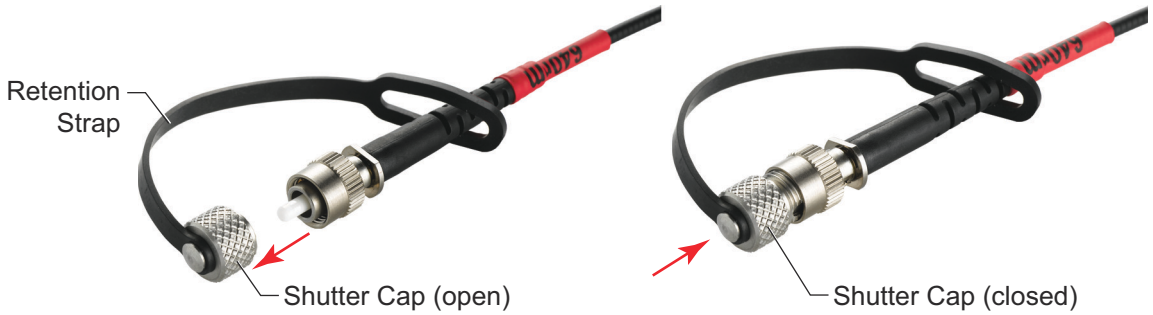


Figure I-5. OBIS FP Shutter Cap in Open and Closed Position

CAUTION!

OBIS FP (fiber pigtail): Always use Nitrile gloves when handling the fiber—DO NOT touch the laser fiber output!

OBIS FP: Open fiber end in an environment that is free of organic material and particulates. The fiber end is susceptible to contamination that can cause fiber degradation.

Before the laser is turned ON, the surface of the fiber tip must be checked for contamination. If contamination cannot be excluded, the fiber tip must be cleaned using designated tools for fiber cleaning that do not damage the fiber tip.

For more information, refer to “Step 8: Clean the OBIS Fiber Tip” (p. 53).

I.3.8 Remote Interlock

The OBIS Remote, the OBIS 6-Laser Remote, the OBIS Scientific Remote, and the OBIS Laser Box have a remote interlock circuit that, when open, prevents the generation of laser radiation. This interlock circuit is fail-safe or redundant.

Figure I-6 shows a diagram of the remote interlock circuit configuration. The remote interlock is applicable to OBIS LX and OBIS LS systems.

I.3.9 CW-Only-Mode Versions for OBIS LX Lasers

If your OBIS LX laser is a **CW-Only-Mode** laser and/or the Serial Number has 'CW' in the number, then the laser is intended to be operated only in the CW-Power mode or CW-Current mode.

CAUTION!
If you have a CW-Only-Mode laser, then:
*** Do *not* operate the laser in Analog Modulation Mode!**
*** Do *not* operate the laser in Digital Modulation Mode!**
*** Do *not* operate the laser in Mixed Modulation Mode!**

If the CW-Only-Mode laser is set to a Modulation Mode, the laser output power could be a maximum of 110%.I

NOTICE
The customer provided modulation input signals will not change the potential maximum 110% output power condition when laser emission is enabled.

CW-Only-Mode laser can be operated as described in this Operator's Manual using Coherent Connection, an OBIS Remote, or USB communication to turn the laser ON and OFF to control emissions.

I.4 Compliance with Government Requirements

The OBIS Laser is an OEM product designed to be integrated into other equipment, and as a standalone part, may not comply with some government requirements, as described in this section.

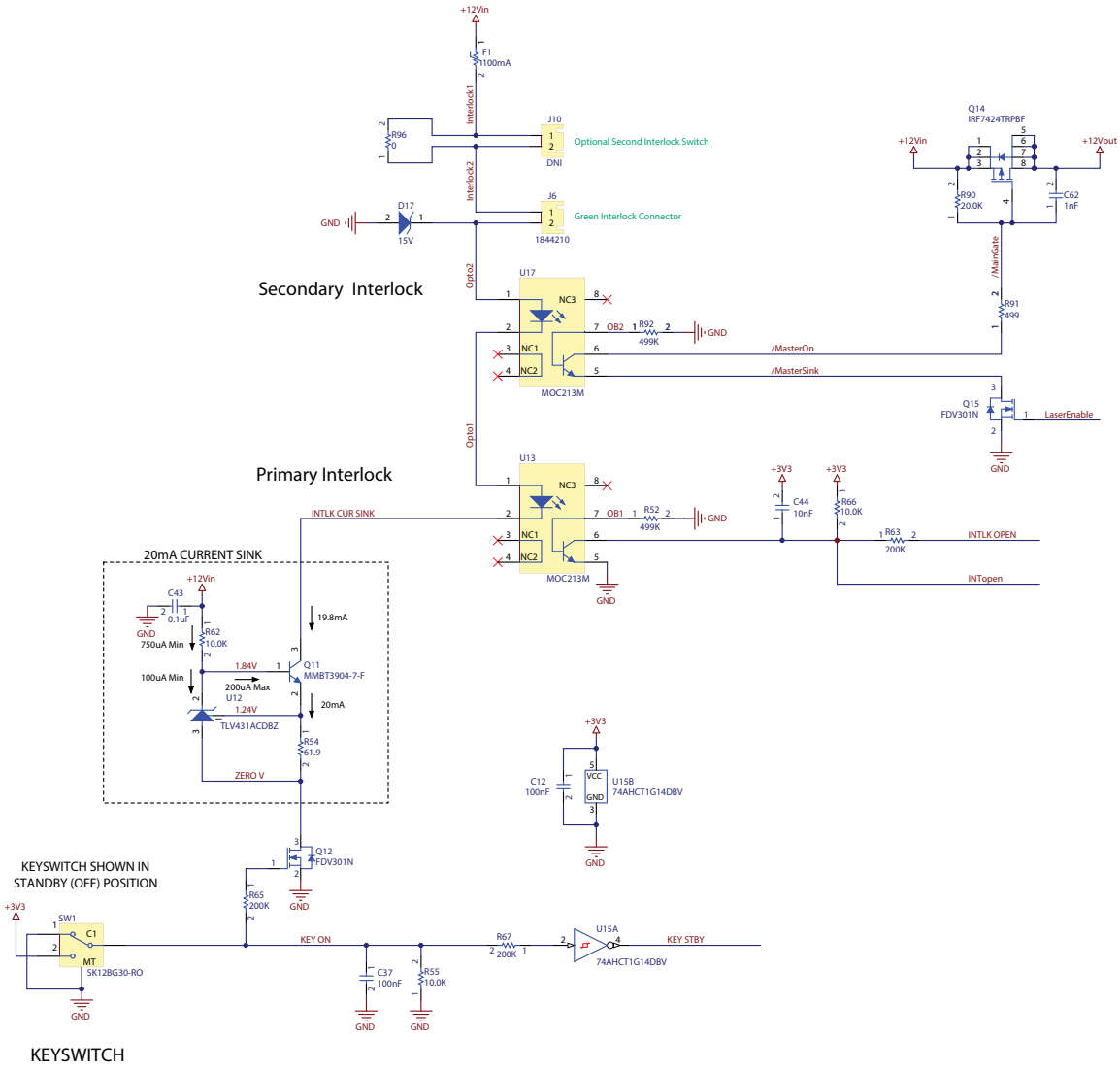


Figure I-6. Remote Interlock Circuit and Keyswitch Diagram for Controllers

The following government requirements must be considered in the process of integrating the OBIS Laser product.

