User Guide

IQS-12004B

DWDM Passive Component Test System

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Telecom Test and Measurement

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Units of Measurement

Units of measurement in this publication conform to SI standards and practices.

Version number 1.3.1.

Contents

Certification Information

F.C.C. Information

Electronic test equipment is exempt from Part 15 compliance (FCC) in the United States. However, compliance verification tests are systematically performed on most EXFO equipment.

CE Information

Electronic test equipment is subject to the EMC Directive in the European Union. The EN61326 standard prescribes both emission and immunity requirements for laboratory, measurement, and control equipment.
This unit has undergone extensive testing according to the European Union Directive and Standards.

IMPORTANT

Use of shielded remote I/O cables, with properly grounded shields and metal connectors, is recommended in order to reduce radio frequency interference that may emanate from these cables.

EXFO CE **DECLARATION OF CONFORMITY**

Application of Council Directive(s):	73/23/EEC - The Low Voltage Directive 89/336/EEC - The EMC Directive
Manufacturer's Name:	EXFO ELECTRO-OPTICAL ENG.
Manufacturer's Address:	400 Godin Avenue Quebec, Quebec Canada G1M 2K2 (418) 683-0211
Equipment Type/Environment:	Light Industrial Scientific Equipment
Trade Name/Model No.:	IQS-12004B DWDM Passive Components Test System
Year of Conformity Assessment:	2002

Standard(s) to which Conformity is Declared:

EN 61010-1:1993/ A2:1995	**Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements**
EN 60825-1:1994 / A2: 2001	**Safety of Laser products-Part 1: Equipment classification, requirement, and user's guide.**
EN 55022: 1998 / A2: 2003	**Limits and methods of measurement of radio disturbance characteristics of information technology equipment.**
EN 61326:1997 / A3:2003	**Electrical Equipment for Measurement, Conttrol and Laboratory Use - EMC Requirements**

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards.

Manufacturer

Signature:	Stephen Bull
Full Name:	Stephen Bull, E. Eng
Position:	Vice-President Research and Development
Address:	400 Godin Avenue Quebec, Quebec, Canada
Date:	March 11, 2002

DECLARATION OF CONFORMITY

Application of Council Directive(s):	73/23/EEC - The Low Voltage Directive 89/336/EEC - The EMC Directive
Manufacturer's Name:	EXFO ELECTRO-OPTICAL ENG.
Manufacturer's Address:	400 Godin Avenue Québec, Quebec Canada G1M 2K2 (418) 683-0211
Equipment Type/Environment:	Industrial Scientific Equipment
Trade Name/Model No.:	Polarization State Adjuster Module IQS-51X0B

Standard(s) to which Conformity is Declared:

EN 61010-1:1993/ A2: 1995	**Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.**
EN 55022: 1998 / A2: 2003	**Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.**
EN 61326:1997 / A3:2003	**Electrical Equipment for Measurement, Control, and Laboratory Use – EMC Requirements**

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Manufacturer's Name:	EXFO ELECTRO-OPTICAL ENG.
Manufacturer's Address:	400 Godin Avenue Quebec, Quebec Canada G1M 2K2 (418) 683-0211
Equipment Type/Environment:	Industrial Scientific Equipment
Trade Name/Model No.:	IQS-9401 Wavelength Reference Module
Year of Conformity Assessment:	2002

Standard(s) to which Conformity is Declared:

EN 61010-1:1993/ A2: 1995	**Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.**
EN 55022: 1998 / A2: 2003	**Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.**
EN 61326:1997 / A3:2003	**Electrical Equipment for Measurement, Control, and Laboratory Use – EMC Requirements**

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards.

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1 Introducing the IQS-12004B DWDM Passive Component Test System

The IQS-12004B DWDM Passive Component Test System, an automated test solution for component manufacturers and system integrators, consists of a series of IQS modular test and measurement instruments that are completely integrated by an off-the-shelf software application. This revolutionary system rapidly analyzes important parameters to help you improve your production efficiency and decrease your product time to market.

Characterization of multiplexers, demultiplexers, filters, and other passive components is a critical step in ensuring the optimum performance of a wavelength-division multiplexing (WDM) system.

The system performs DWDM component characterization and measures insertion loss, spectral uniformity, bandwidth, crosstalk, channel central wavelength, polarization dependence and optical return loss measurements on multiplexers, demultiplexers, filters, and other passive devices. These parameters must be controlled and tested throughout the entire life cycle of a component, from research and development through to production and even deployment.

The rapidity of the test procedure is achieved by scanning a very-low-noise tunable laser source (in this case the IQS-2600B or IQS-2600CT Tunable Laser Source) across the DUT's spectral band while power is measured simultaneously on all device ports. Due to the medium coherence and unmatched sidemode suppression of the IQS-2600B/IQS-2600CT, a dynamic range of nearly 60 dB is easily attained.

The standard configuration includes IL and ORL measurements. Adding the IQS-5150 PSA will enable you to perform PDL measurements.

Step-by-Step Approach

Guided by your selection parameters, the software based on Windows 2000 controls the test procedure from start to finish. This systematic approach eliminates the possibility of data entry and reporting errors, and avoids costly procedural mistakes. In addition, time-saving features such as Pass/Fail testing, filter masks and a part number database simplify the job of DWDM component characterization.

Test Features and Results

Each test step may be accessed either automatically or manually. Complete results are calculated at the end of the scan and are available both graphically and in a data table; values outside the defined test limits are highlighted. All data is saved to a database for archiving and future display or printing.

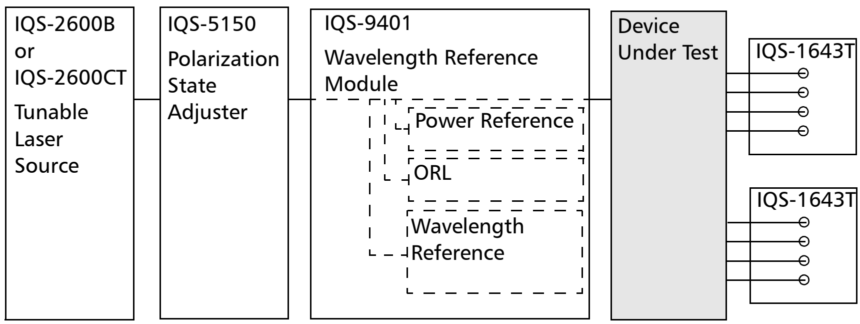
Create as many port types as you require. Once defined, they will be used to build a database of part numbers, enabling you to quickly reconfigure parameters simply by selecting the appropriate part number. The parameters in the port mask are used in the automatic Pass/Fail analysis.

Modularity and Flexibility

The system is built with the future in mind; the modular nature of the hardware and the flexibility of the software make it easy for you to upgrade or expand your test station. A single-channel system for measuring filters or gratings can be expanded to 32, 64, or more channels by simply adding the necessary plug-in modules. The system is also very compact: an entire 16-channel system, including PDL, will fit into a 4U (standard rackmount units) rackmount space.

System Overview

The IQS-12004B DWDM Passive Component Test System provides spectral insertion loss (IL), polarization-dependent loss (PDL), and optical return loss (ORL) measurements with high resolution and accuracy.



The DWDM Passive Component Test System sweeps a very-low-noise tunable laser source across the spectral band of interest (C-band or C+L-band). While the source is sweeping, synchronized measurements from the Wavelength Reference Module (WRM) and the measurement power meters are acquired into the system software. At the end of the sweep, advanced signal processing is applied to the data, resulting in accurate IL, PDL, and ORL data.

This configuration ensures quick testing time that is practically independent of the number of device ports (there is a nominal data transfer and analysis penalty per channel). Because of the low source spontaneous emissions (SSE) of the IQS-2600B/IQS-2600CT Tunable Laser Source, a dynamic range of 60 dB is easily attained. The wavelength reference module ensures wavelength and loss accuracy by providing a fast and continuous wavelength and power reference throughout the sweep.

The numerous software features are explained later in this user guide.

Testing Many Devices with the MultiPath Testing Option

With the MultiPath Testing Option, you will be able to use the standard IQS-12004B DWDM Passive Component Test System along with an optical switch to perform tests on one or many DUTs with a variable number of In ports and Out ports.The MultiPath Testing Option provides:

➤ A LabVIEW application that can be either used as is to perform references, calibrations and tests, or can be tailored to your needs.

➤ COM objects offering all the necessary properties and methods to build your own multipath software.

The MultiPath Testing Option can be used for:

➤ Environmental testing of DWDM passive components.

➤ Testing arrayed components like variable optical attenuators (VOAs).

➤ Testing multiplexers (IL, ORL, PDL, directivity).

➤ Testing optical cross-connections (OXC) and other switches.

Hardware Components Description

Module	Usage
IQS-510P Controller Unit	Controls the measurement process as well as data interpretation and storage. The controller unit is supplied with the necessary equipment for connection to a local area network (LAN). For more information, refer to the *IQS-500 Intelligent Test System* user guide.
IQS-510E Expansion Units	Houses the instruments required by the system. If necessary, a maximum of nine expansion units may be connected to the controller unit. For more information, refer to the *IQS-500 Intelligent Test System* user guide.
IQS-2600B or IQS-2600CT Tunable Laser Source	For more information, refer to the *IQ-2600* user guide or *IQS-2600B Tunable Laser Source* user guide.
IQS-1643 Power Meter	Allows DWDM filters and multiplexers characterization. For more information, refer to the *IQS-1600 High-Speed Power Meter* user guide.
IQS-5150 Polarization State Adjuster (optional)	Allows PDL measurements.
GPIB-controlled switch (optional)	Allows to use the MultiPath Testing Option to perform tests on one or many DUTs with a variable number of In ports and Out ports.

Tunable Laser Source

EXFO has modified its IQS-2600B Tunable Laser Source in order to integrate it into the IQS-12004B DWDM Passive Component Test System. To optimize the performance of the system, the optical attenuator which ensures a constant power output from the tunable laser source has been removed.

You can easily identify which tunable laser source you have. The unit designed for the DWDM Passive Component Test System bears the mention *2600CT*, while the standalone unit bears the mention 2600*B*.

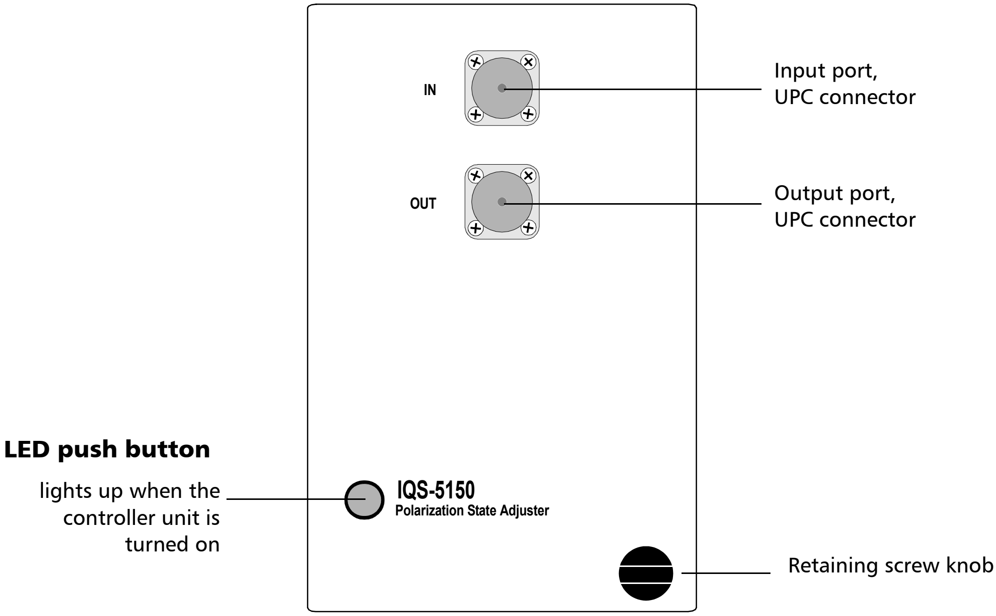
Every customer purchasing the IQS-12004B DWDM Passive Component Test System for applications covering both the C- and L-bands will receive an IQS-2600CT model. Even though the tunable laser source has been modified, it can still be used as a standalone instrument using an IQS-500 Intelligent Test System.

However, you will notice a warning message when turning the instrument on. This warning informs you that the automatic level control (ALC) is disabled. Also note that the power stability and repeatability values presented in the IQS-2600B specification sheet do not apply to the IQS-2600CT.

Any other functionality or specification, particularly those concerning the accuracy of the instrument and wavelength stability, will not be affected by this design change.

Module Description

This section describes the IQS-9401 Wavelength Reference Module and the IQS-5150 Polarization State Adjuster. For a description of the other modules used in the DWDM Passive Component Test System, refer to the modules' user guides.



IMPORTANT

In order to keep the optical ports clean, the protective caps should always be installed when the module is not being used.

Testing Procedure

The IQS-12004B DWDM Passive Component Test System prompts the operator to perform a series of steps, after which it controls the different IQS modules to perform measurements on a device under test (DUT).

The testing procedure used by the system is outlined below.

➤ You can configure different test parameters in the *Setup* step.

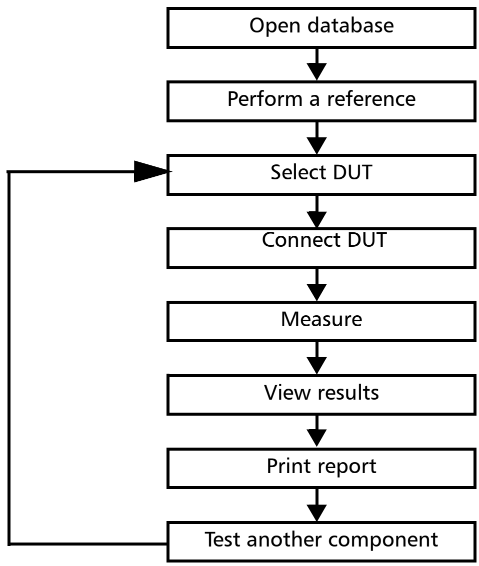
➤ *System calibration* is performed the first time the system is used. It can also be performed as needed. Calibration comprises three elements: detector null measurement of power meters and the WRM, wavelength response calibration, and return loss calibration.

➤ *IL/PDL and ORL reference* measurements are required each time the system is turned on and are recommended whenever there is a significant change in environmental conditions.

➤ The *measurement scan(s)* is performed. The insertion loss (IL) measurement requires one scan, the IL/PDL measurement requires four scans, and the ORL measurement requires one scan.

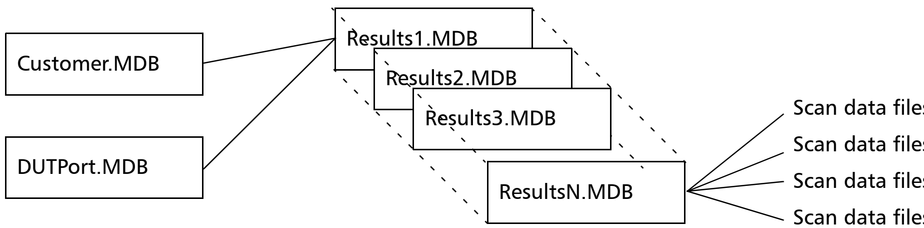
➤ At the end of the scan(s), the results are calculated and analyzed. You can *view the results and print reports* as required.

Once a supervisor has configured the IQS-12004B DWDM Passive Component Test System, a typical test sequence would be similar to the flow chart shown below.



Database Structure

The IQS-12004B DWDM Passive Component Test System uses several different databases for storing test results and configuration information. You have full control over the results database file name and location. The database structure is organized as shown below.



To save test results for later analysis, the IQS-12004B DWDM Passive Component Test System uses three databases:

- *Customer.MDB*: This database contains information about your customers. It is managed internally by the system.
- *DUTPort.MDB*: This database contains Pass/Fail information about the devices that you want to test. It is managed internally by the system.
- *ResultsN.MDB*: This database contains test results. You can create as many files as you want. For example, it might be practical to have different files for different customers, components, or test sessions. Basically, the system has built-in flexibility to let you choose the best way of saving test results.

The IQS-12004B DWDM Passive Component Test System also uses *scan data files.* These files are the test results data files containing the IL vs. λ, PDL vs. λ, and ORL vs. λ data. These files are created and managed by the DWDM Passive Component Test System. They are saved only if *Save Results Curves* is selected in the **System Settings** window.

When you create a new database in the system, you are creating only a new ResultsN database. The customer and DUT information that you previously entered in the first two databases (Customer and DUTPort) will be available for the new ResultsN database.

If you need information or details about the database structure, please contact EXFO (see *Contacting the Technical Support Group* on page 223).

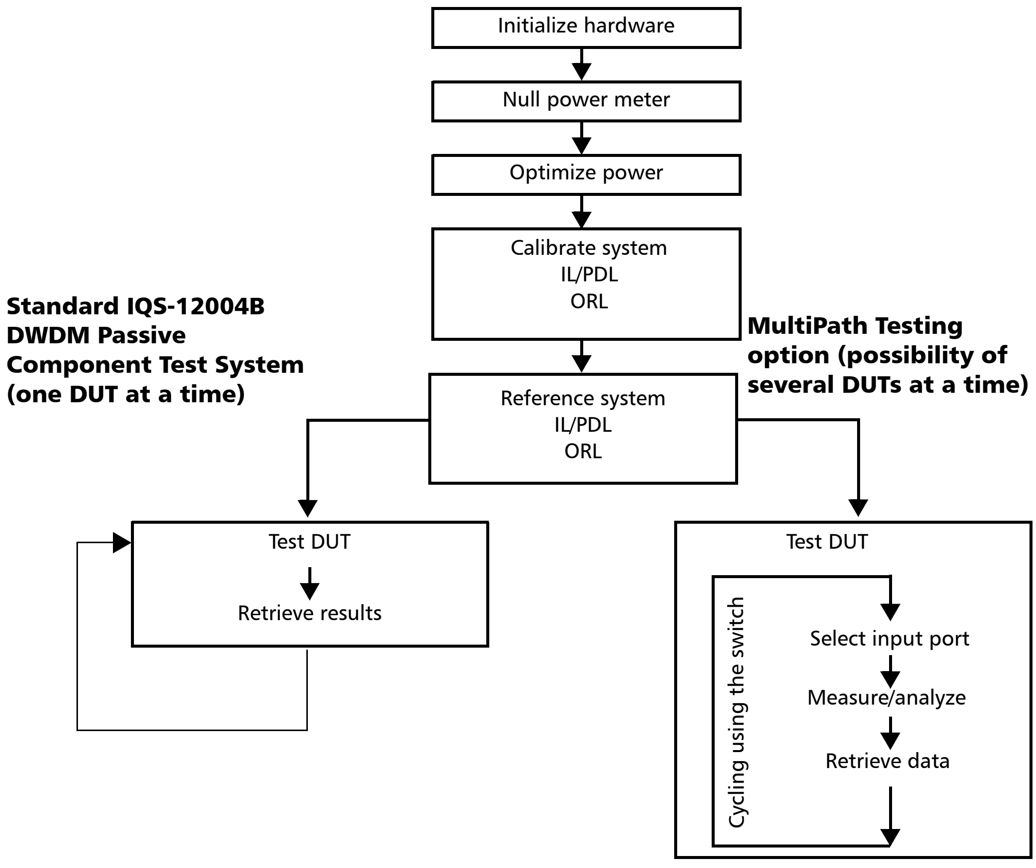
Using GPIB or COM to Control the System

The IQS-12004B DWDM Passive Component Test System gives you the opportunity to develop your own applications using either SCPI commands (GPIB control) or COM objects.

The MultiPath Testing Option allows you to develop your tailored applications using COM objects.

In order to be able to take IL, ORL, and PDL measurements with the standard DWDM Passive Component Test System or the MultiPath Testing Option, there are a number of required steps and procedures to follow.

A typical test sequence would be similar to the flow chart below.



Each time a new test sequence is started, the above steps are required or highly recommended. In some cases, the system will generate error messages where the prerequisite steps have not been performed.

Conventions

Before using the product described in this manual, you should understand the following conventions:

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in *death or serious injury*. Do not proceed unless you understand and meet the required conditions.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in *minor or moderate injury*. Do not proceed unless you understand and meet the required conditions.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in *component damage*. Do not proceed unless you understand and meet the required conditions.

IMPORTANT

Refers to information about this product you should not overlook.

2 Safety Information

Laser Safety Information

WARNING

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

WARNING

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

Safety Information

Your instrument is a Class 1 laser product in compliance with standards IEC 60825-1 Amendment 2: 2001 and 21 CFR 1040.10. Laser radiation may be encountered at the output port.

The following label indicates that a product contains a Class 1 source:

Note: *Label shown for information purposes only. It is not affixed to your product.*

The DWDM Passive Component Test System may be equipped with the IQS-2600B or the IQS-2600CT tunable laser sources. For more information on these modules, refer to the IQS-2600B Tunable Laser Source user guide.

3 Getting Started with Your DWDM Passive Component Test System

This chapter contains a description of hardware components and modules used in the system, information on how to install hardware components and how to install and start the IQS-12004B DWDM Passive Component Test System software. You will also find a description of the utility to organize test files as well as a description of the application main window.

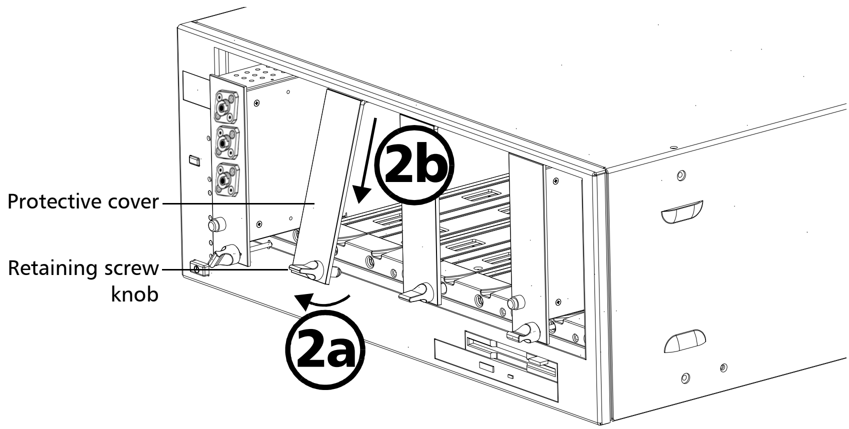
Inserting and Removing Test Modules

CAUTION

Never insert or remove a module while the controller unit and its expansion units are turned on. This will result in immediate and irreparable damage to both the module and unit.

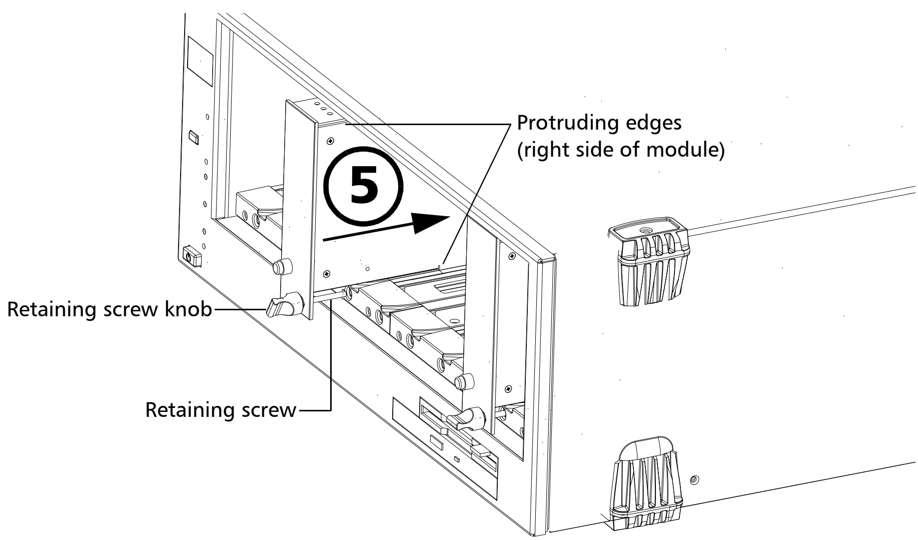
To insert a module into the controller or expansion unit:

1. Exit IQS Manager and turn off all your units.
2. Remove the protective cover from the desired unused module slot.
   - **2a.** Pull the retaining screw knob firmly towards you and release the bottom of the cover.
   - **2b.** Gently pull the top of the protective cover downwards, to remove it from the unit grooves.

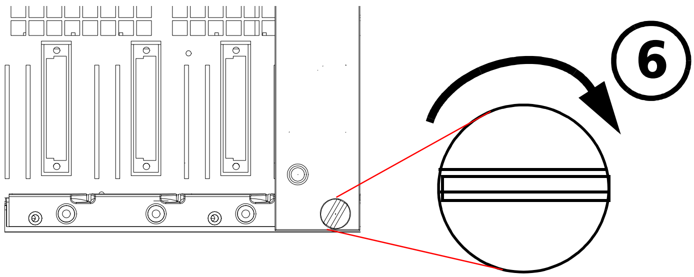


3. Position the module so that its front panel is facing you and the top and bottom protruding edges are to your right.

4. Insert the protruding edges of the module into the grooves of the unit's module slot.



5. Push the module all the way to the back of the slot, until the retaining screw makes contact with the unit casing.
6. While applying slight pressure to the module, turn the retaining screw knob (located at the bottom of the panel) clockwise until the knob is horizontal. This will secure the module into its "seated" position.



The module is correctly inserted when its front panel is flush with the front panel of the controller or expansion unit.

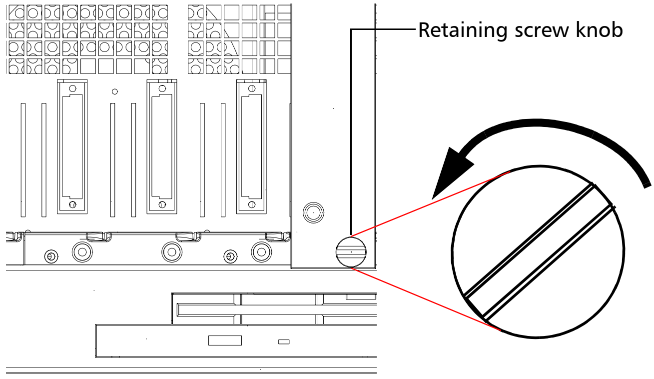
When you turn on the controller unit, the startup sequence will automatically detect your module.

Note: *You can insert IQ modules into your controller or expansion unit; the IQS Manager software will recognize them. However, the IQS-500 locking mechanism (retaining screw) will not work for IQ modules.*

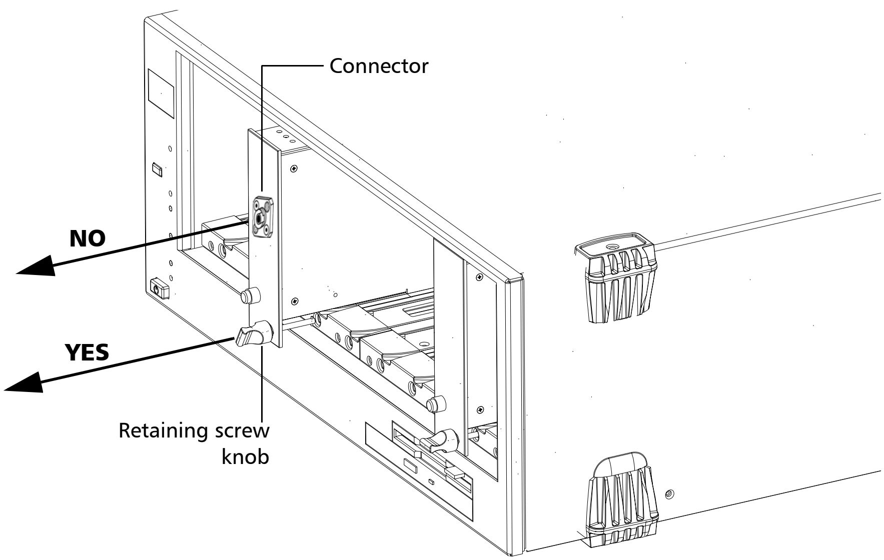
To remove a module from your controller or expansion unit:

1. While pulling gently on the knob, turn it counterclockwise until it stops.

   The module will slowly be released from the slot.



2. Place your fingers underneath the module or hold it by the retaining screw knob *(NOT by the connector)* and pull it out.



CAUTION

Pulling out a module by a connector could seriously damage both the module and connector. Always pull out a module by the retaining screw knob.

3. Cover empty slots with the supplied protective covers. Simply slide the top of the protective cover into the upper grooves of the unit, and then snap into place by pushing the retaining screw knob.

CAUTION

Failure to reinstall protective covers over empty slots will result in ventilation problems.

Installing Hardware Components

The DWDM Passive Component Test System has been configured and tested at the factory, under normal conditions, and installed by an EXFO authorized installation engineer. The following information is provided in the event that it is necessary to move, transport, or reinstall the system.

Controller and Expansion Units

Please refer to the *IQS-500 Intelligent Test System* user guide for detailed information about installing and connecting the controller and expansion unit(s).

Source, Wavelength Reference, and PSA

The source (IQS-2600B or IQS-2600CT), the wavelength reference module (IQS-9401), and the optional polarization state adjuster (IQS-5150) must be installed in the same expansion unit and in a specific order.

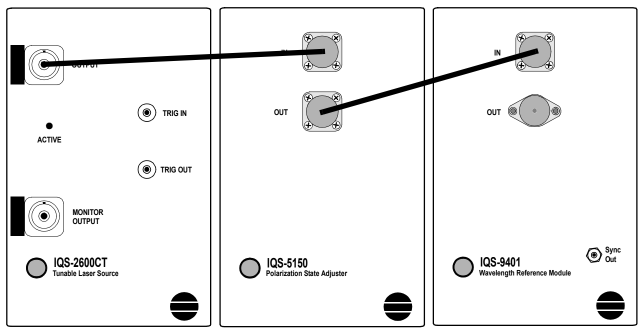
The recommended configurations are presented hereafter.

CAUTION

Never insert or remove a module while the controller or expansion unit is turned on. This will result in immediate and irreparable damage to both the module and unit.

Configuration with PDL

Connect the tunable output of the IQS-2600B/IQS-2600CT to the input of the IQS-5150 using the rigid patchcord supplied with the IQS-2600B/IQS-2600CT. Connect the output of the IQS-5150 to the input of the IQS-9401, as illustrated below.

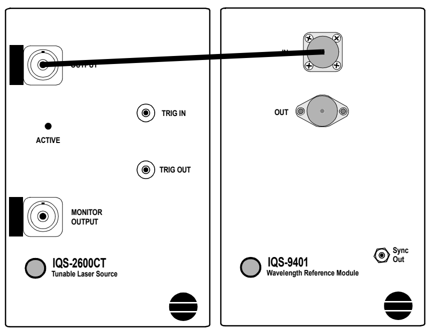


Connect the launch fiber to the output of the IQS-9401.

Note: *The IQS-9401 has an angled (APC) output connector.*

Configuration without PDL

Connect the tunable output of the IQS-2600B/IQS-2600CT to the input of the IQS-9401 using the rigid patchcord supplied with the tunable source, as illustrated below.

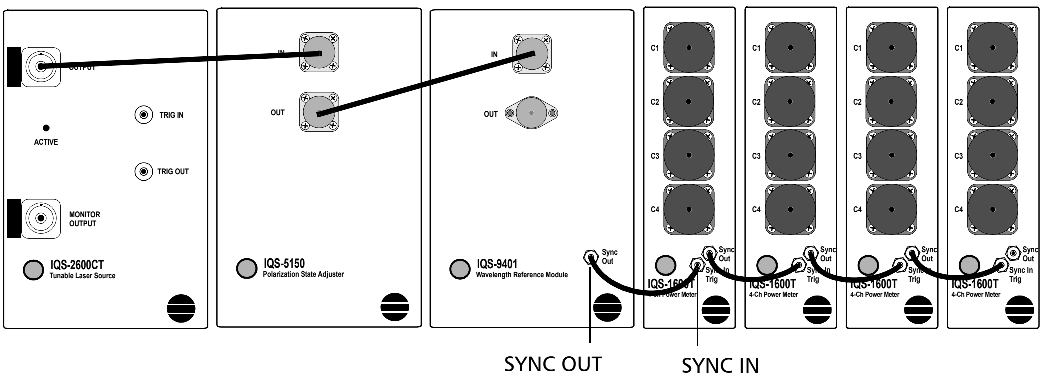


Connect the launch fiber to the output of the IQS-9401.

Note: *The IQS-9401 has an angled (APC) output connector.*

Configuration of Power Meters

The IQS-1643T power meters must be installed sequentially in the unit. Use the short synchronization cables to connect power meters in the same unit, and the long synchronization cables to connect power meters in different units. It is also necessary to install a synchronization cable between the IQS-9401 and the first power meter, as illustrated below.



> **IMPORTANT**
>
> **The power meters must be correctly installed and configured before starting IQS Manager or before turning the unit on. If modules need to be repositioned, you will have to restart the system.**

> **IMPORTANT**
>
> **To keep the optical ports clean, ensure that protective caps are always installed when the module is not being used.**

To work with the MultiPath Testing Option, you will have to add a switch to your standard IQS-12004B DWDM Passive Component Test System to benefit from its inherent features.

CAUTION

Never insert or remove a module while the controller or expansion unit is turned on. This will result in immediate and irreparable damage to both the module and unit.

The minimum hardware components required for multipath testing are:

- Tunable laser source (IQS-2600B or IQS-2600CT).
- Wavelength reference module (IQS-9401).
- Power meter (IQS-1643T), one or more.
- Switch (either the IQS-9100, or a GPIB-controlled switch. Check with EXFO to see if a specific model is supported.).

Regardless of whether you will be using an EXFO switch or any of the supported switches, the connection of the switch in the system will remain the same.

The switch has to be connected to the Wavelength Reference Module () and to the power meters. Use the supplied to link the Out port of the WRM to the common port of the switch. Connect the DUT(s) between the power meter and the switch.

To work in high-power mode, you will have to add a switch and an EDFA to your standard IQS-12004B DWDM Passive Component Test System.

IMPORTANT

In order to be able to control the EDFA, the GPIB address of the EDFA must be *smaller* than the GPIB address used for the switch.

CAUTION

Never insert or remove a module while the controller or expansion unit is turned on. This will result in immediate and irreparable damage to both the module and unit.

The minimum hardware components required for multipath testing in high mode are:

- Tunable laser source (IQS-2600B or IQS-2600CT).
- Wavelength reference module (IQS-9401).
- Power meter (IQS-1643T), one or more.
- The KPS-AMP-C-20 fiber amplifier (EDFA).
- A high-power GPIB-controlled switch.

Installing the IQS-12004B DWDM Passive Component Test System Software

For the DWDM Passive Component Test System to function properly, the IQS Manager software must be installed on your IQS-500 Intelligent Test System.

Normally, you wouldn't have to install the IQS Manager software or the DWDM Passive Component Test System software, except in particular circumstances (such as after having reinstalled Microsoft Windows).

For information on installing IQS Manager software, refer to the IQS-500 Intelligent Test System user guide.

To install the DWDM Passive Component Test System on an IQS-500 controller unit:

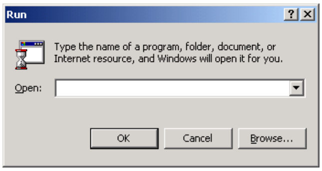
1. Insert CD of the *DWDM Passive Component Test System* in the CD-ROM drive.
2. Select **Run** from the Windows **Start** menu.
3. Type *F:\ setup.exe* in the **Open** text field.
4. Click **OK** to start the wizard and follow the on-screen instructions.

Installing the MultiPath Testing Option Software

Before installing the MultiPath Testing Option software, ensure that the IQS-12004B DWDM Passive Component Test System software has been installed on the IQS-500 controller unit. For more information, see *Installing the IQS-12004B DWDM Passive Component Test System Software* on page 28.

To install the MultiPath Testing software on an IQS-500 controller unit:

1. Insert the *MultiPath Testing software* CD-ROM in the drive.
2. Select **Run** from the Windows **Start** menu. The **Run** window appears.

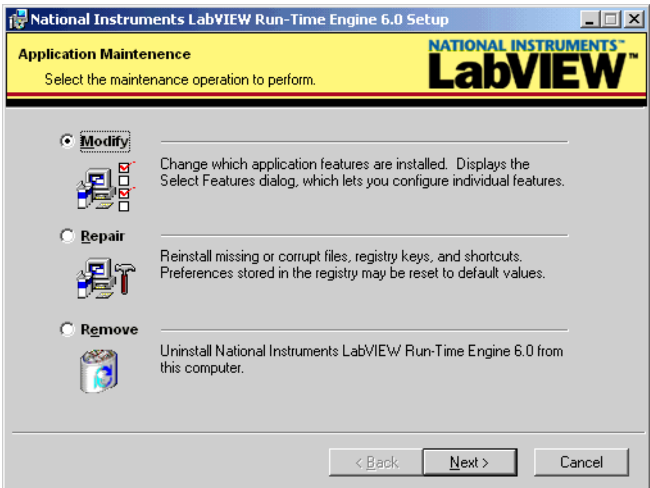


3. Use the **Browse** button to find the *setup.exe* file on the CD-ROM.
4. Click **OK** to start the installation.

EXFO recommends that you keep the default names and paths suggested by the setup program.

Follow the on-screen instructions. Once the LabVIEW demo is installed, the installation of the files required to run LabVIEW will begin.

If the following dialog box appears, that means that LabVIEW has been installed in a previous session.



If this is the case, choose **Modify**, click **Next** and follow the on-screen instructions.

IMPORTANT

Selecting an option other than Modify may prevent the *MultiPath Testing Option* software from working properly.

For information on how to use the MultiPath Testing Option application, see *Testing Multiple DUTs with the LabVIEW Application* on page 117.

Starting and Exiting the DWDM Passive Component Test System Application

To start the DWDM Passive Component Test System application:

➤ On the Windows taskbar, click **Start**, select **Programs** > **EXFO** > ***IQS-12004B*** > ***IQS-12004B DWDM Test System***.

OR

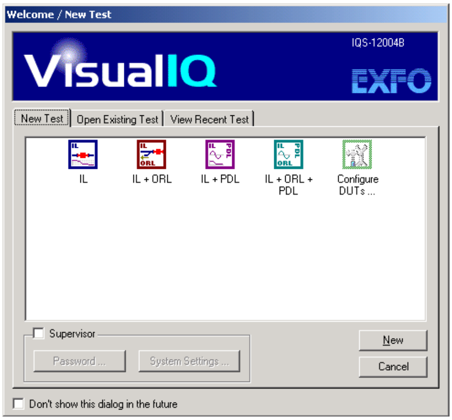
➤ Double-click the *IQS-12004B DWDM Test System* desktop icon.

To exit the DWDM Passive Component Test System application:

Select **Exit** from the **File** menu.

At the starting of the application, a message may appear, indicating that the regional settings of your system were temporary changed. This change consists in using a period for the decimal symbol and using the YYYY-MM-DD date style.

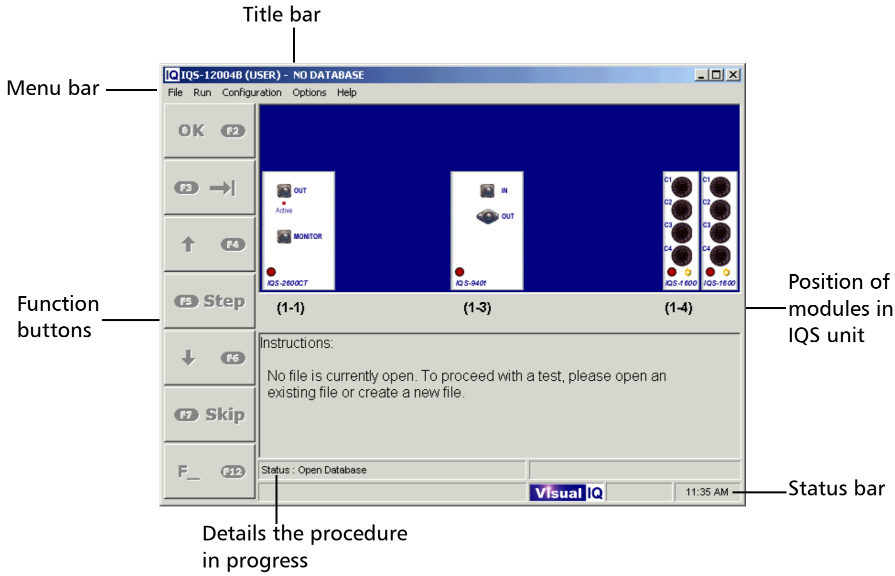
By default, the **Welcome/New Test** window appears first when you start the DWDM Passive Component Test System (see *Opening a New Test Database* on page 61).



The **Welcome/New Test** window gives you the possibility to open a new test database, to open an existing test database, or to view the content of recent test databases.

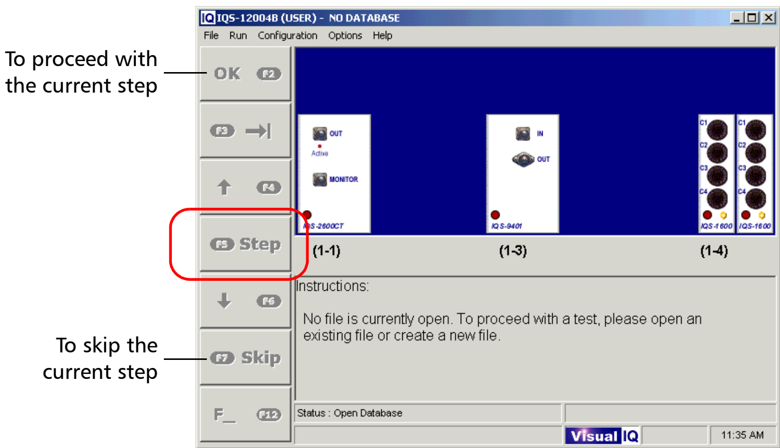
Clicking **Cancel** takes you to the application main window, as shown on the figure below.

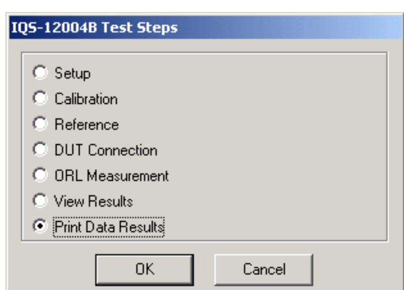
The DWDM Passive Component Test System main window is the central location from where you access all functionalities.



Accessing a Specific Test Step

During the step-by-step procedure, it is possible to access the **Test Steps** dialog box to manually go to a specific step via the **Step** button from the main window.





Starting and Exiting the MultiPath Testing Option Application

You may want to use the provided LabVIEW application to work with the MultiPath Testing option .

To start the LabVIEW application:

➤ On the Windows taskbar, click **Start**, select **Programs** > **EXFO** > **IQS-12004B** > **IQS-12004B Multi Path DWDM Test System**.

OR

➤ Double-click the **IQS-12004B MPT** desktop icon.

The application main window is displayed.

To close the application, select **Exit** from the **File** menu.

4 Setting Up the DWDM Passive Component Test System

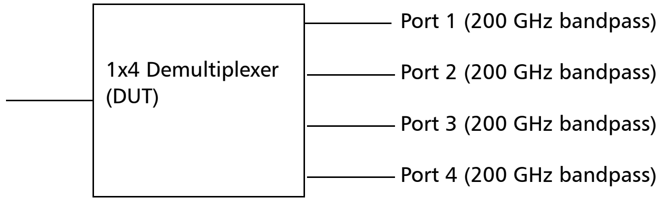
The DWDM Passive Component Test System has been designed to let you define DUTs and optical ports that can be used for future tests.

Configuring DUT Parameters for Pass/Fail Analysis

Note: *You must be working at the Supervisor level to access this window.*

The **DUT Configuration** window allows you to define specific parameters for the optical ports and DUTs you will be testing. Information entered in this window is used to construct and maintain two internal lists: one for port types and one for DUTs. These two lists provide an efficient way of identifying the Pass/Fail limits for all your commonly tested components.

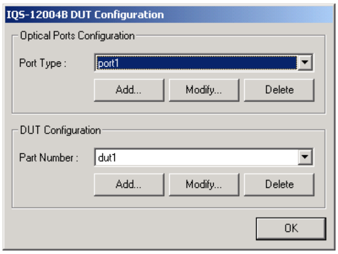
The relationship between optical ports and DUTs is illustrated below. In this example, the DUT is a four-channel device with one common port and four output ports.



To identify the Pass/Fail criteria for this type of component, you must define the different parameters (IL, PDL, BW, etc.) for each port. In most cases, the characteristics for all ports will be identical, except for the wavelength.

The most efficient way of describing the above device would be to create a port (200 GHz bandpass) and define all its Pass/Fail criteria. When you define the DUT, you simply have to select a port type for each output and assign a wavelength to the port mask. This *200 GHz bandpass* port will also be used for defining other devices. There is no practical limit to the number of different ports or DUTs that can be defined.

This window can be accessed via the **Configure DUTs** icon from the **Welcome/New Test** window. For information on how to display this window, see *Opening a New Test Database* on page 61.



➤ **Optical Ports Configuration**: This section contains the list of all configured ports. You can add new ports (click **Add**), modify the port indicated in the **Port Type** list box (click **Modify**), or delete an existing optical port (click **Delete**).

  For information about the configuration of an optical port type, see *Configuring an Optical Port* on page 39.

➤ **DUT Configuration**: This section allows you to configure DUTs based on the optical port types. You can add new DUTs (click **Add**), modify the DUT indicated in the **Part Number** list box (click **Modify**), or delete an existing DUT (click **Delete**).

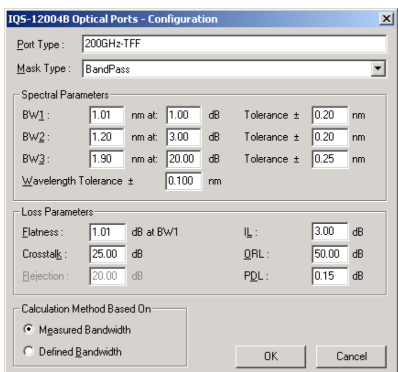
  For information about the configuration of a DUT, see *Configuring a DUT* on page 42.

Configuring an Optical Port

Note: *You must be working at the Supervisor level to access this window.*

This window can be accessed via the **Configure DUTs** icon from the **Welcome/New Test** window. For information on how to display this window, see *Opening a New Test Database* on page 61.

