

IQS-1100/IQS-1500

Power Meters for IQS Platforms



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Units of Measurement

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

Version number: 2.0.3

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Certification Information

F.C.C. Information

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

CE Information

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



IMPORTANT

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

EXFO **CE** **DECLARATION OF CONFORMITY**

Application of Council Directive(s):	73/23/EEC - The Low Voltage Directive 89/336/EEC - The EMC Directive And their amendments
Manufacturer's Name:	EXFO Electro-Optical Engineering Inc.
Manufacturer's Address:	400 Godin Avenue Quebec, Quebec Canada, G1M 2K2 (418) 683-0211
Equipment Type/Environment:	Test & Measurement / Industrial
Trade Name/Model No.:	IQS-1100 Power Meter

Standard(s) to which Conformity is Declared:

EN 61010-1:2001	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.
EN 61326:1997 +A1:1998 +A2:2001	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements
EN 55022: 1998	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.

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

Manufacturer

Signature:



Full Name: Stephen Bull, E. Eng
Position: Vice-President Research and Development
Address: 400 Godin Avenue, Quebec (Quebec),
Canada, G1M 2K2
Date: August 20, 2002

Certification Information

EXFO DECLARATION OF CONFORMITY

Application of Council Directive(s):	73/23/EEC - The Low Voltage Directive 89/336/EEC - The EMC Directive And their amendments
Manufacturer's Name: Manufacturer's Address:	EXFO Electro-Optical Engineering Inc. 400 Godin Avenue Quebec, Quebec Canada, G1M 2K2 (418) 683-0211
Equipment Type/Environment: Trade Name/Model No.:	Test & Measurement / Industrial IQS-1500 Calibration Power Meter

Standard(s) to which Conformity is Declared:

EN 61010-1:2001	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.
EN 61326:1997 +A1:1998 +A2:2001	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements
EN 55022: 1998	Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.

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

Manufacturer

Signature:



Full Name: Stephen Bull, E. Eng
Position: Vice-President Research and
Development
Address: 400 Godin Avenue, Quebec (Quebec),
Canada, G1M 2K2
Date: January 7, 2002

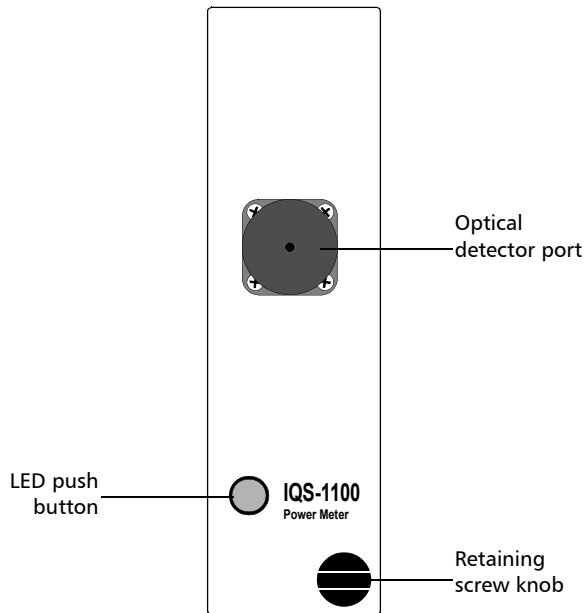
1 **Introducing the IQS-1100/IQS-1500 Power Meters**

Designed for the IQS platforms, the IQS-1100/IQS-1500 Power Meters can help you perform specific power measurements according to your needs.

Main Features

The IQS-1100 Power Meter is offered with the following detector configurations:

- High-power germanium
- Indium gallium arsenide (InGaAs)

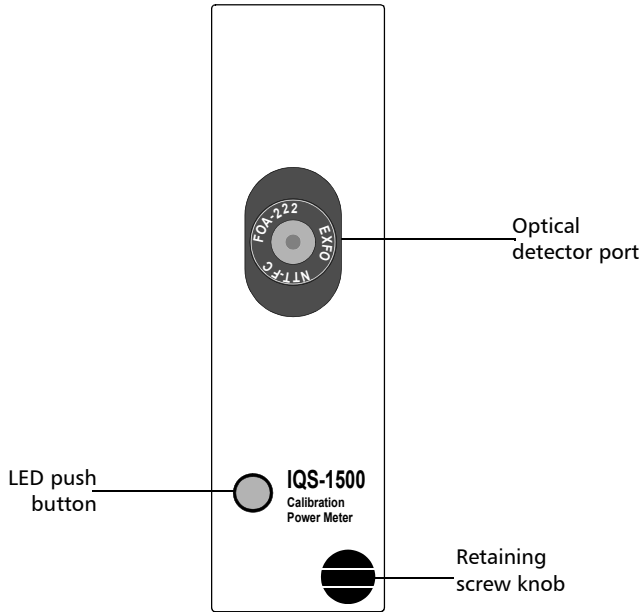


The IQS-1100 Power Meter has a high resolution, excellent linearity and provides accurate power measurements over a high dynamic range.