I.4.1 CDRH/IEC 60825-1 Compliance

When used with the OBIS Remote, the OBIS Laser complies with Center for Devices and Radiological Health (CDRH) (21 CFR 1040.10 and 1040.11, except for deviations pursuant to laser notice no. 50, dated July26, 2001) and International Electrotechnical Commission (IEC) 60825-1.

I.4.1.1 Europe

The European Community requirements for product safety are specified in the Low Voltage Directive (LVD) (published in 2014/35/EU).

The Low Voltage Directive requires that lasers comply with the standard EN 61010-1/IEC 61010-1 'Safety Requirements For Electrical Equipment For Measurement, Control and Laboratory Use' and EN 60825-1/ IEC 60825-1 'Safety of Laser Products'.

Compliance of this laser with the European and UKI requirements (apart from EN60825-1/IEC60825-1) is certified by the CE and UKCA Marks.

I.4.1.2 United States

The applicable United States Government requirements are contained in 21 CFR, Subchapter J, Part 1040 administered by the Center for Devices and Radiological Health (CDRH).

For OBIS LX and OBIS LS lasers, the CDRH Accession Number is 1110019 (current as of the publication date of this document).

CAUTION!
As a stand-alone product, the laser does not fully comply with requirements for certified laser products as defined in the US FDA CFR 21, sections 1040.10 and 1040.11, or the IEC 60825-1:2014 standard.

This laser system is not intended to be used as a stand-alone application. Instead, it can be used with an OBIS Remote or integrated into a laser product by an OEM using appropriate end-user safety mechanisms. It is the responsibility of the integrator to meet all CDRH/IEC compliance requirements.

When used with a Coherent OBIS Remote, this combination results in a laser system that conforms to performance standards for laser products under 21 CFR 1040, except with respect to characteristics authorized by Variance #FDA-2017-V-2596, dated 23 May 2017.

I.4.2 Declaration of Conformity

Declaration of Conformity certificates are available upon request. Contact your Coherent representative or Coherent Technical Support as follows:

- By email: customer.support@coherent.com
- Visit our website: www.Coherent.com

- By phone: +**1-(734) 456-3100**

I.4.3 Environmental and Safety Compliance

In addition to complying with CDRH and IEC 60825-1 requirements, the OBIS family of products has been certified by an outside testing lab to be in compliance with the environmental and safety directives listed in this section.

I.4.3.1 EMI Standard for Emissions per:

CISPR 11:2015 + A1:2016 (for OBIS LS)
Class A Radiated Emissions

CISPR 11:2015 + A1:2016 (for OBIS LS)
Class A Conducted Emissions

IEC61000-3-2:2014
Power Line Harmonics

IEC 61000-3-3:2013
Power Line Voltage Fluctuation and Flicker

I.4.3.2 EMC Standard for Immunity per:

IEC 61326-1:2012

IEC 61000-6-2:2005
Electrostatic Discharge – Performance Criteria B
Radiated Immunity – Performance Criteria A
Electrical Fast Transient Immunity – Performance Criteria B
Electrical Slow Transient Immunity – Performance Criteria B
Conducted RF Immunity – Performance Criteria A
Power Line Interruptions, Dips, and Dropouts – Performance Criteria B

I.4.3.3 Low Voltage Directive 73/23/EEC Tests per:

EN61010-1:2010
Safety Requirements Part 1: General Requirements

I.4.3.4 Machinery Directive for Laser Devices Tests per:

IEC 60825-1:2014
Safety of Laser Products – Part 1: Equipment Classification Requirement and User's Guide

IEC 60825-2:2005
Safety of Laser Products – Part 2: Safety of Optical Fiber Communication Systems

IEC 60825-12:2004
Safety of Laser Products – Part 12: Safety of Free Space Optical Communication Systems Used for Transmission of Information

21CFR 1040.10
Code of Federal Regulations Title 21 - FDA

I.4.4 CE and UKCA Marking

The European Community requirements for product safety are specified in the Low-Voltage Directive (LVD) (published in 2014/35/EU).

This Directive requires that lasers comply with the standard EN 61010-1/ IEC 61010-1 "Safety Requirements For Electrical Equipment For Measurement, Control and Laboratory Use" and EN 60825-1/IEC 60825-1 'Safety of Laser Products'. Compliance with the European requirements is certified by CE and UKCA Marking.

I.4.5 REACH

Coherent product(s) conform to all applicable requirements of the EU-REACH Regulation, (1907/2006). Compliance Declarations are available upon request.

I.4.6 RoHS Compliance

The RoHS directive restricts the use of certain hazardous substances in electrical and electronic equipment.

Coherent product(s) conform to all applicable requirements of the EU-RoHS Directive (2011/65/EU) and Amendment Directive (EU) 2015/863. Compliance Declarations are available upon request.

Compliance with the EMC requirements is certified by the CE mark.

I.4.7 China RoHS Compliance

Coherent product(s) conform to all applicable requirements of Restriction of Hazardous Substances Regulation SJ/T 11364-2014, commonly referred to as China RoHS.

Hazardous substances (if applicable) in the OBIS Laser System are listed on the label, shown in the example in Figure I-7.

Figure I-7. China RoHS Table of Restricted Hazardous Substances

Also, the China RoHS directive requires that the date of manufacture (in Chinese characters) for the OBIS Laser System be shown on the product. This is done on the conforming/nonconforming label, shown in Figure I-8.