When you click **Add** or **Modify** in the **Optical Ports Configuration** section, the following window appears where you can enter or modify port information. For details about the parameters contained in this window, see *Definitions and Calculation Methods* on page 405.



Note: *Some parameters can be disabled (grayed out) when you select a certain mask type.*

➤ **Port Type**: Use this text box to give a unique name to the optical port defined.

➤ **Mask Type**: This list box allows you to select one of two different mask types (bandpass and notch).

The **Spectral Parameters** section is used to specify the limits or the acceptable values that will determine the Pass/Fail result of the tests.

➤ **BW1**, **BW2**, and **BW3**: These text boxes allow you to specify the relative power levels (in dB) at which bandwidth is tested, and the acceptable bandwidth (in nm). Note that only BW2 and BW3 are tested when the **Defined Bandwidth** calculation method is selected.

➤ **BWx Tolerance**: These text boxes allow you to specify the tolerance interval for the bandwidth test. For a DUT to pass this test, the measured BWx value must fall within BWx ±BWx tolerance.

➤ **Wavelength Tolerance**: This text box is used to enter the central wavelength tolerance of the specified port. This test is not performed when the **Defined Bandwidth** calculation method is selected.

The **Loss Parameters** section is used to specify the flatness, crosstalk, rejection as well as the IL, ORL and PDL values.

➤ **Flatness**: This text box is used to enter the acceptable flatness (in dB) of the curve in the measured BW1 interval.

➤ **Crosstalk**: This text box allows you to enter the acceptable channel crosstalk (in dB) for the DUT. This option is disabled (grayed out) when the notch mask type is selected.

➤ **Rejection**: This text box allows you to enter the acceptable rejection level (in dB) for the DUT. This option is disabled (grayed out) when the bandpass mask type is selected.

➤ **IL**: This field allows you to specify the acceptable insertion loss value (dB).

➤ **ORL**: This field allows you to specify the ORL limit value (dB).

➤ **PDL**: This field allows you to specify the PDL limit value (dB).

The **Calculation Method Based On** section is used to select which method will be used to calculate some of the different test results. For details about these methods, see *Definitions and Calculation Methods* on page 405.

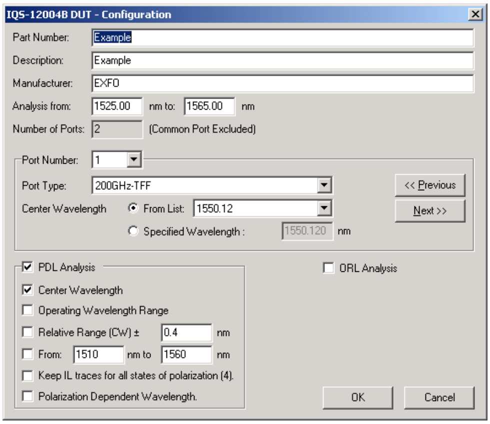
- **Measured Bandwidth**: This option allows BW1 to be determined from the measured data.
- **Defined Bandwidth**: This option allows you to define BW1 yourself. When selecting defined bandwidth, you will enter the defined bandwidth in the BW1 box. During the data analysis, the software will use the CW ±BW1/2 as the analysis range for IL, crosstalk, ripple, etc.

Configuring a DUT

Note: *You must be working at the Supervisor level to access this window.*

This window can be accessed via the **Configure DUTs** icon from the **Welcome**/**New Test** window. For information on how to display this window, see *Opening a New Test Database* on page 61.

Once the optical ports are correctly defined, you can configure DUTs based on these ports. When clicking **Add** or **Modify** in the **DUT Configuration** section, the following window appears where you can enter or modify information about the DUT.



In the upper section of the **DUT Configuration** window, you enter identification and test parameters. These parameters will automatically be selected when performing a scan on a defined device.

Note: *Once a device has been created, the **Number of Ports** cannot be modified.*

- **Part Number**: the part number for the DUT.
- **Description**: a short description of the DUT.
- **Manufacturer**: the name of the manufacturer.

- **Analysis from X nm to Y nm**: the default range of the analysis. The analysis limits can be modified later in the **IQS-12004B Setup** window.
- **Number of Ports**: the number of ports, excluding the common port.
- **Port Number**: In this list box, you select the port for which you will configure the type and central wavelength. You can also use the **Previous** and **Next** buttons to move from one port to another.
- **Port Type**: In this list box, you select the type of port from the list of available ports that you configured previously. Usually for a device, all ports are of the same type, but this is not always the case; and the software allows you to configure devices with different port types. For more information, see *Configuring an Optical Port* on page 39.
- **Center Wavelength**: You can specify a wavelength yourself (using the **Specified Wavelength** option button), or select one of the ITU wavelengths from the list (using the **From List** option button). The ITU wavelength values correspond to the list defined in the **Channel List** dialog. For more information, see *Customizing the Channel List* on page 46.
- **ORL Analysis**: Select this option to perform an ORL analysis.
- The **PDL Analysis** section allows you to select options for PDL testing.
  - If you intend to export detailed IL results, check the **Keep IL traces for all states of polarization (4)** box.
  - If you need to get the results from the polarization-dependent wavelength analysis, check the **Polarization Dependent Wavelength** box.

Note: *These two options can also be selected when you set the test parameters. For more information, see* Preparing the Test Setup *on page 49. If you omit to check the boxes, you won't be able to export the corresponding traces. For more information on exporting, see* Exporting Data *on page 94.*

- **Center Wavelength**: The PDL value is taken at the central wavelength for each port.

➤ **Operating Wavelength Range**: The highest PDL value in the BW1 range is taken.

➤ **Relative Range (CW)±X nm**: allows you to indicate the highest PDL value in the relative range ± *X* nm.

➤ **From X nm to Y nm**: allows you to indicate the highest PDL value between *X* nm and *Y* nm.

Click **OK** to add the DUT to the list of available components to test.

Configuring DUT Company/Customer Parameters

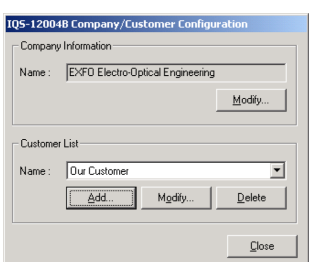
Note: *You must be working at the Supervisor level to access this window.*

The **Company/Customer Configuration** window contains identification and system information including the name of the company (organization performing the tests) and the customer (organization for which the tests are performed).

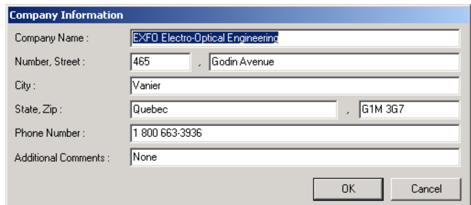
All this information is saved in a database and is useful for documentation and traceability purposes.

To access the Company/Customer Configuration window:

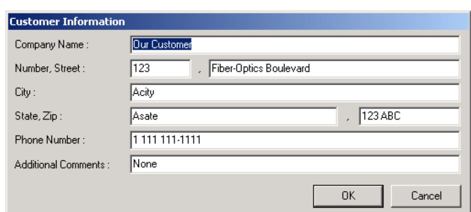
From the **Configuration** menu, select **Company/Customer Configuration**.



- **Company Information**: This section indicates the name of the company performing the tests. You can modify the information by clicking **Modify**.



- **Customer List**: This section allows you to enter data about the different customers. You can add new customers to the database (click **Add**), modify a customer indicated in the list box (click **Modify**), or delete an existing customer (click **Delete**). When clicking **Add** or **Modify**, the following window appears where you can enter or modify customer information.



Customizing the Channel List

Note: *You must be working at the Supervisor level to use this feature.*

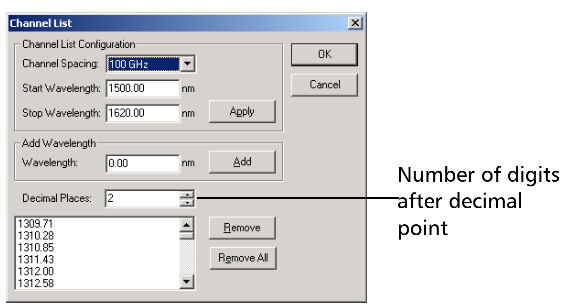
This feature allows you to view and customize the channel list, which contains predefined ITU wavelengths. New wavelengths can also be added to this list. The DWDM Passive Component Test System displays the channel list when a choice of wavelength is required.

The number of digits displayed after the decimal point can be changed to better suit your needs.

You can access the Channel List window by selecting **Channel List** from the **Options** menu.

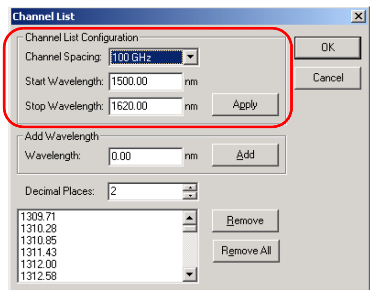
To modify the number of digits displayed after the decimal point:

Use the **Decimal Places** box to set the desired value.



To modify the ITU channel list display:

1. In the **Channel Spacing** box, select the space value (in GHz) between the channels of the DUT.

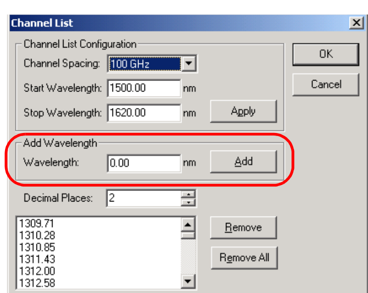


2. In the **Start Wavelength** and **End Wavelength** boxes, enter the values that will determine the wavelength range that will be displayed on the list.

3. Confirm your changes with **Apply**.

To add a new wavelength to the list:

1. Enter the new wavelength in the **Wavelength** text box. The number of decimals depends on the value set in the **Decimal Places** box.



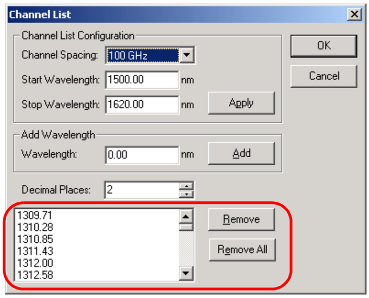
2. Click **Add**. Your new channel will be added to the list.

To delete wavelengths from the list:

If you want to delete a specific item, click the value you want to remove from the wavelength list and click **Remove**.

OR

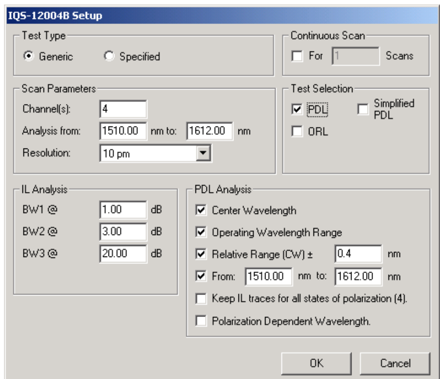
If you want to empty the list, click the **Remove All** button.



Once you are done with the changes, click **OK** to validate the new list or on **Cancel** to discard the modifications.

Preparing the Test Setup

Before performing a test, you have to specify the parameters to be used.



The application offers you two types of tests:

- Generic: Useful to quickly test a DUT by using the default values provided. Some analysis can be done with this option, but no Pass/Fail status will be given.
- Specified: Useful to perform a test using predefined parameters and Pass/Fail limits. When selecting this test, the DUT Identification group box is displayed (see *Identifying the Current DUT* on page 54).

You can specify the values for the scan parameters to be taken into account during tests. These values include:

- The number of channels to be tested: By default, the application displays the total number of available power meter channels. However, if you do not intend to work with all of the available channels, EXFO recommends that you indicate the actual number of channels you are using. This will save some testing time and a lot of disk storage space.
- The tested wavelength range (in nm): By default, the application displays the full range of the source in use. Changing this to a smaller range will save disk storage space and may also reduce testing time.

- The scan resolution (in pm): This parameter determines the approximate scan resolution. The application will set the appropriate source sweep speed and power meter sampling rate.

The application allows you to indicate the test selection:

- PDL: calculations, based on the Mueller Matrix four-state method, take into account the optical retardation of the polarization state adjuster (IQS-5150).
- Simplified PDL: faster than standard PDL (calculations do not take into account the optical retardation of the polarization state adjuster), but adds an uncertainty of about 5 % of the DUT PDL.
- ORL.

You can specify the IL analysis parameters, the PDL analysis parameters and whether the system must perform a continuous scan or not.

The DWDM Passive Component Test System performs PDL measurements as function of wavelength. It can also keep intermediate traces for export purposes.

The result table will be adjusted according to the options specified in the **PDL Analysis** group box.

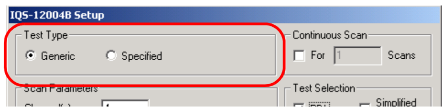
- In addition to standard IL results (DUT IL average values), you may need to get IL results obtained at the four states of polarization.
- You may also need to get traces from the PDW analysis. The PDW analysis is made using proprietary algorithms (patent pending) and is based on calculations using the Mueller Matrix coefficients. Using data from the four scans performed for the PDL measurement, the DWDM Passive Component Test System analysis software internally calculates the transmission response for many states of polarization and generates the insertion loss curves for the extreme values.

Note: *The test setup step is only available when you have already created a test.*

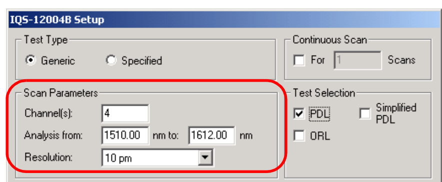
To set the test parameters:

1. Ensure that the **IQS-12004B Setup** window is open. For more information on selecting a step, see *Accessing a Specific Test Step* on page 34.

2. From the **Test Type** group box, select **Generic** or **Specified** test.



3. From the **Scan Parameters** group box, specify the required parameters.



3a. Indicate the number of power meter channels to use by typing the value in the **Channel(s)** entry box.

3b. Specify the wavelength range (in nanometers) that will be used for the analysis in the **Analysis from X nm to Y nm** entry boxes.

IMPORTANT

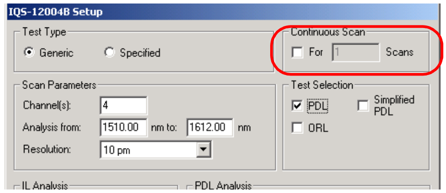
When testing “specified” devices, changing the wavelength range parameter will override the parameter stored in the DUT database.

Note: *Setting a smaller scan range will reduce the database size, the time required for the analysis and for the scan.*

3c. Select the scan resolution value (in picometers) from the **Resolution** list.

Note: *Resolution cannot be set to 5 pm when using the IQS-2600B source.*

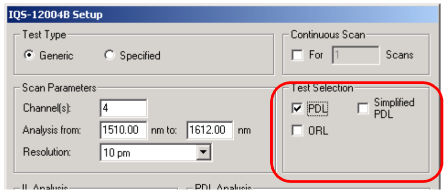
4. If you need the DWDM Passive Component Test System to perform successive scans,



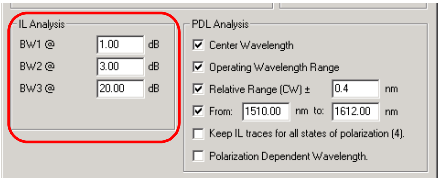
4a. Check the box from the **Continuous Scan** group box.

4b. Enter the number of scans you want to perform in the corresponding text field.

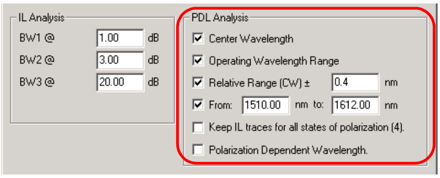
5. From the **Test Selection** group box, check the **PDL**, **Simplified PDL** and/or **ORL** boxes according to the measurements you want to perform.



6. From the **IL Analysis** group box, specify the relative power levels (in dB) at which the bandwidth is calculated (for notch and bandpass filters).



7. From the **PDL Analysis** group box, specify the required parameters.

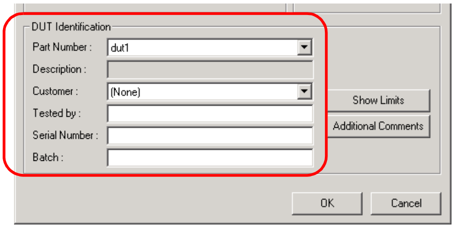


For more information on the various parameters, see *Configuring a DUT* on page 42.

Note: *If you omit to check the **Keep IL traces for all states of polarization (4)** box, you won't be able to export these traces. For more information on exporting, see* Exporting Data *on page 94.*

Note: *If you omit to check the **Polarization Dependent Wavelength** box, you won't be able to export these traces. For more information on exporting, see* Exporting Data *on page 94.*

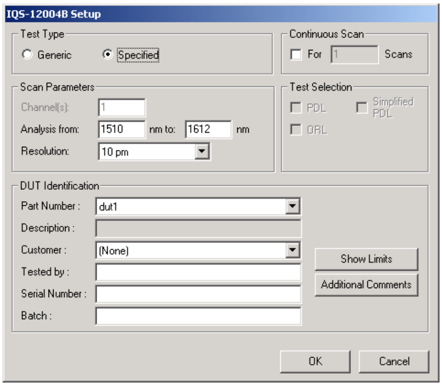
8. If you selected Specified for the test type, the DUT Identification group box is displayed. Use this section to select and identify the device that will be tested. For more information, see *Identifying the Current DUT* on page 54.



Note: *At start-up, your access level is activated by default. For more information about access levels, see Working with Access Levels* on page 59.

Identifying the Current DUT

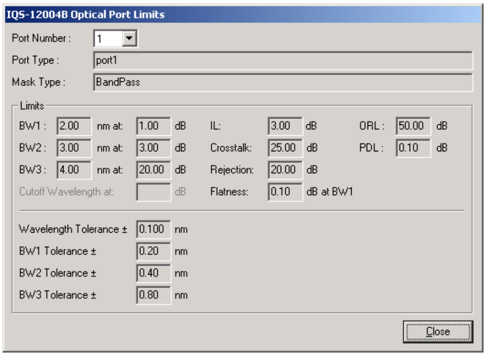
The **DUT Identification** is used to select and identify the device that will be tested next. The **DUT Identification** group box is accessible from the **IQS-12004B Setup** window and by selecting the **Specified** test type.



- **Part Number**: This list box is used to select the part number of the DUT. The available DUTs were previously created in the **DUT Configuration** window. For information on DUT creation, see *Configuring a DUT* on page 42.
- **Description**: This text box shows the short description of the DUT corresponding to the selected part number.
- **Customer**: This list box is used to select the name of the customer associated with the current DUT. For information on modifying the list of customers, see *Configuring DUT Company/Customer Parameters* on page 44.
- **Tested by**: This text field allows you to identify the name of the person doing the current test.
- **Serial Number**: This text field is used to identify the DUT with a serial number. The serial number is mandatory.
- **Batch**: This text field allows you to specify a batch number.

Two buttons are available on the right side of the window to enter and view additional information about the DUT.

➤ **Show Limits**: This button will open the **Optical Port Limits** window (see figure below), where you can see different limits of the current DUT. These parameters were set in *Supervisor* level on the **DUT Configuration** window. For more details, see *Definitions and Calculation Methods* on page 405 or *Configuring DUT Parameters for Pass/Fail Analysis* on page 37.

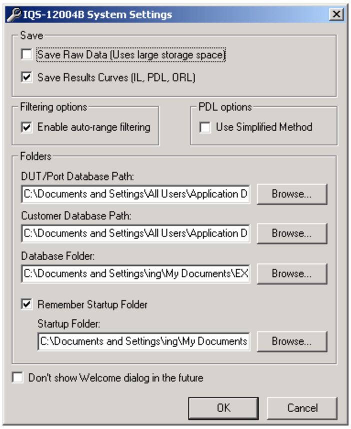


➤ **Additional Comments**: This button will open a text window, where you can enter additional comments about the current DUT.

Modifying System Settings

Note: *You must be working at the Supervisor level to use this feature.*

The **System Settings** window allows you to define two saving options, set filtering options, and select a new database folder. To access this window, from the main window menu, select **Options** > **Supervisor Options** > **System Settings**.



- **Save Raw Data**: This is a troubleshooting tool that allows EXFO technical support to troubleshoot data analysis problem. This option is normally not selected as it uses a large storage space.
- **Save Results Curves (IL, PDL, ORL)**: This option is selected by default. If not selected, you will only be able to see the results table (not the trace) and the trace data will not be saved.

- **Enable Auto-Range Filtering**: This option is selected by default. When selected, the software signal processing identifies and filters out any invalid datapoints that sometimes occur at power meter autoranging scale changes.

  When not selected, no post process filtering is applied. A small improvement in testing time will be observed. When the filtering is not applied, data spikes between 0 and 0.030 dB may be observed at some scale changes.

- **Use Simplified Method**: This option is selected by default. It indicates that the PDL simplified method will be used for each test. Simplified PDL is faster than “standard” PDL (calculations do not take into account the optical retardation of the polarization state adjuster), but adds an uncertainty of about 5 % of the DUT PDL.

- **Folders**: This feature allows you to specify paths for the different databases.

5 Operating the DWDM Passive Component Test System

Working with Access Levels

The IQS-12004B DWDM Passive Component Test System comprises two levels of operation: User and Supervisor. The level at which the application is working is shown in the title bar.

Note: *When starting the application, the User level is always the default level of operation, even if you last exited the application at the Supervisor level.*

User Level

At the User level, you can perform complete tests on passive components and create new database files. However, certain functions are disabled.

To switch from Supervisor level to User level, select **Level of Operation**, then **User**, from the **Options** menu. A check mark will appear in the menu.

Supervisor Level

The Supervisor level gives you access to all DWDM Passive Component Test System functions. As a Supervisor you can:

- Configure the DUTs. For details about this feature, see *Configuring DUT Parameters for Pass/Fail Analysis* on page 37.
- Modify system settings. For details about this feature, see *Modifying System Settings* on page 56.
- Modify ITU channel list. For details about this feature, see *Customizing the Channel List* on page 46.

To switch from User level to Supervisor level:

1. From the main widow menu, select **Options** >**Level of Operation** > **Supervisor**.
2. Enter the requested password. The default password is *VISUALIQ*.

It is also possible to directly log on at the Supervisor level when creating a new test database.

To log on at the Supervisor level:

1. From the **Welcome/New Test** window, check the **Supervisor** box.
2. Press the **Password** button. The **Supervisor Level** window is displayed.
3. Type your password and press **OK**.

You can later change your password in the **Options** menu. For details, see *Changing Supervisor Password* on page 60.

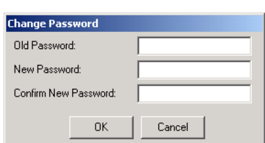
Changing Supervisor Password

IMPORTANT

Under Windows 2000, you must have Administrator rights to modify the supervisor password.

To change the password once you are at the Supervisor level:

1. From the main window menu, select **Options** > **Supervisor Options**> **Change Password**. The following window appears:



2. Enter the old password and then enter the new password twice.

Note: *Passwords must be between six and ten characters long.*

3. Click **OK** to save the new password.

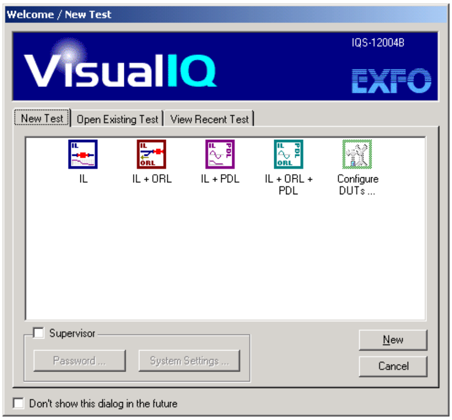
Opening a New Test Database

IMPORTANT

To help you copy and move the database and also prevent data corruption, save your tests in several databases and keep the results database to a manageable size.

To open a new test database:

1. From the **Welcome/New Test** window, select the **New Test tab**.



2. Select the icon for the type of test you want to perform:
   - **IL** measures the insertion loss.
   - **IL+ORL** measures both the insertion loss and the optical return loss.
   - **IL+PDL** measures both the insertion loss and the polarization-dependent loss.
   - **IL+ORL+PDL** measures the insertion loss, the optical return loss, and the polarization-dependent loss in the same test.
   - **Configure DUTs** allows you to configure the optical ports and the DUT (see *Configuring an Optical Port* on page 39 and *Configuring a DUT* on page 42). This option is enabled only if you have selected the Supervisor level of operation and provided a valid password.

   You can later change the types of test you want to perform in the **Setup** window, under **Test Selection**.

Note: *Certain tests may not be available if the required modules are not present. If this is the case, the icons will be grayed out.*

3. If you want to work at the Supervisor level, enter a password in the **Supervisor** box. For more information, see *Working with Access Levels* on page 59. As a supervisor, you can modify system settings (see *Modifying System Settings* on page 56).

4. Press **New**. The **Open New** window is displayed.

> **IMPORTANT**
>
> **If you use the name of an already-existing test for a new database, the data related to this test will be lost (the file will be overwritten). If you want the new data to be appended to the existing database, see *Opening an Existing Test Database* on page 64.**

Give a name to the new database and click **Open**. The database opens and you are brought to the **IQS-12004B Setup** window.

Note: *To proceed directly, you can double-click the icon for the type of test you want to perform. You can also access this function by selecting **New Database** from the **File** menu.*

If new hardware components were installed on the system, message windows will appear indicating that a new system calibration and a new ORL calibration will have to be performed. For details, see *Calibrating the System* on page 73.

Database files can be stored in any directory, either on a local drive or network drive. The database files must have the .MDB extension, which is the standard Microsoft Access database file format.

> **IMPORTANT**
>
> **It is important to wait 30 minutes for the system to warm up. If this warmup period is not respected, results may be inaccurate.**

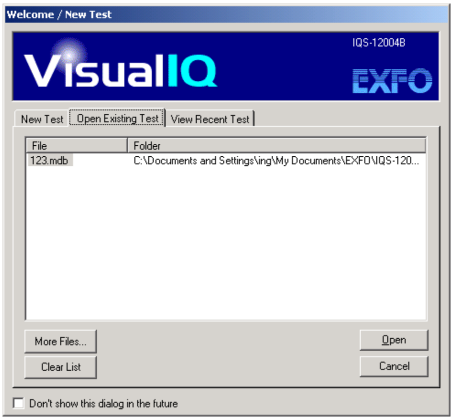
Opening an Existing Test Database

IMPORTANT

The new data will be appended to the existing database. If you only want to view the results of an already-existent database, see ***Opening an Existing Test Database* on page 64.**

To open an existing test database file with already defined settings:

1. From the **Welcome/New Test** window, select **Open Existing Test**.



2. Select the database you want to use. If the database does not appear in the list, click **More Files** to find the desired database file.

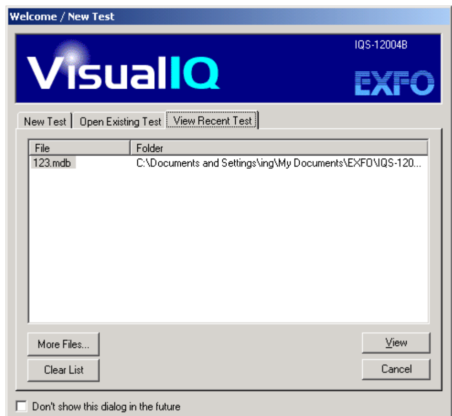
3. Click **Open**. The database opens and you are brought to the **IQS-12004B Setup** window.

Note: *You can double-click the test database file to proceed directly. You can also access this function by selecting **Open Database** from the **File** menu.*

Viewing a Recent Test

To view a recent test database file:

1. From the **Welcome/New Test** window, select **View Recent Test**.



2. Select the database that you want to consult. The default folder is IQS\MAESTRO\IQS_DWDMTS\Userfile. If the desired database does not appear in the list, click **More Files** to find it.

3. click **View**. The database opens and you are brought to the **IQS-12004B Database Browser** window, which contains information about previous tests (see *Using the Database Browser* on page 109).

Note: *You can double-click the database file to proceed directly. You can also access this function by selecting* ***View Database*** *from the* ***File*** *menu.*

Hiding the Welcome/New Test Window

You can deactivate the automatic display of the **Welcome/New Test** window by checking the **Don't show this dialog in the future** box. When this option is selected, you will be brought directly to the DWDM Passive Component Test System main window. This option can be disabled in the **System Settings** window (see *Modifying System Settings* on page 56).

Cleaning and Connecting Optical Fibers

IMPORTANT

To ensure maximum power and to avoid erroneous readings:

- **Always clean fiber ends as explained below before inserting them into the port. EXFO is not responsible for damage or errors caused by bad fiber cleaning or handling.**
- **Ensure that your patchcord has appropriate connectors. Joining mismatched connectors will damage the ferrules.**

To connect the fiber-optic cable to the port:

1. Clean the fiber ends as follows:

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

   1b. Use compressed air to dry completely.

   1c. Visually inspect the fiber end to ensure its cleanliness.

2. Carefully align the connector and port to prevent the fiber end from touching the outside of the port or rubbing against other surfaces.

   If your connector features a key, ensure that it is fully fitted into the port's corresponding notch.

3. Push the connector in so that the fiber-optic cable is firmly in place, thus ensuring adequate contact.

   If your connector features a screwsleeve, tighten the connector enough to firmly maintain the fiber in place. Do not overtighten, as this will damage the fiber and the port.

Note: *If your fiber-optic cable is not properly aligned and/or connected, you will notice heavy loss and reflection.*

Connecting DUT and Modules

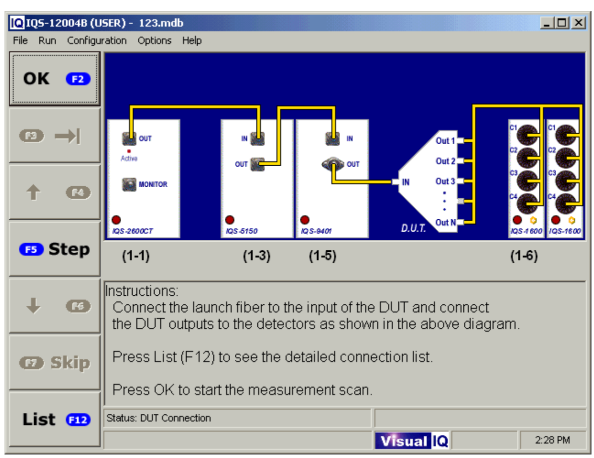
Once the reference measurements have been completed, you need to connect the DUT to the launch fiber and to the power meters. Normally, the application brings you to this step automatically. If necessary, you can go directly to the DUT Connection step. For information on accessing a step, see *Accessing a Specific Test Step* on page 34.

For information on reference measurements, see *Calibrating the System* on page 73 and *Performing Reference Measurements* on page 82.

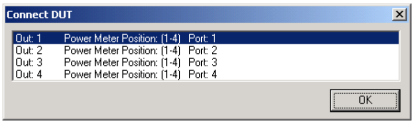
WARNING

Never stare into the beam or view directly with optical instruments.

Connect the DUT input port to the start fiber and the DUT output ports to the power meters, as indicated on the screen.



You can click **List** or press *F12* to see a detailed list of required connections (as shown below). This list shows you which DUT output port must be connected to which port on the power meters. Basically, channel 1 of the device is connected to channel 1 of the first power meter, channel 2 to the second channel of the first power meter, and so on.



Once all connections have been made, click **OK** to start the measurement. The system will sweep the source, transfer the data, and analyze the results in accordance with the parameters selected in the Setup window.

IMPORTANT

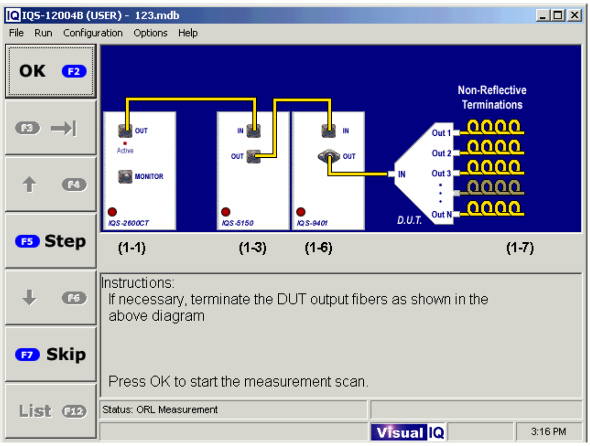
Before running any test, ensure that all the connectors and fiber-optic adapters (FOAs) to be used are clean, and that all fiber-optic light source warmup periods have been respected.

Starting the ORL Measurement Scan

Once the reference measurement is complete and if the ORL measurement has been selected, you will be prompted to prepare for the ORL measurement.

If the device you are testing is not terminated with low-reflection APC connectors, you will have to provide some sort of temporary low-reflection termination. One method is to mandrel wrap the output fibers (see figure below). Another option would be to use an index matching material.

Once all connections and preparations have been made, click **OK** in the main window to activate the software and start the ORL measurement scan.



Note: *You can abort the ORL measurement scan at any time by clicking the* **Stop** *button or pressing* F2.

Once the measurement is done, you are brought directly to the next step.

Testing Another Component

When a test is complete, you have the possibility to begin a new test. Click **OK**. This will bring you back to the **IQS-12004B Setup** window. Restart the procedure with new parameters, as explained in *Preparing the Test Setup* on page 49.

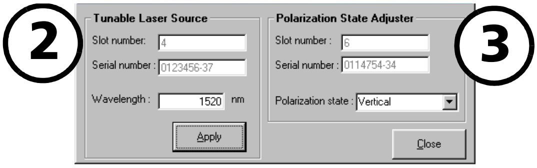
Sharing the Power Meters and WRM with an External Application

You can use the power meters and the Wavelength Reference Meter with an external application without exiting the system application. You can also set the source to a specific wavelength and modify the polarization state of the IQS-5150 Polarization State Adjuster.

Note: *This feature is only available after a power optimization is performed (i.e., after a reference or calibration.) Otherwise, the option will be grayed out.*

To use the power meters and WRM with an external application:

1. From the main window menu, select **Options** > **Alignment**. The system deallocates the power meters and the WRM.
2. If necessary, set a wavelength for the source. Click **Apply** to confirm your changes.



3. If necessary, adjust the polarization state to your needs.
4. Click **Close** to return to the main application. The power meters and WRM are automatically reinitialized allowing you to proceed with the system as you would normally.

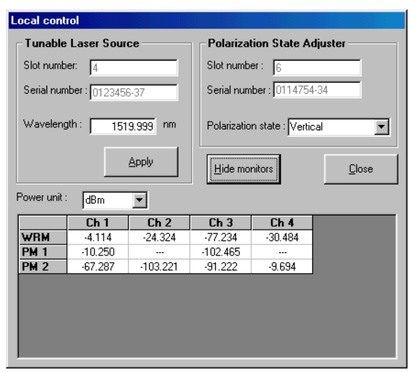
Monitoring Modules in Local Mode

The DWDM Passive Component Test System allows you to locally monitor the power meters and the Wavelength Reference Meter without exiting the application. You can also set the source to a specific wavelength and modify the polarization state of the IQS-5150 Polarization State Adjuster.

Note: *This feature is only available after a power optimization is performed (i.e., after a reference or calibration.)*
Otherwise, the option will be grayed out.

To monitor the power meters and WRM:

1. From the main window menu, select **Options** >**Local control**.



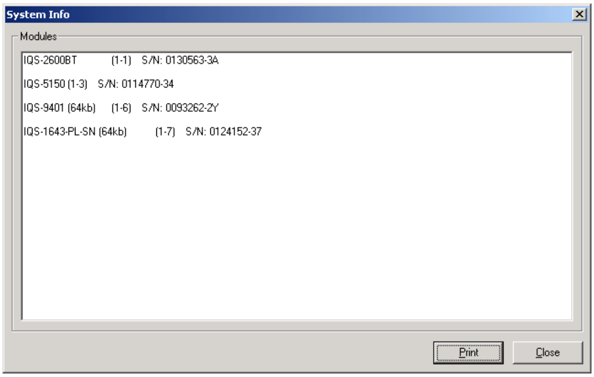
2. If necessary, set a wavelength for the source. Click **Apply** to confirm your changes.
3. If necessary, adjust the polarization state to your needs.
4. To display the monitoring zone, click **Show monitors**. You can hide the zone by clicking **Hide monitors**.
5. If necessary, use the **Power unit** box to adjust the displayed unit.
6. When you want to come back to the DWDM Passive Component Test System application, click **Close**. You can then proceed with the system as you would normally.

Viewing System Information

It is possible to view the description and serial number of modules used in the system as well as enter comments about the system setup.

To view system information:

1. From the main window menu, select **Help** > **System Info**.



2. If desired, enter comments below the list of modules.
3. Press the **Print** button if you want to print the displayed information.

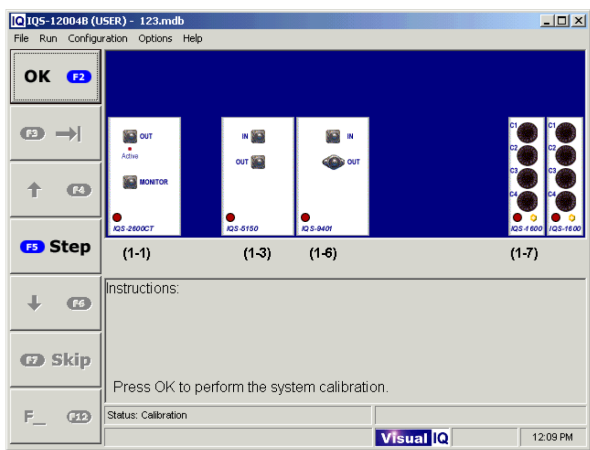
6 Calibrating the DWDM Passive Component Test System

Calibrating the System

After selecting the setup parameters, the main window is displayed (see figure below). Normally, the application brings you to this step automatically. If necessary, you can go directly to the Calibration step. For information on accessing a step, see *Accessing a Specific Test Step* on page 34.

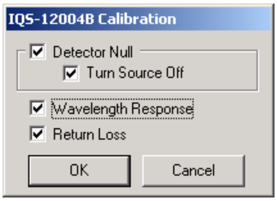
Note: *The system has been calibrated at the factory and upon installation. Recommended recalibration procedures are explained in the following pages.*

To perform a system calibration, click **OK** as indicated on the screen.



The **Calibration** window appears (see figure below). In this window, you can independently select the calibration options you want by checking the appropriate boxes.

- **Detector Null**: Check this option to perform an electrical offset nulling of the power meters. To avoid disconnecting the rigid patchcord to perform the nulling, select **Turn Source Off**.
- **Wavelength Response**: Check this option to correct variations in sensitivity and response of the different power meters.
- **Return Loss**: Check this option to perform the return loss calibration.



Nulling Electrical Offsets

The offset nulling process provides a zero-power reference measurement, thus eliminating the effects of electronic offsets and dark current due to detectors.

Temperature and humidity variations affect the performance of electronic circuits and optical detectors. For this reason, EXFO recommends performing a nulling of the electrical offsets whenever environmental conditions change.

IMPORTANT

Light must not reach the detector when nulling offsets.

The IQS-12004B DWDM Passive Component Test System uses both external optical power meters and internal optical power meters inside the IQS-9401 WRM.

Protective caps should be placed on the external power meters. The WRM can be blacked out by placing protective caps on both the input and output or by placing a protective cap only on the output if the **Turn Source Off** option is selected.

This operation ensures accuracy of the power readings by taking a measurement while a protective cap is put on the power meter detector.

A nulling of the electrical offsets should be done:

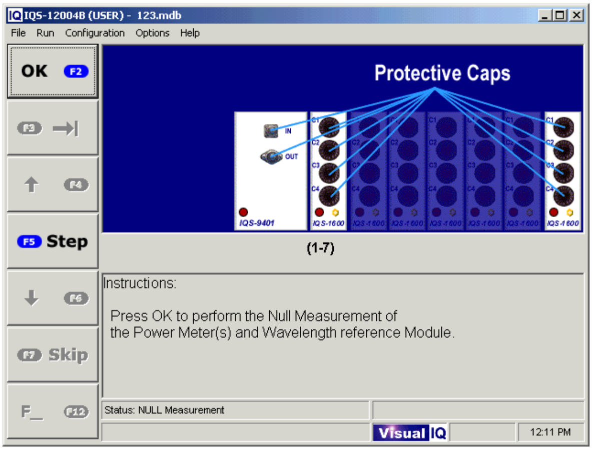
➤ At the initial installation after the system has reached a stable operating temperature (approximately 30 minutes).

➤ If there is a significant change in environmental conditions.

EXFO also recommends that a nulling be performed prior to the wavelength response calibration and/or before the return loss calibration.

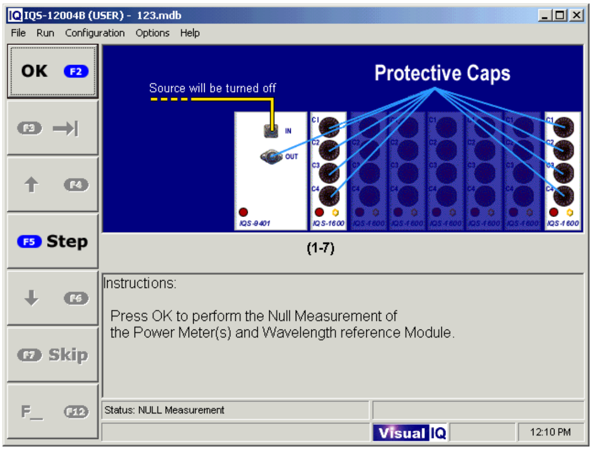
To perform a nulling:

1. Put protective caps on power meter detectors as well as on the input and output of the WRM, as shown on the screen.
2. Click **OK** to perform the measurement.

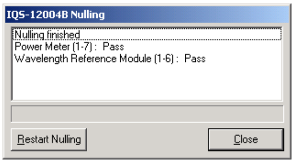


OR

the source will be turned off (as shown on the screen) and you won't have to perform an electrical offset nulling of the power meters if you have selected the **Turn Source Off** option in the calibration window.



When the detector null measurement is complete, the **Nulling** window appears and provides you with a Pass or Fail indication. In the case of a Failed response, you have the possibility to restart the nulling by pressing the **Restart Nulling** button.



Wavelength Response Calibration

The wavelength response calibration is a full-range sweep with a launch jumper connected in sequence to each of the external power meters. It is a series of measurements starting with the first channel of the first power meter and ending at the last channel of the last power meter. This series of measurements allows the system software to correct any variations in sensitivity and response of the different power meters.

The calibration data is saved to a file and is associated with the module serial numbers. If a new module is added to the system, it will be automatically detected and you will be forced to perform a new calibration.

A wavelength response calibration must be done in the following cases:

➤ Power meter(s) is replaced.

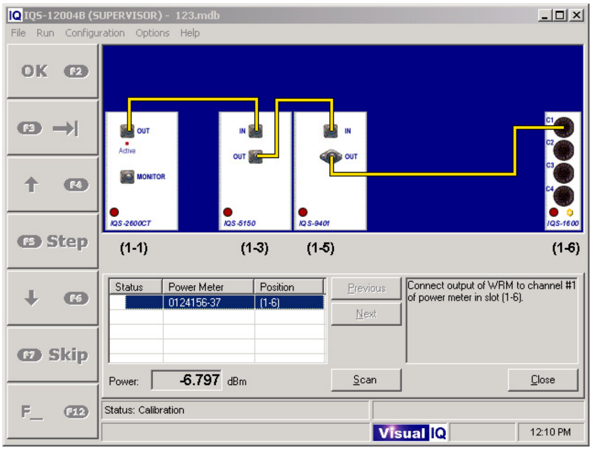
➤ Power meters are added to the system.

➤ The Source or WRM or PSA is replaced.

➤ A PSA is added to the system.

To perform the wavelength response calibration:

1. Connect the output port of the Wavelength Reference Module to channel 1 of the power meter, as indicated on the screen.



➤ Click **Scan**.

➤ Connect the WRM to all remaining channels in the system, as indicated on the screen.

When the wavelength response measurement has been completed, a green check mark will appear in the **Status** column field, indicating that the measurement has been successfully completed for the current power meter.

2. Once the measurements have been completed for all power meters, click **Close** to exit the window and proceed to the next step.

Return Loss Calibration

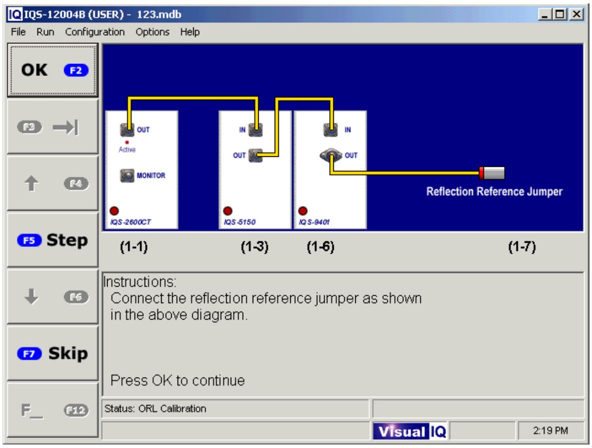
The return loss calibration is performed in two steps (ORL Calibration and ORL Calibration Zero) using a reflection reference jumper supplied with the IQS-12004B DWDM Passive Component Test System. This reflection reference is connected to the output of the WRM and provides a known optical reflection.

During the first step, the system will scan the full tuning range. The second step of the ORL calibration is a zero reflection scan (again across the complete tuning range) of the reference jumper. Based on the two scans, the ORL calibration factors are calculated and stored into a system calibration file.

It will be necessary to repeat the return loss calibration if any of the modules (Source, WRM, or PSA) are replaced. One way of verifying the ORL measurements is to measure the ORL of the reflection reference. The result should be 14.7 dB ± the uncertainty specified in the specification table.

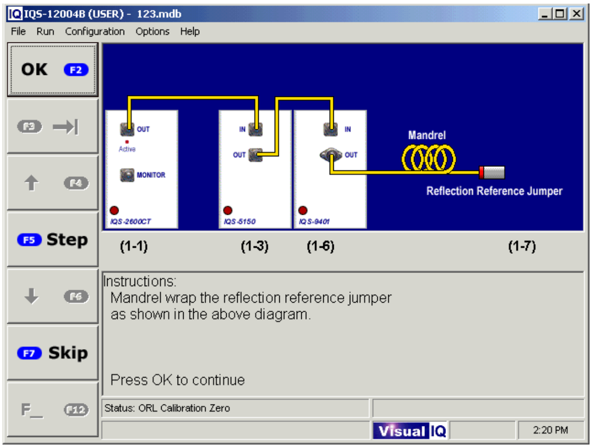
To perform the return loss calibration:

1. Connect the reflection reference jumper, as shown in the figure below.



2. Click **OK**.

3. Mandrel the reflection reference jumper, as shown in figure below.



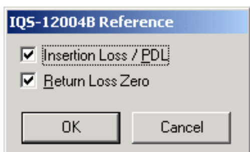
4. Click **OK**.

