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IQ Light Source Series

IQ-2100 Light Source

IQ-2300 ASE Source

IQ-2400 WDM Laser Source

IQ-2600 Tunable Laser Source

Instruction Manual

January 2000
P/N: MAN-117-I .4ACE

Fourth Edition

CE

If the equipment described herein bears the CE *symbol, the said equipment complies with the European Community Directive and Standards found in the Declaration of Conformity.*

If the equipment described herein bears an **FCC** *statement, the said equipment complies with the relevant Federal Communications Commission standards.*

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CERTIFICATION INFORMATION

F.C.C. INFORMATION TO USER

This unit has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 (Subpart B) of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the unit is operated in a commercial environment. This unit generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this unit in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or modifications not expressly approved by EXFO Electro-Optical Engineering could void the user's authority to operate the unit.

INDEPENDENT LABORATORY TESTING

This unit has undergone extensive CE certification testing both internally, at EXFO, and externally, at an independent, qualified laboratory. All pre-qualification tests were performed at EXFO while all final tests were performed at UltraTech Engineering Labs, Inc., a renowned test laboratory from Mississauga, Canada. This guarantees the unerring objectivity and authoritative compliance of all test results.

CE INFORMATION TO USER

This unit has been tested and found to comply with the limits for a Class A digital device. Please see the Declaration of Conformity.

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1 INTRODUCTION

EXFO E. O. Engineering, Inc. (EXFO) is pleased to introduce the IQ Light Source Series, which includes

- IQ-2100 Light Source
- IQ-2300 ASE Source
- IQ-2400 WDM Laser Source
- IQ-2600 Tunable Laser Source

EXFO's commitment to superior design in all its fiber-optic instrumentation is respected throughout the industry and is based on the following four goals:

- reliable and accurate performance
- simple operation
- extensive features
- dedicated interest in customer needs

The IQ Light Source Series will provide many years of reliable operation. To benefit fully from the many features offered by the IQ Light Source Series, it is important to read the following instructions thoroughly.

1.1 IQ-200 Optical Test System Product Line

The IQ-200 Optical Test System product line is a modular optical test system designed for laboratory applications. Thanks to the Windows™ compatible IQ Software, the IQ-200 Optical Test System combines power, performance, and flexibility with a user-friendly interface. The main components of the system are the IQ-203 Mainframe, which can house three modules, and the IQ-206 Expansion Unit, which can house six modules. It is also possible to control one or several IQ-206 Expansion Units with an IQ-206 PC Expansion Card.

For more information on the IQ-200 Optical Test System and the IQ Software, please refer to the *IQ-200 Optical Test System Instruction Manual*.

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1.2 Unpacking and Inspection

The IQ Light Source Series modules are delivered with the following standard items:

- Instruction Manual
- backup floppy disk
- Certificate of Calibration
- accessory kit
- Certificate of compliance
- Test report

These modules have been thoroughly inspected before shipment. If any damage has occurred during transportation or if any item is missing, please notify EXFO immediately. Retain the original packing material in case you need to return the equipment.

1.3 Safety Conventions

The following conventions should be understood before operating the unit:

WARNING	Refers to a potential *personal* hazard. It requires a procedure which, if not correctly followed, may result in bodily harm or injury. Do not proceed beyond a **WARNING** unless the required conditions are understood and met.
CAUTION	Refers to a potential *product* hazard. It requires a procedure which, if not correctly followed, may result in component damage. Do not proceed beyond a **CAUTION** unless the required conditions are understood and met.
IMPORTANT	Refers to any information regarding the operation of the product which should not be overlooked.

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1.4 Transportation and Storage

Maintain a temperature range within specifications when transporting or storing the unit. Transportation damage can occur from improper handling. The following steps are recommended to minimize the possibility of damage:

- Pack the unit in the original packing material when shipping.
- Store unit at room temperature in a clean and dry area. Avoid high humidity or large temperature fluctuations.
- Keep the unit out of direct sunlight.
- Avoid unnecessary shock and vibration.

1.5 Safety Information

WARNING

Do not install or terminate fibers while a laser source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times.

CAUTION

Use of controls, adjustments and procedures for operation and maintenance other than those specified herein may result in hazardous radiation exposure.

CAUTION

Use of optical instruments with this product will increase eye hazard.

1.5.1 Class I Laser Products

The following source module configurations are classified as 21 CFR Class I laser products that comply with 21 CFR 1040.10 and 1040.11 and IEC 825-1: 1993. Laser radiation may be encountered at their output ports.

- IQ-2100 Light Source (single- or dual-wavelength LED or laser source with semiconductor diode lasers)

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- IQ-2403BLD-xx-P0 WDM Laser Source (contains semiconductor diode lasers)
- IQ-2600 Tunable Laser Source

The level of radiation is below that known to cause eye injury through accidental short term exposure. However, avoid prolonged exposure to light emitted from the fiber and do not stare directly at a light beam, visible or not.

WARNING

Do not install or terminate fibers while a laser source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times. Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

The Class 1 Explanatory labels, depicted in Figure 1-1, Figure 1-2, and Figure 1-3 indicate safety parameters relating to the IQ-2100, IQ-2403BLD-xx-P0, IQ-2403BLD-xx-P1, IQ-2403BLD-xx-P2, and IQ-2600.

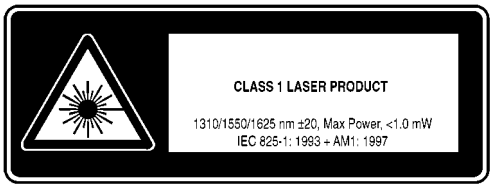


Figure 1-1. Class 1 Laser Product Indication

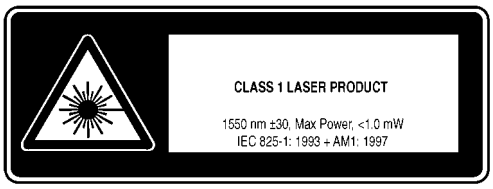


Figure 1-2. Class 1 Laser Product Indication

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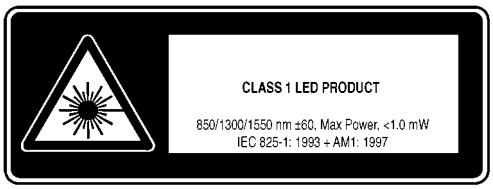


Figure 1-3. Class 1 LED Product Indication

1.5.2 Class 3A Laser Products (IEC 825)

The following source modules are classified as Class 3A laser products according to IEC-825-1: 1993 + AM1 : 1997.

- IQ-2300 ASE Source (contains an erbium-doped fiber pumped with a 980 nm laser diode)
- IQ-2403BLD-xx-P4 WDM Laser Source (contains semiconductor diode lasers)

Light in the 1550 nm wavelength region is invisible to the human eye and can cause unexpected, permanent eye damage. Use caution at all times when working with Class 3A laser products. Wear appropriate eye protection and follow laser safety precautions.

WARNING

Do not install or terminate fibers while a laser source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times. Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

The Class 3A Safety Sticker, depicted in Figure 1-4, is found on the side panel of the IQ-2300 and IQ-2403BLD-xx-P4.

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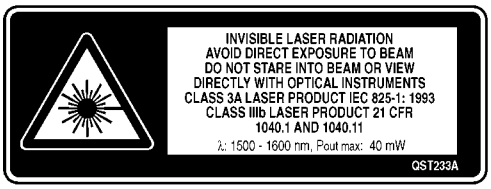


Figure 1-4. Class 3A Safety Sticker

1.5.3 Class IIIB Laser Products (FDA only)

The following source modules are classified as Class IIIB laser products according to 21 CFR-1040-10. They are potentially harmful instruments if not used with extreme caution.

- IQ-2300 ASE Source (contains an erbium-doped fiber pumped with a 980 nm laser diode)
- IQ-2403BLD-xx-P4 WDM Laser Source (contains semiconductor diode lasers)

Light in the 1550 nm wavelength region is invisible to the human eye and can cause unexpected, permanent eye damage. Use caution at all times when working with Class 3A laser products. Wear appropriate eye protection and follow laser safety precautions.

WARNING

Do not install or terminate fibers while a laser source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times. Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

The Class IIIB Safety Sticker, depicted in Figure 1-5, is found on the side panel of the IQ-2300 and IQ-2403BLD-xx-P4.

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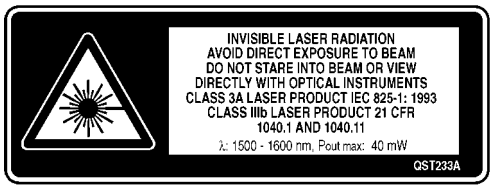


Figure 1-5. Class IIIB Safety Sticker

1.6 Transportation and Storage

Maintain a temperature range within specifications when transporting or storing the unit. Transportation damage can occur from improper handling. The following steps are recommended to minimize the possibility of damage:

- Pack the unit in the original packing material when shipping.
- Store unit at room temperature in a clean and dry area.
- Avoid high humidity, large temperature fluctuations, direct sunlight, and unnecessary shock and vibration.

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1.7 Getting Help

If you encounter any difficulty while operating this product, please call EXFO at one of the offices listed below. Our Customer Service Group is available in North America from 7:30 a.m. to 8:00 p.m. (Eastern Standard Time), Monday to Friday.

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Tel.: 33-1 34 63 00 20
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2 PRELIMINARY INFORMATION

2.1 Module Descriptions

The IQ Series light source modules support local and remote control. Local control is via the Windows-compatible IQ Software, which is preinstalled on the IQ-203 or installed on a host PC when using the IQ-206 and PC expansion card. Remote control of the IQ-2100, IQ-2300, and IQ-2400 is accomplished through one of four ways:

- a GPIB interface*
- an RS-232 external interface
- Windows OLE (Object Linking and Embedding) automation
- a Windows DDE (Dynamic Data Exchange) communication channel

* LabVIEW drivers™ are available upon request for the IQ-2100 and IQ-2400 models.

Please refer to the *IQ-200 GPIB and Application Development Guide* for detailed information about remote control of the IQ components.

The product nameplate, shown in Figure 2-1, is located on a side panel near the rear of the module.

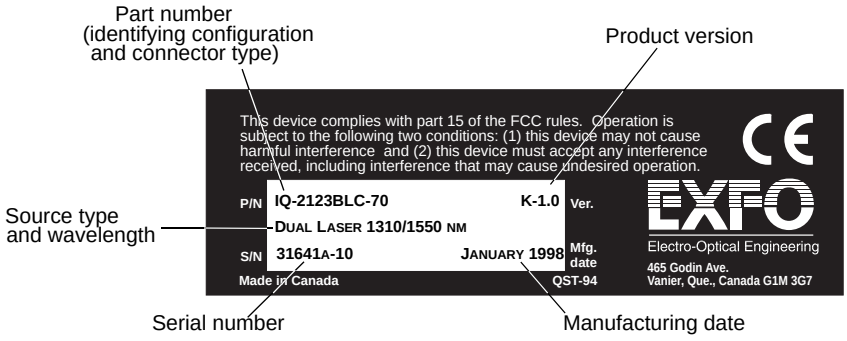


Figure 2-1. Module Nameplate

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2.1.1 IQ-2100 Light Source

The IQ-2100 Light Source is a fiber-optic light source designed for laboratory and industry applications using the IQ-203 Mainframe or IQ-206 Expansion Unit.

The IQ-2100 comes with different emitter types at various wavelengths. Table 2-1 summarizes the configurations available.

Model	Wavelength (nm)	Emitter Type
IQ-2101 - C or D	850	LED
IQ-2102 - C or D	1300	LED
IQ-2102 BLC	1310 Fabry-Perot	TEC Laser
IQ-2102 ORL	1310 Fabry-Perot, ORL	TEC Laser
IQ-2102 BS	1310	Singlemode LED
IQ-2102 BP	1310	Singlemode LED, polarized
IQ-2102 BPL	1310	Singlemode LED, polarized low power
IQ-2102 BLD	1310	TEC DFB Laser
IQ-2103 ORL	1550 Fabry-Perot, ORL	TEC Laser
IQ-2103 BS	1550	Singlemode LED
IQ-2103 BP	1550	Singlemode LED, polarized
IQ-2103 BPL	1550	Singlemode LED, polarized low power
IQ-2103 BLC	1550 Fabry-Perot	TEC Laser
IQ-2104 ORL	1625 Fabry-Perot, ORL	TEC Laser
IQ-2112 - C or D	850/1300	Dual LED
IQ-2123 ORL	1310/1550 Fabry-Perot, ORL	TEC Laser

Table 2-1. IQ-2100 Series Wavelength and Emitter Type Configurations (Part 1 of 2)

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Model	Wavelength (nm)	Emitter Type
IQ-2123 BH	1310/1550 (hybrid)	Singlemode LED
IQ-2123 BS	1310/1550	Singlemode LED
IQ-2123 BP	1310/1550	LED, polarized
IQ-2123 BPL	1310/1550	Singlemode LED, polarized low power
IQ-2123 BLC	1310/1550 Fabry-Perot	Dual TEC Laser
IQ-2134 ORL	1550/1625 Fabry-Perot, ORL	TEC Laser

Table 2-1. IQ-2100 Series Wavelength and Emitter Type Configurations (Part 2 of 2)

Note: *Other source types may also be available. Please contact EXFO to obtain the latest information.*

The IQ-2100 series comes with several connector configurations. Table 2-2 summarizes the configurations available.

Model	Connector Type
IQ-2100-28	DIN 47256
IQ-2100-40	HMS-0 or HFS-3
IQ-2100-50	FC/PC
IQ-2100-54	SC/PC
IQ-2100-58	FC/APC narrow key
IQ-2100-74	ST/PC
IQ-2100-86	DIN/APC
IQ-2100-88	SC/APC
IQ-2100-89	FC/UPC

Table 2-2. IQ-2100 Series Connector Configurations (Part 1 of 2)

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Model	Connector Type
IQ-2100-90	ST/UPC
IQ-2100-91	SC/UPC
IQ-2100-EUI	EXFO Universal Interface[a]

Table 2-2. IQ-2100 Series Connector Configurations (Part 2 of 2)

a. The EUI base plate can be UPC or APC. The APC base plate is identified by a green dot in the upper left corner. For details, see *EXFO Universal Interface (EUI)*, on page 2-17.

2.1.2 IQ-2300 ASE Source

The IQ-2300 ASE Source is a stable, high power, non-polarized fiber-optic source. It is designed for laboratory applications such as WDM component and white light interferometry testing using the IQ-203 Mainframe or IQ-206 Expansion Unit.

The Laser Radiation Warning Sticker, depicted in Figure 2-2, is found on the front panel of the IQ-2300.



Figure 2-2. Laser Radiation Warning Sticker

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The IQ-2300 comes in 1550 nm wavelength only. It is equipped with a standard E-2000 connector. Different hybrid patchcords are available and must be chosen at time of purchase. Table 2-3 summarizes the hybrid patchcord options available.

Model	Wavelength (nm)	Hybrid Patchcord Type
IQ-2300-58	1550	FC/APC
IQ-2300-88	1550	SC/APC
IQ-2300-89	1550	FC/UPC
IQ-2300-91	1550	SC/UPC

Table 2-3. IQ-2300 Series Wavelength and Connector Configurations

2.1.3 IQ-2400 WDM Laser Source

The IQ-2400 WDM Laser Source is a DFB laser source available at one of the 36 channel wavelengths ranging from 1532.68 nm to 1560.61 nm. Other wavelengths are also available. For information, contact EXFO. Each wavelength can be adjusted by the user within a ±1 nm tuning range around the ITU-T wavelengths. The built-in optical isolator of the DFB laser increases power stability.

The Laser Radiation Warning Sticker, depicted in Figure 2-3, is found on the front panels of the IQ-2403BLD-xx-P1 and IQ-2403BLD-xx-P2.



Figure 2-3. Laser Radiation Warning Sticker

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The IQ-2400 comes in various wavelengths. Table 2-4 summarizes the configurations available.

Model	Wavelength (nm)	Emitter Type
IQ-2403BLD-92	1525.66	TEC DFB Laser
IQ-2403BLD-93	1526.44	TEC DFB Laser
IQ-2403BLD-94	1527.22	TEC DFB Laser
IQ-2403BLD-95	1527.99	TEC DFB Laser
IQ-2403BLD-96	1528.77	TEC DFB Laser
IQ-2403BLD-97	1529.55	TEC DFB Laser
IQ-2403BLD-98	1530.33	TEC DFB Laser
IQ-2403BLD-99	1531.12	TEC DFB Laser
IQ-2403BLD-00	1531.90	TEC DFB Laser
IQ-2403BLD-01	1532.68	TEC DFB Laser
IQ-2403BLD-02	1533.47	TEC DFB Laser
IQ-2403BLD-03	1534.25	TEC DFB Laser
IQ-2403BLD-04	1535.04	TEC DFB Laser
IQ-2403BLD-05	1535.82	TEC DFB Laser
IQ-2403BLD-06	1536.61	TEC DFB Laser
IQ-2403BLD-07	1537.40	TEC DFB Laser
IQ-2403BLD-08	1538.19	TEC DFB Laser
IQ-2403BLD-09	1538.98	TEC DFB Laser
IQ-2403BLD-10	1539.77	TEC DFB Laser

Table 2-4. IQ-2400 Series Wavelength and Emitter Type Configurations (Part 1 of 3)

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Model	Wavelength (nm)	Emitter Type
IQ-2403BLD-11	1540.56	TEC DFB Laser
IQ-2403BLD-12	1541.35	TEC DFB Laser
IQ-2403BLD-13	1542.14	TEC DFB Laser
IQ-2403BLD-14	1542.94	TEC DFB Laser
IQ-2403BLD-15	1543.73	TEC DFB Laser
IQ-2403BLD-16	1544.53	TEC DFB Laser
IQ-2403BLD-17	1545.32	TEC DFB Laser
IQ-2403BLD-18	1546.12	TEC DFB Laser
IQ-2403BLD-19	1546.92	TEC DFB Laser
IQ-2403BLD-20	1547.72	TEC DFB Laser
IQ-2403BLD-21	1548.51	TEC DFB Laser
IQ-2403BLD-22	1549.32	TEC DFB Laser
IQ-2403BLD-23	1550.12	TEC DFB Laser
IQ-2403BLD-24	1550.92	TEC DFB Laser
IQ-2403BLD-25	1551.72	TEC DFB Laser
IQ-2403BLD-26	1552.52	TEC DFB Laser
IQ-2403BLD-27	1553.33	TEC DFB Laser
IQ-2403BLD-28	1554.13	TEC DFB Laser
IQ-2403BLD-29	1554.94	TEC DFB Laser
IQ-2403BLD-30	1555.75	TEC DFB Laser
IQ-2403BLD-31	1556.55	TEC DFB Laser

Table 2-4. IQ-2400 Series Wavelength and Emitter Type Configurations (Part 2 of 3)

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Model	Wavelength (nm)	Emitter Type
IQ-2403BLD-32	1557.36	TEC DFB Laser
IQ-2403BLD-33	1558.17	TEC DFB Laser
IQ-2403BLD-34	1558.98	TEC DFB Laser
IQ-2403BLD-35	1559.79	TEC DFB Laser
IQ-2403BLD-36	1560.61	TEC DFB Laser
IQ-2403BLD-37	1561.42	TEC DFB Laser
IQ-2403BLD-38	1562.23	TEC DFB Laser
IQ-2403BLD-39	1563.05	TEC DFB Laser
IQ-2403BLD-40	1563.86	TEC DFB Laser
IQ-2403BLD-41	1564.68	TEC DFB Laser
IQ-2403BLD-42	1565.50	TEC DFB Laser
IQ-2403BLD-43	1566.31	TEC DFB Laser
IQ-2403BLD-44	1567.13	TEC DFB Laser
IQ-2403BLD-45	1567.95	TEC DFB Laser
IQ-2403BLD-46	1568.77	TEC DFB Laser

Table 2-4. IQ-2400 Series Wavelength and Emitter Type Configurations (Part 3 of 3)

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In addition to selecting the wavelength, you must also select the output power of your IQ-2400 module at time of purchase. Table 2-5 summarizes the various output power configurations.

Model	Minimum Output Power (dBm)
IQ-2403BLD-xx-P0-xx	3
IQ-2403BLD-xx-P1-xx	8
IQ-2403BLD-xx-P2-xx	8 (with PMF output)
IQ-2403BLD-xx-P3-xx	user-provided DFB(s)
IQ-2403BLD-xx-P6-xxx[a]	13
IQ-2403BLD-xx-P7-xxx[a]	13 (with PMF output)

Table 2-5. IQ-2400 Series Minimum Output Power

a. In order to meet FDA requirements, the P6 and P7 options come with an E-2000 connector only when sold in the United States. In other contries, the EUI-58 connector is also available. We supply an adaptor patchcord.

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The IQ-2400 series comes with one of several possible connector configurations (summarized in Table 2-6) which must be chosen at time of purchase.

Model	Connector Type
IQ-2403BLD-xx-xx-58	FC/APC narrow key
IQ-2403BLD-xx-xx-88	SC/APC
IQ-2403BLD-xx-xx-89	FC/UPC
IQ-2403BLD-xx-xx-96	E-2000/APC
IQ-2403BLD-xx-xx-EUI	EXFO Universal Interface[a]

Table 2-6. IQ-2400 Series Connector Configurations

a. The EUI base plate can be UPC or APC. The APC base plate is identified by a green dot in the upper left corner. The IQ-2400 comes with the APC base plate only. For details, see *EXFO Universal Interface (EUI)*, on page 2-17.

2.1.4 IQ-2600 Tunable Laser Source

The IQ-2600 Tunable Laser Source contains a 980 nm pump laser coupled to a fiber cavity that includes an erbium-doped section and bandpass tunable filter, along with other optical and electronic components needed for control and stabilization. Output wavelengths from 1520 nm to 1570 nm are selectable at 0.01 nm resolution, and output power can be varied over a 3 dB range.

The IQ-2600 can be operated in ASE (amplified spontaneous emission) mode as a non-coherent broadband source with a spectrum typical of non-flattened erbium-doped fiber.

The IQ-2600 series comes with one of several possible connector configurations. The connector configuration must be chosen at time of purchase. Table 2-7 summarizes the available connector configurations.

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Model	Connector Type
IQ-2600-58	FC/APC narrow key
IQ-2600-88	SC/APC
IQ-2600-89	FC/UPC
IQ-2600-91	SC/UPC
IQ-2600-95	E-2000/PC
IQ-2600-96	E-2000/APC
IQ-2600-UI	PC universal interface
IQ-2600-UA	APC universal interface
IQ-2600-EUI	EXFO Universal Interface[a]

Table 2-7. IQ-2600 Series Connector Configurations

a. The EUI base plate can be UPC or APC. The APC base plate is identified by a green dot on the upper left corner. For details, see *EXFO Universal Interface (EUI)*, on page 2-17.

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2.2 Front Panel Descriptions

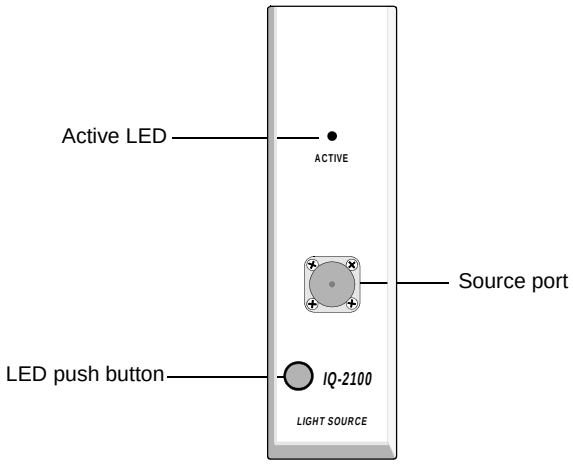


Figure 2-4. IQ-2100 Light Source

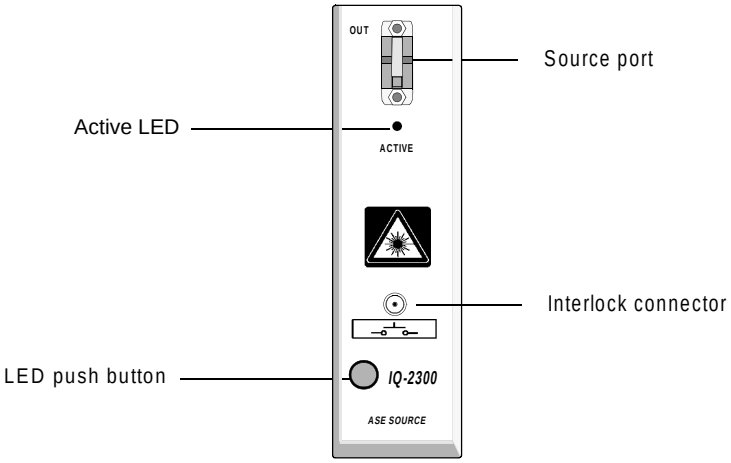
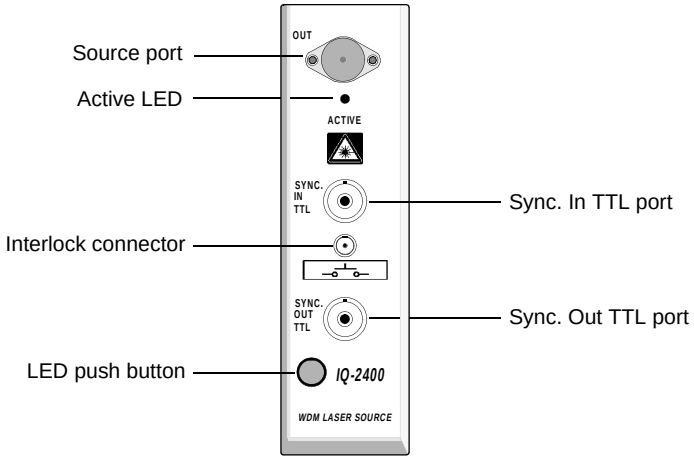


Figure 2-5. IQ-2300 ASE Source

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Note: An IQ-2400BLD-xx-P0 is depicted in this illustration. The P1 and P2 options have different output ports.

Figure 2-6. IQ-2400 WDM Laser Source

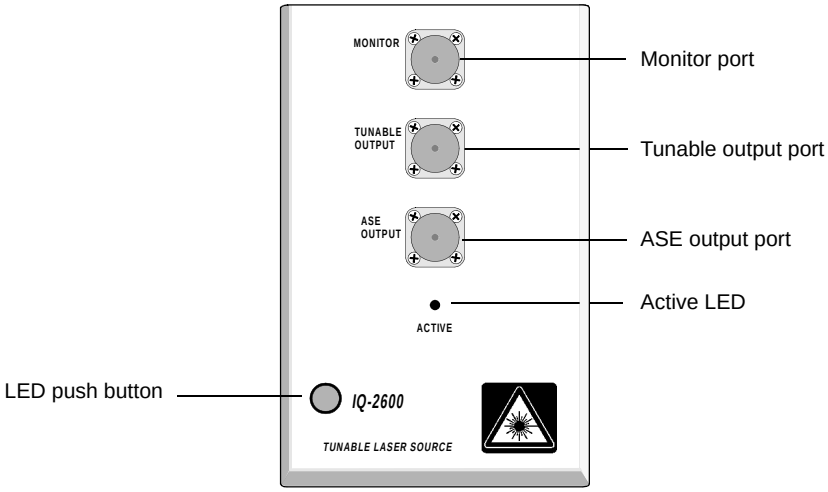


Figure 2-7. IQ-2600 Tunable Laser Source

Note: *Actual connectors may differ from the ones depicted in the illustrations.*

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2.2.1 Active LED

When lit, the active LED indicates that an optical signal is being emitted from the source port. On class III B models, the active LED will turn on 5 seconds before the laser starts emitting above the class 1 limit.

2.2.2 Source Port

The optical signal is emitted from the source port. The Laser Radiation Hazard Sticker, depicted in Figure 2-8, is found on the front panels of the IQ-2300, and IQ-2403BLD-xx-PX.



Figure 2-8. Laser Radiation Hazard Sticker

2.2.3 Sync. In TTL Port (IQ-2400 only)

The Sync. In TTL port is used to receive a TTL synchronization signal from another module or an external instrument.

2.2.4 Sync. Out TTL Port (IQ-2400 only)

The Sync. Out TTL port is used to send a TTL synchronization signal to another module or to an external instrument.

2.2.5 Monitor Port (IQ-2600 only)

The Monitor port is used to send a 10% signal and can be used as a secondary output port or connected to a wavelength-monitoring instrument. The signal is present when the IQ-2600 is operating in Tunable mode.

2.2.6 Tunable Output Port (IQ-2600 only)

The Tunable Output port is the high power signal output when the IQ-2600 is operating in Tunable mode.

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2.2.7 ASE Output Port (IQ-2600 only)

When operating the ASE mode, a non-flattened erbium-ASE signal is available at the ASE Output port.

2.2.8 Interlock Connector (IQ-2300 and IQ-2400 only)

All of the IQ-2300 module configurations and each IQ-2400 module configuration rated as a Class IIIB laser source have an interlock connector which allows you to install a security switch or panic button. The interlock circuit has the following characteristics:

- When the interlock circuit is open, the light source cannot be activated
- If the light source is active before the interlock circuit is opened, the light source becomes inactive. Upon closing the interlock circuit, the source will become active after a five second safety delay. Pressing the software application stop button will shut down the laser source at any time and will prevent reactivation of the laser source upon closing the interlock circuit.

