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PDL/OL Meter

IQ-3400B



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

Instruction Manual

P/N: MAN-189-I .1AN
June 2001

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Certification Information

F.C.C. Information

Electronic test equipment is exempt from Part 15 compliance (FCC) in the United States. While EXFO makes reasonable efforts to ensure this compliance, EXFO does not guarantee such compliance.

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

Independent Laboratory Testing

This unit has undergone extensive testing according to the European Community Directive and Standards. All pre-qualification tests were performed internally, at EXFO, while all final tests were performed externally, at an independent, accredited laboratory. This guarantees the unerring objectivity and authoritative compliance of all test results.

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1 Introducing the IQ-3400B PDL/OL Meter

The IQ-3400B PDL/OL Meter was developed for the IQ-200 Optical Test System. It is designed for laboratory and manufacturing measurement applications using the IQ-203 Mainframe or an IQ-206 PC Expansion Card.

IQ-200 Optical Test System



IQ-3400B module

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Possible Measurements

The PDL/OL Meter can perform the following measurements using the three testing modes available in the software.

Measurement	Testing Mode
Polarization-dependent loss (PDL)	DUT testing mode
Insertion loss (IL)	DUT testing mode Coupler testing mode
Optical return loss (ORL)	ORL testing mode
Excess loss	Coupler testing mode
Coupling ratio	Coupler testing mode
Polarization-dependent coupling ratio	Coupler testing mode
Reference power	DUT testing mode Coupler testing mode

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Hardware Components Required

Below is a description of the two modules required with the IQ-3400B PDL/OL Meter.

Module	Description
IQ-5100B Polarization Scrambler	This polarization scrambler provides continuous random scanning of all possible states of polarization. For more information, refer to the *IQ-5100B Polarization Scrambler* instruction manual.
IQ-2600/2600B Tunable Laser Source	This source is tunable and has a high noise suppression. Tests can be performed at different wavelengths.
IQ-2400 WDM Laser Source (M5 option)	This source offers high accuracy and stability and must be modulated on/off at 300 kHz.
IQ-2100 Light Source (BP option)	This source has a polarized LED and can be used for singlemode test applications. Note that if the PDL is lower than 2 dB, PDL results can be underestimated. For more information about these sources, refer to the *IQ-2000 Light Source Series* instruction manual.

For more information about recommended sources, see *Recommended Sources* on page 109.

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PDL Test System Utility

The PDL Test System utility facilitates taking PDL measurements by combining the main parameters of the IQ-3400B PDL/OL Meter, the IQ-5100B Polarization Scrambler and the source. For more information on this utility, see *Using the PDL Test System Utility* on page 49.

Basic Theory

Polarization-dependent loss (PDL) consists of the maximum optical component insertion loss variation caused by changes in the polarization state of input light.

Accumulation of component PDL produces wide variations in a system's optical power. These variations are caused by changes in the environmental conditions under which the optical system works. In addition, the cumulative system attenuation is not equivalent to the sum of component polarization-dependent losses.

The first component of the system changes the polarization state of the second component, thus affecting its loss. In some cases, the changes in the state of polarization may create what is called polarization-dependent gain (PDG) for certain components of the optical system. Therefore, the PDL or PDG of the second component will depend, in part, on the relative orientation of both components and on the rotation of the polarization state created by the connecting fiber.

Variation in system attenuation caused by PDL/PDG affects the characterization of optical components in light systems. Lightwave systems with optical amplifiers, for example, are vulnerable to performance degradation caused by PDL or PDG.

PDL may be caused by optical components such as attenuators, isolators, or couplers, whereas PDG maybe caused by a polarization hole burning in optical amplifiers. PDL and PDG cause a polarized signal to be attenuated or amplified differently from the unpolarized noise. This difference changes the signal-to-noise ratio (SNR) at the system output and results in performance degradation.

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Furthermore, since the state of polarization of the transmitted light is changed randomly, PDL and PDG may cause system performance to fluctuate over time.

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2 Safety Information

Safety Conventions

You should understand the following conventions before using the product described in this manual:

WARNING

Refers to a potential *personal* hazard. It requires a procedure which, if not correctly followed, may result in bodily harm or injury. Do not proceed beyond a **WARNING** unless you understand and meet the required conditions.

CAUTION

Refers to a potential *product* hazard. It requires a procedure which, if not correctly followed, may result in component damage. Do not proceed beyond a **CAUTION** unless you understand and meet the required conditions.

IMPORTANT

Refers to any information regarding the operation of the product which you should not overlook.

Laser Safety

Although the IQ-3400B PDL/OL Meter does not incorporate any laser source, laser radiation may still emanate from the C2 and REF optical ports when a laser source is connected to the C1 optical port. Avoid long-term exposure to laser radiation.

WARNING

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

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CAUTION

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

CAUTION

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

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3 Getting Started with Your PDL/OL Meter

This section contains information on how to insert and remove modules, how to connect the fiber-optic cable and how to start and exit the software.

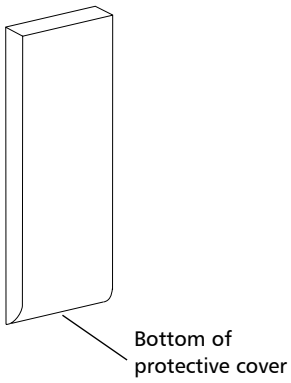
Inserting and Removing Modules

CAUTION

Never insert or remove a module while the IQ-203 Mainframe or IQ-206 PC Expansion Card is powered on. This will result in immediate and irreparable damage to the module and the IQ-203 or IQ-206.

To insert an IQ module in the IQ-200 Optical Test System,

1. Exit the IQ-200 software and power off the IQ-203 and IQ-206. If you are controlling modules from a PC, you do not need to turn the PC off.
2. Remove the protective cover of any unused module slot, by pulling the bottom of the cover and removing it completely.



3. Insert the IQ module into the empty slot. The IQ-203 or IQ-206 will automatically recognize which slot you selected.

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IMPORTANT

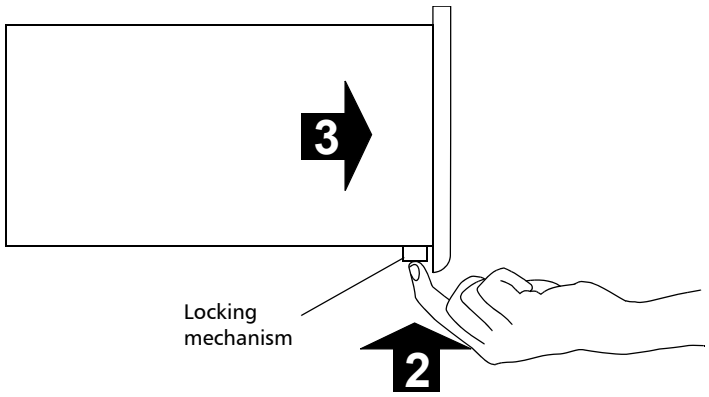
Be sure to insert the module all the way to the back of the IQ-203 or IQ-206 so that the backplane connectors are properly mated. The module is correctly inserted when its front panel is flush with the IQ-203 or IQ-206 front panel.

Depending on the locking system design, there are two ways to remove an IQ module from the IQ-203 Mainframe or IQ-206 PC Expansion Unit.

1. Exit the IQ-200 software and power off the IQ-203 and IQ-206. If you are controlling modules from a PC, you do not need to turn the PC off.
2. Place your fingers under the module's front panel.

   OR

   Push up the locking mechanism under the module's front panel, as shown below.



3. Firmly pull the module outward.
4. Put one of the supplied protective covers over the empty slot to prevent dust from entering the module's housing.

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Connecting the Fiber-Optic Cable

IMPORTANT

Always clean the fiber end prior to insertion into the port.

To connect the fiber-optic cable to the port,

1. Make sure the connector is dry.
2. Align the connector and port to avoid the fiber end touching the outside of the port or rubbing against other surfaces.
3. Do not overtighten.

Starting and Exiting the PDL/OL Meter Application

To open the PDL/OL Meter application,

➤ Double-click on the PDL/OL Meter icon on the IQ-200 Optical Test System main window.

OR

➤ Press the LED button on the module's front panel.

Note: *Module applications may be set to automatically launch in 640 x 480 display resolution. For details, refer to the* IQ-200 Optical Test System *instruction manual.*

The application main window contains all the necessary commands to control the PDL/OL Meter.

To exit the application,

➤ Click on ✕ in the top right corner of the application main window.

OR

➤ Click on ✕ in the top right corner of the module monitor window.

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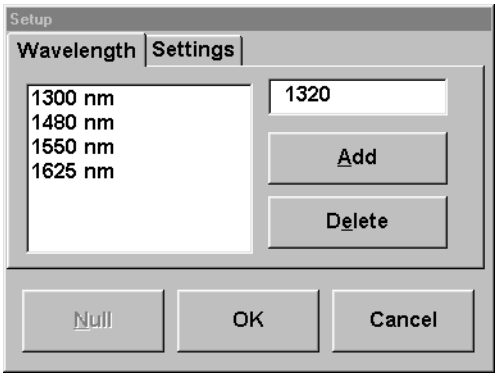
4 Setting Parameters for PDL Measurements

Note: *Parameters described in this chapter apply to both the DUT and Coupler testing modes. For information on the ORL testing mode parameters, see* Setting ORL Parameters *on page 57.*

Adding and Deleting Test Wavelengths

The values contained in the *Wavelength* tab determine which wavelengths are available during PDL measurements. To add a wavelength to the list of already defined wavelengths,

1. Click on the *Setup* button located in the *General* tab of the application main window.
2. Select the *Wavelength* tab.
3. Type the desired wavelength in the text box.



The wavelength range covered by the IQ-3400B PDL/OL Meter module goes from 1200 to 1625 nm inclusively.

4. Click on *Add* to transfer the value to the wavelength list.

To erase a wavelength value from the list,

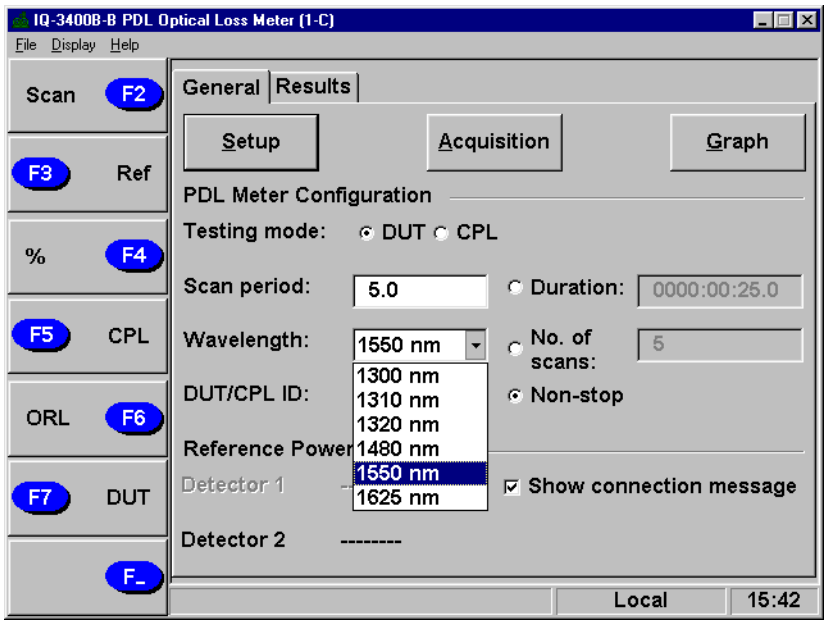
1. Select the value to be deleted.
2. Click on *Delete*.

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Choosing a Test Wavelength

Select the desired wavelength in the drop-down list located in the *General* tab of the application main window. Measurements will be taken at the set wavelength.



For information on how to add or delete a wavelength, see *Adding and Deleting Test Wavelengths* on page 13.

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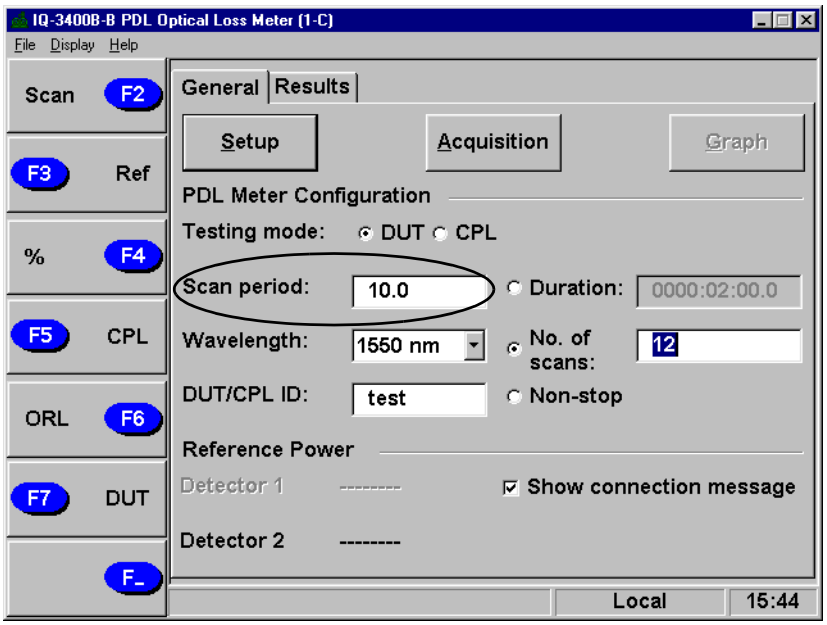
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Setting the Scan Period

Note: *The scan period is a multiple of the scrambling period. For example, if the scan period is 10 seconds, the scrambling period would be 2.5 or 5 seconds. See also* Setting PDL Test System Parameters *on page 51.*

To set the scan period,

➤ simply enter the desired scan period in the *Scan Period* text box located in the *General* tab of the application main window. The minimum value is 1 second and the maximum value is 99.9 seconds.



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Selecting the Type of Scan

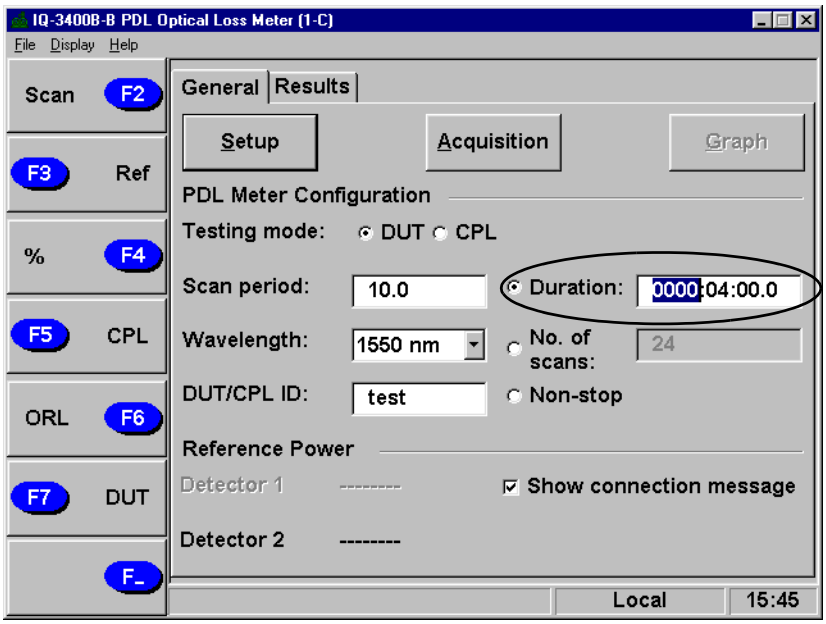
After setting the scan period, you will need to set the duration of the complete acquisition, or set the number of scans, or perform a continuous scan. Information about these parameters is provided below.

Setting the Duration

This parameter allows you to make an acquisition last a specific time.

To set the duration,

1. Select the *Duration* radio button located in the *General* tab of the application main window.

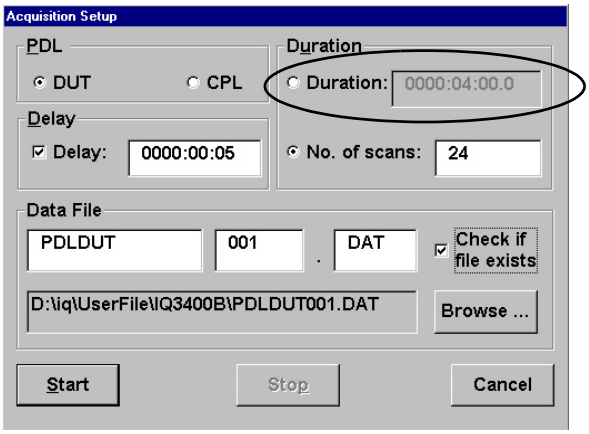


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OR

Click on the *Acquisition* button located in the *General* tab of the application main window and select the *Duration* radio button.



2. Type the desired value in the text box next to the *Duration* radio button. The maximum duration value allowed is 999:59:59.

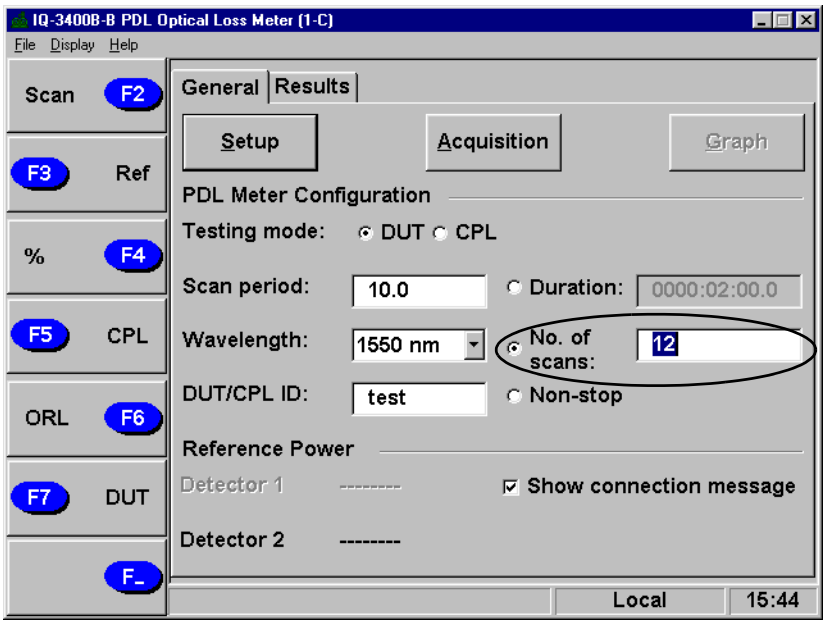
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Setting the Number of Scans

Select this parameter to make an acquisition stop after a specific number of scans have been made.