WARNING

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

Performing Reference Measurements

Once the calibration is complete, you will have to perform an Insertion Loss/PDL reference as well as a Return Loss Zero reference. Normally, the application brings you to this step automatically. If necessary, you can go directly to the Reference step. For information on accessing a step, see *Accessing a Specific Test Step* on page 34.



Note: *The IQS-12004B DWDM Passive Component Test System test system automatically prompts you to perform a reference measurement (see procedure below) at start-up. However, to obtain good results, EXFO recommends to also perform a reference measurement when the test system is used non-stop during a long period of time or when there are important variations in environmental conditions.*

IL/PDL Reference Measurement

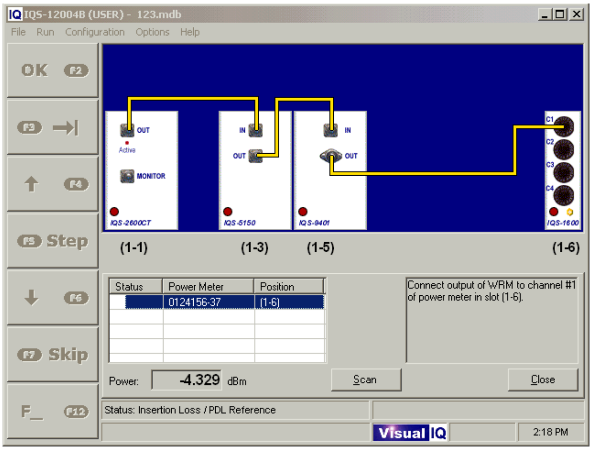
An IL/PDL reference is performed to compensate for any loss or spectral non-uniformity of the launch fiber connection to the WRM output port.

During this step, a complete sweep on the first channel is performed.

Note: *An IL/PDL reference measurement is required each time the system is turned on, and is recommended whenever there is a significant change in environmental conditions.*

To perform the IL/PDL reference measurement:

1. Clean the connectors and connect the modules as indicated on the screen. For more information, see *Maintenance* on page 213 and *Connecting Optical Fibers* on page 66.
2. Select **Insertion Loss/PDL** in the **Reference** window and press **OK**.
3. Connect the output of the Wavelength Reference Module to channel 1 of the first power meter (the location of the first parameter is shown on the screen) using the desired launch cable, as indicated on the screen.
4. Click **Scan** to start the operation.
5. When the IL/PDL reference measurement has been completed, a green check mark will appear in the **Status** column field, indicating that the reference has been successfully completed.
6. Click **Close** to proceed to the next step.



IMPORTANT

Before running any reference check, ensure that all the connectors and fiber-optic adapters (FOAs) to be used are clean, and that the warmup periods have been respected.

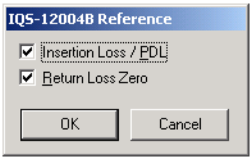
Return Loss Zero Reference Measurement

The Return Loss Zero measurement provides a zero reflection reference to the WRM return loss detector. This reference will be used to compensate for internal WRM parasitic reflections as well as parasitic reflections originating at the WRM output/launch fiber connector.

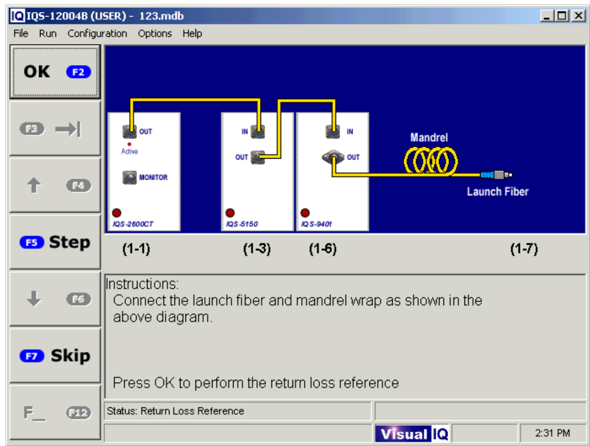
Note: *A Return Loss Zero reference measurement is required each time the system is turned on, and is recommended whenever there is a significant change in environmental conditions.*

To perform the Return Loss Zero reference measurement:

1. Clean the connectors and connect the modules as indicated on the screen. For more information, see *Maintenance* on page 213 and *Connecting Optical Fibers* on page 66.
2. Select **Return Loss Zero** in the **IQS-12004B Reference** window and press **OK**.



3. Connect the launch fiber, as indicated on the screen.



4. Mandrel the launch fiber (i.e., wrap the fiber a minimum of five turns around the mandrel tool).

WARNING

Never look directly into a live fiber and ensure that your eyes are protected at all times.

5. Click **OK** to start the operation.

7 Interpreting the DWDM Passive Component Test System Results

Optimizing Performance

The following section gives you important information on how to get optimum performance from your DWDM Passive Component Test System.

Spectral Errors

The IQS-12004B DWDM Passive Component Test System uses a temperature-stabilized Fabry-Perot interferometer and high-precision absolute wavelength reference component to ensure wavelength accuracy of the spectral measurements. To ensure that the system is operating to its published specifications, it is important to respect the recommended 30-minute warmup period and the specified operating environment.

The system is calibrated at EXFO and verified with the NIST SRM 2519 HCN absorption cell. EXFO recommends a yearly recalibration of the IQS-9401 Wavelength Reference Module.

IL/PDL Errors

There are numerous possible sources of errors for the insertion loss measurement. Some of them are inherent to system and test procedures, while others are related to operation and fiber handling. Understanding these sources of error will help you to optimize the accuracy of your loss measurements.

➤ *Environmental stability*

To ensure optimum results, it is important to respect the recommended 30-minute warmup period before performing any calibration, reference, or null measurement.

➤ *Source power stability*

The IQS-9401 has an internal detector that is always measuring the optical power at the output of the WRM. This reference power is used along with the calibrated coupling ratio of the output coupler to correct variations in the source power. Therefore the effect of any instabilities in the source output power have been minimized.

➤ *Connector repeatability*

It is well known that connector repeatability is a significant source of error when testing the IL of any connectorized component. There is no practical way of completely eliminating these errors. However, if all connectors are of good quality and adequately cleaned, the errors are minimized. Where it is important to measure the IL of the device alone, you should use fusion splices on the launch side of the DUT.

➤ *Different connector types*

Often it will be necessary to test components with different connector types. To do this, you will have to change the launch fiber (or to use a hybrid adapter) and you will also have to change the fiber-optic adapters (FOAs) on the IQS power meters. In this situation, it will be necessary to perform a new reference measurement and, for truly optimum results, repeat the spectral response calibration. This is because different FOAs have slightly different alignment characteristics (manufacturing tolerances), and this will contribute to an increase in measurement uncertainty. This also applies when switching from APC to PC connector types.

Return Loss Errors

Most of the factors affecting IL and PDL also affect the return loss accuracy. There are, however, some additional factors that should be considered.

➤ *Power budget*

A return loss measurement is generally a very low power measurement. In order to have good accuracy when measuring weak reflections, it is important to have as much power as possible. One way of improving the ORL sensitivity and accuracy is to bypass the optional IQS-5150 PSA. This will give an additional 5 to 8 dB sensitivity as well as better accuracy and resolution.

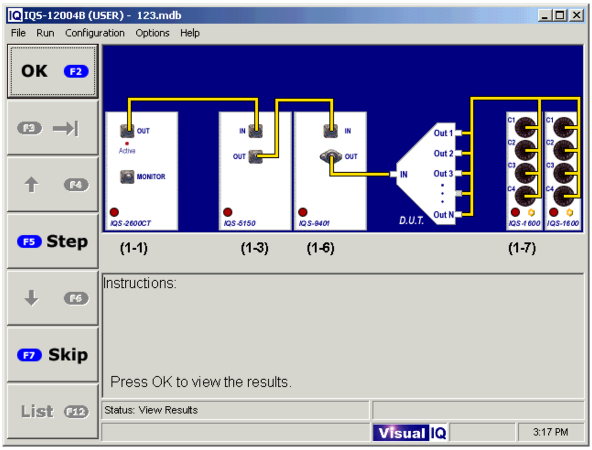
➤ *Calibration reference*

The calibration reference supplied with the DWDM Passive Component Test System is used as an absolute reflection reference based on the glass-to-air interface reflection of $\approx$4% (–14.7 dB). When performing measurements, a different launch cable is used. The insertion loss of the WRM output connector/launch fiber connector will not be exactly the same as the insertion loss of the WRM output connector/reference fiber connector. This difference contributes directly to the ORL measurement error. For this reason, it is important to use launch fiber with a good quality connector.

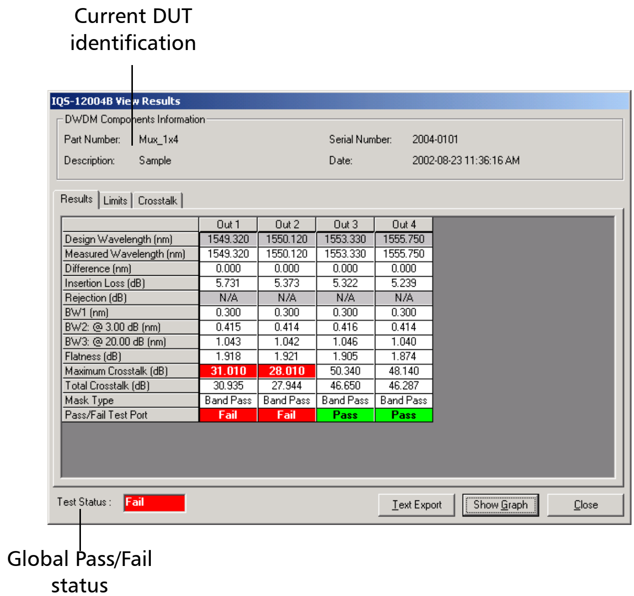
Viewing Test Results

To view the results of the current device tested, click **OK** as indicated on the screen. Normally, the application brings you to this step automatically. If necessary, you can go directly to the View Results step. For information on accessing a step, see *Accessing a Specific Test Step* on page 34.

If you wish to view the results of an already existing test, see *Using the Database Browser* on page 109.



The **IQS-12004B View Results** window will appear, as shown in the following figure.



Unsatisfactory results are highlighted in red (dark in the illustration above).

➤ The **Results** tab contains a summary of the actual measurements performed on the DUT, as shown below.

The data shown in this table is calculated in accordance with the definitions in *Definitions and Calculation Methods* on page 405.

Results | Limits | Crosstalk

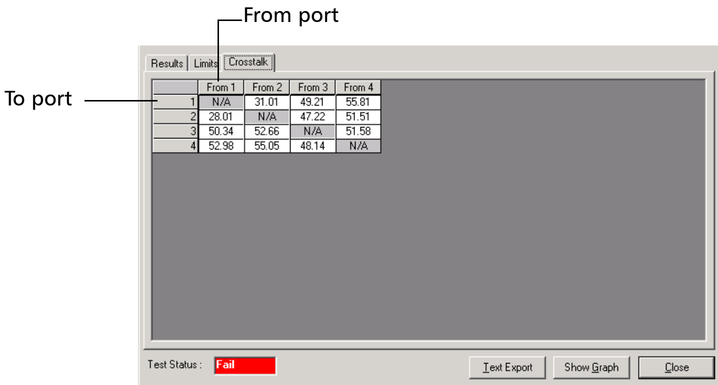
	Out 1	Out 2	Out 3	Out 4
Design Wavelength (nm)	1549.320	1550.120	1553.330	1555.750
Measured Wavelength (nm)	1549.320	1550.120	1553.330	1555.750
Difference (nm)	0.000	0.000	0.000	0.000
Insertion Loss (dB)	5.731	5.373	5.322	5.239
Rejection (dB)	N/A	N/A	N/A	N/A
BW1 (nm)	0.300	0.300	0.300	0.300
BW2: @ 3.00 dB (nm)	0.415	0.414	0.416	0.414
BW3: @ 20.00 dB (nm)	1.043	1.042	1.046	1.040
Flatness (dB)	1.918	1.921	1.905	1.874
Maximum Crosstalk (dB)	31.010	28.010	50.340	48.140
Total Crosstalk (dB)	30.935	27.944	46.650	46.287
Mask Type	Band Pass	Band Pass	Band Pass	Band Pass
Pass/Fail Test Port	Fail	Fail	Pass	Pass

➤ The **Limits** tab displays the limits entered as acceptable values in the **IQS-12004B Optical Ports-Configuration** dialog box.

Results | Limits | Crosstalk

	Out 1	Out 2	Out 3	Out 4
Design Wavelength (nm)	1549.320	1550.120	1553.330	1555.750
Measured Wavelength (nm)	1549.320	1550.120	1553.330	1555.750
Difference (nm)	N/A	N/A	N/A	N/A
Insertion Loss (dB)	6.00	6.00	6.00	6.00
Rejection (dB)	N/A	N/A	N/A	N/A
BW1 (nm)	0.30	0.30	0.30	0.30
BW2: @ 3.00 dB (nm)	0.40	0.40	0.40	0.40
BW3: @ 20.00 dB (nm)	1.50	1.50	1.50	1.50
Flatness (dB)	2.00	2.00	2.00	2.00
Maximum Crosstalk (dB)	35.00	35.00	35.00	35.00
Total Crosstalk (dB)	N/A	N/A	N/A	N/A
Mask Type	Band Pass	Band Pass	Band Pass	Band Pass
Pass/Fail Test Port	Fail	Fail	Pass	Pass

- The **Crosstalk** tab provides a summary table of the measured crosstalk values between the DUT output channels, as shown below. For example, the crosstalk from channel 1 to channel 2 is 25.66 dB.



Also, you can perform other operations with your data.

- Click **Text Export** to export the data to a text file. For details about this feature, see *Exporting Data* below.
- Click **Show Graph** to view and print the insertion loss, the PDL and the ORL curves, as explained in *Viewing the Results Graph* on page 97.

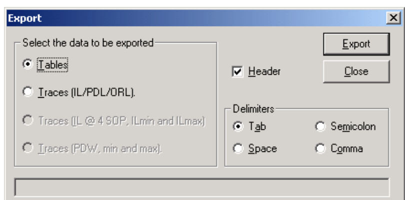
Once you are done viewing the results, click **Close** to leave the **View Results** window and move to the next step.

Exporting Data

As explained in *Opening a New Test Database* on page 61, results are automatically saved into the active database file after each DUT has been tested. You can convert the current database record into a text file and open it with any word processor or spreadsheet program. Data can then be easily viewed, analyzed, and processed.

To export data:

1. Click **Test Export** located at the bottom of the **View Results** window. The **Export** window appears.



2. Select the export parameters and click **Export**:

   ➤ **Tables**: exports the results of the measurement scan.

   ➤ **Traces (IL/PDL/ORL)**: exports all the data points of the measurement scan, which allows you to reproduce the curves of the scan in a spreadsheet, for example.

   ➤ **Traces (IL @ 4 SOP, ILmin and ILmax)**: The **Traces (IL/PDL/ORL)** option, presented above, allow you to export the “standard” IL results (corresponding to the DUT IL average values). However, you may need to get detailed IL results, obtained at the four states of polarization., the minimum IL trace, as well as the maximum IL trace. select the **Traces (IL @ 4 SOP, ILmin and ILmax)** option to export detailed information.

Note: *These complete traces are only available for exporting if you have selected the corresponding option at time of test setup. For information, see* Preparing the Test Setup *on page 49.*

- **Traces (PDW, min and max)**: You may also need to get traces from the PDW analysis. The PDW analysis is made using proprietary algorithms (patent pending) and is based on calculations using the Mueller Matrix coefficients. Using data from the four scans performed for the PDL measurement, the DWDM Passive Component Test System analysis software internally calculates the transmission response for many states of polarization and generates the insertion loss curves for the extreme values. Select **Traces (PDW, min and max)** to export detailed PDW information.

Note: *These traces are only available for exporting if you have selected the corresponding option at time of test setup. For information, see* Preparing the Test Setup *on page 49.*

- **Delimiter**: indicates which delimiter you want to separate columns of data i.e., a tab, a space, a semicolon or a comma.
- **Header**: select this parameter if you want information to appear in the header.

3. The **Save As** window appears. Enter the name of the new file.
   By default, the file will be named with the serial number given in the *Setup* step (see *Identifying the Current DUT* on page 54), it will be given the .TXT extension, and it will be saved in the C:\IQS\Maestro\IQS_DWDMTS folder.
4. Click **Save**. A window confirms the success (or failure) of the export operation and indicates where the file was saved.

5. Open a spreadsheet or word processor application to view the file. The file is a plain text file, as shown in the following examples. The columns (fields) are separated using the previously selected delimiter.

Generic DUT_Table.txt - Notepad

File Edit Format Help

```
Intall Kit Version:     2.0.0.0 Application version:     1.3.0.0
Tested on       2002-05-29 2:21:45 PM
Test status:    N/A


RESULTS:

        Out 1   Out 2   Out 3   Out 4
Design Wavelength (nm)  N/A     N/A     N/A     N/A
Measured Wavelength (nm)        1550.137        N/A     N/A     N/A
Difference (nm) N/A     N/A     N/A     N/A
Insertion Loss (dB)     5.747   68.727  68.022  67.677
Rejection (dB)  29.578  N/A     N/A     N/A
BW1: @ 1.00 dB (nm)     0.071   N/A     N/A     N/A
BW2: @ 3.00 dB (nm)     0.134   N/A     N/A     N/A
BW3: @ 20.00 dB (nm)    0.311   N/A     N/A     N/A
Flatness (dB)   0.127   3.695   3.838   3.768
Maximum Crosstalk (dB)  N/A     N/A     N/A     N/A
Total Crosstalk (dB)    N/A     N/A     N/A     N/A
PDL ITU (dB)    0.081   N/A     N/A     N/A
PDL (dB) on BW1 1.493   N/A     N/A     N/A
PDL (dB) on ITU ± 0.40 nm       3.429   N/A     N/A     N/A
PDL (dB) on 1509.00-1612.50 nm  3.429   43.223  40.460  34.807
PDBW (nm)       0.000   0.000   0.000   0.000
PDCW (nm)       0.000   0.000   0.000   0.000
ORL (dB)        N/A     N/A     N/A     N/A
Mask Type       Notch   Undefined       Undefined       Undefined
Pass/Fail Test Port     N/A     N/A     N/A     N/A


LIMITS:

        Out 1   Out 2   Out 3   Out 4
Design Wavelength (nm)  N/A     N/A     N/A     N/A
Measured Wavelength (nm)        1550.137        N/A     N/A     N/A
Difference (nm) N/A     N/A     N/A     N/A
Insertion Loss (dB)     3.00    3.00    3.00    3.00
Rejection (dB)  20.00   N/A     N/A     N/A
BW1: @ 1.00 dB (nm)     2.00    N/A     N/A     N/A
BW2: @ 3.00 dB (nm)     3.00    N/A     N/A     N/A
BW3: @ 20.00 dB (nm)    4.00    N/A     N/A     N/A
```

Generic DUT_ResultsTraces.txt - Notepad

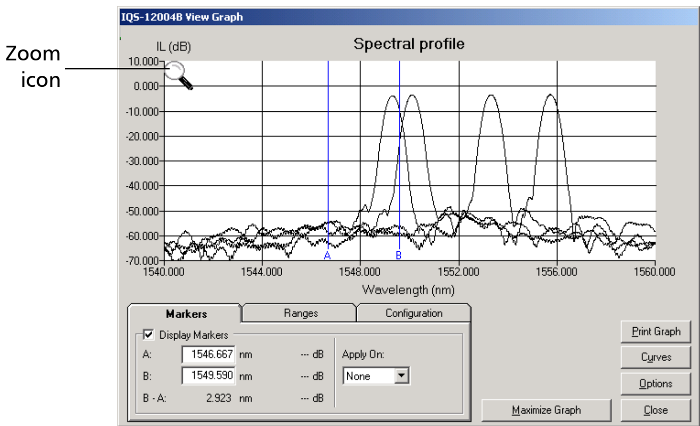
File Edit Format Help

```
Intall Kit Version:     2.0.0.0 Application version:     1.3.0.0
Tested on       2002-05-29 2:21:45 PM
Test status:    N/A

IL / PDL traces
Data points count       10655
Wavelength      IL1     PDL1    IL2     PDL2    IL3     PDL3    IL4     PDL4
1509.5140       -5.6962 0.1241  -66.6529        7.3315  -65.9358        6.8638  -65.5742        6.9371
1509.5236       -5.6965 0.1219  -66.5908        7.4392  -65.8869        6.9918  -65.5093        7.0425
1509.5332       -5.6956 0.1228  -66.5430        7.6695  -65.8381        7.3204  -65.4767        7.2411
1509.5429       -5.6960 0.1217  -66.5200        7.9733  -65.7918        7.6778  -65.3987        7.7138
1509.5525       -5.6946 0.1230  -66.4690        8.4122  -65.7611        8.0059  -65.3390        8.3041
1509.5621       -5.6952 0.1234  -66.4132        9.0348  -65.7015        8.5533  -65.3148        8.7229
1509.5718       -5.6949 0.1222  -66.4595        9.6036  -65.7368        9.1222  -65.3634        9.2143
1509.5814       -5.6949 0.1229  -66.5172        9.8878  -65.7614        9.5397  -65.3861        9.5128
1509.5911       -5.6949 0.1236  -66.5829        9.7291  -65.8043        9.5888  -65.4312        9.5921
1509.6007       -5.6942 0.1228  -66.6344        9.3400  -65.8902        9.0384  -65.5412        8.9653
1509.6103       -5.6947 0.1220  -66.7037        8.8035  -65.9887        8.5044  -65.5831        8.5449
1509.6200       -5.6949 0.1227  -66.7663        8.2895  -66.0430        8.0244  -65.6271        8.2150
1509.6296       -5.6944 0.1234  -66.7715        7.8627  -66.0675        7.5028  -65.6522        7.6498
1509.6392       -5.6944 0.1217  -66.7752        7.4277  -66.0456        7.1586  -65.6600        7.1848
1509.6489       -5.6937 0.1237  -66.7544        7.1995  -66.0202        6.9284  -65.6513        6.9190
1509.6585       -5.6943 0.1232  -66.7330        7.2478  -65.9802        6.9656  -65.6071        6.9412
1509.6681       -5.6946 0.1236  -66.6861        7.4835  -65.9387        7.1838  -65.5648        7.1637
1509.6778       -5.6940 0.1249  -66.5876        8.0422  -65.8670        7.5949  -65.4591        7.7122
1509.6874       -5.6948 0.1241  -66.4951        8.6452  -65.7995        8.1971  -65.4415        8.1810
1509.6971       -5.6955 0.1217  -66.5353        8.9935  -65.7724        8.8497  -65.3982        8.8796
1509.7068       -5.6959 0.1232  -66.5301        9.5504  -65.7820        9.3544  -65.4150        9.4847
1509.7165       -5.6959 0.1215  -66.5607        9.8747  -65.8398        9.4688  -65.4664        9.6920
1509.7262       -5.6959 0.1228  -66.6037        9.9235  -65.9091        9.3780  -65.5119        9.5427
1509.7359       -5.6969 0.1219  -66.6628        9.6232  -65.9633        9.1706  -65.5681        9.1677
1509.7456       -5.6972 0.1229  -66.7870        8.8977  -66.0631        8.5372  -65.6262        8.5874
1509.7554       -5.6967 0.1226  -66.8562        8.2275  -66.0903        7.9108  -65.7050        8.0010
1509.7651       -5.6962 0.1251  -66.8490        7.7514  -66.0663        7.6047  -65.7297        7.4643
1509.7748       -5.6977 0.1213  -66.8476        7.4375  -66.1015        7.2021  -65.7788        7.0205
1509.7845       -5.6977 0.1234  -66.8361        7.2447  -66.0912        7.0416  -65.7398        7.0035
1509.7942       -5.6981 0.1216  -66.7510        7.3172  -66.0036        7.0920  -65.6627        7.0020
1509.8039       -5.6979 0.1229  -66.7091        7.4186  -65.9604        7.2588  -65.6413        7.0871
1509.8136       -5.6993 0.1223  -66.6335        7.9190  -65.9129        7.6150  -65.5670        7.6663
1509.8233       -5.6982 0.1246  -66.6111        8.5862  -65.9000        8.0903  -65.5368        8.2463
1509.8330       -5.6995 0.1220  -66.5814        9.1112  -65.8893        8.7382  -65.5120        8.8888
```

Viewing the Results Graph

When you click **Show Graph** from the **View Results** window, the following window appears.



To enlarge or reduce the desired area with the zoom icon:

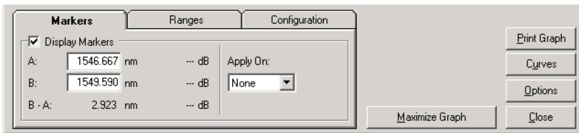
1. Place the cursor over the zoom icon. The cursor changes.
2. Drag and drop the zoom icon to the center of the area to enlarge.
3. Double-click the zoom icon with the left button to zoom in or with the right button to zoom out.

The graph displays the IL, PDL, and ORL measurements. You can independently select the types of measurement you want to view by checking the appropriate boxes in the **Display** box. In figure shown above, only the IL measurement is displayed.

Note: *IL and ORL are displayed using the same scale, and PDL is displayed on a separate scale. In order to obtain a bandpass orientation, IL is displayed as a negative value. In order to use the same scale, ORL is also displayed as a negative value.*

Markers

To perform a point-by-point analysis on a specific interval, select the **Markers** tab.



To view markers on the graph:

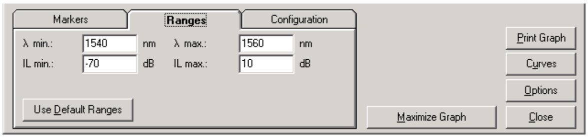
1. Check **Display Markers** to show the A and B markers on the graph.
2. Select the channel for which the values will be displayed in the **Apply On** list box.
3. Move the markers on the graph with your mouse, or enter precise wavelength values in the **A** and **B** text boxes.

   Loss values at marker positions and loss variation between the markers are shown for the selected channel.

Ranges

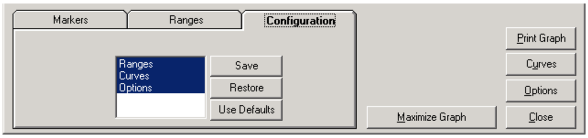
To define the graph scaling and visible ranges, select the **Ranges** tab. Click **Use Default Ranges** to return to the default values shown below at any time.

Note: *The default wavelength range is determined by the* Analysis Range *selected in the* Setup *window.*



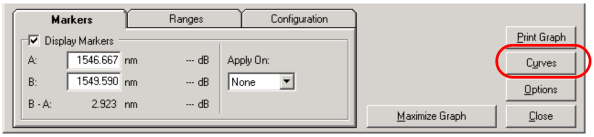
Configuration

To save the parameters defined for ranges, curves, and graph options, select the **Configuration** tab.



Curves

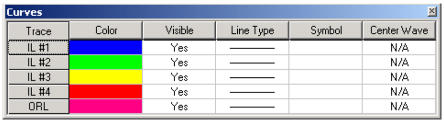
To modify the appearance of the curves, such as the color and the type of lines, click **Curves**.



The following options are available in the **Curves** window:

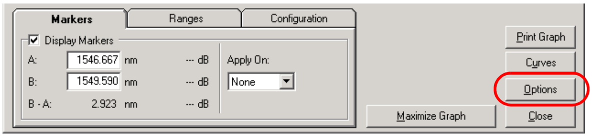
- **Color**: Click **Color** to select trace colors.
- **Visible**: Click **Visible** to indicate whether or not the trace is shown.
- **Line Type**: Click **Line Type** to select different line types for a trace.
- **Symbol**: Click **Symbol** to add symbols to the trace.
- **Center Wave**: Click Center Wave to display the central wavelength markers.

Clicking the top row changes all the values, and clicking a specific box changes only that value.



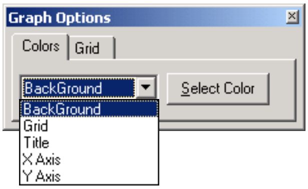
Options

To access the graph options, click **Options**.

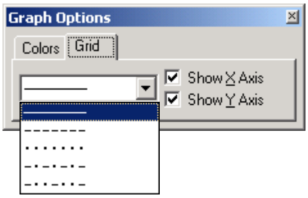


The **Graph Options** window contains the following tabs:

➤ **Colors**: Select the **Colors** tab to modify the color of the graph components such as the background, the grid, the title as well as the X and Y axes.

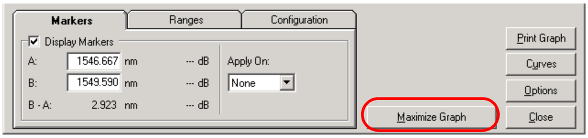


➤ **Grid**: Select the **Grid** tab to modify the type of lines for the X and Y axes.



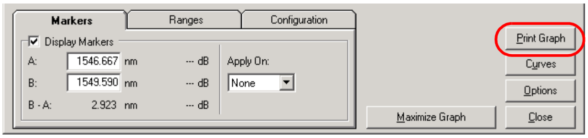
Maximize/Minimize Graph

To increase the size of the display area or to return to the display area’s original size, click the **Maximize/Minimize Graph** button.



Print Graph

To print the graph as displayed, click **Print Graph**.



Close

To close the **View Graph** window, click **Close**.

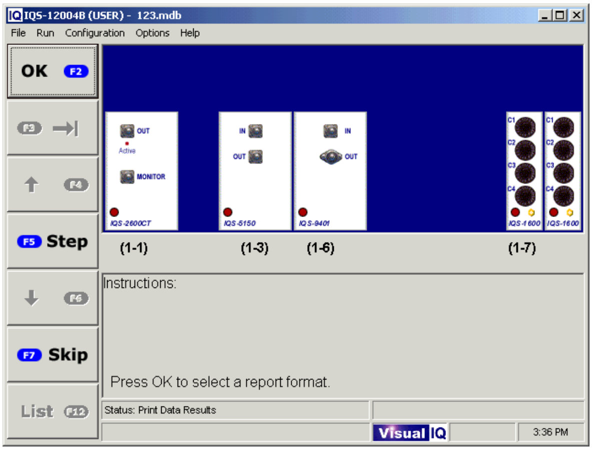
Printing Test Results

Once you have viewed the results, they can now be printed. Normally, the application brings you to this step automatically. If necessary, you can go directly to the Print Data Results step. For information on accessing a step, see *Accessing a Specific Test Step* on page 34.

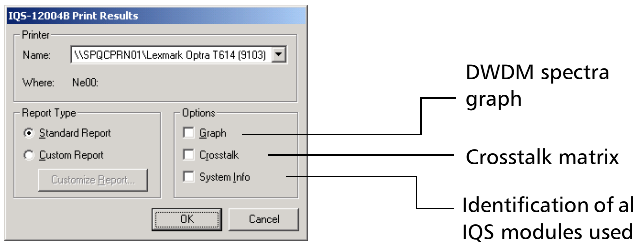
If you want to print the results from an already existing test, see *Using the Database Browser* on page 109.

To print a report of the results:

1. Click **OK** as indicated on the screen.



The **Print Results** window appears, allowing you to select the type of information you want to print.



2. Select the correct printer in the **Name** list box of the **Printer** section. If your printer is not in the list, you can add it from the Windows Control Panel.

3. In the **Report Type** section, choose whether you want a standard or a custom report by selecting the corresponding option button.

The **Options** section will only be enabled if you select **Standard Report**. In that case, check the appropriate boxes to include the desired information in the report.

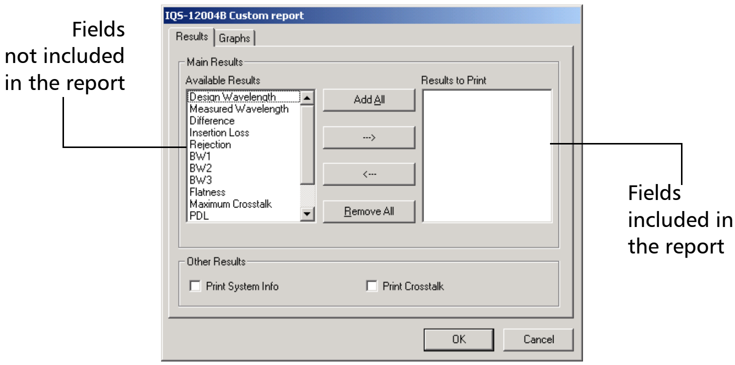
The **Customize Report** button will only be enabled if you select **Custom Report**. Clicking this button will display the **Custom Report** window, which contains two tabs: **Results** and **Graph**. For details, see *Customizing Printed Results* on page 105, and *Customizing Printed Graph* on page 106.

Note: *By default, the standard report includes only a data table. Select the appropriate options to include additional information.*

4. Click **OK** to print the report or click **Cancel** to simply go back to the main window. In both cases, you will be brought to the next step.

Customizing Printed Results

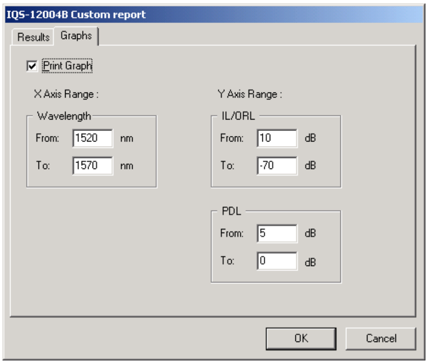
On the **Results** tab, you can select which information will appear on the report.



- ➤ The middle buttons (**Add All**, **—>**, **<—**, **Remove All**) are used to move a particular field from one box to the other.
- ➤ Check the appropriate boxes from the **Other results** section to add information to the report.

Customizing Printed Graph

The **Graphs** tab allows you to specify if and how the graph will be printed.



➤ Check **Print Graph** to include the graph in the report.

➤ Give the axis ranges in nm for the X axis, in dB for the IL/ORL Y axis, in dB for the PDL Y axis.

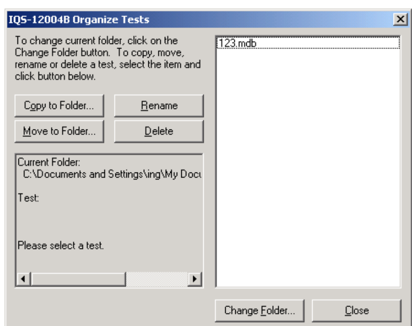
Organizing Tests

The IQS-12004B DWDM Passive Component Test System has an utility for organizing test files. This utility ensures that the database and all associated files are copied.

IMPORTANT

Do not to copy or move database files without using this utility for it may destroy test results.

The **Test Organizer** feature is accessible from the **File** menu. It allows you to copy (click **Copy to Folder**) or move (click **Move to Folder**) a selected database file to a new folder, or to rename (click **Rename**) or delete (click **Delete**) a selected file.



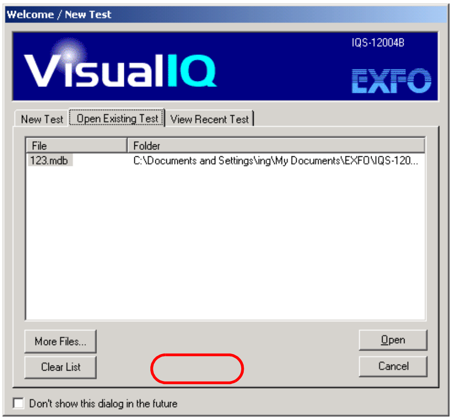
Running Windows Explorer from the Application

For file management, you can run Windows Explorer directly from the IQS-12004B DWDM Passive Component Test System.

To use Windows Explorer, select **Windows Explorer** from the **Run** menu.

Clearing Database Files from the List

When opening an existing test database or viewing a recent test database file, click **Clear List** if you want to clear the list of recently opened files.



Note: *Clearing the list does not delete the files.*

8 Using the Database Browser

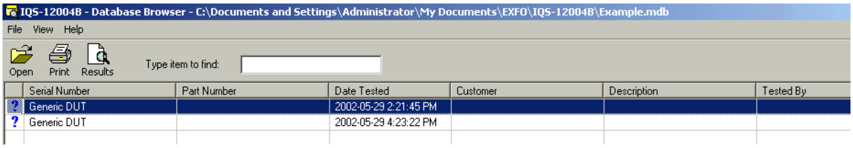
The system Database Browser allows you to view and print the contents of different databases and to export data without the need of any hardware module. It is automatically installed on your testing system. However, the Database Browser as well as the IQS-12004B DWDM Passive Component Test System software can also be installed on another PC, which allows you to analyze data, print reports, etc.

For more information on the IQS-12004B DWDM Passive Component Test System software installation, see *Installing the IQS-12004B DWDM Passive Component Test System Software* on page 28.

Opening the Database Browser

To open the database browser:

1. Select **Database Browser** from the **Run** menu, or select **View Database** from the **File** menu. The **View Test** window is displayed.
2. Select the database you want to consult in the dialog box.
3. Click **View**. The database opens and the main window is filled with information pertaining to previous tests. The path of the currently opened database is shown in the title bar.



Note: *If the database does not appear in the list, click **More Files** to find the desired database file.*

Each line corresponds to a DUT test. The first column identifies the DUT test result: ✘ for a failure, ✔ for a success, and **?** when no Pass/Fail analysis was done. You can resize a column width by moving the separator in the column title.

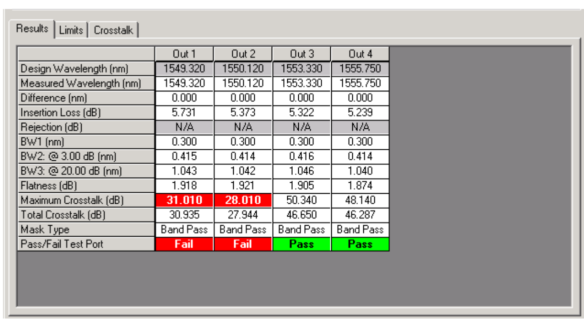
Browsing the Database

Use the vertical scroll bar to navigate between records in the open database. If you cannot see all the columns, scroll to the right using the horizontal scroll bar.

Viewing Test Results

Note: *This command is disabled (grayed out) if no database file is opened.*

Select **View Results** from the **View** menu, or click **Results** from the toolbar. The following window appears:



Results | Limits | Crosstalk

	Out 1	Out 2	Out 3	Out 4
Design Wavelength (nm)	1549.320	1550.120	1553.330	1555.750
Measured Wavelength (nm)	1549.320	1550.120	1553.330	1555.750
Difference (nm)	0.000	0.000	0.000	0.000
Insertion Loss (dB)	5.731	5.373	5.322	5.239
Rejection (dB)	N/A	N/A	N/A	N/A
BW1 (nm)	0.300	0.300	0.300	0.300
BW2: @ 3.00 dB (nm)	0.415	0.414	0.416	0.414
BW3: @ 20.00 dB (nm)	1.043	1.042	1.046	1.040
Flatness (dB)	1.918	1.921	1.905	1.874
Maximum Crosstalk (dB)	31.010	28.010	50.340	48.140
Total Crosstalk (dB)	30.935	27.944	46.650	46.287
Mask Type	Band Pass	Band Pass	Band Pass	Band Pass
Pass/Fail Test Port	Fail	Fail	Pass	Pass

For details about the elements in this window, see *Viewing Test Results* on page 90.

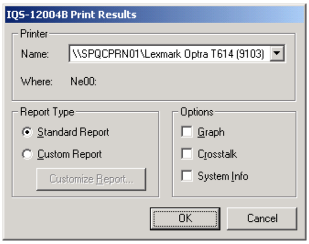
Click **Close** to return to the main window.

Printing a Report

Note: *This command is disabled (grayed out) if no database file is opened.*

To print a report:

1. Select **Print Report** from the **File** menu, or click **Print** of the toolbar. The following window appears:



2. Select the print settings you want. For details about the different parameters, see *Printing Test Results* on page 103.

3. Click **OK** to print the report or **Cancel** to simply go back to the main window.

Typing Items to Find

This feature allows you to find information displayed on the spreadsheet such as the serial number, the part number, the data tested and the customer.

Exiting the Database Browser

To exit the system Database Browser, select **Close** from the **File** menu.

9 Referencing the System with MultiPath Testing Option

This section presents the procedures to perform reference and calibration on your system when working with the MultiPath Testing Option. This is particularly useful if you develop your own MPT application (without using the provided LabVIEW application).

All the procedures presented in the current section are included in the LabVIEW application provided with the MPT option. If you intend to use the provided application, see *Testing Multiple DUTs with the LabVIEW Application* on page 117.

Nulling Electrical Offsets

The offset nulling process provides a zero-power reference measurement, thus eliminating the effects of electronic offsets and dark current due to detectors.

Temperature and humidity variations affect the performance of electronic circuits and optical detectors. For this reason, EXFO recommends performing a nulling of the electrical offsets whenever environmental conditions change.

IMPORTANT

Light must not reach the detector when nulling offsets.

A nulling should be performed during the initial installation, after the system has reached a stable operating temperature (approximately 30 minutes). It should be repeated if there is a significant change in environmental conditions. EXFO also recommends that a detector null measurement be performed, prior to the wavelength response calibration and/or before the return loss calibration. For more information, see *Nulling Electrical Offsets* on page 75.

To perform a null measurement:

1. Put protective caps on power meter detectors as well as on the input and output ports of the WRM.
2. Perform the null measurement.

OR

1. Connect the rigid and semi-rigid patchcords to the appropriate modules (source, polarization state adjuster, wavelength reference module and switch). See *To work with the MultiPath Testing Option, you will have to add a switch to your standard IQS-12004B DWDM Passive Component Test System to benefit from its inherent features.* on page 26 for more information.
2. Put protective caps on power meter detectors.
3. Turn the source off.
4. Perform the null measurement.

Calibrating the System Wavelength Response

This operation allows to correct any variations in the response and sensitivity of the different power meters.

To perform a wavelength response calibration:

1. Connect output port 1 of the switch to channel 1 of the power meter.
2. Perform the wavelength response calibration.
3. Repeat the previous steps with all of the remaining power meter channels.

Calibrating Your System for ORL Testing

This operation measures ORL in the system before testing DUTs. The results obtained will be used to calculate the ORL specific to the DUTs.

To perform an ORL calibration:

1. Connect an ORL reference test jumper to output port 1 of the switch.
2. Perform an ORL calibration scan.
3. Mandrel the ORL reference test jumper.
4. Perform an ORL zero measurement.
5. Repeat steps 1 to 4 for all of the switch ports.

Optimizing Power

This operation allows to adjust the power from the IQS-5150 to its optimum level.

To optimize power:

1. Connect the patchcords to the appropriate modules (source, polarization state adjuster, wavelength reference module and switch) .
2. Connect output port 1 of the switch to channel 1 of the power meter.
3. Perform the power optimization.

Performing Reference Measurements

An IL reference is performed to compensate for any loss or spectral non-uniformity of the launch-fiber connection to the WRM output port.

To perform an IL reference:

1. Connect output port 1 of the switch to channel 1 of the power meter.
2. Perform an IL reference measurement.
3. Repeat the above steps for each of the remaining switch output ports by connecting the switch port to channel 1 of the power meter.

An IL/PDL reference is performed to compensate for any loss or spectral non-uniformity of the launch fiber connection to the WRM output port.

To perform an IL/PDL reference:

Note: *References are valid as long as rigid and semi-rigid patchcords do not move.*

1. Connect output port 1 of the switch to channel 1 of the power meter.
2. Perform an IL/PDL reference measurement.
3. Repeat the above steps for each of the remaining switch output ports by connecting the switch port to channel 1 of the power meter.

The return-loss zero measurement provides a zero-reflection reference to the WRM return loss detector. This reference will be used to compensate for internal WRM parasitic reflections as well as parasitic reflections originating at the WRM output/launch-fiber connector.

To perform an ORL zero-reference measurement:

1. Connect the launch fiber to output port 1 of the switch.
2. Mandrel the launch fiber.
3. Perform the measurement.
4. Repeat the preceding steps for each switch port.

10 Testing Multiple DUTs with the LabVIEW Application

The MultiPath Testing Option comes with a “prebuilt” application and with a series of VIs and COM functions you can use to develop your own MPT application.

If you choose to build your own application and you need information on referencing the system, see *Referencing the System with MultiPath Testing Option* on page 113.

The LabVIEW application provided with the MultiPath Testing Option allows you to:

- Reference and calibrate the system

  Referencing and calibrating the system are necessary in order to ensure optimum accuracy. References are saved to a file for future tests. References are valid as long as rigid and semi-rigid patchcords do not move, and no new power optimization is performed. Power optimization deletes all the previous references, so they will have to be taken again. Referencing and calibrating include:

  - performing a null measurement
  - optimizing power
  - calibrating the wavelength response of the system
  - calibrating the system for return loss (ORL) testing
  - performing reference measurements for IL, PDL and ORL.

- Define the connectivity of the devices to be tested (DUT), save connectivities and reload them.
- Configure tests.
- Perform tests on the defined DUTs sequentially.
- View test results, export them and print them.

Starting a New Test

In order to perform calibrations, references and tests, you must first create a new test database. From the **File** menu, select **New**. The following dialog box is displayed.

To create a test database:

1. Ensure that the path appearing in the entry box is appropriate. If not, use the browse button (the one with a folder icon) to specify the folder you want.
2. To specify a name for your new test, you can directly type it in the entry zone or use the browse button. If you use the name of an already-existing test, the data related to this test will be lost.
3. If you want to perform a test in real mode, make sure the switch appearing in the **Switch Selection** box is appropriate. If necessary, use the up and down arrows to select the switch that will suit your needs.

   If the **Switch Selection** box only displays **None**, make sure that

   - the switch has been added to the system
   - it is properly connected (EXFO switch)
   - the GPIB has been correctly configured (external switch)

   When the switch is set to **None**, the system can only be used in simulation mode.

   If you want to perform a test in simulation mode, click **Simulator**. All the necessary hardware will be simulated to start IL, PDL and ORL tests.