Introducing the IQS-1100/IQS-1500 Power Meters

Main Features

The IQS-1500 Calibration Power Meter is a germanium power meter designed to be used with the IQS platforms.



It is designed to offer you highly precise readings, and is used to check power meter calibration, both in singlemode and multimode. The application features both a manual and step-by-step procedure for your calibration testing needs.

The graphical display mode shows all channels on a real-time graph, which you can analyze afterwards.

The IQS-1100/IQS-1500 Power Meters supports local control (via the IQS Manager software) and remote control (through GPIB, RS-232, or Ethernet TCP/IP using SCPI commands or the provided LabVIEW drivers). For more information, refer to the *IQS platform* user guide.

The IQS-1500 Calibration Power Meter is offered in two options, depending on the level of uncertainty desired:

- ± 2 to 3 %
- $\leq \pm 0.9$ % at 3λ , when calibrated at NIST

Typical Applications

Your power meter is suitable for numerous applications, including the following:

- Insertion loss of passive components in the production environment
- Component and system monitoring
- Source stability characterization
- Absolute power measurements
- Multicomponent testing
- Remote monitoring and alarm activation
- WDM component testing
- Multiport coupler testing
- Linearity verification
- Power meter verification
- Periodic multichannel monitoring
- Power meter calibration (IQS-1500)

Conventions

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



WARNING

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



CAUTION

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



CAUTION

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



IMPORTANT

Refers to information about this product you should not overlook.

2 **Safety Information**

Your power meter does not contain laser components in itself. However, you will be using it with light sources.



WARNING

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



WARNING

Use of controls, adjustments and procedures for operation and maintenance other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.

3 Getting Started with Your Power Meters

Inserting and Removing Test Modules

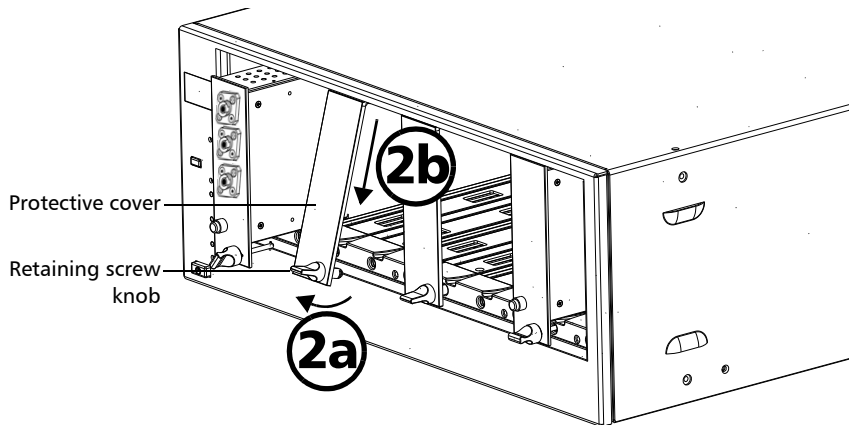


CAUTION

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

To insert a module into the controller or expansion unit:

