

Multiwavelength Comb Controller

IQ-12007A



Controls up to 160 WDM laser sources

Subsystem for EDFA characterization

Supports broadband and WDM coupling

System-based specifications

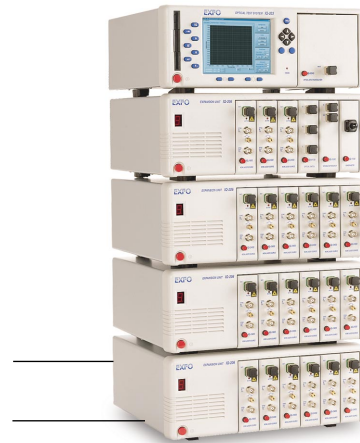


Fiber-optic test, measurement
and monitoring instruments

EXFO

Fast, Automated, Flexible

The IQ-12007A Multiwavelength Comb Controller is a fully integrated system that enables total control of a bank of IQ-2400 WDM laser sources. This system can be used either as a turnkey solution, or as a subsystem for integration into more complex automated test equipment (ATE). IQ-2400 laser sources are WDM-DFB controlled for wavelength and power. They provide saturation tones across the C- and L-bands for amplifier testing or transmission channels in WDM characterization.



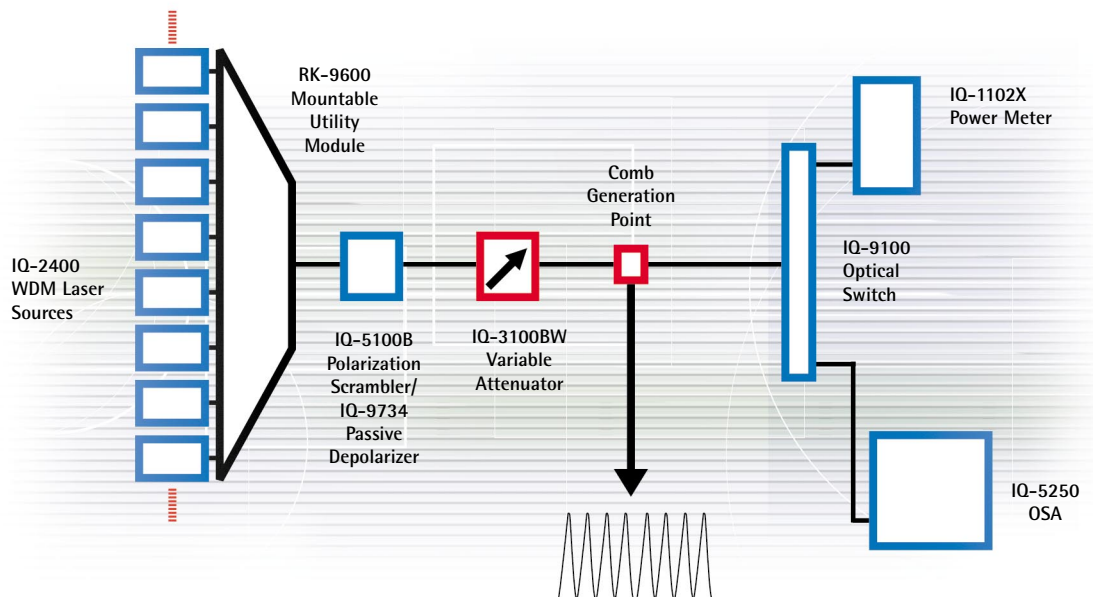
Key Features

- Tilt, flat or specified comb power distribution
- Specifications for power, flatness and comb generation time
- Up to 17 dBm total output power
- GPIB, LabVIEW® virtual instruments and ActiveX remote control
- LabVIEW® graphical user interface
- Most commercial OSAs supported

Simulate Any Traffic Condition

To emulate real life traffic conditions, more and more channels have to be combined. System specialists also need to be able to characterize network responses at different load conditions, from no signal to full occupation. Managing large numbers of sources and configurations can become troublesome and time-consuming. The IQ-12007A system simplifies configuration and management of multiple sources by supporting up to 160 WDM laser sources.