Note: *The hardware section is only available when the modules have not been initialized.*

4. Click **OK**.

Opening an Existing Test Database

Previous tests can be loaded for on-screen viewing, printing and exporting.

To open an existing test database:

1. Select **View** from the **File** menu of the main window.
2. Select the test to open. Click **Open**.
3. The information is automatically loaded into the main window.

Note: *The **DUT Connectivity** and **Acquisition Settings** tabs are not available in view mode. Also, **System** menu and **System Info** from the **Help** menu are not available. To view the DUT connectivity, use the export tool (see* Exporting Test Results *on page 136)* *or the graph settings tool (see* Adjusting Result Settings *on page 134).*

Setting Up Device (DUT) Connectivity Configuration

The **DUT Connectivity** tab of the main window has been designed to specify switch port numbers and power meter channels to which the devices under test are connected. It is also possible to save a connectivity and to reload an existing one.

The window can be divided into two main parts:

➤ A connectivity definition section that allows to identify each device and to specify how it is connected in the system.

➤ An open/save section that allows the saving and the reloading of connection plans.

To set up a connectivity configuration:

1. If the **DUT Connectivity** tab is grayed out, that means no test has been created since the application was started. To enable the tab, start a new test. For more information, see *Starting a New Test* on page 118.
2. With the help of the up/down arrows, select the appropriate number of switch ports and power meter channels.
3. In the **S/N** text box, enter the serial number or a description of the device to be tested.
4. If you want the device to become a reference, click **Reference**. Once the definition will be sent to the grid, DUTs having been defined as a reference will be indicated by a **1**.
5. Click **Add** to transfer the information to the connectivity grid.

Note: *You can remove items from the grid by clicking* ***Delete****. Rows are deleted one at a time from the bottom of the grid to the top.*

6. Repeat steps 2 to 5 for each DUT that must be added.

Note: *When there are no more available switch ports (In) or power meter channels (Out) i.e. when their number equals zero, you won't be able to add anymore DUTs to the connectivity grid.*

Although connectivity configurations do not need to be saved to disk in order to be used in the current test session, you may find it useful to store it for future tests.

To save the current connectivity configuration:

1. Click **Save**.
2. From the dialog box, specify the name of the connectivity and click **Save**. The name of the new connectivity file is now displayed in the **Configuration File** box, at the bottom of the tab.

To reload a DUT connectivity configuration:

1. Click **Open**.
2. From the dialog box, select the connectivity file that you want to use (file with a *.dut* extension) and click **Open**. The file content has been automatically loaded onto the grid.

Configuring Test Parameters

The **Acquisition Settings** tab has been designed to specify all the necessary parameters for the system to perform a test.

To configure test parameters:

1. If the **Acquisition Settings** tab is grayed out, that means no test has been created since the application was started. To enable the tab, start a new test. For more information, see *Starting a New Test* on page 118.
2. From the **Measurement Selection** zone, select the types of tests you want to perform.
3. Indicate the appropriate values in dB for bandwidth analysis. For central wavelength, select BW1, BW2 or BW3 from the list. For more information on bandwidth and central wavelength, see *Definitions and Calculation Methods* on page 405.

4. From the **Acquisition Mode** section, select the type of acquisition that best suits your needs.

   A sequence is a set of acquisitions performed in the order in which the DUTs were added when setting up the DUTs' connectivity.

   Select **Single** if you want the measurements to be taken only once.

   Select **Continuous** if you want the system to perform successive sequences. Specify the number of sequences you want by using the up/down arrows or by typing the value in the text box.

   Select **Periodic** if you want the system to perform a series of sequences separated by a time interval. Specify the number of minutes between sequences. Also indicate the number of sequences to perform during the test.

5. Specify the **Acquisition Range** by entering a start value and a stop value in nanometers.

6. In the **Acquisition Type** section, you can specify a resolution in picometers.

7. By default, only analysis traces are saved. If you also want the data traces to be saved, click **Save All Data Curves**.

Note: *Saving all data curves will dramatically increase used space on the computer disk.*

Nulling Electrical Offsets

This feature allows you to perform an electrical offset nulling of the power meters. For more information, see *Nulling Electrical Offsets* on page 75.

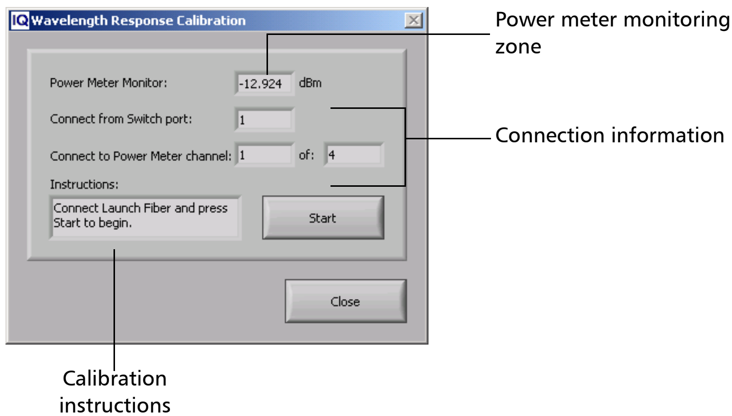
To null the electrical offsets:

1. If the **System** menu is grayed out, that means no test has been created since the application was started. Consequently, no nulling can be performed until you start a new test. For more information, see *Starting a New Test* on page 118.
2. Select **Nulling** from the **System** menu of the main window.
3. Put protective caps on power meter detectors as well as on the input and output of the IQS-9401 WRM as described at the top of the dialog box.
4. During a nulling, no light should reach the detectors. To avoid disconnecting the rigid patchcords, click **Turn Source Off**. The source and the EDFA will be turned off as soon as you press **Start**. Once the nulling is complete, the source is automatically turned on.
5. Click **Start** to start the null measurement. The **Instruction** box displays Nulling in progress.
6. When the operation has been completed, the **Instruction** box content changes to Nulling completed. Click **Close** to return to the main window.

Calibrating the System Wavelength Response

This feature allows you to correct variations in the response and sensitivity of the different power meters. If you need more information on wavelength response calibration, see *Wavelength Response Calibration* on page 78.

To calibrate the system wavelength response, select **Wavelength Response Calibration** from the **System** menu of the main window.



The dialog box can be divided into three main parts:

- A monitoring zone that allows you to verify the power read on the power meter, in dBm.
- A connection information section that indicates between which switch port and which power meter channel the fiber should be connected.
- A section that displays useful instructions about wavelength response calibration.

To perform a wavelength response calibration:

1. If the **System** menu is grayed out, that means no test has been created since the application was started. Consequently, no calibration can be performed until you start a new test. For more information, see *Starting a New Test* on page 118.
2. Select **Wavelength Response Calibration** from the **System** menu of the main window.
3. Connect start fiber to the specified switch port and power meter channel.
4. When you are satisfied with the value displayed in the **Power Meter Monitor** box, click **Start**.
5. Repeat steps 3 and 4 for each power meter channel. The *connection information* section provides you with the number of the switch port and the number of the power meter channel indicating where the patchcord must be connected.
6. When you are done with wavelength response calibration, simply click **Close** to return to the main window.

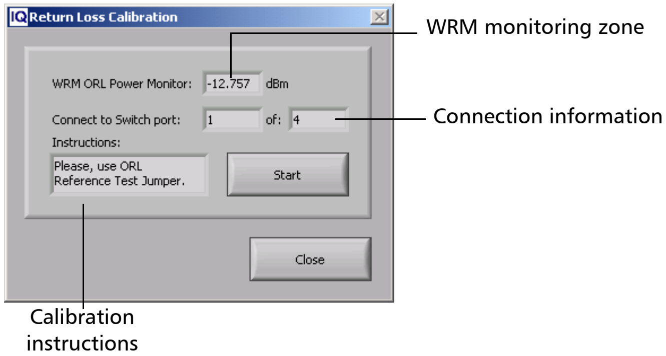
Note: *The zone labeled **Instructions** guides you through the whole wavelength response calibration process.*

Calibrating your System for ORL Testing

The current section gives you the information you need to perform an ORL calibration. This operation measures ORL in the system before testing DUTs. The results obtained will be used to calculate the ORL specific to the DUTs.

If you need more details about ORL calibration, see *Return Loss Calibration* on page 80.

From the **System** menu of the main window, select **Return Loss Calibration**. The following dialog box is displayed.



The dialog box can be divided into three main parts:

- A monitoring zone that allows you to verify the power read from the WRM, in dBm.
- A connection information section that indicates which switch port the reference test jumper should be connected to.
- A section that displays useful instructions about ORL calibration.

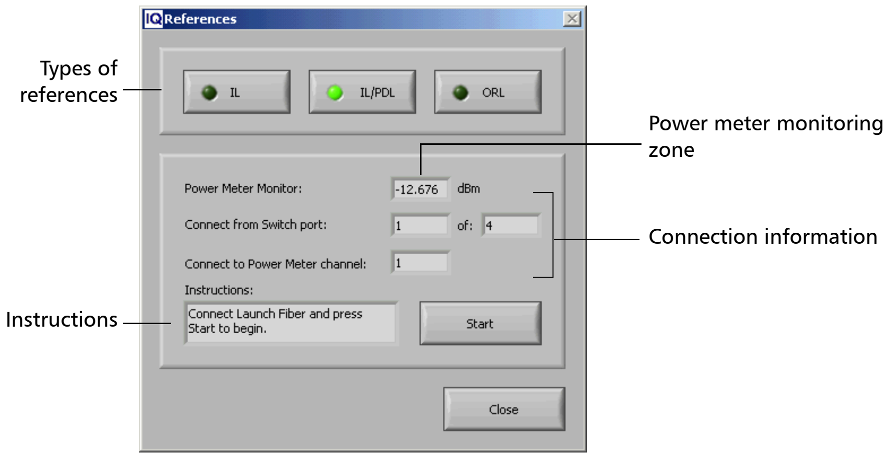
To perform an ORL calibration:

1. If the **System** menu is grayed out, that means no test has been created since the application was started. Consequently, no calibration can be performed until you start a new test. For more information, see *Starting a New Test* on page 118.
2. Select **Return Loss Calibration** from the **System** menu of the main window.
3. Connect an ORL reference test jumper to the specified port.
4. When you are satisfied with the displayed value in the WRM monitoring box, click **Start**.
5. Mandrel the reference test jumper as specified in the *calibration instructions* section and click **Start**.
6. Repeat steps 3 to 5 for each switch port. The *connection information* section provides you with the number of the switch port on which calibration must be performed.
7. When you are done with ORL calibration, simply click **Close** to return to the main window.

Note: *The zone labeled **Instructions** guides you through the whole ORL calibration process.*

Performing Reference Measurements

Once the calibration is complete, you will have to perform reference measurements. More detailed information about references can be found in *Performing Reference Measurements* on page 82.



The dialog box can be divided into four main parts:

- A section that specifies the types of reference measurements that can be performed on the system: IL, IL/PDL, ORL
- A monitoring zone that allows you to verify the power read from the power meter, in dBm
- A connection information section that indicates to which switch port and to which power meter channel the fiber should be connected
- A section that displays useful instructions about reference measurements

Note: *When choosing a type of reference, take into account that a reference measurement must have been previously taken for the type of the tests you will perform. For instance, if an IL/PDL reference measurement has been previously taken, you will be able to perform IL tests. However, with such a reference measurement, ORL tests will not be possible.*

To perform reference measurements:

1. If the **System** menu is grayed out, that means no test has been created since the application was started. Consequently, no references can be performed until you start a new test. For more information, see *Starting a New Test* on page 118.
2. Select **References** from the **System** menu of the main window.
3. Select the reference type you need.
4. Connect start fiber to the specified switch port and power meter channel.
5. When you are satisfied with the value displayed in the power meter monitoring box, click **Start**.
6. Repeat steps 4 and 5 for each switch port. The *connection information* section provides you with the number of the switch port and the number of the power meter channel to which the patchcord must be connected.

Note: *You only need to reference the switch ports that you plan to use, starting sequentially at channel 1.*

7. Repeat the above procedure for each reference type you need.
8. When you are done with reference measurements, simply click **Close** to return to the main window.

Note: *The zone labeled* ***Instructions*** *guides you through the whole reference measurement process.*

Performing a Test

In the acquisition window, data is presented both in a graph and in a grid. In the grid, the information is given for all the Out ports of the current sequence. Depending on the type of the selected graph, certain items will differ.

➤ If the selected graph corresponds to an acquisition trace (IL trace, PDL trace or ORL trace), the X axis will represent wavelength values and the Y axis, dB values. The grid will show the greatest value among all the values that have been measured for a particular test type.

➤ If the selected graph corresponds to an analysis curve, the X axis will present absolute time values and the Y axis, will present dB values, except for a Central Wavelength curve for which the Y axis will present values in nm. The grid will show all the values that have been measured for a particular test type, at a given time.

Note: *A change in the graph type will be effective on the next acquisition only.*

There are three buttons to control the execution of the test:

➤ **Start**: Allows you to start the acquisition process. Once the test has started, all the menus and buttons become disabled except for the **Pause** and **Stop** buttons. At the end of the test, menus and buttons become enabled.

➤ **Pause**: Allows you to momentarily stop the test. When a test is paused, it is possible to adjust graph settings and to export the results. Simply click **Resume** to restart the test. Pausing the test is only possible between sequences.

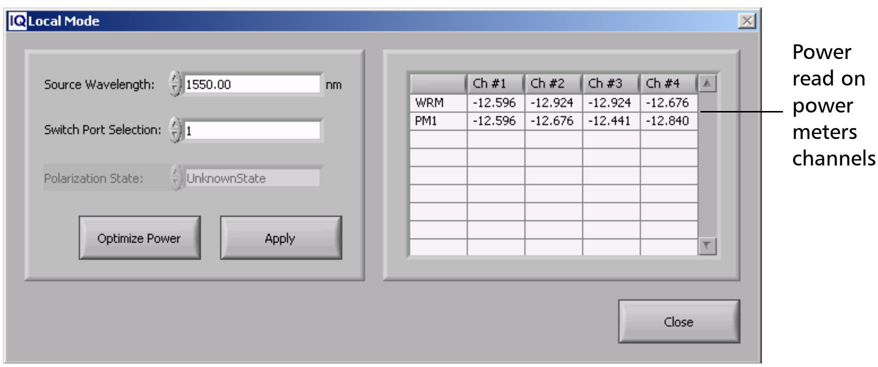
➤ **Stop**: Allows you to stop completely the test. Stopping the test is only possible between sequences.

Monitoring Modules in Local Mode

Local Mode gives a general overview of the system. It can be used anytime except when a test is running.

If the **System** menu is grayed out, that means no test has been created since the application was started. Consequently, it is impossible to monitor modules in local mode until you start a new test. For more information, see *Starting a New Test* on page 118.

To access this mode, select **Local Mode** from the **System** menu.



The window contains:

➤ A section that allows you to set the wavelength. The minimum and the maximum values are determined by the supported range of the source itself.

➤ A section that allows you to set the switch port.

➤ A section that allows you to set the polarization state.

Note: *The first time you work with the system, the polarization state appears as "Unknown* State"*. Use the* ***Optimize Power*** *button to get the system to determine a valid polarization state (*"Linear Horizontal"*). Although it is possible to optimize power at any time except when a test is running, be aware that optimizing will result in the deletion of all the references that were taken previously.*

As soon as a valid state is displayed, you can modify it using the up and down arrows if the one presented does not suit your needs.

➤ A display zone that allows you to see the output power of the WRM channels and of all the power meters, in dBm.

Note: *For the WRM, channel 1 (**Ch #1**) corresponds to the power reference and channel 4 (**Ch #4**) to the value read on the ORL detector.*

When you are done with the settings, simply click **Apply** so the modifications will be taken into account. Click **Close** to return to the main window.

Viewing System Information

To view all relevant information about the system modules (identification, serial number, slot position), select **System Info** from the **Help** menu.

If the **System Info** option is grayed out, that means no test has been created since the application was started. Consequently, it is impossible to consult modules' information until you start a new test. For more information, see *Starting a New Test* on page 118.

You can print the information on the default printer by clicking **Print**.

Adjusting Result Settings

When you click **Result Settings** from the **Acquisition** tab, the following dialog box is displayed.

There are two possible graph types: **Analysis** and **Acquisition**. If you select **Analysis**, a graph showing analysis results will present dB values (or nm values for central wavelength) corresponding to absolute time values. If you select **Acquisition**, a graph displaying data traces will include dB values corresponding to all of the wavelengths swept during the displayed acquisition.

To set up an Analysis graph:

1. Select the DUT, the In port and the Out port for whose results you want to view in a graph.
2. Select **Analysis**.
3. Select the desired curve type from the provided list.
4. Confirm by clicking **Apply**.

To set up an Acquisition graph:

1. Select the DUT, the In port and the Out port whose results you want to view in a graph.
2. Select **Acquisition**.
3. Select the desired trace type (IL, PDL, ORL).
4. Specify the sequence results you want to see by indicating the values in the **Sequence From** and **Sequence To** boxes.
5. Confirm by clicking **Apply**.

Exporting Test Results

You may want to have the tests results exported to a text file for further analysis. The export feature creates such a file with the information that you choose to include.

When you click **Export** from the **Acquisition** tab, the following dialog box is displayed.

Note: *The DUT connectivity grid acts as a reminder to guide you in the selection of data to be exported to a text file.*

To export data to a text file:

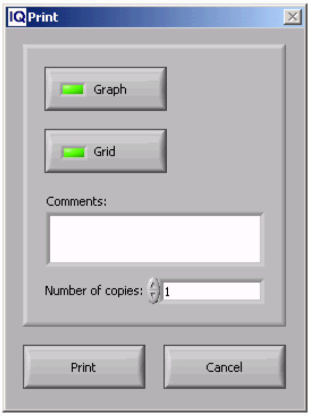
1. Select the DUT for which you want the results.
2. Select the In port and the Out port.
3. Select the sequences of results you want to export by indicating a value in the **Sequence From** and **Sequence To** boxes.
4. Choose between analysis results and trace data results by clicking the corresponding button.

   If you select **Analysis**, dB values (or nm values for central wavelength) corresponding to absolute time values will be exported.

   If you select **Traces**, dB values corresponding to all of the wavelengths swept during the displayed acquisition will be exported.
5. If you want column headers to be added to the file content, click **With Header**.
6. In the corresponding entry box, type a path and a filename for the file you want to export. Click **Export**. A message will be displayed as soon as the export will be completed.
7. Click **Close** to exit the export tool.

Printing Test Results

When you click **Print** from the **File** menu, the following window is displayed.



Information that will be sent to the printer corresponds exactly to the results that are displayed on the screen (graph and/or grid).

To print test results:

1. Select **Graph** and/or **Grid**, depending on your needs.
2. Use the **Comments** box to add any comments.
3. Specify the number of copies.
4. Click **Print** to send the document to the default printer.

Modifying the Supplied MPT Application

The source code for the supplied LabVIEW application is available should you want to modify it according to your needs. The source code can be found in the *Iqs12004Mpt\Src* folder. It is divided in two main parts:

- The code for user interfaces is located in the *Main* folder. In this folder, each of the subfolders corresponds to a particular user interface.
- The code to access COM objects is located in the *COMAccess* folder. In this folder, you will find code samples using some of the COM objects offered with the *Acq12004B* dll. For more information, see *Automating or Remotely Controlling the System* on page 167, *Referencing the System with MultiPath Testing Option* on page 113 and *COM Objects Reference* on page 269.

11 Using the Wavelength Calibration Software

The Wavelength Calibration software uses a Hydrogen Cyanide ($H_{13}C_{14}N$) absorption cell with 100 torr of pressure. Considered as a calibration reference, it covers the region from 1530 nm to 1560 nm and uses 16 very precise lines to perform the calibration.

This software performs scans using the $H_{13}C_{14}N$ cell as a DUT and compares the measured spectral values with the certified spectral values. The software then analyses the average deviation and calculates a correction factor to be applied to the calibration of the IQS-9401 Wavelength Reference Module (WRM).

Overview of the Application

The application's interface is divided into several steps; each step must be performed correctly before gaining access to the next step. Because the application is based on a Wizard (i.e. **Next** and **Back** buttons are used to move from window to window), the **Next** button is not available until the step has been completed.

Simply follow the Wizard to determine which step to perform: the step to perform and that is in progress will be displayed in bold; and a green checkpoint will appear to the left of the steps already completed.

The **Stop** button is available only during certain steps, which are **Wavelength Response**, **Reference** and **Acquisition**. A progress bar as well a message will always be present above this control indicating the operation presently in progress.

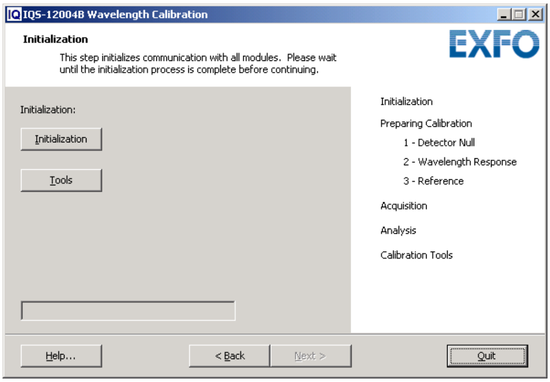
If necessary, online help is available by clicking **Help**, then **Online Manual**. In addition, the **Quit** button is accessible at all times.

To start the application:

from the **Start** menu, select **Programs >EXFO >IQS-12004B >Tools > IQS-12004B Wavelength Calibration.**

Initializing the Modules

The following window appears, allowing you to proceed with the **Initialization** step.



When the **Initialization** button is selected, all modules present in the system will be initialized. Once initialization has been successfully performed, you will be able to access the next step, **Preparing Calibration**.

When the **Tools** button is selected, only the IQS-9401 WRM will be used. This step has two functions:

- To save a copy of the calibration file in the directory of your choice.
- To replace the current calibration in the IQS-9401 WRM module with a new one, i.e. the **Factory Default** or one from a previous calibration file.

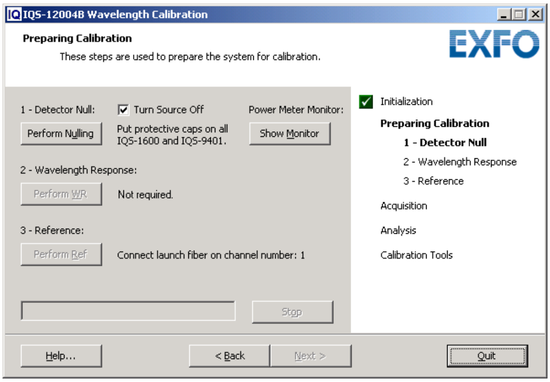
Preparing the Calibration

The second step, **Preparing Calibration**, is divided into three sub-steps:

- Detector Null
- Wavelength Response
- Reference

These three steps must be successfully completed before gaining access to the next step. A description of each of these sub-steps is provided in the following window.

The **Show Monitor** button is used to show the power readings of each IQS-1600 Power Meter and IQS-9401 WRM, in real time. The window can be left open during the entire procedure, as it is not accessible during *Acquisition*. Also, the **Stop** button is accessible only while *Wavelength Response* and *Reference* testing are being performed.



Nulling Electrical Offsets

The offset nulling process provides a zero-power reference measurement, thus eliminating the effects of electronic offsets and dark current due to detectors.

Temperature and humidity variations affect the performance of electronic circuits and optical detectors. For this reason, EXFO recommends performing a nulling of the electrical offsets whenever environmental conditions change.

IMPORTANT

Light must not reach the detector when nulling offsets.

The nulling is performed on all channels of the IQS-1600 Power Meters as well as those on the IQS-9401 WRM. It is important to put protective caps on all channels on these modules. Using the **Turn Source Off** option avoids having to disconnect rigid patchcords; when used, you must wait at least 30 minutes after the source is turned on to allow it to warm up.

Wavelength Response

The wavelength response is the system's wavelength calibration.

If it has already been performed (by the IQS-12004B DWDM Passive Component Test System system), this sub-step can be skipped. Therefore, the same calibration measurements will be used and the message *Not required* will appear.

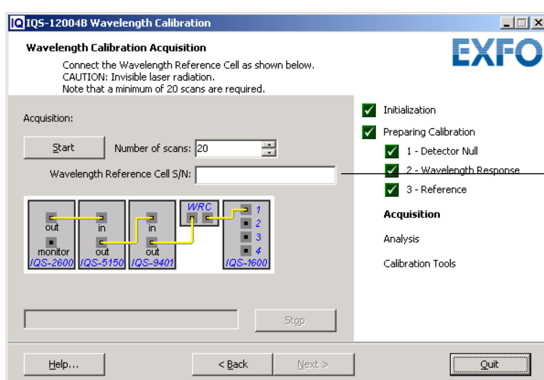
However, if it has not already been performed, the IQS-9401 WRM output must be connected to the first channel of the first IQS-1600 Power Meter, as indicated to the right of the **Perform WR** button. The *Wavelength Response* sub-step follows the order of the channels, from first to last. In addition, if a IQS-5150 Polarization State Adjuster is present in the system, the *Optimize Power* command will be performed prior to calibration.

Reference

A power reference on the IQS-12004B DWDM Passive Component Test System must be performed once a *Nulling* or a *Wavelength Response* has been performed. The reference will be preceded by a power optimization, if the software detects the presence of an IQS-5150 PSA and if the *Wavelength Response* was not required. Once the reference has been taken, you will be able to access the next step, *Acquisition*.

Performing the Acquisition

During this step, different connections must be made, that is, the absorption cell must be connected to the output of the IQS-9401 WRM as well as positioning the output of the cell in the first channel of the first IQS-1600 Power Meter. You can enter the serial number of the NIST cell that you are using for the test in the **Wavelength Reference Cell S/N** box.
A minimum of 20 scans is required, after which you can access the next step, *Analysis*. The **Stop** button may be used at any time.

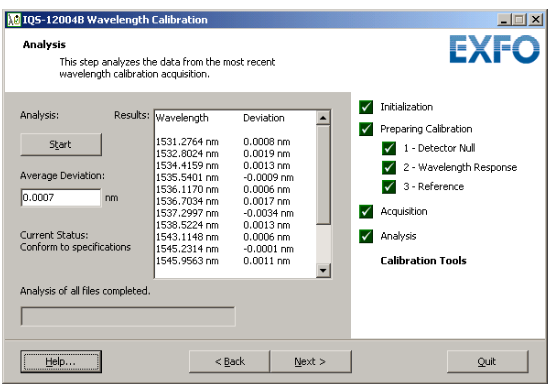


NIST cell's serial number

Analyzing the Results

The *Analysis* step analyses acquisitions taken, providing a result for 16 lines; the average of these results determines the average deviation to be applied to all of the calibration constants on the IQS-9401 WRM. The first column of **Results** lists the wavelengths that have been certified in nanometers, and the second lists the deviation detected by the system, in picometers. The average deviation found is the value, in picometers, that will be applied to all calibration constants of the IQS-9401 WRM module.

If the cell was not connected during the *Acquisition* procedure, no results will be available (N/A) and an error message will be displayed. In addition, if one or several of the 16 lines were not detected on one or several of the 20 acquisitions, the same error message will be displayed. If application of the average deviation is desired, the next step, *Calibration Tools*, will become available to perform it.

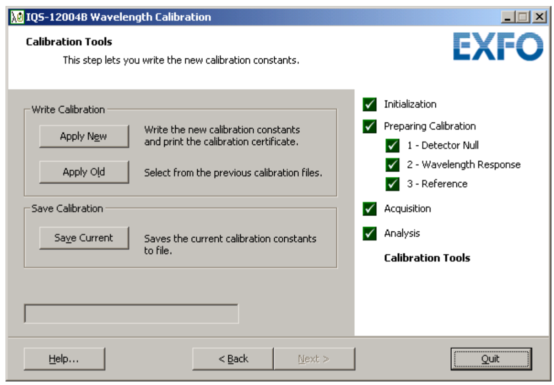


Using Calibration Tools

There are two ways to access this step:

➤ By clicking **Tools** during the first step.

➤ By carrying out the entire process.



➤ **Apply New**: writes the new calibration constants found for the IQS-9401 WRM module and displays a calibration certificate. For more information on the calibration certificate, see *Viewing and Printing a Calibration Certificate* on page 146. However, if the whole process is not performed, you will not be able to access the **Apply New** button because no calibration constants have been found.

➤ **Apply Old**: Accessible even if the whole calibration process is not performed. It re-writes calibration constants, by applying an old calibration file or the *Factory Default*.

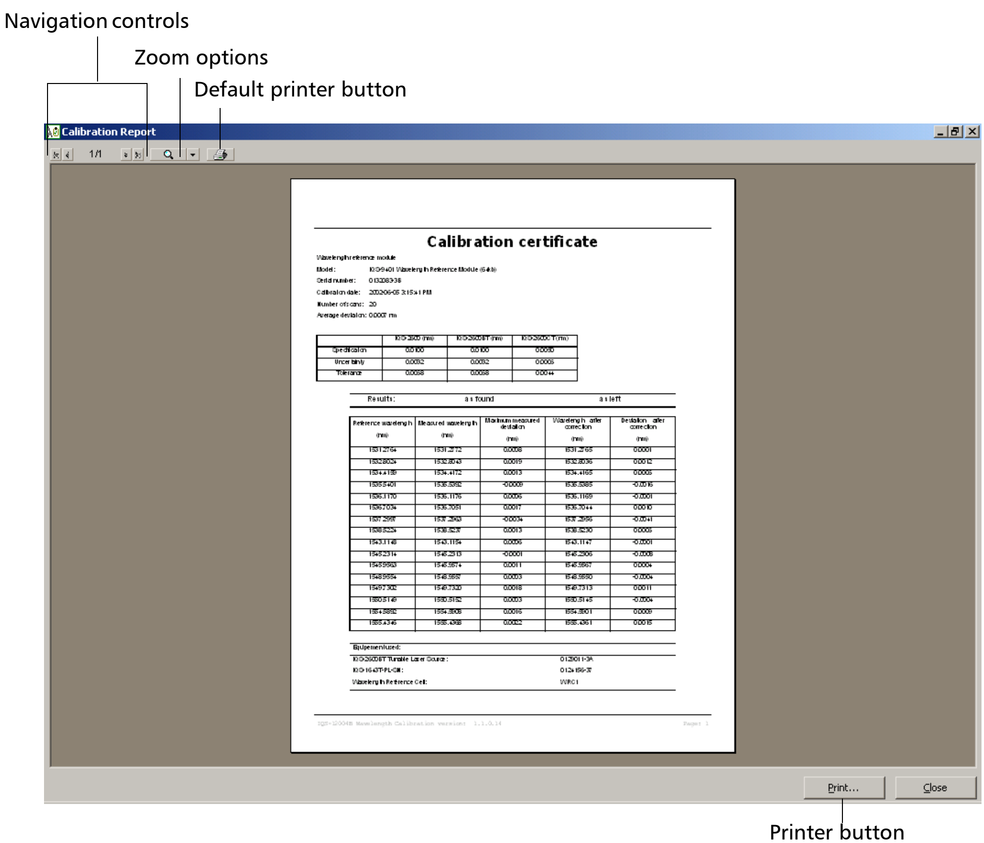
➤ **Save Current**: Accessible even if the whole calibration process is not performed. It allows you to save the current calibration constants to a binary file identified with the following format name: *SerialNumber-Date-Hour.dat*.

Viewing and Printing a Calibration Certificate

Once the calibration is complete, you may find it useful to view and/or print calibration information.

To view a calibration report:

Click **Apply New**. The **Calibration Report** window is displayed.



To browse through the document:

Use the  and  buttons. You can also adjust the zoom factor with the  button.

To print the certificate:

Use the  button to send it to the default printer or the **Print** button to send it to a printer you will have selected.

To come back to the calibration tool:

Click **Close**.

12 Using the Power Meter Linearity Verification Tool

Results' accuracy is influenced by the linearity of the power meters used in your system. Ideally, the readings of a power meter should be accurate at each power level.

The Power Meter Linearity Verification tool has been designed to detect changes in linearity, ensuring that you get the best possible results from your IQS-12004B DWDM Passive Component Test System.

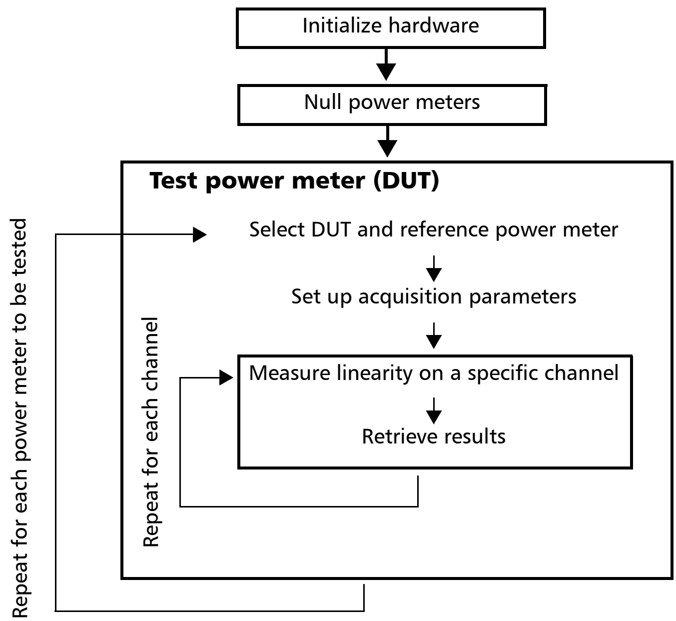
IMPORTANT

To optimize results' accuracy, EXFO recommends that you perform a linearity verification every six months or at least once per year.

If the linearity of a power meter seems inappropriate, please contact EXFO. For information, see *Contacting the Technical Support Group* on page 223.

The linearity verification is accomplished by comparing the values read from the power meter to be tested to the readings taken from a calibrated power meter, acting as a reference.

The following diagram illustrates the steps of a typical linearity verification sequence that can be performed with the tool.

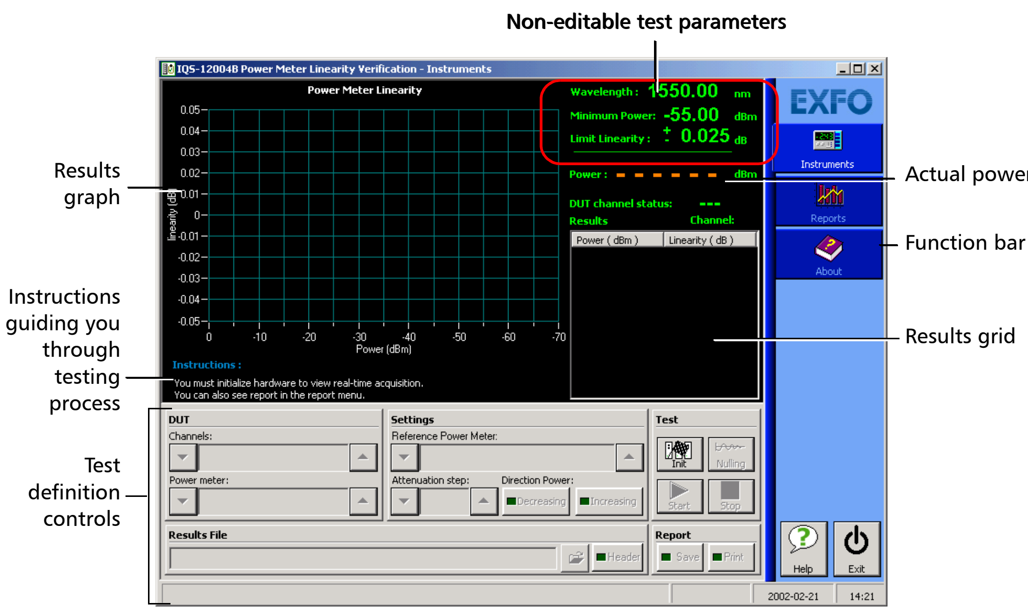


Starting and Exiting the Application

To start the application:

from the **Start** menu, select **Programs >EXFO >IQS-12004B** >Tools > **IQS-12004B PM Linearity Verification.**

The **Instruments** window is displayed.



Closing any application that is not currently being used is a good way to free up system memory.

To close the Power Meter Linearity Verification tool:

➤ Click (in the top right corner of the main window).

➤ Click **Exit** located at the bottom of the function bar.

Connecting the Modules for Linearity Testing

With the Power Meter Linearity Verification tool, you can test one or many power meters. Since verification is performed on one power meter at a time, the connections remain the same, regardless of the number of modules to be verified. Only the connections for the device channels will change.

CAUTION

Never insert or remove a module while the controller or expansion unit is turned on. This will result in immediate and irreparable damage to both the module and unit.

This tool is associated with the following EXFO's calibration kits.

➤ If you are using IQ modules,

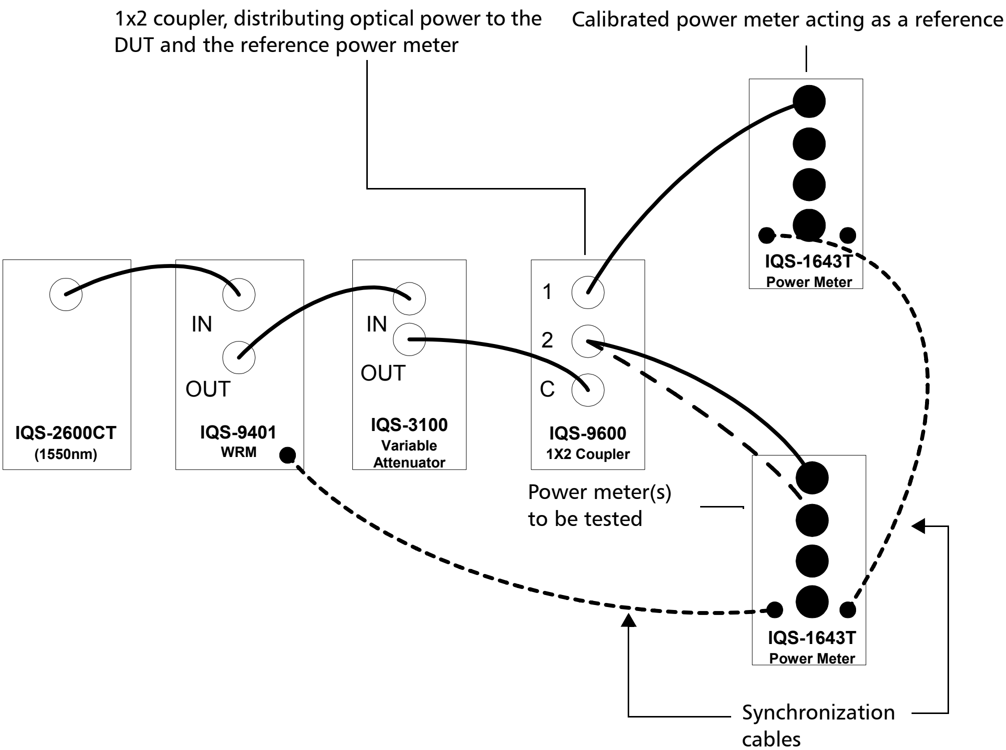
	IQ-3100 Variable Attenuator	IQ-9600 1x2 Coupler	IQ-1643T Power Meter
Calibration kit: CKT-10	X	X	
Calibration kit: CKT-11	X	X	X

➤ If you are using IQS modules,

	IQS-3100 Variable Attenuator	IQS-9600 1x2 Coupler	IQS-1643T Power Meter
Calibration kit: CKT-20	X	X	
Calibration kit: CKT-21	X	X	X

For more detailed information, please contact EXFO (see *Contacting the Technical Support Group* on page 223).

The following diagram illustrates how to link the required modules.



Connect synchronization cables (the black ones) between:

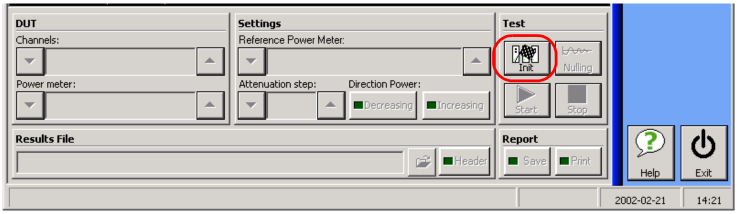
➤ The IQS-9401 Wavelength Reference Module (WRM) and the power meter to be tested.

➤ The power meter to be tested and the reference power meter.

You can use standard patchcords for optical connections. However, to ensure more stability during the verification, you may prefer to use the supplied semi-rigid patchcord to connect the optical source output port to the In port of the Wavelength Reference Module.

Initializing Hardware

Once the required modules have been properly inserted into the system and properly connected, a hardware detection is necessary before being able to perform linearity verifications.



To start the initialization, simply click **Init** from the **Test** panel.

Nulling Electrical Offsets

The offset nulling process provides a zero-power reference measurement, thus eliminating the effects of electronic offsets and dark current due to detectors.

Temperature and humidity variations affect the performance of electronic circuits and optical detectors. For this reason, EXFO recommends performing a nulling of the electrical offsets whenever environmental conditions change.

IMPORTANT

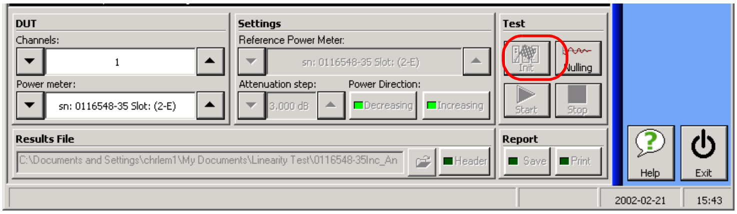
Light must not reach the detector when nulling offsets.

This operation allows to perform an electrical zero measurement on both external (IQS-1643/1643T) and internal (IQS-9401 WRM) power meters. Null measurement ensures accuracy of the power readings by taking a measurement while protective caps are put on all power meters' detectors. A correction factor is determined and applied to any future measurement.

Note: *You don't have to disconnect any patchcord except the DUT when performing a null measurement. Once the nulling is started, the source will automatically stop emitting.*

To perform a nulling:

1. Put protective caps on power meter detectors as described in the **Instructions** zone.



2. Click **Nulling** to start the null measurement. The nulling is performed on all power meters at the same time.

When the operation is complete, the **Start** button becomes enabled and the **Instructions** zone indicates that the tool is ready for linearity verification.

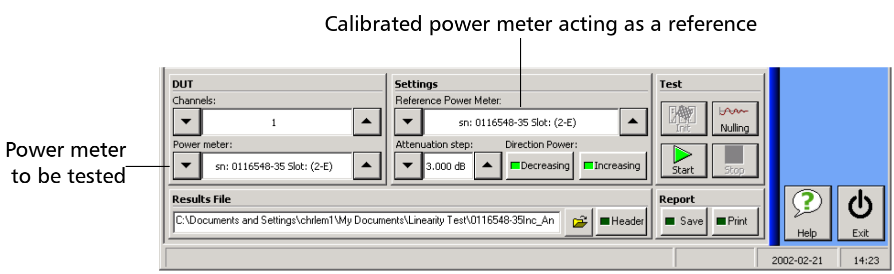
Note: *Once the hardware initialization is complete, you can perform a nulling at any moment, except during an acquisition.*

Selecting the DUT and Reference Power Meter

In order to perform a linearity verification, you need to specify which power meter has to be tested (DUT) and which power meter will act as a reference.

IMPORTANT

Any power meter can be used as a reference power meter. However, to avoid erroneous results, make sure that the module you intend to use as a reference has been properly calibrated.



Note: *You must have performed the hardware initialization and the nulling before being able to select power meters.*

➤ To select the DUT, use the up/down arrows next to the **Power meter:** box from the **DUT** panel.

➤ To select the reference power meter, use the up/down arrows next to the **Reference Power Meter:** box from the **Settings** panel.

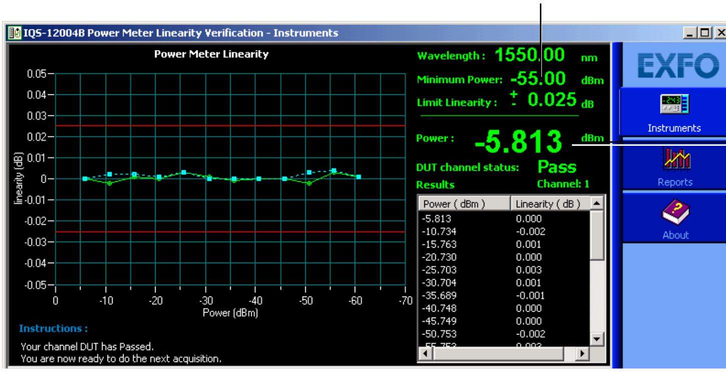
Setting Up the Acquisition Parameters

The linearity verification is made by comparing results obtained when attenuating the power level on a power meter to be tested and a reference power meter.

The power direction can be *decreasing*, *increasing* or both (a specific trace will be displayed and values will be added to the results grid for each of the power directions).

If you select both directions, the decreasing values will be displayed first. The increasing values will be added just after.

Minimum power threshold (non-editable)



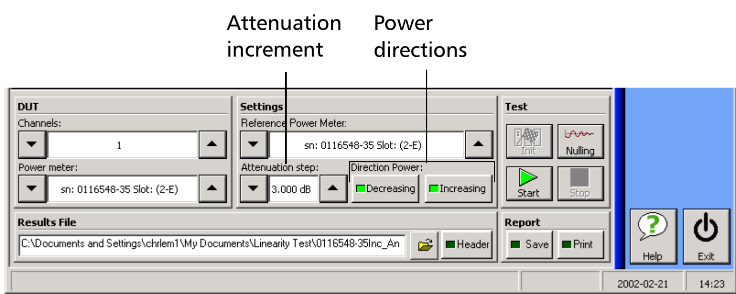
Actual power

Power direction	First power value in dBm (for a specific acquisition)	Last power value in dBm (for a specific acquisition)	Attenuation
Decreasing	Max power value[a]	Min power value[b]	Increases
Increasing	Min power value[b]	Max power value[a]	Decreases

a. Power value obtained when variable attenuator is set to the lowest (attenuation) value supported
b. Minimum power threshold allowed by the application

Note: *Since the maximum power value is not equal to 0 dBm, the last power value displayed on the graph and in the grid will be less than the minimum power value. However, values under –55 dBm are not taken into account when determining channel status.*
E.g.:
maximum power = –5 dBm
minimum power allowed = –55 dBm
last power value displayed = –60 dBm

On each acquisition, attenuation will be increased and/or decreased of a value corresponding to the increment (in dB) that you will have specified during parameter setup.