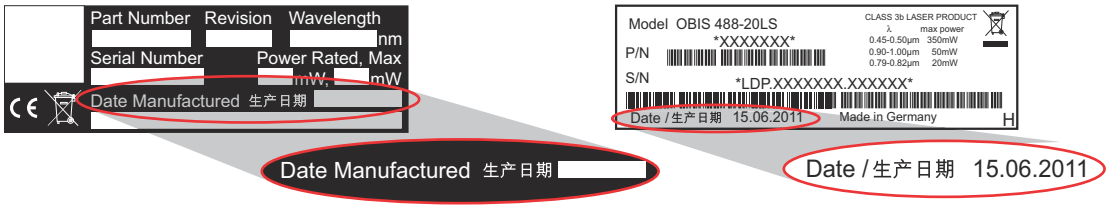


Figure I-8. China RoHS Date of Manufacture

I.4.8 Waste Electrical and Electronic Equipment (WEEE)

Coherent product(s) conform to all applicable requirements of the EU Waste Electrical and Electronic Equipment (WEEE)- Directive (2012/19/EU). WEEE management also covers EU Directive 2006/66/EC-EU Battery Directive and Directive 94/62/EC on Packaging and Packaging Waste.

The purpose of the European Waste Electrical and Electronic Equipment (WEEE) Directive is to minimize the disposal of WEEE as unsorted municipal waste and to facilitate its separate collection. The crossed-out garbage container label, shown in Figure I-9, is affixed to the cover of the OBIS Laser.

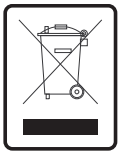


Figure I-9. Waste Electrical and Electronic Equipment Label

Do not dispose of these products or packaging as unsorted municipal waste. Contact Coherent or the local distributor for procedures for recycling this equipment. For further information about Coherent Compliance, please visit:
https://www.coherent.com/company/environmental

I.5 Safety Labels

The following figures show the location of product labels. These include warning labels indicating apertures through which laser radiation is emitted, as well as labels of certification and identification [21 CFR § 1040.10(g), 21 CFR § 1010.2, and 21 CFR § 1010.3/ EN 60825-1/IEC 60825-1, Clause 7].

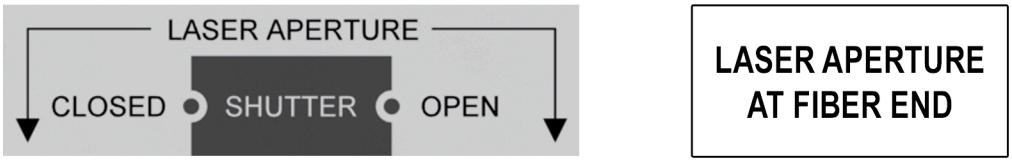
Figure I-10 shows the location of the safety labels on the OBIS laser.

Figure I-10. Safety Labels on the OBIS Laser

Figure I-11 shows the wording on the Laser Safety label.

Figure I-11. Laser Safety Label

Figure I-12 shows labels that indicate locations for the laser aperture.



OBIS OBIS FP

Figure I-12. Labels for Laser Aperture Locations

Figure I-13 shows examples of product-specific information, including the part number, serial number, date of manufacture, power and wavelength for each laser.

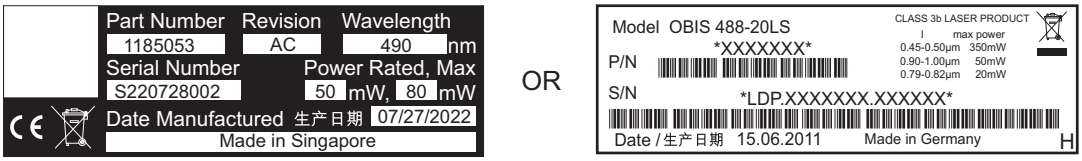


Figure I-13. Product-Specific Information Examples

II APPENDIX - LASER BACK REFLECTION

This section describes laser back reflection and tells how to prevent damage or noise caused by back reflection.

NOTICE

***Back reflection* (also referred to as *retroreflection*) occurs when a part of the laser beam is sent back into the laser's exit aperture. Back reflection can be caused by any object in front of the laser and can result in instability, noise, or damage to the laser.**

In a normal application the laser beam exits the beam aperture and none of the light from the laser is reflected back. Ideally 100% of the output power from the laser is used in the application and none of the light is scattered or sent back into the laser exit aperture.

WARNING!

Always wear correct laser safety eyewear and follow laser safety precautions when using the procedures described in this document.

Figure II-1 shows the location of the laser exit aperture on some Coherent products.

The amount of back reflection that can damage a laser diode changes from device-to-device. Sometimes a back reflection as low as 4% of the total beam power is sufficient to cause damage.

Damage from back reflection can be immediate, or it can be subtle and slowly decrease the service life of the laser.

Indications that back reflections are causing permanent damage to the laser diode include:

- No output power
- Low output power
- Over-current of the laser diode

Back reflection can also cause the output power noise (RMS noise and Peak-to-Peak noise) to increase if the reflection interferes with the laser cavity or light-loop.

Figure II-1. Examples of Exit Aperture Locations

Figure II-2 shows a laser beam hitting an object and reflecting part of the beam back into the laser exit aperture.

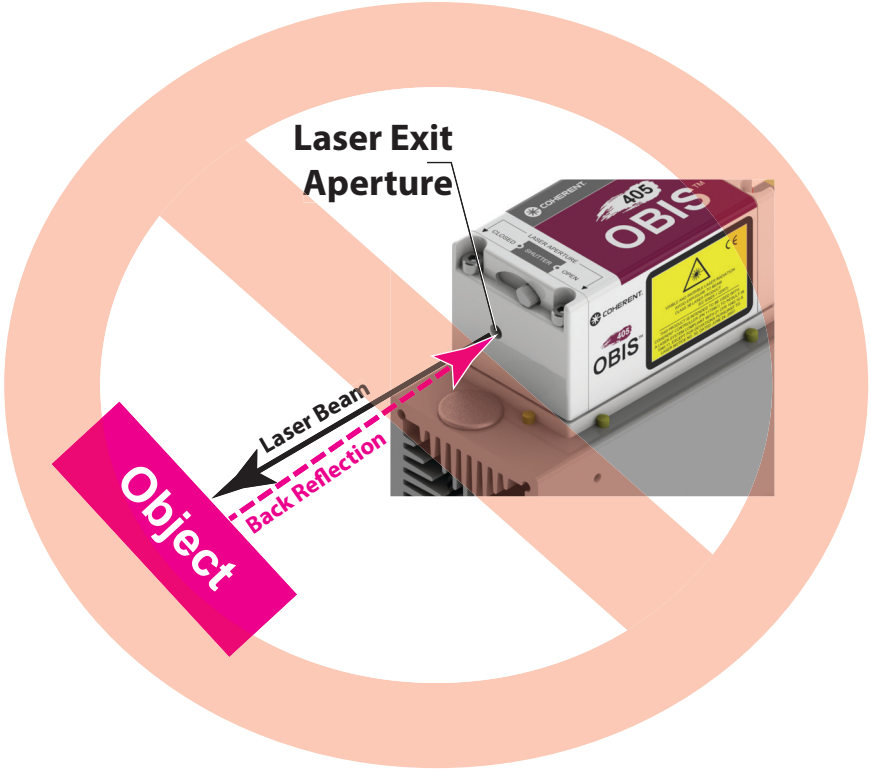


Figure II-2. Laser Back Reflection

CAUTION!