Comb generation, control and feedback



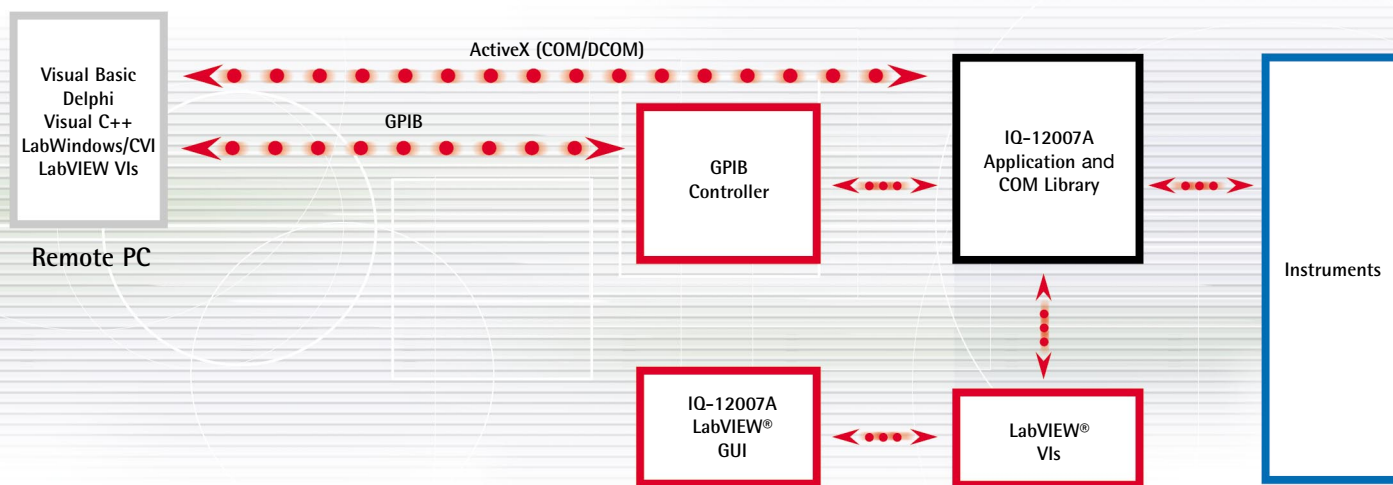
High-Level of Integration

The integration of an OSA and power meter into the IQ-12007A enables accurate feedback of both power distribution and total power. A variable attenuator allows for control of total power while maintaining good spectral uniformity across the C- and L-bands. An optical switch between the OSA and power meter minimizes errors caused by connecting and disconnecting instruments. A polarization scrambler or a passive depolarizer provide more stable, repeatable comb power distribution over time by averaging or reducing the effects of polarization in measures.

Architecture and Operation

GPIB/SCPI commands, LabVIEW® virtual instruments and ActiveX components allow this subsystem and its various functions to be integrated into different programming environments.

Controlling the system remotely



- System supports ActiveX, which can be used by Visual Basic, Delphi, Visual C++, LabVIEW® and LabWindows/CVI.
- Provides graphical user interface (GUI) as an executable file.
- Software package includes the source code for LabVIEW® allowing for fast, easy system start up.
- Supports remote control from most standard programming environments via two different technologies; SCPI commands and COM/DCOM interface¹.
- All programs come on a single CD-ROM for ease of installation and use.

Standard Equipment

IQ-2400 WDM Laser Source

DFBs emulate saturating signals on the ITU grid over the C- and L-bands with 10 dBm or 13 dBm output power. This source provides high wavelength accuracy and stability for both power and wavelength: a change in power level does not shift the wavelength, and the power level is maintained while tuning the wavelength. With tunability over ± 0.8 nm, a 50 GHz spacing comb is supported using standard 100 GHz spacing central wavelength source modules.



TJ-BXX-XX Test Jumpers and Fiber Management

Ensure optimal fiber management with appropriate accessories. Test jumpers (except for sources) are supplied with the system.