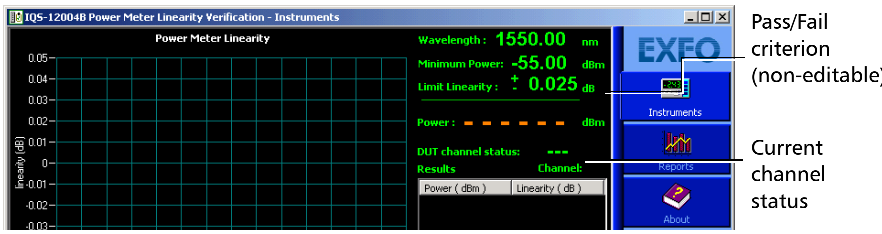
To set up acquisition parameters:

1. Ensure that the appropriate DUT and reference power meter are selected. For more information, see *Selecting the DUT and Reference Power Meter* on page 157.
2. Select the power direction: **Decreasing** and/or **Increasing**.
3. Select the attenuation increment by using the up/down arrows next to the **Attenuation step** box.

Verifying Linearity on a Specific Channel

Linearity must be verified on each channel of the power meter to be tested. After each acquisition, a linearity value is calculated:

reference power meter result – DUT result = linearity value



The channel status (Pass/Fail) will be determined by comparing the obtained value to the limit linearity (value appearing on the upper right of the **Instrument** function tab).

The channel will be tagged as **Pass** if

$$|\text{obtained linearity}| \leq |\text{permitted limit}|$$

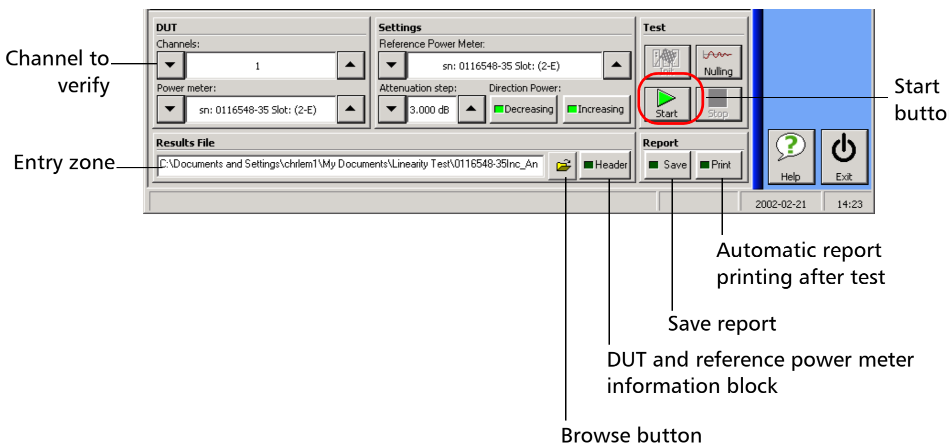
otherwise, it will be identified as **Fail**.

IMPORTANT

Linearity values obtained when power is under –55 dBm are not taken into account when determining the channel status, due to the power meter specifications.

IMPORTANT

Starting a new acquisition (on a new channel) will remove all previous data from memory and will overwrite the previous results file.
To prevent unwanted data loss, specify a new results filename and save your report file before starting a new acquisition.



To verify linearity on a specific channel:

1. Ensure that the acquisition parameters are properly set. For more information, see *Setting Up the Acquisition Parameters* on page 158.
2. If necessary, select the channel number from which you want the verification to start, using the up/down arrows next to the **Channels:** box from the **DUT** panel.

Note: *You don't have to specify a channel for the reference power meter since channel 1 always acts as the reference channel.*

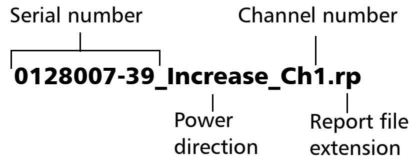
3. If you need to save the results for future use in a spreadsheet, specify a new filename. You can directly type it in the entry zone or use the browse button. If you use the name of an already-existing file, the data related to the previous test will be lost.

If you want information about the DUT and reference power meter to be added at the beginning of the file, choose **Header** from the **Results File** panel.

4. To be able to view and print a report with the data that will be obtained for the new channel, choose **Save** from the **Report** panel.

Note: *It is also possible to save a report from the* ***Reports*** *function tab. However, this operation must be made* before *verifying another channel.*

The saved file will automatically be named in the following format:



5. Connect the patchcord between the coupler and the channel to be tested.

6. Use the **Start** button from the **Test** panel to start the verification. The results will be displayed both in a graph and in a grid.

If both increasing and decreasing power directions were chosen, the tool will take all the measurements for decreasing and then all the measurements for increasing.

7. Repeat steps 1 to 6 for each channel of the DUT.

Viewing and Printing Test Results

The Power Meter Linearity Verification tool offers two ways of using test results:

➤ In an external spreadsheet (using the generated .txt file).

➤ In the supplied report tool.

In both cases, test results include:

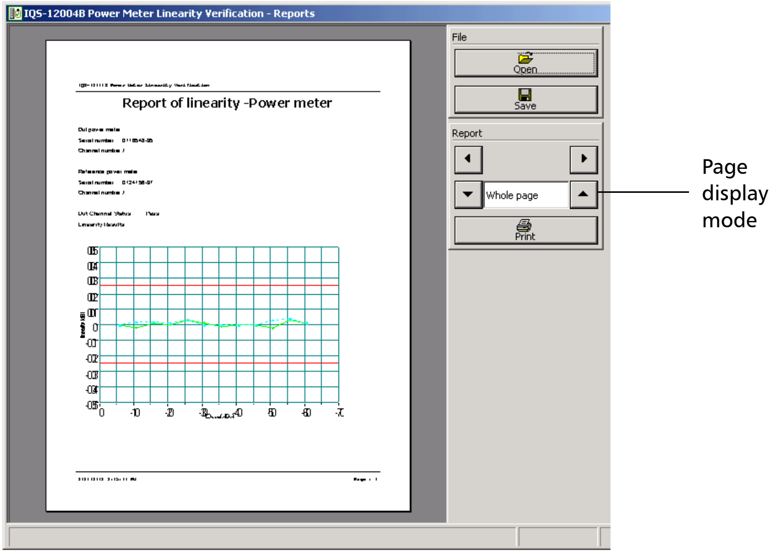
➤ DUT power in dBm.

➤ Reference power in dB.

➤ DUT power in dB.

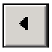
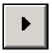
➤ Linearity in %.

➤ Linearity in dB.



To view a test report from the Power Meter Linearity Verification tool:

1. Select the **Report** function tab.
2. If the desired report is not already displayed, choose **Open** from the **File** panel.

You can use  and  to browse the document.

You can also adjust the page display using the up/down arrows next to the *page display mode* box.

If necessary, the report file can be saved by using the **Save** button.

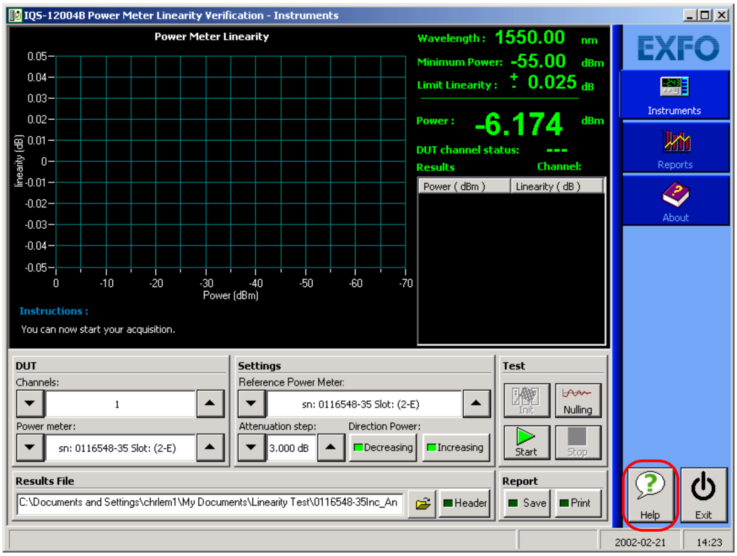
To print a test report:

1. If necessary, select the **Report** function tab.
2. If the desired report is not already displayed, choose **Open** from the **File** panel.
3. Use the Print button to send the report to the default printer. An error message is displayed if no printer has been installed on the system.

Note: *If you want the data report to be automatically printed at the end of the test, go to the* ***Instrument*** *function tab and select* ***Print*** *from the* ***Report*** *panel.*

Viewing Online User Guide

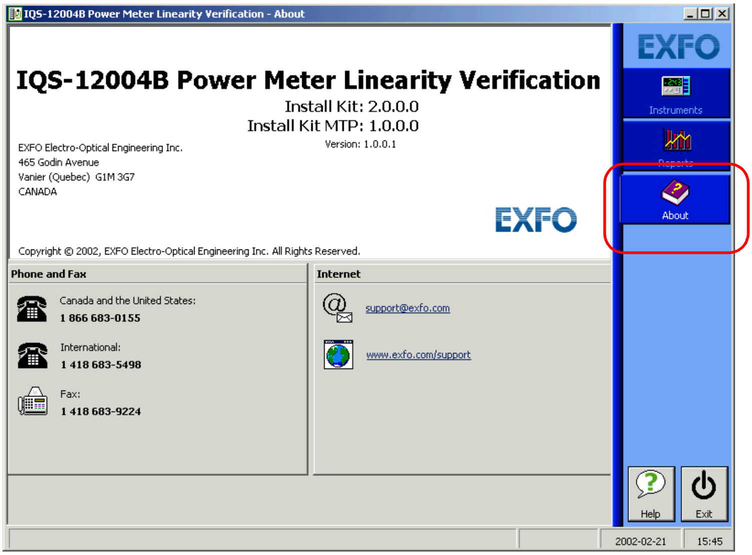
You can read the user guide online with Acrobat Reader.



To view the user guide, use the **Help** button at the bottom of the function bar.

Getting Technical Support Information

The **About** function tab provides useful information such as application version, phone numbers and active Internet links to EXFO's Technical Support Group. Use these links to send an information request by e-mail or to access EXFO's web site.



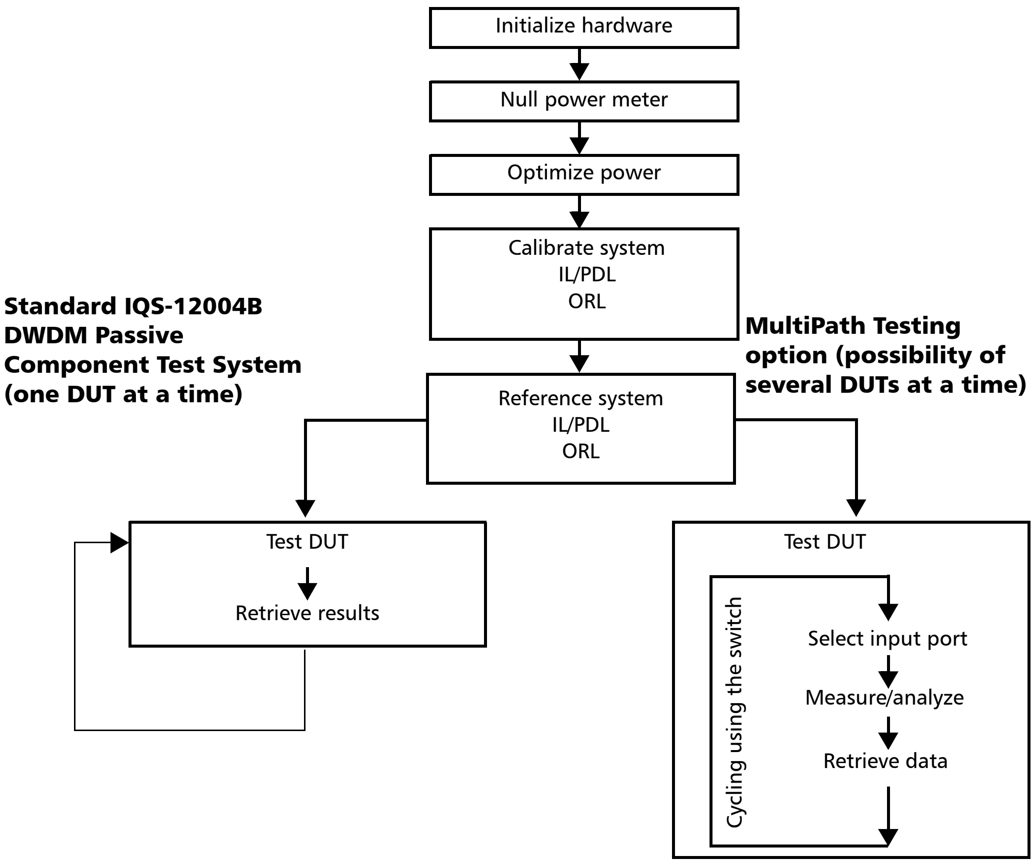
13 Automating or Remotely Controlling the System

The IQS-12004B DWDM Passive Component Test System gives you the opportunity to develop your own applications using either SCPI commands (GPIB control) or COM objects.

The provided SCPI commands give access to the standard DWDM Passive Component Test System features. The *Acq12004B* dll provides the necessary COM objects to access either the standard DWDM Passive Component Test System or the multipath testing option features.

In order to be able to tests including IL, ORL, and PDL measurements with the standard DWDM Passive Component Test System or the MultiPath Testing Option, there are a number of required steps and procedures to follow.

A typical test sequence would be similar to the flow chart below.



Each time a new test sequence is started, the reference step is highly recommended.

Each step is further explained in the following pages.

Initializing the Hardware

Perform this step each time you start the application. If modules are not initialized, the system cannot take any measurements and therefore provide results.

The minimum hardware components required are:

- Tunable laser source (IQS-2600B or IQS-2600CT).
- Wavelength reference module (IQS-9401).
- Power meter (IQS-1643T), one or more.
- If you want to use the MultiPath Testing option, will also need a switch (either the IQS-9100, or a GPIB-controlled switch. Check with EXFO to see if a specific model is supported.).

This hardware configuration will allow you to perform IL and ORL measurements. Optional hardware components:

- Polarization State Adjuster (IQS-5150), which allows PDL measurements.
- Switch if you do not intend to work with the MultiPath Testing option.

The COM method associated with this step is *InitHardware* (see page 287).

The SCPI command associated with this step is *INITialization:INITialize* (see page 233).

Nulling Electrical Offsets

To obtain the best possible results, it is recommended to perform a nulling of the power meters and wavelength reference module. During this operation, no light should reach the detectors. For more information, see *Nulling Electrical Offsets* on page 124 and *Nulling Electrical Offsets* on page 75.

The COM method associated with this step is *Nulling* (see page 287).

The SCPI command associated with this step is *CALibrationNULLing* (see page 245).

Optimizing the Power

This step is required to ensure that we have the maximum dynamic range when the IQS-5150 module is present. If this step is not performed, power may not come out of the IQS-5150 module and, therefore, the system will not be able to calibrate properly and provide any valid measurements.

The COM method associated with this step is *OptimizePower* (see page 288).

The SCPI command associated with this step is *PolarizationStateAdjuster:MAXimum* (see page 263).

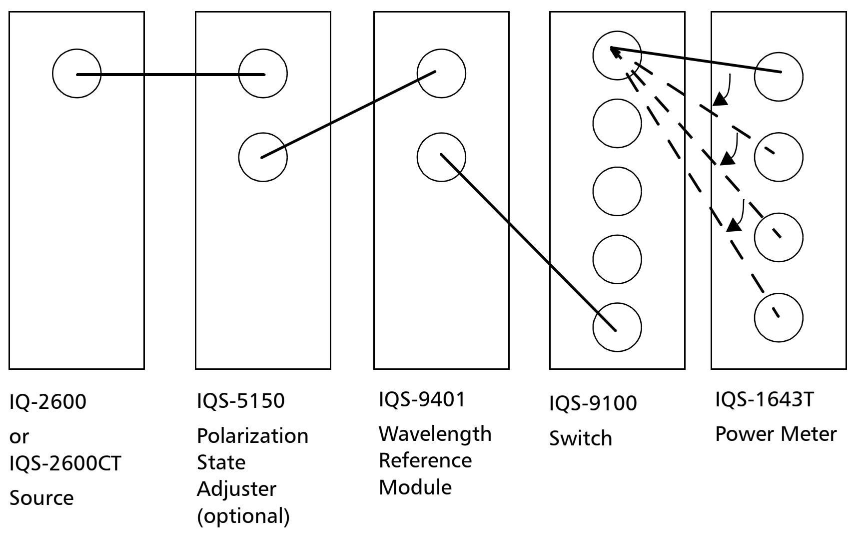
Calibrating the System

During calibration step, you can perform:

- Wavelength response (IL/PDL) calibration
- Return Loss (ORL) calibration

For more information on the calibration of the standard IQS-12004B DWDM Passive Component Test System, see *Calibrating the System* on page 73.

In multipath testing, the wavelength response is taken by connecting each detector to switch port 1 during these steps.



For more information on calibration with the MultiPath Testing option, see *Calibrating the System Wavelength Response* on page 125 and *Calibrating your System for ORL Testing* on page 127.

The COM methods associated with this step are *CalWr* (see page 278), *CalOrlRtj* (see page 277), *CalOrlMandrelRtj* (see page 277).

The SCPI commands associated with this step are *CALibration:WavelengthResponse:ACQuisition* (see page 244), *CALibration:ORLRtj* (see page 246), *CALibration:ORLMandrelrtj* (see page 248).

Referencing the System

- If you are working with the standard DWDM Passive Component Test System, each time the system is turned on, a reference measurement has to be performed.

  This reference measurement takes into account any power fluctuation that occurred *since the system was last used* (e.g., connection and reconnection of rigid and semi-rigid patch cords, power optimization).

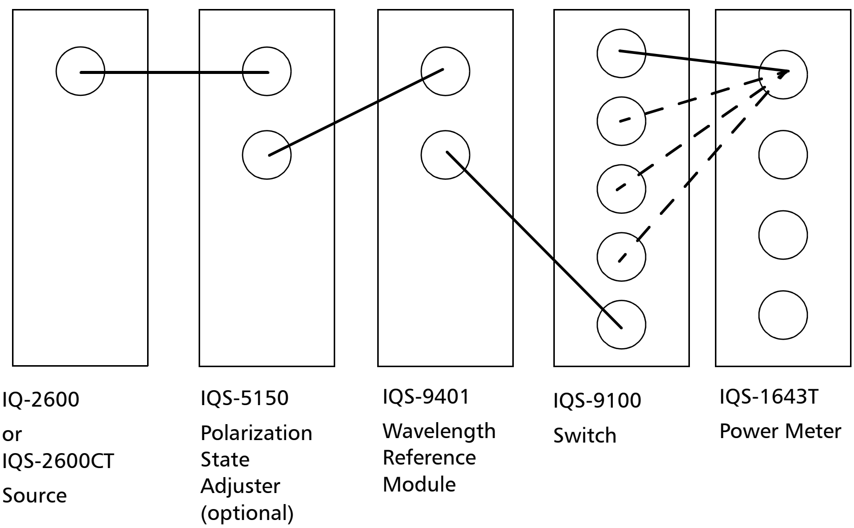
- If you are working with the multipath option, you do not have to perform a reference measurement each time the system is turned on.

  The reference measurement takes into account any power fluctuation that occurred *since certain operations were performed on the system* (e.g., connection and reconnection of rigid and semi-rigid patch cords, power optimization).

Note: *To obtain good results, EXFO recommends that you to regularly perform reference measurements. EXFO also recommends to perform a reference measurement when the test system is used non-stop during a long period of time or when there are important variations in environmental conditions.*

For more information on referencing of the standard IQS-12004B DWDM Passive Component Test System, see *Performing Reference Measurements* on page 82.

In multipath testing, reference scans are performed by connecting each switch port to detector 1 of the power meter during this step.



Note: *To ensure better results, EXFO recommends that you use a different patchcord for each switch port. This will avoid disconnecting the patchcords from the switch once the reference is complete.*

For more information on referencing the system with the MultiPath Testing option, see *Performing Reference Measurements* on page 129.

The COM methods associated with this step are *RefIl* (see page 278), *RefIlPdl* (see page 279), *RefOrlMandrel* (see page 279).

The SCPI commands associated with this step are *REFerence:IL* (see page 249), *REFerence:ILPDl* (see page 250), *REFerence:ORLM* (see page 251).

Testing the DUT

Once the previous steps have been successfully completed and the device(s) under test—DUT(s)—have been properly connected, the system is ready to perform IL, PDL, and ORL measurements of the DUT(s).

Note: *Only the MultiPath Testing option allows you to test more than a device at a time and devices having a variable number of In ports and Out ports.*

For more information, see *Connecting DUT and Modules* on page 67 and *Starting the ORL Measurement Scan* on page 69.

With the MultiPath Testing Option, the DUT(s) have to be connected between the power meter and the switch.

The COM properties and methods associated with this step are *Position* (see page 341), *AcqIlDut* (see page 274), *AcqIlPdlDut* (see page 275), *AcqOrlMandrelDut* (see page 275).

The SCPI commands associated with this step are ACQuisition:IL (see page 253), ACQuisition:ILPDl (see page 253), ACQuisition:ORL (see page 254).

Retrieving Results

Once the measurements have been performed, it is possible to retrieve IL, PDL, ORL curves. These curves are returned in separate commands (one for the IL, one for the PDL, and one for the ORL).

With the provided COM objects, it is also possible to retrieve single-value results such as:

- ➤ Flatness
- ➤ Bandwidth
- ➤ Central wavelength
- ➤ IL, ORL, PDL
- ➤ Polarization-dependent central wavelength
- ➤ Polarization-dependent central bandwidth
- ➤ Crosstalk

The availability of these single-value results depends on the DUT filter type (bandpass, notch or undefined).

Note: *Single-value results cannot be retrieved using SCPI commands.*

Controlling Instruments with GPIB

The GPIB communication protocol was designed to connect computers so that information could be transmitted between them. The GPIB interface developed for the IQS-12004B DWDM Passive Component Test System permits you to remotely control the DWDM Passive Component Test System modules. To do so, a GPIB controller card must be installed in your computer.

Starting the GPIB Remote Application

The supplied GPIB remote application allows you to:

➤ Set the GPIB parameters.

➤ Open/close a GPIB connection.

➤ View the GPIB commands received.

➤ Edit, log and print information.

➤ Monitor power meters.

To start the DWDM Passive Component Test System GPIB application, double-click the *IQS-12004B GPIB* icon on your desktop.

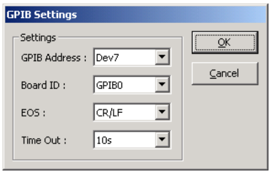
Note: *The IQS-12004B DWDM Passive Component Test System and the* IQS-12004B GPIB *application cannot run at the same time.*

This remote application is further explained in the following pages.

Modifying GPIB Parameters

To modify the default GPIB settings:

1. Select **GPIB Settings** from the **Communication** menu. The **GPIB Settings** window appears.



2. Enter the desired parameters and click **OK** to save the new settings.

Note: *GPIB Address and Board ID cannot be modified when the GPIB connection is opened.*

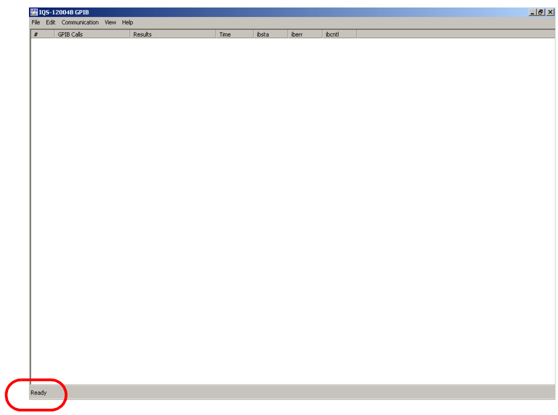
- **GPIB Address**: The primary address assigned to the GPIB card (ranging from 0 to 30). A secondary address is automatically assigned and is set to 0.
- **Board ID**: The GPIB card identification name as set in the system properties. The available options are: GPIB 0, GPIB 1, GPIB 2, and GPIB 3.
- **EOS**: The end-of-string code sent as the last byte of a data message. The available options are: Disable, CR (carriage return), LF (line feed), and CR/LF (carriage return-line feed combination).
- **Time Out**: The maximum time allowed for the system to reply to a command. If the system does not respond according to the time set, an error message appears. Available choices are: Disable as well as values in microseconds (μs), milliseconds (ms), and seconds (s).

All the parameters are saved in the system until a new GPIB connection is opened.

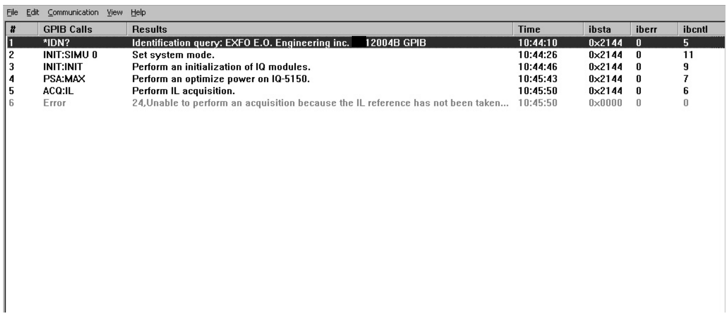
Opening a GPIB Connection

Once the GPIB application is started, you will need to open a new connection.

To open a new connection, select **Open Connection** from the **File** menu. The IQS-12004B GPIB main window appears and the status bar displays **Ready**.



When a GPIB command is sent to the DWDM Passive Component Test System, information about the command appears in the IQS-12004B GPIB main window.



The information contained in the different columns is explained below:

- **#**: This column indicates the request number.
- **GPIB Calls**: This column indicates the name of the command received and its parameters, if any.
- **Results**: This column provides a description of the command. If an error occurred, the error number as well as a description of the error will be displayed in red.
- **Time**: This column indicates the time when the command was received by the system.
- **ibsta**: This column indicates the state of the GPIB card. For more information, refer to the GPIB card instructions manual *NI-488.2 Function Reference Manual for Windows*, in the *Status Word Conditions* chapter.

- **iberr**: This column indicates if an error occurred on the GPIB bus. For more information, refer to the GPIB card instructions manual *NI-488.2 Function Reference Manual for Windows*, in the *Error Codes and Solutions* chapter.
- **ibcntl**: This column indicates the number of characters in the command. For example, *IDN? contains 5 characters.

Closing a GPIB Connection

To close the connection, select **Close Connection** from the **File** menu. The status bar displays **Disconnected**.

Editing GPIB Information

To edit the information that appears in the GPIB main window:

1. Select the desired row(s) of information.
2. In the **Edit** menu, select **Cut**, **Copy**, or **Delete** whether you want to remove, copy or erase selected rows of information.

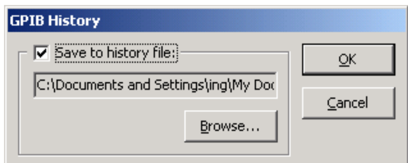
To edit all the rows of information, choose **Select All**.

Note: *You can also access the **Edit** menu by right clicking your mouse.*

Logging GPIB Information

To save GPIB information in a log file:

1. Select **Options** from the **Communication** menu.

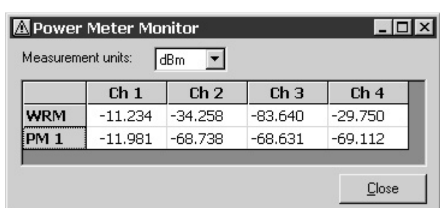


2. Check the **Save to history file** box.
3. If you want to change the default folder where the log file will be saved, click **Browse** and select the desired folder.
4. Click **OK** when you are done.

Monitoring the Power Meter

To view the power of each wavelength reference module and power meter channels:

1. Select **Power Meter IQS-1600 Monitor** from the **View** menu. The **Power Meter Monitor** window may be accessed only when the modules are initialized.



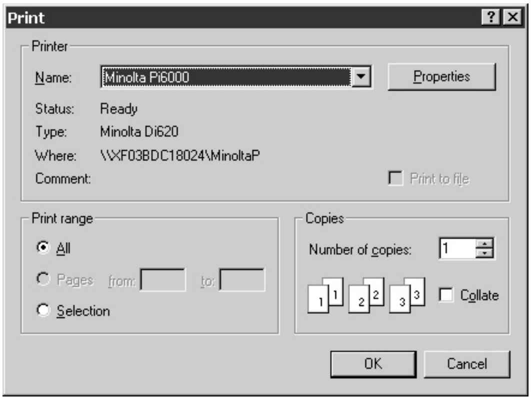
2. Select the desired measurement unit in the list box (**dBm** or **watt**).
3. Click **Close** to exit the window.

Printing GPIB Information

Once you have viewed the information on the IQS-12004B GPIB main window, it is possible to print a report.

To print a report:

1. Select **Print** from the **File** menu. The **Print** window appears.



2. Select the correct printer in the **Name** list box.
3. In the **Print range** section, select **All** if you want to print all the information appearing in the main screen, or **Selection** if you want to print the rows of information you selected.
4. Click **OK** to print the report.

GPIB Command Structure

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

CONF:CHAN<wsp><number channels> command syntax

is used to change the number of channels to test in the IQS-12004B DWDM Passive Component Test System.

In this example,

- CONF identifies that the command is part of the SCPI CONFiguration subset of commands.
- CHAN is a keyword that define the function of the command.
- <wsp> is included to indicate that a space is required (**wsp** stands for **white space**).
- <number channels> is the command parameter.

Keywords must be separated by a colon. A typical command would be

CONF:CHAN 4

This command instructs the system to test four channels in one acquisition.

To enter commands or queries you must use either the full word for the command, or the three- or four-letter shortcut. Commands are not case-sensitive, however spelling errors will cancel the command or query.

The command or query can be written using only shortcuts, only full words, or a combination of both.

Other command syntax elements are:

➤ The comma, which is used to separate values in a command or query.

➤ The semi-colon, which is used to separate commands or queries, when you send more than one at a time.

Note: *It is recommended that you retrieve the response immediately after each query.*

GPIB General Commands—Quick Reference

The SCPI Manager recognizes the main commands identified in IEEE-488.2. The table below summarizes these commands. For more information about general commands, see *General Commands* on page 231.

Command	Function
*CLS	Clear last error
*ESE	Not supported
*ESE?	Not supported
*ESR?	Not supported
*IDN?	Identification query
*LOK	Not supported
*OPC	Not supported
*OPC?	Operation complete query
*REM	Not supported
*RST	Not supported
*SRE	Not supported
*SRE?	Not supported
*STB?	Not supported
*TRG	Not supported
*TST?	Not supported
*WAI	Not supported

GPIB Specific Commands—Quick Reference

The following table contains a summary of the IQS-12004B DWDM Passive Component Test System specific commands. If you need more information about these specific commands, see *Specific Commands* on page 233.

Command			Parameter/Response	Description
INIT	INIT		--	This command performs an initialization of all IQS modules.
	INIT?		(0 | 1)	The response to this query indicates if an initialization of the modules has been performed.
	SIMU		<0 | 1>	This command sets the system to simulation mode.
	SIMU?		(0 | 1)	The response to this query indicates if the system is in simulation mode.
CONF	AVAC?		(999)	The response to this query indicates the number of available channels in the system.
	CHAN		<999 >	This command sets the number of channels to test.
	CHAN?		(999)	The response to this query indicates the number of channels to test.
	ACQT		<1 | 2 | 3 | 4>	This command sets the acquisition type.
	ACQT?		(1 | 2 | 3 | 4)	The response to this query indicates the acquisition type.
CONF	KIL		<0 | 1>	This command keeps IL curves for all SOP, when a PDL acquisition has been performed.
	KIL?		(0 | 1)	The response to this query indicates if IL curves are kept for all SOP.

Command			Parameter/Response	Description
	ARF		<0 | 1>	This command sets the filtering mode.
	ARF?		(0 | 1)	The response to this query indicates the filtering mode.
	MINW?		(9999.999)	The response to this query indicates the minimum wavelength (in nm) available in the system.
	MAXW?		(9999.999)	The response to this query indicates the maximum wavelength (in nm) available in the system.
	STAR		<9999.999>	This command sets the position (in nm) where to start the acquisition.
	STAR?		(9999.999)	The response to this query indicates the position (in nm) where to start the acquisition.
	STOP		<9999.999>	This command sets the position (in nm) where to stop the acquisition.
CONF	STOP?		(9999.999)	The response to this query indicates the position (in nm) where to stop the acquisition.
CAL	WR	CHAN	<999>	This command sets the active channel for the wavelength response calibration acquisition.
		CHAN?	(999)	The response to this query indicates the active channel for the wavelength response calibration acquisition.
		ACQ	--	This command performs a wavelength response calibration on the active channel.

Command			Parameter/Response	Description
		ACQ?	(0 | 1)	The response to this query indicates if a wavelength response calibration has been performed.
	NULL		--	This command performs a nulling on the power meter and wavelength reference module channels.
	ORLR		--	This command performs an ORL calibration with a reference test jumper.
CAL	ORLR?		(0 | 1)	The response to this query indicates if an ORL calibration with a reference test jumper has been performed.
	STOP		--	This command stops the current calibration acquisition.
	ORLM		--	This command performs an ORL calibration acquisition with mandrel and reference test jumper.
	ORLM?		(0 | 1)	The response to this query indicates if an ORL calibration acquisition with mandrel and reference test jumper has been performed.
REF	ORLM		--	This command performs an ORL reference acquisition using a mandrel.
	ORLM?		(0 | 1)	The response to this query indicates if an ORL reference using a mandrel has been performed.
	STOP		--	This command stops the current reference acquisition.

Command			Parameter/Response	Description
	IL		--	This command performs an IL reference acquisition.
REF	IL?		(0 | 1)	The response to this query indicates if an IL reference acquisition has been performed.
	ILPD		--	This command performs a PDL reference acquisition.
	ILPD?		(0 | 1)	The response to this query indicates if a PDL reference acquisition has been performed.
TEST	AVAT?		(1 | 2 | 3 | 4 | 5 | 6)	The response to this query indicates which test can be performed according to the modules detected, the calibration, and the reference.
	CLR		--	This command clears the last IL, PDL, and ORL results.
ACQ	IL		--	This command performs an IL acquisition on the DUT.
	ILPD		--	This command performs a PDL acquisition on the DUT.
	ORL		--	This command performs an ORL acquisition on the DUT.
	SYNC		<99999>	This command performs a synchronized power acquisition on all IQS-1600 power meters.
ACQ	STOP		--	This command stops the current acquisition on the DUT.
STAT	ERR?		(Error Number, “Error description”)	The response to this query indicates the last error and provides a description.

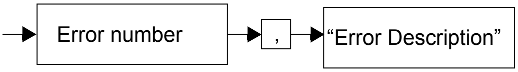
Command			Parameter/Response	Description
READ	CURV	IL?	x(nm), y(dB)	This query reads the IL results curve on a specified channel.
		PDL?	x(nm), y(dB)	This query reads the PDL results curve on a specified channel.
		ORL?	x(nm), y(dB)	This query reads the ORL results curve.
		ILPD?	x(nm), y(dB)	The response to this query indicates the IL curve for a specific SOP, when a PDL acquisition has been performed.
		SYNC?	PowerPoints,Status	The response to this query indicates the power synchronized acquisition result curve on a specified channel.
	CHAN		<999>	This command sets the active channel to read curves and the power meter as well as the channel localization information.
READ	CHAN?		(999)	The response to this query indicates the active channel.
	CHLO?		(Slot position, Power Meter Channel)	The response to this query indicates the localization information about specified channels.
	PM?		(9999.999)	The response to this query indicates the power meter value (in dBm) for the specified channel.
	WRM?		(9999.999,9999.999)	The response to this query indicates the value (in dBm) of the wavelength reference module.
	SN?		(ModuleName SlotPosition: Serial Number)	The response to this query indicates the serial number of each module initialized in the system.

Command			Parameter/Response	Description
	SOP		<0 | 1 | 2 | 3 |>	This command indicates on which SOP to take the IL curve, when a PDL acquisition has been performed.
	SOP?		(0 | 1 | 2 | 3 |)	The response to this query indicates the current SOP when reading the IL during a PDL acquisition.
PSA	MAX		--	This command optimizes the power.
PSA	MAX?		(0 | 1)	The response to this query indicates if the power has been optimized.
	SOP		<0 | 1 | 2 | 3 |>	This command sets a new polarization state on the IQS-5150 polarization state adjuster.
	SOP?		(0 | 1 | 2 | 3 |)	The response to this query indicates the current polarization state of the IQS-5150 polarization state adjuster.
SOUR	MINW?		(9999.999)	The response to this query indicates the minimum wavelength (in nm) of the current source.
	MAXW?		(9999.999)	The response to this query indicates the maximum wavelength (in nm) of the current source.
	ON		<0 | 1>	This command turns the source ON or OFF.
	ON?		(0 | 1)	The response to this query indicates if the source was active.
	STAB?		(Time)	The response to this query indicates (in seconds) how long the source has been turned on.

Command			Parameter/Response	Description
	WAVE		<9999.999>	This command sets the source wavelength in nm.
SOUR	WAVE?		(9999.999)	The response to this query indicates the wavelength (in nm) of the current source.

GPIB Error Messages Format

System-and device-specific errors are managed by the IQS-12004B GPIB application. The generic format for error messages is illustrated below.



As shown in the above figure, the message is a string that contains two parts:

➤ Error number

➤ Error description

All error messages are stacked in an application buffer. Use the command STAT:*ERR?* to read the most recent message.

The error message buffer is initialized when starting the IQS-12004B GPIB application or when executing the **CLS* command.

SCPI Error Messages

The following table contains a list of error messages.

Note: *For more information about error messages, refer to the* GPIB card instructions manual NI-488.2 Function Reference Manual *for Windows.*

Error Number	Description
1	Unable to initialize a hardware module.
2	Unable to detect a hardware module.
3	Unable to initialize the IQS-2600CT source module.
4	Unable to initialize the IQS-9401 wavelength reference module.
5	Unable to initialize the IQS-5150 polarization state adjuster module.
6	Unable to initialize the IQS-1600 power meter module(s).
7	Required modules are not available or not installed.
8	Module initialization has stopped.
9	Invalid IQS-9401 calibration.
10	Unable to perform a power meter nulling.
11	Invalid power meter number. Unable to perform the nulling.
12	Invalid nulling type.
15	Unable to start an acquisition at this time. An acquisition is already in progress.
16	Unable to perform this test because some modules are not selected or not installed.

Error Number	Description
17	Unable to execute another command at this time. Please wait until the current command is complete.
18	An inappropriate channel value has been assigned.
20	Unable to use the modules because the module initialization has not been done. Please initialize the modules.
21	Unable to perform an acquisition because the ORL calibration with an RTJ has not been performed. Please perform an ORL calibration.
22	Unable to perform an acquisition because the ORL calibration with a mandreled RTJ has not been performed. Please perform a calibration of the ORL with a mandreled RTJ.
23	Unable to perform an acquisition because the wavelength response calibration has not been performed. Please perform a wavelength response calibration.
24	Unable to perform an acquisition because the IL reference has not been performed. Please performed an IL reference.
25	Unable to perform an acquisition because the IL/PDL reference has not been performed. Please performed an IL/PDL reference.
26	Unable to perform an acquisition because the ORL reference has not been performed. Please perform an ORL reference.
27	Unable to get a curve because the acquisition result curve is empty. Please perform an acquisition.
28	Unable to change the polarization state because the power has not been optimized. Please optimize the power.

Error Number	Description
30	Unable to perform an acquisition because the power at the WRM input is too low. Please check your connection.
31	Unable to perform an acquisition because the power for the reference is too low. Please check your connection.
32	Unable to perform an acquisition because the power for the calibration is too low. Please check your connection.
33	The acquisition has stopped.
34	Cannot find simulator data file.
35	An inappropriate number of acquisition channels has been assigned.
36	Invalid ORL result curve.
37	Unable to determine a sweep span that fits with the sweep time.
38	Invalid scan range. The acquisition has stopped.
39	Invalid acquisition type. The acquisition has stopped.
40	Power meter synchronization error. The acquisition has stopped.
41	The command is not supported by the current source module.
42	Missing calibration parameter.
43	Missing wavelength reference calibration.
44	Missing ORL calibration.
45	The database templates are missing in the path.
46	Invalid power meter value.
47	Invalid power meter value (under range).

Error Number	Description
48	Invalid power meter value (over range).
49	The sweep cannot be performed. The laser source is not turned on.
52	Not available in simulator mode.
53	Number of acquisition points must be between 1 and 32 000.
513	Invalid parameter.
514	Wrong function was called.
515	Invalid number of channels.
516	No module is initialized.
517	Unable to open the log file.
518	Error when closing the log file.
532	System error.
533	GPIB board has to be controller in charge (CIC) to function properly.
534	No listeners on the GPIB.
535	GPIB board not correctly addressed.
536	Invalid argument when the function is called.
537	GPIB board is not CIC, as required.
538	I/O operation aborted (Time Out).
539	GPIB board not installed.
540	Direct memory access (DMA) error.
542	Asynchronous I/O in progress.
543	Cannot operate.
544	File system error.

Error Number	Description
546	GPIB bus error.
547	Serial poll status byte queue overflow.
548	SRQ stuck in ON position.
552	Problem in table.
554	Invalid end of string terminator.
555	Unable to access the registry.
556	An IQS-12004B GPIB application is already running.

Configuring Your DWDM Passive Component Test System as a GPIB Controller

At time of purchase, your IQS-12004B controller unit is configured to be used as a GPIB device. However, it is possible to configure it as a GPIB controller.

Note: *The following procedure is based on Windows 2000.*

IMPORTANT

Do not remove the GPIB card from the IQS-12004B controller unit.

To configure your IQS-12004B controller unit as a GPIB controller:

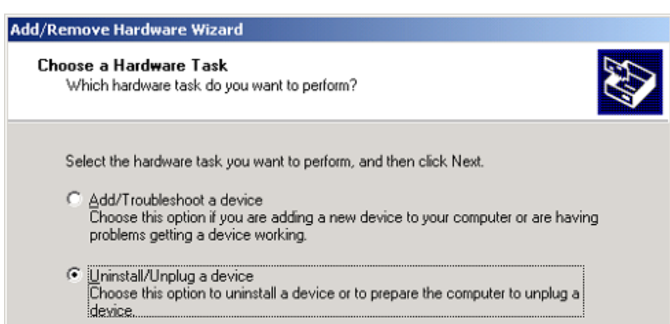
1. Uninstall the GPIB card as follows:

   1a. On the Windows taskbar, click **Start** and select **Settings** > **Control Panel**.

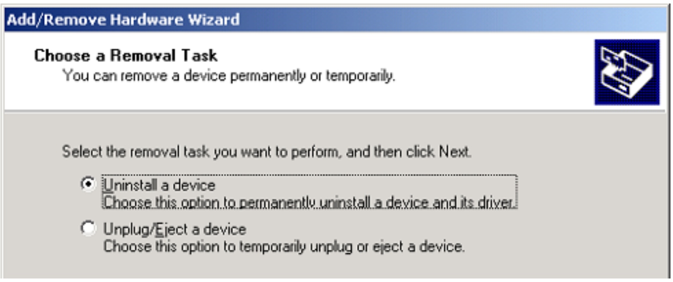
   1b. From the **Control Panel**, double-click the **Add/Remove Hardware** icon.

   1c. From the welcome step, click **Next**.

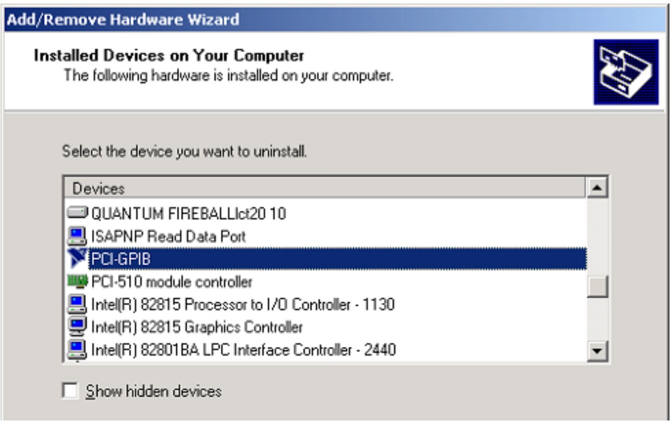
   1d. From the **Choose a Hardware Task** step, select the **Uninstall/Unplug a device** option and click **Next**.



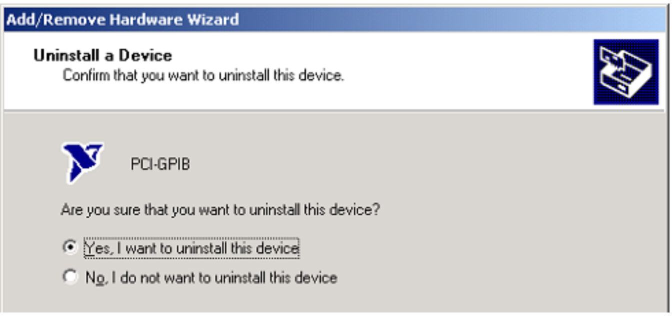
1e. From the **Choose a Removal Task** step, choose **Uninstall a device**. Click **Next**.



1f. From the **Installed Devices on Your Computer** list, choose **PCI-GPIB**. Click **Next**.



1g. From the **Uninstall a Device** step, choose **Yes, I want to uninstall this device**. Click **Next**.

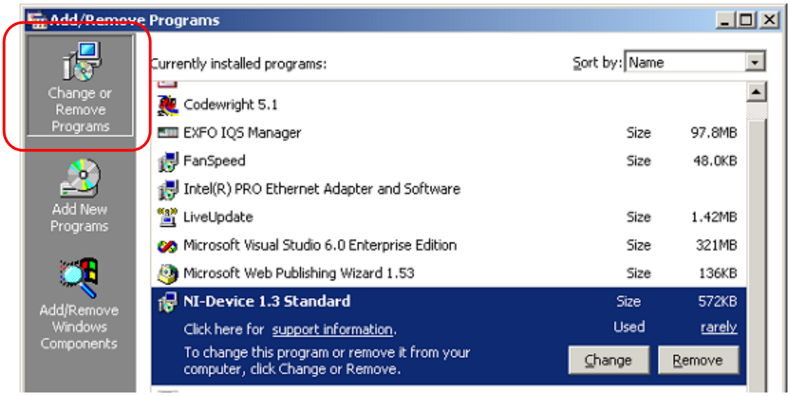


1h. From the **Completing the Add/Remove Hardware Wizard** step, click **Finish** to close the wizard. All corresponding hardware is removed automatically.