To set the number of scans,

1. Select the *No. of scans* radio button located in the *General* tab of the application main window.

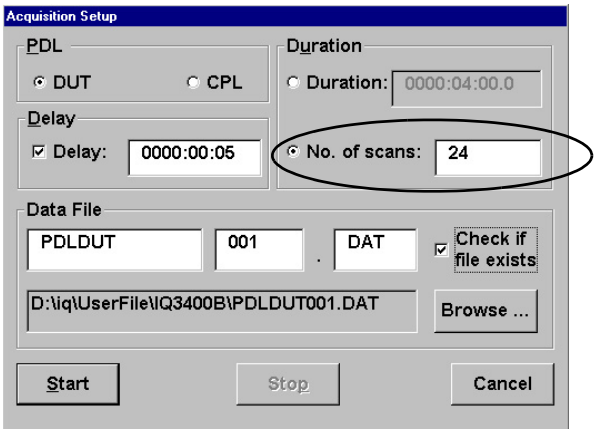


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OR

Click on the *Acquisition* button located in the *General* tab of the application main window and select the *No. of scans* radio button.



2. Type the desired number of scans in the text box next to the *No. of scans* radio button. The minimum value is 1 and the maximum value is 9999.

For example, you can make an acquisition of 12 scans, each scan lasting ten seconds. Using this setup, a complete acquisition will take two minutes (120 seconds).

Or, you can make a four-minute acquisition composed of ten-second scans. Using this setup, a complete acquisition will be composed of 24 scans (see the settings in the illustration on page 16).

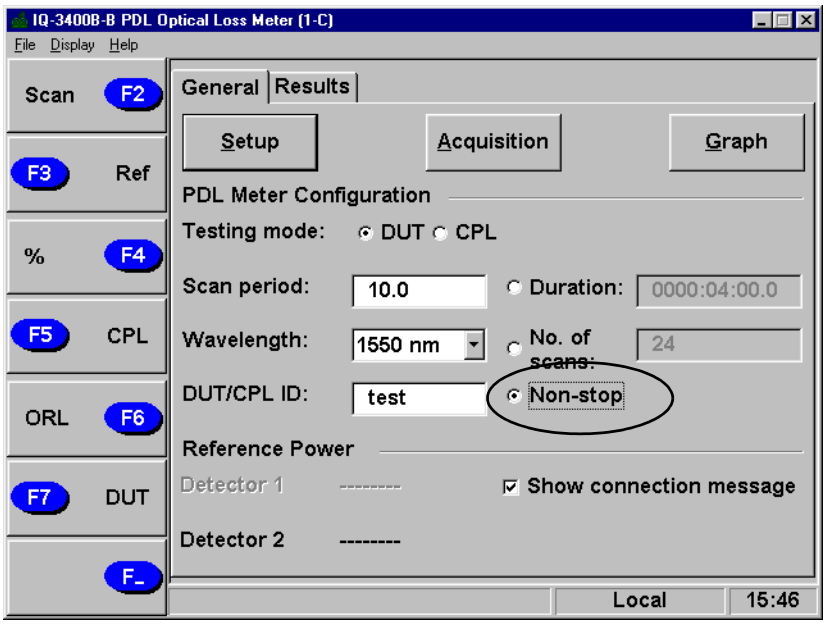
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Performing a Continuous Scan

Note: *This parameter can be set for acquisitions viewed on-screen only.*

To perform scans until the *Stop* button is pressed, select the *Non-stop* radio button located in the *General* tab of the application main window.



Continuous scan results can be viewed using the Graphical Display mode (see *Using the Graphical Display Mode* on page 77).

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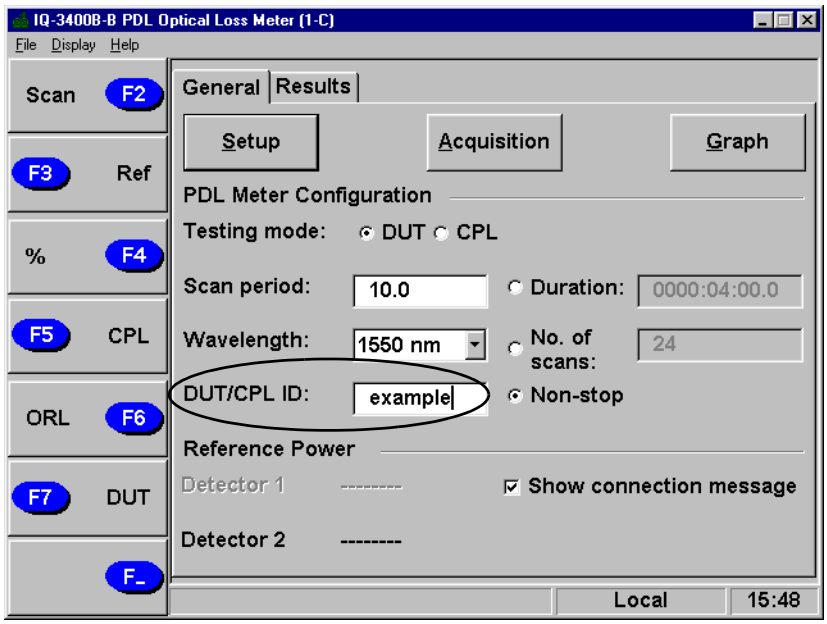
Specifying a DUT Name

It is strongly recommended to specify a DUT name, as this information will be assigned to the corresponding data file if a filename is not specified.

The serial number of the DUT is a recommended DUT identification name.

To specify a DUT name,

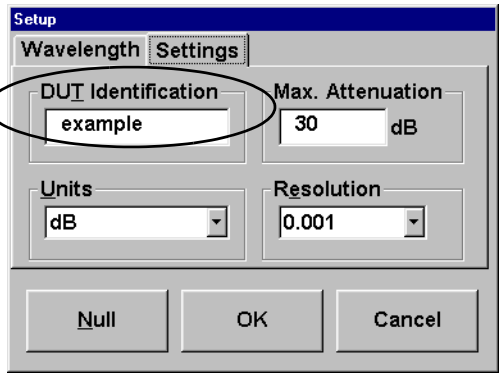
➤ Enter the DUT name in the *DUT/CPL ID* text field located in the *General* tab of the application main window.



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OR

1. Click on the *Setup* button located in the *General* tab of the application main window.
2. Select the *Settings* tab.
3. Enter the desired name in the *DUT Identification* text box.



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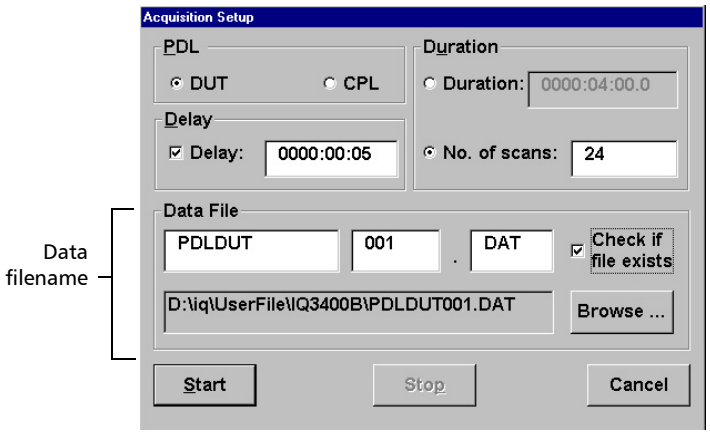
Specifying a Data Filename

Note: *This parameter can be set for acquisitions saved in a file only.*

If you want to save the acquisition in a file, you will need to specify a name for the acquisition file as well as where the acquisition file will be saved. To do so,

1. Click on the *Acquisition* button located in the *General* tab of the application main window.
2. Enter the desired filename in the first text box located in the *Data File* section.
3. If desired, select the folder where the acquisition file will be saved by clicking on *Browse*.
4. Select *Check if file exists* to ensure you do not overwrite an existing file having the same name.

If the name of the file contains a number at the end, this number will automatically increase by one every time an acquisition is made. In the illustration below, the file has three digits at the end. This will allow 999 acquisitions that will share the same base name.

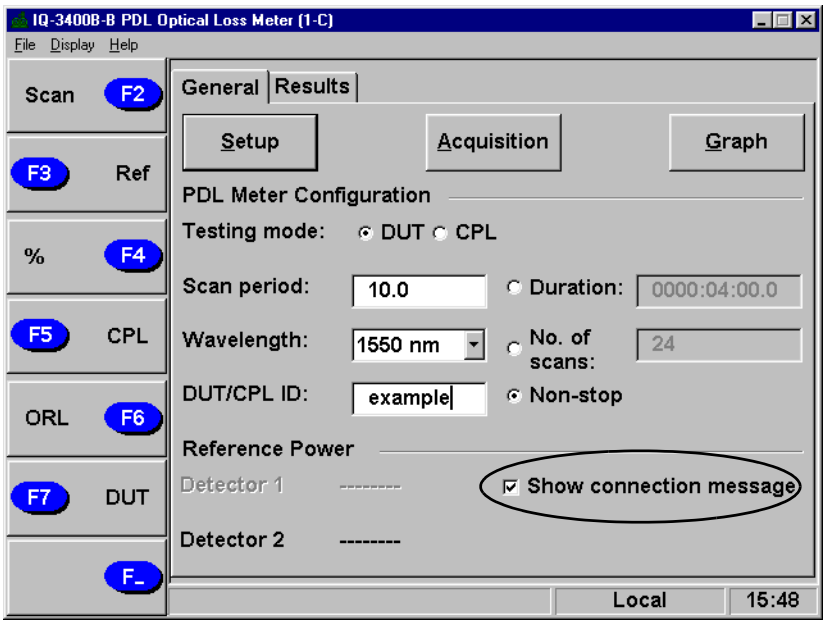


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Displaying Connection Messages

If you want to see messages on how to connect the modules while performing tests, select the *Show connection message* in the *General* tab of the application main window.



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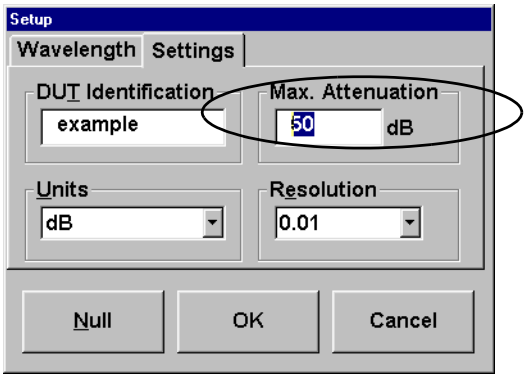
Setting the Maximum Attenuation

This parameter allows you to set the maximum loss permitted. When the defined attenuation is exceeded, the insertion loss result is displayed in red.

The minimum value is -9999 dB and the maximum value is 9999 dB.

To set the maximum attenuation,

1. Click on the *Setup* button located in the *General* tab of the application main window.
2. Select the *Settings* tab.
3. Enter the desired value in the *Max. Attenuation* text box.



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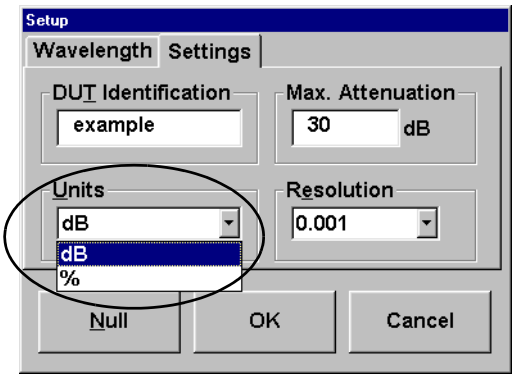
Selecting the Measurement Unit

Measurements can be displayed in dB or in percentage.

To select the measurement unit,

1. Click on the *Setup* button located in the *General* tab of the application main window.
2. Select the *Settings* tab.
3. Select the desired measurement unit (dB or %) using the drop-down list.

You can also use the *dB/% (F4)* function button located in the application main window to toggle the measurement unit between dB and %.



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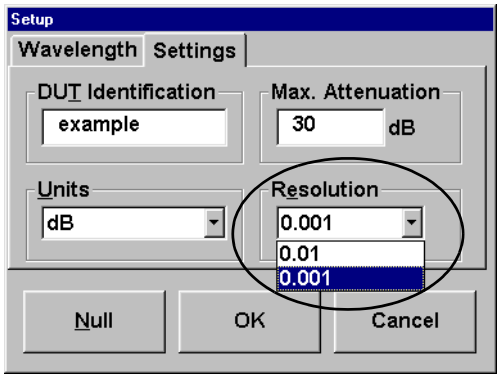
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Setting the Resolution

The resolution is the number of significant decimal digits.

To set the resolution,

1. Click on the *Setup* button located in the *General* tab of the application main window.
2. Select the *Settings* tab.
3. Select the desired resolution using the drop-down list.



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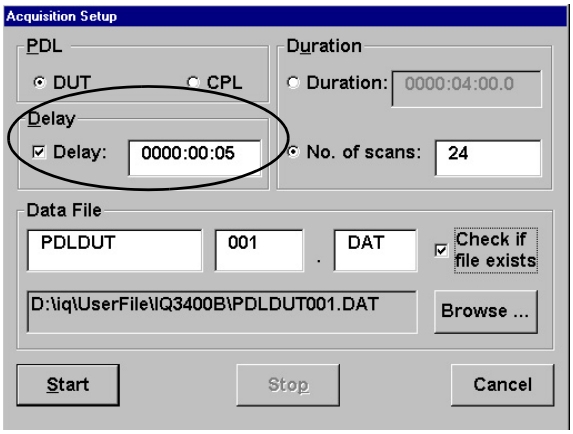
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Setting a Trigger Time

Note: *This parameter can be set for acquisitions saved in a file only.*

It is possible to set a trigger time to delay the start of the acquisition.

1. Click on the *Acquisition* button located in the *General* tab of the application main window.
2. Select the *Delay* radio button.
3. In the *Delay* text box, type the desired trigger time.



The delay can be set according to a specific time or a specific number of scans. For example, you can make a four-minute acquisition composed of ten-second scans. The complete acquisition will be composed of 24 scans. If you set a delay value of five minutes, the total acquisition will take nine minutes.

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5 Testing the DUT

Use the DUT testing mode to perform the following measurements:

- polarization-dependent loss (PDL)
- insertion loss (IL)
- reference power

Average PDL/PDG and PDL/PDG standard deviation are provided for a complete DUT analysis.

Preparing for the DUT Test

1. Power off the IQ-203 and IQ-206 and properly insert the IQ-3400B PDL/OL Meter, the IQ-5100B Polarization Scrambler, and a source into their slots. For more information, see *Inserting and Removing Modules* on page 9.
2. Start the application. For more information, see *Starting and Exiting the PDL/OL Meter Application* on page 11.

Setting DUT Parameters

Configure the following parameters, as desired. For more information, see *Setting Parameters for PDL Measurements* on page 13.

- test wavelength
- scan period
- type of scan (duration, number of scans, or continuous scan)
- DUT name
- data filename
- maximum attenuation
- measurement unit
- resolution
- trigger time

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Performing a Nulling

Before proceeding with the DUT test, perform a nulling to eliminate electronic offsets.

IMPORTANT

EXFO recommends performing a nulling 30 minutes after starting the application and also before each test session.

1. Click on the *Setup* button located in the *General* tab of the application main window.
2. Select the *Settings* tab.
3. Install protective caps on detector ports D1 and D2.
4. Press the *Null* button.

Measuring the DUT Reference Power

The steps below indicate how to perform a DUT reference. The connections required when referencing the unit are also illustrated.

1. In the *General* tab of the application main window, select the *DUT* radio button.
2. Connect the modules as follows:

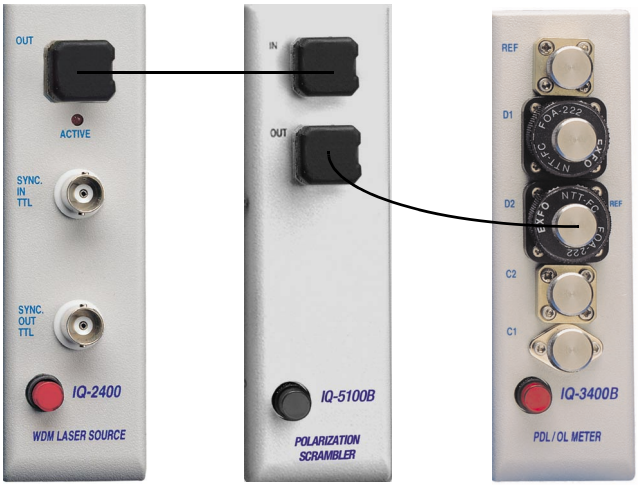
IMPORTANT

As in all fiber testing situations, verify that the connectors have been properly cleaned prior to testing.

- Connect the source port to the IQ-5100B Polarization Scrambler input port.
- Connect the IQ-5100B Polarization Scrambler output port to detector D2.

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3. Make sure that the source is powered on.

Note: *The IQ-5100B Polarization Scrambler must be in pause mode.*

4. In the *General* tab of the application main window, click on the *Ref (F5)* function button to start the reference measurement.