IQ-3100BW Variable Attenuator

Adjust total input power from 17 dBm at 1550 nm (or maximum allowed by the coupling scheme), down to -50 dBm, while maintaining good spectral uniformity.



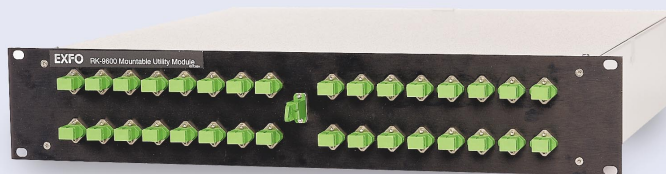
IQ-5250 Optical Spectrum Analyzer or User-Provided OSA

Perform flat, tilted or specified comb distributions with an OSA. EXFO's IQ-5250 is a top-of-the-line modular OSA for spectrum measurement. It can be used to perform measurements on its own, once a comb configuration has been set. The IQ-12007A system supports most commercially available OSAs; please contact EXFO for a list of supported models.



RK-9600 Mountable Utility Module

Coupling is provided within a 2U-19-inch rack module with SC connectors. WDMs are used for low insertion loss when combining signals, while reducing SSE levels between channels (selective filtering). A 32-channel system uses two 16-channel WDMs and one broadband 1X2 coupler. Identification of first wavelength and spacing is required when ordering a WDM coupling method. Broadband couplers are also supported for 8- to 40-channel systems.



Optional Equipment

IQ-5100B Polarization Scrambler

Obtain 98 % Poincaré sphere coverage in 2.5 seconds. A slower coverage period can also be set. The IQ-5100B is an all-fiber polarization scrambler with very low insertion loss and low activation loss. This unit is ideal for measuring maximum and minimum gain or loss with an OSA. In fast mode (for setting comb generation), it provides better stability and repeatability by avoiding PDL.



IQ-9734 Passive Depolarizer

Achieve very fast, almost instantaneous, depolarization by using the IQ-9734. This passive depolarizer performs like an active polarization scrambler. It provides less than 6 dB insertion loss and a remaining DOP of 11 % when used with DFBs in Dither mode (coherence reduced or effective line width enlarged to 500 MHz typical). It can be used to provide faster average loss or gain measurements with a comb of highly polarized DFB lasers.



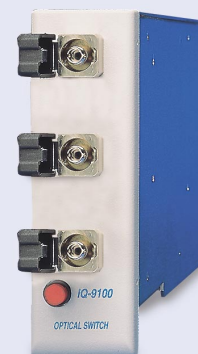
IQ-1102X Power Meter

Measure output power and feedback to the variable attenuator to ensure accurate control of total comb power. Measures up to 20 dBm. Used to calibrate optical switch path loss as a function of wavelength.



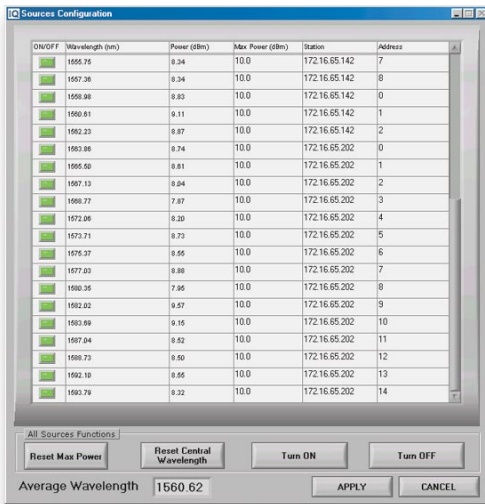
IQ-9100 Optical Switch

Toggle with high repeatability from the power meter to the OSA with the IQ-9100. This will enable you to minimize errors resulting from connecting and reconnecting instruments.