For more information, see *Safety Measures (IQ-2300 and IQ-2400)*, on page 3-1.

2.2.9 LED Push Button

The LED push button has three functions:

- When system is powered on, the LED will illuminate.
- Pressing the LED push button activates the main window.
- Pressing the LED push button when the main window is open activates the monitor window.

Note: *The monitor window is a compact window displaying basic data and is fully explained in the Operation section describing the module in question.*

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2.3 Module Insertion

CAUTION

Never insert or remove any module when the IQ-203 Mainframe or the IQ-206 Expansion Unit are powered on. This will damage the module and the IQ-203/IQ-206.

To insert the module,

1. Power off the IQ-203/IQ-206.

2. Insert the module into any available slot. The IQ-203/IQ-206 will automatically recognize the module.

IMPORTANT

Be sure to insert the module all the way to the back of the IQ-203/IQ-206 to ensure that the backplane connectors are properly mated. The module is correctly inserted when the module front panel is flush with the IQ-203/IQ-206 front panel.

2.4 Optical Connections

IMPORTANT

Always clean fiber end prior to insertion into the port as explained below.

The fiber-optic cable end should be cleaned at all times to ensure maximum output power and avoid erroneous readings.

2.4.1 Fiber Connections

To clean the fiber end,

1. Gently wipe the end with a lint-free swab dipped in isopropyl alcohol.

2. Dry using clean compressed air.

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To connect the fiber-optic cable to the port,

1. Ensure that the connector is dry.

2. Align the connector and port to avoid the fiber end touching the outside of the port or rubbing against other surfaces.

3. Do not overtighten.

2.4.2 EXFO Universal Interface (EUI)

The EUI fixed base plate is available for connectors with angled (APC) or non angled (UPC) polishing. A green dot in the top left corner of the base plate indicates that it is for APC type connectors as shown in Figure 2-9.

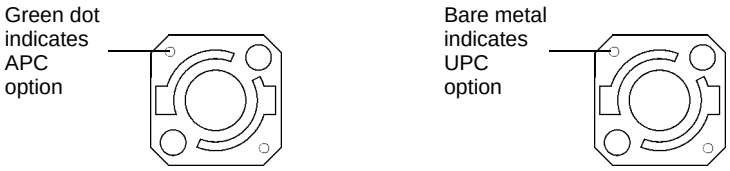


Figure 2-9. EUI Base Plate Options

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To mount an EUI connector adaptor to the EUI base plate

1. Hold the EUI connector adaptor so the dust cap opens downwards as depicted in Figure 2-10 below.

2. Close the dust cap in order to hold the connector adaptor more firmly.

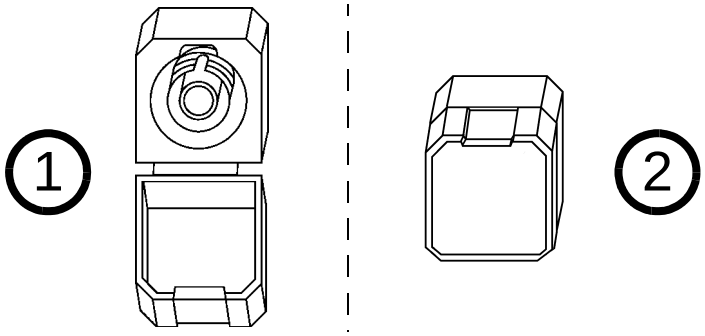


Figure 2-10. EUI Connector Adaptor

3. Insert the connector adaptor into the base plate.

4. Turn the connector adaptor clockwise to lock it in place.

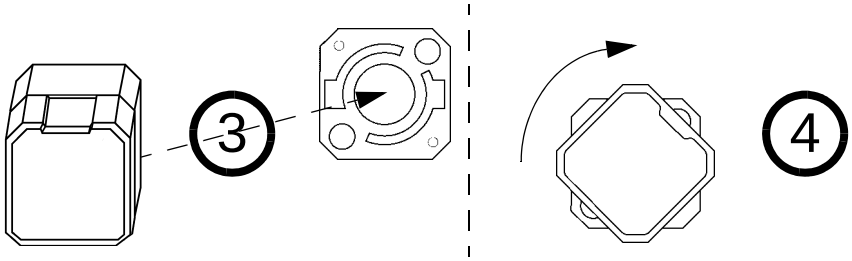


Figure 2-11. Mounting EUI Connector Adaptor

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2.5 Polarization Maintaining Laser Connectorization (IQ-2400 Only)

The DFB-LD integrated in the IQ-2400 comes with a polarization maintaining pigtail. The slow propagation axis of this pigtail has been aligned in order to be parallel to the linear state of polarization (SOP) of the laser. Once connectorized and mounted on the IQ-2400 front panel, the slow propagation axis will be aligned with the FC key of the FC/APC connector on the inside. Depending on the type of connector you have on the outside of the IQ-2400 front panel, the slow propagation axis will either be horizontal, vertical, or other.

2.5.1 FC/APC Narrow Key Connector Option

If your IQ-2400 has an FC/APC narrow key connector on the front panel, the slow propagation axis is horizontal, as shown in Figure 2-12.

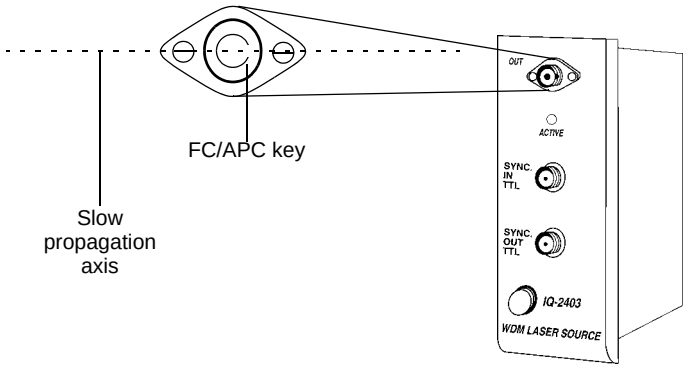


Figure 2-12. IQ-2400: FC/APC Connector Option

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2.5.2 SC/APC Connector Option

If your IQ-2400 has an SC/APC narrow key connector on the front panel, the slow propagation axis is perpendicular to the length (long side) of the connector, regardless of how it is positioned, as shown in Figure 2-13.

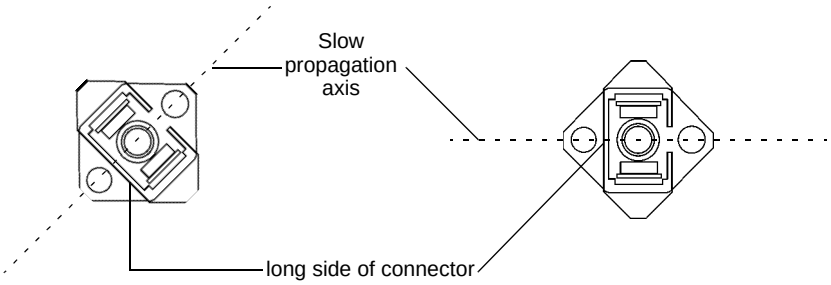


Figure 2-13. IQ-2400: SC/APC Connector Option

2.5.3 E-2000/APC Connector Option

If your IQ-2400 has an E-2000/APC connector on the front panel, the slow propagation axis is vertical, as shown in Figure 2-14.

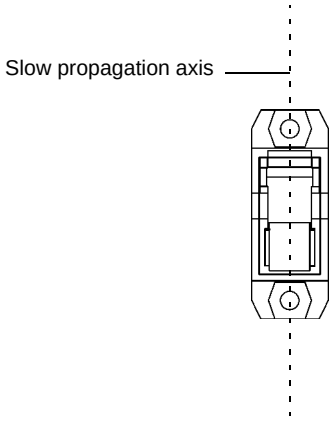


Figure 2-14. IQ-2400: E-2000/APC Connector Option

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2.5.4 EUI Connector Option

If your IQ-2400 has an EUI (EXFO Universal Interface) connector on the front panel, the slow propagation axis is horizontal, as shown in Figure 2-15.

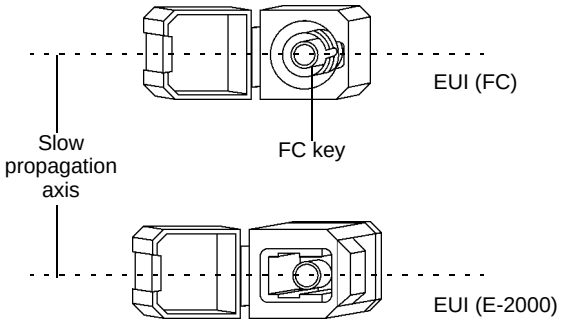


Figure 2-15. IQ-2400: EUI Connector Option

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2.6 Module Removal

CAUTION

Never insert or remove any module when the IQ-203 Mainframe or the IQ-206 Expansion Unit is powered on. This will result in immediate irreparable damage to the module and IQ-203/IQ-206.

To remove module from IQ-203/IQ-206

1. Make sure the IQ-203 /IQ-206 is powered off.

2. If your module has a locking mechanism, push up the locking mechanism under the front panel of the module, as shown in Figure 2-16. Otherwise, simply place your fingers under the front panel of the module.

3. Firmly pull the module outward.

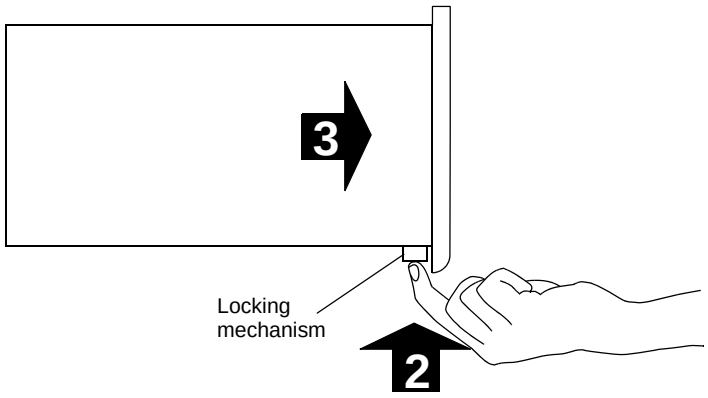


Figure 2-16. Removing an IQ Module

4. Put one of the supplied protective covers over the empty slot to prevent dust from entering the module housing.

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3 SAFETY MEASURES (IQ-2300 AND IQ-2400)

Note: *This section applies only to the IQ-2300 module configurations and each IQ-2400 module configurations rated as Class IIIB laser sources to be used in an area under the jurisdiction of the* Radiation Control for Health and Safety Act of 1968.

3.1 Description of Safety Measures

To comply with section 21 CFR 1040.10 and 1040.11 of the *Radiation Control for Health and Safety Act* of 1968, various safety measures have been added to all Class IIIB laser sources. All IQ-2300 configurations and some IQ-2400 configurations are rated as Class IIIB laser sources. To comply with these regulations, each light source is supplied with

- an integrated remote interlock connector which allows the introduction of external remote interlocks,
- a software key-activated master control, and
- an emission indicator which provides a visible signal sufficiently before emission to allow appropriate action to avoid exposure to the laser radiation.

3.1.1 Interlock Connector

All of the IQ-2300 module configurations and each IQ-2400 module configuration rated as a Class IIIB laser source have an integrated remote interlock connector which allows you to install a security switch or panic button. These modules are shipped with an internally shorted interlock cap. It is the user's responsibility to install external remote interlocks to ensure safe use of these sourses.

The interlock circuit has the following characteristics:

- When the interlock circuit is open, the light source cannot be activated.
- If the light source is active before the interlock circuit is opened, the light source becomes inactive. Upon closing the interlock circuit, the source will become active after a five second safety delay, unless the source software application **Off** button was pressed while the interlock circuit was open.

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The state of the interlock circuit (open or closed) is indicated by an icon in the **Status** display box of the IQ-2300 and IQ-2400 applications (see Figure 3-1).

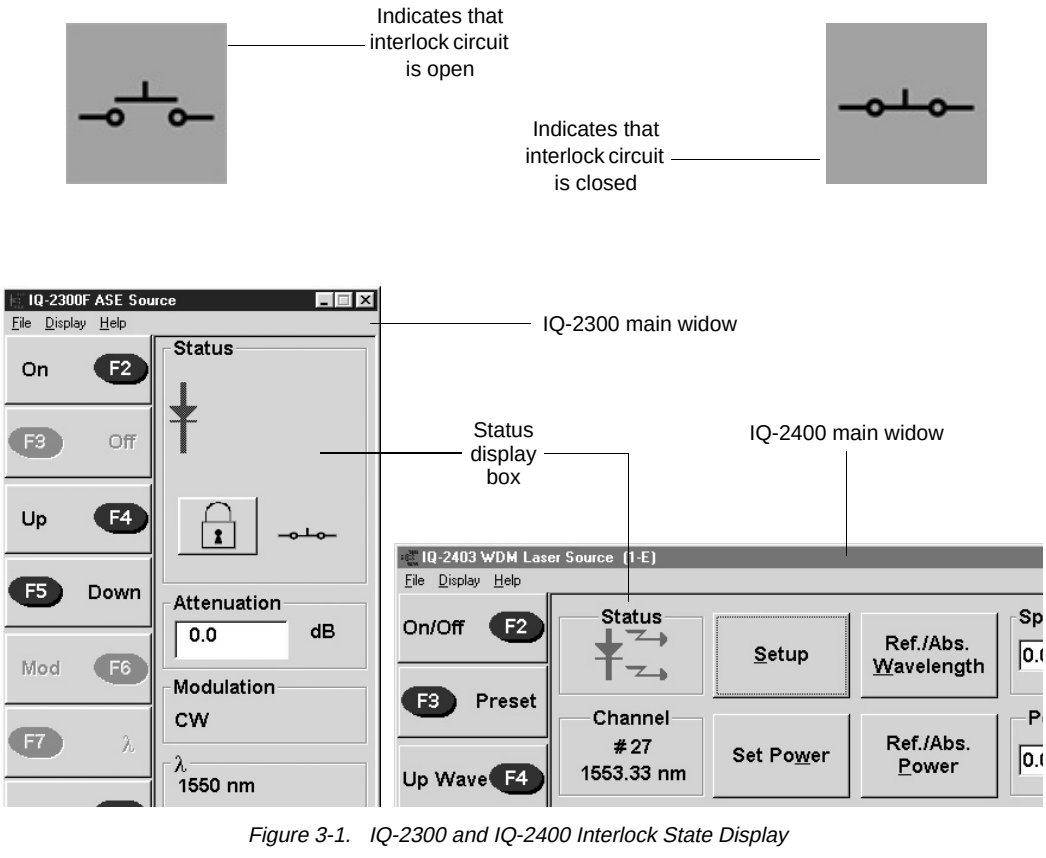


Figure 3-1. IQ-2300 and IQ-2400 Interlock State Display

The interlock circuit cannot be opened or closed via the applications.

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3.1.2 Software Key-Activated Master Control

In order for the **On** button (IQ-2300) or the **On/Off** button (IQ-2400) to turn on the light source, the software key must be turned on by entering the security password when prompted to do so.

The state of the master control (on or off) is indicated on the button in the **Status** display box of the IQ-2300 and IQ-2400 applications (see Figure 3-2).

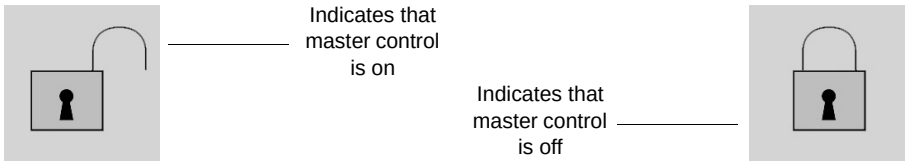


Figure 3-2. IQ-2300 and IQ-2400 Master Control State Display

When the master control is off, it is impossible to activate the light source.

3.1.3 Five Second Safety Delay

The IQ-2300 and IQ-2400 applications provide a five second safety delay between the source activation and actual light emission. During this five second delay, you may alter the output power level, or cancel the activation of the laser by clicking on the source deactivation button (**Off** for IQ-2300 and **On/Off** for the IQ-2400), by opening the interlock circuit or by pushing on the sofware key button.

Note: *The source emits a weak signal during the five second delay.*

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3.2 Source Activation with Security Measures

The software key password is “safekey”. This password cannot be modified and is the same for all IQ modules requiring a software key.

3.2.1 IQ-2300

To activate the IQ-2300 source

1. Setup the source as described in *Source Setup*, on page 5-9.

2. Make sure that the interlock circuit is closed. The interlock status icon indicates wether the interlock circuit is closed or open.

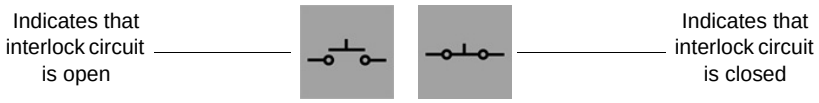


Figure 3-3. Interlock Status Icon

3. Activate the software key by clicking on the lock button. When prompted, enter the password “safekey”.

4. Choose **ON** to activate the light emission. The active LED on the module front panel will then light up indicating that the source is active or will be after the five second safety delay.

   Two red right-pointing arrows will then appear in the Status box, as shown in Figure 3-4, indicating that the source is on. These will blink during the five second safety delay.

To deactivate the IQ-2300 source, choose **OFF.** The active LED on the module front panel will then turn off, indicating that the source is off.

The two right-pointing arrows will disappear from the Status box indicating that the source has been deactivated. The symbol will also return to its original grayed-out color.

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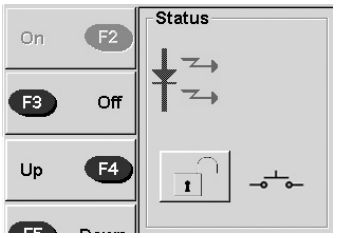


Figure 3-4. Light Source Activation/Deactivation Buttons and Status Box

Note: *To obtain optimum stability, a laser source should be allowed to warm up for a period of 10 minutes.*

3.2.2 IQ-2400

To activate the IQ-2400 source

1. Setup the source as described in *Source Setup*, on page 5-9.

2. Make sure that the interlock is closed. The interlock status icon indicates wether the interlock is closed or open.

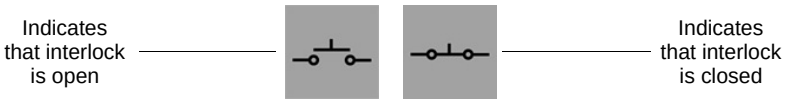


Figure 3-5. Interlock Status Icon

3. Activate the software key by clicking on the lock button. When prompted, enter the password “Turnkey”.



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4. Choose **On/Off** to activate light emission.

   When the source is active, the LED on the module front panel lights up and the Status indicator appears in red with two right-pointing arrows. These will blink during the five second safety delay.

To deactivate light emission, choose **ON/Off.** Once the source has been deactivated, the LED on the module front panel turns off, the Status indicator appears in black and the arrows disappear.



Figure 3-6. On/Off Button and Status Indicator

Note: *To obtain optimum stability, a laser source should be allowed to warm up for 60 minutes.*

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4 OPERATION (IQ-2100)

The many features of the light source are controlled using the Windows-compatible IQ Software. Please refer to the *IQ-200 Optical Test System Instruction Manual* for information regarding the IQ-200 Optical Test System, IQ-203 Mainframe, and IQ Software conventions.

4.1 Loading the Application Software

There are two ways to load the application software:

- Push the LED push button on the front panel.
- Double-click on the IQ-2100 icon in the IQ-200 Optical Test System main window.

Note: *Pushing the LED push button does not activate the source.*

Once the IQ-2100 application software is loaded, the IQ-2100 main window opens. The main window contains all the necessary commands to control the light source. Once open, the main window appears as illustrated in Figure 4-1.

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4.2 Main Window Description

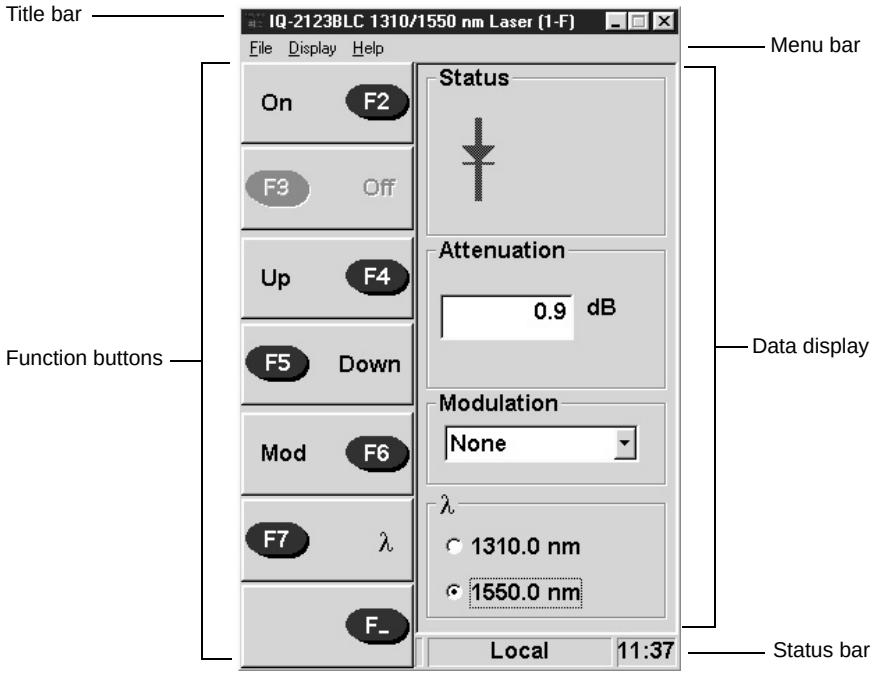


Figure 4-1. Main Window (IQ-2100)

The main window shown in Figure 4-1 can be divided into four sections:

- title bar and menu bar
- function buttons
- data display
- status bar

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4.2.1 Title Bar and Menu Bar

The title bar and menu bar are at the top of the main window (see Figure 4-1). The title bar indicates the wavelength, LED/laser specifications, and operating conditions. The menu bar contains three drop-down menus that are explained in Table 4-1.

Menu	Option	Function
File	Open Config...	Opens a previously saved configuration.
	Save Config...	Saves the current configuration.
	Exit	Closes the application.
Display	Monitor	Opens the monitor window that displays basic source data (refer to *Monitor Window Description*, on page 4-6 for detailed information).
Help	Online Manual	Opens the application Help file, which contains the text of this instruction manual.
	About...	Opens a window which provides the following information: • module model number • software version • serial number • corporate headquarters address • technical assistance telephone numbers, e-mail address, and Web site • available IQ-203 mainframe system memory (includes RAM and virtual memory) • remaining hard drive storage space

Table 4-1. Main Menu Windows

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4.2.2 Function Buttons

The function buttons, located on the left side of the main window, are used for immediate control of the light source. Table 4-2 provides a quick reference guide to these controls.

Function Button	Description
	Activates light emission (see *Source Activation/Deactivation*, on page 4-8).
	Deactivates light emission (see *Source Activation/Deactivation*, on page 4-8).
	Increases attenuation (see *Attenuation Setting*, on page 4-9).
	Decreases attenuation (see *Attenuation Setting*, on page 4-9).
	Selects the modulation (see *Modulation Selection*, on page 4-10).
	Selects the wavelength (see *Wavelength Selection*, on page 4-11).
	Transfers control between software function buttons and IQ-203 front panel hardware function keys (refer to *IQ-200 Optical Test System Instruction Manual*). When software function buttons are disabled, they will be grayed out.

Table 4-2. Function Buttons

Note: *The software function buttons are also available in monitor window mode.*

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4.2.3 Data Display

The data display boxes, located on the right side of the main window (Figure 4-1) indicate the result of the function button actions.

Table 4-3 provides a quick reference guide to these boxes. For further information on operation of the IQ-2100 using the data display boxes, see *Source Activation/Deactivation*, on page 4-8.

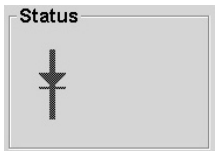
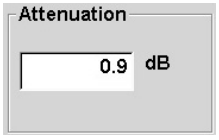
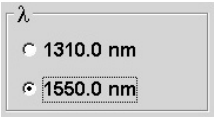
Display Box	Description
	Indicates light source status.
	Indicates the attenuation level. • Edit the attenuation value displayed.
	Sets the modulation. • Select a modulation value in the list box.
	Indicates the wavelength. • Select a wavelength with the radio button.

Table 4-3. Data Display Boxes

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4.2.4 Status Bar

On the status bar, you also find the inscription **Local**, **Remote**, or **Lockout**, which indicate if the IQ-2100 is controlled locally or remotely. Table 4-4 explains the meaning of these inscriptions. For more information on how to control the different IQ modules remotely, refer to the *GPIB and Application Development Guide*. The status bar also displays the time.

Indication	Meaning
Local	The unit is controlled locally.
Remote	The unit is controlled remotely but local commands can still be used.
Lockout	The unit is exclusively controlled remotely.

Table 4-4. Module Control Status

4.3 Monitor Window Description

The monitor window displays basic light source data. Using the monitor window with other module monitor windows allows the creation of an integrated data display screen (refer to the *IQ-200 Optical Test System Instruction Manual*). The size and position of the monitor window can be customized.

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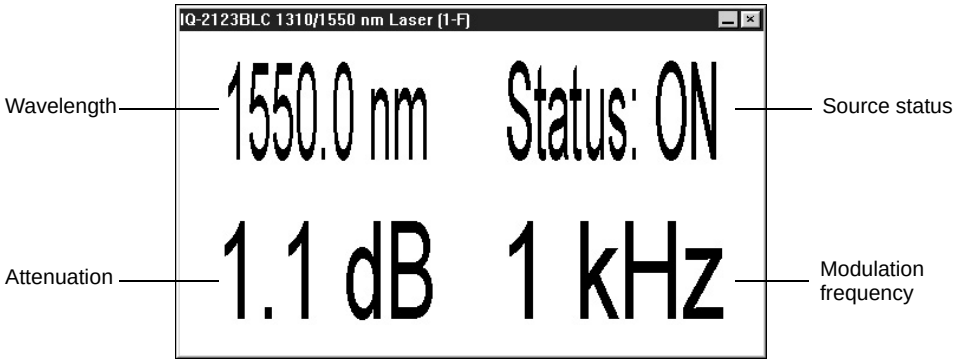


Figure 4-2. Monitor Window (IQ-2100)

4.3.1 Opening the Monitor Window

There are two ways to open the monitor window:

- Choose **Monitor** from the *Display* menu in the main window.
- Push the LED push button on the front panel of the module.

4.3.2 Closing the Monitor Window

There are two ways to close the monitor window to return to the main window:

- Double-click anywhere in the monitor window.
- Push the LED push button on the front panel of the module.

Note: *The function buttons can be accessed while in monitor window mode by positioning the cursor inside the monitor window and clicking the right mouse button. The function button keypad will appear to the left of the monitor window.*

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4.4 Exiting the Application Software

Closing any application software that is not in use is a good way to free system memory. The application software can be closed either from the main window or monitor window.

4.4.1 From the Main Window

There are three ways to exit the application software from the main window:

- Click on ☒ (in the top right corner of the main window).
- Choose **Exit** from the *File* menu.
- Click on the module icon (in the top left corner of the main window) and select **Close**.

4.4.2 From the Monitor Window

To exit the application software from the monitor window, click on ☒ (in the top right corner of the monitor window).

4.5 Source Activation/Deactivation

The following section describes how to power on the light source.

- Choose **ON** to activate the light emission. The active LED on the module front panel will then light up, indicating that the source is active.

Two red right-pointing arrows will then appear in the Status box, as shown in Figure 4-3, indicating that the source is on.

- Choose **OFF** to deactivate the light emission. The active LED on the module front panel will then turn off, indicating that the source is off.

The two right-pointing arrows will disappear from the Status box indicating that the source has been deactivated. The symbol will also return to its original grayed-out color.

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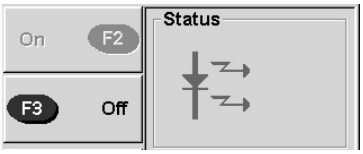


Figure 4-3. Light Source Activation/Deactivation Buttons and Status Box

Note: *To obtain optimum stability, a laser source should be allowed to warm up for a period of 30 minutes.*

4.6 Source Setup

The source is operated and controlled from within the main window. The following operations are available:

- attenuation setting
- modulation selection
- wavelength selection

4.6.1 Attenuation Setting

- Choose **UP** to increase the attenuation by increments of 0.1 dB. The Attenuation edit box will then indicate the increased attenuation.
- Choose **DOWN** to lower the attenuation by increments of 0.1 dB. The Attenuation edit box will then indicate the decreased level of attenuation.

IMPORTANT

On the IQ-2123BH, no attenuation can be applied when both wavelengths are activated.

The **Attenuation** edit box shown in Figure 4-4 indicates the level of dB power attenuation (variable power output loss) selected using the increase and decrease buttons. The range varies up to a maximum of 6 dB for LEDs and 9.9 dB for lasers (subject to change).