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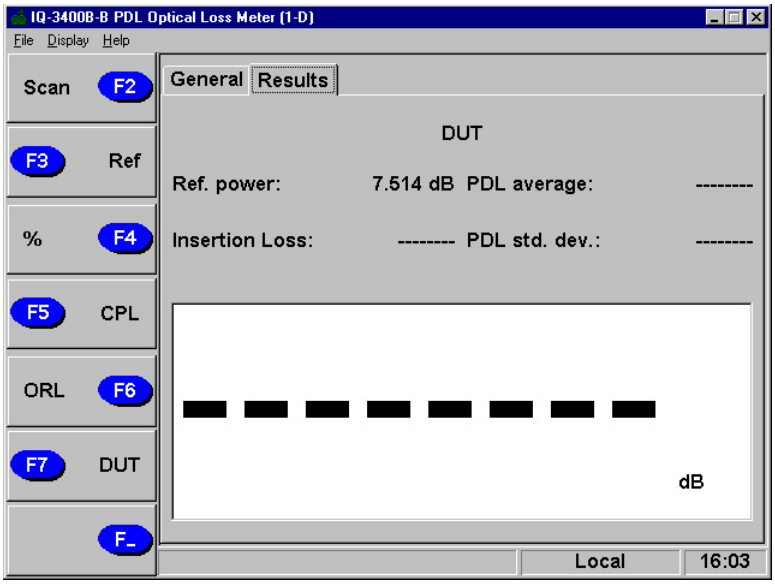
To see the results,

➤ look in the *Reference Power* section in the *General* tab.



OR

➤ select the *Results* tab or click on the *DUT (F7)* function button.



It is possible to perform a reference power measurement for several wavelengths. To see the results obtained for a specific wavelength, select the wavelength in the *Wavelength* drop-down list box located in the *General* tab of the application main window.

Reference power measurements are kept in memory as long as the PDL/OL Meter is open.

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Testing the DUT

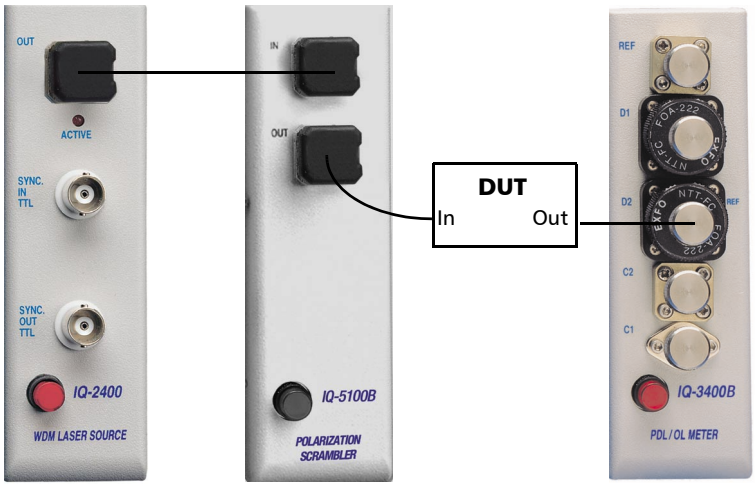
IMPORTANT

The IQ-5100B Polarization Scrambler must be in scanning mode when testing the DUT. For more information, refer to the *IQ-5100B Polarization Scrambler* instruction manual.

After having completed a reference measurement, you may begin testing in DUT mode. The steps below indicate how to test the DUT.
The connections required are also illustrated.

To test the DUT,

1. Leave the source connected to the IQ-5100B Polarization Scrambler input port.
2. Connect the IQ-5100B Polarization Scrambler output port to the DUT input port.
3. Connect the DUT output port to detector D2.



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4. In the IQ-5100B Polarization Scrambler main window, click on the *Scan (F2)* function button.

Note: *If the* Scan *function button does not appear in the main window, the module is already in scanning mode.*

5. On the *General* tab of the PDL/OL Meter main window, click on the *Scan (F2)* function button.

OR

Click on *Start* in the *Acquisition Setup* dialog box if you want to save the results (see *Specifying a Data Filename* on page 23).

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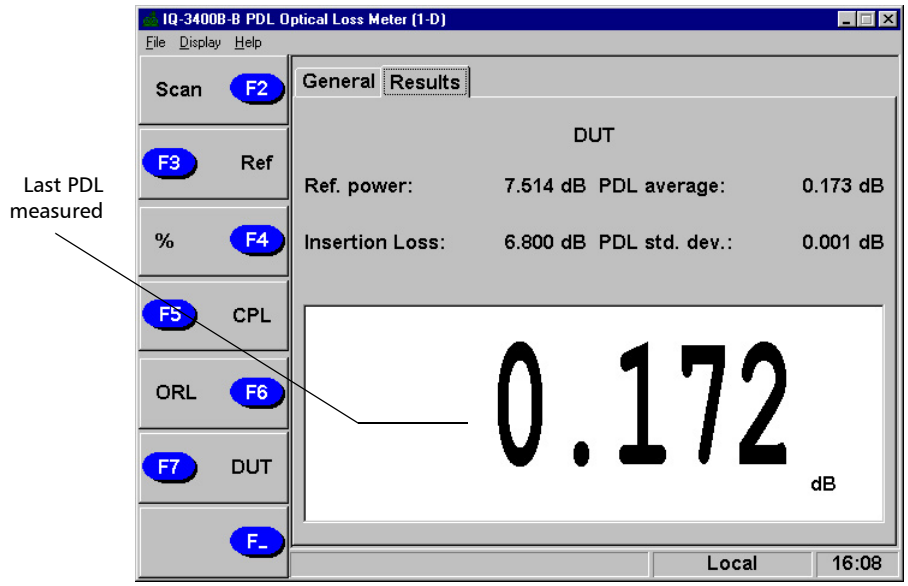
Viewing On-Screen DUT Results

To view the results displayed on screen,

➤ Click on the *DUT (F7)* function button.

OR

Click on the *Results* tab located on the application main window.



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Results are described below:

- *Ref. power:* Reference power obtained at each scan.
- *Insertion loss:* The ratio of input power to output power, in dB units (for a given output port), for an optical component such as a connector, a splice, or a coupler. For a multiport device, the insertion loss includes the splitting ratio and the excess loss.
- *PDL average:* Average polarization-dependent loss value calculated from all acquisitions made during the actual testing session.
- *PDL std. dev.*: Polarization-dependent loss standard deviation.

The last PDL measured is displayed in the results box (see illustration on the previous page).

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Viewing and Printing Saved DUT Results

If the acquisition has been saved in a file (see *Specifying a Data Filename* on page 23), you can view and print the acquisition file using a spreadsheet or a word processor application.

The file is a tab-delimited plain text, as shown in the following example.

```
EXFO_FILE:    ACQFILE, PDL
VERSION:                1,1

FILE:                   D:\ACQDUT000.DAT
DATE:                   Thu May 24  2001
TIME:                      10:42:54

DUT ID:                 DUT 0.1dB
LAMBDA:                 1527 nm
UNITS:                  dB
DIGITS:                 0,001
PERIOD:                 5.0 sec
PDL type:               DUT


Scan#      PDL          I L          Ref. power   PDL avg.     PDL std. dev.
         1 0.089 dB     5.545 dB     -31.416 dB   0.089 dB     ++++++++
         2 0.090 dB     5.544 dB     -31.416 dB   0.089 dB     0.001 dB
         3 0.086 dB     5.543 dB     -31.416 dB   0.088 dB     0.002 dB
         4 0.088 dB     5.543 dB     -31.416 dB   0.088 dB     0.002 dB
         5 0.089 dB     5.544 dB     -31.416 dB   0.088 dB     0.001 dB
```

The file contains the information displayed on screen (see *Viewing On-Screen DUT Results* on page 35) i.e., the polarization-dependent loss, the insertion loss, the reference power, the polarization-dependent loss average, and the polarization-dependent loss standard deviation.

Note that the *PDL avg.* column represents the average of the current scan and previous scans. For example:

Scan#	PDL	I L	Ref. power	PDL avg.
1	0.089 dB	5.545 dB	-31.416 dB	0.089 dB
2	0.090 dB	5.544 dB	-31.416 dB	0.089 dB
3	0.086 dB	5.543 dB	-31.416 dB	0.088 dB
4	0.088 dB	5.543 dB	-31.416 dB	0.088 dB
5	0.089 dB	5.544 dB	-31.416 dB	0.088 dB

Average of scan 1 (0.089)

Average of scan 1 (0.089) and scan 2 (0.090)

Average of scan 1 (0.089), scan 2 (0.090), and scan 3 (0.086)

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6 Testing the Coupler

Use the Coupler testing mode to perform the following measurements:

- coupling ratio
- polarization-dependent coupling ratio
- excess loss
- reference power
- insertion loss

Preparing for the Coupler Test

1. Power off the IQ-203 and IQ-206 and properly insert the IQ-3400B PDL/OL Meter, the IQ-5100B Polarization Scrambler, and a source into their slots. For more information, see *Inserting and Removing Modules* on page 9.
2. Start the application. For more information, see *Starting and Exiting the PDL/OL Meter Application* on page 11.

Setting Coupler Parameters

Configure the following parameters, as desired. For more information, see *Setting Parameters for PDL Measurements* on page 13.

- test wavelength
- scan period
- type of scan (duration, number of scans, or continuous scan)
- DUT name
- data filename
- maximum attenuation
- measurement unit
- resolution
- trigger time

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Performing a Nulling

Before proceeding with the Coupler test, perform a nulling to eliminate electronic offsets.

IMPORTANT

EXFO recommends performing a nulling 30 minutes after starting the application and also before each test session.

1. Click on the *Setup* button located in the *General* tab of the application main window.
2. Select the *Settings* tab.
3. Install protective caps on detector ports D1 and D2.
4. Press the *Null* button.

Measuring the Coupler Reference Power

The steps below indicate how to perform a coupler reference. The connections required when referencing the unit are also illustrated.

1. In the *General* tab of the application main window, select the *CPL* radio button.
2. Connect the modules as follows:

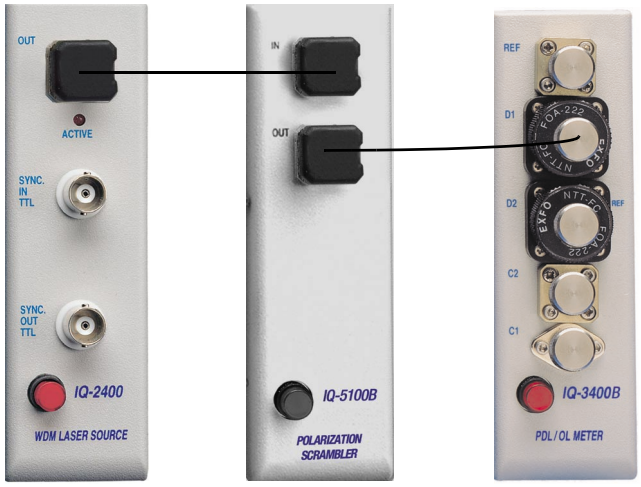
IMPORTANT

As in all fiber testing situations, verify that the connectors have been properly cleaned prior to testing.

- Connect the source port to the IQ-5100B Polarization Scrambler input port.
- Connect the IQ-5100B Polarization Scrambler output port to detector D1 to take the reference on detector D1.

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3. Make sure that the source is powered on.

Note: *The IQ-5100B Polarization Scrambler must be in pause mode.*

4. In the *General* tab of the application main window, click on the *Ref (F3)* function button to start the reference measurement.

➤ Connect the IQ-5100B Polarization Scrambler output port to detector D2 to take the reference on detector D2.

To take the reference power measurement on detector D2, simply connect the IQ-5100B Polarization Scrambler output port to detector D2 and repeat the same steps as above.

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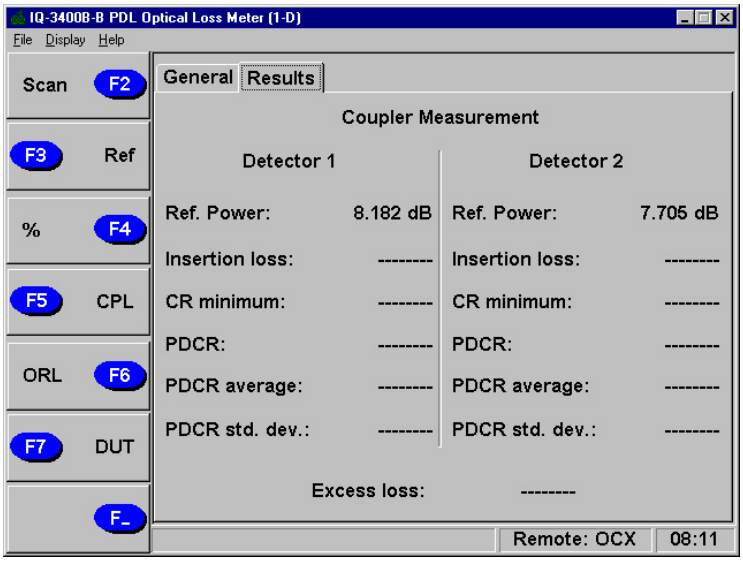
To see the results,

➤ look in the *Reference Power* section in the *General* tab.



OR

➤ select the *Results* tab or click on the *CPL (F5)* function button.



It is possible to perform reference power measurements for several wavelengths. To see the results obtained for a specific wavelength, select the wavelength in the *Wavelength* drop-down list box located in the *General* tab of the application main window.

Reference power measurements are kept in memory as long as the PDL/OL Meter is open.

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Testing the Coupler

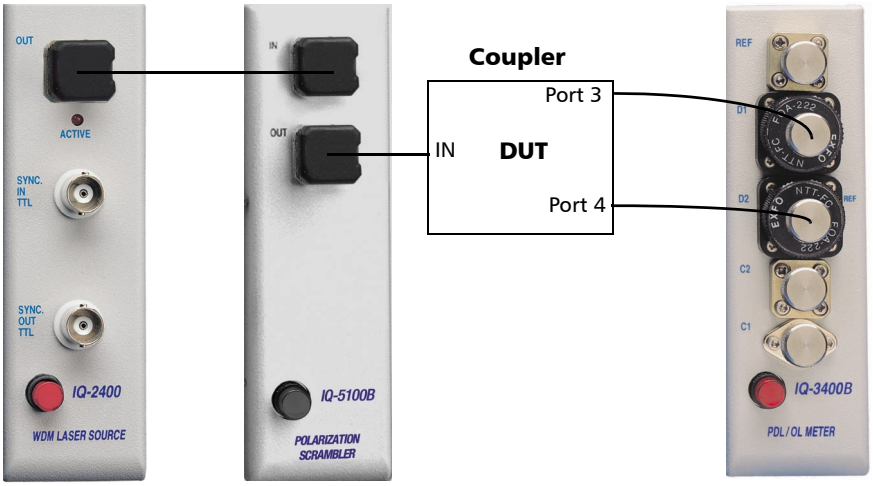
IMPORTANT

The IQ-5100B Polarization Scrambler must be in scanning mode when testing the DUT. For more information, refer to the *IQ-5100B Polarization Scrambler* instruction manual.

After having done a reference measurement, you may begin testing in Coupler mode. The steps below indicate how to test the coupler. The connections required are also illustrated.

To test the coupler,

1. Connect the source to the IQ-5100B Polarization Scrambler input port.
2. Connect the IQ-5100B Polarization Scrambler output port to the coupler input port.
3. Connect the coupler output ports to detectors D1 and D2.



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4. In the IQ-5100B Polarization Scrambler main window, click on the *Scan (F2)* function button.

Note: *If the* Scan *function button does not appear in the main window, the module is already in scanning mode.*

5. In the *General* tab of the PDL/OL Meter main window, click on the *Scan (F2)* function button.

OR

Click on *Start* in the *Acquisition Setup* dialog box to save the results (see *Specifying a Data Filename* on page 23).

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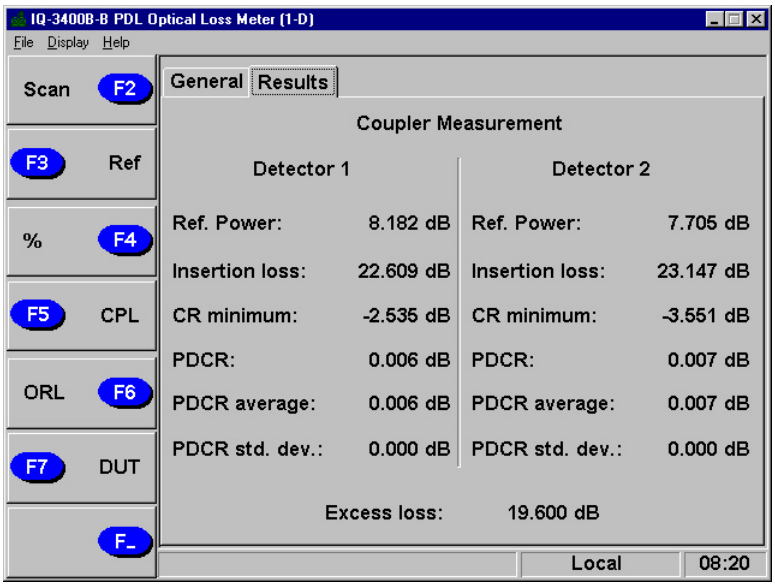
Viewing On-Screen Coupler Results

To view the results displayed on screen,

➤ Click on the *CPL (F5)* function button.

OR

Click on the *Results* tab located in the application main window.



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Results are described below:

- *Ref. power:* Reference power obtained at each scan.
- *Excess loss:* In relation to multiport components, the excess loss is a measure of the insertion loss over and above that induced by the splitting ratio. Excess loss is normally defined (in dB units) as the ratio of the input power divided by the sum of the powers in the output ports.
- *Insertion loss:* The ratio of input power to output power (for a given output port) for an optical component such as a connector, a splice, or a coupler. For a multiport device, the insertion loss includes the splitting ratio and the excess loss. Insertion loss is given in dB.
- *Transmission:* The ratio of input power to output power, for a given output port. The transmission indicates the percentage of remaining power. Transmission is displayed in %.
- *CR minimum:* The smallest of the values obtained by measuring the power at both output ports and providing the ratio between the output power for one port and the sum of the output power of both output ports.
- *PDCR:* The polarization-dependent coupling ratio for each output port.
- *PDCR average:* The polarization-dependent coupling ratio average for each output port.
- *PDCR std. dev.:* The polarization-dependent coupling ratio standard deviation for each output port.

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Viewing and Printing Saved Coupler Results

If the acquisition has been saved in a file (see *Specifying a Data Filename* on page 23), you can view and print the acquisition file using a spreadsheet or a word processor application.