2. Remove the NI-Device 1.3 Standard software as follows:

2a. From the **Control Panel**, double-click the **Add/Remove Programs** icon.

2b. Select the **Change or Remove Programs** function tab.

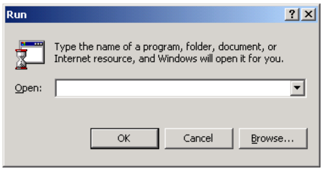


2c. From the list of currently installed programs, select **NI-Device 1.3 Standard** and click **Remove**.

3. Install the NI-488.2 1.70 software as follows:

3a. Insert the installation CD-ROM in the drive.

3b. On the Windows taskbar, click **Start** and select **Run**.



3c. Use the **Browse** button to find the *GPIB Controller* folder on the CD-ROM, then select *setup.exe*.

3d. Click **OK** to start the installation. The installation is relatively straightforward: click **Next** until you reach the end (**Finish**).

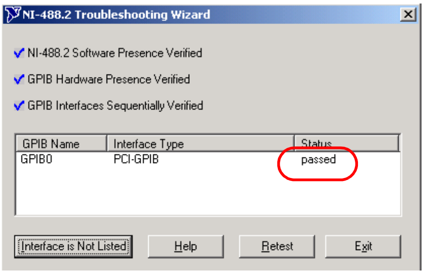
4. Restart the IQS-12004B controller unit. Once the unit has restarted, the following dialog box appears.

5. Test the GPIB card as follows:

5a. Check the **Do not show at Windows startup** box located at the bottom of the dialog box.

5b. Click **Verify your hardware and software installation**. The NI-488.2 Troubleshooting wizard is automatically started.

5c. Tests take about 15 seconds to complete. Wait until the **Status** field displays “passed”, and then close all windows.



The IQS-12004B controller unit can now be used as a GPIB controller.

COM Objects

The IQS-12004B DWDM Passive Component Test System (standard) and the MultiPath Testing Option were developed using Microsoft Component Object Model (COM). COM defines a common way to access and create software components and services.

COM promotes the integration and the reuse of software components, as well as interoperability. In order to interoperate, components developed in different languages must adhere to a binary structure specified by Microsoft.

OLE and ActiveX are based on COM. Also, programming languages such as C, C++, Smalltalk, Pascal, Ada, Java, and LabVIEW can create and use COM components.

COM Installation

COM is installed during the IQS-12004B DWDM Passive Component Test System installation.

COM Example

To view how COM commands work, refer to the example provided in the IQS\Maestro\IQS_DWDMTS\Sample folder.

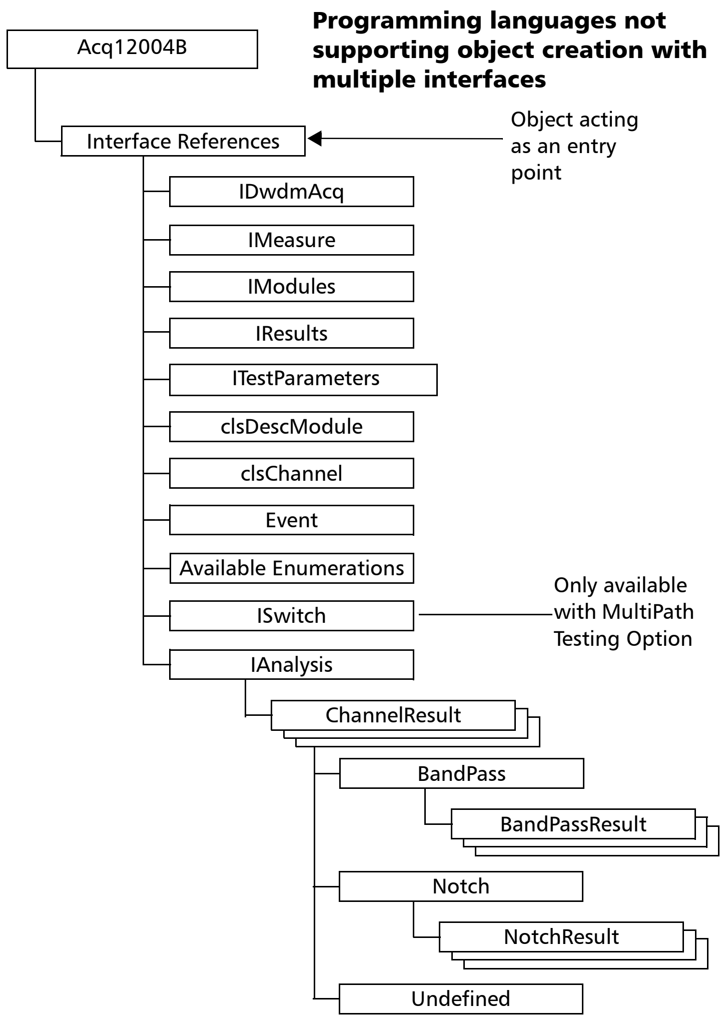
COM Objects Overview

Except for the *Switch* properties and methods that are only functional with the MultiPath Testing Option, all properties and methods offered work with the standard IQS-12004B DWDM Passive Component Test System and the option.

IMPORTANT

The provided COM objects were designed to be both used with programming languages that support object creation with multiple interfaces and with languages, like LabVIEW, that do not. Depending on the type of programming language you intend to use, you will choose the corresponding "entry point" and set of COM objects.

The figures shown on the following pages present the entry point to use as well as the objects structure according to the type of programming language.



Detailed information about the offered properties and methods can be found in appendix *COM Objects Reference* on page 269.

IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages

Error Number	Description
ErrAcqBefore	Unable to get a curve because the acquisition result curve is empty. Please perform an acquisition.
ErrAcqChannel	An inappropriate number of acquisition channels has been assigned.
ErrAcqRun	Unable to start an acquisition at this time. An acquisition is already in progress.
ErrAcqStopped	The acquisition has stopped.
ErrAcqType	Invalid acquisition type. The acquisition has stopped.
ErrCalOrlMandrelRtjBefore	Unable to perform an acquisition because the ORL calibration with a mandreled RTJ has not been performed. Please perform a calibration of the ORL with a mandreled RTJ.
ErrCalOrlRtjBefore	Unable to perform an acquisition because the ORL calibration with an RTJ has not been performed. Please perform an ORL calibration.
ErrCalWrBefore	Unable to perform an acquisition because the wavelength response calibration has not been performed. Please perform a wavelength response calibration.
ErrCalWrm	Invalid IQS-9401 calibration.
ErrChannelNumber	An inappropriate channel value has been assigned.
ErrCommandNot SupportedBySource	The command is not supported by the current source module.
ErrDetection	Unable to detect hardware module.
ErrHardNotCompatible	Unable to perform this test because some modules are not selected or not installed.

Error Number	Description
ErrInit	Unable to initialize a hardware module.
ErrInitBefore	Unable to use modules because the module initialization has not been done. Please initialize modules.
ErrInitPm	Unable to initialize the IQS-1600 Power Meter module(s).
ErrInitPsa	Unable to initialize the IQS-5150 Polarization State Adjuster module.
ErrInitSource	Unable to initialize theIQS-2600CT source module.
ErrInitStopped	Module initialization has stopped.
ErrInitWrm	Unable to initialize the IQS-9401 Wavelength Reference Module.
ErrInprogress	Unable to execute another command at this time. Please wait until the current command is complete.
ErrInvalidIlCurvePolState	The IL curve is not available for this polarization state.
ErrMissingCalibration Parameter	Missing calibration parameter.
ErrMissingDBTemplate	The database templates are missing in the specified path.
ErrMissingORLCalibration	Missing ORL calibration.
ErrMissingWRCalibration	Missing wavelength reference calibration.
ErrNoHardware	Some required modules are not available or not installed.
ErrNotAvailableIn SimulatorMode	Not available in simulator mode.
ErrNulling	Unable to perform a power meter nulling.
ErrNullingIndex	Invalid power meter number to perform the nulling.
ErrNullingType	Invalid nulling type.
ErrNumberOfAcquisition Points	Number of acquisition points must be between 1 and 32 000.

Error Number	Description
ErrOptimizeBefore	Unable to change the polarization state because the power optimization has not been performed. Please optimize the power.
ErrOrlResultCurve	Invalid ORL result curve.
ErrPmValue	Invalid power meter value.
ErrPmValueOver	Invalid power meter value (over range).
ErrPmValueUnder	Invalid power meter value (under range).
ErrPowerMin_PM	Unable to perform an acquisition because the power at the power meter input is too low. Please check your connection.
ErrPowerMin_Wrm	Unable to perform an acquisition because the power at the WRM input is too low. Please check your connection.
ErrPrevInstance	A previous object instance is already running. Only one instance can run on each computer.
ErrRefIlBefore	Unable to perform an acquisition because the IL reference has not been taken. Please take IL reference.
ErrRefOrlMandrelBefore	Unable to perform an acquisition because the ORL reference has not been taken. Please take ORL reference.
ErrScanRange	Invalid scan range. The acquisition has stopped.
ErrSimData	Cannot find simulator data file.
ErrSourceNotEnabled	The sweep cannot be performed. The laser source is turned on.
ErrSweepSpan	Unable to determine a sweep span that fits with the sweep time.
ErrSynchro	Power meter synchronization error. The acquisition has stopped.

MultiPath Testing Option COM Error Messages

Error Number	Description
ErrDetection	Unable to initialize the switch because the detection has not been performed. Please perform switch detection.
ErrNoHardware	Some required modules are not available or have not been installed.
ErrMissingDBTemplate	The database templates are missing in the specified path.
ErrMptoNotInstalled	Inappropriate version of IQS-DWDMTS. Please install MultiPath Testing Option to use Switch interface.
ErrInvalidSwPort	An inappropriate switch port value has been assigned.
ErrEmptyTrace	Unable to compute curve because some input traces are empty.
ErrNumberRefExtTrace	An inappropriate number of reference channels has been assigned (Reference at t=0 is not the same as t=x).
ErrDoAnalysisBefore	Unable to proceed with polarization dependency analysis because the standard analysis has not been performed. Please perform standard analysis before.

14 Maintenance

To help ensure long, trouble-free operation:

- Always clean fiber-optic connectors before using them.
- Keep the unit free of dust.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store unit at room temperature in a clean and dry area. Keep the unit out of direct sunlight.
- Avoid high humidity or significant temperature fluctuations.
- Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, turn off the power immediately and let the unit dry completely.

WARNING

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

Cleaning Fixed Connectors

Regular cleaning of connectors will help maintain optimum performance. *Do not try to disassemble the unit. Doing so would break the connector.*

To clean fixed connectors:

1. Fold a lint-free wiping cloth in four to form a square.
2. Moisten the center of the lint-free wiping cloth with *only one drop* of isopropyl alcohol.

IMPORTANT

Alcohol may leave traces if used abundantly. Avoid contact between the tip of the bottle and the wiping cloth, and do not use bottles that distribute too much alcohol at a time.

3. Gently wipe the connector threads three times with the folded and moistened section of the wiping cloth.

IMPORTANT

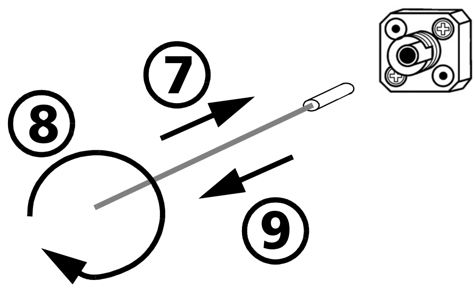
Isopropyl alcohol takes approximately ten seconds to evaporate. Since isopropyl alcohol is not absolutely pure, evaporation will leave microscopic residue. Make sure you dry the surfaces before evaporation occurs.

4. With a dry lint-free wiping cloth, gently wipe the same surfaces three times with a rotating movement.
5. Throw out the wiping cloths after one use.
6. Moisten a cleaning tip (2.5 mm tip) with *only one drop* of isopropyl alcohol.

IMPORTANT

Alcohol may leave traces if used abundantly. Avoid contact between the tip of the bottle and the cleaning tip, and do not use bottles that distribute too much alcohol at a time.

7. Slowly insert the cleaning tip into the connector until it reaches the ferrule inside (a slow clockwise rotating movement may help).



8. Gently turn the cleaning tip one full turn.
9. Continue to turn as you withdraw the cleaning tip.
10. Repeat steps 7 to 9, but this time with a dry cleaning tip (2.5 mm tip provided by EXFO).

Note: *Make sure you don't touch the soft end of the cleaning tip and verify the cleanliness of the cotton tip.*

11. Throw out the cleaning tips after one use.

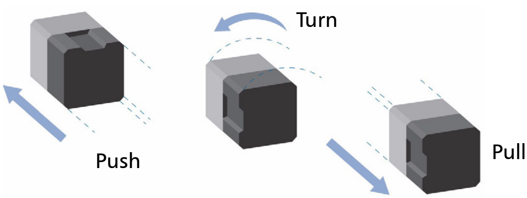
Cleaning EUI Connectors

Regular cleaning of EUI connectors will help maintain optimum performance. There is no need to disassemble the unit.

> **IMPORTANT**
> **If any damage occurs to internal connectors, the module casing will have to be opened and a new calibration will be required.**

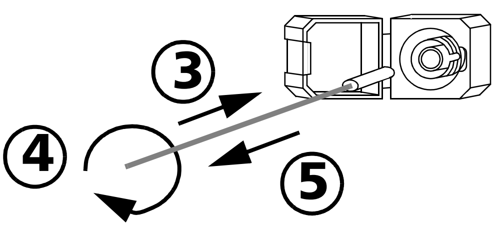
To clean EUI connectors:

1. Remove the EUI from the instrument to expose the connector baseplate and ferrule.



2. Moisten a 2.5 mm cleaning tip with *one drop* of isopropyl alcohol (alcohol may leave traces if used abundantly).

3. Slowly insert the cleaning tip into the EUI adapter until it comes out on the other side (a slow clockwise rotating movement may help).



4. Gently turn the cleaning tip one full turn, then continue to turn as you withdraw it.

5. Repeat steps 3 to 4 with a dry cleaning tip.

Note: *Make sure you don't touch the soft end of the cleaning tip.*

6. Clean the ferrule in the connector port as follows:

6a. Deposit *one drop* of isopropyl alcohol on a lint-free wiping cloth.

IMPORTANT

Isopropyl alcohol may leave residues if used abundantly or left to evaporate (about 10 seconds).

Avoid contact between the tip of the bottle and the wiping cloth, and dry the surface quickly.

6b. Gently wipe the connector and ferrule.

6c. With a dry lint-free wiping cloth, gently wipe the same surfaces to ensure that the connector and ferrule are perfectly dry.

6d. Verify connector surface with a portable fiber-optic microscope (e.g., EXFO's FOMS) or fiber inspection probe (e.g., EXFO's FIP).

WARNING

Verifying the surface of the connector WHILE THE UNIT IS ACTIVE WILL result in permanent eye damage.

7. Put the EUI back onto the instrument (push and turn clockwise).

8. Throw out cleaning tips and wiping cloths after one use.

Cleaning Detector Ports

Regular cleaning of detectors will help maintain measurement accuracy.

IMPORTANT
Always cover detectors with protective caps when unit is not in use.

To clean detector ports:

1. Remove the protective cap and adapter (FOA) from the detector.
2. If the detector is dusty, blow dry with compressed air.
3. Being careful not to touch the soft end of the swab, moisten a cleaning tip with *only one drop* of isopropyl alcohol.

IMPORTANT
Alcohol may leave traces if used abundantly. Do not use bottles that distribute too much alcohol at a time.

4. While applying light pressure (to avoid breaking the detector window), gently rotate the cleaning tip on the detector window.
5. Repeat step 4 with a dry cleaning tip or blow dry with compressed air.
6. Discard the cleaning tips after one use.

Cleaning Fiber Ends

To ensure optimum performance and avoid erroneous acquisitions, the fiber-optic cable end should be cleaned at all times.

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.

Recalibrating the Unit

Manufacturing and service center calibrations are based on the ISO/IEC 17025 Standard, which states that calibration documents must not contain a recommended calibration interval, unless this has been previously agreed upon with the customer.

Validity of specifications depends on operating conditions. For example, the calibration validity period can be longer or shorter depending on the intensity of use, environmental conditions and unit maintenance. You should determine the adequate calibration interval for your unit according to your accuracy requirements.

Under normal use, EXFO recommends calibrating your unit every year.

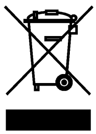
Disposing of Old CKT Modules

Your DWDM Passive Component Test System uses a wavelength-reference absorbtion cell (CKT module), which contains Hydrogen Cyanide ($H_{13}C_{14}N$). If you ever need to dispose of CKT modules, be very careful.

WARNING

Since CKT modules contain Hydrogen Cyanide, do NOT dispose of old modules in municipal waste. Follow all applicable laws and regulations governing disposal.

Recycling and Disposal (Applies to European Union Only)



Recycle or dispose of your product (including electric and electronic accessories) properly, in accordance with local regulations. Do not dispose of it in ordinary garbage receptacles.

This equipment was sold after August 13, 2005 (as identified by the black rectangle).

- ➤ Unless otherwise noted in a separate agreement between EXFO and a customer, distributor or commercial partner, EXFO will cover costs related to the collection, treatment, recovery and disposal of end-of-lifecycle waste generated by electronic equipment introduced after August 13, 2005 to an European Union member state with legislation regarding Directive 2002/96/EC.
- ➤ Except for reasons of safety or environmental benefit, equipment manufactured by EXFO, under its brand name, is generally designed to facilitate dismantling and reclamation.

For complete recycling/disposal procedures and contact information, visit the EXFO Web site at www.exfo.com/recycle.

15 Troubleshooting

Viewing the Online User Guide

If you have Acrobat Reader (version 5 or above) installed on your system, you can read the user guides online.

To view the user guide from the DWDM Passive Component Test System software:

Select **Online Manual** from the **Help** menu.

To view the user guide from the provided LabVIEW application:

Select **Help Topics** from the **Help** menu of the LabVIEW application.

If Acrobat Reader is not installed on your system, you can download a free copy from the Adobe Web site at http://www.adobe.com.

Note: *EXFO does not provide support for Adobe Acrobat Reader.*

Consulting the About Window of the LabVIEW Application

The **About** window, available from the **Help** menu, provides useful information such as application version, EXFO's address, Internet and phone technical support references.

Finding Information on the EXFO Web Site

The EXFO Web site provides answers to frequently asked questions (FAQs) regarding the use of your IQS-12004B DWDM Passive Component Test System.

To access FAQs:

1. Type http://www.exfo.com in your Internet browser.
2. Click the **Support** tab.
3. Click **FAQs** and follow the on-screen instructions. You will be given a list of questions pertaining to your subject.

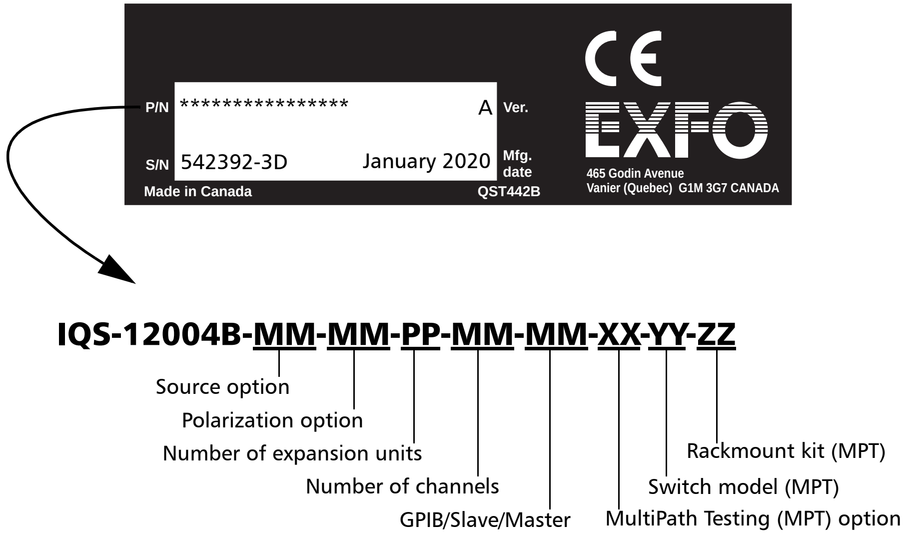
The EXFO Web site also provides the product's most recent technical specifications.

Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact EXFO at one of the following numbers. The Technical Support Group is available to take your calls from Monday to Friday, 7:30 a.m. to 8:00 p.m. (Eastern Time in North America).

Technical Support Group	
400 Godin Avenue	1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2	Tel.: 1 418 683-5498
CANADA	Fax: 1 418 683-9224
	support@exfo.com

To accelerate the process, please have information such as the name and the serial number (see the product identification label—an example is shown below), as well as a description of your problem, close at hand.



Transportation

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

➤ Pack the unit in its original packing material when shipping.

➤ Avoid high humidity or large temperature fluctuations.

➤ Keep the unit out of direct sunlight.

➤ Avoid unnecessary shocks and vibrations.

16 Warranty

General Information

EXFO Electro-Optical Engineering Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period oftwo 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, as well as verify and adjust the product free of charge should the equipment need to be repaired or if the original calibration is erroneous. If the equipment is sent back for verification of calibration during the warranty period and found to meet all published specifications, EXFO will charge standard calibration fees.

IMPORTANT

The warranty can become null and void if:

- **unit has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel.**
- **warranty sticker has been removed.**
- **case screws, other than those specified in this guide, have been removed.**
- **case has been opened, other than as explained in this guide.**
- **unit serial number has been altered, erased, or removed.**
- **unit 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.

Liability

EXFO shall not be liable for damages resulting from the use of the product, nor shall be responsible for any failure in the performance of other items to which the product is connected or the operation of any system of which the product may be a part.

EXFO shall not be liable for damages resulting from improper usage or unauthorized modification of the product, its accompanying accessories and software.

Exclusions

EXFO reserves the right to make changes in the design or construction of any of its products at any time without incurring obligation to make any changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps, batteries and universal interfaces (EUI) used with EXFO products are not covered by this warranty.

This warranty excludes failure resulting from: improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the product or other factors beyond EXFO's control.

IMPORTANT

EXFO will charge a fee for replacing optical connectors that were damaged due to misuse or bad cleaning.

Certification

EXFO certifies that this equipment met its published specifications at the time of shipment from the factory.

Service and Repairs

EXFO commits to providing product service and repair for five years following the date of purchase.

To send any equipment for service or repair:

1. Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 228). Support personnel will determine if the equipment requires service, repair, or calibration.
2. If equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) number and provide an address for return.
3. If possible, back up your data before sending the unit for repair.
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.
5. Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the RMA number on the shipping slip. *EXFO will refuse and return any package that does not bear an RMA number.*

Note: *A test setup fee will apply to any returned unit that, 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, you will be invoiced for the cost appearing on this report. EXFO will pay return-to-customer shipping costs for equipment under warranty. Shipping insurance is at your expense.

Routine recalibration is not included in any of the warranty plans. Since calibrations/verifications are not covered by the basic or extended warranties, you may elect to purchase FlexCare Calibration/Verification Packages for a definite period of time. Contact an authorized service center (see *EXFO Service Centers Worldwide* on page 228).

EXFO Service Centers Worldwide

If your product requires servicing, contact your nearest authorized service center.

EXFO Headquarters Service Center
400 Godin Avenue
Quebec (Quebec) G1M 2K2
CANADA

1 866 683-0155 (USA and Canada)
Tel.: 1 418 683-5498
Fax: 1 418 683-9224
quebec.service@exfo.com

EXFO Europe Service Center
Omega Enterprise Park, Electron Way
Chandlers Ford, Hampshire S053 4SE
ENGLAND

Tel.: +44 2380 246810
Fax: +44 2380 246801
europe.service@exfo.com

**EXFO China Service Center/
Beijing OSIC**
Beijing New Century Hotel
Office Tower, Room 1754-1755
No. 6 Southern Capital Gym Road
Beijing 100044
P. R. CHINA

Tel.: +86 (10) 6849 2738
Fax: +86 (10) 6849 2662
beijing.service@exfo.com

A Technical Specifications

IMPORTANT

The following technical specifications can change without notice. The information presented in this section is provided as a reference only. To obtain this product's most recent technical specifications, visit the EXFO Web site at *www.exfo.com*.

IQS-12004B DWDM Passive Component Test System

SPECIFICATIONS

Specifications [a]

	IQS-2600CT
Testing time [b]	< 18 s for 1 channel
	< 25 s for 40 channels
Sampling resolution [c]	0.005 nm, 0.01 nm, 0.02 nm, and 0.04 nm
Wavelength uncertainty [d]	± 0.005 nm
Wavelength repeatability [d] (2s)	± 0.001 nm
Wavelength range	1511 nm to 1611 nm
Loss measurement uncertainty [e, f]	± 0.05 dB (0 to 50 dB loss)
Loss measurement repeatability [e, f]	± 0.01 dB (0 to 50 dB loss)
Loss measurement range [f]	0 to 75 dB
Loss measurement resolution	0.001 dB
Optical rejection ratio [g]	> 60 dB
PDL measurement resolution	0.001 dB
PDL uncertainty [f, h]	1520 nm to 1570 nm ± (0.02 dB + 5 % of PDL DUT) 1511 nm to 1611 nm ± (0.03 dB + 5 % of PDL DUT)
PDL range	0 to 10 dB
ORL uncertainty [i]	± 0.5 dB (0 to 45 dB) ± 1 dB (45 to 50 dB)
ORL range [i]	0 to 65 dB
Number of channels [j]	> 80
Operating temperature	23 °C ± 3 °C
Storage temperature	–10 °C to 50 °C

IQS-12004B MultiPath Testing Option

Specifications[1]

Loss measurement uncertainty[2, 3, 5]	± 0.06 dB
Loss measurement repeatability[2, 3, 6]	± 0.04 dB
PDL uncertainty[2, 4, 5]	± (0.05 dB + 5 % of DUT PDL)
PDL repeatability[2, 4, 6]	± (0.025 dB + 3 % of DUT PDL)
ORL uncertainty[2, 5, 7]	± 1 dB (0 dB to 45 dB) ± 2 dB (45 dB to 50 dB)
ORL repeatability[2, 3, 6]	± 0.3 dB (0 dB to 45 dB)
ORL range[2]	0 dB to 55 dB
Operating temperature	Any stable temperature at ± 1 °C in the range 20 °C to 30 °C
All other specifications	Please refer to IQS-12004B data sheet

Notes:
1. All specifications are typical, after 60-minute warmup and testing a low loss components using the recommended EXFO accessories and EXFO low PDL switch.
2. Using a semi-rigid patchcord between the IQS-9401 and the switch.
3. Valid for spectrally uniform component. Does not include uncertainties due to connector or connector adapter.
4. Valid for spectrally uniform component terminated with a non-angled connector. Does not include uncertainties due to connector or connector adapter.
5. For first 100 cycles, within 100 hours after calibration and reference.
6. For 100 consecutive cycles within 100 hours.
7. Calibrated using a UPC connector with 14.7 dB of return loss.

B SCPI Commands Reference

This section presents all SCPI commands supported by your IQS-12004B DWDM Passive Component Test System.

General Commands

The SCPI Manager recognizes all of the common commands identified as mandatory by IEEE-488.2. These commands are fully explained on the following pages.

Note: *The expression* <wsp> *stands for white space in certain GPIB commands syntax.*

	*CLS
Description	This command clears the last error of the application buffer.
Syntax	*CLS
Note	If you get “STAT:ERR?” after having sent this command, you will read “0, No Error”.

	*IDN?
Description	This query reads the IQS system identification string.
Syntax	*IDN?
Response	“EXFO IQS-12004B GPIB x.x.x.x”, where x.x.x.x is the current product version

	*OPC?
Description	The response to this query indicates if the last operation was complete (whether or not it is successfully complete, it will return "1").
Syntax	*OPC?
Response	"1" - Operation is complete "0" - Operation is not complete

Specific Commands

INITialization:INITialize

Description	This command performs an initialization of all IQS modules.
Syntax	INIT:INIT
Parameter	None
Response	None
Example	INIT:INIT
Note	When INIT:SIMU = 1, the object simulator is used to develop without IQS modules. This is a blocking function i.e., **In progress** appears in the status bar and you must wait before sending a new command.

INITialization:INITialize?

Description	The response to this query indicates if an initialization of the modules has been performed.
Syntax	INIT:INIT?
Parameter	None
Response	A boolean response representing the state of initialization. “1” - The system is initialized. “0” - The system is not initialized.
Example	INIT:INIT?

INITialization:SIMUlation

Description	This commands sets the system to simulation mode.
Syntax	INIT:SIMU<wsp><simulation>
Parameter	The <simulation> parameter is a boolean value indicating if it is in simulation mode: “1” - Sets the system to simulation mode “0” - Sets the system to normal mode
Response	None
Example	INIT:SIMU 1

INITialization:SIMUlation?

Description	The response to this query indicates if the system was in simulation mode.
Syntax	INIT:SIMU?
Parameter	None
Response	A boolean value representing the state of the system: “1” - The system is in simulation mode “0” - The system is in normal mode
Example	INIT:SIMU?

CONFiguration:AVAilableChannel?

Description	The response to this query indicates the number of available channels in the system.
Syntax	CONF:AVAC?
Parameter	None
Response	The number of available channels in “999” format.
Example	CONF:AVAC?

CONFiguration:CHANnel

Description	This command sets the number of channels to test.
Syntax	CONF:CHAN<wsp><number channel>
Parameter	The <number channel> value refers to the number of channels to test in the system.
Response	None
Example	CONF:CHAN 3

CONFiguration:CHANnel?

Description	The response to this query indicates the number of channels to test.
Syntax	CONF:CHAN?
Parameter	None
Response	The number of channels is represented by the “999” format.
Example	CONF:CHAN?

CONFiguration:ACQuisitionType

Description	This command sets the acquisition type.
Syntax	CONF:ACQT<wsp><acquisition type>
Parameter	The <acquisition type> parameter value indicates: “1” - Resolution of 5 pm (only for the IQS-2600CT) “2” - Resolution of 10 pm “3” - Resolution of 20 pm “4” - Resolution of 40 pm
Response	None
Example	CONF:ACQT 2

CONFiguration:ACQuisitionType?

Description	The response to this query indicates the acquisition type.
Syntax	CONF:ACQT?
Parameter	None
Response	A value representing the selected acquisition type: “1” - Resolution of 5 pm (only for the IQS-2600CT) “2” - Resolution of 10 pm “3” - Resolution of 20 pm “4” - Resolution of 40 pm
Example	CONF:ACQT?

CONFiguration:KeepIL

Description	This command keeps insertion loss curves for all states of polarization (4), when a PDL acquisition has been performed.
Syntax	CONF:KIL<wsp><KeepIL>
Parameter	The <KeepIL> parameter is a boolean value indicating if the IL curve is kept for all SOP: “1” - Keep IL for all SOP “0” - Do not keep IL for all SOP
Response	None
Example	CONF:KIL1
See also	READ:SOP, READ:CURV:ILPD?
Note	Default: 0 This command requires a lot of memory space as there are four more curves by channel.

CONFiguration:KeepIL?

Description	The response to this query indicates if insertion loss curves are kept for all states of polarization.
Syntax	CONF:KIL?
Parameter	None
Response	A value representing if the IL is kept for all SOP: “1” - The IL is kept for all SOP “0” - The IL is not kept for all SOP
See also	READ:SOP?, READ:CURV:ILPD?

CONFiguration:AutoRangeFiltering

Description	This command sets the filtering mode.
Syntax	CONF:ARF<wsp><filtering>
Parameter	The <filtering> parameter is a boolean value indicating if it is in filtering mode: “1” - Sets the system to filtering mode “0” - Does not set the system to filtering mode
Response	None
Example	CONF:ARF 1
Note	It is highly recommended to set the system to filtering mode.

CONFiguration:AutoRangeFiltering?

Description	The response to this query indicates the filtering mode.
Syntax	CONF:ARF?
Parameter	None
Response	A value representing the selected filtering mode: “1” - The system is in filtering mode “0” - The system is not in filtering mode
Example	CONF:ARF?

CONFiguration:MINimumWavelength?

Description	The response to this query indicates the minimum wavelength available in the system.
Syntax	CONF:MINW?
Parameter	None
Response	The minimum wavelength in the 9999.999 nm format.
Example	CONF:MINW?

CONFiguration:MAXimumWavelength?

Description	The response to this query indicates the maximum wavelength available in the system.
Syntax	CONF:MAXW?
Parameter	None
Response	The maximum wavelength in the 9999.999 nm format.
Example	CONF:MAXW?

CONFiguration:STARt

Description	This command sets the position where to start the acquisition.
Syntax	CONF:STAR<wsp><wavelength>
Parameter	The <wavelength> parameter value indicates the wavelength using the 9999.999 nm format.
Response	None
Example	CONF:STAR 1520.500

CONFiguration:STARt?

Description	The response to this query indicates the position where to start the acquisition.
Syntax	CONF:STAR?
Parameter	None
Response	Wavelength in 9999.999 nm format.
Example	CONF:STAR?

CONFiguration:STOP

Description	This command sets the position where to stop the acquisition.
Syntax	CONF:STOP<wsp><wavelength>
Parameter	The <wavelength> parameter value indicates the wavelength using the 9999.999 nm format.
Response	None
Example	CONF:STOP 1569.000

CONFiguration:STOP?

Description	The response to this query indicates the position where to stop the acquisition.
Syntax	CONF:STOP?
Parameter	None
Response	Wavelength in 9999.999 nm format.
Example	CONF:STOP?

CALibration:WavelengthResponse:CHANnel

Description	This command sets the active channel for the wavelength response calibration acquisition.
Syntax	CAL:WR:CHAN<wsp><channel number>
Parameter	The <channel number> parameter value indicates the active channel number in "999" format.
Response	None
Example	CAL:WR:CHAN 2

CALibration:WavelengthResponse:CHANnel?

Description	The response to this query indicates the active channel for the wavelength response calibration acquisition.
Syntax	CAL:WR:CHAN?
Parameter	None
Response	Active channel number in "999" format.
Example	CAL:WR:CHAN?

CALibration:WavelengthResponse:ACQuisition

Description	This command performs a wavelength response calibration on the active channel.
Syntax	CAL:WR:ACQ
Parameter	None
Response	None
Example	CAL:WR:ACQ

CALibration:WavelengthResponse:ACQuisition?

Description	The response to this query indicates if a wavelength response calibration has been performed.
Syntax	CAL:WR:ACQ?
Parameter	None
Response	A boolean response indicates the state of the wavelength response calibration acquisition: “1” - The acquisition is performed “0” - The acquisition is not performed
Example	CAL:WR:ACQ?

CALibration:NULLing

Description	This command performs a nulling on the power meter and wavelength reference module channels.
Syntax	CAL:NULL
Parameter	None
Response	None
Example	CAL:NULL

CALibration:ORLRtj

Description	This command performs an ORL calibration with a reference test jumper.
Syntax	CAL:ORLR
Parameter	None
Response	None
Example	CAL:ORLR

CALibration:ORLRtj?

Description	The response to this query indicates if an ORL calibration with a reference test jumper has been performed.
Syntax	CAL:ORLR?
Parameter	None
Response	A boolean response representing the state of the ORL calibration performed with the RTJ. “1” - The ORL calibration with the RTJ is performed. “0” - The ORL calibration with the RTJ is not performed
Example	CAL:ORLR?

CALibration:STOP

Description	This command stops the current calibration acquisition.
Syntax	CAL:STOP
Parameter	None
Response	None
Example	CAL:STOP
Note	Applies to all calibration acquisition (i.e., WR, ORLR, ORLM), but not to nulling.

CALibration:ORLMandrelrtj

Description	This command performs an ORL calibration with a mandrel and reference test jumper.
Syntax	CAL:ORLM
Parameter	None
Response	None
Example	CAL:ORLM

CALibration:ORLMandrelrtj?

Description	The response to this query indicates if an ORL calibration with a mandrel and reference test jumper has been performed.
Syntax	CAL:ORLM?
Parameter	None
Response	A boolean response representing the state of the ORL mandrel RTJ calibration acquisition: “1” - The ORL mandrel RTJ calibration is performed “0” - The ORL mandrel RTJ calibration is not performed
Example	CAL:ORLM?

REFerence:IL

Description	This command performs an IL reference acquisition.
Syntax	REF:IL
Parameter	None
Response	None
Example	REF:IL

REFerence:IL?

Description	The response to this query indicates if an IL reference acquisition has been performed.
Syntax	REF:IL?
Parameter	None
Response	A boolean response representing the state of the IL reference acquisition: “1” - The IL reference acquisition is performed “0” - The IL reference acquisition is not performed
Example	REF:IL?

REFerence:ILPDl

Description	This command performs an IL/PDL reference acquisition.
Syntax	REF:ILPD
Parameter	None
Response	None
Example	REF:ILPD

REFerence:ILPDl?

Description	The response to this query indicates if an IL/PDL reference acquisition has been performed.
Syntax	REF:ILPD?
Parameter	None
Response	A boolean response representing the state of the IL/PDL reference acquisition: “1” - The IL/PDL reference acquisition is performed “0” - The IL/PDL reference acquisition is not performed
Example	REF:PD?

REFerence:ORLM

Description	This command performs an ORL reference acquisition using a mandrel.
Syntax	REF:ORLM
Parameter	None
Response	None
Example	REF:ORLM

REFerence:ORLM?

Description	The response to this query indicates if an ORL reference using a mandrel has been performed.
Syntax	REF:ORLM?
Parameter	None
Response	A boolean response representing the state of the ORL reference acquisition using a mandrel: “1” - The ORL reference acquisition using a mandrel is performed “0” - The ORL reference acquisition using a mandrel is not performed
Example	REF:ORLM?

REFerence:STOP

Description	This command stops the current reference acquisition.
Syntax	REF:STOP
Parameter	None
Response	None
Example	REF:STOP
Note	Applies to all reference acquisitions (i.e., IL, PDL, and ORL).

TEST:AVAilableTests?

Description	The response to this query indicates which tests can be performed according to the modules detected, the calibration, and the reference.
Syntax	TEST:AVAT?
Parameter	None
Response	A value representing the available tests: “1” - None “2” - IL “3” - ORL “4” - IL/ORL “5” - IL/PDL “6” - IL/ORL/PDL
Example	TEST:AVAT?

TEST:CLeaR

Description	This command clears the last IL, PDL, and ORL results.
Syntax	TEST:CLR
Parameter	None
Response	None
Example	TEST:CLR

ACQuisition:IL

Description	This command performs an IL acquisition on a DUT.
Syntax	ACQ:IL
Parameter	None
Response	None
Example	ACQ:IL

ACQuisition:ILPDl

Description	This command performs an IL/PDL acquisition on a DUT.
Syntax	ACQ:ILPD
Parameter	None
Response	None
Example	ACQ:ILPD

ACQuisition:ORL

Description	This command performs an ORL acquisition on a DUT.
Syntax	ACQ:ORL
Parameter	None
Response	None
Example	ACQ:ORL

ACQuisition:SYNChronized

Description	This command performs a synchronized power acquisition on all IQS-1600 power meters.
Syntax	ACQ:SYNC<wsp><NumberPoints>
Parameter	The <NumberPoints> parameter indicates the number of points to take for the acquisition.
Response	None
Example	ACQ:SYNC 25000
Note	A maximum of 32 000 points is allowed.
See also	READ:CURV:SYNC?

ACQuisition:STOP

Description	This command stops the current acquisition on a DUT.
Syntax	ACQ:STOP
Parameter	None
Response	None
Example	ACQ:STOP

STATus:ERRor?

Description	The response to this query indicates the last error and provides a description.
Syntax	STAT:ERR?
Parameter	None
Response	A string representing: Error Number,"Error description"
Example	STAT:ERR?
Note	See also *SCPI Error Messages* on page 195.

READ:CURVe:IL?

Description	The response to this query indicates the IL results curve on a specified channel.
Syntax	READ:CURV:IL?
Parameter	None
Response	A string response representing all points of the IL acquisition using the "x (nm), y (dB)" format.
Example	READ:CURV:IL?
See also	READ:CHAN?

READ:CURVe:PDL?

Description	The response to this query indicates the PDL results curve on a specified channel.
Syntax	READ:CURV:PDL?
Parameter	None
Response	A string response representing all points of the PDL acquisition using the "x (nm), y (dB)" format.
Example	READ:CURV:PDL?
See also	READ:CHAN?

READ:CURVe:ORL?

Description	The response to this query indicates the ORL results curve.
Syntax	READ:CURV:ORL?
Parameter	None
Response	A string response representing all points of the ORL acquisition using the "x (nm), y (dB)" format.
Example	READ:CURV:ORL?

READ:CURVe:ILPDl?

Description	The response to this query indicates the IL curve for a specific state of polarization, when a PDL acquisition has been performed.
Syntax	READ:CURV:ILPD?
Parameter	None
Response	A string response representing all points of the IL curve using the “x (nm), y (dB)” format.
Example	READ:CURV:ILPD?
Note	Available only for the last PDL acquisition, with CONF:KIL=1
See also	READ:CHAN?, READ:SOP?, CONF:KIL?

READ:CURVe:SYNChronized?

Description	The response to this query indicates the power synchronized acquisition result curve on a specified channel.
Syntax	READ:CURV:SYNC?
Parameter	None
Response	A string response representing all points of the power synchronized acquisition using “PowerPoints (dB), Status” format.
Example	READ:CURV:SYNC?
See also	ACQ:SYNC

READ:CHANnel?

Description	The response to this query indicates the active channel.
Syntax	READ:CHAN?
Parameter	None
Response	Active channel number in the “999” format.
Example	READ:CHAN?

READ:CHannelLOcalization?

Description	The response to this query indicates the localization information about the specified channels.
Syntax	READ:CHLO?
Parameter	None
Response	A string response in the “Slot Position,Power Meter Channel” format. For example: - Slot position: (1-3) - Power meter channel: 2 (range: 1-4)
Example	READ:CHLO?

READ:PowerMeter?

Description	The response to this query indicates the power meter value for the specified channel.
Syntax	READ:PM?
Parameter	None
Response	A power measurement in the 9999.999 dBm format for the specified channel.
Example	READ:PM?
Note	This is a blocking function i.e., **In progress** appears in the status bar and you must wait before sending a new command.

READ:WavelengthReferenceModule?

Description	The response to this query indicates the power of both channels on the wavelength reference module.
Syntax	READ:WRM?
Parameter	None
Response	A string in the “Reference channel, ORL channel” dBm format, i.e., “9999.999,9999.999” dBm format.
Example	READ:WRM?
Note	This is a blocking function i.e., **In progress** appears in the status bar and you must wait before sending a new command.

READ:SerialNumber?

Description	The response to this query indicates the serial number of each modules initialized in the system.
Syntax	READ:SN?
Parameter	None
Response	A string in the “ModuleName SlotPosition: Serial Number” format.
Example	READ:SN?
Note	Each module description is separated by a comma.

READ:StateOfPolarization

Description	This command indicates on which state of polarization to take the IL curve, when a PDL acquisition has been performed.
Syntax	READ:SOP<wsp><StateOfPolarization>
Parameter	The <StateOfPolarization> parameter value can be 0, 1, 2, or 3.
Response	None
Example	READ:SOP 2
See also	CONF:KIL, READ:CURV:ILPD?

READ:StateOfPolarization?

Description	The response to this query indicates the current state of polarization when reading the IL during a PDL acquisition.
Syntax	READ:SOP?
Parameter	None
Response	A string response representing the current state of polarization, i.e., 0, 1, 2, or 3.
Example	READ:SOP?
See also	CONF:KIL? READ:CURV:ILPD?

PolarizationStateAdjuster:MAXimum

Description	This command optimizes the power.
Syntax	PSA:MAX
Parameter	None
Response	None
Example	PSA:MAX

PolarizationStateAdjuster:MAXimum?

Description	The response to this query indicates if the power was optimized.
Syntax	PSA:MAX?
Parameter	None
Response	A boolean response representing the state of the PSA: “1” - The power is optimized “0” - The power is not optimized
Example	PSA:MAX?

PolarizationStateAdjuster:StateOfPolarization

Description	This command sets a new polarization state on the IQS-5150 polarization state adjuster.
Syntax	PSA:SOP<wsp><StateOfPolarization>
Parameter	The <StateOfPolarization> parameter value is a new state of polarization. It can be: 0, 1, 2, or 3
Response	None
Example	PSA:SOP 2

PolarizationStateAdjuster:StateOfPolarization?

Description	The response to this query indicates the current polarization state on the IQS-5150 polarization state adjuster.
Syntax	PSA:SOP?
Parameter	None
Response	A string response representing the current state of polarization. It can be: 0, 1, 2, or 3
Example	PSA:SOP?

SOURce:MINimumWavelength?

Description	The response to this query indicates the minimum wavelength of the current source.
Syntax	SOUR:MINW?
Parameter	None
Response	Minimum wavelength in 9999.999 nm format.
Example	SOUR:MINW?

SOURce:MAXimumWavelength?

Description	The response to this query indicates the maximum wavelength of the current source.
Syntax	SOUR:MAXW?
Parameter	None
Response	Maximum wavelength in 9999.999 nm format.
Example	SOUR:MAXW?

SOURce:ON

Description	This command turns the source ON or OFF.
Syntax	SOUR:ON<wsp><state>
Parameter	The <state> parameter is a boolean value indicating the new state of the source: “1” - Sets the source to ON “0” - Sets the source to OFF
Response	None
Example	SOUR:ON 1
Note	This is a blocking function i.e., **In progress** appears in the status bar and you must wait before sending a new command.

SOURce:ON?

Description	The response to this query indicates if the source was active.
Syntax	SOUR:ON?
Parameter	None
Response	A boolean value representing the current state of the source: “1” - The source is ON “0” - The source is OFF
Example	SOUR:ON?

SOURce:STABilization?

Description	The response to this query indicates how long the source has been turned on.
Syntax	SOUR:STAB?
Parameter	None
Response	A string value indicating since when the source is ON using the “9999.999” seconds format.
Example	SOUR:STAB?

SOURce:WAVElength

Description	This command sets the source wavelength.
Syntax	SOUR:WAVE<wsp><wavelength>
Parameter	The <wavelength> parameter value indicating the wavelength in "9999.999" nm format.
Response	None
Example	SOUR:WAVE 1520.050
Note	This is a blocking function i.e., **In progress** appears in the status bar and you must wait before sending a new command.