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

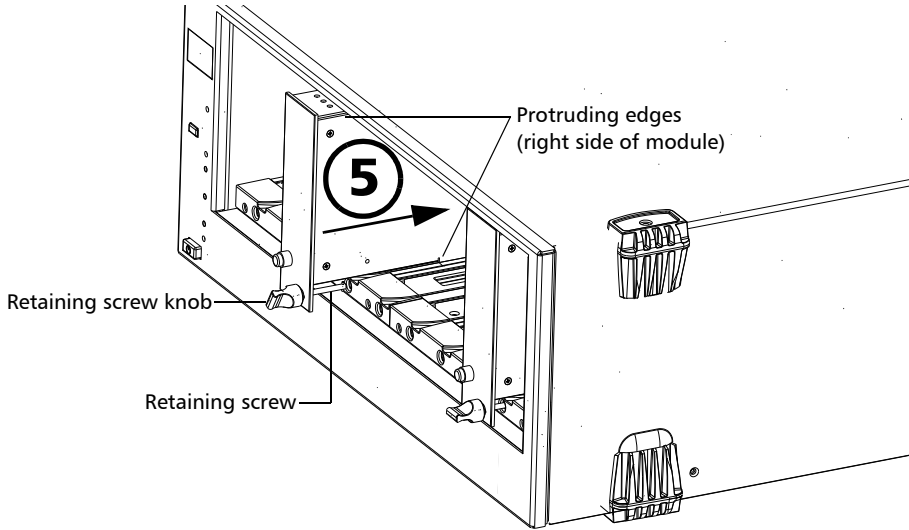


3. Position the module so that its front panel is facing you and the top and bottom protruding edges are to your right.

Getting Started with Your Power Meters

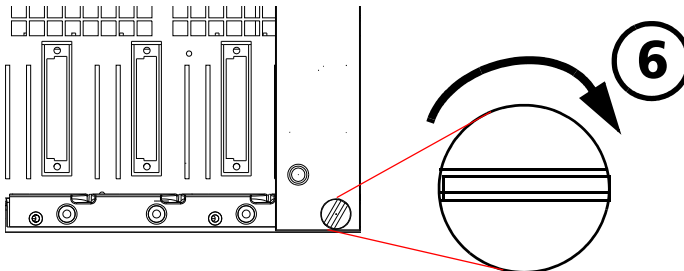
Inserting and Removing Test Modules

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



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

This will secure the module into its “seated” position.



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

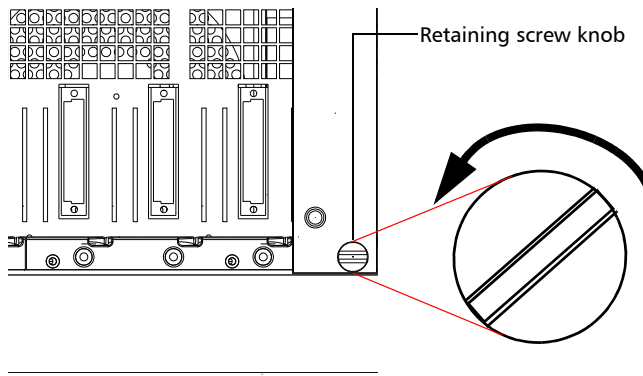
When you turn on the controller unit, the startup sequence will automatically detect your module.

Note: *You can insert IQ modules into your controller or expansion unit; the IQS Manager software will recognize them. However, the IQS-1100/IQS-1500 locking mechanism (retaining screw) will not work for IQ modules.*

To remove a module from your controller or expansion unit:

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

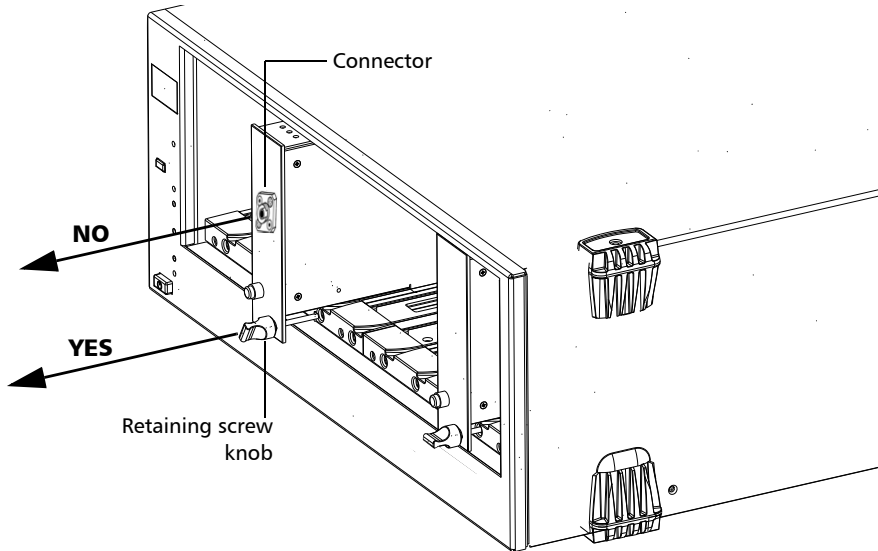
The module will slowly be released from the slot.



Getting Started with Your Power Meters

Inserting and Removing Test Modules

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



CAUTION

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

3. Cover empty slots with the supplied protective covers.
 - 3a. Slide the top of the protective cover into the upper grooves of the unit.
 - 3b. Snap the cover into place by pushing the retaining screw knob.