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Note: *To obtain maximum output power, the attenuation should be set to 0.0 dB and modulation should be set to none.*

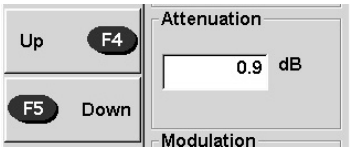


Figure 4-4. Increase/Decrease Buttons and Attenuation Edit Box

4.6.2 Modulation Selection

- Select a desired modulation frequency by choosing a value in the **Modulation** list box, shown in Figure 4-5.
- Choose **MOD** to step through the available modulation frequencies.

IMPORTANT

No modulation can be set on the IQ-2123BH.

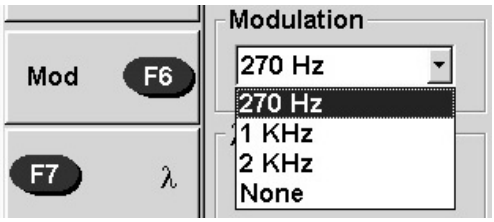


Figure 4-5. Modulation List Box

Note: *The internal modulation is full on/off modulation at a 50% duty cycle.*

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4.6.3 Wavelength Selection

- Choose λ to select the source wavelength (if a dual-wavelength source is being used).
- Click the radio button of the desired wavelength in the **Wavelength (λ)** box (see Figure 4-6).

A window displaying **Performing laser stabilization** will appear to indicate a successful wavelength selection (only if the source is a laser and the laser is active).

Note: *The wavelengths specified in the* **Wavelength (λ)** *box are the measured wavelengths of the optical sources; to the nearest 1 nm for FP lasers; to the nearest 0.1 nm for DFB lasers; and to the nearest 10 nm for LED sources for attenuation settings of 0.0 dB.*

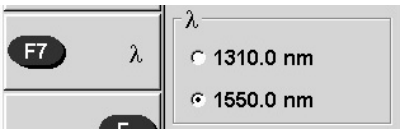


Figure 4-6. Wavelength Radio Button and Box

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5 OPERATION (IQ-2300)

The many features of the ASE source are controlled using the Windows-compatible IQ Software. Please refer to the *IQ-200 Optical Test System Instruction Manual* for information regarding the IQ-200 Optical Test System, IQ-203 Mainframe, and IQ Software conventions.

5.1 Loading the Application Software

There are two ways to load the application software:

- Push the LED push button on the front panel.
- Double-click on the IQ-2300 icon in the IQ-200 Optical Test System main window.

Note: *Pushing the LED push button does not automatically activate the source.*

Once the IQ-2300 application software is loaded, the IQ-2300 main window opens. The main window contains all the necessary commands to control the light source. Once open, the main window appears as illustrated in Figure 5-1.

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5.2 Main Window Description

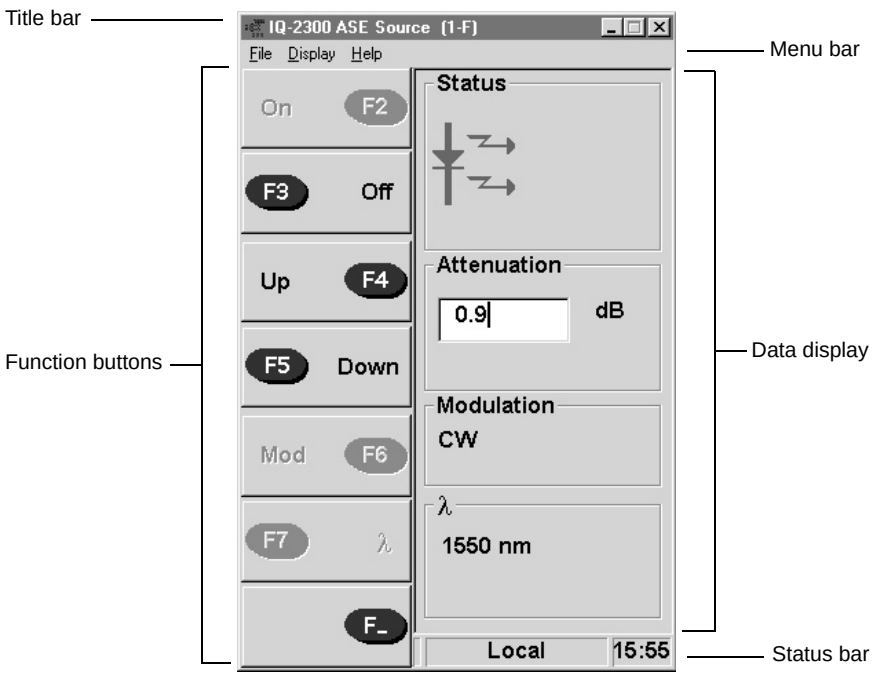


Figure 5-1. Main Window (IQ-2300)

The main window shown in Figure 5-1 can be divided into four sections:

- title bar and menu bar
- function buttons
- data display
- status bar

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5.2.1 Title Bar and Menu Bar

The title bar and menu bar are at the top of the main window (see Figure 5-1). The title bar indicates the type of source (ASE) and module location (O-A). The menu bar contains three drop-down menus that are explained in Table 5-1.

Menu	Option	Function
File	Open Config...	Opens a previously saved configuration.
	Save Config...	Saves the current configuration.
	Exit	Closes the application.
Display	Monitor	Opens the monitor window that displays basic source data (see *Monitor Window Description*, on page 5-7 for detailed information).

Table 5-1. Main Menu Windows (Part 1 of 2)

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Menu	Option	Function
Help	Online Manual	Opens the application Help file, which contains the text of this instruction manual.
	Hardware	Opens a window that provides the following information: • module name • module ID • serial number • minimum version (necessary for module updates) • embed version (version of software downloaded to the module)
	About...	Opens a window that provides the following information: • module model number • corporate headquarters address • technical assistance telephone numbers, e-mail address, and Web site • software version • available IQ-203 mainframe system memory (includes RAM and virtual memory) • remaining hard drive storage space

Table 5-1. Main Menu Windows (Part 2 of 2)

5.2.2 Function Buttons

The function buttons, located on the left side of the main window, are used for immediate control of the light source. Table 5-2 provides a quick reference guide to these controls.

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Function Button	Description
	Activates light emission (see *Source Activation/Deactivation*, on page 5-9).
	Deactivates light emission (see *Source Activation/Deactivation*, on page 5-9).
	Increases attenuation (see *Attenuation Setting*, on page 5-9).
	Decreases attenuation (see *Attenuation Setting*, on page 5-9).
	The modulation selection button is grayed out since this function is not available.
	The wavelength selection button is grayed out since the wavelength cannot be modified (see *Wavelength Box*, on page 5-10).
	Transfers control between software function buttons and IQ-203 front panel hardware function keys (refer to the *IQ-200 Optical Test System Instruction Manual*). When the hardware function keys are selected, the software function buttons will be grayed out.

Table 5-2. Function Buttons

Note: *The software function buttons are also available in monitor window mode.*

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5.2.3 Data Display

The data display boxes, located on the right side of the main window (Figure 5-1) indicate the result of function button actions. Table 5-3 provides a quick reference guide to these boxes.

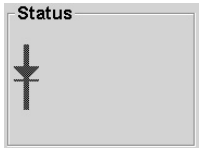
Display Box	Description
	Indicates light source, interlock and master control status.
	Indicates the attenuation level. • Edit the attenuation value displayed.
	Indicates the wavelength.

Table 5-3. Data Display Boxes

5.2.4 Status Bar

On the status bar, you also find the inscription **Local**, **Remote**, or **Lockout**, which indicate if the IQ-2300 is controlled locally or remotely. Table 5-4 explains the meaning of these inscriptions. For more information on how to control the different IQ modules remotely, refer to the *GPIB and Application Development Guide*. The status bar also displays the time.

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Indication	Meaning
Local	The unit is controlled locally.
Remote	The unit is controlled remotely, but local commands can still be used.
Lockout	The unit is exclusively controlled remotely.

Table 5-4. Module Control Status

5.3 Monitor Window Description

The monitor window displays basic light source data. Using the monitor window with other module monitor windows allows the creation of an integrated data display screen (refer to the *IQ-200 Optical Test System Instruction Manual*). The size and position of the monitor window can be customized.

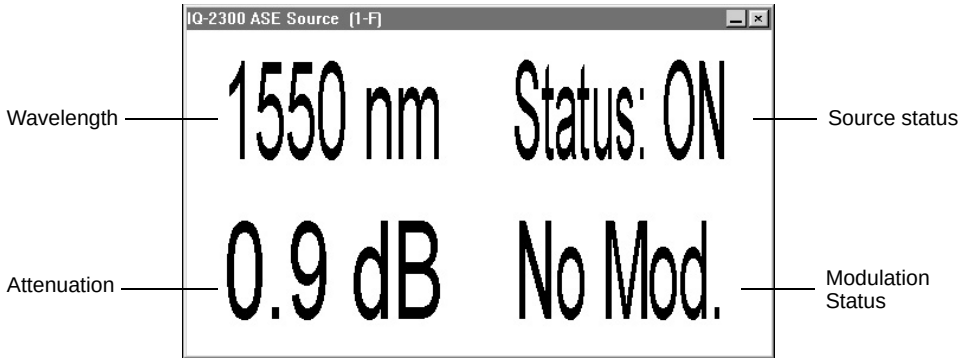


Figure 5-2. Monitor Window (IQ-2300)

5.3.1 Opening the Monitor Window

There are two ways to open the monitor window:

- Choose **Monitor** from the *Display* menu in the main window.
- Push the LED push button on the front panel of the module.

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5.3.2 Closing the Monitor Window

There are two ways to close the monitor window to return to the main window:

- Double-click anywhere in the monitor window.
- Push the LED push button on the front panel of the module.

Note: *The function buttons can be accessed while in monitor window mode by positioning the cursor inside the monitor window and clicking the right mouse button. The function button keypad will appear to the left of the monitor window.*

5.4 Exiting the Application Software

Closing any application software that is not in use is a good way to free system memory. The application software can be closed either from the main window or monitor window.

5.4.1 From the Main Window

There are three ways to exit the application software from the main window:

- Click on  (in the top right corner of the main window).
- Choose **Exit** from the *File* menu.
- Click on the module icon (in the top left corner of the main window) and select **Close**.

5.4.2 From the Monitor Window

To exit the application software from the monitor window, click on  (in the top right corner of the monitor window).

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5.5 Source Activation/Deactivation

The following section describes how to power on the light source.

- Choose **ON** to activate the light emission. The active LED on the module front panel will then light up, indicating that the source is active.

Two red right-pointing arrows will then appear in the Status box, as shown in Figure 5-3, indicating that the source is on.

- Choose **OFF** to deactivate the light emission. The active LED on the module front panel will then turn off, indicating that the source is off.

The two right-pointing arrows will disappear from the Status box indicating that the source has been deactivated. The symbol will also return to its original grayed-out color.

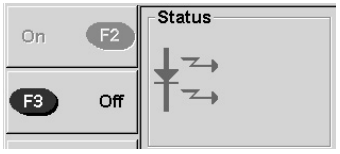


Figure 5-3. Light Source Activation/Deactivation Buttons and Status Box

Note: *To obtain optimum stability, a laser source should be allowed to warm up for a period of 10 minutes.*

5.6 Source Setup

The source is operated and controlled from within the main window. The user can control the attenuation setting of the source.

5.6.1 Attenuation Setting

- Choose **UP** to increase the attenuation by increments of 0.1 dB. The **Attenuation** edit box will then indicate the increased attenuation.

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- Choose **DOWN** to lower the attenuation by increments of 0.1 dB. The **Attenuation** edit box will then indicate the decreased level of attenuation.

The **Attenuation** edit box shown in Figure 5-4 indicates the level of dB power attenuation (variable power output loss) selected using the increase and decrease buttons. The range varies up to a maximum of 3 dB.

Note: *To obtain maximum output power, the attenuation should be set to 0.0 dB.*

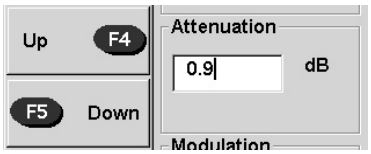


Figure 5-4. Increase/Decrease Buttons and Attenuation Edit Box

5.6.2 Wavelength Box

The wavelength is shown in the **Wavelength (λ)** box (see Figure 5-5).



Figure 5-5. Wavelength Box

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6 OPERATION (IQ-2400)

The many features of the laser source are controlled using the Windows-compatible IQ Software. Please refer to the *IQ-200 Optical Test System Instruction Manual* for information regarding the IQ-200 Optical Test System, IQ-203 Mainframe, and IQ Software conventions.

6.1 Theory

6.1.1 Wavelength and Power Control

The source wavelength is influenced mostly by laser temperature and, to a lesser extent, by laser current intensity. In the IQ-2400, you can control and stabilize wavelength by modifying laser temperature. The laser temperature[1] can be set to any value between (T_{set}-10°C) and (T_{set}-10°C). Wavelength variation corresponds to an average of 0.1 nm/°C for a total wavelength tuning range superior to 2.0 nm.

At module power-up, the laser is warmed up to 24°C in order for it to stabilize more rapidly when it is activated. When the laser is deactivated (but module is still on), the laser temperature is maintained.

Temperature stability and control are essential for wavelength adjustment; therefore, the source module includes a thermistor that is placed inside the laser package and is used to measure internal laser temperature. The source module also drives the thermoelectric cooler (TEC) used to reach required temperatures and regulate specific values.

To ensure more power stability, the source module is mounted with a back-facet photodiode measuring a monitor current coming from the rear facet of the laser. Since the output power is directly proportional to the monitor current, power is calculated using the monitor current in relation to the coupling efficiency.

The user can control the source power. The power level is modified through a change in laser drive current. A 10.0 dB attenuation range is possible. Wavelength precision will be maintained throughout the attenuation range.

1. T_{set} is the temperature that the laser must have to generate the central wavelength.

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6.1.2 Control Modes

The IQ-2400 offers four different control modes , which are described in the following paragraphs: Normal, High Wavelength Stability, Dither Modulation, and On/Off Modulation.

Normal

Normal mode is used to maximize output power stability. This mode is the default, meaning that it is used to tune wavelength and power throughout their respective ranges (2 nm for wavelength and 10 dB for power). To maintain power at the specified level, the monitor current at the rear end of the laser will be held constant. Laser current intensity is adjusted in real time to produce a constant output power. Since peak wavelength varies with laser current intensity, the emission spectra is slightly enlarged.

High Wavelength Stability

High Wavelength Stability mode is used when central wavelength stability is critical. In High Wavelength Stability mode, current is constant thus maintaining wavelength stability. Once power and wavelength have been set to the required levels (in Normal mode), choose High Wavelength Stability mode to enhance wavelength stability at the established value. A limited tuning range is permitted around this value (±1°C for wavelength or ±1 mA for current). Power stability can be enhanced after a very long stabilization period (typically 2 days).

Dither Modulation

This mode is a combination of Normal mode and dithering (see *Normal*, on page 6-2). In Dither Modulation, the user can have a 1 mA to 5 mA tone (dithering), which can either be a square or triangle wave.

On/Off Modulation

On/Off Modulation (50% duty cycle) halves the average power available from the source module. This mode controls current during the “on” cycle of the signal. The tuning range for temperature and current are the same as in High Wavelength Stability mode.

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6.2 Loading the Application Software

There are two ways to load the application software:

- Push the LED push button on the front panel.
- Double-click on the IQ-2400 icon in the IQ-200 Optical Test System main window.

Note: *Pressing the LED push button does not activate the source.*

Once the IQ-2400 application software is loaded, the main window opens. The main window contains all the necessary commands to control the light source and appears as illustrated in Figure 6-1.

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6.3 Main Window Description

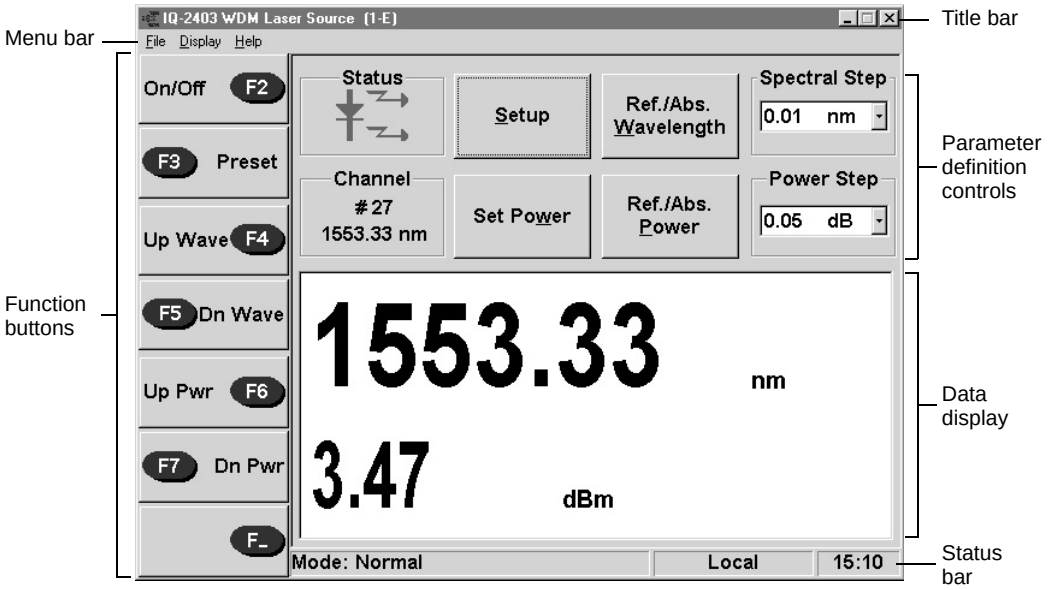


Figure 6-1. Main Window (IQ-2400)

The main window shown in Figure 6-1 can be divided into five sections:

- title bar and menu bar
- function buttons
- parameter definition controls
- data display
- status bar

6.3.1 Title Bar and Menu Bar

The title bar and menu bar are at the top of the main window (see Figure 6-1). The menu bar contains three drop-down menus that are explained in Table 6-1.

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Menu	Option	Function
File	Open Config...	Opens to a previously saved configuration. When opening files, the module's serial number is verified. If the serial number matches, the file is loaded.[a]
	Save Config...	Saves the current configuration.[b]
	Exit	Closes the application.
Display	Monitor	Opens the monitor window, which displays basic source data (see *Monitor Window Description*, on page 6-11 for detailed information).
	Monitor Options	Opens a dialog box where the user can select the following information to be shown in the data display: • wavelength • power • status • channel number • module • setpoint name

Table 6-1. Main Window Menus (Part 1 of 2)

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Menu	Option	Function
Help	Online Manual	Opens the application Help file, which contains the text of this instruction manual.
	Hardware	Opens a window that provides the following information: • module name • module ID • serial number • minimum version (necessary for module updates) • checksum (module memory)
	About...	Opens a window that provides the following information: • module model number • corporate headquarters address • technical assistance telephone numbers, e-mail address, and Web site • software version • available IQ-203 mainframe system memory (includes RAM and virtual memory) • remaining hard drive storage space

Table 6-1. Main Window Menus (Part 2 of 2)

a. A module can only load a file if the serial numbers of the module and file match.
b. Configuration files should be named in a manner so the user can easily find the file that corresponds to the module.

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6.3.2 Function Buttons

The function buttons, located on the left side of the main window, are used for immediate control of the laser source. Table 6-2 provides a quick reference guide to these controls.

Function Button	Description
	• Activates/Deactivates light emission (see *Source Activation/Deactivation*, on page 6-13).
	• Opens the Preset window where the user can access the available preset wavelengths and power in their respective modes (see *Setpoints*, on page 6-17).
	• Increases frequency in Normal mode (see *Source Parameters*, on page 6-21). • Decreases temperature in High Wavelength Stability mode.
	• Increases wavelength. • Increases laser temperature in High Wavelength Stability mode (see *Source Parameters*, on page 6-21).
	• Decreases source frequency (see *Source Parameters*, on page 6-21). • Increases temperature in High Wavelength Stability mode.
	• Decreases wavelength. • Decreases laser temperature in High Wavelength Stability mode (see *Source Parameters*, on page 6-21).
	• Increases power in Normal mode. • Increases current in High Wavelength Stability mode (see *Source Parameters*, on page 6-21).

Table 6-2. Function Button Description (Part 1 of 2)

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Function Button	Description
	• Decreases power in Normal mode. • Decreases current in High Wavelength Stability mode (see *Source Parameters*, on page 6-21).
	• Transfers control between software function buttons and IQ-203 front panel hardware function keys (refer to *IQ-200 Optical Test System Instruction Manual*). • When software function buttons are disabled, they are grayed-out.

Table 6-2. Function Button Description (Part 2 of 2)

6.3.3 Parameter Definition Controls

Parameter	Description
	• Displays the present channel and wavelength that are in use. • The reference channel number is an EXFO reference number.
	• Opens the **Setup** window used to configure environment parameters and working preferences (see *Setup*, on page 6-13).
	• Opens the **Set Power** window when pressed (see *Set Power*, on page 6-19).

Table 6-3. Parameter Definition Controls (Part 1 of 2)

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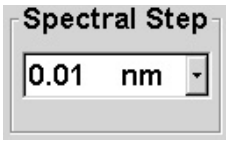
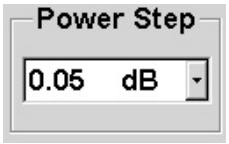
Parameter	Description
	• Toggles display between reference frequency and absolute frequency (see *Reference Mode vs. Absolute Mode*, on page 6-20).
	• Toggles display between reference wavelength and absolute wavelength (see *Reference Mode vs. Absolute Mode*, on page 6-20).
	• Toggles display between reference power and absolute power (see *Reference Mode vs. Absolute Mode*, on page 6-20).
	• Displays the spectral step currently used and enables selection of another power step. The spectral step selected is used for power up and power down functions (see *Source Parameters*, on page 6-21).
	• Displays the power step currently used and enables selection of another power step. The power step selected is used for power up and power down functions (see *Source Parameters*, on page 6-21).

Table 6-3. Parameter Definition Controls (Part 2 of 2)

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6.3.4 Data Display

In addition to the parameter definition controls, the main window also contains the source status indicator and data display (see Figure 6-1).

Depending on the setup, Normal mode displays either wavelength in nm or frequency in THz. Power is presented in dBm or mW. During laser stabilization, spectral value (wavelength or frequency) and power are displayed in gray; however, adjustments can be made by pressing buttons **F4** to **F7**. After laser temperature stabilization, the two values are displayed in black. If you use Reference mode, reference values appear in the middle of the right-hand side of the display (see *Reference Mode vs. Absolute Mode*, on page 6-20).

In High Wavelength Stability mode, wavelength and power are displayed in gray and cannot be adjusted. This mode is used for fine-tuning laser temperature and current on a limited range around nominal wavelength and power levels reached in Normal mode. Laser temperature and current are displayed at the bottom of the right-hand side of the data display.

In both Normal and High Wavelength Stability modes, if the current setting corresponds to a predefined setpoint, the setpoint name appears at the top of the right-hand side of the data display. This can be achieved by either choosing a new setpoint using the Preset button or by modifying source parameters using the **F4** to **F7** function buttons.

6.3.5 Status Bar

The first part of the status bar displays messages. In addition, it shows the current application mode (**Normal**, **High Wavelength Stability**, **Dither Modulation**, or **On/Off Modulation**).

The second part of the status bar displays the inscription **Local**, **Remote**, or **Lockout**, which indicate if the IQ-2400 is controlled locally or remotely. For more information on how to control the different IQ modules remotely, refer to the *GPIB and Application Development Guide*. Table 6-4 explains the meaning of these inscriptions. The status bar also displays the time.

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Indication	Meaning
Local	The unit is controlled locally.
Remote	The unit is controlled remotely, but local commands can still be used.
Lockout	The unit is controlled remotely.

Table 6-4. Module Control Status

6.4 Monitor Window Description

The monitor window displays basic laser source data. Using the monitor window with other module monitor windows allows the creation of an integrated data display screen (refer to the *IQ-200 Optical Test System Instruction Manual*). The size and position of the monitor window can be customized.

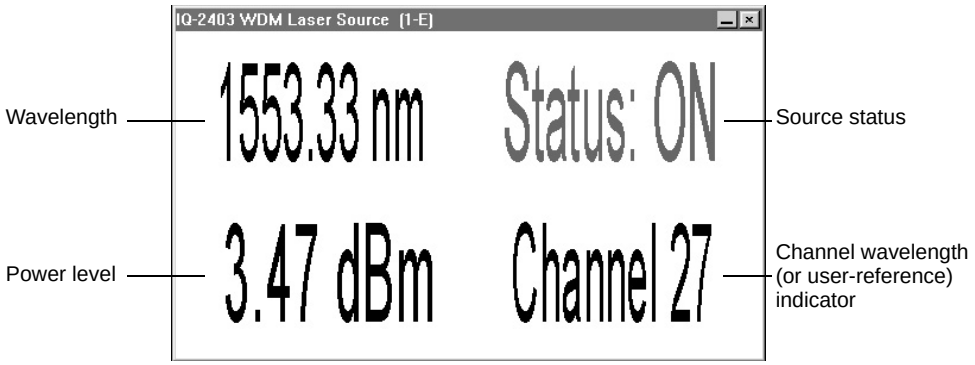


Figure 6-2. Monitor Window (IQ-2400)

6.4.1 Opening Monitor Window

There are two ways to open the monitor window:

- Choose **Monitor** from the *Display* menu in the main window.
- Push the LED push button on the front panel of the module.

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By choosing **Monitor Options** from the **Display** menu, a dialog box opens and users can decide which information is to be shown in the data display (see Table 6-1 for list of options).

6.4.2 Closing Monitor Window

There are two ways to close the monitor window and return to the main window:

- Double-click anywhere in the monitor window.
- Push the LED push button on the front panel of the module.

6.5 Exiting the Application Software

Closing any application software that is not in use is a good way to free system memory. The application software can be closed either from the main window or monitor window.

6.5.1 From the Main Window

There are three ways to exit the application software from the main window:

- Click on  (in the top right corner of the main window).
- Choose **Exit** from the *File* menu.
- Click on the module icon (in the top left corner of the main window) and select **Close**.

6.5.2 From the Monitor Window

- To exit the application software from the monitor window, click on  (in the top right corner of the monitor window).

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6.6 Source Activation/Deactivation

Choose **On/Off** to activate or deactivate light emission. When the source is active, the LED on the module front panel lights up and the Status indicator appears in red with two right-pointing arrows. Once the source has been deactivated, the LED on the module front panel turns off, the Status indicator appears in black and the arrows disappear.



Figure 6-3. On/Off Button and Status Indicator

Note: *To obtain optimum stability, a laser source should be allowed to warm up for 60 minutes.*

6.7 Setup

The *Setup* window is used to configure environment parameters and working preferences. To access the *Setup* window, choose **Setup** in the main window. The following sections describe the three different pages available through the *Setup* window: control, modulation, and step. To display a particular page within the *Setup* window, simply choose the corresponding tab (Control, Modulation, or Step) on the top of the window. Choose **OK** to save any modifications or **Cancel** to quit the *Setup* window without changing the configuration.

Note: *You can access the* **Setup** *window while the laser is active. Changes to laser operation take effect only once you have quit the* **Setup** *window.*

6.7.1 Control Page

Use the **Control** page to choose control modes; modify the information presented on the data display by selecting spectral and power units; and add, remove, or rename setpoints. The **Control** page appears as shown in Figure 6-4.

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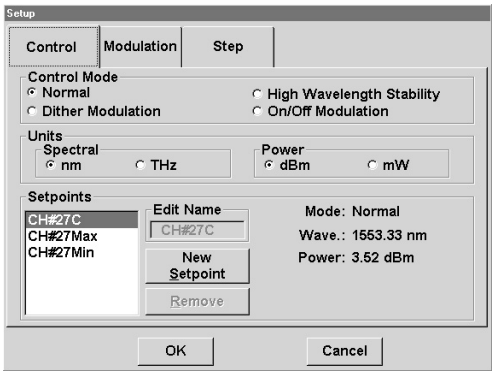


Figure 6-4. Control Page

Choose **Normal**, **High Wavelength Stability**, **Dither Modulation**, or **On/Off Modulation** in the **Control Mode** group to select one of the four control modes. for a description of the characteristics of each control mode, see *Theory*, on page 6-1.

If you want the data display to present the source wavelength, choose the **nm** radio button in the **Spectral** group. Choose the **THz** radio button and the data display will give you the source frequency. Choose **dBm** or **mW** in the **Power** group to modify the power units used in the data display. For more details on the data display, see Figure 6-1, on page 6-4 and *Data Display*, on page 6-10.

The **Setpoints** list contains setpoints previously defined in either Normal or High Wavelength Stability mode. Each mode has its specific list. Dither Modulation uses setpoints established in Normal mode, whereas On/Off Modulation uses High Wavelength Stability setpoints.

Press **New Setpoint** to add a new setpoint with current wavelength and power values (see *Creating a New Setpoint*, on page 6-17,) or press **Remove** to delete the selected setpoint. You can also rename the selected setpoint by typing the new name in the **Edit Name** text box. EXFO-defined setpoints are calibrated at the wavelength specified by the user when the unit was ordered. They cannot be deleted but can be renamed.