The file is a tab-delimited plain text, as shown in the following example.

```
EXFO_FILE:  ACQFILE, PDL
VERSION:                1,1

FILE:                   D:\ACQCPL001.DAT
DATE:                   Thu May 24  2001
TIME:                         10:58:04

DUT ID:                 CPL27
LAMBDA:                 1527 nm
UNITS:                  dB
DIGITS:                 0,001
PERIOD:                 5.0 sec
PDL type:               CPL


Scan#   Ref. power(1)   Ref. power(2)   Excess loss   Ins. loss(1)   I L(2)   CR minimum(1)   CR minimum(2)   PDCR(1)   PDCR(2)   PDCR avg.(1)   PDCR avg.(2)   PDCR std. dev.(1)
        1 -34.658 dB    -32.031 dB      24.822 dB     22.540 dB      35.991 dB -0.677 dB       -35.145 dB      0.676 dB  26.740 dB 0.676 dB       26.740 dB      ++++++++
        2 -34.658 dB    -32.031 dB      24.868 dB     22.616 dB      35.688 dB -0.736 dB       -35.282 dB      0.735 dB  27.212 dB 0.705 dB       26.976 dB      0.042 dB
        3 -34.658 dB    -32.031 dB      24.808 dB     22.575 dB      35.426 dB -0.788 dB       -35.323 dB      0.787 dB  27.524 dB 0.733 dB       27.159 dB      0.056 dB
        4 -34.658 dB    -32.031 dB      24.840 dB     22.578 dB      35.776 dB -0.722 dB       -35.351 dB      0.721 dB  27.204 dB 0.730 dB       27.170 dB      0.046 dB
        5 -34.658 dB    -32.031 dB      24.838 dB     22.591 dB      35.609 dB -0.788 dB       -35.452 dB      0.787 dB  27.653 dB 0.741 dB       27.267 dB      0.047 dB
```

The file contains the information displayed on screen (see *Viewing On-Screen Coupler Results* on page 45) i.e., the number of scans, the reference power, the excess loss, the insertion loss, the coupling ratio (CR), the polarization-dependent coupling ratio (PDCR), the polarization-dependent coupling ratio average (PDCR avg.), and the polarization-dependent coupling ratio standard deviation (PDCR std. dev.).

Note that the *PDCR avg.* column represents the average of the current scan and previous scans. For example:

Scan#	PDCR(1)	PDCR avg.(1)
1	0.676 dB	0.676 dB
2	0.735 dB	0.705 dB
3	0.787 dB	0.733 dB
4	0.721 dB	0.730 dB
5	0.787 dB	0.741 dB

Average of scan 1 (0.676)

Average of scan 1 (0.676) and scan 2 (0.735)

Average of scan 1 (0.676), scan 2 (0.735), and scan 3 (0.787)

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7 Using the PDL Test System Utility

The PDL Test System utility facilitates taking PDL measurements by combining the IQ-3400B PDL/OL Meter, the IQ-5100B Polarization Scrambler and a source. It ensures that the source is on, that the Polarization Scrambler is in scanning mode and that measurements are saved in a file.

Note: *If you have the IQ-200 Optical Test System version 2.6, the installation files are located in the* Tools *folder of the installation CD. If you have a prior version, use the installation disks provided with the module to install the PDL Test System utility.*

Activating the PDL Test System Utility

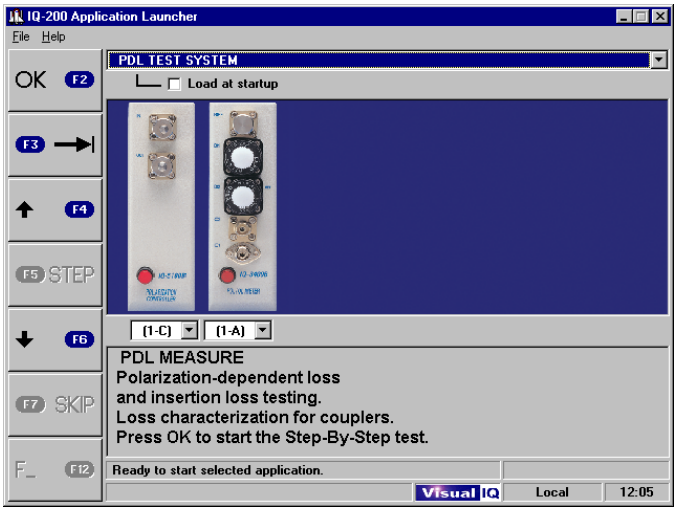
To activate the PDL test system utility,

1. Power off the IQ-203 and IQ-206 and insert your modules in the IQ-200 Optical Test System (see *Inserting and Removing Modules* on page 9).
2. Start the IQ-200 Optical Test System (for details, refer to the *IQ-200 Optical Test System* instruction manual).
3. Double-click on the *Launcher* button in the IQ-200 Optical Test System main window.

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4. Select the *PDL Test System* configuration in the upper drop-down list.



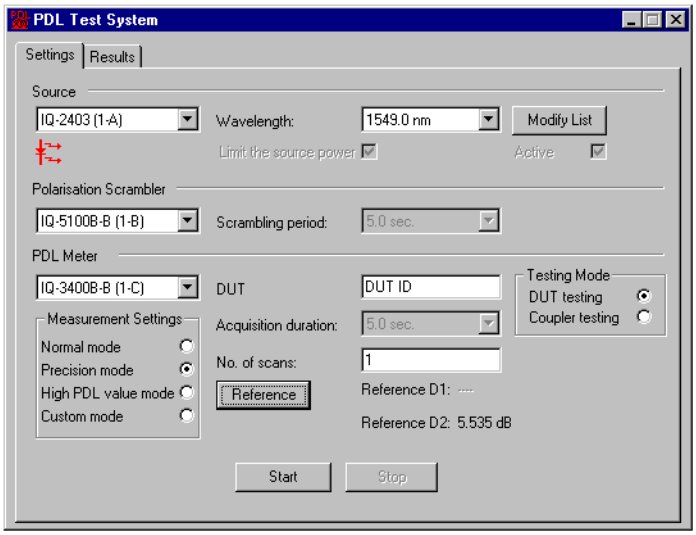
5. Press *OK* to launch the application.

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Setting PDL Test System Parameters

Once the application is started, set the parameters in the *PDL Test System* window (illustrated below):



➤ Set the source parameters:

  ➤ Select a source from among the available sources (see *Hardware Components Required* on page 3).

  ➤ Select the wavelength at which you want to perform the test.

  ➤ Click on *Modify List* to add a wavelength to the list of defined wavelengths.

  ➤ Select *Limit the source power* to set the source power to 6 dBm. If you want to set the power to a higher value, select *External* in the drop-down list.

  ➤ Select *Active* to warm up the source before performing the test.

➤ The IQ-5100B Polarization Scrambler module is selected by default.

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- Set parameters for the IQ-3400B PDL/OL Meter:
  - The IQ-3400B PDL/OL Meter module is selected by default.
  - Specify a DUT name in the *DUT* text field. The DUT name specified is assigned to the corresponding data acquisition file (for more information, see *Specifying a DUT Name* on page 21).
  - Set the number of scans in the *No. of scans* text field (for more information, see *Setting the Number of Scans* on page 18).
  - Select the testing mode (*DUT* or *Coupler*) in the *Testing Mode* section (for more information, see *Testing the DUT* on page 29 and *Testing the Coupler* on page 39).
  - Press *Reference* to measure the reference power (for more information, see *Measuring the DUT Reference Power* on page 30).
- Select one of the following measurement settings:
  - *Normal mode*: the acquisition duration equals the scrambling period (i.e., acquisition duration of 2.5 seconds and scrambling period of 2.5 seconds).
  - *Precision mode*: the acquisition duration is two times longer than the scrambling period (i.e., acquisition duration of 10 seconds and scrambling period of 5 seconds). The PDL measurement is slower but provides more precise results.
  - *High PDL value mode*: the acquisition duration is four times longer than the scrambling period (i.e., acquisition duration of 40 seconds and scrambling period of 10 seconds). The scrambling period must be longer when the PDL value is higher.
  - *Custom mode*: select the values available in the *Scrambling period* and the *Acquisition duration* drop-down lists.

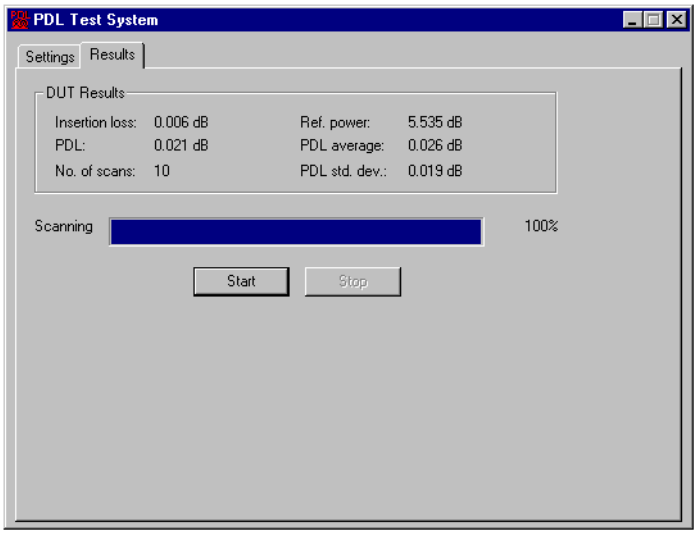
Simply press *Start* to launch the PDL measurement.

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Viewing Results

DUT or Coupler results are available in the *Results* tab, as illustrated below. For more information, see *Viewing On-Screen DUT Results* on page 35 and *Viewing On-Screen Coupler Results* on page 45).



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8 Testing the ORL

ORL characterization of optical components is made possible through the ORL testing mode.

Preparing for the ORL Test

1. Power off the IQ-203 and IQ-206 and properly insert the IQ-3400B PDL/OL Meter, the IQ-5100B Polarization Scrambler, and a source into their slots. For more information, see *Inserting and Removing Modules* on page 9.

Note: *The IQ-5100B Polarization Scrambler module is not required for the ORL measurement, but it can remain in the IQ-203.*

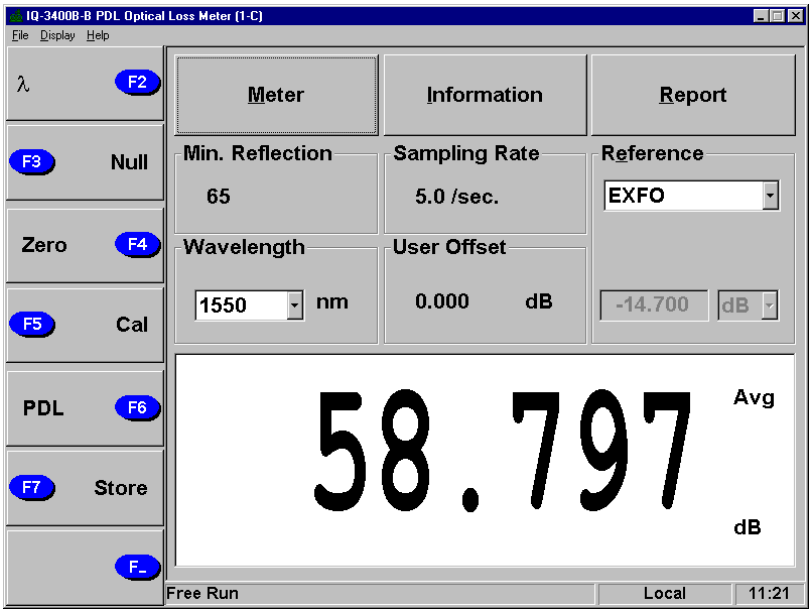
2. Start the application. For more information, see *Starting and Exiting the PDL/OL Meter Application* on page 11.

3. To activate the ORL testing mode, click on the *ORL (F6)* function button located on the application main window. The ORL main screen appears as illustrated below.

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Testing the ORL

Preparing for the ORL Test



To return to the DUT and Coupler testing modes, click on the *PDL (F6)* function button.

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Setting ORL Parameters

Click on the *Meter* button to open the *Meter Setup* dialog box where you can set the following measurement parameters:

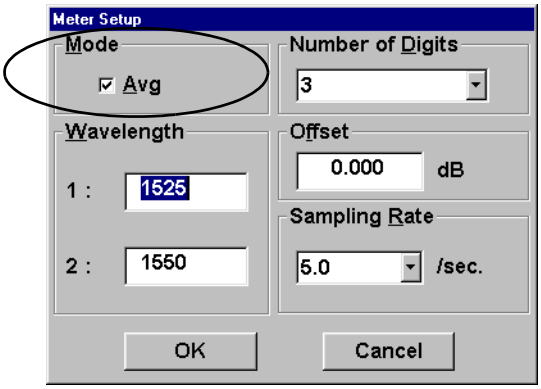
- averaging mode
- number of digits
- wavelength
- offset
- sampling rate

The minimum reflection and reflection reference parameters are set in the application main window.

These parameters are explained below.

Activating the Averaging Mode

In the *Meter Setup* dialog box, select the *Avg.* mode to display the averaged measurement values.



Avg. will be displayed in the measurement display, indicating that averaging is enabled.

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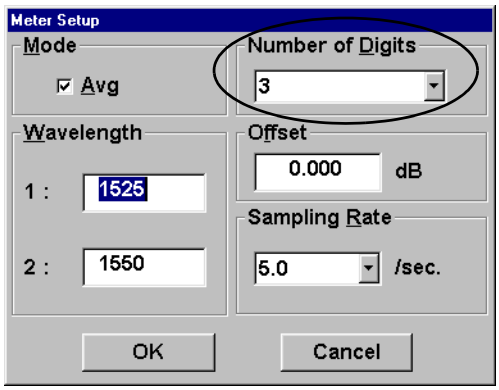
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Setting the Number of Digits

Depending on the required resolution, 0, 1, 2, or 3 digits can be displayed after the decimal point. When *Auto* is selected, the resolution is determined by the power level being measured.

To set the number of digits,

➤ In the *Meter Setup* dialog box, select the number of digits you want in the list box.



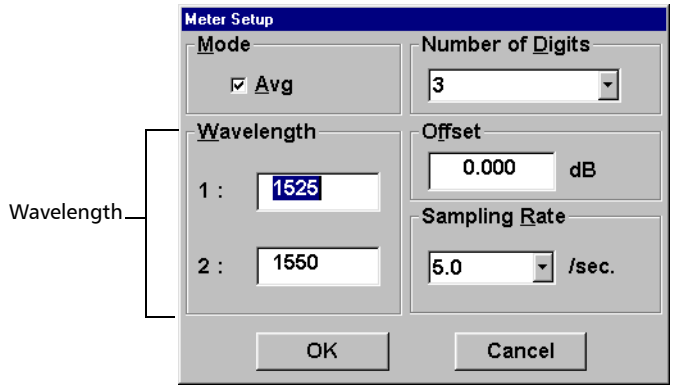
Defining and Selecting a Wavelength

Yo can define two wavelengths to perform ORL tests.

1. In the *Meter Setup* dialog box, enter the desired wavelength in the first text field.
2. Enter a second wavelength in the second text field, if desired.
3. Once you have defined your wavelengths, use the λ *(F2)* function button to toggle between the two defined wavelengths.

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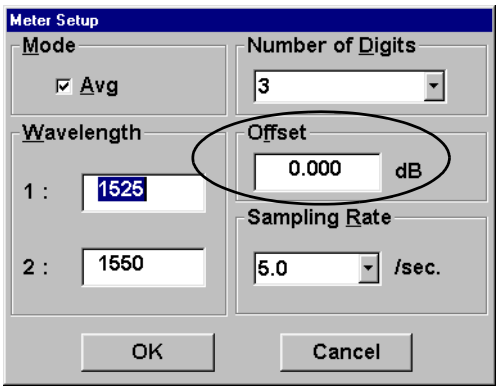


Setting the Offset

The offset is added to the measured return loss. It is expressed in dB.

In the *Meter Setup* dialog box, enter the desired offset.

The offset value is also displayed on the main screen in the *User Offset* section.



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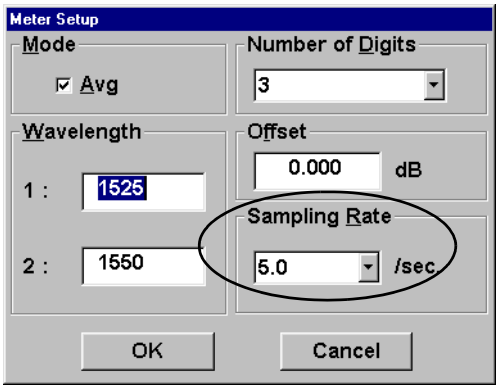
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Setting the Sampling Rate

This is the frequency at which the measure is taken. For example, if the sampling rate is set at 5.0/seconds, the module will take five measurements every second.

In the *Meter Setup* dialog box, enter the sampling rate. The available choices are 0.1, 0.5, 1.0, and 5.0/seconds.

The selected sampling rate is also displayed on the main screen in the *Sampling Rate* section.



Setting the Minimum Reflection

This is the level of sensitivity that can be measured under present conditions. The minimum reflection is determined during the zero-reflection and calibration measurements and also depends on the output power of the source used.

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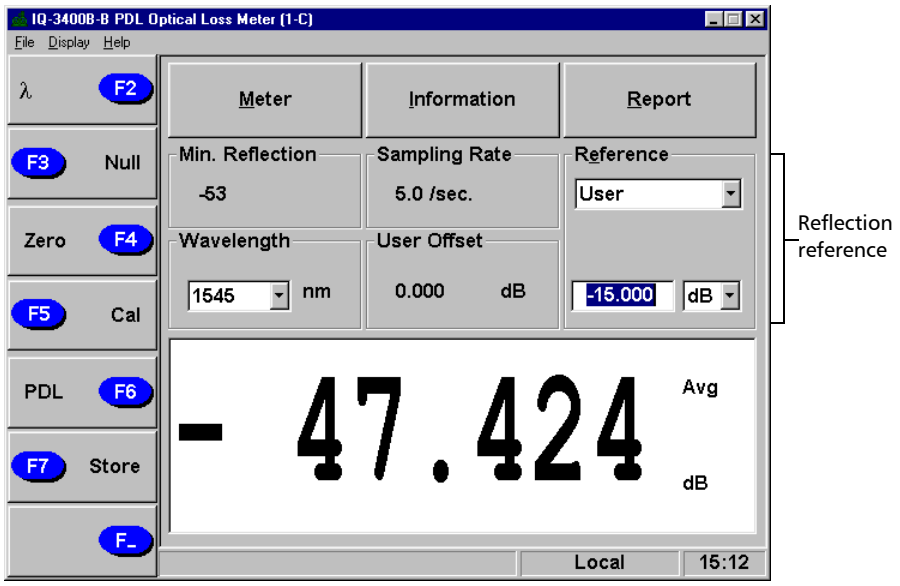
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Setting the Reflection Reference

Select the reflection reference that will be used during the reference calibration.