CAUTION

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

Starting the Power Meters Application

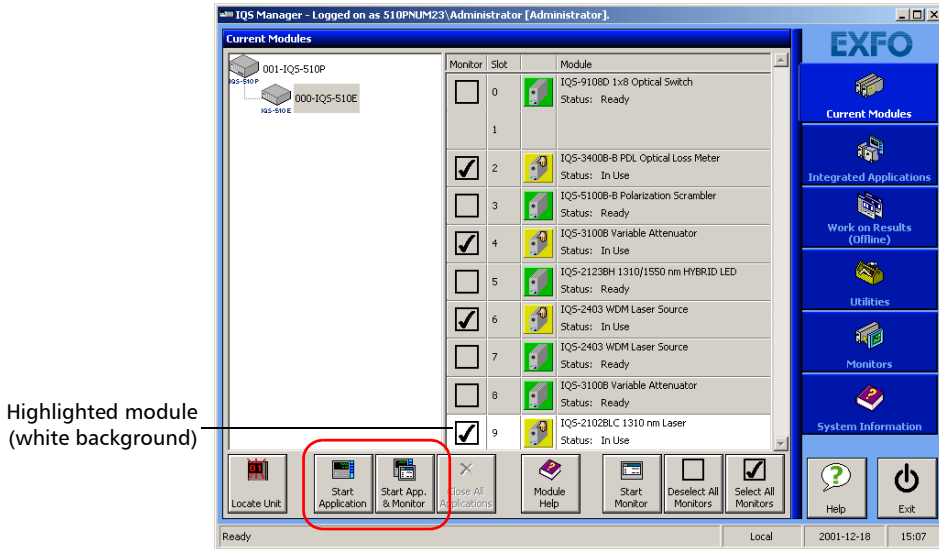
Your IQS-1100/IQS-1500 Power Meters module can be configured and controlled from its dedicated IQS Manager application.

Note: For details about IQS Manager, refer to the IQS platform user guide.

To start the application:

1. From the **Current Modules** function tab select the module to use.

It will turn white to indicate that it is highlighted.



2. Click **Start Application**.

OR

Press the green LED push button on the front of the corresponding module.

You can also double-click its row.

Getting Started with Your Power Meters

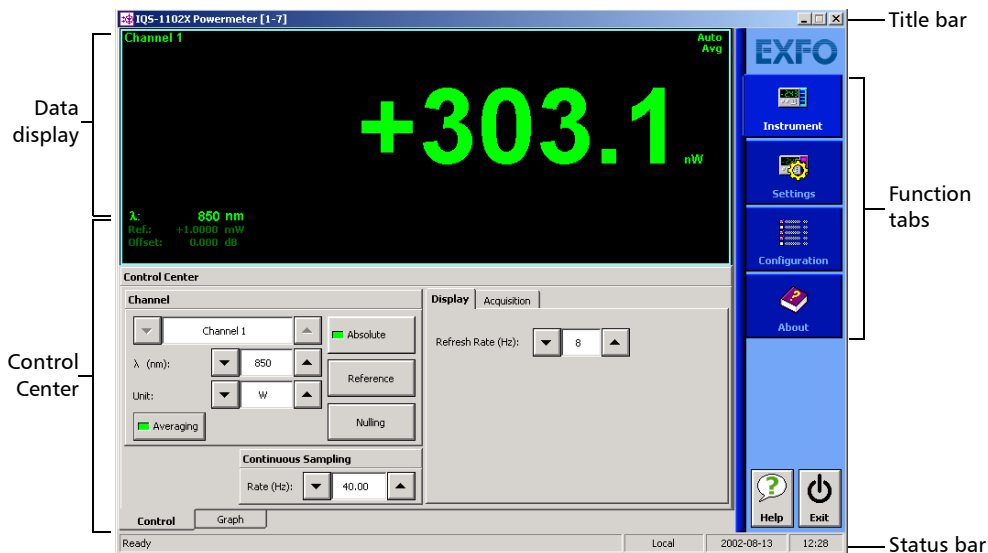
Starting the Power Meters Application

Note: Pressing the LED push button will not activate or turn on the module.