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6.7.2 Modulation Page

Use the **Modulation** page to determine parameters of modulation mode. The **Modulation** page appears as shown in Figure 6-5.

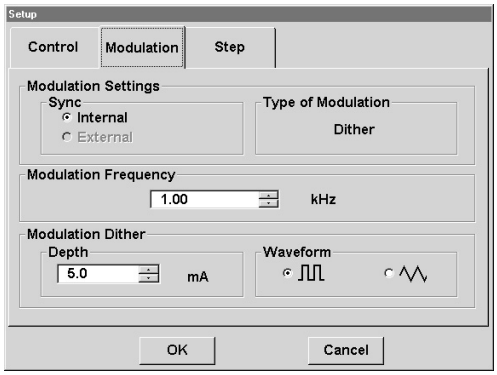


Figure 6-5. Modulation Page

Modulation can be synchronized with a TTL signal coming from the module (Internal) or from another module (External). On the **Control** page, the user can choose between Dither Modulation or On/Off Modulation (50% duty cycle). Default values are Internal and On/Off. Synchronization can only be internal if you choose Dither Modulation.

For an internal synchronization, you can choose the modulation frequency of the laser signal emitted by the source. Minimum and maximum frequencies are determined by the module. Acceptable values range from 0.01 kHz to 300 kHz. With On/Off Modulation, frequency will be limited to 300 kHz. If synchronization is external, this option is deactivated.

For a Dither Modulation signal, you can choose the depth and waveform of the amplitude modulation signal added or overlapped over the CW signal. Minimum and maximum depths are determined by the module's differential efficiency. Acceptable values range from 1 mA to 5 mA. Modulation waveform is either square or triangular. For an On/Off Modulation signal, these options are deactivated. In On/Off, the waveform is square.

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6.7.3 Step Page

Use the **Step** page (see Figure 6-6) to add or delete both spectral and power steps. Step values are the increments used in Normal mode to increase or decrease signal wavelength, frequency, and power emitted by the source (for more information, see *Source Parameters*, on page 6-21).

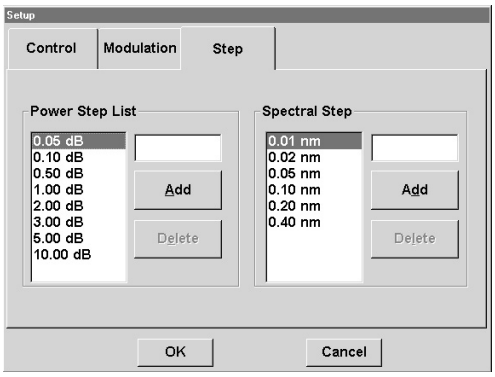


Figure 6-6. Step Page

The **Spectral Step** can appear in nm or THz, depending on the spectral unit chosen in the **Spectral** group on the **Control** page. The **Spectral Step** is used in the main window to modify wavelength or frequency of the source using the **F4** and **F5** buttons (**Up Wave/Up Freq** or **Dn Wave/Dn Freq**) (see *Function Buttons*, on page 6-7).

The **Power Step** list can appear in dB or mW, depending on the power unit chosen in the **Power** group on the **Control** page. Values are not converted from one unit to the other. In Normal mode, the **Power Step** list selected is used in the main window to modify source power using the **F6** and **F7** buttons (**Up Pwr** and **Dn Pwr**) (see *Function Buttons*, on page 6-7).

To delete either a **Spectral Step** or **Power Step** from the lists, select the step and push **Delete** to remove it. To create either a **Spectral Step** or **Power Step**, type in the value of the new step and push **Add**.

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6.8 Setpoints

A setpoint is a specific configuration of the source included in the **Setpoint** list on the **Control** page. You can create a setpoint in both Normal and High Wavelength Stability modes (see *Control Page*, on page 6-13).

In Normal mode, setpoints define the source power and wavelength. In High Wavelength Stability mode, in addition to power and wavelength, setpoints define relative laser temperature and drive current. In High Wavelength Stability mode, new setpoints refer to the differences in temperature and current from the absolute temperature (wavelength) and current (power) levels obtained in Normal mode before switching to High Wavelength Stability mode.

Each setpoint is saved under a specific name defined by EXFO or by the user. Setpoints are especially useful when you often have to set the source to specific parameters.

6.8.1 Using a Setpoint

The name of the active setpoint is always displayed in the top right corner of the data display. To set the source to a predetermined setpoint,

1. Press the **Preset** button.

2. Select the desired setpoint from the list.

3. Press **OK** or double-click on the Setpoint name in the list.

New parameters are sent to the module. The source then takes a few seconds to adjust to the predetermined values, and the message "**Stabilization in progress**" is displayed in the status bar.

6.8.2 Creating a New Setpoint

Setpoints can be created in any mode; however, if a setpoint is created in either Dither Modulation or On/Off Modulation mode, the setpoint does not retain any modulation information.

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Setpoints created in Dither Modulation mode can be used in Dither Modulation or Normal mode.

If the setpoint is created in On/Off Modulation mode, it can be used in On/Off Modulation or High Wavelength Stability modes. To create a setpoint in High Wavelength Stability or On/Off Modulation mode, the laser must be “on” and stabilized.

To create a setpoint,

1. Choose the desired mode in the **Control** page of the *Setup* window if not already done (for more information, see *Control Page*, on page 6-13).

2. Adjust source wavelength and power to the desired levels (for more information, see *Source Parameters*, on page 6-21).

3. Press **New Setpoint** on the **Control** page. The **New Setpoint** dialog box shown in Figure 6-7 appears prompting for a name.

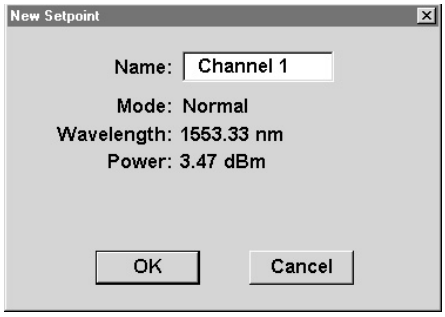


Figure 6-7. New Setpoint Dialog Box

4. Enter a name for the new setpoint and choose **OK** to return to the main window. The new setpoint becomes the active setpoint and is displayed in the main window.

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Note: *We recommend that you choose a significant name to facilitate further usage of the setpoint. For example, identify the new setpoint by its wavelength (e.g. 1552.23) or give it the name of the destination of the signal (e.g. Channel_1). The name can have up to 10 characters.*

6.9 Set Power

Although the module is precisely calibrated, the actual output power level may slightly drift over time due to connector usage and laser aging. The **Set Power** option is then used to adjust the output power level to its actual value, as measured using a calibrated power meter.

Correcting the source output power level is only possible in Normal mode. Proceed as follows:

1. Use a reference patchcord that has been properly cleaned at both ends and of a known insertion loss.

2. Connect the test jumper between a calibrated power meter and the IQ-2400 source port.

3. Make sure source activation was performed at least one hour before (for more information, see *Source Activation/Deactivation*, on page 6-13).

4. Press **Set Power** on the main window. The **Set Power** dialog box shown in Figure 6-8 appears prompting for the new power level.

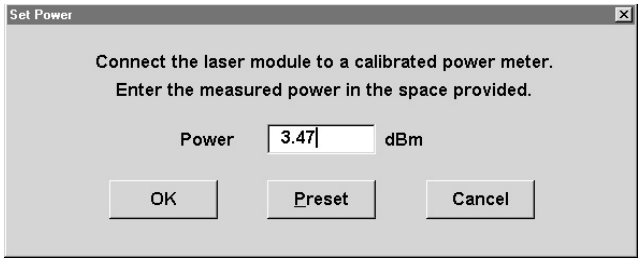


Figure 6-8. Set Power Dialog Box

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5. Enter the reading given by the power meter less the insertion loss of the reference test jumpers and choose **OK** to return to the main window. The new power level is used as a reference to reestablish the correspondence between the output power level and the displayed values. When you choose **OK**, the following warning message appears: **"This output power correction will be applied to all recorded setpoint power levels and the displayed current power level."** Use the **Preset** button to return to EXFO's original calibration at any time.

6.10 Reference Mode vs. Absolute Mode

Power, wavelength, or frequency readings are usually given in Absolute mode; therefore, values appearing on the display correspond to the actual value at the source port. Reference mode is used to set a given power, wavelength, or frequency as a reference value. The new reading shown on the data display then corresponds to the difference between the reference value and actual value.

Depending on the setup, power readings are given in dBm or mW. When the power unit used is the dBm, the reference power appears in dBm, but the main power reading is given in dB since it is not referenced to a mW.

The spectral value shown on the data display is either the wavelength or the frequency of the signal emitted. The spectral value corresponds to the spectral unit you choose in the setup page. Wavelength values are given in nm and frequency values in THz.

6.10.1 Reference Power

When the source is active, choose **Ref./Abs. Power** to set the current output power as the reference power. The reference power appears in the lower right corner of the data display, and the power reading given now corresponds to the difference between the reference power and actual power level.

Choose **Ref./Abs. Power** to return to the absolute power mode. The reference power disappears, and the power reading shows the actual power level.

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6.10.2 Reference Wavelength

If the spectral unit is nm, choose **Ref./Abs. Wavelength** to set the current wavelength as the reference wavelength. The reference wavelength appears in the lower right corner of the data display, just above the reference power. The wavelength reading given now corresponds to the difference between the reference wavelength and actual wavelength.

Choose **Ref./Abs. Wavelength** to return to absolute wavelength mode. The reference wavelength disappears, and the wavelength reading given is the actual wavelength.

6.10.3 Reference Frequency

If the spectral unit is the THz, choose **Ref./Abs. Freq.** to set the current frequency as the reference frequency. The reference frequency appears in the lower right corner of the data display, just above the reference power. The frequency reading given now corresponds to the difference between the reference frequency and actual frequency.

Choose **Ref./Abs. Freq.** to return to absolute frequency mode. The reference frequency disappears, and the frequency reading given is the actual frequency.

6.11 Source Parameters

You can modify source parameters from within the main window. Adjustable parameters depend on the control mode. Normal mode is used to adjust the spectral value (wavelength or frequency) and source power. High Wavelength Stability mode is used once the desired power and wavelength have been set to the required levels (in Normal mode) to enhance wavelength stability at the established value. A limited tuning range will be permitted around this value (±1°C for temperature/wavelength or ±1 mA for current/power).

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6.11.1 Source Operation in Normal Mode

Function buttons **F4** and **F5** alternate between wavelength and frequency according to the spectral unit selected in the **Control** page (see *Control Page*, on page 6-13).

In Normal mode, use the **Up Wave** and **Dn Wave** buttons to modify source wavelength. This action also modifies the internal laser temperature. The source takes a few seconds to adjust to the new wavelength, and a message is displayed in the status bar.

In Normal mode, use the **Up Freq** or **Dn Freq** buttons to adjust the frequency accordingly.

Use the **Up Pwr** and **Dn Pwr** buttons (**F6** and **F7**) to modify source power. Power is changed according to the power step displayed in the **Power Step** list box. You can modify the power step by simply selecting a new power step from the list. Remember that the power step list presented always corresponds to the power unit chosen in the setup (dBm or mW).

6.11.2 Source Operation in High Wavelength Stability Mode

In High Wavelength Stability mode, new setpoints refer to the difference in temperature and in current from the absolute temperature (wavelength) and current (power) levels obtained in Normal mode before switching to High Wavelength Stability mode.

In High Wavelength Stability mode, use the **Up Wave** and **Dn Wave** buttons to modify laser temperature. The module takes a few seconds to adjust the source to the new wavelength, and a message is displayed in the status bar. The step used is the smallest increment of the internal laser temperature; therefore, in this mode, the central wavelength can be adjusted and stabilized to a resolution less than 0.01 nm.

Use the **Up Pwr** and **Dn Pwr** buttons (**F6** and **F7**) to modify current. The step used is the smallest increment of the laser drive current.

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6.12 Source Synchronization

Proceed as follows to synchronize the source module with a signal coming from an external instrument:

1. Connect a BNC cable from the external device to the Sync. In TTL port of the first source module.

2. Use a BNC-T connector between each Sync. In port if more than one IQ-2400 module needs to be synchronized.

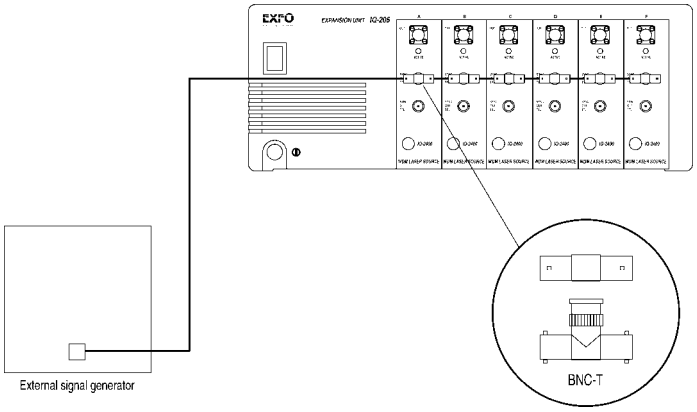


Figure 6-9. Source Synchronization with External Signal Generator

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Proceed as follows to synchronize the source module with a signal provided from an IQ-2400 module:

1. Connect a BNC cable from the Sync. Out port of the synchronizing module to the Sync. In TTL port of the synchronized module.

2. Use a BNC T connector between each Sync. In port if more than one IQ-2400 module need to be synchronized.

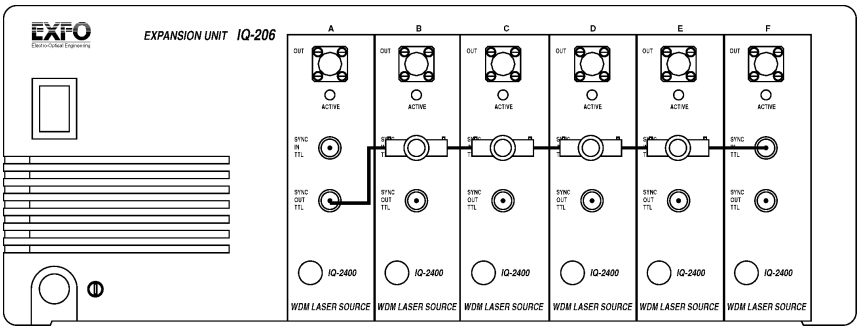


Figure 6-10. Source Synchronization with Signal Generated by IQ-2400 Module

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7 OPERATION (IQ-2600)

The many features of the tunable laser source are controlled using the Windows-compatible IQ Software. Please refer to the *IQ-200 Optical Test System Instruction Manual* for information regarding the IQ-200 Optical Test System, IQ-203 Mainframe, and IQ Software conventions.

7.1 Loading the Application Software

There are two ways to load the application software:

- Push the LED push button on the front panel.
- Double-click on the IQ-2600 icon in the IQ-200 Optical Test System main window.

Note: *Pressing the LED push button does not activate the source.*

Once the IQ-2600 application software is loaded, the main window opens. The main window contains all the necessary commands to control the laser source and appears as illustrated in Figure 7-1.

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7.2 Main Window Description

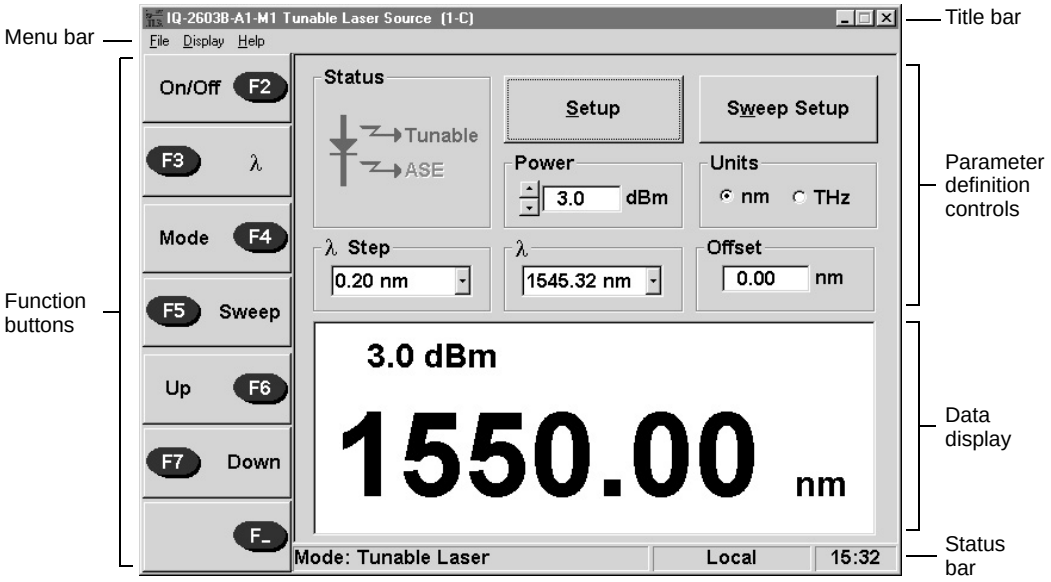


Figure 7-1. Main Window (IQ-2600 Tunable Mode)

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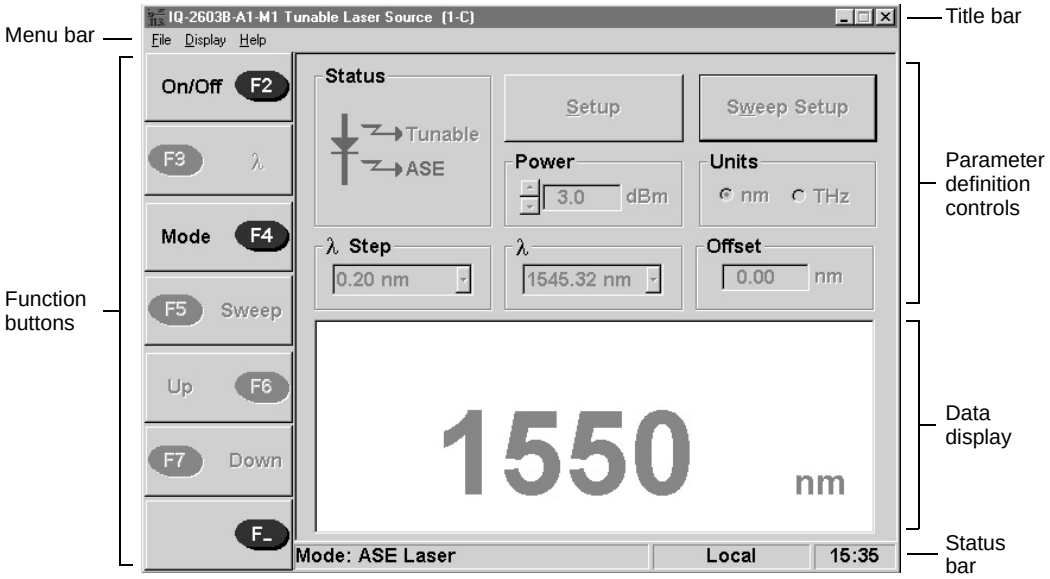


Figure 7-2. Main Window (IQ-2600 ASE Mode)

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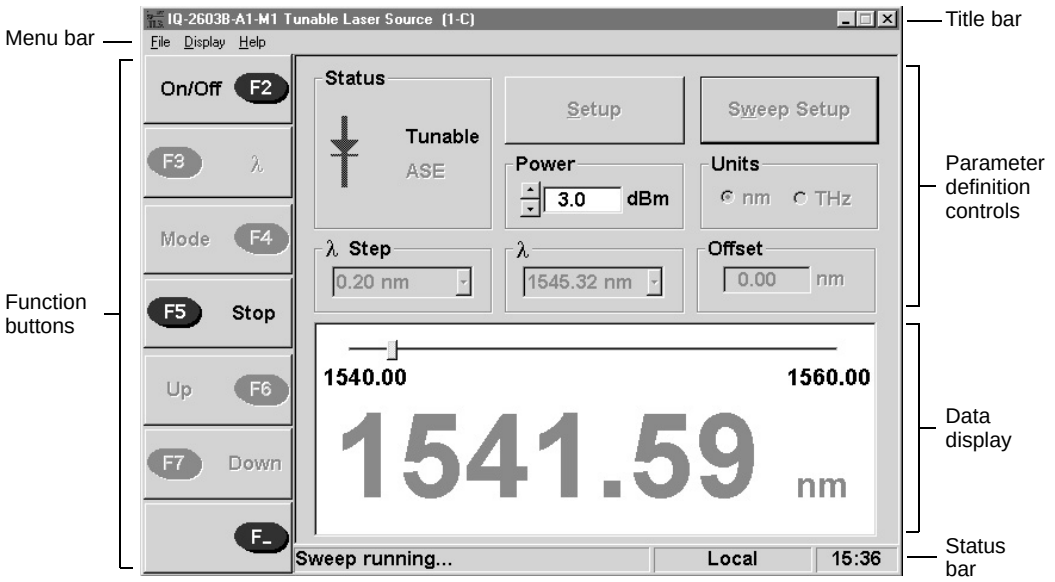


Figure 7-3. Main Window (IQ-2600 Sweeping)

The main windows shown in Figure 7-1, Figure 7-2, and Figure 7-3, can be divided into five sections:

- title bar and menu bar
- function buttons
- parameter definition controls
- data display
- status bar

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7.2.1 Title Bar and Menu Bar

The title bar and menu bar are at the top of the main window (see Figure 7-1, Figure 7-2, and Figure 7-3). The menu bar contains three drop-down menus that are explained in Table 7-1.

Menu	Option	Function
File	Open Config...	Opens to a previously saved configuration.
	Save Config...	Saves the current configuration.
	Exit	Closes the application.
Display	Monitor	Opens the monitor window, which displays basic source data (see Section 6.4, *Monitor Window Description* for detailed information).

Table 7-1. Main Window Menus (Part 1 of 2)

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Menu	Option	Function
Help	Online Manual	Opens the application Help file, which contains the text of this instruction manual.
	Hardware	Opens a window that provides the following information: • module name • module ID • serial number • minimum version (necessary for module updates) • checksum (verification)
	About...	Opens a window that provides the following information: • module model number • corporate headquarters address • technical assistance telephone numbers, e-mail address, and Web site • software version • available IQ-203 mainframe system memory (includes RAM and virtual memory) • remaining hard drive storage space

Table 7-1. Main Window Menus (Part 2 of 2)

7.2.2 Function Buttons

The IQ-2600 can be operated in two principal modes: a tunable narrow band source or a non-flattened broadband ASE source (ASE operation is an IQ-2600 option). The appearance of the main window varies according to the mode in use (see Figure 7-1, Figure 7-2, and Figure 7-3). Function buttons that are not available in a particular mode are disabled.

The function buttons, located on the left side of the main window, are used for immediate control of the laser source. Table 7-2 provides a quick reference guide to these controls.

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Function Button	Description
On/Off F2	• Activates/Deactivates light emission (see Section 6.6, *Source Activation/Deactivation*).
F3 λ	• Steps from one wavelength to the next defined in the λ drop-down list box (Section 7.7.2). A step beyond the end of the list reverts to the first entry (inactive in ASE mode).
Mode F4	• Selects either Tunable or ASE mode, if the latter option is installed. ***Note:*** *The IQ-2600 does not use the same connector for both the Tunable and ASE Output ports. When switching from one mode to another, you must switch output connectors.*
F5 Sweep	• Initiates a wavelength sweep, as defined in the *Sweep Setup* window (see Section 7.8). Reads **Stop** after being pressed. • If a sweep is already in progress when the button is pressed, it will be terminated immediately and the source wavelength returned to its value prior to the start of the sweep (inactive in ASE mode).
Up F6	• Increases source wavelength by the amount displayed in the λ **Step** box (see Section 7.7.3). An error message is presented in the status bar if the resulting wavelength would be outside the range of the source (inactive in ASE mode).

Table 7-2. Function Button Description (Part 1 of 2)

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Function Button	Description
	• Decreases the source wavelength by the amount displayed in the λ **Step** box (see Section 7.7.3). An error message is presented in the status bar if the resulting wavelength would be outside the range of the source (inactive in ASE mode).
	• Transfers control between software function buttons and IQ-203 front panel hardware function keys (refer to *IQ-200 Optical Test System Instruction Manual*). • When software function buttons are disabled, they will be grayed out.

Table 7-2. Function Button Description (Part 2 of 2)

7.3 Parameter Definition Controls

Parameter controls that are not available in a particular mode are disabled.

Parameter	Description
	• Opens the *Setup* window (Section 7.7.2).
	• The current power level (nominal, at the end of a 2 m connecting fiber). The value can be edited directly or can be modified in 0.1 dB steps using the control arrows.
	• Appropriate values on the main window and subwindows can be displayed—and entered—as wavelengths (nm) or as frequencies (THz), depending upon the selection made here.

Table 7-3. Parameter Definition Controls (Part 1 of 2)

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Parameter	Description
	• A list of available wavelength (or frequency) steps, defined in the **Setup** window.
	• A list of absolute wavelengths, defined in the *Setup* window. The default values are a sampling of ITU-grid wavelengths.
	• A wavelength offset to be applied to the display of wavelength values.

Table 7-3. Parameter Definition Controls (Part 2 of 2)

7.3.1 Data Display

In addition to the parameter definition controls, the main window contains the source status indicator and data display.

In normal operation (Tunable mode), the data display indicates the power level and wavelength selected (see Figure 7-1, on page 7-2).

While a sweep is in progress, the wavelength limits and the present wavelength are shown, with a sliding indicator showing the progress of the sweep (see Figure 7-3, on page 7-4).

In ASE mode (when installed), the display reads a default **1550 nm** (see Figure 7-2, on page 7-3).

7.3.2 Status Bar

The first part of the status bar displays messages. In addition, it shows the current application mode (**Tunable Laser** or **ASE Laser**).

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The second part of the status bar displays the inscription **Local**, **Remote**, or **Lockout**, which indicates if the IQ-2600 is controlled locally or remotely. For more information on how to control the different IQ modules remotely, refer to the *GPIB and Application Development Guide*. Table 7-4 explains the meaning of these inscriptions. Finally, the status bar displays the time.

Indication	Meaning
Local	The unit is controlled locally.
Remote	The unit is controlled remotely, but local commands can still be used.
Lockout	The unit is controlled remotely.

Table 7-4. Module Control Status

7.4 Monitor Window Description

The monitor window displays basic laser source data. Using the monitor window with other module monitor windows allows the creation of an integrated data display screen (refer to the *IQ-200 Optical Test System Instruction Manual*). The size and position of the monitor window can be customized.

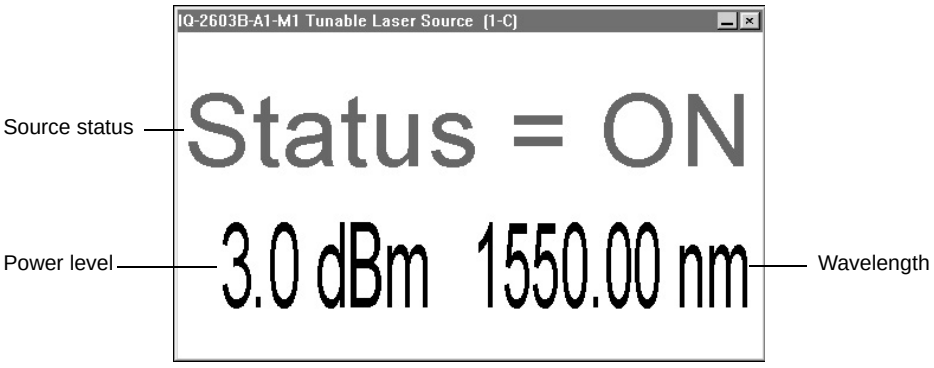


Figure 7-4. Monitor Window (IQ-2600)

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7.4.1 Opening Monitor Window

There are two ways to open the monitor window:

- Choose **Monitor** from the *Display* menu in the main window.
- Push the LED push button on the front panel of the module.

7.4.2 Closing Monitor Window

There are two ways to close the monitor window and return to the main window:

- Double-click anywhere in the monitor window.
- Push the LED push button on the front panel of the module.

7.5 Exiting the Application Software

Closing any application software that is not in use is a good way to free system memory. The application software can be closed either from the main window or monitor window.

7.5.1 From the Main Window

There are three ways to exit the application software from the main window:

- Click on  (in the top right corner of the main window).
- Choose **Exit** from the *File* menu.
- Click on the module icon (in the top left corner of the main window) and select **Close**.

7.5.2 From the Monitor Window

- To exit the application software from the monitor window, click on  (in the top right corner of the monitor window).

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7.6 Source Activation/Deactivation

Choose **On/Off** to activate or deactivate light emission. When the source is active, the LED on the module front panel will light up and the Status indicator will appear in red with two right-pointing arrows. The mode chosen will also appear in red. Once the source is deactivated, the LED on the module front panel will turn off, the Status indicator will appear in black and the arrows will disappear. The modes will also return to their black color.