In the application main window, select either *EXFO* or *User*.

- Under the *EXFO* reflection reference, the value is automatically displayed (-14.65 dB @ 1310 nm, -14.70 dB @ 1550 nm).
- Under the *User* reflection reference, enter the value in the text box and select the appropriate unit (dB or %).



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Performing a Nulling

Perform a nulling to eliminate electronic offsets.

IMPORTANT

EXFO recommends performing a nulling 30 minutes after starting the application and also before each test session.

1. Install protective caps on detector ports D1 and D2.
2. Click on the *Null (F3)* function button.

Performing an ORL Calibration

During ORL calibration, the IQ-3400B compares measured reflectance to a reflection reference value and then computes and applies the necessary correction factor. The calibration can be performed with the reference patchcord provided by EXFO or with any other reference patchcord, as long as the accurate reflection reference value is provided.

The software stores different calibration constants for each available wavelength (i.e., the two wavelengths defined in the *Meter Setup* window).

IMPORTANT

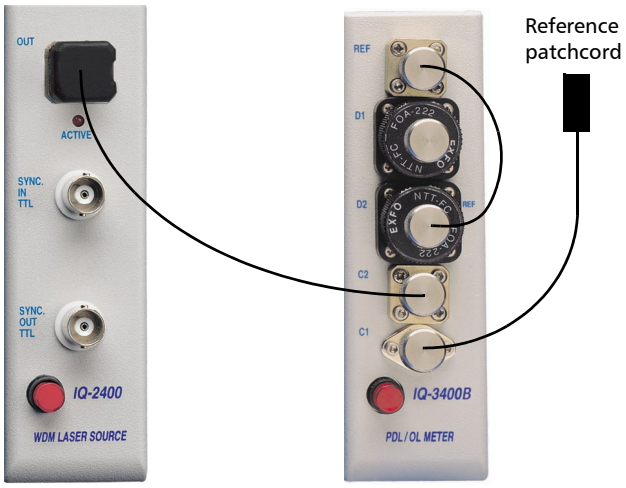
If testing at two wavelengths, the reference calibration must be performed at both wavelengths.

To perform the ORL calibration,

1. Connect the modules as follows:
   - ➤ Connect the source to connector C2.
   - ➤ Connect detector D2 to the REF port.
   - ➤ Connect the reference patchcord to C1.

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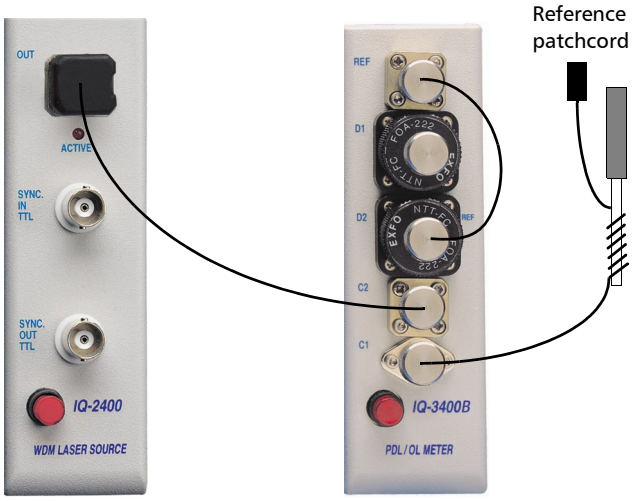
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2. Ensure that the source is activated and stable at the desired wavelength.
3. Press the λ *(F2)* function button to set the IQ-3400B PDL/OL Meter to the same wavelength as the source.
4. Select the desired reference in the application main window (see *Setting the Reflection Reference* on page 61).

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5. Terminate the reference jumper (minimum of 8 turns) as shown in the following illustration. The mandrel termination attenuates reflections from the reference reflector so that a zero-reflection measurement can be performed. The displayed value should now be very close to the sensitivity limit (≈ 65 dB or --------) of the IQ-3400B PDL/OL Meter.



6. Press the *Zero (F4)* function button to perform a zero-reflection measurement. The zero-reflection measurement allows the software to measure and correct any parasitic reflections resulting from the measurement setup (e.g., internal reflections and IQ-3400B PDL/OL Meter to test jumper interface reflections).

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IMPORTANT

Upon completion of the zero-reflection measurement, a new minimum reflection value may be displayed. The minimum reflection represents the sensitivity of the measurement setup and is calculated based on the reflected power measured during the zero measurement. A normal zero measurement should produce a minimum reflection of 65 dB (with the user offset = 0.000 dB). Note that the minimum reflection depends on the output power of the source used. The greater the output power of the source, the greater the possibility of obtaining a minimum reflection of 65 dB.

7. Unwrap and straighten the reflection reference jumper.

8. Press the *Cal (F5)* function button to complete the reference calibration. Upon completion, the displayed value will equal the reference value.

IMPORTANT

Disconnecting the source, either at the source output port or at the IQ-3400B PDL/OL Meter input port, will void the reference calibration. When testing at two wavelengths, a dual-wavelength source with a common output port must be used.

9. If measuring at two wavelengths, repeat this procedure for the second wavelength.

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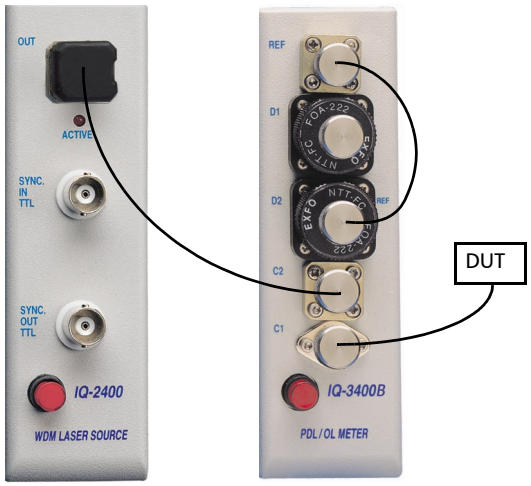
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Testing the ORL

After performing an ORL calibration, you may begin testing in ORL testing mode.

To perform an optical return loss measurement,

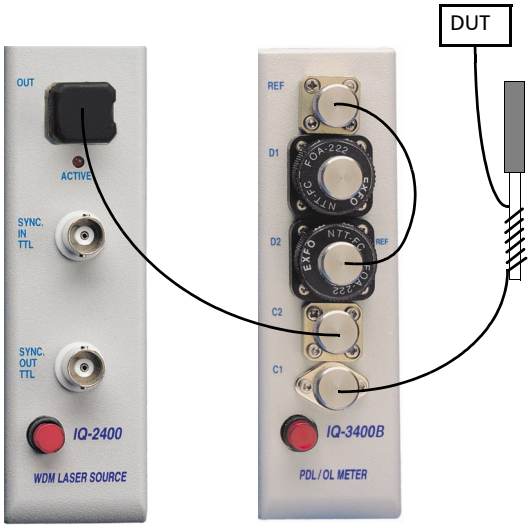
1. Ensure that the source and the IQ-3400B PDL/OL Meter are set to the same wavelength.
2. Using a suitable test jumper, connect the DUT as follows:
   - ➤ Connect the source to connector C2.
   - ➤ Connect detector D2 to the REF port.
   - ➤ Connect the DUT to connector C1.



3. Terminate the test jumper as close as possible to the DUT. The displayed value should now be very close to the sensitivity limit (65 dB or --------) of the IQ-3400B PDL/OL Meter.

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4. Press *Zero* to perform a zero-reflection measurement.

IMPORTANT

A normal zero-reflection measurement should produce a minimum reflection of 65 dB (with the user offset = 0.000 dB).

5. Unwrap and straighten the test jumper.

   The value displayed is the optical return loss of the DUT.

6. Press the *Store (F7)* function button to save the measurement for future printing (see *Printing Saved ORL Results* on page 68).

7. If measuring at two wavelengths, repeat this procedure for the second wavelength.

Note: *Up to 100 values can be stored for each DUT at each wavelength.*

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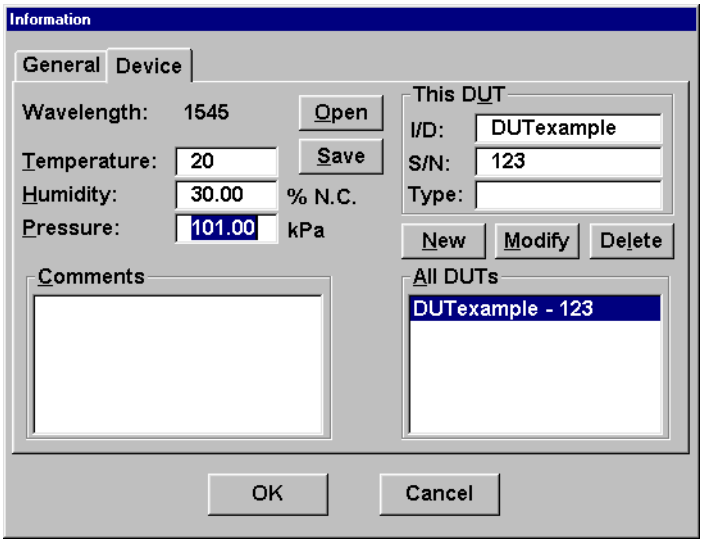
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Printing Saved ORL Results

Once you have performed an ORL measurement, you can store the results and print a report.

To do so,

1. Press the *Store (F7)* function button after having tested the ORL (see *Testing the ORL* on page 66).
2. Click on the *Information* button and then on the *Device* tab to enter information about the tested DUT (see also *Entering Device Information* on page 72).

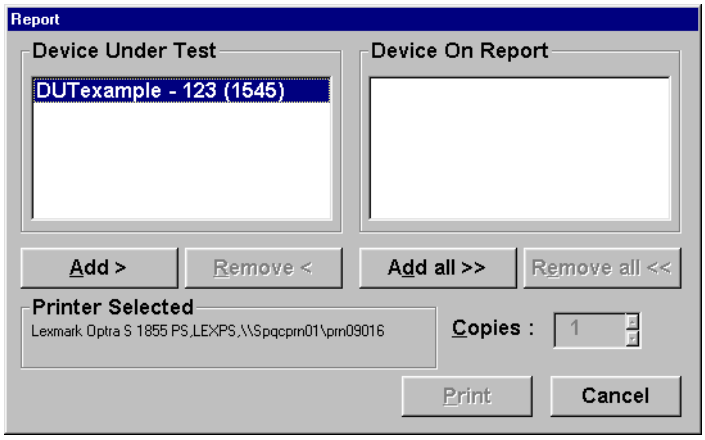


3. Click on the *Report* button to select the DUT you want to print.

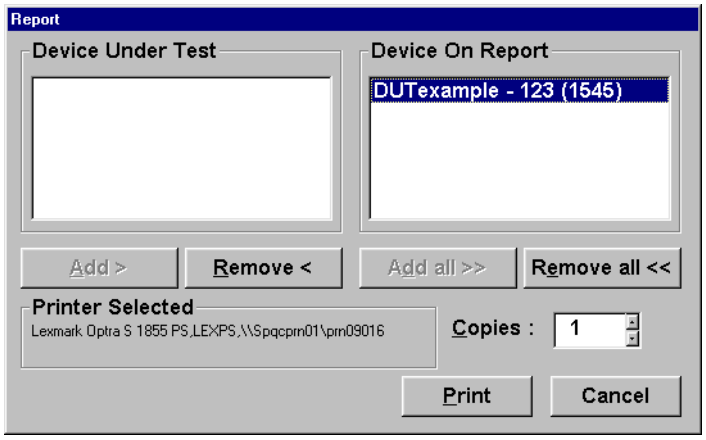
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4. Select the desired DUT in the *Device Under Test* box.



5. Click on the *Add >* button to move the selected DUT in the *Device on Report* box.



6. Click on *Print* to print the report.

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Below is an example of an ORL test report.

RETURN LOSS TEST REPORT

Identification

Date:	2001/06/06	Time: 11:17:47
User name:	User	
Organization:	Exfo Electro-Optical Engineering	
Address:	465 Godin Avenue, Vanier, Canada G1M 3G7	

ORL meter:	ID:	IQ-3400B	SN:	0120552-36
Source:	ID:	IQ-2403	SN:	61890-21

Reference conditions

Wavelength:	1550 nm	Temperature:	27
Reference:	+ 0.000 dB	Relative humidity:	30.00% NC
Offset:	+ 0.000 dB	Pressure:	101.00 kPa
Mode:	Avg		

Device under test

ID:	SampleDut
Type:	Patch Cord
S/N:	123

Test results

Return loss (dB):

(1) 57.870

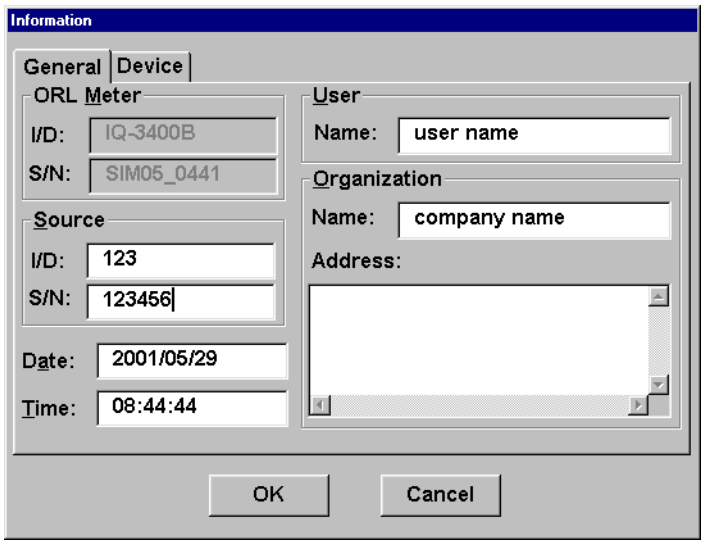
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9 Additional Features

Entering General Information

The following information about the user and the equipment can be entered in the *General* tab of the *Information* dialog box:

- ORL meter identification name and serial number (automatically entered by the system).
- Source identification name and serial number (available on the application *Help* menu).
- Name of the user performing the tests.
- Name and address of the organization for which the tests are performed.
- Date and time when the application was turned on.



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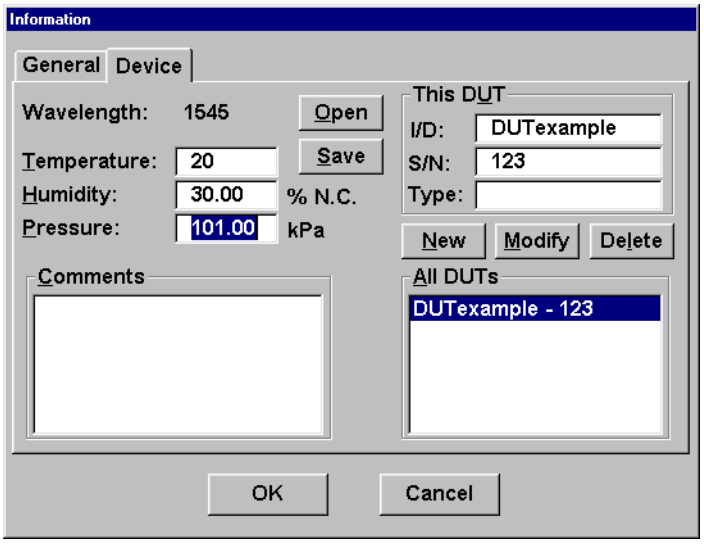
To access the *General* tab,

1. Click on the *Information* button located in the ORL main window.
2. Select the *General* tab.
3. Enter the information required.
4. Press *OK* to save the information.

Entering Device Information

The following information about the DUT can be entered in the *Device* tab of the *Information* dialog box:

- Wavelength used for the test.
- Temperature, humidity and pressure when the test was performed.
- Comments about the test.
- DUT identification name, serial number and type.



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To access the *Device* tab,

1. Click on the *Information* button located on the ORL main window.
2. Select the *Device* tab.
3. Enter the information required.
4. Press *OK* to save the information.

Printing General and Device Information

You can print an ORL report containing the information entered into the *General* and *Device* tabs of the *Report* dialog box.

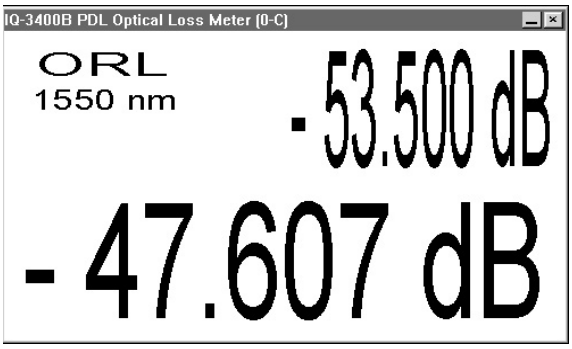
For more information, see *Printing Saved ORL Results* on page 68.

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Using the Monitor Window

The monitor window displays basic loss meter data. Using the monitor window in conjunction with other IQ monitor windows allows you to create an integrated data display screen. For further information, refer to the *IQ-200 Optical Test System* instruction manual.



Note: *The information displayed in the monitor window varies according to the measurement mode that is currently active.*

There are four ways to open the monitor window:

- Choose *Monitor* from the *Display* menu.
- Click on the minimize icon located in the top right corner of the window.
- Right click on the title bar and select *Minimize*.
- Press the LED push button on the front panel of the switch module.