Avoid any condition where the laser beam—or any part of the laser beam—reflects back into the laser exit aperture.

Coherent recommends that the laser light be reflected away from the laser exit aperture to a safe beam dump (absorber), as shown in Figure II-3.

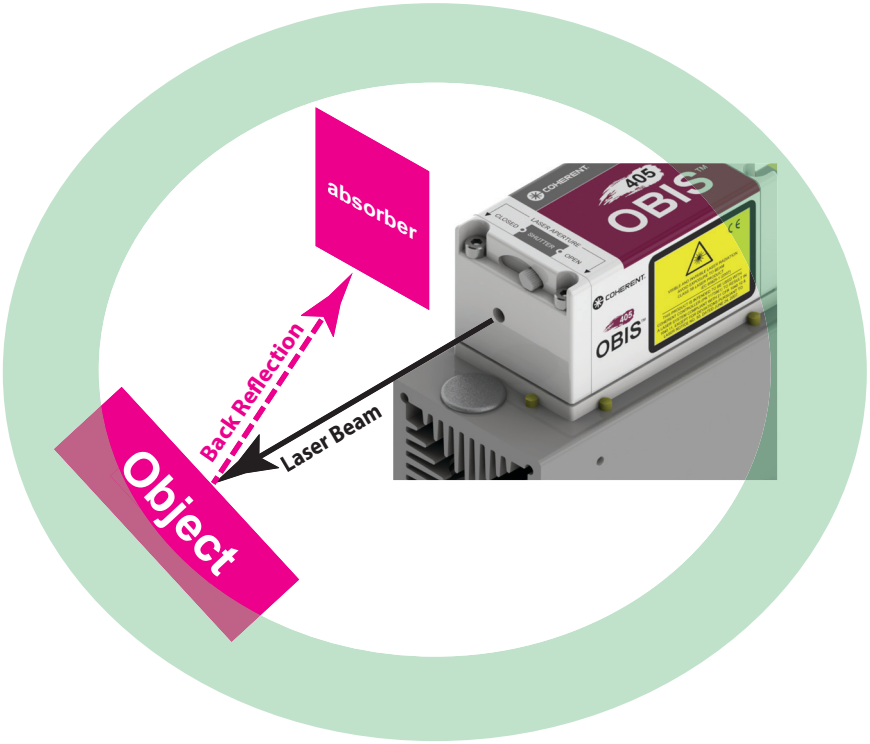


Figure II-3. Reflect Laser Light Away from Laser Exit Aperture

The following procedure describes how to prevent a strong back reflection and possible damage to the laser:

1. Use the USB or RS-232 controls to set the power at 10% of the rated output power before opening the laser aperture.
2. Do optical or laser alignment at this low output power to confirm there are no back reflections.

Sources of back reflections include:

- Fiber, Fiber Ferrule, or Fiber Connector
- Optical Filters that are not angled but are perpendicular to the beam
- Neutral Density Glass or Beam Attenuators that have a front surface reflection that can create a back reflection.
- Beam Block at normal incidence that reflects power back into the laser
- Plano-concave or Plano-convex lenses where the flat surface reflects back part of the beam
- Power measurement probes that use a reflective attenuator or have a surface that reflects the laser light.
- Mirrors or other shiny surfaces from mounts or other optical components in the beam path.

When measuring laser power with a power meter, always angle the power sensor so that the laser beam does not reflect back into the laser exit aperture.

To properly measure laser power:

1. Take the measurement near the laser.
2. Move the power sensor to maximize the reading of the output power. ***DO NOT let this movement and alignment create a back reflection***.

In many cases an object is positioned in front of the laser as a beam block. Make sure the object is not reflective and does not create a back reflection to the laser.

If you cannot adjust your application to decrease the back reflection of the laser light into the laser's exit aperture, add an optical isolator to protect the laser. Although the optical isolator adds cost and requires additional space, it can be an appropriate safety factor to increase the life of the laser.

Be aware of every optical surface in front of the laser. All object have the opportunity to create a back reflection. In many cases the front surface and the back surface of the optic are a source of back reflection. Figure II-4 shows a set-up that might cause back reflection damage.

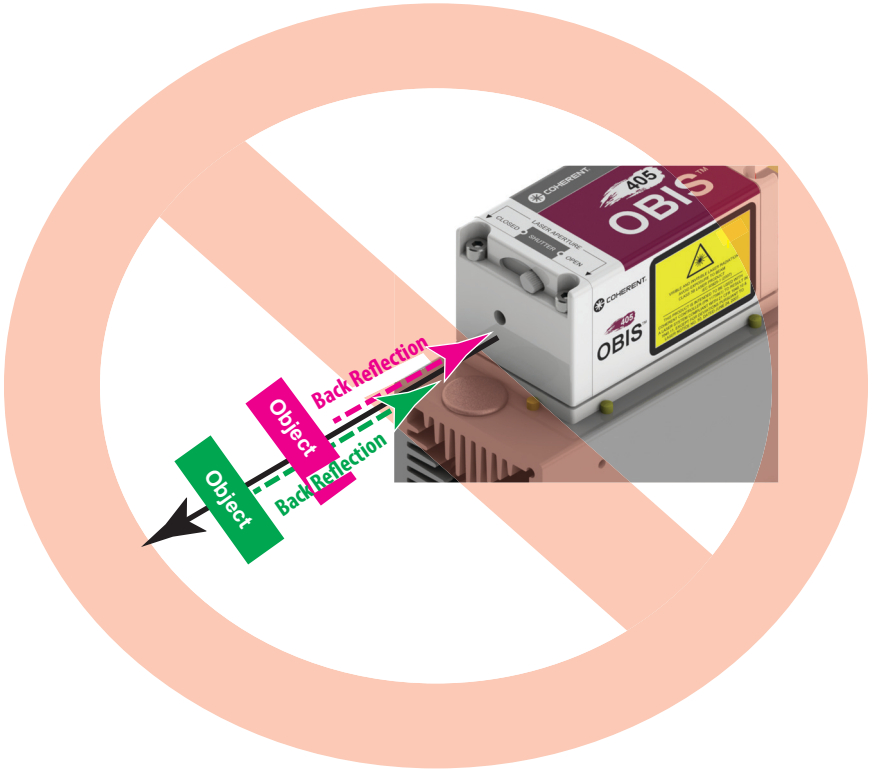


Figure II-4. Incorrect Set-Up Causes Laser Back Reflection Damage

The set-up shown in Figure II-5 is safer than the set-up in the previous illustration because both objects are set at a slight angle to the laser. This change of angle sends the back reflection away from the laser exit aperture.