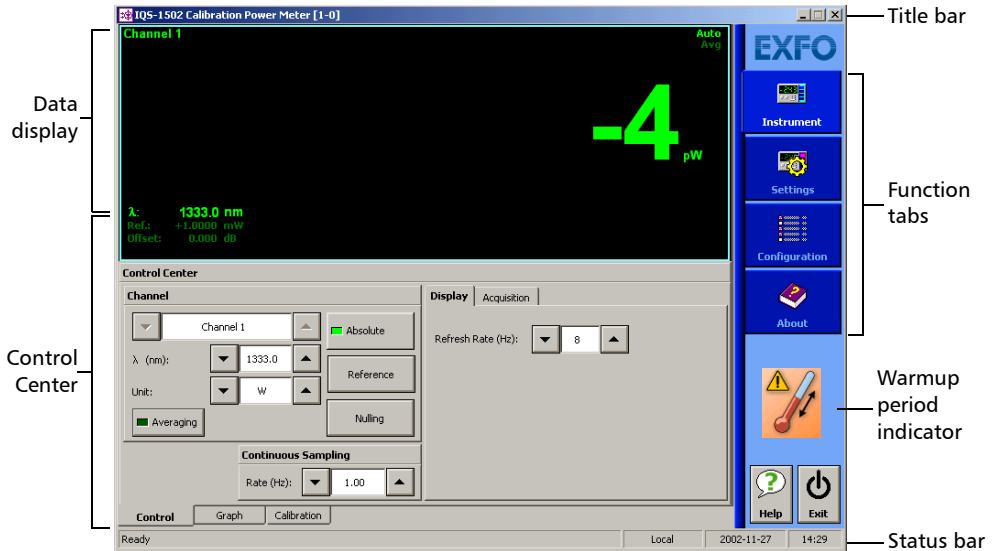
Note: To start the corresponding monitor window at the same time, click **Start App. & Monitor**. The window opens on the **Monitors** function tab.

The main window (shown below) contains all the commands required to control the Power Meters:

IQS-1100



IQS-1500



When you start the IQS-1500 Calibration Power Meter application, you will notice a thermometer icon under the function tabs. This is the warmup period indicator; it will remain on until the initial warmup time is over (approximately 15 minutes).

If the external temperature fluctuates outside the normal operation temperature, the thermometer icon will reappear until the temperature is back within the required range ($23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$).

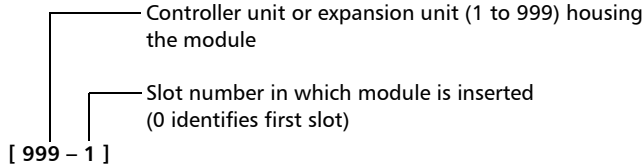
You can still perform measurements while the icon is present, but EXFO recommends postponing critical measurements until the warmup period is over, as you might not benefit from the maximum stability and precision your power meter can offer.

Getting Started with Your Power Meters

Starting the Power Meters Application

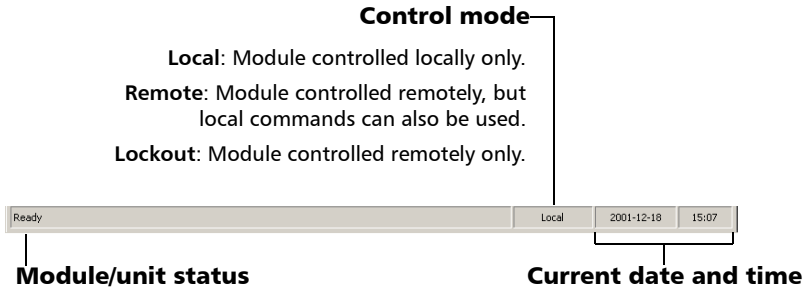
Title Bar

The title bar is located at the top of the main window. It displays the module name and its position in the controller or expansion unit. The module position is identified as follows:



Status Bar

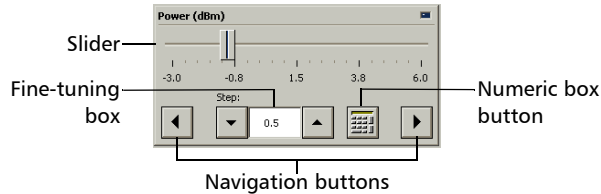
The status bar, located at the bottom of the main window, identifies the operational status of the IQS-1100/IQS-1500 Power Meters.



For more information about automating or remotely controlling the IQS-1100/IQS-1500 Power Meters, refer to your platform user guide.


Entering Values Using Sliders and Numeric Boxes

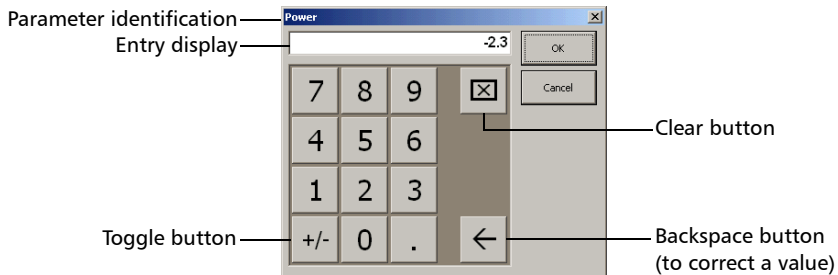
Many parameters in IQS Manager and module applications can be set using the following tools.