To close the monitor window and return to the application main window:

- Double-click anywhere in the monitor window.

  OR

- Press the LED push button on the front panel of the module.

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

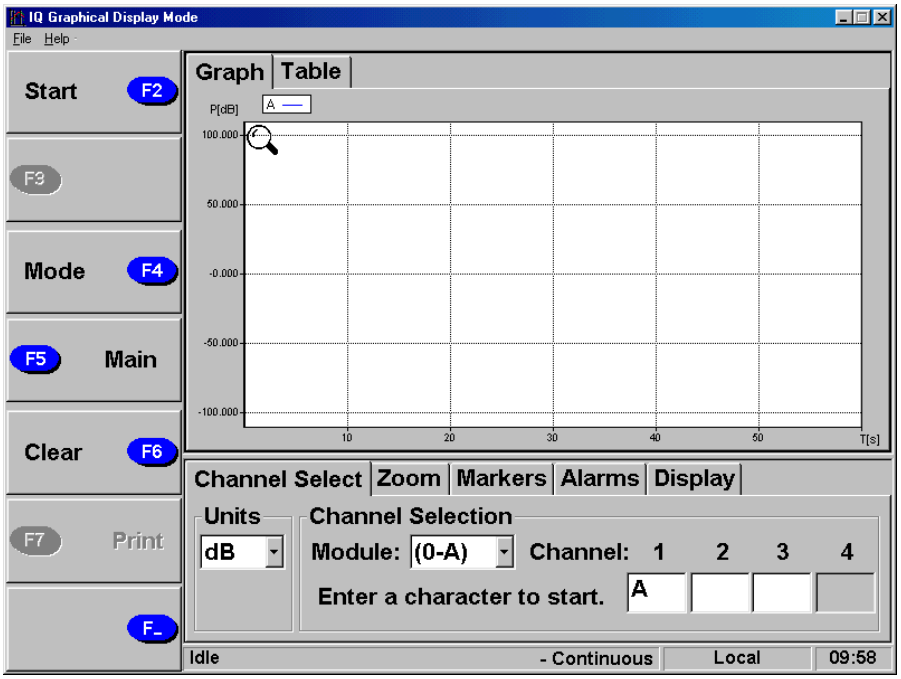
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10 Using the Graphical Display Mode

The *Graphical Display* mode simultaneously offers a real-time sampling display of up to four channels in a tabular format and up to eight channels in a graphical format. Other features include zoom, adjustable markers with automatic delta calculation, minimum and maximum alarm, tabular data display, and printing capabilities.

You can access the *Graphical Display* mode by clicking on *Graph* in the application main window.



Note: *The* Graphical Display *mode is only available when* Non-stop *is selected in the* General *tab of the application main window.*

The *Graphical Display* mode is available for the DUT and Coupler testing modes.

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Using the Graphical Display Mode

1. Enter setup parameters (see *Setting Parameters for PDL Measurements* on page 13) in the application main window.
2. Select *DUT* or *CPL* depending on whether you want to perform a DUT or coupler reference measurement (see *Measuring the DUT Reference Power* on page 30 and *Measuring the Coupler Reference Power* on page 40).
3. Select *Non-stop*.
4. Click on the *Scan (F2)* function button to start the acquisition.
5. Click on the *General* tab to return to the application main window.
6. Click on the *Graph* button to open the *Graphical Display* mode window.
7. Set the following parameters in the *Graphical Display* mode window:
   - channel parameters (see *Selecting Channels* on page 80)
   - alarms parameters (see *Setting Alarms* on page 85)
   - display parameters (see *Selecting Display Parameters* on page 86)
8. Click on the *Start (F2)* function button to start the *Graphical Display* mode.

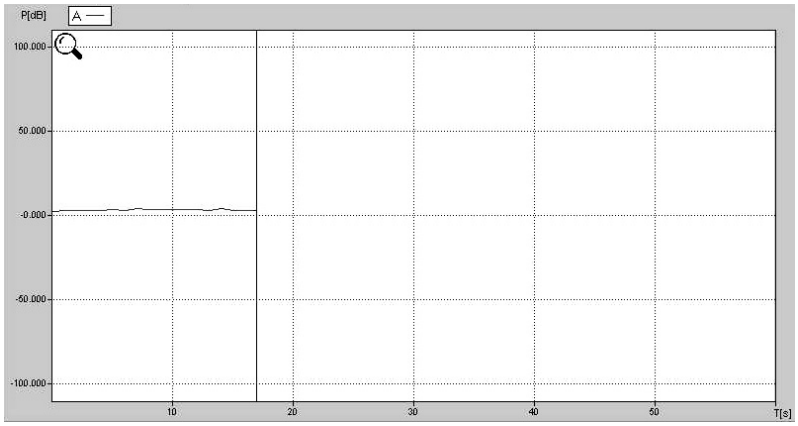
Clicking and dragging down the splitter bar allows you to increase the size of the display area. To return the display area to its original size, simply click and drag it back in place.

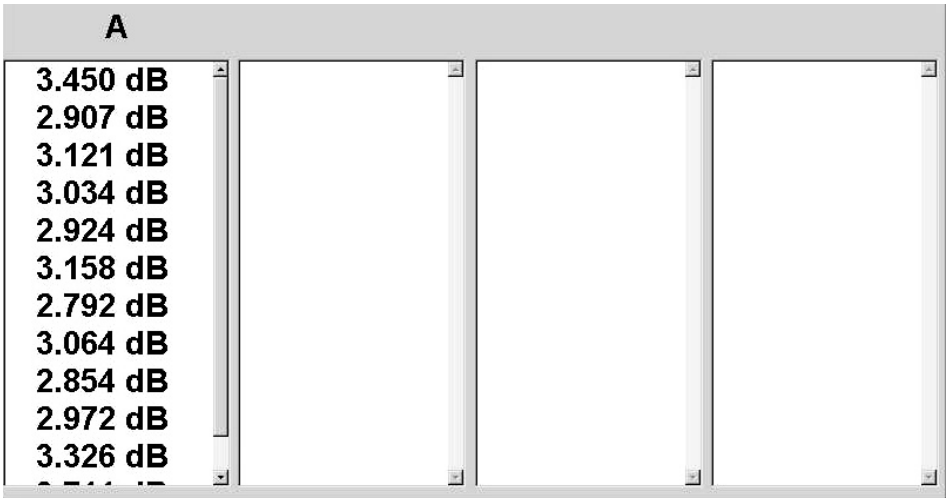
Click on the *Clear (F5)* function button to clear the data displayed in the display area.

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You can view the results in a graphical format (*Graph* tab) or a tabular format (*Table* tab), as illustrated below.





If you want to print a report containing the on-screen results, press the *Print (F7)* function button.

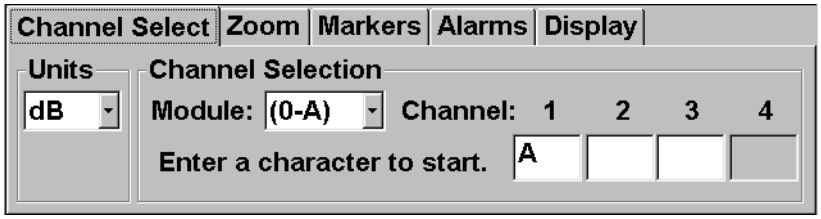
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Selecting Channels

Readings of up to eight channels can be displayed on a curve, whereas readings of up to four channels can be displayed in a table. Channels must be selected and attributed a character for their readings to be displayed.

Note: *The IQ-3400B PDL/OL Meter has only two channels i.e., detector 1 and detector 2.*



To select a channel,

1. Select the measurement units (dBm, dB, or %) in which the readings will be displayed (on the y axis).

Note: *The measurement units selected must be the same as those selected for the DUT or Coupler testing mode.*

2. Scroll through the list of available IQ modules and select the IQ-3400B PDL/OL Meter module.

The position of an IQ module is identified both with a number and a letter. The number indicates in which unit the module is inserted (0 for the IQ-203 Mainframe and 1 to 4 for the IQ-206 PC Expansion Card connected to the mainframe). The letter indicates in which slot the module is inserted.

Note: *Only the IQ modules whose application is set to the same measurement unit as those specified in the* Units *box will be listed.*

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3. Depending on the number of channels available on the selected module, boxes *1*, *2*, *3*, and *4* will be activated.
4. To activate a channel for display, enter a character (either a letter or number) in the corresponding box. This character will be used to identify the channel displayed.

Note: *The same character cannot be used more than once.*

5. Repeat steps 2, 3, and 4 for each desired channel.

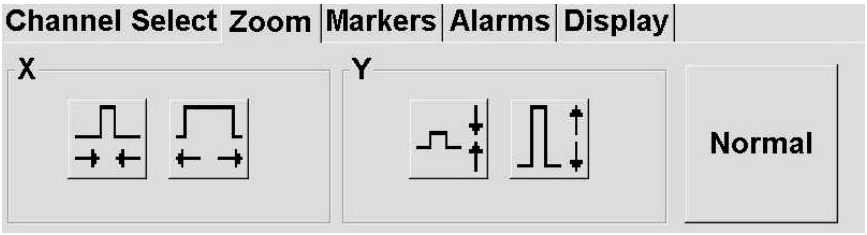
Note: *You must fill in the information in the* Channel Select*,* Alarms*, and* Display *tabs before pressing* Start.

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Using the Zoom

The *Zoom* tab controls the view by increasing or decreasing the axis scales.



The *Zoom* option will not be enabled until a few points have been acquired on the curve. Select the desired button, depending on whether you want to decrease or increase the x axis, shrink or enlarge the y axis, or return to the original settings.

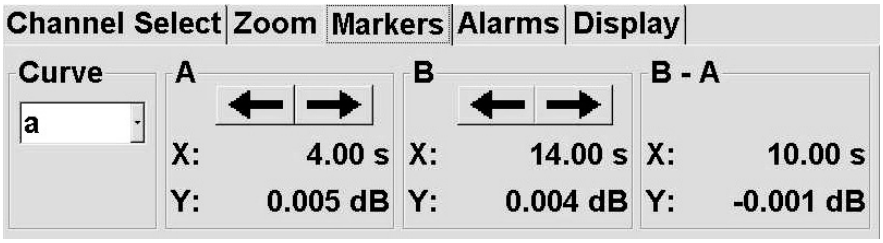
The magnifying glass allows you to move the visible portion of the curve horizontally and vertically by dragging the magnifying glass with the left mouse button on the corresponding border of the display area.

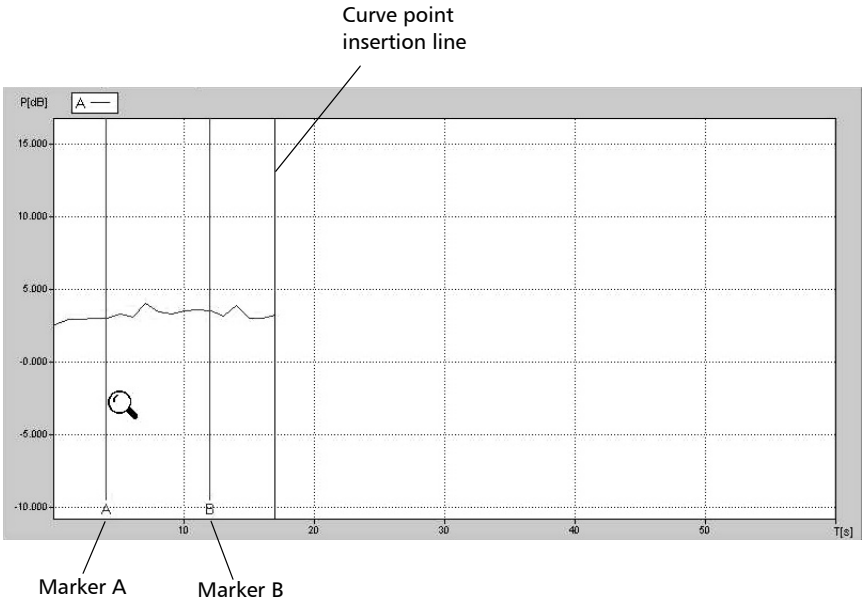
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Using Markers

The markers determine the exact coordinates of a particular point on a curve. You can also find the difference between the coordinates of two points on a curve. To use the marker feature, choose the *Markers* tab at the bottom of the *Graphical Display Mode* window.





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- Markers A and B appear in the display area.
- The A box gives the coordinates of the point met by marker A on the selected curve.
- The B box gives the coordinates of the point met by marker B on the selected curve.
- The B-A box gives the difference between the coordinates of the points met by markers A and B on the selected curve.

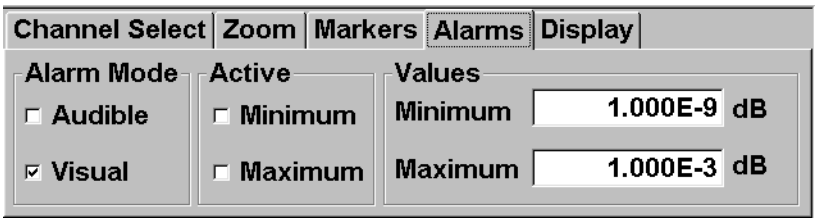
Only two markers are displayed at the same time on the curve selected in the *Markers* tab.

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Setting Alarms

Alarms can be set to warn you when power levels of either channel go below or above set thresholds or outside specified limits. An audible or visual alarm is activated when the power level on any of the displayed channels goes above or below the set thresholds.



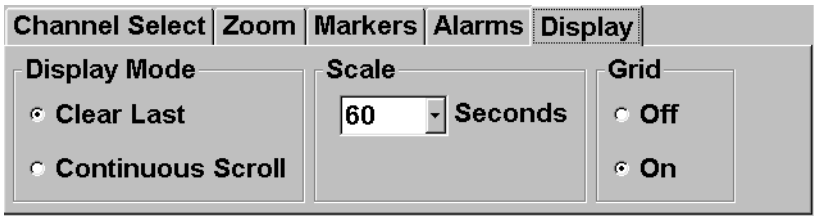
First, select an audible and/or visual alarm. Then, enter the maximum and/or minimum alarm threshold values. Any value entered for the minimum and maximum values will be automatically transformed into a scientific notation.

An audible alarm consists of small beeps generated by the computer. For a visual alarm, the *Min* and/or *Max* indication in the *Display Area* will be outlined in red horizontal dotted lines. The alarm status is displayed in the status bar, alternating between the system status and alarm status. For only the first occurrence, either the minimum or maximum alarm will be displayed in the status bar. To stop the alarm, press *Stop*.

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Selecting Display Parameters



Two curve plotting displays can be selected:

- *Clear Last:* After having gone through a complete sweep of a time scale, curve plotting begins again at the zero point. The previous curve is overwritten as a new one is plotted.
- *Continuous Scroll*: After having gone through a complete sweep of a time scale, curve plotting keeps going on the same curve. Only the portion of the curve plotted within the last time scale is kept in memory and displayed.

Notice that an insertion line moves along the x axis as the curve plotting progresses.

The scale setting determines the length of the x axis (time) when the zoom control is set to full view. It therefore determines how long the curve plotting process will take to perform a complete sweep of the display (in full view). Six choices are available in the *Display* page: 60, 120, 300, 600, 1800 and 3600 seconds.

A grid can be displayed over the curve(s) in the graphical display area so it is easier to refer to the x and y axes from a point on a curve. To turn the grid on or off, choose the appropriate radio button in the *Display* page.

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11 Maintenance

CAUTION

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

To help ensure long, trouble-free operation,

- Keep the unit free of dust.
- Clean the unit casing with a tissue that has been 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.
- If any liquids are spilled on or into the unit, turn off the power immediately and let the unit dry completely.
- Avoid unnecessary shocks and vibrations.

Cleaning the Front Panel

Clean the front panel of the module regularly to avoid build-up of dust, dirt, and other foreign substances. To do so,

1. Gently wipe the front panel with a cloth that has been dampened with soapy water.
2. Rinse the front panel with a cloth that has been dampened with water.
3. Dry with a clean wiping cloth.

IMPORTANT

To help keep the various connectors and adapters clean, EXFO recommends that you install protective caps when the unit is not in use. You should also clean the fiber ends before every connection.

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Cleaning Fixed Connectors

Regular cleaning of connectors will help maintain optimum performance. There is no need to disassemble the module.

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) provided by EXFO with *only one drop* of isopropyl alcohol.

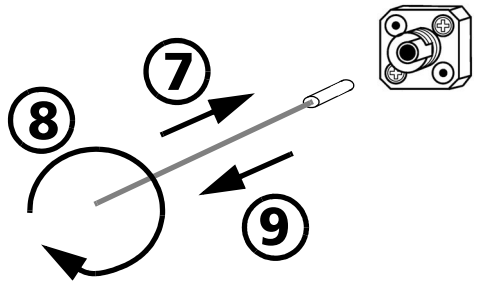
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IMPORTANT

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. Perform steps 7 to 9 again, but this time with a dry cleaning tip (2.5 mm tip provided by EXFO).

Note: *Make sure that you do not 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.

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Cleaning Connectors Equipped with EUI/EUA Adapters

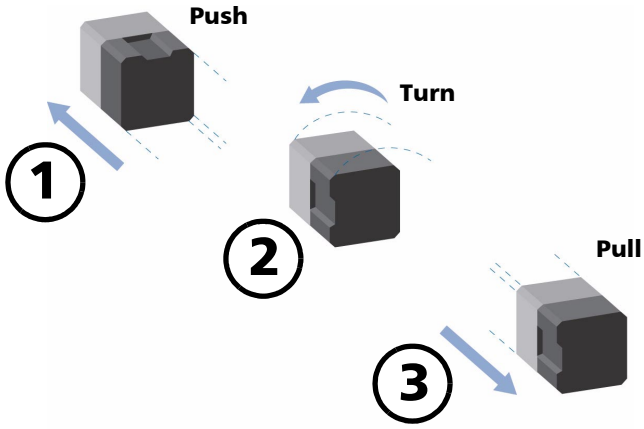
Regular cleaning of connectors equipped with EUI/EUA adapters will help maintain optimum performance. There is no need to disassemble the unit.