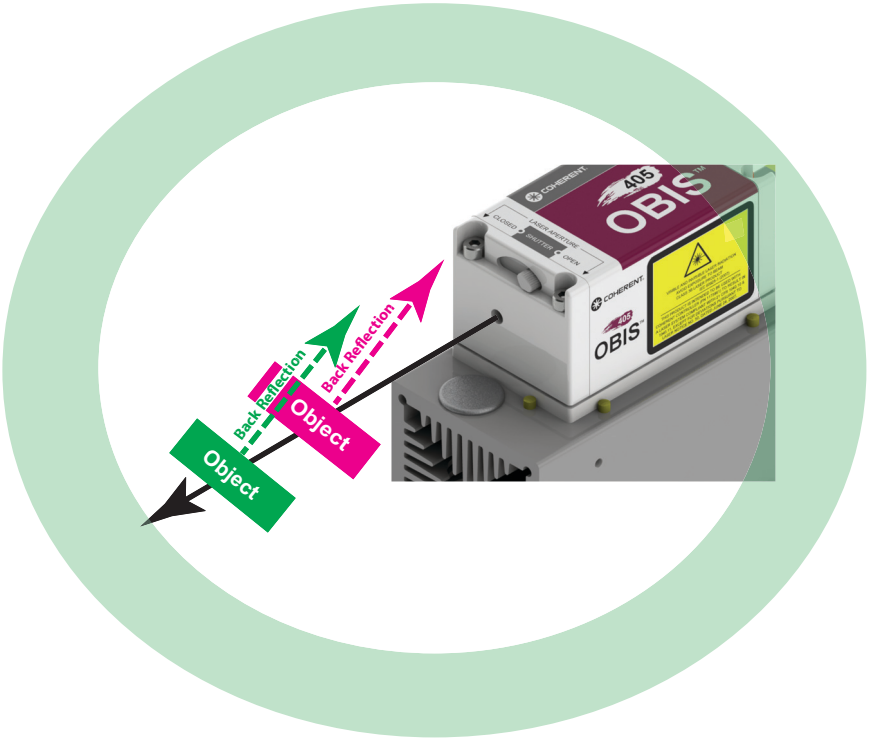


Figure II-5. Safer Laser Set-Up

With any optic or object, the angle of incident can impact the optics performance or function. Review the specifications for each optical element to understand how much angle is acceptable.

- The closer the object is to the laser, the more angle is needed to direct the back reflection away from the laser exit aperture.
- The farther the object is away from the laser, the less angle is needed to direct the back reflection away from the laser exit aperture.

The OBIS XF SF laser diode does not incorporate an optical isolator, so may be highly susceptible to extraneous optical feedback. This can cause damage that may result in a loss of power, reduction to the life of the laser, or a loss of spectral characteristics such as center wavelength and line-width.

It is highly recommended that you use an optical isolator and ensure that all reflective surfaces in the optical path are angled to avoid direct feedback into the laser.

- Turn power level down to 5-10% of nominal before beginning alignment procedure. Do not focus the light output on any highly reflective surface.
- When using wavelength-selective filters with narrow wavelength pass bands, do not align at normal incidence to the beam.
- Use caution when aligning the laser; for example, when sweeping the beam back across the laser during alignment. If such action is unavoid-

able, use a sufficient OD filter (or isolator) at the output of the laser during the alignment process.

Sufficient optical feedback to the laser overcomes the grating-induced stabilization, which unlocks and shifts the wavelength of the laser beyond the pass band of the filter. This dramatically increases the reflected intensity back into the laser and can cause damage.

II.1 Summary

- Review the objects in front of the laser and note which surfaces are a possible hazard for back reflections. Change the objects to be less reflective whenever possible. Adding Anti-Reflective (AR) coatings to optics and more diffuse surfaces to mounts or beam shutters can help.
- If possible, add an angle to the object so that the reflection does not enter the laser exit aperture.
- Take precautions when moving objects that can create a back reflection in front of the laser.
- Decrease the power from any possible back reflections by starting the laser at lower output power—for example 10% output power—before opening the laser shutter.
- ***Using correct safety precautions***, watch where the reflections from objects are returning to make sure the reflections are not at or near the laser exit aperture.
- Take extra precautions when using a laser power meter— consider how close the measurement is being taken to the laser and the angle at which the beam can reflect off the sensor so that it doesn't reflect back into the laser.
- A laser that shows low output power, no output power, over-current, or high noise, indicates a possibility that there is a back reflection to the laser.
- Add an optical isolator to those applications that have laser exit aperture back reflections that cannot be corrected by angling the optics.

III APPENDIX - PARTS & ACCESSORIES

This section lists the accessories you can order for the OBIS laser system.

Coherent product information and related software is now available in one easily accessible location on the Coherent website. Filter your search by product type, document category, or both. To download manuals and software, go to:

https://www.coherent.com/resources

Order these parts as follows:

- Send an e-mail to: customer.support@coherent.com
- Visit our website: www.Coherent.com or contact your local Coherent service representative
- By phone: **+1 (734) 456-3100**

When communicating with the Technical Support Department either via the web or telephone, the Support Engineer responding to your request requires the Coherent part number and the product serial number.

Should you need further assistance, contact Coherent Technical Support; see “Appendix - Service & Support” (p. 199).

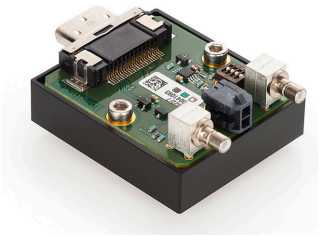
III.1 Laser System Remotes

Table III-1 lists the Remotes that you can order for the OBIS laser system.