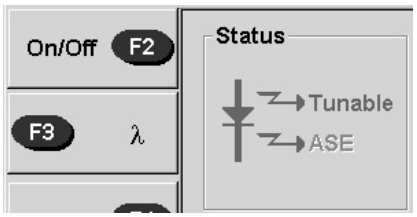


Figure 7-5. On/Off Button and Status Indicator

Note: *To obtain optimum stability, a laser source should be allowed to warm up for 30 minutes.*

7.7 Wavelength Selection

In Tunable mode, the wavelength produced by the IQ-2600 Tunable Laser Source can be selected in a variety of ways.

7.7.1 Direct Selection

Any desired wavelength within the operational limits of the source (1520 nm to 1570 nm) can be entered directly by editing the value that appears in the data display. Pressing **Enter** signals completion of an entry, and an error message will appear briefly in the status bar if an attempt is made to enter an out-of-range value.

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7.7.2 Selection from a Stored List

Clicking on the value displayed in the λ box or on the drop-down arrow opens a wavelength menu. Any of these entries may be selected. Alternatively, the user can step through the wavelengths in this menu by pressing the **F3 λ** button.

The list of wavelengths available for selection is easily modified as follows:

1. Select **Setup**.

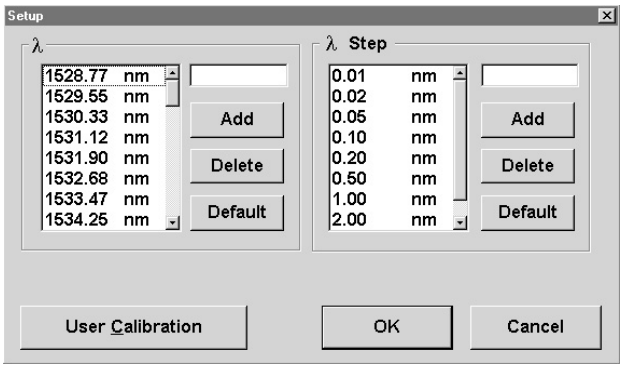


Figure 7-6. Setup Window

   The left table in this window indicates the wavelengths previously defined for quick selection (the values will be displayed as frequencies if **THz** has been selected in the **Units** box on the main window).

   A value in the table can be removed by selecting it and pressing **Delete**.

2. A new value can be entered into the edit box to the right of the λ table. Press **Add** to insert the new value into its proper place in the existing sequence. If the value is invalid, the following message window will appear: "**Value must be between 1520.00 and 1570.00.**"

3. When the entries are completed, press **OK** to return to the main window. The new list of wavelengths or frequencies are now available. Press **Cancel** to return to the main window without accepting changes to its λ list.

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7.7.3 Incremental Selection

Wavelengths may be specified by first selecting an appropriate λ **Step** value from the list in the main window. The user can then step the source wavelength by pressing the **Up** (**F6**) or **Down** (**F7**) function buttons. Selections available for λ **Step** can be edited in the **Setup** window in the same fashion that wavelengths are.

- Press the **Default** button to see the default list of ITU wavelengths.

7.8 Sweep Selection

Automatic wavelength sweeps, initiated with the **Sweep** button (**F5**), are specified in the *Sweep Setup* window (see Figure 7-7).

1. Select **Sweep Setup**.

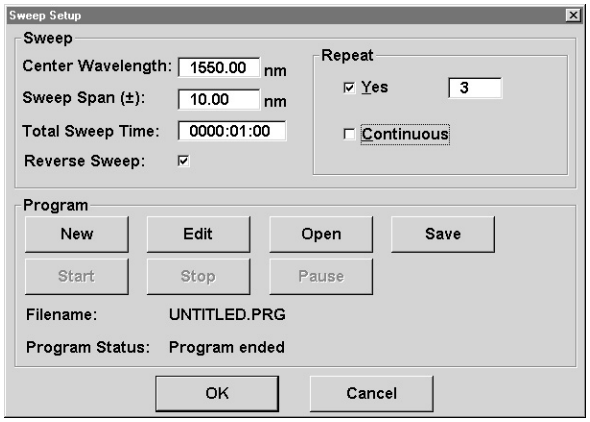


Figure 7-7. Sweep Setup Window

2. Enter appropriate values for the center wavelength of the sweep, its span, and the total sweep time. Invalid entries for any of these parameters will be refused. When selected, a reverse sweep will sweep to the longest wavelength and then sweep back to the shortest wavelength.

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3. Three repetition modes are available: single sweep (do not check the **Repeat Yes** box), a fixed number of sweeps (up to 999), or continuous sweeping.

The Program portion of the *Sweep Setup* menu is described in Section 7.9.

7.9 Programmed Operation

The **Program** portion of the *Sweep Setup* window (Figure 7-7) accesses a user-defined program, in tunable mode. Each programmed sequence holds a succession of wavelength/time-duration pairs, and user-defined programs can be stored for repeated use.

7.9.1 Programming

Pressing either the **New** or **Edit** buttons in the *Sweep Setup* window opens the *Program settings* window (see Figure 7-8).

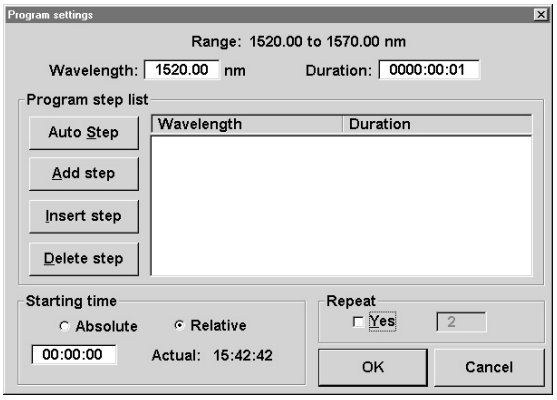


Figure 7-8. Program Settings Window

A sequence of operations can then be defined, each comprising a source wavelength and a duration, by using the **Add step**, **Insert step**, and **Delete step** buttons in this window. Repetition of the program and either a relative or an absolute time for its start can be specified.

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The **Add step** button adds the new step to the end of the program, whereas **Insert step** places it before the currently selected step.

Any number of steps may be defined for a program, and programs may be saved to file by returning to the *Sweep Setup* menu (press **OK** on the **Program settings** frame) and selecting **Save**.

Note: *If the* **Yes** *checkbox is selected and the number of program loops is set to 0 value in the* **Repeat** *group, the program will loop continuously.*

7.9.2 Auto Step

The **Auto step** button allows quick insertion of evenly spaced wavelengths to the programmed list. It opens the **Auto Step** dialog box in which a start wavelength, step interval, step time, and number of steps can be entered.



Figure 7-9. Auto Step Dialog Box

Press **OK** to return to *Program settings* window with all the resulting wavelengths replacing the programmed list. Any steps that would fall outside the wavelength capabilities of the source are deleted.

To define a program that contains a sequence of evenly spaced wavelengths, enter the sequence first using **Auto Step**, then edit it using the procedure outlined in Section 7.9.1.

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7.9.3 Running Programmed Sequences

A stored program is activated by opening it in the *Sweep Setup* window (program file name will be displayed). Then select **Start**, **Stop**, or **Pause** as required.

7.10 User Calibration

The wavelength calibration of the IQ-2600 can be verified at any time and its readouts automatically corrected thereafter. Connect the source to a suitable measurement standard (a wavelength meter, for example) and select **User Calibration** in the **Setup** window. A User Calibration menu appears:

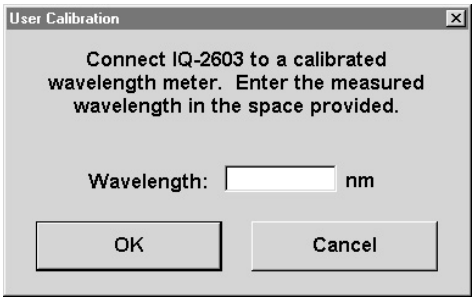


Figure 7-10. User Calibration Menu

Enter the measured wavelength in the dialogue box and press **OK**. The IQ-2600 software computes an appropriate correction and applies it to all future readings (the value appears in the **Offset** edit box of the main window). A warning message is displayed if the calculated offset is greater than ±0.5 nm, asking if the user wishes to accept such an unusually large offset or repeat the calibration. The user can revert to the factory calibration settings by entering a 0.0 offset in the main window.

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7.11 ASE Mode

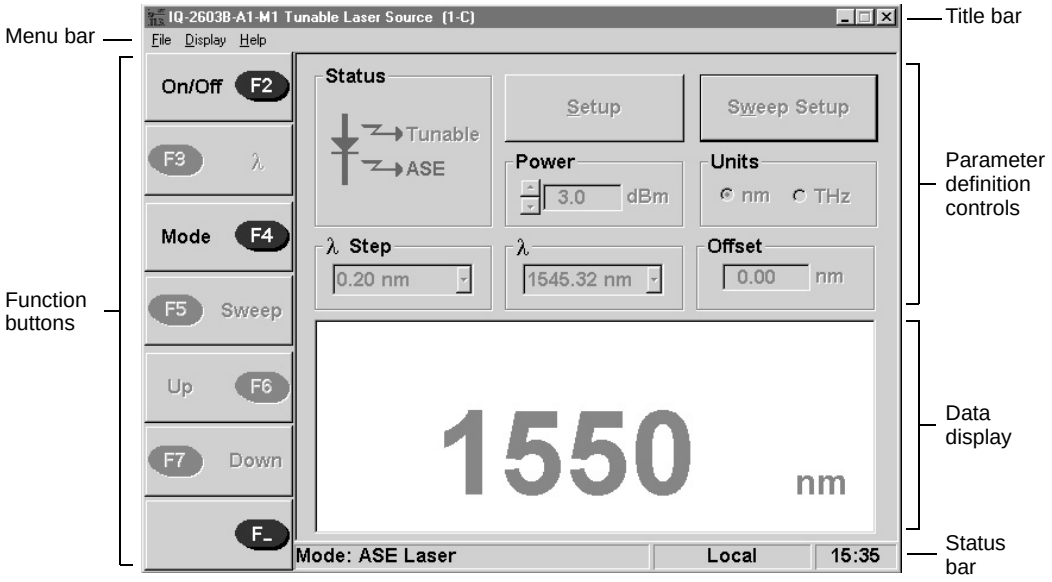


Figure 7-11. Main Window (IQ-2600 ASE Mode)

In ASE (amplified spontaneous emission) operation, the laser cavity is appropriately modified so that the laser operates in a non-coherent broadband mode, with a spectrum typical of a non-flattened erbium-doped fiber source.

In this mode, the user cannot control the wavelength, sweep parameters, or power. **ASE** appears in red in the Status indicator, and the data display shows **1550 nm** (see Figure 7-2).

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8 REMOTE CONTROL COMMANDS

8.1 SCPI Commands

8.1.1 Command Structure

The GPIB commands follow the guidelines determined by the Standard Commands for Programmable Instruments (SCPI) consortium. For example, the command syntax:

FORM(0..26):READ[:DATA]<space><digits>

is used to change the measurement display resolution (number of digits after the decimal point) for an IQ-1100 Power Meter.

In this particular example,

- FORM identifies that the command is a part of the SCPI FORMat subset of commands
- (0..26) is the module address modifier and identifies the specific module to which the command is addressed

Note: *Commands sent to the IQ Optical Test System do not require the address modifier.*

- READ and DATA are keywords that define the function of the command
- [ ] indicates that a keyword or a parameter is optional
- <space> is included to indicate that a space is required
- <digits> is the command parameter

All keywords must be CAPITAL characters separated by a colon. A typical command would be

FORM2:READ:DATA

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This command instructs the module, located in IQ-203 position 2, to display a power measurement with 1 digit after the decimal point.

8.1.2 Common Commands

The SCPI Manager recognizes all of the common commands identified as mandatory by IEEE-488.3. These commands, as well as some optional common commands, are summarized in Table 8-1.

Command	Function
*CLS	Clear status command
*ESE	Standard event status enable command
*ESE?	Standard event status enable query
*ESR?	Standard event status register query
*IDN?	Identification query
*LOK	Set Remote Lockout programming state
*OPC	Operation complete command
*OPC?	Operation complete query
*REM	Set Remote programming state
*RST	Reset command
*SRE	Service request enable command
*SRE?	Service request enable query
*STB?	Read status byte query
*TRG	Trigger command (Not implemented)
*TST?	Self test query
*WAI	Wait to continue command (Not implemented)

Table 8-1. Common Commands Summary

The commands are fully explained on the following pages.

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*CLS

Description This command sets the contents of the Standard Event Register (ESR), the Status Byte Register (STB), and the Error Queue (ERR) to zero. This command is commonly used to clear the status registers before enabling SRQ. Note that the output queue, Standard Event Status Enable Register (ESE), and Service Request Enable Register (SRE) are not affected.

Syntax *CLS

*ESE

Description This command is used to set bits in the Standard Event Status Enable Register (ESE) to a new value (initial value is 255). The contents of the ESE register are logically ANDed with the ESR register. A non zero result will set the Event Summary Bit (ESB) of the Status Byte Register (STB). This command is useful for selecting which events may generate an SRQ.

Syntax *ESE<space><value>

Parameter The <value> parameter must be between 0 and 255.

*ESE?

Description This query reads the contents of the Standard Event Status Enable Register (ESE).

Syntax *ESE?

Response A binary integer between 0 and 255.

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*ESR?

Description This query reads the contents of the Standard Event Status Register (ESR).

Syntax *ESR?

Response A binary integer between 0 and 255.

*IDN?

Description This query reads the IQ system identification string.

Syntax *IDN?

Response “EXFO E.-O. Eng IQ-200 OTS Vxx.xx”, where xx.xx is the current product version.

*LOK

Description This command is used to set the Remote Lockout programming state.

Syntax *LOK

*OPC

Description This command will cause the SCPI Manager to generate the operation complete message in the Standard Event Status Register (ESR) when all pending selected SCPI Manager’s operations have been completed.

Syntax *OPC

Example *OPC;*IDN?

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*OPC?

Description This query puts an ASCII 1 in the output queue when the content of the input queue has been processed. This query is useful to prevent another command from processing until the current command is complete.

Syntax *OPC?

Response “1”

*REM

Description This command is used to set the Remote programming state.

Syntax *REM

*RST

Description This command empties the step response list. It is only seen when it is part of another multiple command. In the example below, by adding this command after *IDN?, you will not be able to access the answer. The *RST, in this instance, erases the identification string. In addition, this command performs the following operations:

1. Return to initial state before command was sent, and not necessarily to previous settings.
2. Force the device to enter into an Operation Complete Command Idle State (OCIS).
3. Force the device to enter into an Operation Complete Query Active State (OQAS).
4. Initialize previous responses unless there has been a program message terminator preceded by an *RST.

Syntax *RST

Example *IDN?;*RST<NL>

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*SRE

Description This command sets bits in the Service Request Enable Register (SRE; initial value is 255), and enables the corresponding bit in the Status Byte Register (STB). The command can be used to select which events can initiate a service request.

Syntax *SRE<space><value>

Parameter The <value> parameter must be between 0 and 255.

*SRE?

Description This query returns the contents of the Service Request Enable Register (SRE).

Syntax *SRE?

Response A binary integer between 0 and 255.

*STB?

Description This query returns the contents of the Status Byte Register (STB).

Syntax *STB?

Response A binary integer between 0 and 255.

*TRG

Description This command will trigger any event that was suspended and is waiting for a trigger. Not supported

Syntax *TRG

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*TST?

Description This query initiates an internal self-test and returns a binary value indicating the results of the test.

Syntax *TST?

Response A binary value:
"0" -test is complete with no errors
"1" -test is complete with errors

*WAI

Description This command prevents the SCPI Manager from processing any further commands until the No-Operation-Pending-Flag is set. All pending operations must be complete before processing another command.Not supported

Syntax *WAI

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8.1.3 IQ-2100 Light Source Commands

SOURce:AM[:INTernal]:FREQuency

Description This command selects the internal modulation frequency. The internal modulation is 50 % duty cycle at the selected frequency.

Syntax SOUR(0..26):AM[:INT]:FREQ<space><value>[<space><units>]

Parameters The <value> parameter represents the new modulation frequency: 270 Hz, 1000 Hz, 2000 Hz, or CW (or 0) for no modulation).
The <units> parameter is optional and can be HZ or KHZ.

Note No modulation can be set on the IQ-2123BH.

Example SOUR3AM:INT:FREQ 270 HZ -(set modulation to 270 Hz)
or
SOUR3:AM:INT:FREQ CW -(set modulation to none)

SOURce:AM[:INTernal]:FREQuency?

Description This query returns a value indicating the current internal modulation frequency. If the source is in CW mode, the function will return “0”.

Syntax SOUR(0..26):AM[:INT:]FREQ?

Response A four-digit integer identifying the frequency (in Hz) in the format “9999”. If the source is in CW mode, the return value is “0”.

Example SOUR3:AM:FREQ?

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SOURce:POWer:ATTenuation

Description This command changes the source internal attenuation. The source power is at its maximum when the attenuation is set to 0.0 dB.

Syntax SOUR(0..26):POW:ATT<space><value>[<space><units>]

Parameters The <value> parameter is between 0.0 and 10.0 for laser sources and between 0.0 and 6.0 for LED sources. The attenuation is a positive value in dB.
The <units> parameter is DB and is optional.

Note On the IQ-2123BH, no attenuation can be set when both sources are active.

Example SOUR3:POW:ATT 5.2 DB

SOURce:POWer:ATTenuation?

Description This query returns the internal source power attenuation value.

Syntax SOUR(0..26):POW:ATT?

Response A value between 0.0 and 10.0 (in dB) in the format “99.9”.

Example SOUR3:POW:ATT?

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SOURce:POWer:STATe

Description This command turns on or off the optical source. When the source is on, the red LED (Active) on the front of the module illuminates.

Syntax SOUR(0..26):POW:STAT<space><state>

Parameters The state parameter is a boolean VALUE:
"0" or "OFF" -turn off the source
"1" or "ON" -turn on the source

Example SOUR3:POW:STAT ON

SOURce:POWer:STATe?

Description This query returns a value indicating the state of the optical source (on or off).

Syntax SOUR(0..26):POW:STAT?

Response "0" -the source is off
"1" -the source is on

Example SOUR3:POW:STAT?

SOURce:POWer:WAVElength

Description This command selects a wavelength when using a dual-wavelength source module (IQ-2112 or IQ-2123).

Syntax SOUR(0..26):POW:WAVE<space><value>

Parameters The <value> parameter can be:
"UPP" -switch to the highest wavelength
"LOW" -switch to the lowest wavelength
"DUAL" -activate both sources on a hybrid source (IQ-2123BH)

Example SOUR3:POW:WAVE UPP

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SOURce:POWer:WAVElength?

Description This query returns a value indicating which wavelength is currently selected.

Syntax SOUR(0..26):POW:WAVE?

Response A four-digit number identifying the current wavelength (in nm) in the format “9999”.

Example SOUR3:POW:WAVE?

SOURce:POWer:WAVElength:COUNt?

Description This query returns the number of available sources on the module.

Syntax SOUR(0..26):POW:WAVE:COUN?

Response A value representing the number of sources:
“1” -one wavelength available
“2” -two wavelengths available

Example SOUR3:POW:WAVE:COUN?

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SOURce:POWer:WAVElength:DUAL?

Description This query returns a value indicating whether two sources are simultaneously selected on the module.

Syntax SOUR(0..26):POW:WAVE:DUAL?

Response A boolean value:
"0" -one wavelength selected
"1" -two wavelengths selected (only possible with an IQ-2123BH hybrid source)

Note If the source is not a hybrid source (IQ-2123BH), this query will always return "0".

Example SOUR3:POW:WAVE:DUAL?

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8.1.4 IQ-2300 ASE Laser Source Commands

SOURce:POWer:ATTenuation

Description This command changes the source internal attenuation. The source output power is at its maximum when the attenuation is set to 0.0 dB.

Syntax SOUR(0..26):POW:ATT<space><float>

Parameters A float parameter between 0.0 and 3.0 dB. The attenuation is a positive value.

Example SOUR3:POW:ATT 2.3

SOURce:POWer:ATTenuation?

Description This query returns the internal source power attenuation value.

Syntax SOUR(0..26):POW:ATT?

Response A float value between 0.0 and 3.0 (units of dB).

Example SOUR3:POW:ATT?

SOURce:POWer:STATe

Description This command turns on or off the currently selected optical source. When the source is on, the red LED on the front of the module illuminates.

Syntax SOUR(0..26):POW:STAT<space><boolean>

Parameters A boolean parameter:
"1" -turn the source on
"0" -turn the source off

Example SOUR3:POW:STAT 1

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SOURce:POWer:STATe?

Description This query returns a value indicating the state of the optical source (on or off).

Syntax SOUR(0..26):POW:STAT?

Response A boolean value:
"1" -the source is on
"0" -the source is off

Example SOUR3:POW:STAT?

SOURce:PROTection:HARdExist?

Description This query returns whether integrated remote intelock connector is present.

Syntax SOUR(0..26):PROT:HARE?

Response A boolean value:
"1" -intelock connector is present
"0" -intelock connector is not present

Example SOUR3:PROT:HARE?

SOURce:PROTection:HARdState?

Description This query returns integrated interlock connector status (open or closed).

Syntax SOUR(0..26):PROT:HARS?

Response A boolean value:
"1" -interlock connector is open
"0" -interlock connector is closed

Example SOUR3:PROT:HARS?

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SOURce:PROTection:RemovePassWorD

Description This command allows you to remove the software protection password.

Syntax SOUR(0..26):PROT:RPWD

Example SOUR3:PROT:RPWD

See also SOUR:PROT:SOFS? and SOUR:PROT:SOFE?

SOURce:PROTection:SetPassWorD

Description This command allows you to enter the software protection password.

Syntax SOUR(0..26):PROT:SPWD<string>

Parameters The string “safekey”.

Note Entering the password is necessary to acitvate Source

Example SOUR3:PROT:SPWDsafekey

See also SOUR:PROT:SOFS? and SOUR:PROT:SOFE?

SOURce:PROTection:SOFtExist?

Description This query returns whether a software key-activated master control is present.

Syntax SOUR(0..26):PROT:SOFE?

Response A boolean value:
“1” -software key is present
“0” -software key is not present

Example SOUR3:PROT:SOFE?

See also SOUR:PROT:SPWD, SOUR:PROT:RPWD, and SOUR:PROT:SOFS?

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SOURce:PROTection:SOFtState?

Description This query returns software key-activated master control status (on or off).

Syntax SOUR(0..26):PROT:SOFS?

Response A boolean value:
"1" -software key is on
"0" -software key is off

Example SOUR3:PROT:SOFS?

See also SOUR:PROT:SPWD, SOUR:PROT:RPWD and SOUR:PROT:SOFE?

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8.1.5 IQ-2400 WDM Laser Source Commands

CALibration:**RES**etvalue**?**

Description This query returns the original calibration value used at the factory. To return the unit to its original factory calibration, use the value returned by CAL:RES? as a parameter to the CAL:VAL command.

Syntax CAL(0..26):RES?

Response A value representing the original calibration value used at the factory, in the format “9999.999E±999”. Depending on the current power units, the original calibration value will be read in watts or in dBm.

Example CAL3:RES?

See also CAL:VAL

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CALibration:**VAL**ue

Description This command is used to set the calibration value of the instrument.

Syntax CAL(0..26):VAL<space><numeric>

Parameters The <numeric> parameter represents the new calibration value in the format “9.999E±999”. Depending on the current power units, the numeric parameter is read in watts or in dBm.

Note To determine the calibration value to enter, connect the source output to a power meter. The power read by the power meter is the parameter to enter with the CAL:VAL command.
To return the unit to its original factory calibration, use the value returned by CAL:RES? as a parameter in the CAL:VAL command.
The value used must not be more than 10 times greater or less than 10 times the factory calibration value. An attempt to exceed these limits will raise a “Parameter out of range” error.

Example CAL3:VAL 0.002225
or
CAL3:VAL 2.225E-3

See also CAL:RES?

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INPut:CHannel?

Description This query returns the channel number of the module. The available wavelength band is divided into channels. Each channel is characterized by a number. The output of each module corresponds to one channel and cannot be modified.

Syntax INP(0..26):CH?

Response An unsigned integer representing the channel number in the format “99”.

Example INP3:CH?

See also SOUR:CURR:CH?, SOUR:TEMP:CH?, SOUR:WAVE:CH?, SOUR:POW:CH?, and SOUR:CURR:CHBA?

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OUTput:SOURce:ACCOutput

Description This command sets the delta temperature (in °C) and the delta current of the laser (in amperes).

Syntax OUT(0..26):SOUR:ACCO<space><deltaT>,<deltaC>

Parameters The <deltaT> parameter represents the delta temperature of the laser (in °C) in the format "9999.99". The value used must be equal to or between the values returned by SOUR:TEMP:LIM:LOW? and SOUR:TEMP:LIM:HIGH?.
The <deltaC> parameter represents the delta current of the laser (in amperes) in the format "±99.99". The value used must be equal to or between the values returned by SOUR:CURR:LIM:LOW? and SOUR:CURR:LIM:HIGH?.
The queries SOUR:CURR:LIM:STEP? and SOUR:TEMP:LIM:STEP? return the module sensitivity.
A request to change the value by a quantity lesser than the step will be ignored.

Note This command must only be called when the module is either in High Wavelength Stability or OnOff modulation mode. If the module is not in these modes, the parameters will be read as a requested wavelength and a requested power, and the error message "Invalid mode" will be raised.

Example OUT3:SOUR:ACCO 0.1,0.0001

See also SOUR:CURR:LIM:HIGH?, SOUR:CURR:LIM:LOW?, SOUR:CURR:LIM:STEP?, SOUR:TEMP:LIM:HIGH?, SOUR:TEMP:LIM:LOW?, and SOUR:TEMP:LIM:STEP?

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OUTput:SOURce:APCOutput

Description This command is used to set the wavelength (if the current spectral units are nm) or the frequency (if the current spectral units are THz) and the power of the signal.

Syntax OUT(0..26):SOUR:APCO<space><wave>,<power>

Parameters The <wave> parameter represents a new wavelength (if the current spectral units are nm), or a new frequency (if the current spectral units are THz) in the format "±9.999E+9". The value used must be equal to or between the values returned by SOUR:WAVE:LIM:LOW? and SOUR:WAVE:LIM:HIGH?.
The <power> parameter represents a new power of the signal in watts or dBm (depending on the current power units) in the format "±9.999E+9". The value used must be equal to or between the values returned by SOUR:POW:LIM:LOW and SOUR:POW:LIM:HIGH.
The queries SOUR:WAVE:LIM:STEP? and SOUR:POW:LIM:STEP? return the module sensitivity.
A request to change the value by a quantity lesser than the step will be ignored.

Note This command must only be called when the module is either in Normal or Normal/Dither mode. If the module is not in these modes, the parameters will be read as a requested delta temperature and a requested delta current, and the error message "Invalid mode" will be raised.

Example OUT3:SOUR:APCO 1550,2.54

See also SOUR:POW:LIM:HIGH?, SOUR:POW:LIM:LOW?, SOUR:POW:LIM:STEP?, SOUR:WAVE:LIM:HIGH?, SOUR:WAVE:LIM:LOW?, SOUR:WAVE:LIM:STEP?, UNIT:POW, and UNIT:WAVE

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OUTput:SOURce:MODE

Description This command sets the operation mode of the source.

Syntax OUT(0..26):SOUR:MODE<space><parameter>

Parameters A parameter indicating the new source mode:
"0" or "APC" -set Normal mode
"1" or "ACC" -set High Wavelength Stability mode
"2" or "APCDITHER" -set Normal mode with Dither modulation
"3" or "ACCONOFF" -set OnOff modulation mode

Note After the mode is changed, the module needs some time to stabilize. It is very important not to change the mode while the module is stabilizing. This would cause the module to return to its central wavelength in Normal mode. Before changing the mode, you should poll OUT:STAB? until it returns "1", indicating that the module has stabilized.

Example OUT3:SOUR:MODE APC

OUTput:SOURce:MODE?

Description This query returns the current operation mode of the source.

Syntax OUT(0..26):SOUR:MODE?

Response A value representing the current mode of the source:
"0" -the source is set to Normal mode
"1" -the source is set to High Wavelength Stability mode
"2" -the source is set to Normal mode with Dither modulation
"3" -the source is set to OnOff modulation mode

Example OUT3:SOUR:MODE?

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OUTput:SOURce:SETP

Description This command sets the module to a predefined setpoint. No command is provided to create setpoints. Setpoints have to be created from within the IQ application software.

Syntax OUT(0..26):SOUR:SETP<space><setpoint>,<mode>

Parameters The <setpoint> parameter is a string parameter representing the name of the setpoint. This name is not case-sensitive.
The <mode> parameter represents the mode of the setpoint:
"0" or "APC" -Normal mode
"1" or "ACC" -High Wavelength Stability mode (HWS)

Note No modulation is associated with a setpoint. Therefore, a setpoint created in Normal or Normal with Dither modulation mode will be considered as having Normal (APC) mode. A setpoint created in either HWS or OnOff modulation mode will have HWS (ACC) mode. In turn, a setpoint having Normal mode can be used in Normal or Normal with Dither mode. Also, a setpoint having HWS mode can be used as well in OnOff modulation mode. The mode must be supplied because setpoints in Normal and HWS mode may have the same name. Therefore, the application will search for the specified setpoint with the specified mode. If such a setpoint exists, the application will adjust the wavelength, power, current step, and temperature step according to the setpoint. If the setpoint does not exist, there will be no change.
Modes: If the instrument is in Normal or Normal with Dither modes and the setpoint is in Normal mode, there will be no change to the mode of the instrument. If the setpoint has HWS mode, the application will go to HWS mode. If the instrument is in HWS or OnOff mode and the setpoint is in HWS mode, there will be no change in mode. If the setpoint has Normal mode, the instrument will go to Normal mode.