- **Slider:** Drag it to the desired value on the scale below.
- **Navigation buttons:** Click either buttons to move the slider. The slider moves by steps corresponding to the number in the fine-tuning box, which you can change by using the up and down arrow buttons next to the box. You cannot change the list of fine-tuning values from here.
- **Numeric box:** Click it to display the on-screen numeric pad, which you can use to enter a power value.

To enter a value using the numeric box:

1. Use the  button to clear the entry display.




2. Enter the value.
3. Click **OK** to confirm the value.

Exiting the Application

Closing any application that is not currently being used helps freeing system memory.

To close the application from the main window:

Click  in the top right corner of the main window.

OR

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

To close all currently running applications:

From IQS Manager, click **Close All Applications**.

4 *Setting Up Your Power Meters*

You can set the following parameters on your IQS-1100/IQS-1500:

- Chanel display
- Wavelength selection and management
- Measurement unit selection
- Display resolution
- Refresh rate
- Measurement range
- Saving and recalling configuration

Setting Up Your Power Meters

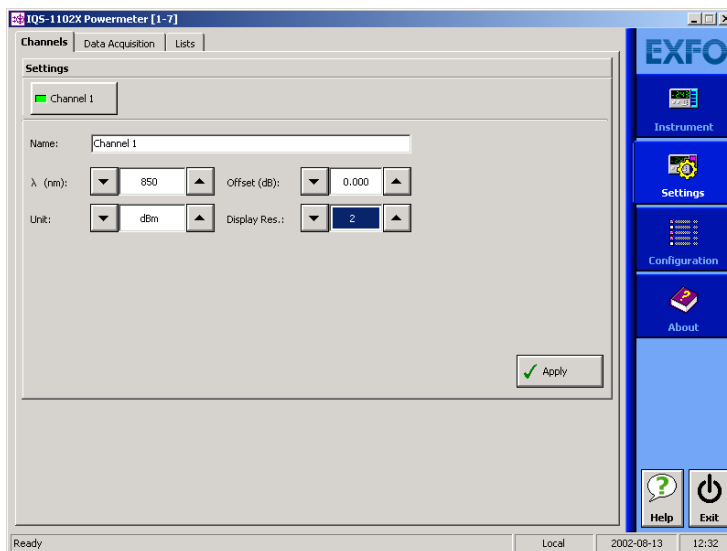
Naming Channels

Naming Channels

A user-selected name can be given to each power meter channel. The channel name appears in the main window. Naming individual channels is particularly useful when you need to display more than one power channel at the same time, especially in Monitor Window mode with several optical power meters displayed simultaneously. The name should be as self-explanatory as possible (for example, Power-Fiber 3).

To enter a channel name:

1. Click the **Settings** function tab.



2. Type in a self-explanatory name in the **Name** box.
3. Click **Apply** to confirm your new setting.

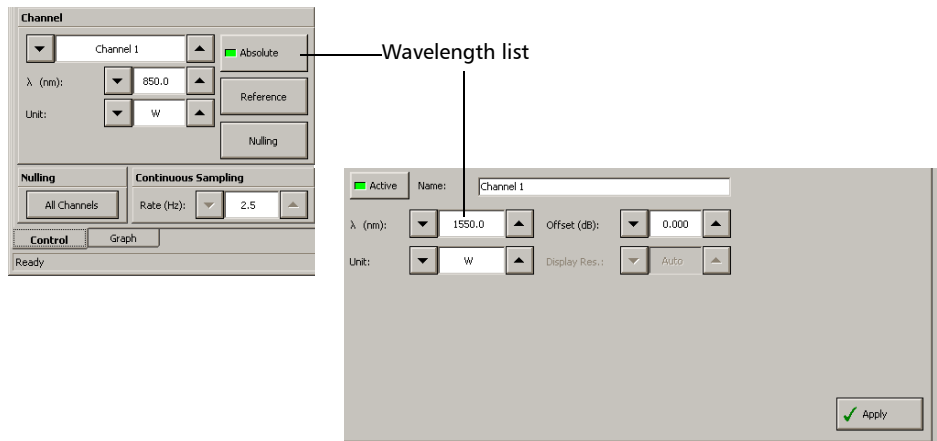
Selecting the Wavelength

When taking accurate measurements, your power meter must be set to the correct wavelength to compensate for the photodetector responsivity at the incident wavelength. Ideally, the power meter's wavelength should be set as close as possible to that of the optical source being used.