User-Friendly LabVIEW® Software

Configuration



Configuring the sources

Sources

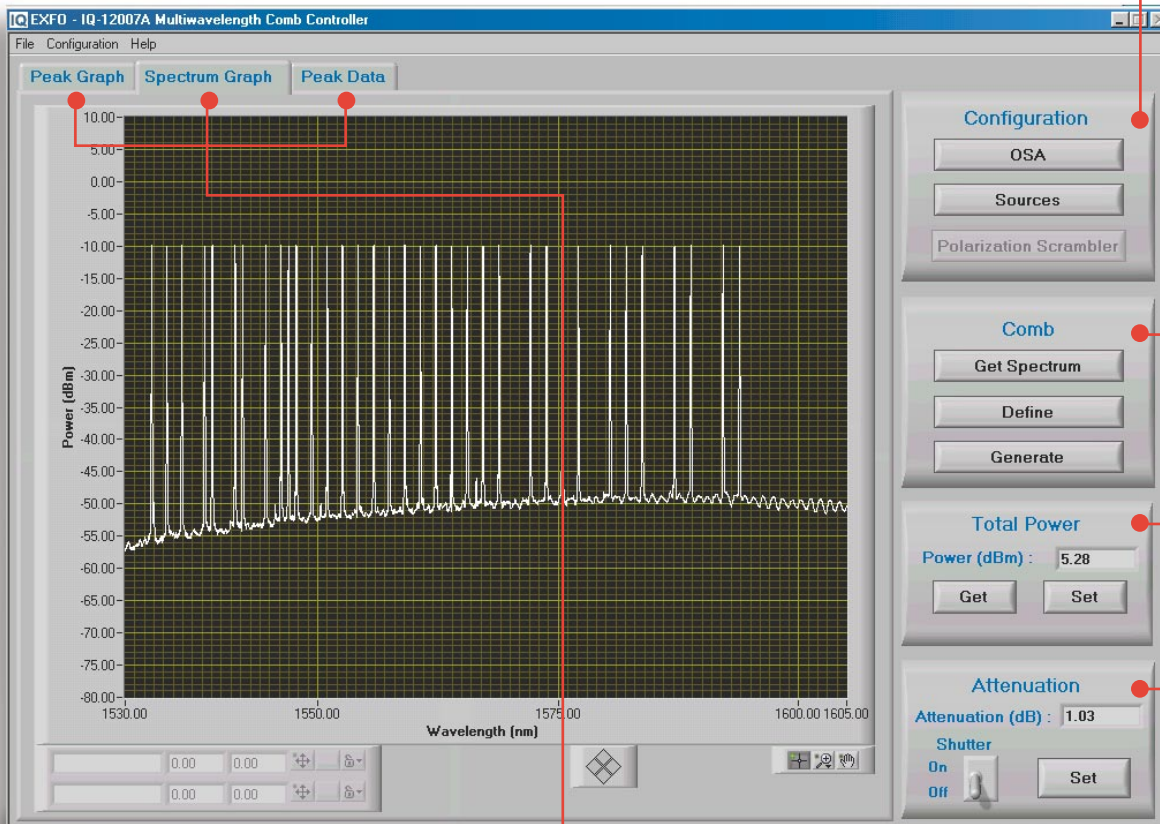
At controller start-up, all sources are activated and adjusted to their central wavelength and maximum power. These parameters can be modified at any time by,

- enabling/disabling one or more sources
- tuning the wavelength over ± 0.8 nm
- adjusting individual power level (internal attenuation of 10 dB available)

Use **All Source Functions** to reset sources to their maximum power, and to activate or deactivate them rapidly. View the location of each source module in the hardware setup via the **Sources** subsection.

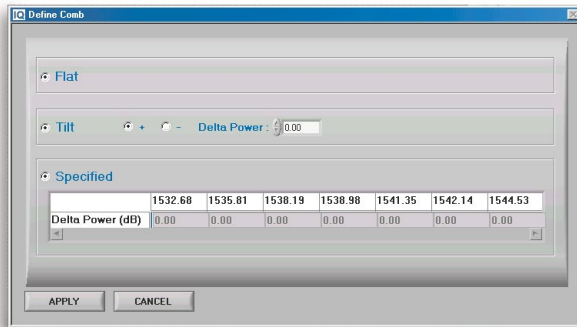
OSA

Reduce comb generation time by determining the wavelength range as well as the scan count. When configuring the OSA, set the detection threshold to correspond to the minimum power an event must have in order to be detected by the OSA module.