Example OUT3:SOUR:SETP config05,1

See also SOUR:CURR:ACCB and SOUR:CURR:ACCB?

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OUTput:SOURce:STATe

Description This command turns on or off the currently selected optical source. When the source is on, the red LED on the front of the module illuminates.

Syntax OUT(0..26):SOUR:STAT<space><boolean>

Parameters The <boolean> value can be:
"1" or "ON" -turn the source on
"0" or "OFF" -turn the source off

Note An invalid parameter will turn the module off.

Example OUT3:SOUR:STAT ON

OUTput:SOURce:STATe?

Description This query returns a value indicating the state of the optical source (on or off).

Syntax OUT(0..26):SOUR:STAT?

Response "1" -the source is on
"0" -the source is off

Example OUT3:SOUR:STAT?

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OUTput:STABle?

Description This query indicates whether the source is stable or stabilizing.

Syntax OUT(0..26):STAB?

Response A boolean value:
"1" -the module has stabilized
"0" -the module is stabilizing

Note After the mode is changed, the module needs some time to stabilize. It is very important not to change the mode while the module is stabilizing. This would cause the module to return to its central wavelength in Normal mode. Before changing the mode, you should poll OUT:STAB? until it returns "1", indicating that the module has stabilized.

Example OUT3:STAB?

See also OUT:STAT?

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OUTput:STATe?

Description This query returns that state of the source module following its last command execution.

Syntax OUT(0..26):STAT?

Response A value indicating the state of the source module:

"00" -the state is Normal;

"01" -the module is stabilizing;

"11" -the requested wavelength or temperature cannot be maintained. The module has become unstable. This applies to all modes (APC, ACC, or Modulation);

"12" -in Normal or Dither mode, this means that the wavelength has stabilized. In HWS or OnOff modulation mode, this means that the temperature has stabilized;

"13" -the requested power or current cannot be maintained. The module has become unstable. This applies to all modes (APC, ACC, or Modulation);

"14" -in Normal or Dither mode, this means that the power has stabilized. In HWS or OnOff modulation mode, this means that the current has stabilized;

"21" -the requested power is too low (APC mode);

"22" -the requested power is too high (APC mode);

"23" -the requested current is too low (ACC mode);

"24" -the requested current is too high (ACC mode);

"25" -the requested wavelength is too low (APC mode) or the requested temperature is too high (ACC mode);

"26" -the requested wavelength is too high (APC mode) or the requested temperature is too low (ACC mode);

"27" -the requested modulation amplitude is too low;

"28" -the requested modulation amplitude is too high;

"29" -using the present module calibration, the calculations do not converge;

"91" -fatal error: the laser temperature is out of range;

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OUTput:STATe?

Response *(continued)*

"92" -fatal error: the TEC is not operating properly;
"94" -fatal error: the ambient temperature is out of range;
"95" -fatal error: the ADC is not operating properly;
"98" -fatal error: the laser current is out of range;
"99" -fatal error: the laser power is out of range.

Note

This query should be used only to gain information on certain potential error conditions. To find out whether the source module is stable, you should use STAB?.

Example

OUT3:STAT?

See also

OUT:STAB?

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SOURce:CURRent:ACCBase

Description This command is used to set the ACC base current (in amperes). The base current is the actual current of the laser. For this command to function properly, the instrument must be in High Wavelength Stability or OnOff modulation mode and the query OUT:STAB? must return "1" (stable). Normally, this command would rarely be used.

Syntax SOUR(0..26):CURR:ACCB

Parameters The desired current of the module, in the format "+9.999E+9".

Note The current properties of the laser may change with time. For this reason, if a setpoint was defined in High Wavelength Stability or OnOff modulation mode, and you want to return to it at a later date, the wavelength and power may differ from those defined with the current step and temperature step when the setpoint was created. To cancel this effect, when creating a setpoint in the above named modes, the base current is recorded internally. This base current is sent to the instrument when returning to the mentioned setpoint. All this is done automatically and is transparent to the user.

Example SOUR3:CURR:ACCB

See also OUT:SOUR:SETP

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SOURce:CURRent:ACCBase?

Description This query returns the ACC base current (in amperes). For this query to function properly, the instrument must be in High Wavelength Stability or OnOff modulation mode and the query OUT:STAB? must return “1” (stable).

Syntax SOUR(0..26):CURR:ACCB?

Response A value representing the ACC base current (in amperes) in the format “9999.999E±9”.

Example SOUR3:CURR:ACCB?

See also OUT:STAB?

SOURce:CURRent:CHannel?

Description This query returns the delta current of the current channel (in amperes).

Syntax SOUR(0..26):CURR:CH?

Response A value representing the delta current of the current channel (in amperes) in the format “9999.999E±9”.

Example SOUR3:CURR:CH?

See also OUT:SOUR:ACCO

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SOURce:CURRent:CHBAse?

Description This query returns the channel base current (in amperes).

Syntax SOUR(0..26):CURR:CHBA?

Response A value representing the base current of the current channel (in amperes) in the format “9999.999E±9”.

Example SOUR3:CURR:CHBA?

See also SOUR:CURR:ACCB

SOURce:CURRent:LEVel?

Description This query returns the current delta current (in A).

Syntax SOUR(0..26):CURR:LEV?

Response A value representing the current delta current (in A) in the format “9999.999E±9”.

Example SOUR3:CURR:LEV?

SOURce:CURRent:LIMit:HIGH?

Description This query returns the maximum delta current (in amperes) used with the command OUT:SOUR:ACCO.

Syntax SOUR(0..26):CURR:LIM:HIGH?

Response A value representing the maximum delta current (in amperes) in the format “+9999.999E±9”. The return value will be positive.

Example SOUR3:CURR:LIM:HIGH?

See also OUT:SOUR:ACCO, SOUR:CURR:LIM:LOW?, and SOUR:CURR:LIM:STEP?

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SOURce:CURRent:LIMit:LOW?

Description This query returns the minimum delta current (in amperes) used with the command OUT:SOUR:ACCO.

Syntax SOUR(0..26):CURR:LIM:LOW?

Response A value representing the minimum delta current (in amperes) in the format "-9999.999E±9". The return value will be negative.

Example SOUR3:CURR:LIM:LOW?

See also OUT:SOUR:ACCO, SOUR:CURR:CH?, SOUR:CURR:LIM:HIGH?, and SOUR:CURR:LIM:STEP?

SOURce:CURRent:LIMit:STEP?

Description This query returns the minimum step available (in amperes) when changing the laser current with the command OUT:SOUR:ACCO.

Syntax SOUR(0..26):CURR:LIM:STEP?

Response A value representing the minimum step available (in amperes) in the format "9999.999E±9".

Note An attempt to change the laser current by a quantity lesser than the minimum step will be ignored.

Example SOUR3:CURR:LIM:STEP?

See also OUT:SOUR:ACCO, SOUR:CURR:LIM:HIGH?, and SOUR:CURR:LIM:LOW?

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SOURce:POWer:CH?

Description This query returns the channel output power (in watts or in dBm depending on the current power units).

Syntax SOUR(0..26):POW:CH?

Response A value representing the channel output power (in watts or in dBm depending on the current power units) in the format "9999.999E±9".

Example SOUR3:POW:CH?

SOURce:POWer:LEVel?

Description This query returns the current output power (in watts or in dBm depending on the current power units).

Syntax SOUR(0..26):POW:LEV?

Response A value representing the channel output power (in watts or in dBm depending on the current power units) in the format "9999.999E±9".

Example SOUR3:POW:LEV?

SOURce:POWer:LIMit:HIGH?

Description This query returns the maximum power at which the output signal can be set (in watts or in dBm depending on the current power units) with the command OUT:SOUR:APCO.

Syntax SOUR(0..26):POW:LIM:HIGH?

Response A value representing the maximum power at which the output signal can be set (in watts or in dBm depending on the current power units) in the format "9999.999E±9".

Note To set the signal output power, use the command OUT:SOUR:APCO.

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Example SOUR3:POW:LIM:HIGH?

See also OUT:SOUR:APCO, SOUR:POW:LIM:LOW?, SOUR:POW:LIM:STEP?, and UNIT:POW

SOURce:POWer:LIMit:LOW?

Description This query returns the minimum power (in watts or in dBm depending on the current power units) that can be used with the command OUT:SOUR:APCO.

Syntax SOUR(0..26):POW:LIM:LOW?

Response A value representing the minimum power (in watts or in dBm depending on the current power units) in the format "±9999.999E±9".

Note To set the signal output power, use the command OUT:SOUR:APCO.

Example SOUR3:POW:LIM:LOW?

See also OUT:SOUR:APCO, SOUR:POW:LIM:HIGH?, SOUR:POW:LIM:STEP?, and UNIT:POW

SOURce:POWer:LIMit:STEP?

Description This query returns the minimum step (in watts or in dBm depending on the current power units) that can be used when changing the power with the command OUT:SOUR:APCO.

Syntax SOUR(0..26):POW:LIM:STEP?

Response A value representing the minimum power step (in watts or in dBm depending on the current power units) in the format "9999.999E±9".

Note An attempt to change the output power by a quantity lesser than the minimum step will be ignored.

Example SOUR3:POW:LIM:STEP?

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See also OUT:SOUR:APCO, SOUR:POW:LIM:HIGH?, SOUR:POW:LIM:LOW?, and UNIT:POW

SOURce:PROTection:HARdExist?

Description This query returns whether integrated remote intelock connector is present.

Syntax SOUR(0..26):PROT:HARE?

Response A boolean value:
"1" -intelock connector is present
"0" -intelock connector is not present

Example SOUR3:PROT:HARE?

SOURce:PROTection:HARdState?

Description This query returns integrated interlock connector status (open or closed).

Syntax SOUR(0..26):PROT:HARS?

Response A boolean value:
"1" -interlock connector is open
"0" -interlock connector is closed

Example SOUR3:PROT:HARS?

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SOURce:PROTection:RemovePassWorD

Description This command allows you to remove the software protection password.

Syntax SOUR(0..26):RPWD

Example SOUR3:PROT:RPWD

See also SOUR:PROT:SOFS? and SOUR:PROT:SOFE?

SOURce:PROTection:SetPassWorD

Description This command allows you to enter the software protection password.

Syntax SOUR(0..26):PROT:SPWD<string>

Parameters The string “safekey”.

Note Entering the password is necessary to acitvate Source

Example SOUR3:PROT:SPWDsafekey

See also SOUR:PROT:SOFS? and SOUR:PROT:SOFE?

SOURce:PROTection:SOFtExist?

Description This query returns whether a software key-activated master control is present.

Syntax SOUR(0..26):PROT:SOFE?

Response A boolean value:
“1” -software key is present
“0” -software key is not present

Example SOUR3:PROT:SOFE?

See also SOUR:PROT:SPWD and SOUR:PROT:RPWD

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SOURce:PROTection:SOFtState?

Description This query returns software key-activated master control status (on or off).

Syntax SOUR(0..26):PROT:SOFE?

Response A boolean value:
"1" -software key is on
"0" -software key is off

Example SOUR3:PROT:SOFE?

See also SOUR:PROT:SPWD, SOUR:PROT:RPWD and SOUR:PROT:SOFE?

SOURce:PULM:INTernal:DEPTh

Description This command is used to set the dither modulation signal depth (in amperes). If the module is not in Dither modulation mode, this command will have no effect.

Syntax SOUR(0..26):PULM:INT:DEPT<space><numeric>

Parameters The <numeric> parameter represents the new dither modulation signal depth (in amperes) in the format "±9.999E+9".

Example SOUR3:PULM:INT:DEPT 0.001

See also SOUR:PULM:INT:DEPT?, SOUR:PULM:LIM:DEPT:HIGH?, SOUR:PULM:LIM:DEPT:LOW?, and SOUR:PULM:LIM:DEPT:STEP?

SOURce:PULM:INTernal:DEPTh?

Description This query returns the dither modulation signal depth (in amperes). If the module is not in Dither modulation mode, the return value is undefined.

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Syntax SOUR(0..26):PULM:INT:DEPT?

Response A value representing the current dither modulation signal depth (in amperes) in the format “9999.999E+9”.

Example SOUR3:PULM:INT:DEPT?

See also SOUR:PULM:INT:DEPT, SOUR:PULM:LIM:DEPT:HIGH?, SOUR:PULM:LIM:DEPT:LOW?, and SOUR:PULM:LIM:DEPT:STEP?

SOURce:**PULM:INT**ernal:**FREQ**uency

Description This command is used to set the frequency (in Hz) of the internal dither or OnOff modulation signal. If the module is not in Dither or OnOff modulation mode, this command will have no effect.

Syntax SOUR(0..26):PULM:INT:FREQ<space><numeric>

Parameters The <numeric> parameter represents the new frequency (in Hz) of the internal dither or OnOff modulation signal in the format “9.999E+9”.

Example SOUR3:PULM:INT:FREQ 1000

See also SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

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SOURce:PULM:INTernal:FREQuency?

Description This query returns the frequency (in Hz) of the internal dither or OnOff modulation signal. If the module is not in Dither or OnOff modulation mode, the return value is undefined.

Syntax SOUR(0..26):PULM:INT:FREQ?

Response A value representing the internal dither or OnOff modulation signal (in Hz) in the format “999999.9”.

Example SOUR3:PULM:INT:FREQ?

See also SOUR:PULM:INT:FREQ, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

SOURce:PULM:INTernal:SHAPe

Description This command is used to set the shape of the internal dither modulation signal. If the module is not in Dither modulation mode, this command will have no effect.

Syntax SOUR(0..26):PULM:INT:SHAP<space><shape>

Parameters The <shape> parameter is an integer representing the new shape of the internal dither modulation signal:
“0” -set a square wave
“1” -set a sawtooth wave

Example SOUR3:PULM:INT:SHAP 1

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SOURce:PULM:INTernal:SHAPe?

Description This query returns the shape of the internal dither modulation signal. If the module is not in Dither modulation mode, the return value is undefined.

Syntax SOUR(0..26):PULM:INT:SHAP?

Response An integer representing the current shape of the internal dither modulation signal:
"1" -indicate a sawtooth wave shape
"0" -indicate a square wave shape

Example SOUR3:PULM:INT:SHAP?

SOURce:PULM:LIMit:DEPTh:HIGH?

Description This query returns the maximum depth at which the dither modulation signal can be set (in amperes) with the command SOUR:PULM:INT:DEPT.

Syntax SOUR(0..26):PULM:LIM:DEPT:HIGH?

Response A value representing the maximum depth at which the dither modulation signal can be set (in amperes) in the format "9999.999E±9".

Note To set the dither modulation signal depth, use the command SOUR:PULM:INT:DEPT.

Example SOUR3:PULM:LIM:DEPT:HIGH?

See also SOUR:PULM:INT:DEPT, SOUR:PULM:INT:DEPT?, SOUR:PULM:LIM:DEPT:LOW?, and SOUR:PULM:LIM:DEPT:STEP?

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SOURce:PULM:LIMit:DEPTh:LOW?

Description This query returns the minimum depth at which the dither modulation signal can be set (in amperes) with the command SOUR:PULM:INT:DEPT.

Syntax SOUR(0..26):PULM:LIM:DEPT:LOW?

Response A value representing the minimum depth at which the dither modulation signal can be set (in amperes) in the format "9999.999E±9".

Note To set the dither modulation signal depth, use the command SOUR:PULM:INT:DEPT.

Example SOUR3:PULM:LIM:DEPT:LOW?

See also SOUR:PULM:INT:DEPT, SOUR:PULM:INT:DEPT?, SOUR:PULM:LIM:DEPT:HIGH?, and SOUR:PULM:LIM:DEPT:STEP?

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SOURce:PULM:LIMit:DEPTh:STEP?

Description This query returns the minimum step available (in amperes) when changing the dither modulation signal depth with the command SOUR:PULM:INT:DEPT.

Syntax SOUR(0..26):PULM:LIM:DEPT:STEP?

Response A value representing the minimum step available for the dither modulation signal depth (in amperes) in the format "9999.999E±9".

Note The step is an indication of the module sensitivity. An attempt to change the dither modulation signal depth by a quantity lesser than the minimum step will be ignored.

Example SOUR3:PULM:LIM:DEPT:STEP?

See also SOUR:PULM:INT:DEPT, SOUR:PULM:INT:DEPT?, SOUR:PULM:LIM:DEPT:HIGH?, and SOUR:PULM:LIM:DEPT:LOW?

SOURce:PULM:LIMit:FREQuency:DMAX?

Description This query returns the maximum modulation frequency possible in Dither mode (in Hz).

Syntax SOUR(0..26):PULM:LIM:FREQ:DMAX?

Response A value representing the maximum modulation frequency possible in Dither mode (in Hz) in the format "999999".

Example SOUR3:PULM:LIM:FREQ:DMAX?

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

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SOURce:PULM:LIMit:FREQuency:DMIN?

Description This query returns the minimum modulation frequency possible in Dither mode (in Hz).

Syntax SOUR(0..26):PULM:LIM:FREQ:DMIN?

Response A value representing the minimum modulation frequency possible in Dither mode (in Hz) in the format “999999”.

Example SOUR3:PULM:LIM:FREQ:DMIN?

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

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SOURce:PULM:LIMit:FREQuency:HIGH?

Description The available modulation frequencies may be divided into more than one range. Each range has a mimimum frequency, a maximum and a step. This query returns the maximum frequency (in Hz) at which the internal dither or OnOff modulation signal can be set for the specified range with the command SOUR:PULM:INT:FREQ.

Syntax SOUR(0..26):PULM:LIM:FREQ:HIGH?<space><rangeIndex>

Parameter The <rangeIndex> parameter represents the index of the range in the format “9”. The smallest index is 0.

Response A value representing the maximum modulation frequency of the range that was used as a parameter, in the format “999999.9”.

Note In Dither modulation mode, make sure that this value does not exceed the value returned by SOUR:PULM:LIM:FREQ:DMAX, which is the maximum dither modulation frequency. In OnOff modulation, make sure that this value does not exceed the value returned by SOUR:PULM:LIM:FREQ:OMAX.
To set the the frequency of the internal dither or OnOff modulation signal, use the command SOUR:PULM:INT:FREQ.

Example SOUR3:PULM:LIM:FREQ:HIGH? 0

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

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SOURce:PULM:LIMit:FREQuency:LOW?

Description The available modulation frequencies may be divided into more than one range. Each range has a mimimum frequency, a maximum and a step. This query returns the minimum frequency (in Hz) at which the internal dither or OnOff modulation signal can be set for the specified range with the command SOUR:PULM:INT:FREQ.

Syntax SOUR(0..26):PULM:LIM:FREQ:LOW?<space><rangeIndex>

Parameter The <rangeIndex> parameter represents the index of the range in the format “9”. The smallest index is 0.

Response A value representing the minimum frequency (in Hz) at which the internal dither or OnOff modulation signal can be set for the specified range, in the format “999999.9”.

Note In Dither modulation mode, make sure that this value is not smaller than the value returned by SOUR:PULM:LIM:FREQ:DMIN?, which is the minimum dither modulation frequency. In OnOff modulation, make sure that this value is not smaller than the value returned by SOUR:PULM:LIM:FREQ:OMIN?.
To set the the frequency of the internal dither or OnOff modulation signal, use the command SOUR:PULM:INT:FREQ.

Example SOUR3:PULM:LIM:FREQ:LOW? 0

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

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SOURce:PULM:LIMit:FREQuency:OMAX?

Description This query returns the maximum modulation frequency possible in OnOff mode (in Hz).

Syntax SOUR(0..26):PULM:LIM:FREQ:OMAX?

Response A value representing the maximum modulation frequency possible in OnOff mode (in Hz) in the format “999999”.

Example SOUR3:PULM:LIM:FREQ:OMAX?

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMIN?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

SOURce:PULM:LIMit:FREQuency:OMIN?

Description This query returns the minimum modulation frequency possible in OnOff mode (in Hz).

Syntax SOUR(0..26):PULM:LIM:FREQ:OMIN?

Response A value representing the minimum modulation frequency possible in OnOff mode (in Hz) in the format “999999”.

Example SOUR3:PULM:LIM:FREQ:OMIN?

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:RANGE?, and SOUR:PULM:LIM:FREQ:STEP?

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SOURce:PULM:LIMit:FREQuency:RANGe?

Description This query returns the number of modulation frequency ranges. The smallest range is 0.

Syntax SOUR(0..26):PULM:LIM:FREQ:RANG?

Response A value representing the number of modulation frequency ranges in the format “9”.

Example SOUR3:PULM:LIM:FREQ:RANG?

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, and SOUR:PULM:LIM:FREQ:STEP?

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SOURce:PULM:LIMit:FREQuency:STEP?

Description The available modulation frequencies may be divided into more than one range. Each range has a mimimum frequency, a maximum and a step. This query returns the minimum step available for the specified range (in Hz) when changing the frequency with the command SOUR:PULM:INT:FREQ.

Syntax SOUR(0..26):PULM:LIM:FREQ:STEP?<space><rangeIndex>

Parameter The <rangeIndex> parameter represents the index of the range in the format “9”. The smallest index is 0.

Response A value representing the minimum step available for the specified range of frequencies (in Hz) in the format “999999.9”.

Note An attempt to change the frequency by less than the minimum step will be ignored.

Example SOUR3:PULM:LIM:FREQ:STEP? 0

See also SOUR:PULM:INT:FREQ, SOUR:PULM:INT:FREQ?, SOUR:PULM:LIM:FREQ:DMAX?, SOUR:PULM:LIM:FREQ:DMIN?, SOUR:PULM:LIM:FREQ:HIGH?, SOUR:PULM:LIM:FREQ:LOW?, SOUR:PULM:LIM:FREQ:OMAX?, SOUR:PULM:LIM:FREQ:OMIN?, and SOUR:PULM:LIM:FREQ:RANGE?

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SOURce:PULM:SOURce

Description This command is used to set the source of the modulation signal (Internal or External). If the module is not in OnOff modulation mode, this command will have no effect.

Syntax SOUR(0..26):PULM:SOUR<space><modul>

Parameters The <modul> parameter represents the new source of the modulation signal:
"0" or "INT" -set Internal modulation
"1" or "EXT" -set External modulation

Note A dither modulation signal may only be used with Internal synchronization. When you choose Normal with Dither modulation mode, the source will automatically be set to Internal. OnOff modulation may be used with Internal or External synchronization. To use the Internal OnOff modulation signal, this parameter must be set to Internal. To use an External OnOff modulation signal, this parameter must be set to External, and the desired signal must be sent to the appropriate input.
If the module is in Dither modulation mode and you try to set the source to External, the error message "Invalid mode" will be raised.

Example SOUR3:PULM:SOUR 1

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SOURce:PULM:SOURce?

Description This query returns the current source of the modulation signal (Internal or External). If the module is not in Dither or OnOff modulation mode, the return value is undefined. If the module is in Dither modulation mode, the return value will always be 1.

Syntax SOUR(0..26):PULM:SOUR?

Response A value representing the current source of the modulation signal (Internal or External):
"0" -source set to Internal modulation
"1" -source set to External modulation

Example SOUR3:PULM:SOUR?

SOURce:TEMPerature:CHannel?

Description This query returns the channel delta temperature (in °C).

Syntax SOUR(0..26):TEMP:CH?

Response A value representing the delta temperature of the current channel (in °C) in the format "±99.99".

Example SOUR3:TEMP:CH?

See also OUT:SOUR:ACCO

SOURce:TEMPerature:LEVel?

Description This query returns the current delta temperature (in °C).

Syntax SOUR(0..26):TEMP:LEV?

Response A value representing the current delta temperature (in °C) in the format "99.9".

Example SOUR3:TEMP:LEV?

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SOURce:TEMPerature:LIMit:HIGH?

Description This query returns the maximum value at which the delta temperature (in °C) can be set with the command OUT:SOUR:ACCO.

Syntax SOUR(0..26):TEMP:LIM:HIGH?

Response A value representing the maximum value at which the delta temperature (in °C) can be set in the format "+99.99". The return value will be positive.

Example SOUR3:TEMP:LIM:HIGH?

See also OUT:SOUR:ACCO, SOUR:TEMP:CH?, SOUR:TEMP:LIM:LOW?, and SOUR:TEMP:LIM:STEP?

SOURce:TEMPerature:LIMit:LOW?

Description This query returns the minimum value at which the delta temperature can be set (in °C) with the command OUT:SOUR:ACCO.

Syntax SOUR(0..26):TEMP:LIM:LOW?

Response A value representing the minimum value at which the delta temperature (in °C) can be set in the format "-99.99". The return value will be negative.

Example SOUR3:TEMP:LIM:LOW?

See also OUT:SOUR:ACCO, SOUR:TEMP:CH?, SOUR:TEMP:LIM:HIGH?, and SOUR:TEMP:LIM:STEP?

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SOURce:TEMPerature:LIMit:STEP?

Description This query returns the minimum step available (in °C) when changing the temperature with the command OUT:SOUR:ACCO.

Syntax SOUR(0..26):TEMP:LIM:STEP?

Response A value representing the minimum step available (in °C) for the temperature in the format “99.99”.

Note An attempt to change the temperature by a quantity lesser than the minimum step will be ignored.

Example SOUR3:TEMP:LIM:STEP?

See also OUT:SOUR:ACCO, SOUR:TEMP:LIM:HIGH?, and SOUR:TEMP:LIM:LOW?

SOURce:WAVElength:CHannel?

Description Depending on the current spectral setting, this query returns the wavelength (in nm) or the central channel frequency (in THz).

Syntax SOUR(0..26):WAVE:CH?

Response A value representing the central wavelength of the channel in the format “9999.99” (nm) or “999.99” (THz).

Example SOUR3:WAVE:CH?

SOURce:WAVEavelength:LEVel?

Description This query returns the current wavelength (in nm or in THz depending on the current wavelength units).

Syntax SOUR(0..26):WAVE:LEV?

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Response A value representing the current wavelength (in nm or in THz depending on the current wavelength units) in the format "9999.999".

Example SOUR3:WAVE:LEV?

SOURce:WAVElength:LIMit:HIGH?

Description Depending on the current spectral units, this query returns the maximum wavelength (in nm) or the minimum frequency (in THz) at which the laser can be set with the command OUT:SOUR:APCO.

Syntax SOUR1:WAVE:LIM:HIGH?

Response A value in the format "9999.99" (nm) or "999.99" (THz).

Example SOUR3:WAVE:LIM:HIGH?

See also OUT:SOUR:APCO, SOUR:WAVE:LIM:LOW?, SOUR:WAVE:LIM:STEP?, and UNIT:WAVE

SOURce:WAVElength:LIMit:LOW?

Description Depending on the current spectral units, this query returns the minimum wavelength (in nm) or the maximum frequency (in THz) at which the laser can be set with the command OUT:SOUR:APCO.

Syntax SOUR(0..26):WAVE:LIM:LOW?

Response A value in the format "9999.99" (nm) or "999.99" (THz).

Example SOUR3:WAVE:LIM:LOW?

See also OUT:SOUR:APCO, SOUR:WAVE:LIM:HIGH?, SOUR:WAVE:LIM:STEP?, and UNIT:WAVE

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SOURce:WAVElength:LIMit:STEP?

Description This query returns the minimum step available when changing the wavelength (or frequency) of the output. Depending on the current spectral units, the return value will be in nanometers (nm) or in terahertz (THz).

Syntax SOUR(0..26):WAVE:LIM:STEP?

Response A value in the format “9999.99” (nm) or “999.99” (THz).

Note An attempt to change the output by a quantity lesser than the minimum step will be ignored.

Example SOUR3:WAVE:LIM:STEP?

See also OUT:SOUR:APCO, SOUR:WAVE:LIM:HIGH?, SOUR:WAVE:LIM:LOW?, and UNIT:WAVE

UNIT:POWer

Description This command is used to set the power units (dBm or watts).

Syntax UNIT(0..26):POW<space><unit>

Parameters The <unit> parameter represents the new spectral units:
“0” or “DB” -select dBm
“1” or “W” -select watts

Example UNIT3:POW 1

See also OUT:SOUR:APCO, SOUR:POW:LIM:HIGH?, SOUR:POW:LIM:LOW?, and SOUR:POW:LIM:STEP?

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UNIT:WAVElength

Description This command is used to set the spectral units (nanometers or terahertz).

Syntax UNIT(0..26):WAVE<space><unit>

Parameters The <unit> parameter represents the new spectral units:
"0" or "NM" -select nanometers
"1" or "THZ" -select terahertz

Example UNIT3:WAVE 1

See also OUT:SOUR:APCO, SOUR:WAVE:LIM:HIGH?, SOUR:WAVE:LIM:LOW?, and SOUR:WAVE:LIM:STEP?

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8.1.6 IQ-2600 Tunable Laser Source Commands

OUTput:ASE?