The wavelength must be selected from the wavelength list. To set the wavelength list, see *Managing Wavelength Lists* on page 22.

To select the wavelength (either from the Instrument or Settings function tab):

1. Select the wavelength using the arrow buttons next to the λ list.



2. If you are in the **Channels** tab of the **Settings** function tab, click **Apply** to confirm your new setting.

Setting Up Your Power Meters

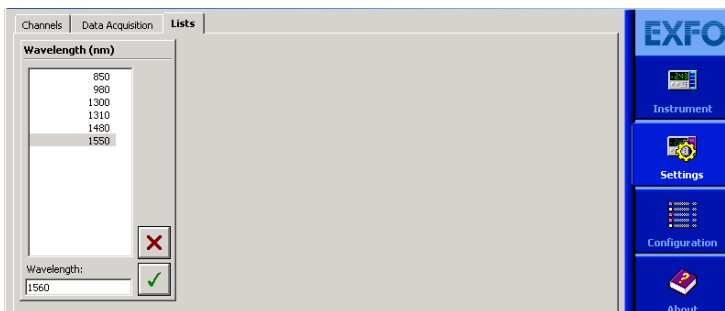
Managing Wavelength Lists

Managing Wavelength Lists

The wavelengths you want to use with your IQS-1100/IQS-1500 must be entered in the **Wavelength** list. Please refer to the Certificate of Compliance supplied with your power meter for information on the wavelength range.

To add a wavelength to the list:

1. From the **Settings** function tab, select the **Lists** tab.



In the **New Value** list, enter the wavelength value to be added.

2. Click to confirm the new wavelength.

Note: A warning message is displayed if the new wavelength is not within the power meter's wavelength range.

To delete a wavelength from the list:

1. From the **Settings** function tab, click the **List** tab.
2. From, the **Wavelength** list, select the wavelength to be deleted.
3. Click to confirm the operation.

Note: It is not possible to delete a wavelength that is currently being used.

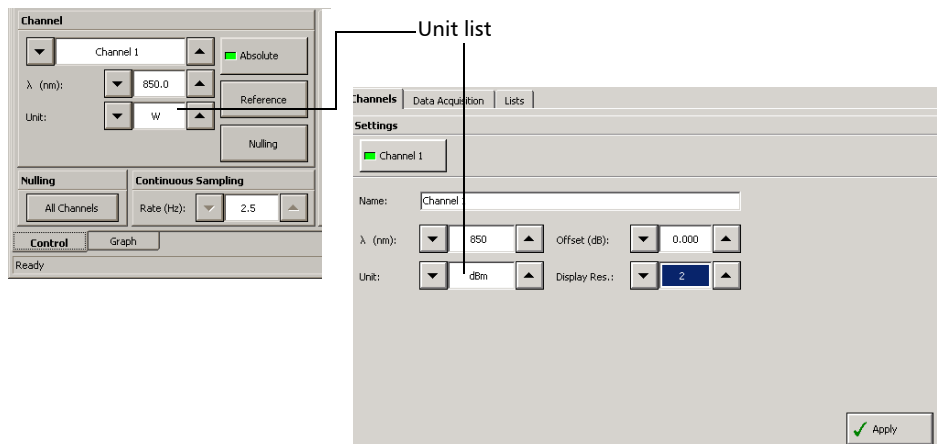
Selecting the Measurement Unit

Power measurements can be displayed in dB, dBm, W, or W/W (the latter indicating the ratio between the power received and the reference for the current wavelength and channel). When W or W/W is selected, the software automatically selects W units (pW, nW, μ W, mW), depending on the measured power and sensitivity of the detector.

When a relative unit is selected (dB or W/W), the most recent reference value used will become the current reference value.

To select the measurement unit (either from the Instrument or Settings function tab):

1. Use the arrow buttons next to the **Unit** list to change the value.



2. click **Apply** to confirm your new setting.