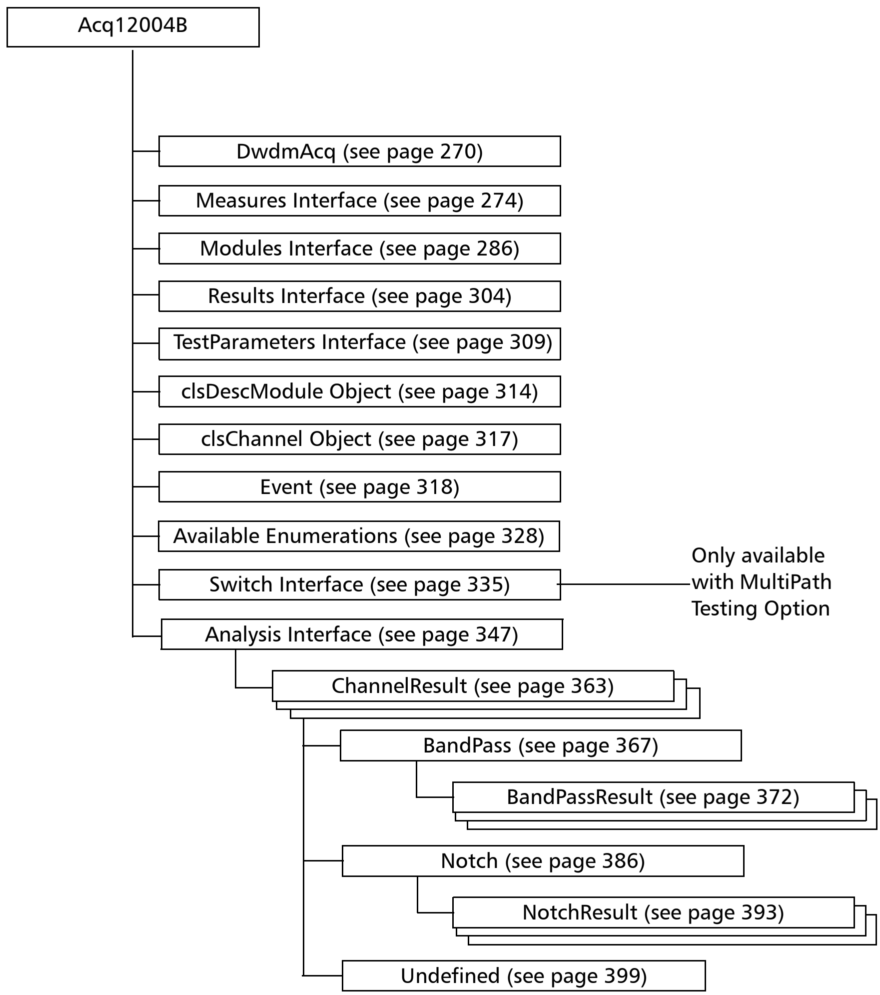
SOURce:WAVElength?

Description	The response to this query indicates the wavelength of the current source.
Syntax	SOUR:WAVE?
Parameter	None
Response	Wavelength in 9999.999 nm format.
Example	SOUR:WAVE?

C COM Objects Reference

This section presents all COM methods and properties supported by your IQS-12004B DWDM Passive Component Test System and/or MultiPath Testing Option.

The information is grouped by interfaces according to following diagram:



For more information see *COM Objects Overview* on page 206.

For each interface, you will find:

- A section with the available methods (when applicable).
- A section with the available properties (when applicable).

In each section (methods or properties), the objects are presented by alphabetical order. The corresponding interface name is always displayed in the method (or property) header.

Interface name | Method /property name

Measures	**AcqIlDut**
Description	This command performs an IL measurement on the DUT.

DWDMAcq Interface—Properties

DWDMAcq	**EnableWaitingEvent**
Description	This command enables or disables the waiting event.
Syntax	object.*EnableWaitingEvent*
Parameters	Byval Boolean
Response	Boolean
Access	Get/Let

DWDMAcq	RawDataPath
Description	This command indicates the path where to save the binary data file. For more information, see *Modifying System Settings* on page 56.
Syntax	object.*RawDataPath*
Parameters	Byval String
Response	String
Access	Get/Let

DWDMAcq	SaveRawData
Description	This command saves the binary data file. For more information, see *Modifying System Settings* on page 56.
Syntax	object.*SaveRawData*
Parameters	Byval Boolean
Response	Boolean
Access	Get/Let

DWDMAcq	State
Description	The response to this query indicates the current object state according to EState. For more information on EState, see *Public Enum EState* on page 334.
Syntax	object.*State*
Parameters	None
Response	Enumeration: EState
Access	Get

DWDMAcq	ComponentVersion
Description	The response to this query indicates the version of the component.
Syntax	object.*ComponentVersion*
Parameters	None
Response	String
Access	Get

DWDMAcq PdlSimplifiedMethod

Description This property returns or sets a value that determines if the simplified PDL method is used. For more information on simplified PDL, see *Modifying System Settings* on page 56.

Syntax object.*PdlSimplifiedMethod* = [*Boolean*]

The following table presents the possible settings for the Boolean value.

Setting	Description
True	The simplified PDL method will be used.
False	(Default). The simplified PDL method will not be used.

Parameters A Boolean value.

Response A Boolean value.

Access Get/Let

Measures Interface—Methods

Note: *With FireEvent = True, the object raises an event at the end of the process. With FireEvent = False, no event occurs.*

Measures	**AcqIlDut**
Description	This command performs an IL measurement on the DUT.
Syntax	object.*AcqIlDut*(*FireEvent*)
Parameters	Byval Boolean *FireEvent*
Response	None
Possible error	ErrInitBefore, ErrCalWrBefore, ErrRefIlBefore, ErrInProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Measures	**AcqIlPdlDut**
Description	This command performs an IL/PDL measurement on the DUT.
Syntax	object.*AcqIlPdlDut*(*FireEvent)*
Parameters	Byval Boolean FireEvent
Response	None
Possible error	ErrInitBefore, ErrHardNotCompatible, ErrCalWrBefore, ErrRefIlPdlBefore, ErrInProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Available only with the IQS-5150 polarization state adjuster.

Measures	**AcqOrlMandrelDut**
Description	This command performs an ORL measurement on the DUT.
Syntax	object.*AcqOrlMandrelDut*(*FireEvent*)
Parameters	Byval Boolean *FireEvent*
Response	None
Possible error	ErrInitBefore, ErrCalOrlRtjBefore, ErrCalOrlMandrelRtjBefore, ErrRefOrlMandrelBefore, ErrInProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Measures	AcqPowerSynchronized
Description	This command performs a synchronized power acquisition on all IQS-1600 power meters.
Syntax	object.*AcqPowerSynchronized* (*NumberOfPorts*, *NumberOfAcquisitionPoints*, *FireEvent*)
Parameters	Byval Long *NumberOfPorts* Byval Double *NumberOfAcquisitionPoints* Byval Boolean *FireEvent*
Response	None
Possible error	ErrInitBefore, ErrHardNotCompatible, ErrCalWrBefore, ErrRefIlPdlBefore, ErrInProgress, ErrAcqType, ErrNumberOfAcquisitionPoints, ErrNotAvailableInSimulatorMode, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	The maximum number of points is 32 000.

Measures	CalOrlMandrelRtj
Description	This command performs an ORL calibration using a mandreled reflection reference jumper (zero measurement).
Syntax	object.*CalOrlMandrelRtj*(*FireEvent*)
Parameters	Byval Boolean FireEvent
Response	None
Possible error	ErrInitBefore, ErrInProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Measures	CalOrlRtj
Description	This command performs an ORL calibration using a reflection reference jumper.
Syntax	object.*CalOrlRtj*(*FireEvent*)
Parameters	Byval Boolean FireEvent
Response	None
Possible error	ErrInitBefore, ErrInProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Measures	CalWr
Description	This command performs a wavelength response calibration on the power meter channel. ChannelToCalibrate represents the number of channels to calibrate, as indicated on the channel localization list.
Syntax	object.*CalWr*(*ChannelToCalibrate*, *FireEvent*)
Parameters	Byval Long *ChannelToCalibrate*, Byval Boolean *FireEvent*
Response	None
Possible error	ErrInitBefore, ErrInProgress, ErrChannelNumber, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
See also	ChannelLocalisation (see page 291)

Measures	RefIl
Description	This command performs an IL reference measurement.
Syntax	object.*RefIl*(*FireEvent*)
Parameters	Byval Boolean FireEvent
Response	None
Possible error	ErrInitBefore, ErrCalWrBefore, InProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Measures	**RefIlPdl**
Description	This command performs an IL/PDL reference measurement.
Syntax	object.*RefIlPdl*(*FireEvent*)
Parameters	Byval Boolean FireEvent
Response	None
Possible error	ErrInitBefore, ErrCalWrBefore, InProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrOptimizeBefore, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Use only the IQS-5150 polarization state adjuster.

Measures	**RefOrlMandrel**
Description	This command performs an ORL reference measurement by mandreling the launch fiber.
Syntax	object.*RefOrlMandrel*(*FireEvent*)
Parameters	Byval Boolean FireEvent
Response	None
Possible error	ErrInitBefore, ErrCalOrlRtjBefore, ErrCalOrlMandrelRtjBefore, ErrInProgress, ErrAcqType, ErrAcqStopped, ErrScanRange, ErrSourceNotEnabled. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Measures	StopAcq
Description	This command stops the current measurement scan.
Syntax	object.*StopAcq*
Parameters	None
Response	None

Measures Interface—Properties

Measures	AcqIlDutDone
Description	The response to this query indicates if an IL measurement has been performed on the DUT.
Syntax	object.*AcqIlDutDone*
Parameters	None
Response	Boolean
Access	Get

Measures	AcqIlPdlDutDone
Description	The response to this query indicates if an IL/PDL measurement has been performed on the DUT.
Syntax	object.*AcqIlPdlDutDone*
Parameters	None
Response	Boolean
Access	Get

Measures	AcqOrlMandrelDutDone
Description	The response to this query indicates if an ORL measurement has been performed on the DUT.
Syntax	object.*AcqOrlMandrelDutDone*
Parameters	None
Response	Boolean
Access	Get

Measures	CalOrlMandrelRtjDone
Description	The response to this query indicates if an ORL calibration using a mandreled reflection reference jumper has been performed.
Syntax	object.*CalOrlMandrelRtjDone*
Parameters	None
Response	Boolean
Access	Get

Measures	CalOrlRtjDone
Description	The response to this query indicates if an ORL calibration using a reflection reference jumper has been performed.
Syntax	object.*CalOrlRtjDone*
Parameters	None
Response	Boolean
Access	Get

Measures	**CalWrDone**
Description	The response to this query indicates if a wavelength response calibration has been performed on a channel. When the channel = 0, the property returns a global status. This global status is true only if a wavelength response calibration is performed on all channels.
Syntax	object.*CalWrDone*(*Channel*)
Parameters	Byval Long Channel
Response	Boolean
Access	Get

Measures	RefIlDone
Description	The response to this query indicates if an IL reference measurement has been performed.
Syntax	object.*RefIlDone*
Parameters	None
Response	Boolean
Access	Get

Measures	RefIlPdlDone
Description	The response to this query indicates if an IL/PDL reference measurement has been performed.
Syntax	object.*RefIlPdlDone*
Parameters	None
Response	Boolean
Access	Get

Measures	**RefOrlMandrelDone**
Description	The response to this query indicates if an ORL reference measurement using a mandreled launch fiber has been performed.
Syntax	object.*RefOrlMandrelDone*
Parameters	None
Response	Boolean
Access	Get

Modules Interface—Methods

Modules	**GetAllPmData**
Description	The response to this query indicates the power meter values and status for a specified power meter.
Syntax	object.*GetAllPmData*(*PmNumber*, *adSample*, *adStatus*)
Parameters	ByVal *PmNumber* As Long, ByRef *adSample()* As Double, ByRef *adStatus()* As EPowerStatus For more information on EPowerStatus, see*Public Enum EPowerStatus* on page 333.
Note	Unit = Watt The status specifies the validity of the sample. If status is 0, the sample is valid.

Modules	**HidePowerMeterMonitor**
Description	This command hides a window which indicates power meter values.
Syntax	object.*HidePowerMeterMonitor*
Parameters	None
Response	None

Modules	InitHardware
Description	This command performs an initialization of all IQS modules. When Simulator is set to True, the simulator mode is enabled, allowing you to develop applications with virtual IQS modules.
Syntax	object.*InitHardware*(*FireEvent*, [*Simulato*r])
Parameters	Byval Boolean *FireEvent*, Byval Boolean *Simulator* (Optional)
Response	None

Modules	Nulling
Description	This command can either perform a nulling on all power meters and wavelength reference modules, on one power meter, or on the wavelength reference module. For nulling one power meter, use PmNumber to identify the desired power meter.
Syntax	object.*Nulling*(*NullingType*, *FireEvent*, [*PmNumber*])
Parameters	ByVal *NullingType* As ENullingType, Byval Boolean *FireEvent*, Optional ByVal *PmNumber* As Long For more information on ENullingType, see *Public Enum ENullingType* on page 332.
Response	None
Possible error	ErrInitBefore, ErrInProgress, ErrNullingtype, ErrNulling, ErrNullingIndex. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Modules	**OptimizePower**
Description	This command optimizes the power.
Syntax	object.*OptimizePower*
Parameters	None
Response	None
Possible error	ErrInitBefore, ErrHardNotCompatible, ErrInProgress. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Use only with the IQS-5150 polarization state adjuster.

Modules	OptimizePowerDone
Description	The response to this query indicates if the power was optimized.
Syntax	object.*OptimizePowerDone*(*FireEvent*)
Parameters	Byval Boolean *FireEvent*
Response	Boolean
Access	Get

Modules	ShowPowerMeterMonitor
Description	This command displays a window which indicates power meter values.
Syntax	object.*ShowPowerMeterMonitor*
Parameters	None
Response	None

Modules Interface—Properties

Modules	**AvailableHardware**
Description	The response to this query indicates the objects containing information on detected IQS module(s).
Syntax	object.*AvailableHardware*
Parameters	None
Response	Module collection
Access	Get
Example	Object.*AvailableHardware*(1).ModuleName Object.*AvailableHardware*(1).SerialNumber Object.*AvailableHardware*(1).Slot
See also	clsDescModule (see *clsDescModule Object—Properties* on page 314)

Modules	**ChannelLocalisation**
Description	The response to this query indicates the channels containing localization information.
Syntax	object.*ChannelLocalisation*
Parameters	None
Response	Collection of Module clsChannel
Access	Get
Example	object.*ChannelLocalisation*(1).PMChannel object.*ChannelLocalisation*(1).PMNumber object.*ChannelLocalisation*(1).DescModule.slot
See also	clsChannel (see *clsChannel Object—Properties* on page 317)

Modules	FormatedPowerAcq
Description	The response to this query indicates the power meter value for the specified channel, according to the source wavelength and polarization state.
Syntax	object.*FormatedPowerAcq*(*Channel*, *NbDecimal*)
Parameters	Byval Long *Channel*, Byval *NoDecimal* as EDecimalFormat For more information on EDecimalFormat, see *Public Enum EDecimalFormat* on page 329.
Response	String
Access	Get
Possible error	ErrInitBefore, ErrInProgress, ErrChannelNumber, ErrPmValue, ErrPmValueOver, ErrPmValueUnder. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=dBm

Modules	**FormatedWrmPowerAcq**
Description	The response to this query indicates the wavelength reference module value for the specified channel (1-4), according to the source wavelength and polarization state.
Syntax	object.*FormatedWrmPowerAcq*(*WrmChannel*,*NbDecimal*)
Parameters	Byval Long *WrmChannel*, Byval *NoDecimal* as EDecimalFormat For more information on EDecimalFormat, see *Public Enum EDecimalFormat* on page 329.
Response	String
Access	Get
Possible error	ErrInitBefore, ErrInProgress, ErrChannelNumber, ErrPmValue, ErrPmValueOver, ErrPmValueUnder. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=dBm

Modules	**InitDate**
Description	The response to this query indicates the initialization date.
Syntax	object.*InitDate*
Parameters	None
Response	Date
Access	Get

Modules	InitDone
Description	The response to this query indicates if an initialization of the modules has been performed.
Syntax	object.*InitDone*
Parameters	None
Response	Boolean
Access	Get

Modules	MinPowerForCal
Description	This command indicates the minimum power required to validate the input of the IQS-1600 power meter modules. This value is used to verify the connection during calibration.
Syntax	object.*MinPowerForCal*
Parameters	Double
Response	Double
Access	Get/Let
Note	Unit=Watt

Modules	**MinPowerForRef**
Description	This command indicates the minimum power required to validate the input of the IQS-1600 power meter modules. This value is used to verify the connection during the reference measurement.
Syntax	object.*MinPowerForRef*
Parameters	Double
Response	Double
Access	Get/Let
Note	Unit=Watt

Modules	**MinPowerInWrm**
Description	This command indicates the minimum power required to validate the input of the IQS-9401 wavelength reference module. This value is used to verify the connection.
Syntax	object.*MinPowerInWrm*
Parameters	Double
Response	Double
Access	Get/Let
Note	Unit=Watt

Modules	NullingDone
Description	The response to this query indicates if a nulling has been performed.
Syntax	object.*NullingDone*(*NullingType*, [*PmNumber*])
Parameters	*NullingType* (ENullingType), Optional *PmNumber* As Long For more information on ENullingType, see *Public Enum ENullingType* on page 332.
Response	Boolean
Access	Get

Modules	PolarizationState
Description	This command indicates the polarization state of the IQS-5150 polarization state adjuster module.
Syntax	object.*PolarizationState*
Parameters	EPolarizationState For more information, see *EPolarizationState* on page 332.
Response	EPolarizationState
Access	Get/Let
Possible error	ErrInitBefore, ErrInProgress, ErrOptimizeBefore. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Modules	**PossibleTestWithHard**
Description	The response to this query indicates the tests that can be performed with the modules detected.
Syntax	object.*PossibleTestWithHard*
Parameters	None
Response	Enumeration EPossibleTestWithHard For more information, see *Public Enum EPossibleTestWithHard* on page 333.
Access	Get
Note	Depending on the modules detected, you can perform and IL, an IL/ORL, or an IL/PDL/ORL measurement.

Modules	**PowerAcq**
Description	The response to this query indicates the power meter value of the specified channel, according to the source wavelength and polarization state.
Syntax	object.*PowerAcq*(*Channel*)
Parameters	Byval Long *Channel*
Response	Double
Access	Get
Possible error	ErrInitBefore, ErrInProgress, ErrChannelNumber, ErrPmValue, ErrPmValueOver, ErrPmValueUnder. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=Watt

Modules	PowerMeterMonitorHeight
Description	This command indicates the height of the monitor window.
Syntax	object.*PowerMeterMonitorHeight*
Parameters	Double
Response	Double
Access	Get/Let
Note	Unit = Twip[a]

a. A twip is a unit of screen measurement that equals 1/20 of a printer's point. There are 567 twips to a centimeter and 1440 twips to an inch.

Modules	PowerMeterMonitorLeftPosition
Description	This command indicates the monitor window position on the left.
Syntax	object.*PowerMeterMonitorLeftPosition*
Parameters	Double
Response	Double
Access	Get/Let
Note	Unit=Twip[a]

a. A twip is a unit of screen measurement that equals 1/20 of a printer's point. There are 567 twips to a centimeter and 1440 twips to an inch.

Modules	**PowerMeterMonitorTopPosition**
Description	This command indicates the monitor window position at the top.
Syntax	object.*PowerMeterMonitorTopPosition*
Parameters	Double
Response	Double
Access	Get/Let
Note	Unit=Twip[a]

a. A twip is a unit of screen measurement that equals 1/20 of a printer's point. There are 567 twips to a centimeter and 1440 twips to an inch.

Modules	**PowerMeterMonitorWidth**
Description	This command indicates the width of the monitor window.
Syntax	object.*PowerMeterMonitorWidth*
Parameters	Double
Response	Double
Access	Get/Let
Note	Unit=Twip[a]

a. A twip is a unit of screen measurement that equals 1/20 of a printer's point. There are 567 twips to a centimeter and 1440 twips to an inch.

Modules	**SourceActive**
Description	This command turns the source ON or OFF, or indicates if the source is active or not.
Syntax	object.*SourceActive*
Parameters	Boolean
Response	Boolean
Access	Get/Let
Possible error	ErrInitBefore. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.

Modules	**SourceMaxWavelength**
Description	The response to this query indicates the source maximum wavelength.
Syntax	object.*SourceMaxWavelength*
Parameters	None
Response	Double
Access	Get
Possible error	ErrInitBefore. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=nm

Modules	**SourceMinWavelength**
Description	The response to this query indicates the source minimum wavelength.
Syntax	object.*SourceMinWavelength*
Parameters	None
Response	Double
Access	Get
Possible error	ErrInitBefore. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=nm

Modules	SourceStabilisationTime
Description	The response to this query indicates the time between the source activation and the use of this function.
Syntax	object.*SourceStabilisationTime*
Parameters	None
Response	Double
Access	Get
Possible error	ErrInitBefore. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=Second

Modules	SourceWavelength
Description	This command indicates the source wavelength.
Syntax	object.*SourceWavelength*
Parameters	Byval Double Wavelength
Response	Double
Access	Get/Let
Possible error	ErrInitBefore. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=nm

Modules	**WrmPowerAcq**
Description	The response to this query indicates the wavelength reference module power value of the specified channel.
Syntax	object.*WrmPowerAcq*(*Channel*)
Parameters	Byval Long *Channel*
Response	Double
Access	Get
Possible error	ErrInitBefore, ErrInProgress, ErrChannelNumber, ErrPmValue, ErrPmValueOver, ErrPmValueUnder. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Unit=Watt

Results Interface—Methods

Results	**ClearResults**
Description	This command clears the last IL, PDL, and ORL results.
Syntax	object.*ClearResults*
Parameters	None
Response	None

Results Interface—Properties

Results	**IlCurve**
Description	The response to this query indicates the IL result curve for the channel (x (nm), y (dB)).
Syntax	object.*IlCurve(Channel*)
Parameters	Byval Long *Channel*
Response	Variant (array of double: x, y)
Access	Get
Possible error	ErrAcqBefore, ErrInProgress, ErrChannelNumber. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Wavelength unit=nm Power unit=dB

Results	**OrlCurve**
Description	The response to this query indicates the ORL result curve for the channel (x (nm), y (dB)).
Syntax	object.*OrlCurve(Channel*)
Parameters	Byval Long *Channel*
Response	Variant (array of double: x, y)
Access	Get
Possible error	ErrAcqBefore, ErrInProgress, ErrChannelNumber. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Wavelength unit=nm Power unit=dB

Results	**PdlCurve**
Description	The response to this query indicates the PDL result curve for the channel (x (nm), y (dB)).
Syntax	object.*PdlCurve(Channel*)
Parameters	Byval Long *Channel*
Response	Variant (array of double: x, y)
Access	Get
Possible error	ErrAcqBefore, ErrInProgress, ErrChannelNumber. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	Wavelength unit=nm Power unit=dB

Results	**IlCurveForPolarization**
Description	The response to this query indicates the insertion loss curve for a specific state of polarization, when a PDL acquisition has been performed.
Syntax	object.*IlCurveForPolarization*(*Channel*, *EPolarizationState*)
Parameters	Byval Long *Channel* *EPolarizationState* For more information on EPolarizationState, see *EPolarizationState* on page 332.
Response	Variant (array of double: x, y)
Access	Get
Possible error	ErrInvalidIlCurvePolState
Note	Wavelength unit=nm Power unit=dB Available only for the last PDL acquisition. KeepIlForAllPolarization=True

Results	**SynchronizedPower**
Description	The response to this query indicates the power synchronized acquisition result curve on a specified channel.
Syntax	object.*SynchronizedPower(Channel*, *adSample*, *adStatus*)
Parameters	Byval Long *Channel* Byref Double *adSample()* Byref Module1600Lib.EPowerStatus *adStatus()* For more information on EPowerStatus, see *Public Enum EPowerStatus* on page 333.
Response	None
Access	Get
Possible error	ErrAcqBefore, ErrInProgress, ErrChannelNumber. For more information, see *IQS-12004B DWDM Passive Component Test System (Standard) COM Error Messages* on page 208.
Note	adSample() = dB

Test Parameters Interface—Properties

Test Parameters	AcqType
Description	This command indicates the type of acquisition.
Syntax	object.*AcqType*
Parameters	Long: Enum EAcqType For more information, see *Public Enum EAcqType* on page 328.
Response	Enumeration EAcqType For more information, see *Public Enum EAcqType* on page 328.
Access	Get/Let

Test Parameters	AnalysisRangeMax
Description	This command indicates the maximum analysis range.
Syntax	object.*AnalysisRangeMax*
Parameters	None
Response	A Double value
Access	Get
Note	Unit=nm

Test Parameters	AnalysisRangeMin
Description	The response to this query indicates the minimum analysis range.
Syntax	object.*AnalysisRangeMin*
Parameters	None
Response	A Double value
Access	Get
Note	Unit=nm

Test Parameters	AnalysisRangeStart
Description	This command indicates the value to start the acquisition.
Syntax	object.*AnalysisRangeStart*
Parameters	Byval Double
Response	Double
Access	Get/Let
Note	Unit=nm

Test Parameters	**AnalysisRangeStop**
Description	This command indicates the value to stop the acquisition.
Syntax	object.*AnalysisRangeStop*
Parameters	Byval Double
Response	Double
Access	Get/Let
Note	Unit=nm

Test Parameters	**AutoRangeFiltering**
Description	This command indicates the filtering mode.
Syntax	object.*AutoRangeFiltering*
Parameter	Boolean
Response	Boolean
Access	Gel/Let
Note	It is highly recommended to set the system in filtering mode. object.*AutoRangeFiltering* = True

Test Parameters	**AvailableTests**
Description	The response to this query indicates the tests that can be performed according to the modules detected, the calibration and the reference measurement.
Syntax	object.*AvailableTests*
Parameters	None
Response	Enumeration EAvailableTests For more information, see *Public Enum EAvailableTests* on page 329.
Access	Get
Note	Depending on the module detected, you can perform an IL, Il/ORL, IL/PDL, IL/ORL/PDL, and ORL measurement.

Test Parameters	**KeepILForAllPolarization**
Description	This command keeps the insertion loss curves for all states of polarization (4), when a PDL acquisition has been performed.
Syntax	object.*KeepForAllPolarization*
Parameters	Boolean
Response	Boolean
Access	Get/Let
Note	Default: False This command requires a lot of memory space as there are four more curves by channel.

Test Parameters	NumberOfAcqChannels
Description	This command indicates the number of channels to test.
Syntax	object.*NumberOfAcqChannels*
Parameters	Byval Long
Response	Long
Access	Get/Let

Test Parameters	NumberOfAvailableChannels
Description	The response to this query indicates the number of channels available.
Syntax	object.*NumberOfAvailableChannels*
Parameters	None
Response	Long
Access	Get

clsDescModule Object—Properties

clsDescModule	ComputerName
Description	This command indicates the computer name.
Syntax	object.*ComputerName*
Parameters	String
Response	String
Access	Get/Let

clsDescModule	ID
Description	This command indicates the module ID.
Syntax	object.*ID*
Parameters	Long
Response	Long
Access	Get/Let

clsDescModule	**InitDone**
Description	This read-only property indicates that the initialization of the module has been performed.
Syntax	object.*InitDone*
Parameters	None
Response	A Boolean value.
Access	Get

clsDescModule	**ModuleName**
Description	This command indicates the module name (part number).
Syntax	object.*ModuleName*
Parameters	String
Response	String
Access	Get/Let

clsDescModule	**SerialNumber**
Description	This command indicates the module serial number.
Syntax	object.*SerialNumber*
Parameters	String
Response	String
Access	Get/Let

clsDescModule	**Slot**
Description	This command indicates the module slot (e.g., 1-0).
Syntax	object.*Slot*
Parameters	String
Response	String
Access	Get/Let

clsDescModule	**SlotNumber**
Description	This command indicates the module slot number (e.g., 3).
Syntax	object.*SlotNumber*
Parameters	Long
Response	Long
Access	Get/Let

clsChannel Object—Properties

clsChannel	**PmChannel**
Description	This command indicates the power meter channel (1-4) used. Use only for IQS-1600 power meter modules (value = 0 for other types of module).
Syntax	object.*PmChannel*
Parameters	Long
Response	Long
Access	Get/Let

clsChannel	**PmNumber**
Description	This command indicates the number of the power meter used. A number is assigned to all IQS-1100 power meter modules according to their position in the system.
Syntax	object.*PmNumber*
Parameters	Long
Response	Long
Access	Get/Let

clsChannel	**oDescModule**
Description	The response to this query indicates the object which contains information about the power meter used.
Syntax	Object.*oDescModule*
Parameters	Object oDescModule
Response	Object oDescModule
Access	Get/Let
Example	Object.DescModule.Id Object.DescModule.SerialNumber
Note	See *clsDescModule Object—Properties* on page 314.

Event

Note: *With FireEvent = True, the object raises an event at the end of the process. With FireEvent = False, no event occurs.*

Event	**AcqCompleted**
Description	*AcqCompleted* will fire once the acquisition is complete.
Parameters	Byval Long: *Enum State* indicates the internal state of the object.
Note	Only if FireEvent=True

Event	AcqError
Description	*AcqError* will fire when an error occurred during acquisition.
Parameters	Long: *Command* indicates the command that generated the error. EState: *State* indicates the internal state of the object. Long: *ErrNumber* indicates the error number. String: *ErrSource* indicates the name of the function that generated the error. String: *ErrDescription* provides a description of the error.
Note	Only if FireEvent=True

Event	AcqInProgress
Description	*AcqInProgress* will fire when the acquisition is in progress.
Parameters	Double: *PercentageDone* indicates the progress of the acquisition in percentage. EState: *State* indicates the internal state of the object. ESubState: *SubState* indicates the internal substate of the object. String: *Description* provides a description of the action. Byref Boolean: *Cancel* allows you to stop the acquisition in progress.
Note	Only if FireEvent=True

Event	CalCompleted
Description	*CalCompleted* will fire when the calibration is complete.
Parameters	Byval Long: *Enum State* indicates the internal state of the object.
Note	Only if FireEvent=True

Event	CalError
Description	*CalError* will fire when an error in calibration occurred.
Parameters	Long: *Command* indicates the command that generated the error. EState: *State* indicates the internal state of the object. Long: *ErrNumber* indicates the error number. String: *ErrSource* indicates the name of the function that generated the error. String: *ErrDescription* provides a description of the error.
Note	Only if FireEvent=True

Event	**CallInProgress**
Description	*CallnProgress* will fire when the calibration is in progress.
Parameters	Double: *PercentageDone* indicates the progress of the calibration in percentage. EState: *State* indicates the internal state of the object. ESubState: *SubState* indicates the internal substate of the object. String: *Description* provides a description of the action. Byref Boolean: *Cancel* allows you to stop the calibration in progress.
Note	Only if FireEvent=True

Event	**Error**
Description	*Error* will fire when an error occurred.
Parameters	Long: *Command* indicates the command that generated the error. EState: *State* indicates the internal state of the object. Long: *ErrNumber* indicates the error number. String: *ErrSource* indicates the name of the function that generated the error. String: *ErrDescription* provides a description of the error.
Note	Only if FireEvent=True

Event	InitCompleted
Description	*InitCompleted* will fire when the initialization is complete.
Parameters	Byval Long: *Enum State* indicates the internal state of the object.
Note	Only if FireEvent=True

Event	InitInProgress
Description	*InitInProgress* will fire when the initialization is in progress.
Parameters	Double: *PercentageDone* indicates the progress of the initialization in percentage. EState: *State* indicates the internal state of the object. ESubState: *SubState* indicates the internal substate of the object. String: *Description* provides a description of the action. Byref Boolean: *Cancel* allows you to stop the initialization in progress.
Note	Only if FireEvent=True

Event	NullingCompleted
Description	*NullingCompleted* will fire when nulling is complete.
Parameters	Byval String: *Description* provides a description of the action.
Note	Only if FireEvent=True

Event	NullingInProgress
Description	*NullingInProgress* will fire when nulling is in progress.
Parameters	Byval Double: *PercentageDone* indicates the progress of the nulling in percentage. Byval String: *Description* provides a description of the action.
Note	Only if FireEvent=True

Event	OptimizePowerCompleted
Description	*OptimizePowerCompleted* will fire when the optimization is complete.
Parameters	Double: *PercentageDone* indicates the progress of the reference measurement in percentage. EState: *State* indicates the internal state of the object. ESubState: *SubState* indicates the internal substate of the object. String: *Description* provides a description of the action. Byref Boolean: *Cancel* gives the possibility to stop the reference in progress.
Note	Only if FireEvent=True

Event	**OptimizePowerInProgress**
Description	*OptimizePowerInProgress* will fire when an optimization is in progress.
Parameters	Double: *PercentageDone* indicates the progress of the acquisition in percentage. EState: *State* indicates the internal state of the object. ESubState: *SubState* indicates the internal substate of the object. String: *Description* provides a description of the action. Byref Boolean: *Cancel* allows you to stop the acquisition in progress.
Note	Only if FireEvent=True

Event	**RefCompleted**
Description	*RefCompleted* will fire when a reference measurement is complete.
Parameters	Byval Long: *Enum State* indicates the internal state of the object.
Note	Only if FireEvent=True

Event	RefError
Description	*RefError* will fire when an error occurred during the reference measurement.
Parameters	Long: *Command* indicates the command that generated the error. EState: *State* indicates the internal state of the object. Long: *ErrNumber* indicates the error number. String: *ErrSource* indicates the name of the function that generated the error. String: *ErrDescription* provides a description of the error.
Note	Only if FireEvent=True

Event	RefInProgress
Description	*RefInProgress* will fire when a reference measurement is in progress.
Parameters	Double: *PercentageDone* indicates the progress of the reference measurement in percentage. EState: *State* indicates the internal state of the object. ESubState: *SubState* indicates the internal substate of the object. String: *Description* provides a description of the action. Byref Boolean: *Cancel* gives the possibility to stop the reference in progress.
Note	Only if FireEvent=True

Event	SourceActive
Description	*SourceActive* will fire when the source is active.
Parameters	If ByVal *bActive* As Boolean=True, the source is ON. If ByVal *bActive* As Boolean =False, the source is OFF. ByVal *Description* As String provides safety information.
Note	Only if FireEvent=True

Event	StabIQ9401
Description	*StabIQ9401* will fire when the temperature of the IQS-9401 module is not stable at the beginning of the acquisition.
Parameters	Long: *Command* indicates the command that generated the error. EState: *State* indicates the internal state of the object. Long: *ErrNumber* indicates the error number. String: *ErrSource* indicates the name of the function that generated the error. String: *ErrDescription* provides a description of the error.
Note	Only if FireEvent=True

Event	**Waiting**
Description	*Waiting* will fire when the system is waiting for the next command.
Parameters	None
Note	To deactivate this function, see *DWDMAcq Interface—Properties* on page 270. EnablingWaitingEvent=False. Only if FireEvent=True

Available Enumerations

Public Enum EAcqType
Res5pm = 1
Res10pm = 2
Res20pm = 3
Res40pm = 4

Public Enum EAvailableTests

None = 1
Il = 2
Orl = 3
IlOrl = 4
IlPdl = 5
IlOrlPdl = 6

Public Enum EDecimalFormat

DecimalFormat0 = 0
DecimalFormat1 = 1
DecimalFormat2 = 2
DecimalFormat3 = 3
DecimalFormat4 = 4
DecimalFormatAuto = 5

Public Enum EErrNumber
ErrPrevInstance = vbObjectError + 512
ErrInit = vbObjectError + 512 + 1
ErrDetection = vbObjectError + 512 + 2
ErrInitSource = vbObjectError + 512 + 3
ErrInitWrm = vbObjectError + 512 + 4
ErrInitPsa = vbObjectError + 512 + 5
ErrInitPm = vbObjectError + 512 + 6
ErrNoHardware = vbObjectError + 512 + 7
ErrInitStopped = vbObjectError + 512 + 8
ErrCalWrm = vbObjectError + 512 + 9
ErrNulling = vbObjectError + 512 + 10
ErrNullingIndex = vbObjectError + 512 + 11
ErrNullingType = vbObjectError + 512 + 12
ErrAcqRun = vbObjectError + 512 + 15
ErrHardNotCompatible = vbObjectError + 512 + 16
ErrInprogress = vbObjectError + 512 + 17
ErrChannelNumber = vbObjectError + 512 + 18
ErrInvalidILCurvePolState = vbObjectError + 512 + 19

Public Enum EErrNumber
ErrInitBefore = vbObjectError + 512 + 20
ErrCalOrlRtjBefore = vbObjectError + 512 + 21
ErrCalOrlMandrelRtjBefore = vbObjectError + 512 + 22
ErrCalWrBefore = vbObjectError + 512 + 23
ErrRefIlBefore = vbObjectError + 512 + 24
ErrRefIlPdlBefore = vbObjectError + 512 + 25
ErrRefOrlMandrelBefore = vbObjectError + 512 + 26
ErrAcqBefore = vbObjectError + 512 + 27
ErrOptimizeBefore = vbObjectError + 512 + 28
ErrPowerMin_Wrm = vbObjectError + 512 + 30
ErrPowerMin_Ref = vbObjectError + 512 + 31
ErrPowerMin_Cal = vbObjectError + 512 + 32
ErrAcqStopped = vbObjectError + 512 + 33
ErrSimData = vbObjectError + 512 + 34
ErrAcqChannel = vbObjectError + 512 + 35
ErrOrlResultCurve = vbObjectError + 512 + 36
ErrSweepSpan = vbObjectError + 512 + 37
ErrScanRange = vbObjectError + 512 + 38
ErrAcqType = vbObjectError + 512 + 39
ErrSynchro = vbObjectError + 512 + 40
ErrCommandNotSupportedBySource = vbObjectError + 512 + 41
ErrMissingCalibrationParameter = vbObjectError + 512 + 42
ErrMissingWRCalibration = vbObjectError + 512 + 43
ErrMissingORLCalibration = vbObjectError + 512 + 44
ErrMissingDBTemplate = vbObjectError + 512 + 45

Public Enum MaskType
BandPass = 0 Notch = 1 Undefined = 4

Public Enum ENullingType
NullAll = 1 NullWrm = 2 NullSinglePm = 3

Public Enum PdCwTrace
Min = 1 Max = 2

EPolarizationState
UnknownState = -1 LinearHorizontal = 0 LinearPositiveDiagonal= 1 LinearVertical= 2 RightCircular = 3 LeftCircular = 4 LinearNegativeDiagonal = 5

Public Enum EPossibleTestWithHard
None = 1
IlORL = 2
IlOrlPdl = 3

Public Enum EPowerStatus
NotAveraged = 6
OverRange = 3
OverScale = 1
UnderRange = 4
UnderScale = 2
Valid = 0

Public Enum EState
ModulesDetection = 1
InitModules = 2
NullMeasurement = 3
CalWrStart = 4
CalWrInProgress = 5
CalWrCompleted = 6
CalOrlRtjStart = 7
CalOrlRtjInProgress = 8
CalOrlRtjCompleted = 9
CalOrlRtjMandrelStart = 10
CalOrlRtjMandrelInProgress = 11
CalOrlRtjMandrelCompleted = 12

Public Enum ESubStateAcq
SubAcqSynchro = 0
SubAcqStart = 1
SubAcqInProgress = 2
SubAcqEnd = 3
SubAcqTransferingData = 4
SubAcqAnalyzingData = 5
SubAcqLoadCal = 6
SubAcqSaveCal = 7

Switch Interface—Methods

Switch	**Detect**
Description	This method starts the detection process of all the switches connected to the system.
Syntax	object.*Detect*
Parameters	None
Response	A Variant containing an array of strings. Each element of the array can be accessed by using an index: *Returned_array* (*Index*) The detection process first checks for the presence of all EXFO IQS switches and then scans the GPIB bus for the presence of external switches. The contents of each string depends on the brand of the switches that have been detected, i.e. EXFO or external switches. The following table presents the possible content for the returned strings.

Switch brand	String content
EXFO	*Model_name*[Slot=(*slot_id*)]
External	Description[BOARDID=? PAD=?]

Note that the terms in italics are module-specific.

Switch	InitSwitch
Description	This method performs the initialization of the specified switch, optionally initializing it in simulation mode.
Syntax	object.*InitSwitch* (*DetectedIndex*,*FireEvent*,[*Simulator*])
Parameters	*DetectedIndex*: Required if the switch is not used in simulation mode. A Long value indicating the index of the detected switch from the *Detect* method. *FireEvent:* Required. A Boolean value indicating if the initialization process runs in the background and raise an event at the end of this process. The following table presents the possible settings for the *FireEvent* argument.

Setting	Description
True	Allows the process to run in the background and raises an event once the process is complete.
False	The client application stops the process and waits for the completion of the initialization process. No event is raised at the end.

Simulator: Optional. A Boolean value indicating if the switch component is initialized in a simulation mode or not. The default value is *False*.

The following table presents the possible settings for the *Simulator* argument.

Setting	Description
True	Initializes a simulated switch. In this case, the *DetectedIndex* argument is not used.
False	(Default). Initializes the specified physical switch. The *DetectedIndex* argument must be valid.

Response None

Note An event will be raised once the initialization is complete if the *FireEvent* argument has been previously set to *True*.

This method starts the initialization process of the specified switch. If the index is invalid or if there is a problem while communicating with the switch device, an error will be raised and the switch won't be correctly initialized.

Switch Interface—Properties

Switch	**Enabled**
Description	This property returns or sets a value that determines if the switch lets the light go through it or not.
Syntax	object.*Enabled* = [*Boolean*] The following table presents the possible values for the boolean argument.

Setting	Description
True	(Default). Allows light to go through the switch port specified by the *Position* property.
False	Prevents light from going through the switch port by positioning it in the reset (0) position or by returning to the last position used.

Parameters	A Boolean value.
Response	If the property is used to get the state of the switch, it will return a Boolean value. True: The light passes through the switch. False: The light does not pass through the switch.
Access	Get/Let

Switch	**InitDone**
Description	This read-only property returns a value that indicates if the switch has been initialized or not.
Syntax	object.*InitDone*
Parameters	None
Response	A Boolean value. The following table presents the possible settings for the Boolean value.

Setting	Description
True	The switch has been correctly initialized.
False	The switch has not been initialized or did not initialize successfully.

Note	The *InitDone* property indicates if the switch can be used or not.
Access	Get

Switch	**InPorts**
Description	This read-only property returns the number of In (input) ports of the switch.
Syntax	object.*InPorts*
Parameters	None
Response	A Long value
Access	Get

Switch	**ModuleName**
Description	This property returns the module identification string as it would be returned by the **IDN?* GPIB command. For an EXFO switch, this identification string corresponds to its part number.
Syntax	object.*ModuleName*
Parameters	None
Response	A String value
Access	Get

Switch	OutPorts
Description	This read-only property returns the number of Out (output) ports of the switch.
Syntax	object.*OutPorts*
Parameters	None
Response	A Long value
Access	Get

Switch	Position
Description	This property returns or sets a value that determines the active output port of the switch.
Syntax	object.*Position* = [*PortNumber*] If the property is used to set the position, *PortNumber* is a Long value that specifies the port number to set as the active output port. This value must be comprised between 1 and the available number of Out ports of the switch.
Parameters	If this property is used to set the active output port number, use a Long value.
Response	If this property is used to get the active output port number, a Long value will be returned.
Access	Get/Let

Switch	RefIlDone
Description	This read-only property returns a one-dimensional array containing Boolean values indicating the IL reference status of each port on the switch.
Syntax	object.*RefIlDone*
Parameters	None
Response	A Variant containing an array of Boolean values (one value per port). Each element of the array can be accessed by giving an index corresponding to the desired port number. object.*RefIlDone* (*PortNumber*) The array has *OutPorts* items (see *OutPorts* on page 341), each representing the IL reference status of each output port of the switch. The following table presents the possible status for the items of the array.

Value	Description
True	The IL reference has been taken on the specified port.
False	The IL reference has not been taken yet on the specified port.

See also	For more information, see *RefIl* on page 278, *RefIlPdl* on page 279,*RefOrlMandrel* on page 279. Note that the methods listed above work in conjunction with the *Position of* the switch (see *Position* on page 341).
Access	Get

Switch	**RefIlPdlDone**
Description	This read-only property returns a one-dimensional array containing Boolean values indicating the IlPdl reference status of each port on the switch.
Syntax	object.*RefIlPdlDone*
Parameters	None
Response	A Variant containing an array of Boolean values (one value per port). Each element of the array can be accessed by giving an index corresponding to the desired port number. object.*RefIlPdlDone* (*PortNumber*) The array has *OutPorts* items (see *OutPorts* on page 341), each representing the IlPdl reference status of each output port of the switch. The following table presents the possible status for the items of the array.

Value	Description
True	The IlPdl reference has been done on the specified port.
False	The IlPdl reference has not been done yet on the specified port.

See also	For more information, see *RefIl* on page 278, *RefIlPdl* on page 279,*RefOrlMandrel* on page 279. Note that the methods listed above work in conjunction with the *Position* of the switch (see page 341).
Access	Get

Switch — RefOrlDone

Description

This read-only property returns a one-dimensional array containing Boolean values indicating the ORL reference status of each port on the switch.

Syntax

object.*RefOrlDone*

Parameters

None

Response

A Variant containing an array of Boolean values (one value per port). Each element of the array can be accessed by giving an index corresponding to the desired port number.

object.*RefOrlDone* (*PortNumber*)

The array has *OutPorts* items (see *OutPorts* on page 341), each representing the ORL reference status of each output port of the switch.

The following table presents the possible status for the items of the array.

Value	Description
True	The ORL reference has been taken on the specified port.
False	The ORL reference has not been taken yet on the specified port.

See also

For more information, see *RefIl* on page 278, *RefIlPdl* on page 279, *RefOrlMandrel* on page 279.

Note that the methods listed above work in conjunction with the *Position* of the switch (see *Position* on page 341).

Access

Get

Switch	**SerialNumber**
Description	This read-only property returns the serial number of the switch.
Syntax	object.*SerialNumber*
Parameters	None
Response	A String value
Access	Get

Switch UseCommonRefIlPdl

Description This property returns or sets a value that determines if the reference measurement performed on switch port 1 (for IL and PDL) is applied to all switch ports.

Syntax object.*UseCommonRefIlPdl* = [*Boolean*]

The following table presents the possible settings for the Boolean value.