Description This query returns a value indicating whether the ASE option is available on the tunable laser source module.

Syntax OUT(0..26):ASE?

Response A boolean value indicating whether the ASE option is available on the tunable laser source module:
"0" -the ASE option is not available
"1" -the ASE option is available

Example OUT3:ASE?

See also OUT:MODE and OUT:MODE?

OUTput:MODE

Description This command is used to set the source mode (Tunable or ASE).

Syntax OUT(0..26):MODE<space><mode>

Parameters The <mode> parameter is a boolean parameter representing the source mode:
"0" -set Tunable mode
"1" -set ASE mode

Note This command cannot be performed if the module is in Program or Sweep mode.

Example OUT3:MODE 1

See also OUT:ASE? and OUT:MODE?

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OUTput:MODE?

Description This query returns the current source mode (Tunable or ASE).

Syntax OUT(0..26):MODE?

Response A boolean value representing the current source mode:
"0" -the source is in Tunable mode
"1" -the source is in ASE mode

Example OUT3:MODE?

See also OUT:ASE? and OUT:MODE

OUTput:STATe

Description This command is used to activate or deactivate the source.

Syntax OUT(0..26):STAT<space><state>

Parameters The <state> parameter is a boolean parameter representing the source state:
"0" -deactivate the source
"1" -activate the source

Example OUT3:STAT 1

OUTput:STATe?

Description This query returns the current source state.

Syntax OUT(0..26):STAT?

Response A boolean value representing the current source state:
"0" -the source is deactivated
"1" -the source is activated

Example OUT3:STAT?

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PROGram:SELected:NAME

Description This command is used to load a program.

Syntax PROG(0..26):SEL:NAME<space><progname>

Parameters The <progname> parameter represents the full DOS path and name of the tunable laser source program file to load.

Note This command cannot be performed if the application is running in ASE or Sweep mode.

Example PROG3:SEL:NAME C:\IQ\2600\PROG0026.PRG

PROGram:SELected:NAME?

Description This query returns the full DOS path and name of the currently loaded program file.

Syntax PROG(0..26):SEL:NAME?

Response The full DOS path and name of the currently loaded tunable laser source program file.

Example PROG3:SEL:NAME?

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PROGram:SELected:STATe

Description This command controls the state of the currently loaded program.

Syntax PROG(0..26):SEL:STAT<space><progstate>

Parameters The <progstate> parameter represents the new program state:
"0" or "RUN" -start the program
"1" or "PAUS" -pause the program
"2" or "STOP" -stop the program
"3" or "CONT" -restart a program after a pause

Note This command cannot be performed if the application is running in ASE or Sweep mode.

Example PROG3:SEL:STAT 3

PROGram:SELected:STATe?

Description This query returns the state of the currently loaded program.

Syntax PROG(0..26):SEL:STAT?

Response The state of the currently loaded program:
"RUNNING" -the program is running
"PAUSE" -the program is paused
"STOP" -the program is stopped
"WAITING" -preprogrammed delay

Example PROG3:SEL:STAT?

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SOURce:POWer:LEVel:IMMediate:AMPLitude

Description This command is used to set the source output power (in dBm).

Syntax SOUR(0..26):POW:LEV:IMM:AMPL<space><power>

Parameters The <power> parameter represents the new source output power (in dBm) in the format "±99.9".

Note This command cannot be performed if the module is in ASE mode. If the entered value is out of range, the closest available value will be selected.

Example SOUR3:POW:LEV:IMM:AMPL 03.4

See also SOUR:POW:LEV:IMM:AMPL?, SOUR:POW:LIM:HIGH?, SOUR:POW:LIM:LOW?, and SOUR:POW:LIM:STEP?

SOURce:POWer:LEVel:IMMediate:AMPLitude?

Description This query returns the source output power (in dBm).

Syntax SOUR(0..26):POW:LEV:IMM:AMPL?

Response The current source output power (in dBm) in the format "±99.9".

Note When in ASE mode, this command will return an invalid value. In case of no power, the message "-----" is returned.

Example SOUR3:POW:LEV:IMM:AMPL?

See also SOUR:POW:LEV:IMM:AMPL, SOUR:POW:LIM:HIGH?, SOUR:POW:LIM:LOW?, and SOUR:POW:LIM:STEP?

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SOURce:POWer:LIMit:HIGH?

Description This query returns the maximum source output power (in dBm) that can be set with the command SOUR:POW:LEV:IMM:AMPL.

Syntax SOUR(0..26):POW:LIM:HIGH?

Response The maximum source output power (in dBm) in the format "±99.9".

Example SOUR3:POW:LIM:HIGH?

See also SOUR:POW:LEV:IMM:AMPL, SOUR:POW:LEV:IMM:AMPL?, SOUR:POW:LIM:LOW?, and SOUR:POW:LIM:STEP?

SOURce:POWer:LIMit:LOW?

Description This query returns the minimum source output power (in dBm) that can be set with the command SOUR:POW:LEV:IMM:AMPL.

Syntax SOUR(0..26):POW:LIM:LOW?

Response The minimum source output power (in dBm) in the format "±99.9".

Example SOUR3:POW:LIM:LOW?

See also SOUR:POW:LEV:IMM:AMPL, SOUR:POW:LEV:IMM:AMPL?, SOUR:POW:LIM:HIGH?, and SOUR:POW:LIM:STEP?

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SOURce:POWer:LIMit:STEP?

Description This query returns the minimum output power step (in dBm) that can be used when changing the source output power with the command SOUR:POW:LEV:IMM:AMPL.

Syntax SOUR(0..26):POW:LIM:STEP?

Response The minimum output power step (in dBm) in the format "±99.9".

Example SOUR3:POW:LIM:STEP?

See also SOUR:POW:LEV:IMM:AMPL, SOUR:POW:LEV:IMM:AMPL?, SOUR:POW:LIM:HIGH?, and SOUR:POW:LIM:LOW?

SOURce:SWEep:CENTer?

Description This query returns the center wavelength for the current sweep program in the current spectral units (nm or THz).

Syntax SOUR(0..26):SWE:CENT?

Response The center wavelength for the current sweep program in the current spectral units in the format "9999.99" (nm) or "999.99" (THz).

Example SOUR3:SWE:CENT?

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SOURce:SWEEp:COUNt

Description This command is used to specify how many times you want the sweep program to loop. To specify whether or not you want the sweep program to loop, use the command SOUR:SWE:REPE.

Syntax SOUR(0..26):SWE:COUN<space><count>

Parameters The <count> parameter represents the new number of loops in the format “999”. For continuous repetition, enter “0”.

Example SOUR3:SWE:COUN 132

SOURce:SWEEp:COUNt?

Description This query returns the number of repetitions set for the sweep program.

Syntax SOUR(0..26):SWE:COUN?

Response The number of repetitions set for the sweep program. “0” makes the program loop continuously.

Example SOUR3:SWE:COUN?

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SOURce:SWEep:PROGram?

Description This function is used to set the parameters for a sweep program. During a sweep program, the application sweeps between two wavelengths: the minimum and the maximum wavelengths. This function also returns the validated parameters.

Syntax SOUR(0..26):SWE:PROG?<space><central>,,<time>

Parameters The <central> parameter represents the center wavelength (the wavelength halfway between the minimum and the maximum wavelengths). The current spectral measurement units apply (nm or THz). The format must be “9999.99” (nm) or “999.999” (THz).
The parameter represents the wavelength range to be swept below and above the center wavelength: span = (max. wavelength – min. wavelength) / 2. The current spectral measurement units apply (nm or THz). The format must be “9999.99” (nm) or “999.999” (THz).
The <time> parameter represents the duration of the sweep. The format must be “HHHH:MM:SS”.

Response A value confirming the new settings. If the entered parameters are not valid, the application will make the necessary changes. The format is “9999.99;99.99;999:99:99” (when the current spectral units are nm) or “999.999;9.999;9999:99:99” (when the current spectral units are THz).

Note It is strongly recommended that you perform the SOUR:SWE:REV command before the SOUR:SWE:PROG? command.

Example SOUR3:SWE:PROG? 1552.52,10.00,0000:01:00

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SOURce:SWEep:REPEat

Description This command is used to specify whether or not you want the sweep program to loop. The sweep program will loop the number of times set by the command SOUR:SWE:COUN.

Syntax SOUR(0..26):SWE:REPE<space><loop>

Parameters The <loop> parameter is a boolean parameter indicating whether or not the sweep program will loop:
"1" -the sweep program will loop
"0" -the sweep program will not loop

Example SOUR3:SWE:REPE 1

SOURce:SWEep:REPEat?

Description This query is used to check whether the sweep repeat function is activated. If activated, the sweep program will loop the number of times set by the command SOUR:SWE:COUN.

Syntax SOUR(0..26):SWE:REPE?

Response A boolean value indicating the state of the sweep repeat function:
"1" -the sweep repeat function is activated
"0" -the sweep repeat function is deactivated

Example SOUR3:SWE:REPE?

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SOURce:SWEep:REV

Description This command is used to enable and disable the sweep reverse function. When the sweep reverse function is enabled, the sweep program is performed in both directions: in the wavelength ascending and descending order.

Syntax SOUR(0..26):SWE:REV<space><sweep>

Parameters The <sweep> parameter is a boolean parameter indicating whether or not the sweep will be done in both directions:
"1" -enable the sweep reverse function
"0" -disable the sweep reverse function

Example SOUR3:SWE:REV 1

SOURce:SWEep:REV?

Description This query returns a value indicating whether the sweep reverse function is enabled.

Syntax SOUR(0..26):SWE:REV?

Response A boolean parameter representing the state of the sweep reverse function:
"1" -the sweep reverse function is enabled
"0" -the sweep reverse function is disabled

Example SOUR3:SWE:REV?

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SOURce:SWEep:SPAN?

Description This query returns the wavelength range to be swept below and above the center wavelength.

Syntax SOUR(0..26):SWE:SPAN?

Response A value representing the wavelength range to be swept below and above the center wavelength.. The current spectral measurement units apply (nm or THz). The format is “9999.99” (nm) or “999.999” (THz).

Example SOUR3:SWE:SPAN?

SOURce:SWEep:STATe

Description This function starts or stops the sweep program.

Syntax SOUR(0..26):SWE:STAT<space><state>

Parameters The <state> parameter is a boolean parameter representing the new state of the sweep program:
“1” -start the sweep program
“0” -stop the sweep program

Note This command cannot be performed if the application is running in ASE or Program mode.

Example SOUR3:SWE:STAT 1

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SOURce:SWEep:STATe?

Description This query returns a value indicating the state of the sweep program.

Syntax SOUR(0..26):SWE:STAT?

Response A boolean value representing the current state of the sweep program:
"1" -the sweep program is in progress
"0" -the sweep program is not in progress

Example SOUR3:SWE:STAT?

SOURce:SWEep:TIME?

Description This query returns the duration currently set for the sweep.

Syntax SOUR(0..26):SWE:TIME?

Response A value representing the duration currently set for the sweep in the format "HHHH:MM:SS".

Example SOUR3:SWE:TIME?

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SOURce:WAVElength:LENGth

Description This command selects a new source wavelength. The current spectral units (nm or THz) apply.

Syntax SOUR(0..26):WAVE:LENG<space><wave>

Parameters The <wave> parameter represents the new wavelength in the format “9999.99” (nm) or “999.999” (THz).

Note This function cannot be performed if the application is running in ASE, Sweep, or Program mode. If the value is out of range, the closest available value will be selected.

Example SOUR3:WAVE:LENG 1310.00

See also SOUR:WAV:LENG?, SOUR:WAV:LIM:HIGH?, SOUR:WAV:LIM:LOW?, SOUR:WAV:LIM:STEP?, UNIT:WAVE, and UNIT:WAVE?

SOURce:WAVElength:LENGth?

Description This query returns the current source wavelength in the current spectral unit (nm or THz).

Syntax SOUR(0..26):WAVE:LENG?

Response A value representing the current wavelength in the format “9999.99” (nm) or “999.999” (THz).

Note This function cannot be performed if the application is running in ASE mode.

Example SOUR3:WAVE:LENG?

See also SOUR:WAV:LENG, SOUR:WAV:LIM:HIGH?, SOUR:WAV:LIM:LOW?, SOUR:WAV:LIM:STEP?, UNIT:WAVE, and UNIT:WAVE?

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SOURce:WAVElength:LIMit:HIGH?

Description This query returns the maximum wavelength that can be set with the command SOUR:WAVE:LENG. The return value will be in the current spectral units (nm or THz).

Syntax SOUR(0..26):WAVE:LIM:HIGH?

Response A value representing the maximum available wavelength in the format “9999.99” (nm) or “999.999” (THz).

Example SOUR3:WAVE:LIM:HIGH?

See also SOUR:WAV:LENG, SOUR:WAV:LENG?, SOUR:WAV:LIM:LOW?, SOUR:WAV:LIM:STEP?, UNIT:WAVE, and UNIT:WAVE?

SOURce:WAVElength:LIMit:LOW?

Description This query returns the minimum wavelength that can be set with the command SOUR:WAVE:LENG. The return value will be in the current spectral units (nm or THz).

Syntax SOUR(0..26):WAVE:LIM:LOW?

Response A value representing the maximum available wavelength in the format “9999.99” (nm) or “999.999” (THz).

Example SOUR3:WAVE:LIM:LOW?

See also SOUR:WAV:LENG, SOUR:WAV:LENG?, SOUR:WAV:LIM:HIGH?, SOUR:WAV:LIM:STEP?, UNIT:WAVE, and UNIT:WAVE?

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SOURce:WAVElength:LIMit:STEP?

Description This query returns the minimum wavelength step that can be used when changing the wavelength with the command SOUR:WAVE:LENG. The return value will be in the current spectral units (nm or THz).

Syntax SOUR(0..26):WAVE:LIM:STEP?

Response A value representing the minimum wavelength step available in the format “9999.99” (nm) or “999.999” (THz).

Example SOUR3:WAVE:LIM:STEP?

See also SOUR:WAV:LENG, SOUR:WAV:LENG?, SOUR:WAV:LIM:HIGH?, SOUR:WAV:LIM:LOW?, UNIT:WAVE, and UNIT:WAVE?

UNITe:WAVElength

Description This command changes the spectral measurement units (nm or THz). This command cannot be used in ASE, Program, or Sweep mode.

Syntax UNIT(0..26):WAVE<space><unit>

Parameters The <unit> parameter is a boolean parameter representing the new spectral measurement units:
“1” -use THz
“0” -use nm

Example UNIT3:WAVE 1

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UNITe:WAVElength?

Description This query returns the current spectral measurement units.

Syntax UNIT(0..26):WAVE?

Response A boolean value representing the current spectral measurement units:
"1" -indicate THz
"0" -indicate nm

Example UNIT3:WAVE?

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8.2 Quick Reference Command Trees

8.2.1 IQ-2100 Light Source Command Tree

Command				Parameter/ Response	Description
SOUR	AM	[INT]	FREQ	<value>[HZ|KHZ]|CW|0	Set internal modulation
			FREQ?	(9999)	Get internal modulation
	POW	ATT		<value>[0..10][DB]	Set attenuation
		ATT?		(99.9)	Get attenuation
		STAT		<1|0|ON|OFF>	Turn source on or off
		STAT?		(0|1)	Source active?
		WAVE		<UPP|LOW|DUAL>	Set wavelength
		WAVE?		(9999)	Get wavelength
		WAVE	COUN?	(1|2)	Get number of available sources
			DUAL?	(0|1)	Source hybrid?

Table 8-2. IQ-2100 Light Source Command Tree

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8.2.2 IQ-2300 ASE Laser Source Command Tree

Command	Parameter/ Response	Description
SOUR POW ATT	<9.9>	Set attenuation
ATT?	(9.9)	Get attenuation
STAT	<0|1>	Turn source on or off
STAT?	(0|1)	Source active?
PROT HARE?	(0|1)	Interlock connector present?
HARS?	(0|1)	Interlock connector open or closed?
RPWD		Remove software protection password
SPWD	“safekey”	Enter software protection password
SOFE?	(0|1)	Software key is present?
SOFS?	(0|1)	Software key on or off?

Table 8-3. IQ-2300 ASE Laser Source Command Tree

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8.2.3 IQ-2400 WDM Laser Source Command Tree

Command			Parameter/ Response	Description
CAL	RES?		(9999.999E±999)	Get calibration value
	VAL		<9.999E±999>	Set calibration value
INP	CH?		(99)	Get channel
OUT	SOUR	ACCO	<9999.99> <±99.99>	Set delta temp. and delta current
		APCO	<±9.999E+9> <±9.999E+9>	Set wavelength or frequency and power
		MODE	<APC|ACC|APCDITHER| ACCONOFF|0|1|2|3>	Set operation mode
		MODE?	(0|1|2|3|)	Get operation mode
		SETP	<setpoint name>, <0|1|APC|ACC>	Set module setpoint
		STAT	<OFF|ON|0|1>	Turn source on or off
		STAT?	(0|1)	Source active?
	STAB?		(0|1)	Source stable?
	STAT?		(00|01|11..14|21..29| 91|92|94|95|98|99)	Get source state
SOUR	CURR	ACCB	<+9.999E+9>	Set ACC base current

Table 8-4. IQ-2400 WDM Laser Source Command Tree (Part 1 of 5)

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Command			Parameter/ Response	Description
SOUR	CURR	ACCB?	(9999.999E±9)	Get ACC base current
		CH?	(9999.999E±9)	Get channel delta current
		CHBA?	(9999.999E±9)	Get channel base current
		LEV	(9999.999E±9)	Get current delta current
		LIM HIGH?	(+9999.999E±9)	Get max. delta current
		LOW?	(-9999.999E±9)	Get min. delta current
		STEP?	(9999.999E±9)	Get min. current step
	PROT	HARE?	(0|1)	Interlock connector present?
		HARS?	(0|1)	Interlock connector open or closed?
		RPWD		Remove software protection password
		SPWD	“safekey”	Enter software protection password
		SOFE?	(0|1)	Software key is present?
		SOFS?	(0|1)	Software key on or off?
	POW	CH?	(9999.999E±9)	Get output power
		LEV	(9999.999E±9)	Get current power level

Table 8-4. IQ-2400 WDM Laser Source Command Tree (Part 2 of 5)

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Command				Parameter/ Response	Description
		LIM	HIGH?	(9999.999E±9)	Get max. power
			LOW?	(±9999.999E±9)	Get min. power
			STEP?	(9999.999E±9)	Get min. power step
	PULM	INT	DEPT	<±9.999E+9>	Set signal depth
			DEPT?	(9999.999E+9)	Get signal depth
			FREQ	<9.999E+9>	Set signal frequency
			FREQ?	(999999.9)	Get signal frequency
			SHAP	<0|1>	Set signal shape
			SHAP?	(0|1)	Get signal shape
		LIM	DEPT	HIGH?	(9999.999E±9)	Get signal max. depth
				LOW?	(9999.999E±9)	Get signal min. depth
				STEP?	(9999.999E±9)	Get signal min. step
SOUR	PULM	LIM	FREQ	DMAX?	<999999>	Get max. frequency in Dither mode
				DMIN?	(999999)	Get min. frequency in Dither mode
				HIGH?	<9> / (999999.9)	Get range maximum frequency
				LOW?	<9> / (999999.9)	Get range minimum frequency
				OMAX?	(999999)	Get max. frequency in OnOff mode

Table 8-4. IQ-2400 WDM Laser Source Command Tree (Part 3 of 5)

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Command			Parameter/ Response	Description
		OMIN?	(999999)	Get min. frequency in OnOff mode
		RANG?	(9)	Get number of frequency ranges
		STEP?	<9> / (999999.9)	Get range min. step
	SOUR		<0|1|INT|EXT>	Set signal source
	SOUR?		(0|1)	Get signal source
TEMP	CH?		(±99.99)	Get channel delta temp.
	LEV		(99.9)	Get current delta temperature
	LIM	HIGH?	(+99.99)	Get max. delta temp.
		LOW?	(-99.99)	Get min. delta temp.
		STEP?	(99.99)	Get temperature minimum step
SOUR WAVE	CH?		(9999.99) [NM] (999.999) [THZ]	Get channel wavelength or frequency
	LEV		(9999.999)	Get current wavelength
	LIM	HIGH?	(9999.99) [NM] (999.999) [THZ]	Get max. wavelength or min. frequency
		LOW?	(9999.99) [NM] (999.999) [THZ]	Get min. wavelength or max. frequency

Table 8-4. IQ-2400 WDM Laser Source Command Tree (Part 4 of 5)

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Command			Parameter/ Response	Description
		STEP?	(9999.99) [NM] (999.999) [THZ]	Get wavelength minimum step
UNIT	POW		<W|DB|1|0>	Set power unit
	WAVE		<THZ|NM|1|0>	Set spectral unit

Table 8-4. IQ-2400 WDM Laser Source Command Tree (Part 5 of 5)

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8.2.4 IQ-2600 Tunable Laser Source Command Tree

Command					Parameter/ Response	Description
OUT	ASE?				(0|1)	Source available?
	MODE				<0|1>	Set source mode
	MODE?				(0|1)	Get source mode
	STAT				<0|1>	Turn source on or off
	STAT?				(0|1)	Source active?
PROG	SEL	NAME			<string>	Load program
		NAME?			(string)	Get program name and path
		STAT			<0|1|2|3|RUN| PAUS|STOP|CONT>	Control program
		STAT?			(STOP|PAUSE| RUNNING|WAITING)	Get program state
SOUR	POW	LEV	IMM	AMPL	<±99.9>	Set source power
				AMPL?	(±99.9)	Get source power
		LIM	HIGH?		(±99.9)	Get max. output power
			LOW?		(±99.9)	Get min. output power
			STEP?		(±99.9)	Get min. power step

Table 8-5. IQ-2600 Tunable Laser Source Command Tree (Part 1 of 3)

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Command				Parameter/ Response	Description
SOUR	SWE	CENT?		(9999.99) [NM] (999.999) [THZ]	Get center wavelength
		COUN		<999>	Set repetitions
		COUN?		(999)	Get repetitions
		PROG?		(9999.99;99.99; 999:99:99) [NM] (999.999;9.999; 9999:99:99) [THZ]	Set sweep parameters
		REPE		<0|1>	Set loop
		REPE?		(0|1)	Loop active?
		REV		<0|1>	Set reverse function
		REV?		(0|1)	Reverse function active?
		SPAN?		(9999.99) [NM] (999.999) [THZ]	Get wavelength span
		STAT		<0|1>	Turn sweep on or off
		STAT?		(0|1)	Sweep active?
		TIME?		(9999:99:99)	Get sweep duration
	WAVE	LENG		<9999.99> [NM] <999.999> [THZ]	Set wavelength
		LENG?		(9999.99) [NM] (999.999) [THZ]	Get wavelength
		LIM	HIGH?	<9999.99> [NM] <999.999> [THZ]	Get max. wavelength

Table 8-5. IQ-2600 Tunable Laser Source Command Tree (Part 2 of 3)

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Command				Parameter/ Response	Description
SOUR	WAV	LIM	LOW?	<9999.99> [NM] <999.999> [THZ]	Get min. wavelength
			STEP?	<9999.99> [NM] <999.999> [THZ]	Get min. wavelength step
UNIT	WAVE			<0|1>	Set wavelength unit
	WAVE?			(0|1)	Get wavelength unit

Table 8-5. IQ-2600 Tunable Laser Source Command Tree (Part 3 of 3)

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8.3 Error Messages

8.3.1 IQ-2100 Light Source Error Messages

Error Number	Description	Probable Cause
402	“Illegal parameter value.”	An illegal data parameter has been received.
403	“Attenuation out of range.”	A command has attempted to set the internal attenuation to an unsupported value.

Table 8-6. IQ-2100 Light Source Error Messages

8.3.2 IQ-2300 ASE Laser Source Error Messages

Error Number	Description	Probable cause
1	“Unknown command.”	The ASE source has received a command that it does not recognize.
402	“Illegal parameter value.”	An illegal data parameter has been received.

Table 8-7. IQ-2300 ASE Laser Source Error Messages

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8.3.3 IQ-2400 WDM Laser Source Error Messages

Error Number	Description	Probable Cause
1	“Unknown command.”	The WDM laser source has received a command that it does not recognize.
1401	“Invalid parameter.”	The source has received a data parameter that it was not expecting.
1402	“Parameter out of range.”	The source has received a data parameter outside the valid range.
1403	“Invalid setpoint name.”	The setpoint name specified does not exist in the setpoints list.
1404	“Invalid mode.”	A request was made that cannot be executed in the current mode.

Table 8-8. IQ-2400 WDM Laser Source Error Messages

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8.3.4 IQ-2600 Tunable Laser Source Error Messages

Error Number	Description	Probable Cause
1101	“Parameter out of range.”	The Tunable Laser source has received a data parameter outside the valid range.
1102	“Invalid parameter.”	The Tunable Laser source has received a data parameter that it was not expecting.
1103	“Cannot execute command”.	A command was sent while unallowed by the application state.
1104	“Query error”.	Internal error.

Table 8-9. IQ-2600 Tunable Laser Source Error Messages

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8.4 GPIB Troubleshooting

Problem	Probable Cause	Solution
Unable to communicate with IQ-203. (No response from *IDN? command)	SCPI Manager is not open.	Open SCPI Manager.
	Incorrect communication type selected.	Select the correct communication type: RS-232, GPIB, or DDE.
	Incorrect communication parameters.	Check the communication parameters: bus address, Baud rate, flow control, etc., as required.
	Incorrect termination characters.	Synchronize termination characters between the GPIB controller and the SCPI Manager.
	Poor bus connection.	Ensure the functioning of the controller card and make sure that the bus cable is properly connected.
	Improper configuration.	Verify that the GPIB interface (IQ settings-Config) is properly configured.
Receive “Undefined header” error.	Missing module address from command.	Ensure that the module address is incorporated in the command.

Table 8-1. Troubleshooting (Part 1 of 2)

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Problem	Probable Cause	Solution
Receive “Undefined header” error. *(continued)*	Incorrect module address.	Ensure that the correct module address is being used.
	Incorrect command syntax.	Verify and correct syntax.
Unstable communications.	DMA is enabled.	Try with DMA disabled.
	Incorrect termination character.	Synchronize termination characters between the GPIB controller and the SCPI Manager.
Commands are working fine but the results and measurements are not as expected.	Synchronization problem with commands in program.	Use the *OPC? query after each command.
SCPI Manager unable to communicate with modules.	The module application is not open.	Open the module application.

Table 8-1. Troubleshooting (Part 2 of 2)

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9 MAINTENANCE AND TROUBLESHOOTING

There are no user-serviceable components in the IQ-2100, IQ-2300, IQ-2400, or IQ-2600 notwithstanding the procedure described in this section. The module has been designed to require a minimum of maintenance and provide accurate operation for many years.

9.1 General Maintenance

To help ensure long, trouble-free operation,

- Keep the IQ module free of dust.
- Be careful not to spill liquids into the unit. If the unit does get wet, turn the power off immediately and let the unit dry completely before turning it on again.
- Clean the IQ module casing with a cloth slightly dampened with water.

9.2 Cleaning the Optical Ports

To ensure maximum power output, the fiber end must be kept clean at all times, as explained in *Optical Connections*, on page 2-16. However, the source port should be cleaned occasionally to ensure minimum insertion loss.

The cleaning swabs supplied with EXFO test equipment are specially designed to clean inside the ports without having to disassemble the unit. No cleaning solution is required as the tips are used dry.

1. Take a swab from the package without touching the soft end.
2. Slowly insert the swab into the port until it reaches the ferrule inside (a slight clock-wise rotating movement may help).
3. Applying moderate pressure, turn the swab one full turn.
4. Continue to turn as you withdraw the swab.
5. Dispose of the used swab after 5 uses or as soon as it is visibly dirty.

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IMPORTANT

To help keep the source port clean, it is recommended that the protective cap be installed when the unit is not being used and that the fiber ends are always cleaned before connecting them to the source port.

The cleaning swabs can also be used to clean adapters before inserting connectors.

Note: *Individual connectors still need to be cleaned according to standard cleaning methods.*

If any abnormal power loss is observed, the source port and pigtail behind the front panel of the module may require cleaning. Contact EXFO for further information.

9.3 Source Verification and Recalibration

To ensure that the unit remains within the published specifications, EXFO recommends that an annual calibration be performed. Please contact EXFO for further information.

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9.4 Troubleshooting

Problem	Probable Cause	Recommended Action
LED push button does not illuminate	Power not on	Check AC power cord and power ON the IQ-203 and IQ-206 Refer to *IQ-200 Optical Test System Instruction Manual* to verify fuse
	Module is not properly inserted	Power OFF the IQ-203 and IQ-206, remove and reinstall the module
	Computer is locked up	Reboot the IQ-203
	LED is burnt	Contact EXFO
Pushing the LED push button does not open the module Main window	Computer is locked up	Reboot the IQ-203
Power lower than expected (IQ-2100)	Attenuation is >0.0 dB	Set attenuation to 0.0 dB
	Source is being modulated	Set modulation to none
	Dirty connectors	Clean all connectors
	Incorrect fiber type	Use the correct fiber type

Table 9-1. Problems, Possible Causes, and Recommended Actions (Part 1 of 2)

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Problem	Probable Cause	Recommended Action
Source appears unstable	Insufficient stabilization time	Wait a minimum of 60 minutes for optimum stabilization
	Reflection destabilizing the source	Connect the source using an optical isolator
	Ambient temperature is varying	Control ambient temperature

Table 9-1. Problems, Possible Causes, and Recommended Actions (Part 2 of 2)

In all cases, if problem persists after performing a recommended action, contact EXFO immediately.