Table III-1. Parts List: Remotes

Image	Part Number	Description
	**OBIS LX/LS Single Laser Remote** with full features for control with Analog and Digital modulation inputs. Includes USB and RS-232 connectors on the back panel of the Remote.	
	1173961	OBIS LX/LS Single Laser Remote, with Power Supply, USB cable, and Coherent Connection applications software. (No SDR Laser-to-Remote cable.)
	1214875	OBIS LX/LS Single Laser Remote, with Power Supply, 1 meter laser-to-remote (SDR) cable, USB cable, and Coherent Connection applications software.
	**OBIS LX/LS 6-Laser Remote with CDRH features**. Separate power switches and power cables for each laser. ***NOTE:*** Does not support modulation inputs.	
	1203909	OBIS LX/LS 6-Laser Remote, with Power Supply, 6 power cables from laser-to-remote, and Coherent Connection applications software.
	1306263	OBIS LX/LS 6-Laser Remote, with Power Supply and Coherent Connection applications software (no laser-to-remote power cables).
	1211389	OBIS 6-Laser Power Supply, 110V/220 VAC, 12 VDC, IEC-320 input (does not include power cord to wall; order separately)
	**OBIS LX/LS Scientific Remote** with full features for control with analog/digital inputs for up to six lasers. User interface touch screen and connectivity through USB, RS-232, and Ethernet.	
	1234465	OBIS LX/LS Scientific Remote, with internal Power Supply, and Coherent Connection applications software (no SDR Laser-to-Remote cables).
	1234466	OBIS LX/LS Scientific Remote, with internal Power Supply, 6 laser-to-remote (SDR) 1-meter cables, and Coherent Connection applications software.

Table III-1. Parts List: Remotes (Continued)

Image	Part Number	Description (Continued)
	**OBIS LX/LS Laser Box** with five laser mounting bays with thermal management, cooling fans, analog/digital inputs, RS-232, USB, key-switch, and interlock in one compact package. Lasers sold separately.	
	1228877	OBIS LX/LS Laser Box, with Power Supply, USB cable, and Coherent Connection applications software. Analog Modulation Impedance = 2k Ω, Digital Modulation Impedance = 50 Ω.
	1343229	OBIS LX/LS Laser Box, with Power Supply, USB cable, and Coherent Connection applications software. Analog Modulation Impedance = 2k Ω, Digital Modulation Impedance = 2k Ω.
	**OBIS LX/LS Modulation Interface**, Analog and Digital Modulation, SDR. Compact board-level Modulation Interface. SMB connector for Analog Modulation control input. SMB Connector for Digital Modulation control input. Plugs directly into OBIS laser.	
	1319290	OBIS LX/LS Modulation Interface, Analog and Digital Modulation, SDR. Compact and easy-to-use, this OBIS Modulation Interface offers separate SMB input for Analog and Digital Modulation. This accessory works with all OBIS LS and LX lasers. • Modulation Interface plugs directly into the OBIS Laser. • Analog Modulation can be set for a 50 Ω or 2K Ω input impedance. • Digital Modulation can be set for a 50 Ω or 2K Ω input impedance. • Digital Modulation can also be set to operate with Laser ON at 3.3 Volts or Laser ON at 5 Volts. Modulation interface must be connected to the OBIS Power Supply, sold separately to then power the interface and laser together. • Dimensions (W x H x L): 40 x 20 x 120 mm (with laser).
	1197523	OBIS SDR Cable, laser-to-remote, 0.3 meter
	1179451	OBIS SDR Cable, laser-to-remote, 1 meter
	1179858	OBIS SDR Cable, laser-to-remote, 3 meters

III.2 Accessories

Table III-2 lists the Accessories that you can order for the OBIS laser system and Remotes.

Table III-2. Parts List: Accessories

Image	Part Number	Description
	1193289	**OBIS Heatsink** with fan for thermal management, includes hardware to mount to table. Laser can be mounted on top or side for horizontal polarization. Convenient 69 mm (2.7 inch) beam height.
	1190901	**OBIS Interlock Laser Warning Light** Assy for OBIS Remote
	1190348	**OBIS Accessory Spare Parts for OBIS Remote** (includes power cable, I/O cable, keys, labels, and interlock)

III.3 Cables and Power Supplies

Table III-3 lists the cables and power supplies that you can order for the OBIS laser system.

Table III-3. Parts List: Cables and Power Supply

Part Number	Description
1184491	OBIS Power Supply, 110V/220 VAC, 12 VDC, IEC-320 input (does not include power cord to wall)
1214874	OBIS Power Supply, 110V/220 VAC, 12 VDC, IEC-320 input (includes USA power cord)

Table III-3. Parts List: Cables and Power Supply

Part Number	Description (Continued)
1190582	OBIS Power Cable to Flying Leads, 2-pin plug-and-socket
1106344	Power Cord, USA, wall plug to IEC-60320 plug, 8 foot
1150025	Power Cord, European, wall plug to IEC-60320 plug, 8 foot
2221647	Power Cord, Japan, wall plug to IEC-60320 plug, 8 foot
1108906	USB Cable, 1.8 meter (USB Type A to Type Mini B)

III.4 Bandpass Filter

OBIS LX/LS Bandpass Filter can reduce noise in fluorescent applications that are sensitive to longer wavelength emissions.

OBIS LX/LS Bandpass Filter conveniently threads into the front of the OBIS LX laser to remove long wavelength emissions. Bandpass filter is specifically mounted to avoid internal retro-reflection from the filter.

Table III-4 lists the filters that you can order for the OBIS laser.

Table III-4. Parts List: Filters

Image	Part Number	Description
	1265259	**BANDPASS FILTER, 445 nm, OBIS LX, Pass 423-468 nm** Transmission of > 90% from 423 nm to 468 nm. Blocking with < 0.01% from 500 nm to 600 nm. Damage Threshold > 1000 W/cm2 at 445 nm.
	1265260	**BANDPASS FILTER, 473 nm, OBIS LX, Pass 468-478 nm** Transmission of > 90% from 468 nm to 478 nm. Blocking with < 0.01% from 500 nm to 600 nm. Damage Threshold > 1000 W/cm2 at 473 nm.
	1263515	**BANDPASS FILTER, 488 nm, OBIS LX, Pass 485-491 nm** Transmission of > 90% from 485 nm to 491 nm. Blocking with < 0.01% from 500 nm to 800 nm. Damage Threshold > 1000 W/cm2 at 488 nm.
	1202061	**BANDPASS FILTER, 633 nm 637nm, OBIS LX, Pass 630-642 nm** Transmission of > 90% from 630 nm to 642 nm. Blocking with < 0.01% at 488 nm. Blocking with < 0.1% at 652 nm to 660 nm. Blocking with < 0.01% at 660 nm to 670 nm.
	1202062	**BANDPASS FILTER, 640 nm, OBIS LX, Pass 635-645 nm** Transmission of > 90% from 635 nm to 645 nm. Blocking with < 0.01% from 483 nm to 493 nm. Blocking with < 0.1% at 652 nm to 660 nm. Blocking with < 0.01% at 660 nm to 670 nm. Damage Threshold > 25 W/cm2 at 405 nm.