IQ-12007A LabVIEW® interface – Spectral graphical result

Comb Definition



Defining a comb

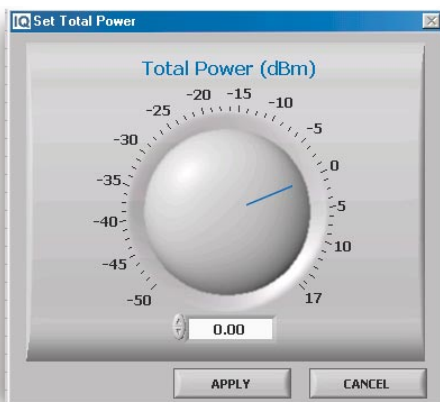
Simply select between **Flat**, **Tilt** or **Specified** comb options.

Flat: All channels are set to the same power at the comb generation point with a comb power uniformity of ± 0.18 dB.

Tilt: Determine the delta between the minimum and maximum power for the wavelength limits, as well as the desired slope. The controller can tolerate up to 6 dB of delta power.

Specified: Define the relative power needed at the comb generation point for specific channels.

Power Control



Adjusting the total power

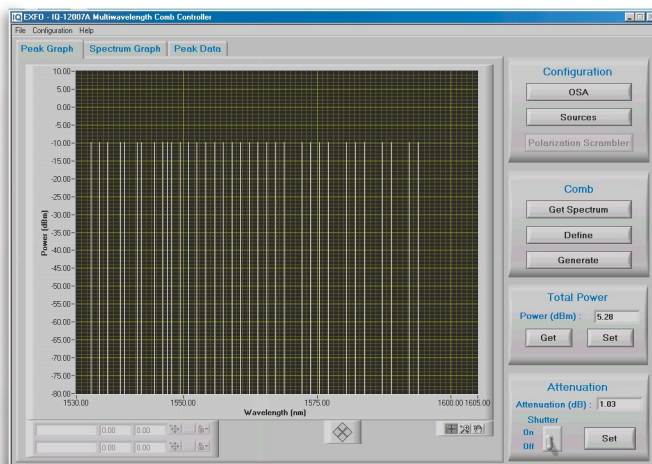
Selected combs can be generated in as little as 40 seconds for 32-channel systems. This versatile instrument can generate combs at different total power settings according to your needs. Simply set the total input power or the attenuation level.

After generating the first comb, set a new total input power (or attenuation level) and, under the **Comb** subsection, select the **Get Spectrum** option to rapidly visualize combs at other total power levels. Select **Generate** to obtain more accurate combs at other total power levels.

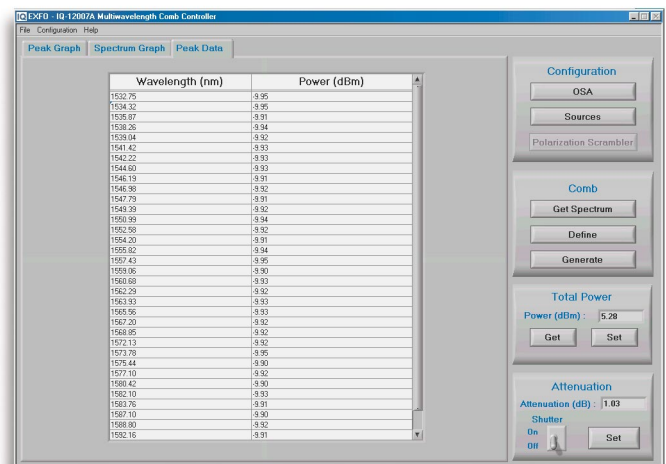
Measure the absolute total output power level of the comb generated, by selecting the **Get** option under in the **Total Power** subsection at any time.