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10 TECHNICAL SPECIFICATIONS

All specifications are subject to change without notice.

10.1 IQ-2100 Light Source

Specifications apply to a 2 m fiber output (specified type) with FC/SPC (singlemode) and FC/PC (multimode) connectors, and are valid for a 0.0 dB attenuation.

Model	IQ-2102 ORL	IQ-2103 ORL	IQ-2123 ORL
Wavelength[a](nm)	1310 ±20	1550 ±20	1310/1550 ±20
Spectral width (nm rms)	≤2.5	≤4	≤2.5/4
Power output[b, c] (dBm)	≥-1	≥-1	≥-2
Stability[d] (dB) 15 min. (T=constant) 8 h (T=0° to 50°C ±1°)	 ±0.01 ±0.03	 ±0.01 ±0.03	 ±0.01 ±0.05
Modulation	270 Hz, 1 kHz, 2 kHz (50% duty cycle)		
Temperature stability (dB)	≤0.25		
Model (cont.)	**IQ-2104 ORL**	**IQ-2134 ORL**	
Wavelength[a](nm)	1625 ±20	1550/1625 ±20	
Spectral width (nm rms)	≤5	≤4/5	
Power output[b, c] (dBm)	≥-5	≥-5/-5	
Stability[d] (dB) 15 min. (T=constant) 8 h (T=0° to 50°C ±1°)	 ±0.01 ±0.03	 ±0.01 ±0.03	
Modulation	270 Hz, 1 kHz, 2 kHz (50% duty cycle)		
Temperature stability (dB)	≤0.25		

Table 10-1. IQ-2100 Fabry-Perot TE Cooled Laser Modules

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Model	IQ-2102 BLC	IQ-2103 BLC	IQ-2123 BLC
Wavelength[a] (nm)	1310 ±20	1550 ±20	1310/1550 ±20
Spectral width (nm rms)	≤2.5	≤4	≤2.5/4
Power output[b, c] (dBm)	≥0	≥0	≥-1
Stability[d] (dB) 15 min. (T=constant) 8 h (T=0° to 50°C ±1°)	 ±0.003 ±0.03	 ±0.003 ±0.03	 ±0.005 ±0.05
Modulation	270 Hz, 1 kHz, 2 kHz (50% duty cycle)		
Temperature stability (dB)	≤0.25		

Table 10-2. IQ-2100 Fabry-Perot TE Cooled Laser Modules

a. Valid over the operating temperature range.
b. Class 1 according to FDA CFR21.
c. The maximum power output is 1.5 dB plus the indicated dBm value. This value takes into account all uncertainties.
d. Valid after an active source 1 hour warmup period. Valid after 30 minutes if the module is stored beforehand at the same temperature.

Model	IQ-2102 BLD	IQ-2103 BLD
Wavelength[a] (nm)	1310 ±10	1550 ±10
Spectral width (nm)	≤0.2	No longer available. Order IQ-2403BLD for DFB lasers in the 1550 range.
Power output[b, c] (dBm)	>-1	
Sidemode suppression ratio type (dB)	30	
Stability[d] (dB) 15 min. (T=constant) 8 h (T=0° to 50°C ±1°)	 ±0.003 ±0.03	
Modulation	270 Hz, 1 kHz, 2 kHz (50% duty cycle)	
Temperature stability	≤0.25 dB ≤0.3 nm	

Table 10-3. IQ-2100 TE Cooled Distributed Feedback Laser Modules

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Model	IQ-2102 BS/BP/BPL	IQ-2103 BS/BP/BPL	IQ-2123 BH/BS/BP/BPL
Wavelength[a] (nm)	1310 ±25	1550 +10/-40	1310 ±25 1550 +10/-40
Spectral width (FWHM)	≥45	≥65	≥45/65
Power output[b, c, e](dBm)	BS ≥-13.5 BP ≥-16 BPL ≥-19	BS ≥-17 BP ≥-20 BPL ≥–23	BH ≥-18/-18 BS ≥-14.5/-18 BP ≥-17/-21 BPL ≥-20/-24
Stability[d, e] (dB) 15 min. (T=constant) 8 h[f] (T=0° to 40°C ±1°)	±0.005/±0.04 ±0.03	±0.005/±0.04 ±0.03	±0.005/±0.04 ±0.03
Modulation	270 Hz, 1kHz, 2 kHz (50% duty cycle) (not available on IQ-2123BH)		
Temperature stability[e] (dB)	≤0.4[f]		

Table 10-4. IQ-2100 Edge Emitting LED Modules

Model	IQ-2101 C/D	IQ-2102 C/D	IQ-2112 C/D
Wavelength[a] (nm)	850 ±25	1300 +50/-60	850/1300 ±25/+50/-60
Spectral width nm (FWHM)	≤50	≤145	≤50/145
Power output[b, c](dBm)	C≥-17 D≥-14	C≥-22.5 D≥-19	C≥-18/-23.5 D≥-15/-20
Stability[d] (dB) 15 min. (T=constant) 8 h (T=0° to 50°C ±1°)	±0.003 ±0.03	±0.003 ±0.03	±0.005 ±0.05
Modulation	270 Hz, 1 kHz, 2 kHz (50% duty cycle)		
Temperature Stability (dB)	<0.4		

Table 10-5. IQ-2100 Surface Emitting LED Modules

a. Valid over the operating temperature range.
b. Class 1 according to FDA CFR21.

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c. The maximum power output is 1.5 dB plus the indicated dBm value. This value takes into account all uncertainties.
d. Valid after an active source 1-hour warmup period. Valid after 30 minutes if the module is stored beforehand at the same temperature.
e. For BS/BP LED sources: for a variation of temperature from 0° to 40°C.
f. Unpredictable value for a polarized LED.

Operating Environment	
Operating temperature	10° to 40°C/50° to 104°F
Storage temperature	-35° to 70°C/-31° to 158°F
Relative humidity[a]	0 to 95% non-condensing

Table 10-6. Operating Environment (IQ-2100)

a. Measured in 0° to 40°C temperature range.

Mechanical Specifications	
Dimensions	Width: 3.8 cm/1.5 in. Height: 12.0 cm/4.75 in. Length: 26.2 cm/10.3 in.
Weight	0.5 kg/1.25 lb

Table 10-7. Mechanical Specifications (IQ-2100)

Please call EXFO to obtain DFB and other source specifications.

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10.2 IQ-2300 ASE Source

Model	IQ-2300
Central wavelength at -10 dB (nm) minimum typical maximum	 1543 1545 1547
Spectral width at -3 dB (nm) minimum typical maximum	 28 33 37
Wavelength span at -10 dB (nm) minimum typical maximum	 65 73 77
Output power (dBm) minimum typical maximum	 11 12 13
Power density[a] (dBm/nm)	-3
Power flatness[b] (dB)	±1
Output stability over 10 hours (dB)	±0.02

Table 10-8. IQ-2300 Module Specifications

a. Typical value.
b. At ±14 nm from central wavelength at 25°C.

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Operating Environment	
Operating temperature	0° to 40°C/32° to 104°F
Storage temperature	-40° to 60°C/-40° to 140°F
Relative humidity	0 to 95% non-condensing

Table 10-9. Operating Environment (IQ-2300)

Mechanical Specifications	
Dimensions	Width: 3.8 cm/1.5 in. Height: 12.0 cm/4.75 in. Length: 26.2 cm/10.3 in.
Weight	0.75 kg/1.65 lb

Table 10-10. Mechanical Specifications (IQ-2300)

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10.3 IQ-2400 WDM Laser Source

The following definitions are used through the IQ-2400 technical specifications:

T_{las}: laser temperature
T_{case}: laser casing temperature
T_{amb}: ambient temperature
T_{set}: temperature at which laser must be to generate the central wavelength
ΔT: absolute deviation between T_{las} and T_{amb}

Unless otherwise specified, all specifications are obtained with:

- the ambient temperature of 23°C ±0.5°C
- the humidity at 50% ±10%
- laser temperature at T_{set}
- short-term specifications are for 15 minutes
- long-term specifications are for 8 hours

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10.3.1 Optical

Model	IQ-2403BLD-x x-P0	IQ-2403BLD-x x-P1	IQ-2403BLD-x x-P2
Output power[a] (dBm) (at the user-specified wavelength)	>3	>8	
DFB wavelength range[b] (nm)	1530 to 1561		
Wavelength tuning range[c] (nm)	±1.1		
Wavelength tuning resolution[d] (nm)	0.01		
Wavelength accuracy[e] (nm)	±0.01		
Wavelength stability[f] (nm)	±0.002		
Wavelength linearity[g] (nm)	±0.005		
Wavelength flatness (nm)	±0.005		
Wavelength drift along the operating temperature range (nm) typical maximum	 ±0.027 ±0.068		
Spectral linewidth (MHz) in CW mode	≤20		
Sidemode suppression ratio (dB) minimum typical	 30 40		
Laser optical isolation[h] minimum typical	 25 35		
Power stability[f] (dB) (short-term) (long-term)	 ±0.005 ±0.03		
Power linearity[i] (dB)	±0.05		
Power uncertainty[j] (dB)	±0.3		
Power flatness[g] (dB)	±0.1		

Table 10-11. IQ-2400 Model Specifications (Part 1 of 2)

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Model	IQ-2403BLD-x x-P0	IQ-2403BLD-x x-P1	IQ-2403BLD-x x-P2
Power drift along the operating temperature range[k] (dB)	±0.75		
Stabilization time[l] (seconds): minimum typical maximum	 5 20 180		
Startup stabilization time[m] (min)	15		
Laser temperature at T_{set} (°C) minimum maximum	 15 35		
Internal modulation ON/OFF (kHz) minimum maximum	 0.010 300		

Table 10-11. IQ-2400 Model Specifications (Part 2 of 2)

a. Test jumper included
b. Other wavelengths may be available, please contact factory.
c. Around ITU-T channel if ambient temperature stays within +15° to 30°C.
d. Better resolution available in High Wavelength Stability mode.
e. After a one-hour warmup.
f. After a one-hour warmup and with a constant (±0.5°C) ambient temperature.
g. At maximum power for the entire tuning range ±1.1 nm.
h. Tcase is between -20° and 65°C.
i. At the central wavelength, in Normal or Dither mode.
j. Test jumper not included.
k. Tlas = Tset and Tamb varies from 10°C to 40°C.
l. Switch from maximum wavelength to minimum wavelength. Typical value is with Tamb = 23°C and maximum value is with Tamb = 40°C.
m. Wavelength variation is <±0.005 nm.

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10.3.2 Internal Frequency Generator

Model	IQ-2403BLD
Internal generator resolution (Hz) from 10 to 300 Hz from 300 to 9000 Hz from 9 to 300 kHz	 1 10 100
Optical duty cycle[a] (%)	45
Frequency accuracy	±(1 Hz +1%)
Frequency stability (%)	±1

Table 10-12. IQ-2400 Model Specifications

a. Measured at a 50-kHz frequency.

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10.3.3 Dithering

Model	IQ-2403BLD
Shape of the Dither modulation	triangular and square
Internal modulation frequency (kHz) minimum maximum	 1 300
Amplitude modulation[a] (mA p-p) minimum maximum	 1 5
Wavelength linearity with relation to frequency[b] (nm)	±0.003
Power linearity with relation to frequency[b] (dB)	±0.05
Power linearity with relation to Dither current[c] (dB)	±0.05

Table 10-13. IQ-2400 Model Specifications

a. Current accuracy is ±10%.
b. Dither mode set at 5 mA at maximum output power, and Tlas = Tset.
c. Dither mode set at 200 kHz at maximum output power, and Tlas = Tset.

10.3.4 On/Off

Model	IQ-2403BLD
Optical duty cycle with external generator[a] (%)	45
Extinction ratio[b] (dB)	45

Table 10-14. IQ-2400 Model Specifications

a. Measured with TTL-IN 50% duty cycle and a 50 kHz frequency.
b. Measured at a 50 kHz frequency.

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10.3.5 TTL-IN (IQ-2400 is synchronized by another instrument)

Model	IQ-2403BLD
Maximum V_{IL} (volts)	0.7
Minimum V_{IH} (volts)	2.25
Delay TTL-IN/optical signal[a] (ns)	1500
Delay TTL-IN/TTL-OUT[b] (ns)	1050

Table 10-15. IQ-2400 Model Specifications

a. Delay between the reception of a TTL signal and the generation of an optical signal.
b. Delay between SYNC IN TTL and SYNC OUT TTL BNC connectors.

10.3.6 TTL-OUT (IQ-2400 synchronizes other instruments)

Model	IQ-2403BLD
Maximum V_{OL} (volts)	0.55
Minimum V_{OH} (volts)	3
Delay optical signal/TTL-OUT[a] (ns)	560
Delay between the first and the N^{th} module in serial configuration (ns)	2060 + (N–1) x 1050

Table 10-16. IQ-2400 Model Specifications

a. Delay between optical signal and SYNC OUT TTL

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10.3.7 HWS Mode

Model	IQ-2403BLD
Power stability (dB) short term (typical) long term (typical)	 ±0.005 ±0.03
Wavelength stability[a] (nm)	±0.002
Wavelength drift along the operating temperature range (nm) typical maximum	 ±0.027 ±0.068

Table 10-17. IQ-2400 Model Specifications

a. After a one-hour warmup.

10.3.8 General

Operating Environment	
Operating temperature	10° to 40°C/50° to 104°F
Storage temperature	-40° to 70°C/-40° to 158°F
Relative humidity	0 to 95% non-condensing

Table 10-18. Operating Environment (IQ-2400)

Mechanical Specifications	
Dimensions	3.8 cm/Width: 1.5 in. 12.0 cm/Height: 4.75 in. 26.2 cm/Length: 10.3 in.
Weight	0.5 kg/1.25 lb

Table 10-19. Mechanical Specifications (IQ-2400)

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10.4 IQ-2600 Tunable Laser Source

10.4.1 Tunable Mode

Model	IQ-2600
Wavelength range (nm)	1520 to 1570
Wavelength resolution (nm)	0.01
Output power (dBm) minimum typical maximum	 4 5 6
Power stability[a] (dB) over 15 minutes over 1 hour	 ±0.01 ±0.05
Power flatness (dB)	0.6
Spectral linewidth (FWHM) (nm)	<0.01
Wavelength accuracy[b] (nm)	±0.15
Sweep speed (nm/sec) minimum maximum	 0.1 2.5
Tuning speed[c] (nm/sec)	5
Wavelength repeatability (nm)	±0.02
Maximum wavelength stability[a, b, d] (nm)	±0.01
Minimum optical rejection ratio[e] (dB)	65
Maximum relaxation oscillation (RMS) (%)	1
Minimum monitoring output power (dBm)	-10

Table 10-20. IQ-2600 Model Specifications (Tunable Mode)

a. At a constant temperature.
b. After a 30-minute warmup at 25°C.
c. Minimum 2.2 seconds required for any wavelength shift.
d. Over 1 hour.
e. Measured at ±5 nm from the central wavelength with an optical spectrum analyzer with a 0.08-nm wavelength resolution.

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10.4.2 ASE Mode

Model	IQ-2600
ASE output power (dBm) minimum typical maximum	 4 5 6
Total wavelength span (nm) minimum typical maximum	 55 58 61
Output power stability[a] (dB)	±0.05

Table 10-21. IQ-2600 Model Specifications (ASE Mode)

a. Over 10 hours at a constant temperature.

Operating Environment	
Operating temperature	0° to 40°C/32° to 104°F
Storage temperature	-40° to 60°C/-40° to 140°F
Relative humidity	0 to 95% non-condensing

Table 10-22. Operating Environment (IQ-2600)

Mechanical Specifications	
Dimensions	7.6 cm/Width: 3 in. 12.0 cm/Height: 4.75 in. 26.2 cm/Length: 10.3 in.
Weight	1.2 kg/2.64 lb
Number of IQ slots	2

Table 10-23. Mechanical Specifications (IQ-2600)

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11 WARRANTY

11.1 General Information

EXFO Electro-Optical Engineering, Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period of two years from the date of original shipment. EXFO also warrants that this equipment will meet applicable specifications under normal use.

During the warranty period, EXFO will, at its discretion, repair, replace, or issue credit for any defective product. This warranty also covers recalibration during two years if the equipment is repaired or if the original calibration is erroneous.

IMPORTANT

The warranty can become null and void if

- ***the equipment has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel,***
- ***the warranty sticker has been removed,***
- ***case screws, other than those specified in this manual, have been removed,***
- ***the case has been opened, other than as explained in this manual,***
- ***the equipment serial number has been altered, erased, or removed,***
- ***the equipment has been misused, neglected, or damaged by accident.***

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL EXFO BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

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11.2 Liability

EXFO shall not be liable for damages resulting from the use of the purchased product, nor shall be responsible for any failure in the performance of other items to which the purchased product is connected or the operation of any system of which the purchased product may be a part.

11.3 Exclusions

EXFO reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligation to make changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps and batteries used with EXFO's products are not covered by this warranty.

11.4 Certification

EXFO certifies that this equipment met its published specifications at the time of shipment from the factory.

11.5 Service and Repairs

To obtain service or repair for any equipment, follow the procedure below.

1. Call EXFO Customer Service Group. Support personnel will determine if the equipment requires service, repair, or calibration.

2. If the equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) and an address for return.

3. If the unit has an internal storage device, do a backup of your data before sending the unit for repairs.

4. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.

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IMPORTANT

Never send any unit or accessory back to EXFO without a Return Merchandise Authorization (RMA).

5. Return the equipment, prepaid, to the address given by the support personnel. Be sure to write the RMA on the shipping slip. EXFO will refuse and return any package which does not bear an RMA.

Note: *A test setup fee will apply to any returned unit which, after test, is found to meet the applicable specifications.*

After repair, the equipment will be returned with a repair report. If the equipment is not under warranty, the customer will be invoiced for the cost appearing on this report. Return-to-customer shipping costs will be paid by EXFO for equipment under warranty. Shipping insurance is at the customer's expense.

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GLOSSARY

a	Abbreviation for atto, which indicates 10^{-18} units.
AC	Alternating current
adapter	A device for coupling two connectors.
amplitude	The distance between high and low points of a waveform or signal.
ASCII	American Standard Code for Information Interchange. A system used to represent letters, numbers, symbols, and punctuation as bytes of binary signals.
attenuation	The diminution of average optical power. Attenuation results from absorption, scattering, and other radiation losses. Attenuation is generally expressed in dB without a negative sign.
attenuation coefficient	A factor expressing attenuation per unit length, expressed in dB/km.
attenuator	An optical device, either fixed or adjustable, that reduces the intensity of light propagating through it.
axis of birefringence	One of two generally orthogonal orientations transverse to the fiber core corresponding to fast and slow propagation of the group velocity of a light beam. In general, these orientations are elliptical and the orientation and amplitude vary along the fiber. In the special case of a HiBi fiber, the axes are linear and constant along the length of the fiber.
backscattering	That portion of scattered light that returns in a direction generally opposite to the direction of propagation.
baud rate	Measurement of data transmission speed, expressed in bits per second or bps.
beat length	In a reasonably uniform, birefringent medium, the distance over which a light wave propagating along the slow axis will accumulate a phase lag of one wavelength (2π) with respect to light propagating along the fast axis. As a rule, the shorter

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	the beat length, the higher the fiber birefringence. Typical HiBi fibers have a beat length of 3 mm at 1550 nm.
Bellcore	Bell communications research, an organization that contains much of the former Bell labs. It specializes in telephone network technology, standards and interfaces.
BER	Bit error rate. On a transmission link, the number of digital "highs" that are interpreted as "lows", and vice versa, divided by the total number of bits received. In modern networks, BERs much better than 10^{-9} are expected.
birefringence	The property whereby the effective propagation speed of a light wave in a medium depends upon the orientation of the electric field (state of polarization) of the light.
c	Velocity of light in a vacuum = 2.997925 x 10^8 m/s
°C	Degree Celsius. To convert to Fahrenheit: $F = \frac{9}{5}C + 32$.
CFR	Code of Federal Regulations
connector	A junction that allows an optical fiber or cable to be repeatedly connected or disconnected to a device such as a source or detector.
coupler	A device whose purpose is to distribute optical power among two or more ports or to combine optical power from two or more fibers into a single port.
CW	Abbreviation for continuous wave. Refers to non-modulated, constant-intensity light.
dB	Decibel
dBm	Decibel referenced to a milliwatt.
DC	Direct current
DDE	Dynamic Data Exchange
decibel (dB)	The standard unit used to express gain or loss of optical power. A standard logarithmic unit for the ratio of two powers.

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directivity	In a 3-port optical circulator, the ratio of power launched into port 1 that exits via port 2 vs. the fraction that exits via port 3.
DLL	Dynamic Link Library
DMA	Direct Memory Addressing
DUT	Device under test
dynamic range	For an optical instrument, generally defined as the ratio (in dB) of the smallest signal that can be observed (at a specified wavelength separation) in the presence of a strong, nearly saturating signal.
E	Abbreviation for exa, which indicates 10^{18} units.
EDFFA	Erbium doped fluoride fiber amplifier
EDFSA	Erbium doped silica fiber amplifier
EIA	Electronics Industries Association
electromagnetic interference	Any electrical or electromagnetic interference that causes degradation, failure in electronic equipment, or undesirable response. Optical fibers neither emit nor are affected by EMI.
EMI	Electromagnetic interference.
EOI	End of Image Marker
EOS	Effective Opening Size
ESB	Event Summary Bit
ESE	Standard Event Status Enable Register
ESR	Standard Event Status Register
f	Abbreviation for femto, which indicates 10^{-15} units.
f	Frequency, often also designated by ν.
FCC	Federal Communications Commission. A U.S. government body overseeing and regulating national electrical and radio communications. The FCC, formed in 1934, also deals with

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	licences, tariffs, and limitations. The members of the commission are appointed by the U.S. president.
FIFO	First In First Out
frequency	The number of cycles per second, denoted by hertz (Hz).
G	Abbreviation for giga, which indicates 10^9 units.
Ge	Germanium
GeX	High power germanium
GPIB	General Purpose Interface Bus
HiBi	High birefringence (fiber)
hr	Hour
Hz	Hertz. Denotes number of cycles per second.
k	Abbreviation for kilo, which indicates 10^3 units.
IEC	International Electrotechnical Commission. A standardization body at the same level as ISO.
IEE	Institute of Electronic Engineering. It is a professional body covering all aspects of electronics and electrical engineering, including software, network, and computer engineering.
IEEE	Institute of Electrical and Electronics Engineering. It is a professional body very active, among other things, in many fiber-optic and opto-electronic related fields.
index matching material	A material, often a liquid or a cement, whose refractive index is nearly equal to the core index, used to reduce Fresnel reflections from a fiber's endface.
index of refraction	The ratio of the group velocity of light in a vacuum to the group velocity of light in a given medium.
InGaAs	Indium gallium arsenide.
ISA	Industry Standard Architecture

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ISO	International Organization for Standardization. Commonly believed to stand for International Standards Organization. In fact, ISO is not an abbreviation—it is intended to signify uniformity (derived from the Greek *iso* meaning “equal”). ISO is responsible for many standards including those for data communications and computing.
ITU	International Telecommunications Union. The ruling body for telecommunications and the source of many network standards.
jumper	Fiber-optic cable that has connectors terminated on both ends. Used to connect two pieces of equipment, modules, or components.
LoBi	Low birefringence (fiber)
LD	Laser diode
LED	Light emitting diode
loopback	Type of diagnostic test in which the transmitted signal is returned to the sending device after passing through a communications link or network.
M	Abbreviation for mega, which indicates 10^{6} units.
m	Abbreviation for milli, which indicates 10^{-3} units.
min	Minute
mode coupling	The exchange of power among modes.
n	Abbreviation for nano, which indicates 10^{-9} units.
n	Refractive index. For the silica glass used in optical fibers, $n \approx 1.465$.
NIST	National Institute of Standards and Technology. U.S. governmental body that provides the assistance in developing standards. It was formerly the National Bureau of Standards.
noise figure	A measure of the quality of an amplifier, defined as the ratio of output to input SNRs.

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P	Abbreviation for peta, which indicates 10^{15} units.
p	Abbreviation for pico, which indicates 10^{-12} units
P	Power
PC	In optical schematics, used to designate a polarization controller.
PCS	Plastic-clad silica (fiber)
PMF	Polarization maintaining fiber
polarization mode dispersion (PMD)	Pulse spreading in a singlemode fiber that arises on account of the different group velocities associated with each of the two principal states of polarization of the fiber.
RMA	Return merchandise authorization
s	Second
SCPI	Standard Commands for Programmable Instruments
sensitivity	For an optical instrument, the smallest signal that can be detected in the absence of any other signal.
Si	Silicon
SNR	Signal-to-noise ratio. The ratio of the received optical power, divided by the noise floor for the optical system.
SRE	Service Request Enable Register
SRQ	Service Request
state of polarization (SOP)	The orientation of the electric field vector of a propagating optical wave. In general, this vector will trace an ellipse as it propagates. In special cases, it will remain oriented in one direction (linear polarization) or will trace out a circle (left or right circular polarization).
STB	Status Byte Register
t	Time
T	Abbreviation for tera, which indicates 10^{12} units.
V	volt

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VA	volt-ampere
W	watt
wavelength	For monochromatic light, the distance between two successive peaks (or troughs) of the sinusoidally-varying electric-field amplitude. Note that, unlike frequency, the wavelength of light is inversely proportional to the refractive index of the medium through which it propagates. It is for this reason that accurate wavelength measurements are generally specified as being determined in “air” or in “vacuum”.
λ	lambda. Greek letter used to denote wavelength.
μ	Abbreviation for micro, which indicates 10^{-6} units.
ν	nu. Greek letter used to denote frequency. Traditionally, the physics community uses “ν” to denote frequency whereas the engineering community uses “*f*”.

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ERRATUM

This Information Applies Only To The *IQ-2100/2300/2400/2600 Light Source Series* Instruction Manual

Source Safety Requirements

- **On pages 1-3 and 1-4 of the manual, replace the text of section 1.5.1 by the following:**

  The following source module configurations are classified as 21 CFR Class I laser products that comply with 21 CFR 1040.10 and 1040.11 and IEC 825-1: 1993. Laser radiation may be encountered at their output ports.

  - IQ-2100 Light Source (single- or dual-wavelength LED or laser source with semiconductor diode lasers)
  - IQ-2403BLD-xx-P0, IQ-2403BLD-xx-P1, and IQ-2403BLD-xx-P2 WDM Laser Sources (contain semiconductor diode lasers)
  - IQ-2600 Tunable Laser Source

  The level of radiation is below that known to cause eye injury through accidental short term exposure. However, avoid prolonged exposure to light emitted from the fiber and do not stare directly at a light beam, visible or not.

  The following label indicates that these products contain a Class 1 laser source.



- **On pages 1-5 and 1-6 of the manual, replace the text of sections 1.5.2 and 1.5.3 by the following new combined section 1.5.2:**

  The following source modules are classified as Class 3A laser products according to IEC-825-1: 1993 + AM1 : 1997. The source modules are also classified as Class IIIb laser products according to 21 CFR-1040-10. They are potentially harmful instruments if not used with extreme caution.

  - IQ-2300 ASE Broadband Source (contains an erbium-doped fiber pumped with a 980 nm laser diode)
  - IQ-2403BLD-xx-P4, IQ-2403BLD-xx-P5, IQ-2403BLD-xx-P6, and IQ-2403BLD-xx-P7 WDM Laser Sources (contain semiconductor diode lasers)
  - IQ-2403BLD-xx-P3 WDM Laser Source if it contains a Class IIIb laser.

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Light in the 1550 nm wavelength region is invisible to the human eye and can cause unexpected, permanent eye damage. Use caution at all times when working with Class 3A or Class IIIb laser products. Wear appropriate eye protection and follow laser safety precautions.

The Class 3A and Class IIIb safety label, depicted in the following figure, is found on the side panel of the IQ-2300 source modules:



The Class 3A and Class IIIb safety label, depicted in the following figure, is found on the side panel of the IQ-2403BLD-xx-P3 (if applicable) IQ-2403BLD-xx-P4, IQ-2403BLD-xx-P5, IQ-2403BLD-xx-P6, and IQ-2403BLD-xx-P7 source modules:



- **On page 2-4 of the manual, replace the second paragraph of section 2.1.2 with the following text:**

  The Laser Radiation Warning label, depicted in Figure 2-2, is found on the *side* panel of the IQ-2300.

- **On page 2-5 of the manual, replace the second paragraph of section 2.1.3 with the following text:**

  The Laser Radiation Warning label, depicted in Figure 2-3, is found on the *side* panels of the IQ-2403BLD-xx-P1, IQ-2403BLD-xx-P2, IQ-2403BLD-xx-P3, IQ-2403BLD-xx-P4, IQ-2403BLD-xx-P5, IQ-2403BLD-xx-P6, and IQ-2403BLD-xx-P7.

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