IV Appendix - OBIS Power Measurement

Coherent offers a wide variety of instruments for laser test and measurement.

For the most common diagnostics need—measuring the output power of the OBIS—Coherent recommends two different types of power meters that are ideal fits to the OBIS product family.

Coherent product information and related software is now available in one easily accessible location on the Coherent website. For detailed information about these products, contact your Coherent sales representative or visit:
https://www.coherent.com/resources

IV.1 First Recommendation

Coherent offers a product combination that covers that entire wavelength range at these power levels.

The PS10, shown in Figure IV-1, is a thermally-stabilized, amplified thermopile power sensor with a broad spectral response, high sensitivity, and a large active area. It is designed for measurements in the 100 µW to 1 W region.

PS10 High-Sensitive Thermopile Sensor (RoHS), P/N 1098350

FC Fiber Optic Connector Adapter, P/N 0012-3863

Figure IV-1. Power Measurement: PS10 Sensor and Adapter

Coherent recommends the FieldMaxII-TOP, shown in Figure IV-2, to work with the PS10 sensor.

The FieldMaxII—an affordable, versatile, easy-to-use digital meter—is designed for field service and production applications. This meter features an easy-to-read liquid crystal display (LCD) with a back light and direct button-driven commands for simple, no-hassle use.

FieldMaxII-TOP Laser Power and Energy Meter
(RoHS), P/N 1098580

Figure IV-2. Power Measurement: FieldMax–II

IV.2 Additional Recommended Products

LaserCheck is a hand-held, inexpensive laser power meter designed to supply power measurements in a small, lightweight, self-contained package. This device, shown in Figure IV-3, can easily be stored in a pocket or tool kit.

With its compact size, LaserCheck enables measurements at places in optical set-ups where a standard detector cannot fit. With its built-in attenuator, this device is prepared to measure output power from 0.5 μW to 1 W.

LaserCheck Hand-held Power Meter
(RoHS), P/N 1098293

Figure IV-3. Power Measurement: LaserCheck

NOTICE
LaserCheck does not measure below 400 nm, so this device is not recommended for the OBIS 375 laser.

IV.3 OBIS Galaxy Power Meter Accessory

The PowerMax-USB UV/VIS Quantum Power Sensor incorporates a Silicon photodiode for measurement of power from 5 μW to several hundred milliwatts.

A spectrally-calibrated ND2 filter is used to attenuate the laser beam, thus allowing for a higher average power measurement than is typically possible with a photodiode.

Figure IV-4 shows the PowerMax-USB Quantum Power Sensor.

PowerMax-USB UV/VIS Quantum
Power Sensor (RoHS),
P/N 1168337

Figure IV-4. Power Measurement: PowerMAX–USB

The sensor works with Continuous Wave (CW) as well as pulsed sources greater than 100 pulses per second (PPS).

The removable nose cone can be used to reduce stray light, which is helpful when measuring on the low end of the power range.

V APPENDIX - WARRANTY

Coherent, Inc. warrants OBIS Laser Systems to the original purchaser (the Buyer) only; that the laser system that is the subject of this sale, (a) conforms to Coherent's published specifications, and (b) is free from defects in materials and workmanship.

Laser systems are warranted to conform to Coherent's published specifications and to be free from defects in materials and workmanship for a period of twelve (12) months. Replacement units shipped within warranty, carry the remainder warranty of the failed unit.

V.1 Responsibilities of the Buyer

The Buyer is responsible for providing the appropriate utilities and an operating environment as outlined in the product literature. Damage to the laser system caused by failure of Buyer's utilities or failure to maintain an appropriate operating environment, is solely the responsibility of the Buyer and is specifically excluded from any warranty, warranty extension, or service agreement.

The Buyer is responsible for prompt notification to Coherent of any claims made under warranty. In no event will Coherent be responsible for warranty claims made later than seven (7) days after the expiration of warranty.

V.2 Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from any of the following conditions:

- Components and accessories manufactured by companies other than Coherent, which have separate warranties
- Improper or inadequate maintenance by the Buyer
- Buyer-supplied interfacing
- Operation outside the environmental specifications of the product
- Unauthorized modification or misuse
- Improper site preparation and maintenance
- Opening the housing

Coherent assumes no responsibility for customer-supplied material. The obligations of Coherent are limited to repairing or replacing, without charge, equipment that proves to be defective during the warranty period. Replacement sub-assemblies may contain reconditioned parts. Repaired or replaced parts are warranted for the duration of the original warranty period only. The warranty on parts purchased after expiration of system warranty is ninety (90) days. This warranty does not cover damage due to misuse, negligence or accidents; or damage due to installations, repairs or adjustments not authorized specifically by Coherent.

This warranty applies only to the original purchaser at the initial installation point in the country of purchase, unless otherwise specified in the sales contract. The warranty is transferable to another location or to another customer only by special agreement, which will include additional inspection or installation at the new site.

Coherent disclaims any responsibility to provide product warranty, technical or service support to a customer that acquires products from someone other than Coherent or an authorized representative.

THIS WARRANTY IS EXCLUSIVE IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED, AND DOES NOT COVER INCIDENTAL OR CONSEQUENTIAL LOSS. COHERENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

VI APPENDIX - SERVICE & SUPPORT

This section provides information about:

VI.1 Technical Support

Coherent provides telephone and web-based technical assistance as a service to its customers and assumes no liability for any injury or damage that can occur at the same time with such services.

Operation of any Coherent laser with any of its interlocks (or safety features) defeated is always at the operator's own risk. Under no circumstances do these support services affect the terms of any Warranty agreement between Coherent and the buyer.

Be prepared to provide the following information to the Product Support Engineer responding to your request:

- Model or part number of your unit
- Laser head serial number
- A description of the problem
- Any corrective steps you may have attempted

VI.1.1 Support in the USA and North America

Should you experience any difficulties with your laser or need product or technical information, contact Coherent Technical Support as follows:

- By email: customer.support@coherent.com
- Visit our website: www.Coherent.com
- By phone: +**1 (734) 456-3100**

Telephone coverage is available Monday through Friday (except U.S. holidays and company shutdowns). Inquiries received outside of normal office hours will be captured by our automatic answering system and calls will be quickly returned the next business day.