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 connectors,

1. Remove the EUI/EUA adapter from the module to expose the optical connector baseplate and ferrule.



2. Use a lint-free wiping cloth and deposit *only one drop* of isopropyl alcohol on it.

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.

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3. Gently wipe the connector and ferrule.

IMPORTANT

Isopropyl alcohol takes approximately ten seconds to evaporate. Since isopropyl alcohol is not absolutely pure, evaporation will leave microscopic residues. Make sure you dry the surfaces before evaporation occurs.

4. With a dry lint-free wiping cloth, gently wipe the same surfaces in order to be sure that the connector and ferrule are perfectly dry.

5. Throw out the wiping cloths after one use.

WARNING

DO NOT verify the surface of the connector with a fiber-optic microscope WHILE THE UNIT IS ACTIVE. Doing so WILL result in permanent eye damage.

6. After having cleaned the connectors and having made sure that the unit is not active, verify the surface of the connector with a small, portable fiber-optic microscope.

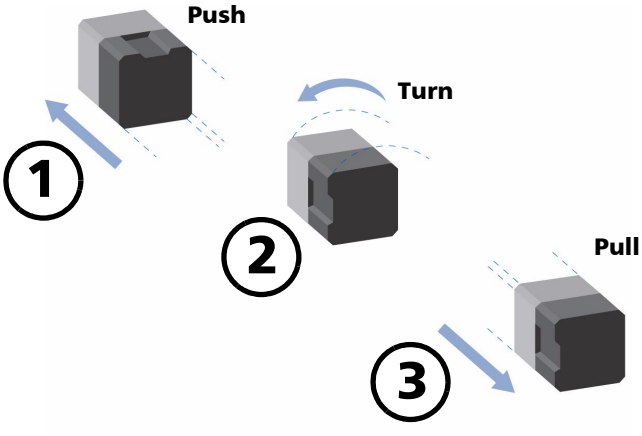
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Cleaning EUI/EUA Adapters

To clean EUI/EUA adapters,

1. Remove the EUI/EUA adapter from the module connector.



2. Moisten a cleaning tip (2.5 mm tip) provided by EXFO with *only one drop* of isopropyl alcohol.

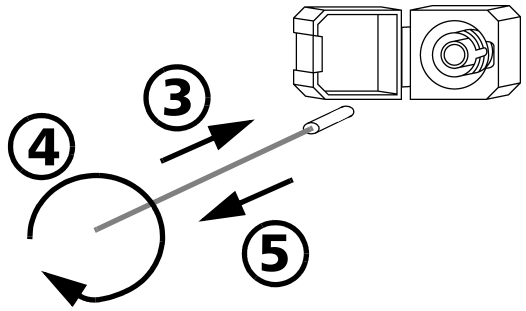
IMPORTANT

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.

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3. Slowly insert the cleaning tip into the 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.
5. Continue to turn as you withdraw the cleaning tip.
6. Perform steps 3 to 5 again, but this time with a dry cleaning tip (2.5 mm tip provided by EXFO).

Note: *Make sure that you do not touch the soft end of the cleaning tip, and verify the cleanliness of the cotton tip.*

7. Throw out the cleaning tips after one use.

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Cleaning Detector Ports

Regular cleaning of detector ports helps maintain optimum performance.

CAUTION

Never clean a detector with a cleaning tip. When the detector is not in use, cover it with a detector protective cap.

To clean detector ports,

1. Remove the detector protective cap.
2. If the detector is dusty, blow dry with compressed air.
3. Gently wipe both the cap and the detector with a lint-free wiping cloth that has been moistened with isopropyl alcohol.
4. Gently wipe the same surfaces with a dry lint-free wiping cloth or blow dry.

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12 Troubleshooting

Common Problems

Problem	Probable Cause	Recommended Action
LED push button does not illuminate	Power is not on.	Check AC power cord and power on the IQ system.
		Refer to *IQ-200 Optical Test System* instruction manual to locate and verify fuse.
	Module is not properly inserted.	Power off the IQ system, remove and reinstall the module.
	Computer is locked up.	Reboot the IQ system.
	LED is burnt out.	Call EXFO.
Pushing the LED push button does not open the main window	Computer is locked up.	Reboot the IQ system.
Dashed line is displayed (--------) during ORL and PDL measurements	Power level is below or above the minimum detectable power.	No action is required.
Questionable ORL or PDL measurements	Optical connectors are dirty.	Clean all optical connectors.
	Calibration is incorrect.	Perform a new nulling and reference calibration.
	Improper wavelength is selected.	Switch to the correct wavelength on all instruments being used.
	Optical source is unstable (loops in the test jumper).	Wait for source to stabilize. Remove loops.
	Nulling was not performed.	Perform a nulling.

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Using the Online Help

Context-sensitive and interactive help is available to guide you through the use of your application.

To obtain online help,

1. Click on the *Help* button or press on *F1*. A question mark will appear next to your pointer.
2. Click on any element and a pop-up window will appear to display a description of the selected element.

Finding FAQs on the EXFO Web Site

The EXFO Web site provides answers to frequently asked questions (FAQs) regarding the use of your product.

To access FAQs,

1. Type the following address in your Internet browser: **www.exfo.com**.
2. Click on the *Support* tab.
3. Click on *FAQs* and follow the on-screen instructions. You will be given a list of questions pertaining to your subject.

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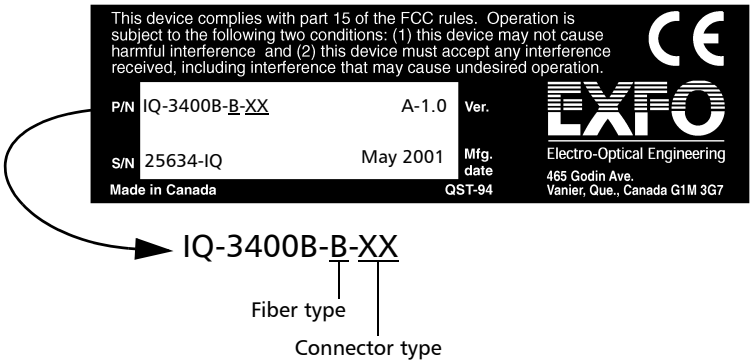
Contacting the Technical Support Group

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
Vanier (Quebec) G1M 2K2
CANADA

1 866 683-0155 (USA and Canada)
Tel.: (418) 683-5498
Fax: (418) 683-9224
support@exfo.com

To accelerate the process, please have information such as the name and the serial number of your product (see the product nameplate shown below) as well as a description of your problem close at hand.



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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 the original packing material when shipping.
- Avoid high humidity or large temperature fluctuations.
- Keep the unit out of direct sunlight.
- Avoid unnecessary shock and vibration.

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13 Warranty

General Information

EXFO Electro-Optical Engineering Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period of two years from the date of original shipment. EXFO also warrants that this equipment will meet applicable specifications under normal use.

During the warranty period, EXFO will, at its discretion, repair, replace, or issue credit for any defective product, as well as recalibrate the product free of charge should the equipment need to be repaired or if the original calibration is erroneous.

IMPORTANT

The warranty can become null and void if

- **the equipment has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel.**
- **the warranty sticker has been removed.**
- **case screws, other than those specified in this manual, have been removed.**
- **the case has been opened, other than as explained in this manual.**
- **the equipment serial number has been altered, erased, or removed.**
- **the equipment has been misused, neglected, or damaged by accident.**

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL EXFO BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

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Liability

EXFO shall not be liable for damages resulting from the use of the purchased product, nor shall be responsible for any failure in the performance of other items to which the purchased product is connected or the operation of any system of which the purchased product may be a part.

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, and batteries used with EXFO products are not covered by this warranty.

Certification

EXFO certifies that this equipment met its published specifications at the time of shipment from the factory.

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Service and Repairs

EXFO commits to providing product service and repair for five years after the date of purchase.

For service or repair of any equipment, follow the procedure below:

1. Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 102). Support personnel will determine if the equipment requires service, repair, or calibration.
2. If the equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) and an address for return.

IMPORTANT

Never send any unit or accessory back to EXFO without a Return Merchandise Authorization (RMA).

3. If the unit has an internal storage device, do a backup of your data before sending the unit for repairs.
4. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.
5. Return the equipment, prepaid, to the address given by the support personnel. Be sure to write the RMA on the shipping slip. EXFO will refuse and return any package that does not bear an RMA.

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, the customer will be invoiced for the cost appearing on this report. Return-to-customer shipping costs will be paid by EXFO for equipment under warranty. Shipping insurance is at the customer's expense.

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EXFO Service Centers Worldwide

If you think your product requires servicing, contact your nearest authorized service center.

EXFO Headquarters Service Center
400 Godin Avenue
Vanier (Quebec) G1M 2K2
CANADA

1 866 683-0155 (USA and Canada)
Tel.: (418) 683-5498
Fax: (418) 683-9224
quebec.service@exfo.com

EXFO Europe Service Center
Le Dynasteur
10/12, rue Andras Beck
92366 Meudon la Forêt Cedex
FRANCE

Tel.: +33.1.40.83.85.85
Fax: +33.1.40.83.04.42
europe.service@exfo.com

Beijing OSIC EXFO Service Center
No. 559 Beijing New Century Hotel
Office Tower
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

EXFO Asia Pacific Service Center
151 Chin Swee Road
#03-29 Manhattan House
SINGAPORE 169876

Tel.: +65 333 8241
Fax: +65 333 8242
asiapacific.service@exfo.com

Burleigh Instruments Service Center
7647 Main Street Fishers
Victor, NEW YORK 14564
USA

Tel.: (716) 924-9355
Fax: (716) 924-9072
service@burleigh.com

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A Technical Specifications

Optical Specifications

Optical Specifications[a]	
General	
Wavelength range	1260 to 1635 nm
Detector type	Germanium 2 mm
Display resolution	0.01 and 0.001 dB
Dynamic range	9 to -55 dBm
Fiber	9/125 μm
Measurement time	1.0 to 9999.0 s (typ. 2.5 s)
DUT Testing Mode	
PDL range	0.010 to 30 dB
PDL uncertainty[b]	0.01 dB/-0.005 dB -3 % of PDL
Insertion loss uncertainty[c]	± (0.05 dB + 5 % of PDL)
Insertion loss repeatability	± (0.01 + 5 % of PDL)
Coupler Testing Mode	
PDCR range	0.005 to 30 dB
PDCR uncertainty	± (0.005 + 10 % of PDCR)
Coupling ratio uncertainty	± 0.1 dB
Coupling ratio repeatability[d]	± 0.01 dB
Insertion loss uncertainty[c]	± (0.05 dB + PDCR)
Insertion loss repeatability	± (0.015 dB +PDCR)

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Optical Specifications[a]	
ORL Testing Mode	
Dynamic range[e]	0 to 55 dB
Uncertainty[f]	0 to 35 dB ± 0.5 dB 35 to 45 dB ± 0.7 dB 45 to 55 dB ± 1.2 dB

a. At 23° C and 1550 nm. All uncertainties are reported with a level of confidence of 95% using the IQ-5100B Polarization Scrambler.
b. For a PDL < 1 dB, and a 2.5 s measurement time at 1550 nm.
c. Plus connector repeatability.
d. For coupling ratio better than 20 %.
e. Using a 10 dBm optically isolated source with ±0.001 dB stability.
f. Includes linearity, polarization sensitivity and connector repeatability.

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Environmental Specifications

WARNING

This unit is intended for indoor use only.

Environmental Specifications	
Operating temperature	0 °C to 50 °C (32 °F to 122 °F)
Storage temperature	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity	0 to 95% non-condensing up to 40 °C
Altitude	up to 5000 m
Dimensions	Width: 3.8 cm (1.5 in) Height: 12 cm (4.75 in) Depth: 26.2 cm (10.3 in)
Weight	0.64 kg (1.45 lb)

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PDL Measurement Precision

For a < 1dB PDL Value[a, b, c]			
Measurement Setting	**Duration**	**Error in 95% of cases**	**Maximum Error**
Normal mode	2.5 s	0.01 dB -0.005 dB -3 %	0.013 dB -0.007 dB -5 %
Precision mode	10 s	0.01 dB -0.005 dB -2 %	0.013 dB -0.007 dB -3 %
High PDL value mode	40 s	0.012 dB -0.005 dB -1 %	0.013 dB -0.007 dB -2 %

a. At 23 °C and 1550 nm.
b. When the power of detector D2 reaches -35 dBm, a residual noise on the power meter adds uncertainty to the measurements. The following figures indicate the added error as a function of the power in dBm:
Power (dBm): -37 -42 -47 -52 -57
Error (dB): 0.007 0.018 0.048 0.143 0.511
c. At 1310 nm, for fibers that are not perfectly monomode, a residual noise of 1% can be present, which limits PDL measurement between 0.03 and 20 dB.

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For a 6 dB PDL Value[a, b, c]			
Measurement Setting	**Duration**	**Error in 95% of cases**	**Maximum Error**
Normal mode	2.5 seconds	0.02 dB -6 %	0.02 dB -10 %
Precision mode	10 seconds	0.02 dB -3 %	0.02 dB -5 %
High PDL value mode	40 seconds	0.02 dB -1 %	0.02 dB -2 %

a. At 23 °C and 1550 nm.
b. When the power of detector D2 reaches -35 dBm, a residual noise on the power meter adds uncertainty to the measurements. The following figures indicate the added error as a function of the power in dBm:
Power (dBm): -37 -42 -47 -52 -57
Error (dB): 0.007 0.018 0.048 0.143 0.511
c. At 1310 nm, for fibers that are not perfectly monomode, a residual noise of 1% can be present, which limits PDL measurement between 0.03 and 20 dB.

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For a 20 dB PDL Value[a, b, c]			
Measurement Setting	**Duration**	**Error in 95% of cases**	**Maximum Error**
Normal mode	2.5 seconds	0.1 dB -30 %	0.1 dB -45 %
Precision mode	10 seconds	0.1 dB -15 %	0.1 dB -30 %
High PDL value mode	40 seconds	0.1 dB -5 %	0.1 dB -20 %

a. At 23 °C and 1550 nm.

b. When the power of detector D2 reaches -35 dBm, a residual noise on the power meter adds uncertainty to the measurements. The following figures indicate the added error as a function of the power in dBm:

Power (dBm):	-37	-42	-47	-52	-57
Error (dB):	0.007	0.018	0.048	0.143	0.511

c. At 1310 nm, for fibers that are not perfectly monomode, a residual noise of 1% can be present, which limits PDL measurement between 0.03 and 20 dB.

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Recommended Sources

Recommended Sources	
IQ-24xx M5 WDM Laser Source	DFB laser O-, C- and L-band
IQ-2600 Tunable Laser Source	Fiber laser C-band
IQ-2600B Tunable Laser Source	Fiber laser C- and L-band
IQ-21xxBP Light Source	Polarized LED source

For more information, please contact EXFO.

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B Remote Control

Command Structure

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

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

is used to change the measurement display resolution (number of digits after the decimal point) of a given module.

In this particular example,

- FORM identifies that the command is part of the SCPI FORMat subset of commands.
- (0..26) is a whole number between 0 and 26 that identifies the module.
- READ and DATA are keywords that define the function of the command.
- [ ] indicates that a keyword or parameter is optional.
- <space> is included to indicate that a space is required.
- <digit> is the command parameter.

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

FORM4:READ:DATA 1

This command instructs the module to display a power measurement with one digit after the decimal point.

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

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General Commands

The IQ-3400B PDL/OL Meter recognizes the main commands identified in IEEE 488.2.

The IQ-3400B PDL/OL Meter general commands are summarized below and further explained in the following pages.

IQ-3400B PDL/OL Meter General Commands	
Command	**Description**
*CLS	Clear status command
*ESE	Standard event status enable command
*ESE?	Standard event status enable query
*ESR?	Standard event status register query
*IDN?	Identification query
*LOK	Set remote lockout programming state
*OPC	Operation complete command
*OPC?	Operation complete query
*REM	Set remote programming state
*RST	Reset command
*SRE	Service request enable command
*SRE?	Service request enable query
*STB?	Read status byte query
*TRG	Not supported
*TST?	Self-test query
*WAI	Not supported

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*CLS

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

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*ESE

Description	This command is used to set bits in the Standard Event Status Enable Register (ESE) to a new value (initial value is 255). The contents of the ESE register are logically ANDed with the ESR register. A non-zero result will set the Event Summary Bit (ESB) of the Status Byte Register (STB). This command is useful for selecting which events may generate an SRQ.
Syntax	*ESE<space><value>
Parameter	The <value> parameter must be between 0 and 255.
Response	N/A
Example	N/A
See also	N/A

*ESE?

Description	This query reads the contents of the Standard Event Status Enable Register (ESE).
Syntax	*ESE?
Parameters	N/A
Response	Displays a binary integer between 0 and 255.
Example	N/A
See also	N/A

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*ESR?

Description	This query reads the contents of the Standard Event Status Register (ESR).
Syntax	*ESR?
Parameters	N/A
Response	Displays a binary integer between 0 and 255.
Example	N/A
See also	N/A

*IDN?

Description	This query reads the IQ system identification string.
Syntax	*IDN?
Parameters	N/A
Response	Displays “EXFO E.-O. Eng. IQ-200 OTS Vxx.xx”, where xx.xx is the current product version.
Example	N/A
See also	N/A

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*LOK

Description	This command is used to set the Remote Lockout programming state.
Syntax	*LOK<space><data>
Parameters	The <data> parameter can be “1” to set the Remote programming state to Remote Lockout or “0” to set the Remote programming state to Remote.
Response	N/A
Example	N/A
See also	N/A

*OPC

Description	This command will cause the SCPI Manager to generate the “Operation complete” message in the Standard Event Status Register (ESR) when all pending selected SCPI Manager’s operations have been completed.
Syntax	*OPC
Parameters	N/A
Response	N/A
Example	*OPC;*IDN?
See also	N/A

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*OPC?