Setting	Description
True	Allows to use the reference value of switch port 1 as the reference value for all of the other switch ports. Using the same reference value for all ports speeds up the referencing process, especially when working with large switches. However, the result accuracy will be affected.
False	(Default). Since no common reference will be applied to switch ports, individual reference measurements will have to be performed.

Parameters If the property is used to indicate that the reference value of switch port 1 must be applied to all switch ports, use a Boolean value.

Response If the property is used to find out if the reference value of switch port 1 is being applied to all switch ports, it will return a Boolean value.

True: A common reference value for IL and PDL is used.

False: No common reference value for IL and PDL is used (each port has its own reference).

Access Get/Let

Analysis Interface—Methods

Analysis	**AddRefExtTrace**
Description	This method lets you add a trace that will be used in the calculation of an offset that can be applied to acquired traces for periodic testing.
Syntax	object.*AddRefExtTrace* (*Trace*)
Parameters	*Trace*: Required. A Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the trace to set.
Response	None
Note	This method allows you to add a trace to define an offset that can be applied to acquired traces during periodic test. This trace should be the acquisition result of an external reference patchcord used as a reference device. There should be as many traces as there are external reference patchcords connected to the setup. This offset may be used to compensate intrinsic deviation of the system, mainly caused by the repeatability of the switch. Use this method in conjunction with the following methods: *AddRefExtZeroTrace*, *GetDriftTrace*, *GetCorrectedIlTrace*.

Analysis	**AddRefExtZeroTrace**
Description	This method adds an initial (zero) trace for the calculation of an offset that can be applied to acquired traces for periodic testing.
Syntax	object.*AddRefExtZeroTrace* (*Trace*)
Parameters	*Trace*: Required. A Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the trace to set.
Response	None.
Note	This method lets you specify which traces will serve as the *zero traces* to calculate an offset that can be applied to acquired traces during periodic tests. This trace should be the acquisition result of an external reference patchcord used as a reference device. There should be as many zero traces as there are external reference patchcords connected to the setup. This offset may be used to compensate intrinsic deviation of the system, mainly caused by the repeatability of the switch. Use this method in conjunction with the following methods: *AddRefExtTrace*, *GetDriftTrace*, *GetCorrectedIlTrace*.

Analysis	ClearRefExtTraces
Description	This method removes all the initial (zero) traces used in the calculation of an offset that can be applied to acquired traces for periodic testing.
Syntax	object.*ClearRefExtTraces*
Parameters	None
Response	None
Note	This method lets you remove all previously set external reference traces. After clearing the zero traces, you can no longer use the following methods: *GetDriftTrace*, *GetCorrectedIlTrace*.

Analysis	ClearRefExtZeroTraces
Description	This method removes all the initial (zero) traces used in the calculation of an offset that can be applied to acquired traces for periodic testing.
Syntax	object.*ClearRefExtZeroTraces*
Parameters	None
Response	None
Note	This method lets you to remove the previously set zero traces. After clearing the zero traces, you can no longer use the following methods: *GetDriftTrace*, *GetCorrectedIlTrace*.

Analysis	ClearResults
Description	This method removes all resulting (IL, ORL, PDL) traces and the analysis results from memory.
Syntax	object.*ClearResults*
Parameters	None
Response	None
Note	This method allows you to remove from memory all previously acquired traces, and all analysis results that are available through the *ChannelResults* property.

Analysis	DoAnalysis
Description	This method performs the analysis on the most recently acquired data that is available. The available results depend on the type of test that has been selected and on the acquired data.
Syntax	object.*DoAnalysis* (*ChannelStart*, *ChannelStop*, *PerformCrosstalk*, *PerformPd*)
Parameters	*ChannelStart:* Required. A Long value indicating the channel number of the power meter on which we want to start the analysis. *ChannelStop:* Required. A Long value indicating the channel number of the power meter on which we want to stop the analysis. For details on *ChannelStart* and *ChannelStop*, see *ChannelLocalisation* on page 291. *PerformCrosstalk:* Required. A Boolean value indicating whether the analysis must include crosstalk results or not. *PerformPd:* Required. A Boolean value indicating whether the analysis must include polarization dependency (pd) results or not.

Response	None
Note	This method starts the entire analysis process. You must have set the starting and the ending power meter channels so the results can be compiled and analyzed correctly, accordingly to what is physically connected. Once the analysis is complete, the results are available through the *IResults* and the *IAnalysis* interfaces. *IResults* allows you to retrieve the compiled traces for IL, ORL and/or PDL tests. *IAnalysis* is used to retrieve a Single value as a result for IL, ORL, PDL, central wavelength, flatness, bandwidth, polarization dependency, etc. If a calculation cannot be properly performed for a certain property, the returned value will be a Double containing an infinite value (1.#INF). All retrieved data is for a given switch port. If you select a new switch port, all results will be lost and new acquisitions must be done before starting a new *DoAnalysis* method. Each time the *DoAnalysis* method is started, all structured results from prior analysis (available through the *IAnalysis* interface) will be erased from memory.
See also	*PowerLevels*, *PdBw*, *PdCw* properties and *GetPdCwTrace* method.

Analysis	**GetCorrectedIlTrace**
Description	This method returns a calculated trace where an offset is applied to an acquired trace.
Syntax	object.*GetCorrectedIlTrace* (*DriftTrace*, *IlResultTrace*) As Variant
Parameters	*DriftTrace:* Required. A Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the trace to set. Normally, you should provide the *DriftTrace* retrieved through the use of the *GetDriftTrace* method. *IlResultTrace:* Required. A Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the trace to set. The *IlResultTrace* parameter should be a previously acquired trace coming from acquisitions done on the DUTs.
Response	This method returns a Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the trace.
Note	This method computes a trace where we apply an offset trace (*DriftTrace*) to a resulting IL trace (*IlResultTrace*). This method must manipulate both traces to obtain a matching trace in terms of X,Y coordinates pairs. In some cases, interpolation must be used to fit the traces. Note that this method has been designed for IL-type traces only. Use this method in conjunction with the following method: *GetDriftTrace*.

Analysis	GetDriftTrace
Description	This method returns a calculated trace that acts as an offset that can be applied to acquired traces for periodic testing.
Syntax	object.*GetDriftTrace*
Parameters	None
Response	This method returns a Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the trace.
Note	This method computes a trace based on those that have been set through the use of the *AddRefExtZeroTrace* and *AddRefExtTrace* methods. If either one of the latter methods has not been used correctly, the *GetDriftTrace* method will fail. Once you have retrieved this drift trace, you can apply it to previously acquired traces you have stored somewhere using your own algorithm. If you prefer, you can use the *GetCorrectedIlTrace* method to apply this offset. This offset may be used to compensate for intrinsic deviation of the system, mainly caused by the repeatability of the switch. Use this method in conjunction with the following method: *GetCorrectedIlTrace*.

Analysis	SetIlTrace, SetOrlTrace, SetPdlTrace
Description	Each of these methods allows to re-analyze a previously acquired trace.
Syntax	object.*SetIlTrace* (*Trace*) object.*SetOrlTrace* (*Trace*) object.*SetPdlTrace* (*Trace*)
Parameters	*Trace*: Required. A Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the trace to re-analyze.
Response	None
Note	The *SetIlTrace*, *SetOrlTrace* and *SetPdlTrace* methods let you re-analyze any acquired trace at a later time. This is mainly useful when you want to compare the results before and after applying drift traces for environmental type tests. Once the trace of interest is set, you must start the *DoAnalysis* method before retrieving results. Use this method in conjunction with the following methods: *AddRefExtZeroTrace*, *AddRefExtTrace*, *GetDriftTrace*, *GetCorrectedIlTrace*.

Analysis	**SetUserWavelengthRange**
Description	This method sets a user-specific wavelength range for the analysis of the results.
Syntax	object.*SetUserWavelengthRange* (*LowerBound*,U*pperBound*)
Parameters	*LowerBound:* Required. A Double value indicating the starting wavelength to limit the range for the analysis features. *UpperBound:* Required. A Double value indicating the ending wavelength to limit the range for the analysis features.
Response	None
Note	This method allows you to specify a second wavelength range for the results of the analysis. An error will be raised if the *LowerBound* value is higher than the *UpperBound* value. The results may be obtained through the following functions: *FlatnessOnUserRange*, *IlOnUserRange*, *OrlOnUserRange* and *PdlOnUserRange*.

Analysis Interface—Properties

Analysis	**ChannelResults**
Description	This read-only property returns a one-dimensional array containing *ChannelResult* objects.
Syntax	object.*ChannelResults*
Parameters	None
Response	A Variant containing an array of *ChannelResult* objects. Each object is accessible through the use of an index. The index is a required Integer value that corresponds to the position of the *ChannelObject* in the array.
Example	Set oChannel = object.ChannelResults (1)
Note	There are as many *ChannelResult* objects in the array as there are (*ChannelStop - ChannelStart* + 1) channels to analyze. *ChannelStart* and *ChannelStop* are specified through the use of the *DoAnalysis* method.
Access	Get

Analysis	**CrossTalkTables**
Description	This read-only property returns a one-dimensional array containing several crosstalk tables (a crosstalk table for each power level). Each crosstalk table corresponds to a two-dimensional array containing crosstalk values (in dB) between all channels under test.
Syntax	Each crosstalk table is accessible through the use of an index. object.*CrossTalkTables* (*Index*)
Parameters	*Index:* Required. A Long value corresponding to the power level for which a crosstalk table is requested.
Response	A Variant containing a two-dimensional array of Variant values. The values can be either a string or a numeric value.
Note	The array forms a square matrix where: ➤ Number of rows = number of channels that have been scanned + 1 (for the title row). ➤ Number of columns = number of channels that have been scanned + 1 (for the title column). The first row (after the title row) and the first column (after the title column) represent the first channel scanned (i.e. *ChannelStart* set through the *DoAnalysis* method). In the same way, the last row and the last column represent the last channel scanned (i.e. *ChannelStop*). The value at the intersection of a column and a row is the crosstalk calculated between the channels represented by the column and by the row. This means that the values in the diagonal of the matrix (i.e. where column = row) are all N/A.
Access	Get

Analysis	**PdPrecision**
Description	This property returns or sets the precision used for polarization dependency analysis. Precision is expressed in dB.
Syntax	object.*PdPrecision* (to retrieve the values) objet.*PdPrecision=Precision* (to set the values) *Precision:* a Long value comprised between 36 and 100. 36: lowest precision (fastest analysis) 100: highest precision (slowest analysis).
Parameters	If the property is used to set the precision used for polarization dependency analysis, use a Long value.
Response	If the property is used to get the precision used for polarization dependency analysis, the property will return a Long value.
Access	Get/Let

Analysis	**PowerLevels**
Description	This property returns or sets the attenuation level values used to obtain: bandwidth, flatness, central wavelength, IL, ORL, PDL, PdBw and PdCw. Power level values are expressed in dB.
Syntax	object.*PowerLevels* (to retrieve the values) objet.*PowerLevels=Powers* (to set the values) *Powers:* a one-dimensional array containing Double values representing power values.
Parameters	If the property is used to set the power levels, use a Variant containing a one-dimensional array of Double values representing power values.
Response	If the property is used to get the power levels, the property will return a Variant containing a one-dimensional array of Double values representing power values.
Note	Once the power levels have been set and the *DoAnalysis* method has been started, it is possible to retrieve the results through the *BandPassResult* and the *NotchResults* objects. For a single *ChannelResult* object, there will be as many of these objects as there are power levels defined through this property.
Access	Get/Let

Analysis	UserWavelengthRangeLowerBound
Description	This read-only property returns the lower bound of the user-defined wavelength range in use for the results of the analysis. This value, expressed in nm, was previously set with the *SetUserWavelengthRange* method.
Syntax	object.*UserWavelengthRangeLowerBound*
Parameters	None
Response	A Double value corresponding to the lower bound of the wavelength range.
Access	Get

Analysis	UserWavelengthRangeUpperBound
Description	This read-only property returns the upper bound of the user-defined wavelength range in use for the analysis of the results. This value, expressed in nm, was previously set with the *SetUserWavelengthRange* method.
Syntax	object.*UserWavelengthRangeUpperBound*
Parameters	None
Response	A Double value corresponding to the upper bound of the wavelength range.
Note	Until the upper bound is set via the *SetUserWavelengthRange* method, the default value for this property is 0.0.
Access	Get

ChannelResult Object

	ChannelResult Object
Description	This object acts as a repository that indicates the type of detected channel that references a unique object based on the detected type, and specifies the number of the channel from which the results have been analyzed. *ChannelResult* objects constitute the items of the array returned by the *ChannelResults* property from the *Analysis* interface (see *ChannelResults* on page 358 for more details).
Note	You can access a *ChanneResult* object (an individual item of the array)by using an index value. object.*ChannelResults* (*Index*) *Index:* Required. An Integer value that indicates the position of an element in the *ChannelResults* array. A *ChannelResult* object contains a reference to a unique object containing the results of the analysis retrieved by the *DoAnalysis* method. The availability of the unique object is restricted by the *DetectedMaskType* property. *ChannelResult* object has these properties: ➤ Bandpass ➤ ChannelNumber ➤ DetectedMaskType ➤ Notch ➤ Undefined

ChannelResult Object—Properties

ChannelResult	**BandPass**
Description	This read-only property returns a reference to a *Bandpass* object. This type of object contains the results of the analysis for a channel type that has been detected as a bandpass.
Syntax	object.*Bandpass*
Parameters	None
Returned value	A reference to a *Bandpass* object
Access	Get

ChannelResult	**ChannelNumber**
Description	This read-only property returns the logical number of the power meter channel from which the acquired data has been analyzed.
Syntax	object.*ChannelNumber*
Parameters	None
Response	A Long value. For more information, see *ChannelLocalisation* on page 291.
Access	Get

ChannelResult — DetectedMaskType

Description This read-only property returns the mask type of the channel that has been detected during the analysis of the data.

Syntax object.*DetectedMaskType*

Parameters None

Response A numeric value that corresponds to the mask type of the detected channel.

The table below displays the different types of masks with their corresponding constants.

Constant	Value	Description
Bandpass	0	The mask type is a bandpass.
Notch	1	The mask type is a notch.
Undefined	4	The mask type is undefined (not identifiable).

Note You must use this property to retrieve the right reference on the unique object that has been created to contain the results of the analysis.

Based on the *DetectedMaskType* value, you can select which of these properties point to a valid unique object: *Bandpass*, *Notch*, *Undefined*.

Access Get

ChannelResult	**Notch**
Description	This read-only property returns a reference to a *Notch* object. This type of object contains the results of the analysis for a channel type that has been detected as a notch.
Syntax	object.*Notch*
Parameters	None
Response	A reference to a *Notch* object
Access	Get

ChannelResult	**Undefined**
Description	This read-only property returns a reference to an object of type *Undefined*. An *Undefined* object contains the results of the analysis for a non-detectable channel type (bandpass or notch).
Syntax	object.*Undefined*
Parameters	None
Response	A reference to an *Undefined* object
Access	Get

BandPass Object

	BandPass Object
Description	This object acts as a repository that contains the results of the analysis of a channel for which the mask type could be identified as a bandpass filter.
Note	You can access a *BandPass* object directly. object.*BandPass* A *BandPass* object contains many analysis results based on the entire analysis range and on the user-defined range (if explicitly set). This object allows you to obtain the IL, ORL and PDL results for the current channel. *BandPass* object has these properties: ➤ IlOnAnalysisRange ➤ IlOnUserRange ➤ OrlOnAnalysisRange ➤ OrlOnUserRange ➤ PdlOnAnalysisRange ➤ PdlOnUserRange ➤ PowerLevels

BandPass—Properties

BandPass	**IlOnAnalysisRange**
Description	This read-only property returns the maximum IL based on the entire analysis range. The value is expressed in dB.
Syntax	object.*IlOnAnalysisRange*
Parameters	None
Response	A Double value
Note	The entire analysis range has been previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface.
Access	Get

BandPass	**IlOnUserRange**
Description	This read-only property returns the maximum IL based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*IlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

BandPass	OrlOnAnalysisRange
Description	This read-only property returns the lowest ORL (strongest reflection) based on the entire analysis range. The value is expressed in dB.
Syntax	object.*OrlOnAnalysisRange*
Parameters	None
Response	A Double value
Note	The entire analysis range has been previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface.
Access	Get

BandPass	OrlOnUserRange
Description	This read-only property returns the lowest ORL (strongest reflection) based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*OrlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

BandPass	PdlOnAnalysisRange
Description	This read-only property returns the maximum PDL based on the entire analysis range. The value is expressed in dB.
Syntax	object.*PdlOnAnalysisRange*
Parameters	None
Response	A Double value
Note	The entire analysis range has been previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface.
Access	Get

BandPass	PdlOnUserRange
Description	This read-only property returns the maximum PDL based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*PdlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

BandPass	**PowerLevels**
Description	This read-only property returns a one-dimensional array containing *BandPassResult* objects.
Syntax	object.*PowerLevels*
Parameters	None
Response	A Variant containing an array of *BandPassResult* objects. Each *BandPassResult* object can be accessed using an index. The index is a required Integer value corresponding to the position of the item in the array.
Example	Set oResult = object.PowerLevels (1)
Note	There are as many *BandPassResult* objects in the array as there are defined power levels with the *PowerLevels* property (for more information, see *PowerLevels* on page 361).
Access	Get

BandPassResult Object

	BandPassResult Object
Description	This object acts as a repository that contains the analysis results of a channel for which the mask type has been identified as a bandpass. *BandPassResult* objects constitute the items of the array returned by the *PowerLevels* property from the *BandPass* object.
Note	You can access a *BandPassResult* object (an individual item of the array) with the help of an index value. object.*PowerLevels* (*Index*) *Index:* Required. An Integer value that uniquely identifies a member of the *PowerLevels* array. For more information, see *PowerLevels* on page 371.

A *BandPassResult* object contains many analysis results based on one of the power levels defined in the *PowerLevels* property. This object allows you to obtain the bandwidth, central wavelength, flatness, IL, ORL, PDL, PdBw and PdCw results for the current channel at the current power level.

BandPassResult object has these properties:

- Bandwidth
- BwLowerBound
- BwUpperBound
- CentralWavelength
- Flatness
- IlBw
- IlCw
- MaxCrosstalk
- OrlBw
- OrlCw
- PdBw
- PdCw
- PdlBw
- PdlCw
- PowerLevel
- TotalCrosstalk

and method:

- GetPdCwTrace

BandPassResult—Methods

BandPassResult	**GetPdCwTrace**

Description This method returns the trace associated with the minimum or the maximum central wavelength values affected by the polarization state of the signal.

Syntax object.*GetPdCwTrace* (*PdCwTrace*) as Variant

Parameters *PdCwTrace:* Required. A numeric value that corresponds to the constant associated with the desired trace.

The table below shows the possible values with their corresponding constants.

Constant	Value	Description
Min	1	Retrieved trace will correspond to the minimum central wavelength values.
Max	2	Retrieved trace will correspond to the maximum central wavelength values.

Response A Variant value containing a two-dimensional array representing pairs of X,Y coordinates of the desired trace.

Note This method returns the trace that corresponds to an extreme trace (representing the minimum central wavelength value or the maximum central wavelength) that the analysis can find, based on polarization state variations.

The central wavelength value is obtained from trace analysis.

BandPassResult—Properties

BandPassResult	**Bandwidth**
Description	This read-only property returns the spectral-width value based on the power level of the parent object. The value is expressed in nm.
Syntax	object.*Bandwidth*
Parameters	None
Response	A Double value
Note	This property allows to retrieve the spectral width over which the transmission of the channel exceeds the current power level (from the peak)as specified in the *PowerLevel* property of the parent object.
Access	Get

BandPassResult	**BwLowerBound**
Description	This read-only property returns the lower-bound wavelength value over the bandwidth interval, based on the current power level (from the peak). The power level is defined in the *PowerLevel* property of the parent object. *BwLowerBound* value is expressed in nm.
Syntax	object.*BwLowerBound*
Parameters	None
Response	A Double value
Access	Get

BandPassResult	BwUpperBound
Description	This read-only property returns the upper-bound wavelength value over the bandwidth interval, based on the current power level (from the peak). The power level is defined in the *PowerLevel* property of the parent object. *BwUpperBound* value is expressed in nm.
Syntax	object.*BwUpperBound*
Parameters	None
Response	A Double value
Access	Get

BandPassResult	CentralWavelength
Description	This read-only property returns the wavelength at the midpoint between the lower and the upper wavelengths based on the power level of the parent object. The value is expressed in nm.
Syntax	object.*CentralWavelength*
Parameters	None
Response	A Double value
Note	The midpoint that is returned is calculated for the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

BandPassResult	**Flatness**
Description	This read-only property returns the flatness based on the power level of the parent object. The value is expressed in dB.
Syntax	object.*Flatness*
Parameters	None
Response	A Double value
Note	This property allows to retrieve the flatness over the bandwidth interval based on the current power level (from the peak)as specified in the *PowerLevel* property of the parent object.
Access	Get

BandPassResult	**IlBw**
Description	This read-only property returns the maximum IL value based on the power level of the parent object. The value is expressed in dB.
Syntax	object.*IlBw*
Parameters	None
Response	A Double value
Note	This property allows you to retrieve the maximum IL value over the bandwidth interval based on the current power level (from the peak)as specified in the *PowerLevel* property of the parent object.
Access	Get

BandPassResult	IlCw
Description	This read-only property returns the IL value based on the calculated central wavelength available in the parent object. The value is expressed in dB.
Syntax	object.*IlCw*
Parameters	None
Response	A Double value
Note	This property allows you to retrieve the IL value obtained from analysis at the calculated central wavelength as specified in the *CentralWavelength* property of the parent object.
Access	Get

BandPassResult	**MaxCrosstalk**
Description	This read-only property returns the maximum crosstalk value between the current channel and all channels under test. The value is expressed in dB.
Syntax	object.*MaxCrosstalk*
Parameters	None
Response	A Double value representing the crosstalk value.
Note	There is a crosstalk value between the current channel and each of the other channels under test. If there are N channels under test, then there are (N–1) crosstalk results associated with the current channel. This property returns the *highest value* of these calculated crosstalk values.
Access	Get

BandPassResult	**OrlBw**
Description	This read-only property returns the lowest ORL value (strongest reflection) based on the power level of the parent object. The value is expressed in dB.
Syntax	object.*OrlBw*
Parameters	None
Response	A Double value
Note	This property allows you to retrieve the lowest ORL value over the bandwidth interval based on the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

BandPassResult	**OrlCw**
Description	This read-only property returns the ORL value based on the calculated central wavelength available in the parent object. The value is expressed in dB.
Syntax	object.*OrlCw*
Parameters	None
Response	A Double value
Note	This property allows you to retrieve the ORL value obtained from analysis at the calculated central wavelength as specified in the *CentralWavelength* property of the parent object.
Access	Get

BandPassResult	**PdBw**
Description	This read-only property returns the critical bandwidth value that comes from the difference between the minimum and maximum PDL traces resulting from the analysis, based on polarization state variations. The value is expressed in nm.
Syntax	object.*PdBw*
Parameters	None
Response	A Double value
Note	The bandwidth interval, for each trace case, is based on the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

BandPassResult	**PdCw**
Description	This read-only property returns the critical central wavelength value affected by the polarization state of the signal, based on the calculated central wavelength available in the parent object. The value is expressed in nm.
Syntax	object.*PdCw*
Parameters	None
Response	A Double value
Note	This property allows to retrieve the central wavelength value that comes from the difference between the minimum and maximum PDL traces resulting from the analysis, based on polarization state variations. The central wavelength value is obtained from the analysis of each trace case.
Access	Get

BandPassResult	**PdlBw**
Description	This read-only property returns the maximum PDL value based on the power level of the parent object. The value is expressed in dB.
Syntax	object.*PdlBw*
Parameters	None
Response	A Double value
Note	This property allows you to retrieve the maximum PDL value over the bandwidth interval based on the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

BandPassResult	**PdlCw**
Description	This read-only property returns the PDL value based on the calculated central wavelength available in the parent object. The value is expressed in dB.
Syntax	object.*PdlCw*
Parameters	None
Response	A Double value
Note	This property allows you to retrieve the PDL value obtained from analysis at the calculated central wavelength as specified in the *CentralWavelength* property of the parent object.
Access	Get

BandPassResult	PowerLevel
Description	This read-only property returns the current attenuation level used for analyzing the results stored in the parent object. The value is expressed in dB.
Syntax	object.*PowerLevel*
Parameters	None
Response	A Double value
Note	The property returns the power level used for the analysis to get the results that can be retrieved through the parent object. This power level is one of the defined power levels set in the *PowerLevels* property.
Access	Get

BandPassResult	**TotalCrosstalk**
Description	This read-only property returns the sum of all crosstalk values between the current channel and all channels under test. The value is expressed in dB.
Syntax	object.*TotalCrosstalk*
Parameters	None
Response	A Double value representing the total crosstalk value.
Note	There is a crosstalk value between the current channel and each of the other channels under test. If there are N channels under test, then there are (N–1) crosstalk results associated with the current channel. This property returns the *sum* of these calculated crosstalk values.
Access	Get

Notch Object

	Notch Object
Description	This object acts as a repository that contains the results of the analysis of a channel for which the mask type could be identified as a notch filter.
Note	You can access a *Notch* object directly. object.*Notch* A *Notch* object contains many analysis results based on entire analysis range and on the user-defined range (if explicitly set). This object allows to obtain the rejection, flatness, IL, ORL and PDL results for the current channel. *Notch* object has these properties: ➤ FlatnessOnTransmission ➤ IlOnTransmission ➤ IlOnUserRange ➤ OrlOnTransmission ➤ OrlOnUserRange ➤ PdlOnTransmission ➤ PdlOnUserRange ➤ PowerLevels ➤ Rejection

Notch—Properties

Notch	**FlatnessOnTransmission**
Description	This read-only property returns the flatness based on the transmission portion of the notch. The value is expressed in dB.
Syntax	object.*FlatnessOnTransmission*
Parameters	None
Response	A Double value
Access	Get

Notch	**IlOnTransmission**
Description	This read-only property returns the maximum IL based on the transmission portion of the notch. The value is expressed in dB.
Syntax	object.*IlOnTransmission*
Parameters	None
Response	A Double value
Access	Get

Notch	IlOnUserRange
Description	This read-only property returns the maximum IL based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*IlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

Notch	OrlOnTransmission
Description	This read-only property returns the lowest ORL (strongest reflection) based on the transmission portion of the notch. The value is expressed in dB.
Syntax	object.*OrlOnTransmission*
Parameters	None
Response	A Double value
Access	Get

Notch	OrlOnUserRange
Description	This read-only property returns the lowest ORL (strongest reflection) based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*OrlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

Notch	PdlOnTransmission
Description	This read-only property returns the maximum PDL based on the transmission portion of the notch. The value is expressed in dB.
Syntax	object.*PdlOnTransmission*
Parameters	None
Response	A Double value
Access	Get

Notch	PdlOnUserRange
Description	This read-only property returns the maximum PDL based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*PdlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

Notch	**PowerLevels**
Description	This read-only property returns a one-dimensional array containing *NotchResult* objects.
Syntax	object.*PowerLevels*
Parameters	None
Response	A Variant containing an array of *NotchResult* objects. Each *NotchResult* object can be accessed using an index. The index is a required Integer value that corresponds to the position of the item in the array.
Example	Set oResult = object.PowerLevels (1)
Note	There are as many *NotchResult* objects in the array as there are defined power levels with the *PowerLevels* property (for more information, see *PowerLevels* on page 361).
Access	Get

Notch	**Rejection**
Description	This read-only property returns the maximum attenuation value based on the entire analysis range and constraint to the non-transmission portion. The value is expressed in dB.
Syntax	object.*Rejection*
Parameters	None
Response	A Double value
Note	The maximum attenuation value is based on the entire analysis range previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface. It is also restricted to the section where the attenuation is said to lie in the notch portion.
Access	Get

NotchResult Object

NotchResult Object	
Description	This object acts as a repository that contains the results of the analysis of a channel for which the mask type has been identified as a notch. *NotchResult* objects constitute the items of the array returned by the *PowerLevels* property from the *Notch* object.
Note	You can access a *NotchResult* object (an individual item of the array) with the help of an index value. object.*NotchResults* (*Index*) *Index:* Required. An Integer value that uniquely identifies a member of the *PowerLevels* array. A *NotchResult* object contains many results of analysis based on one of the power levels defined through the *PowerLevels* property. This object allows to obtain the bandwidth, central wavelength, ORL and PDL results for the current channel at the current power level. *NotchResult* object has these properties: ➤ Bandwidth ➤ BwLowerBound ➤ BwUpperBound ➤ CentralWavelength ➤ OrlBw ➤ OrlCw ➤ PdlBw ➤ PdlCw ➤ PowerLevel

NotchResult—Properties

NotchResult	**Bandwidth**
Description	This read-only property returns the spectral width value based on the power level of the parent object. The value is expressed in nm.
Syntax	object.*Bandwidth*
Parameters	None
Response	A Double value
Note	This property allows you to retrieve the spectral width over which the transmission of the channel exceeds the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

NotchResult	**BwLowerBound**
Description	This read-only property returns the lower-bound wavelength value over the bandwidth interval, based on the current power level (from the peak). The power level is indicated in the *PowerLevel* property of the parent object. *BwLowerBound* is expressed in nm.
Syntax	object.*BwLowerBound*
Parameters	None
Response	A Double value
Access	Get

NotchResult	BwUpperBound
Description	This read-only property returns the upper-bound wavelength value over the bandwidth interval, based on the current power level (from the peak). The power level is stated by the *PowerLevel* property of the parent object. *BwUpperBound* is expressed in nm.
Syntax	object.*BwUpperBound*
Parameters	None
Response	A Double value
Access	Get

NotchResult	CentralWavelength
Description	This read-only property returns the wavelength at the midpoint between the lower and the upper wavelengths based on the power level of the parent object. The value is expressed in nm.
Syntax	object.*CentralWavelength*
Parameters	None
Response	A Double value
Note	The midpoint that is returned is calculated for the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

NotchResult	OrlBw
Description	This read-only property returns the lowest ORL value (strongest reflection) based on the power level of the parent object. The value is expressed in dB.
Syntax	object.*OrlBw*
Parameters	None
Response	A Double value
Note	This property allows to retrieve the lowest ORL value over the bandwidth interval based on the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

NotchResult	OrlCw
Description	This read-only property returns the ORL value based on the calculated central wavelength available in the parent object. The value is expressed in dB.
Syntax	object.*OrlCw*
Parameters	None
Response	A Double value
Note	This property allows to retrieve the ORL value obtained from analysis at the calculated central wavelength as specified in the *CentralWavelength* property of the parent object.
Access	Get

NotchResult	PdlBw
Description	This read-only property returns the maximum PDL value based on the power level of the parent object. The value is expressed in dB.
Syntax	object.*PdlBw*
Parameters	None
Response	A Double value
Note	This property allows to retrieve the maximum PDL value over the bandwidth interval based on the current power level (from the peak) as specified in the *PowerLevel* property of the parent object.
Access	Get

NotchResult	PdlCw
Description	This read-only property returns the PDL value based on the calculated central wavelength available in the parent object. The value is expressed in dB.
Syntax	object.*PdlCw*
Parameters	None
Response	A Double value
Note	This property allows to retrieve the PDL value obtained from analysis at the calculated central wavelength as specified in the *CentralWavelength* property of the parent object.
Access	Get

NotchResult	PowerLevel
Description	This read-only property returns the current power level used for analyzing the results stored in the parent object. The value is expressed in dB.
Syntax	object.*PowerLevel*
Parameters	None
Response	A Double value
Note	The property returns the power level used for the analysis to get the results that can be retrieved through the parent object. This power level is one of the defined power levels set in the *PowerLevels* property.
Access	Get

Undefined

Undefined Object

Description	This object acts as a repository that contains the results of the analysis of a channel for which the mask type could not be identified.
Note	You can access an Undefined object directly. object.*Undefined* An *Undefined* object contains many analysis results based on entire analysis range and on the user-defined range (if explicitly set). This object allows to obtain the flatness, IL, ORL and PDL results for the current channel. *Undefined* object has these properties: ➤ FlatnessOnAnalysisRange ➤ FlatnessOnUserRange ➤ IlOnAnalysisRange ➤ IlOnUserRange ➤ OrlOnAnalysisRange ➤ OrlOnUserRange ➤ PdlOnAnalysisRange ➤ PdlOnUserRange

Undefined—Properties

Undefined	FlatnessOnAnalysisRange
Description	This read-only property returns the flatness based on the entire analysis range. The value is expressed in dB.
Syntax	object.*FlatnessOnAnalysisRange*
Parameters	None
Response	A Double value
Note	The entire analysis range has been previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface.
Access	Get

Undefined	FlatnessOnUserRange
Description	This read-only property returns the flatness based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*FlatnessOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

Undefined	IlOnAnalysisRange
Description	This read-only property returns the maximum IL based on the entire analysis range. The value is expressed in dB.
Syntax	object.*IlOnAnalysisRange*
Parameters	None
Response	A Double value
Note	The entire analysis range has been previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface.
Access	Get

Undefined	IlOnUserRange
Description	This read-only property returns the maximum IL based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*IlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

Undefined	**OrlOnAnalysisRange**
Description	This read-only property returns the lowest ORL (strongest reflection) based on the entire analysis range. The value is expressed in dB.
Syntax	object.*OrlOnAnalysisRange*
Parameters	None
Response	A Double value
Note	The entire analysis range has been previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface.
Access	Get

Undefined	**OrlOnUserRange**
Description	This read-only property returns the lowest ORL (strongest reflection) based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*OrlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

Undefined	**PdlOnAnalysisRange**
Description	This read-only property returns the maximum PDL based on the entire analysis range. The value is expressed in dB.
Syntax	object.*PdlOnAnalysisRange*
Parameters	None
Response	A Double value
Note	The entire analysis range has been previously set using the *AnalysisRangeStart* and *AnalysisRangeStop* properties available through the *ITestParameters* interface.
Access	Get

Undefined	PdlOnUserRange
Description	This read-only property returns the maximum PDL based on the user-defined analysis range. The value is expressed in dB.
Syntax	object.*PdlOnUserRange*
Parameters	None
Response	A Double value
Note	The user-specific analysis range has been previously set using the *SetUserWavelengthRange* method (see page 357).
Access	Get

D Definitions and Calculation Methods

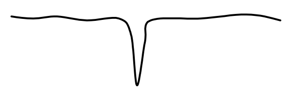
The IQS-12004B DWDM Passive Component Test System performs a series of measurements and uses them in automated calculations. The different definitions and calculation methods used are explained in the following subsections.

The DWDM Passive Component Test System can automatically analyze three different filter types:

➤ bandpass

➤ notch

➤ undefined

Bandpass	Notch	Undefined
		

Depending on the mode of operation (Specified or Generic), the user may specify the filter type (Specified) or the system will attempt to auto-detect the filter type (Generic).

The following sections describe the methods used for this data analysis.

Bandpass Filters

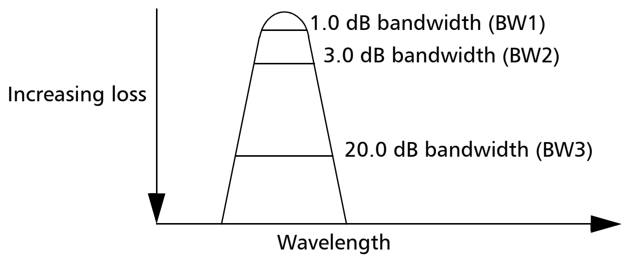
The following table summarizes the analysis made with bandpass filters.

Bandpass Filters	
Central Wavelength	*X*-dB center, where *X* is the dB level at which BW1 is measured (see *Central Wavelength (nm)* on page 410). When PDL is available, this is calculated using the average attenuation.
Difference	The difference between the defined wavelength and the measured central wavelength.
IL	Max attenuation over operating wavelength range (BW1) (see *Insertion Loss (dB)* on page 410). When PDL is available, this is calculated using the average attenuation.
PDL (BW1)	Max PDL over the range defined by BW1.
PDL (CW)	PDL at the defined central wavelength (measured center for Generic).
PDL (Central wavelength ±*x* nm)	Max PDL over the range.
PDL (*x* to *y* nm)	Max PDL over the range.
BW1, BW2, BW3	The bandwidth at dB level relative to the peak transmission (see *Bandwidth (nm)* on page 408). When PDL is available, this is calculated using the average attenuation.
Flatness	Delta attenuation across BW1 (see *Flatness/Ripple (dB)* on page 411). When PDL is available, this is calculated using the average attenuation.

Bandpass Filters	
Crosstalk	Smallest difference between in-band (BW1) loss and other channel band (BW1) loss (see *Channel Crosstalk (dB)* on page 412). When PDL is available, this is calculated using the average attenuation.
Max Crosstalk	Maximum crosstalk value between the current channel and all channels under test.
Total Crosstalk	Sum of crosstalk from other channels. When PDL is available, this is calculated using the average attenuation.
ORL	Lowest ORL (strongest reflection) value within BW1.

Bandwidth (nm)

Bandwidth is the spectral width over which the transmission of the device exceeds some stated loss value. The system can measure bandwidth at three different power levels, called BW1, BW2, and BW3, relative to the peak power level, as illustrated in the following diagram.



These levels are configurable by the user, but they are given the default values of 1.0 dB, 3.0 dB, and 20.0 dB.

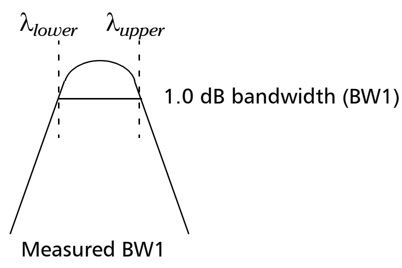
- A BW1 bandpass filter (at 1.0 dB or 0.5 dB) is commonly referred to as the passband or operating wavelength range of the device.
- BW2 (at 3 dB) is the half-power bandwidth.
- BW3 (at 20 dB or higher) is often used to describe the rejection or isolation band. The BW1/BW3 ratio can be used as an indicator of the filter shape.

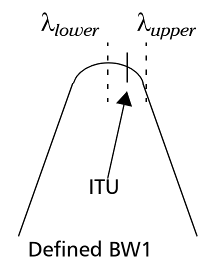
IMPORTANT

The application uses BW1 for a number of calculations (IL, ripple, and crosstalk), and the results will depend on the selected method.

Measured BW1

In this method, BW1 is calculated based on measurement data.
For example, if you select a 1.0 dB bandwidth, the software will calculate the wavelength range corresponding to the measured BW1. As shown in the diagram, λ_{lower} and λ_{upper} correspond to the 1.0 dB cutoff wavelengths, and this wavelength range will be used for the IL, ripple, and crosstalk measurements.





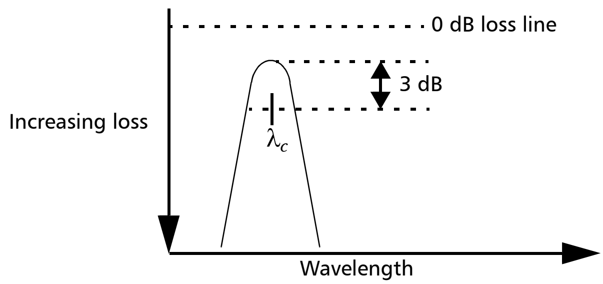
Defined BW1

In this method, you specify to the software the wavelength range to use for the evaluation. You will have to provide a specific wavelength (normally an ITU wavelength) and a span centered at this wavelength.

As shown in the diagrams, the wavelength range for each case is different and the resulting calculations will be different. The choice between the two calculation methods is made in the Optical Ports Configuration window, as explained in *Configuring an Optical Port* on page 39.

Central Wavelength (nm)

The central wavelength is the wavelength at the midpoint between the lower and upper wavelengths at BW1 dB level from the peak. Note that the central wavelength is not necessarily the peak wavelength.

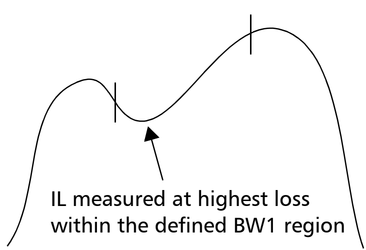


Insertion Loss (dB)

The insertion loss (IL) of a filter or multiplexer channel can be described in many different ways. The DWDM Passive Component Test System uses the following method to determine the insertion loss:

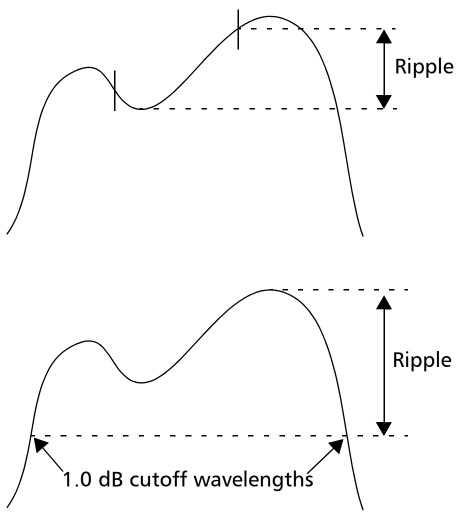
➤ Maximum attenuation within the BW1 interval

The BW1 value you specified will be used as an interval on which the highest loss will be taken. This is illustrated below:



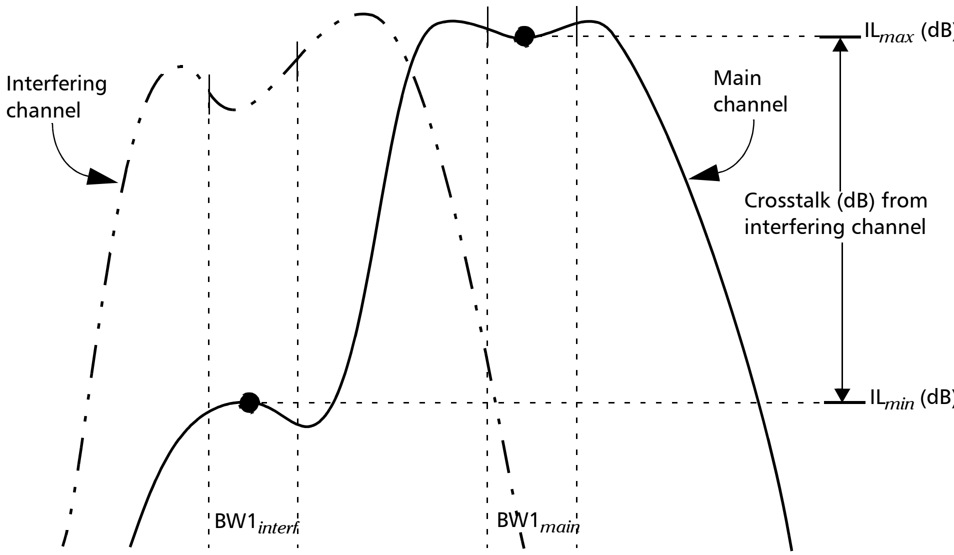
Flatness/Ripple (dB)

The flatness (or ripple) is the IL variation over the BW1 interval of each channel.



Note: *The ripple value for a measured BW1 analysis would most often be the power (dB) value at which BW1 is measured.*

Channel Crosstalk (dB)



The software calculates the worst-case crosstalk, which is the smallest difference in IL between two intervals on the main channel curve (BW1$_{main}$ and BW1$_{interf}$).

➤ IL$_{max}$ is the highest loss on the main channel curve in the BW1$_{main}$ interval.

➤ IL$_{min}$ is the lowest loss on the main channel curve in the BW1$_{interf}$ interval.

Note: *Measurements are taken between all bandpass channels, not only adjacent channels.*

Notch Filters

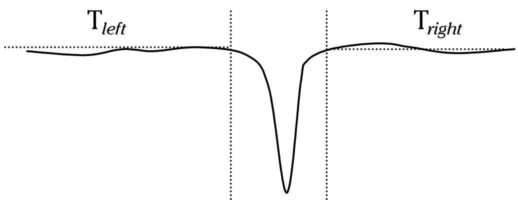
Notch Filters	
Central Wavelength	*X*-dB center of the notch (*X* is the BW1 dB level) (see *Central Wavelength (nm)* on page 410). When PDL is available, this is calculated using the average attenuation.
Difference	The difference between the defined center and the measured central wavelength.
IL	Maximum attenuation value in the transmission portion (see *Transmission Portion of Notch* on page 414). When PDL is available, this is calculated using the average attenuation.
PDL (BW1 Range)	Max PDL over the range defined by BW1.
PDL (CW)	PDL at operating wavelength (measured center for Generic).
PDL (CW ±*x* nm)	Max PDL over the range.
PDL (*x* to *y* nm)	Max PDL over the range.
BW1, BW2, BW3	At dB level from maximum attenuation (see *Bandwidth (nm)* on page 408). When PDL is available, this is calculated using the average attenuation.
Flatness	Delta attenuation across complete transmission portion (see *Flatness/Ripple (dB)* on page 411). When PDL is available, this is calculated using the average attenuation.
ORL	ORL value at central wavelength.
Rejection	Maximum attenuation in the notch region.

Transmission Portion of Notch

The attenuation data is divided into three regions:

- transmission left (T_{left})
- transmission right (T_{right})
- notch

The transmission portion is the total range of T_{left} and T_{right}.



The wavelengths that segregate these regions are determined in a function that will find the nominal attenuation for each of the left and right shoulders. This is a statistical calculation and can be different for the right and left shoulders.

Undefined Filters

Undefined Filters	
IL	Maximum attenuation over the entire range. When PDL is available, this is calculated using the average attenuation.
PDL	Max PDL based on the entire analysis range.
ORL	ORL value representing the strongest reflection.
Flatness	Maximum attenuation minus minimum attenuation over the entire range. When PDL is available, this is calculated using the average attenuation.

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P/N: 1051413

www.EXFO.com · info@exfo.com

CORPORATE HEADQUARTERS	400 Godin Avenue	Quebec (Quebec) G1M 2K2 CANADA Tel.: 1 418 683-0211 · Fax: 1 418 683-2170
EXFO AMERICA	3701 Plano Parkway, Suite 160	Plano TX, 75075 USA Tel.: 1 972 907-1505 · Fax: 1 972 836-0164
EXFO EUROPE	Omega Enterprise Park, Electron Way	Chandlers Ford, Hampshire S053 4SE ENGLAND Tel.: +44 2380 246810 · Fax: +44 2380 246801
EXFO ASIA-PACIFIC	151 Chin Swee Road #03-29, Manhattan House	SINGAPORE 169876 Tel.: +65 6333 8241 · Fax: +65 6333 8242
TOLL-FREE	(USA and Canada)	1 800 663-3936

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