Data Visualization

Comb results can be displayed as **Peak Graph**, **Spectrum Graph** and **Peak Data**. Graphical analysis tools are also available for a more detailed evaluation.



Peak graphical results



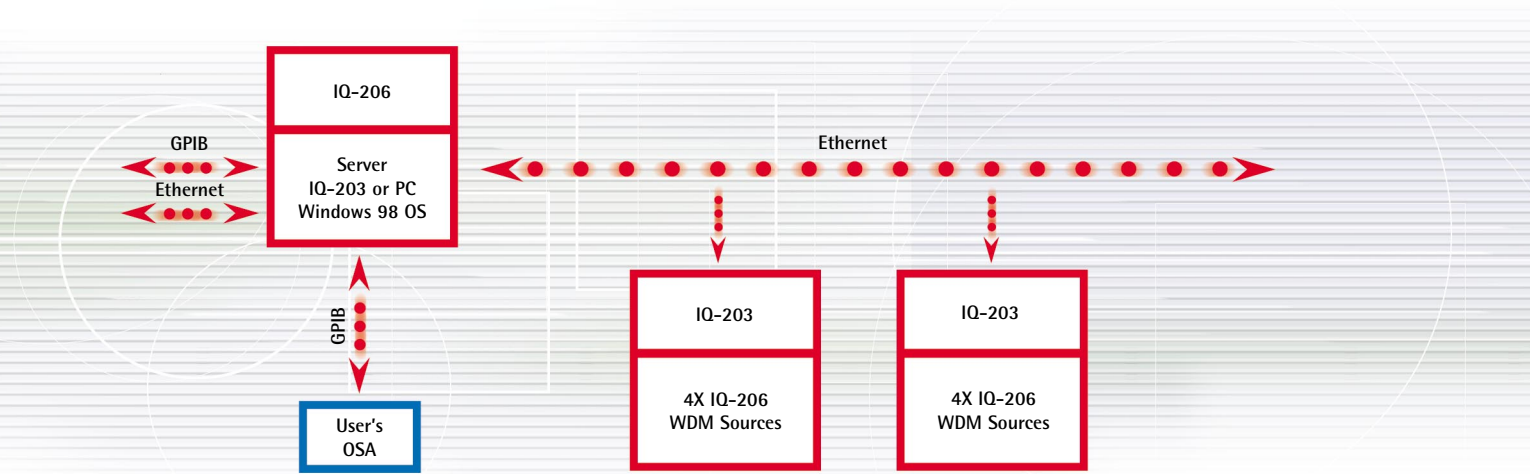
Tabulated test results

Applications

Applications using a WDM comb can vary from just a few wavelengths to as many as 160. These applications are mainly for testing EDFAs or a fiber link where amplifiers are lined up over long distances. Using an OSA at the output allows the measurement of many parameters including:

- Gain tilt
- Gain uniformity
- Sensitivity of gain to different states of polarization at saturating wavelengths
- Gain and noise figure, as well as ASE level according to wavelength
- Power flatness
- BER and eye-pattern test
- Measurement and reduction non-linear effects

Hardware and Connectivity Layout



All source modules and their platforms are linked via Ethernet and controlled via DCOM protocol. This allows distribution of sources remotely from the main PC or the IQ-203 housing the IQ-12007A software.

For remote control of the entire system, GPIB link and Ethernet connections are supported. User-provided OSA is remotely controlled via a GPIB link.

Specifications^{1, 2}

System

Wavelength range	1529 nm to 1605 nm
Wavelength uncertainty	± 0.05 nm
Total power ³	17 dBm to -50 dBm
Total power uncertainty ^{4, 5, 6}	± 7 % (0.29 dB / -0.32 dB)
Spectral uniformity uncertainty ⁶	± 4 % (0.17 dB / -0.18 dB)
Tilt comb range ⁷	± 3 dB
Comb generation time ⁸	< 40 s

Notes

1. Specified at 23 °C, ± 1 °C.
2. After a 1-hour warmup period.
3. With WDM coupling methods.
4. Guaranteed for -35 dBm to 17 dBm.
5. For a flat comb between 1530 nm and 1560 nm, with center wavelength at 1550 nm.
6. PDL not included.
7. Typical.
8. For 32-channel system.