VI.1.2 International Support

If you are located outside the U.S., visit www.Coherent.com for technical assistance, or contact your local Service Representative directly:

- Germany: +49–6071–968–0
- Japan: +813–5635–8680

On the Coherent website, you can also view contact information (telephone numbers and addresses) for Service Representatives worldwide.

VI.2 Obtain Service

To obtain service under this warranty, Customer must notify the Company of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service.

The Company shall, in its sole discretion, determine whether to perform warranty service at the Customer's facility, at the Company's facility, or at an authorized repair station.

If Customer is directed by the Company to ship the product to the Company or a repair station, Customer shall:

- Package the product (to protect from damage during shipping) as instructed in "Product Shipping Instructions" next.
- Ship it to the address specified by the Company, with shipping prepaid. back to Coherent in conjunction with recalibration and recertification.
- Coherent shall pay the cost of shipping the Product back to the Customer in conjunction with product failures within the first twelve (12) months of time of sale or during an extended 12-month warranty period.

VI.3 Product Shipping Instructions

Refer to section "Appendix - Laser Repacking Procedure" (p. 191) for instructions about factory-recommended repacking of OBIS laser systems.

You must include a Returned Material Authorization number (RMA) assigned by the Company on the outside of all shipping packages and containers. Items returned without an RMA number are subject to return to the sender. Detailed instructions to prepare a product for shipping are provided in the next section.

To prepare a product for shipping to Coherent:

1. Contact Customer Service for a Return Material Authorization number.
2. Attach a tag to the product that includes the name and address of the owner, the person to contact, the serial number, and the RMA number you received from Coherent Customer Service. Pack this tag inside the box.
3. Wrap the product with polyethylene sheeting or equivalent material.
4. Using the original shipping and packaging materials, pack the product.
5. Seal the shipping carton with shipping tape or an industrial stapler.
6. Write the RMA number on the shipping label on the outside of the box.
7. Ship the product to the following address:

   Coherent, Inc.
   Attn: RMA #
   27650 SW 95th Ave.
   Wilsonville, OR 97070 USA

GLOSSARY

°C	Degrees Centigrade or Celsius
°F	Degrees Fahrenheit
Ω	Ohm(s)
μ	Micron(s)
μm	Micrometer(s) = 10^{-6} meters
μrad	Microradian(s) = 10^{-6} radians
μsec	Microsecond(s) = 10^{-6} seconds
$1/e^2$	Beam diameter parameter = 0.13534
AC	Alternating current
Address	A unique one-byte identifier assigned to each device on the bus
Amp	Ampere(s)
APC	Angle physical contact
Application Protocol	A set of application defined commands and replies used to implement a system of cooperative devices
Automatic Send Data Control	An optional hardware feature that is useful to control enable/disable of transmit enable line of RS-485 transceiver
BNC	Type of connector
Broadcast Message	Message sent by a master device and received by all connected slave devices
BUSMGMT	Message is a bus management message
CCB	Coherent Connection Bus, a RS-485 communication bus
CDRH	Center for Devices and Radiological Health
cm	Centimeter(s)
CW	Continuous wave
DC	Direct current
DDL	Direct diode laser
Destination Address	Address of the recipient device for a message
DHCP	Dynamic Host Configuration Protocol. A protocol that provides a means to dynamically allocate IP addresses to computers on a local area network.
DLE	Data link escape
EOM	A two-byte sequence indicating the end of a message packet
ESD	Electrostatic discharge
ETX	End of message data
FC	Fiber-connector
FP	Fiber pigtail

g	Gram(s) or earth's gravitational force (gravity)
GUI	Graphical user interface
HeNe	Helium neon
Hz	Hertz or cycles per second (frequency) (= 1/pulse period)
IEC	International Electrotechnical Commission
IR	Infrared (wavelength)
I/O	Input/output
kg	Kilogram(s) = 10^3 grams
kHz	Kilohertz = 10^3 hertz
kOhm	Kilohm(s) = 10^3 ohms
LCD	Liquid crystal display
LED	Light emitting diode
LS version	OBIS Laser, based on optically pumped semiconductor laser (OPSL) technology
LX version	OBIS Laser, based on direct diode laser (DDL) technology
m	Meter(s) (length)
mA	Milliamp(s) = 10^{-3} Amperes
mAmp	Milliampere(s)
Master	Controlling device which manages bus direction, assigns device addresses, and generally the source for all application protocol command initiation
MHz	Megahertz = 10^6 hertz
mm	Millimeter(s) = 10^{-3} meters
mrad	Milliradian(s) = 10^{-3} radians (angle)
ms	Millisecond(s) = 10^{-3} seconds
mV	Millivolt(s)
MVP	Modulation and variable power
mW	Milliwatt(s) = 10^{-3} Watts (power)
NA	Numerical aperture
nm	Nanometer(s) = 10^{-9} meters (wavelength)
N·m	Newton meter
OBIS Remote	A dedicated Coherent device that serves as a communication gateway to a single laser and provides a CDRH-compliant keyswitch and interlock capabilities.
OEM	Original equipment manufacturer
OPSL	Optically-pumped semiconductor laser
oz·in.	Ounce inches
PIP	Port Identification Pin, a signal pin located on the cable connecting the slave device to the CCB
PPS	Pulses per second
rms	Root mean square (effective value of a sinusoidal wave)
RMA	Return material authorization

SCPI Standard commands for programmable instruments. This standard, developed by Hewlett-Packard, complements IEEE 488 and is promoted by the SCPI Consortium.

SDR Shrunk delta ribbon. This connector type is used on the back panel of the OBIS Laser for the full-feature I/O cable.

Slave Device which receives and interprets messages and responds as required

SOM A two-byte sequence indicating the start of a message packet

Source Address
Address of the device transmitting a message

Standard Message
Message sent from the master device to a specific slave device address

SRCCCB
Message originated from CCB stack

SRCCONT
Message originated from master device (controller)

STX Start of message data

System Protocol
A set of predefined bus management commands and responses used by CCB protocol stacks for set-up and management of the bus

TEC Thermoelectric cooler

TEM Transverse electromagnetic mode (cross-sectional laser beam mode)

TTL Transistor-transistor logic

UART Universal asynchronous receiver/transmitter

UFC Ultra-flat contact

UV Ultraviolet

V Volt(s)

VAC Volts, alternating current

VDC Volts, direct current

W Watt(s) (power)

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V

W

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