Description	This query puts an ASCII 1 in the output queue when the content of the input queue has been processed. This query is useful to prevent another command from being processed until the current command is complete.
Syntax	*OPC?
Parameters	N/A
Response	“1”
Example	N/A
See also	N/A

*REM

Description	This command is used to set the Remote programming state.
Syntax	*REM<space><data>
Parameters	The <data> parameter can be “1” to set the Remote programming state to Remote or “0” to set the Remote programming state to Local.
Response	N/A
Example	N/A
See also	N/A

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*RST

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

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

Syntax *RST

Parameters N/A

Response N/A

Example *IDN?;*RST<NL>

See also N/A

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*SRE

Description	This command sets bits in the Service Request Enable Register (SRE; initial value is 255), and enables the corresponding bit in the Status Byte Register (STB). The command can be used to select which events can initiate a service request.
Syntax	*SRE<space><value>
Parameter	The <value> parameter must be between 0 and 255.
Response	N/A
Example	N/A
See also	N/A

*SRE?

Description	This query returns the contents of the Service Request Enable Register (SRE).
Syntax	*SRE?
Parameters	N/A
Response	A binary integer between 0 and 255.
Example	N/A
See also	N/A

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*STB?

Description	This query returns the contents of the Status Byte Register (STB).
Syntax	*STB?
Parameters	N/A
Response	Displays a binary integer between 0 and 255.
Example	N/A
See also	N/A

*TST?

Description	This query initiates an internal self-test and returns a binary value indicating the results of the test. If an error occurs, it is possible to return the error using the SYST:ERR? query.
Syntax	*TST?
Parameters	N/A
Response	Displays a binary value: “0”-test is complete without errors “1”-test is complete with errors
Example	N/A
See also	N/A

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Specific Commands

The IQ-3400B PDL/OL Meter specific commands are summarized below and further explained in the following pages.

IQ-3400B PDL/OL Meter Specific Commands					
Command				**Parameter/ Response**	**Description**
ABOR				—	Stop PDL measurements.
DISP	[MODE]	CPL		—	Enable CPL.
		DUT		—	Enable DUT.
		ORL		—	Enable ORL.
	MODE?			—	Get current mode.
FETC	[SCAL]	POW	DC?	<±999.999>	Get ORL measurement.
FORM	READ	DATA		<0|1|2|3|4>	Set resolution.
		DATA?		(0|1|2|3|4)	Get resolution.
INIT	CONT			<0|1>	Set non-stop mode.
	CONT?			(0|1)	Non-stop mode activated?
	[IMM]			—	Store single measurement.

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IQ-3400B PDL/OL Meter Specific Commands					
Command				**Parameter/ Response**	**Description**
INP	OFFS			<±99.999>	Set offset value.
	OFFS?			(±99.999)	Get offset value.
MMEM	ACQ			<0|1>	Start/stop acquisition.
	ACQ?			(0|1)	Acquisition in progress?
READ	POW?			(±999.999)	Store and get ORL measurement.
READ	POW	REF?		(XXX;±9999.99 dB)	Get testing mode and reference power.
SENS	AVER	STAT		<0|1>	Activate/deactivate data averaging.
		STAT?		(0|1)	Averaging activated?
	CORR	COLL	ZERO	—	Perform offset nulling.
	POW	CAL		<0|1,1|2>	Start reference power reading.
		COUN		<9999>	Set number of scans.
		COUN?		(9999)	Get number of scans.
		PER		<9999.9>	Set period.
		PER?		(9999.9)	Get period.

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IQ-3400B PDL/OL Meter Specific Commands					
Command				**Parameter/ Response**	**Description**
SENS	POW	RANG?		-999.9	Get minimum reflection.
		REF		<±99.999|EXFO>[DB|%]	Perform reference calibration.
		REFL		—	Perform zero measurement.
		WAV		<9999>	Set wavelength.
		WAV?		(9999)	Get current wavelength.
		WAV	LIST?	(9999), (9999)	Get wavelength list.
			PROG	<1|2>	Program wavelengths.
			SET	<9999>	Set new wavelength.
UNIT	POW			<0|1>	Set power unit.
	POW?			(0|1)	Get power unit.

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ABORt

Description	This command stops any PDL measurement currently in progress.
Syntax	ABOR(0..26)
Parameters	N/A
Response	N/A
Example	ABOR4
See also	N/A

DISPlay[:MODE]:CPL

Description	This command enables the CPL testing mode.
Syntax	DISP(0..26)[:MODE]:CPL
Parameters	N/A
Response	N/A
Example	DISP4:CPL
See also	N/A

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DISPlay[:MODE]:DUT

Description	This command enables the DUT testing mode.
Syntax	DISP(0..26)[:MODE]:DUT
Parameters	N/A
Response	N/A
Example	DISP4:DUT
See also	N/A

DISPlay[:MODE]:ORL

Description	This command enables the ORL testing mode.
Syntax	DISP(0..26)[:MODE]:ORL
Parameters	N/A
Response	N/A
Example	DISP4:ORL
See also	N/A

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DISPlay:MODE?

Description	This query returns the current testing mode.
Syntax	DISP(0..26):MODE?
Parameters	N/A
Response	N/A
Example	DISP4:MODE?
See also	N/A

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FETCh[:SCALar]:POWer:DC?

Description	This query returns the last measurement depending on the testing mode currently set. In ORL mode, you must use the INIT:CONT 1 command before using this query.
Syntax	FETC(0..26)[:SCAL]:POW:DC?
Parameters	N/A
Response	In ORL testing mode - Displays the last measurement stored in the stack in the "±999.999" format. In DUT testing mode - All the following measurements in the "±999.999" format: DUT, IL, reference power, PDL avg., PDL std. dev. In Coupler testing mode - All the following measurements in the "±999.999" format: coupler, IL, reference power 1, IL 1, CR 1, PDCR 1, PDCR avg. 1, PDCR std. dev. 1, reference power 2, IL 2, CR 2, PDCR 2, PDCR avg. 2, PDCR std. dev. 2. * 1 means detector 1 * 2 means detector 2
Example	FETC4:SCAL:POW:DC?
See also	INIT:CONT, INIT:CONT?, INIT:IMM, and READ:POW?
Note	To store measurements in the stack, use the INIT:CONT or INIT:IMM commands or the READ:POW? query.

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FORMat:READings:DATA

Description	This command changes the resolution of the displayed ORL or PDL value (number of digits after the decimal point).
Syntax	FORM(0..26):READ:DATA<space><resol>
Parameters	The <resol> parameter represents the new resolution: “0”- no digits after the decimal point (not available in PDL mode) “1”- 1 digit after the decimal point (not available in PDL mode) “2”- 2 digits after the decimal point “3”- 3 digits after the decimal point “4”- automatic resolution (determined by the measured value) (not available in PDL mode)
Response	N/A
Example	FORM4:READ:DATA 3
See also	N/A

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FORMat:READings:DATA?

Description	This query returns the current resolution of the displayed value.
Syntax	FORM(0..26):READ:DATA?
Parameters	N/A
Response	A value representing the new resolution: “0”- no digit after the decimal point “1”- 1 digit after the decimal point “2”- 2 digits after the decimal point “3”- 3 digits after the decimal point “4”- automatic resolution (determined by the measured value)
Example	FORM4:READ:DATA?
See also	N/A

INITiate:CONTinuous

Description	This command can be used only in PDL mode to start or stop a scan.
Syntax	INIT(0..26):CONT<space><state>
Parameters	The <state> parameter is a boolean parameter: “1”- start action “0”- stop action
Response	N/A
Example	INIT4:CONT 1
See also	INIT:CONT?, INIT:IMM, FETC:SCAL:POW:DC?, and READ:POW?
Note	To obtain the last measurement stored into the stack, use the FETC[:SCAL]:POW:DC? query.

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INITiate:CONTinuous?

Description	This query returns a value indicating whether Non-stop mode is activated. This query can only be performed in ORL testing mode.
Syntax	INIT(0..26):CONT?
Parameters	N/A
Response	A boolean value: “1”- Non-stop mode is activated “0”- Non-stop mode is deactivated
Example	INIT4:CONT?
See also	INIT:CONT, INIT:IMM, FETC:SCAL:POW:DC?, and READ:POW?

INITiate[:IMMediate]

Description	This command stores the current measurement in a stack.
Syntax	INIT(0..26)[:IMM]
Parameters	N/A
Response	N/A
Example	INIT4:IMM
See also	INIT:CONT, INIT:CONT?, FETC:SCAL:POW:DC?, and READ:POW?
Note	To obtain the last measurement stored in the stack, use the FETC[:SCAL]:POW:DC? query.

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INPut:OFFSet

Description	This command sets an offset value that is applied to ORL measurements. This command can only be performed in ORL mode.
Syntax	INP(0..26):OFFS<space><offset>
Parameters	The <offset> parameter represents a new offset value (in dB) in the "±99.999" format.
Response	N/A
Example	INP4:OFFS 25.000
See also	N/A

INPut:OFFSet?

Description	This query returns the current offset value that is applied to ORL measurements. This query can only be performed in ORL mode.
Syntax	INP(0..26):OFFS?
Parameters	N/A
Response	A value representing the current offset (in dB) in the "±99.999" format.
Example	INP4:OFFS?
See also	N/A

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MMEMory:ACQuisition

Description	This command starts or stops a PDL scan in the DUT or CPL testing mode (acquisition data are saved). This command can only be performed in PDL mode and when no scan (INIT:CONT) is in progress.
Syntax	MMEM(0..26):ACQ<space><state>
Parameters	The <state> parameter is a boolean parameter: "1"- starts an acquisition "0"- stops an acquisition
Example	MMEM4:ACQ 1
Response	N/A
Example	N/A
See also	N/A

MMEMory:ACQuisition?

Description	This query returns a value indicating whether an acquisition is in progress. This query can only be performed in PDL mode.
Syntax	MMEM(0..26):ACQ?
Parameters	N/A
Response	A boolean value: "1"- acquisition is in progress "0"- acquisition is not in progress
Example	MMEM4:ACQ?
See also	N/A

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READ:POWer?

Description	This query stores the current ORL measurement in the stack and fetches it right away. This query can only be performed in ORL mode.
Syntax	READ(0..26):POW?
Parameters	N/A
Response	Shows a value representing the current ORL measurement in the "±999.999" format.
Example	READ4:POW?
See also	INIT:CONT, INIT:CONT?, INIT:IMM, and FETC:SCAL:POW:DC?

READ:POW:REF?

Description	This query returns the last reference power of a scan stored in the stack. This query can only be performed in PDL mode.
Syntax	READ(0..26):POW:REF?<space><detector>
Parameters	The <detector> parameter represents detector 1 or 2.
Response	Shows a value representing the testing mode (CPL or DUT) followed by the last reference power (in dB) stored in the stack in the "±999.999" format.
Example	READ4:POW:REF? 1
See also	N/A

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SENSitivity:AVERage:STATe

Description	This command activates or deactivates data averaging. This command can only be performed in ORL mode.
Syntax	SENS(0..26):AVER:STAT<space><average>
Parameters	The <average> parameter is a boolean parameter: “1”- enables data averaging “0”- disables data averaging
Response	N/A
Example	SENS4:AVER:STAT 1
See also	N/A

SENSitivity:AVERage:STATe?

Description	This query returns a value indicating whether data averaging is enabled.
Syntax	SENS(0..26):AVER:STAT?
Response	A boolean value: “1”- data averaging is enabled “0”- data averaging is disabled
Example	SENS4:AVER:STAT?
Parameters	N/A
Response	N/A
Example	N/A
See also	N/A

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SENSitivity:CORRection:COLLect:ZERO

Description	This command performs an offset nulling measurement. This command cannot be performed if a scan is in progress.
Syntax	SENS(0..26):CORR:COLL:ZERO
Parameters	N/A
Response	N/A
Example	SENS4:CORR:COLL:ZERO
See also	N/A

SENSitivity:POWer:CALibrate

Description	This command is used to perform a PDL calibration in the DUT or CPL testing mode. This command can only be performed in PDL mode and when a scan is not in progress.
Syntax	SENS(0..26):POW:CAL<space><calib>,<detector>
Parameters	The <calib> parameter is a boolean parameter: “0”- performs a PDL calibration in DUT testing mode “1”- performs a PDL calibration in CPL testing mode
Response	The <detector> parameter represents detector 1 or 2.
Example	SENS4:POW:CAL 1,2
See also	N/A

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SENSitivity:POWer:COUNt

Description	This command is used to set the total number of scans to be performed. This command can only be performed in PDL mode and when a scan is not in progress.
Syntax	SENS(0..26):POW:COUN<space><scans>
Parameters	The <scans> parameter represents the new number of scans in the “9999” format. The value must be between 1 and 9999.
Response	N/A
Example	SENS4:POW:COUN 1500
See also	N/A

SENSitivity:POWer:COUNt?

Description	This query returns the number of scans to be performed. This query can only be performed in PDL mode.
Syntax	SENS(0..26):POW:COUN?
Parameters	N/A
Response	Displays a value representing the number of scans to be performed in the “9999” format.
Example	SENS4:POW:COUN?
See also	N/A

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SENSitivity:POWer:PERiod

Description	This command is used to set the period. This command can only be performed in PDL mode and when a scan is not in progress.
Syntax	SENS(0..26):POW:PER<space><period>
Parameters	The <period> parameter represents the new period (in seconds) in the “9999.9” format, between 1 and 9999.0.
Response	N/A
Example	SENS4:POW:PER 10.5
See also	N/A

SENSitivity:POWer:PERiod?

Description	This query returns the current period in seconds. This query can only be performed in PDL mode.
Syntax	SENS(0..26):POW:PER?
Parameters	N/A
Response	Displays a value representing the current period (in seconds) in the “9999.9” format, between 1 and 9999.
Example	SENS4:POW:PER?
See also	N/A

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SENSitivity:POWer:RANGe?

Description	This query returns the minimum measurable reflection. This query can only be performed in ORL mode.
Syntax	SENS(0..26):POW:RANG?
Parameters	N/A
Response	Displays the minimum measurable reflection (in dB) in the "-999.9" format.
Example	SENS4:POW:RANG:LOW?
See also	N/A

SENSitivity:POWer:REFerence

Description	This command is used to perform the IQ-3400B reference calibration. When using the EXFO supplied reference reflection test jumper, the software automatically determines the appropriate calibration value based on the current wavelength. This command can only be performed in ORL mode.
Syntax	SENS(0..26):POW:REF<space><numeric><space><unit>
Parameters	The <numeric> parameter represents the reference in ORL mode (in dB) in the "±99.999" format. Acceptable values are between -50.000 and 0.0000 dB, and/or between 0.000 and 50.000 %. The <unit> parameter represents the measurement unit: "dB"- use dB unit "%"- use % unit
Response	N/A
Example	SENS3:POW:REF 25.000 %
See also	N/A

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SENSitivity:POWer:REFLection

Description	This command performs a zero measurement for the current wavelength. A zero measurement eliminates the effects of parasitic reflections and must be performed for each wavelength (maximum of 2). This command can only be performed in ORL mode.
Syntax	SENS(0..26):POW:REFL
Parameters	N/A
Response	N/A
Example	SENS4:POW:REFL
See also	N/A

SENSitivity:POWer:WAVelength

Description	This command selects a new operating wavelength in PDL mode.
Syntax	SENS(0..26):POW:WAV<space><wave>
Parameters	The <wave> parameter represents the new operating wavelength in PDL mode. The value must be between 780 and 1800.
Response	N/A
Example	SENS4:POW:WAV 1310
See also	SENS:POW:WAV?, SENS:POW:WAV:LIST, SENS:POW:WAV:PROG, and SENS:POW:WAV:SET

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SENSitivity:POWer:WAVelength?

Description	This query returns the wavelength currently selected in the present mode (PDL or ORL).
Syntax	SENS(0..26):POW:WAV?
Parameters	N/A
Response	Displays a value representing the currently selected wavelength (in nm) in the “9999” format. The value is between 1200 and 1625.
Example	SENS4:POW:WAV?
See also	SENS:POW:WAV, SENS:POW:WAV:LIST, SENS:POW:WAV:PROG, and SENS:POW:WAV:SET

SENSitivity:POWer:WAVelength:LIST?

Description	This query returns the two programmed wavelengths. This query can only be performed in ORL mode.
Syntax	SENS(0..26):POW:WAV:LIST?
Parameters	N/A
Response	Shows the two programmed wavelengths (in nm) in the “9999;9999” format, each between 780 and 1800.
Example	SENS4:POW:WAV:LIST?
See also	SENS:POW:WAV, SENS:POW:WAV?, SENS:POW:WAV:PROG, and SENS:POW:WAV:SET

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SENSitivity:POWer:WAVelength:PROGram

Description	This command is used to program two wavelengths. This command can only be performed in ORL mode.
Syntax	SENS(0..26):POW:WAV:PROG<space><case>,<wave>
Parameters	The <case> parameter specifies the wavelength to be programmed: “1”- programs the first wavelength “2”- programs the second wavelength The <wave> parameter represents the new wavelength (in nm) in the “9999” format. The value must be between 1250 and 1650.
Response	N/A
Example	SENS4:POW:WAV:PROG 2,1310
See also	SENS:POW:WAV, SENS:POW:WAV?, SENS:POW:WAV:LIST, and SENS:POW:WAV:SET

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SENSitivity:POWer:WAVelength:SET

Description	This command selects a new operating wavelength in ORL mode. The wavelength must be one of the two programmed values for ORL mode.
Syntax	SENS(0..26):POW:WAV:SET<space><wave>
Parameters	The <wave> parameter represents the new operating wavelength in ORL mode.
Response	N/A
Example	SENS4:POW:WAV:SET 1310
See also	SENS:POW:WAV, SENS:POW:WAV?, SENS:POW:WAV:LIST, and SENS:POW:WAV:PROG

UNIT:POWer

Description	This command changes the power measurement unit. This command can only be performed in PDL mode.
Syntax	UNIT(0..26):POW<space><unit>
Parameters	The <unit> parameter represents the new power measurement unit: “0”- sets dB “1”- sets %
Response	N/A
Example	UNIT4:POW 1
See also	N/A

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UNIT:POWer?

Description	This query returns the current power measurement unit. This query can only be performed in PDL mode.
Syntax	UNIT(0..26):POW?
Parameters	N/A
Response	Displays a value representing the current power measurement unit: “0”- indicates dB “1”- indicates %
Example	UNIT4:POW?
See also	N/A

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