General Specifications

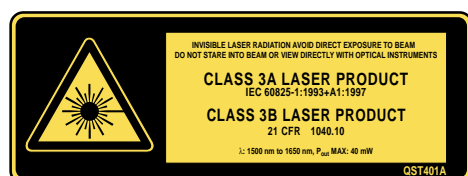
Temperature	Operating	10 °C to 40 °C	(50 °F to 104 °F)
	Storage	-20 °C to 60 °C	(-4 °F to 140 °F)
Relative humidity	0 % to 80 % non-condensing		

Standard Accessories

IQ-12007A software
Mainframe and/or expansion unit as required
Variable attenuator
GPIB device card
Network adapter card as required
Laser security Interface
Instruction manual

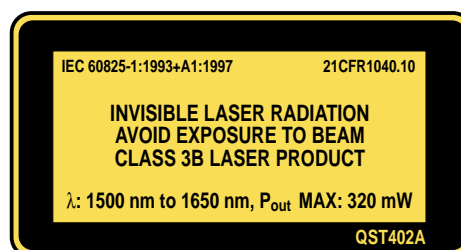
EXFO guarantees comb generation specifications on fully equipped systems.

Safety



21 CFR 1040.10
IEC 60825-1:1993+A1:1997

CLASS 3B LASER PRODUCT
CLASS 3A LASER PRODUCT



21 CFR 1040.10
IEC 60825-1:1993+A1:1997

CLASS 3B LASER PRODUCT
CLASS 3B LASER PRODUCT

Ordering Information

IQ-12007A-XX-XX-XX-XX-XX-XX-XX-XX

Controller Option

IQ = IQ-203
PC = PC with monitor

Number of Channels

008 to 160 (multiples of 8)

Coupler Option

C01 = 1-1X8 Broadband Coupler
C02 = 1-1X16 Broadband Coupler
C03 = 1-1X32 Broadband Coupler
C04 = 1-1X40 Broadband Coupler
M01 = 1-1X16 Multiplexer
M02 = 2-1X16 Multiplexers
M03 = 1-1X40 Multiplexer
M04 = 3-1X16 Multiplexers
M05 = 1-1X16 and 1-1X40 Multiplexers
M06 = 4-1X16 Multiplexers
M07 = 2-1X16 and 1-1X40 Multiplexers
M08 = 2-1X40 Multiplexers
M09 = 3-1X16 and 1-1X40 Multiplexers
M10 = 1-1X16 and 2-1X40 Multiplexers
M11 = 2-1X16 and 2-1X40 Multiplexers
M12 = 3-1X40 Multiplexers
M13 = 4-1X40 Multiplexers
M14 = 3-1X40 and 1-1X16 Multiplexers

Number of Additional Expansion Units

00 = None
61 = 1 additional IQ-206
62 = 2 additional IQ-206

Safety Cabinet Option

00 = None
S1 = 1-39U
S2 = 1-45U
S3 = 2-39U
S4 = 1-39U and 1-45U
S5 = 3-39U
S6 = 2-39U and 1-45U
S7 = 4-39U
S8 = 3-39U and 1-45U

OSA Option

EXT = External OSA Option
40 = IQ-5240
50 = IQ-5250

Power Meter Option

00 = None
P0 = IQ-1102X without IQ-9100
PS = IQ-1102X with IQ-9100

Polarization Option

00 = None
P1 = IQ-5100B
P2 = IQ-9734



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EXFO is certified ISO 9001 and attests to the quality of these products, which come with a 24-month warranty and after-sales support service. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. EXFO has made every effort to ensure that the information contained in this specification sheet is accurate. However, we accept no responsibility for any errors or omissions, and we reserve the right to modify design, characteristics and products at any time without obligation. Units of measurement in this document conform to SI standards and practices.

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