Setting Up Your Power Meters

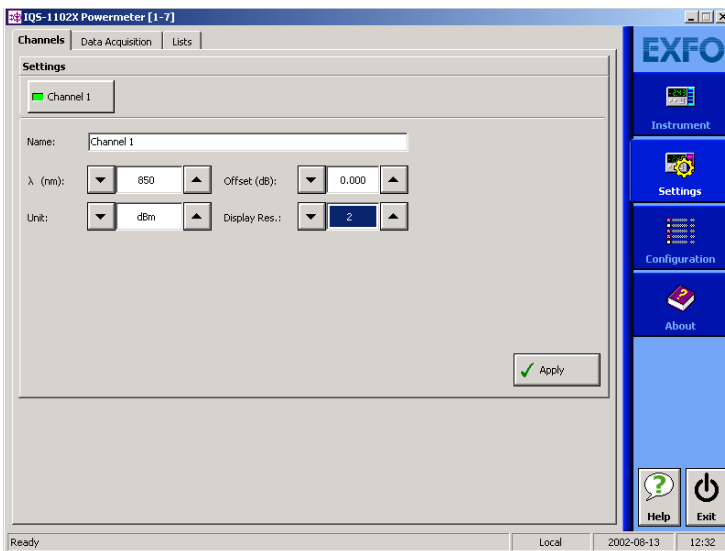
Setting the Display Resolution

Setting the Display Resolution

Depending on the required resolution and operating power level, 0, 1, 2, 3, or 4 digits can be displayed after the decimal point. When the auto setting is selected, the display resolution is determined by the power level being measured.

To select the display resolution of a power measurement expressed in dB or dBm:

1. Click the **Settings** function tab, then click the **Channels** tab.



2. Use the arrow buttons to select the value in the **Display Res.** list.

If you have previously selected watts as units, the **Display Res.** list will be grayed out (as illustrated above).

3. Click **Apply** to confirm your new setting.

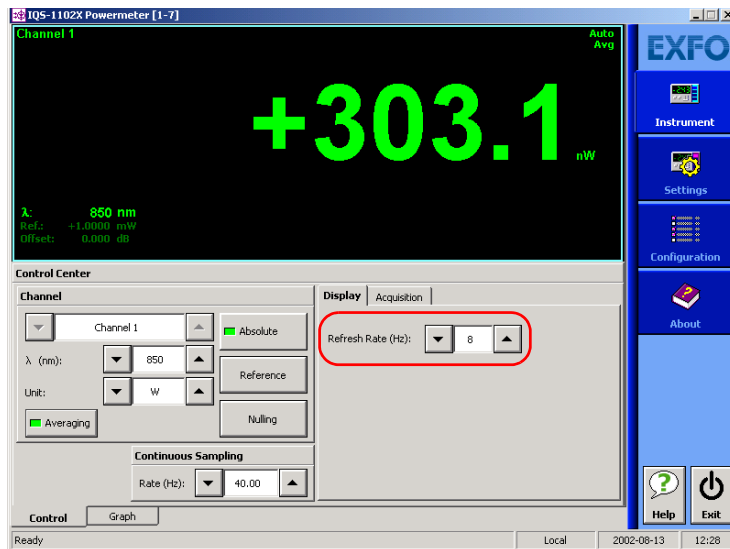
Note: When *W* or *W/W* is selected, the display resolution changes to Auto (the appropriate *W* unit will be used according to the power of the signal detected). It is then impossible to access the display resolution list.

Setting the Refresh Rate

This function allows you to define the refresh rate of the power readings on the display. The refresh rate is the number of times per second that a new power measurement will be displayed on the screen. The refresh rate applies to all channels when using a multichannel power meter.

To set the refresh rate:

1. From the **Instrument** tab, select the **Display** tab.



2. Use the arrow buttons to select the refresh rate you want to use.

Note: *The refresh rate can be faster or slower than the sampling rate; however, only a refresh rate slower than the sampling rate will have an effect.*

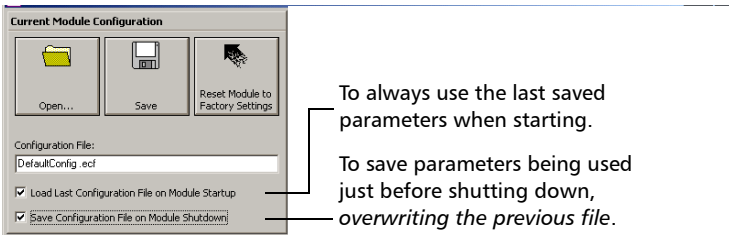
Saving and Recalling Configurations

Once you have set the IQS-1100/IQS-1500 Power Meters parameters, you can save your custom configuration and recall it at any time. You can also recall the factory-defined settings.

Saved configurations include all parameters set in the **Control Center** (**Instrument** function tab) and in the **Settings** function tab (if present).

To save a configuration:

1. Select the **Configuration** function tab.



2. In the **Current Module Configuration** panel, enter the name you wish to use for your configuration file.

It will be saved in
D:\IQS Manager\Configuration Files*(your_module)*.\

3. Click **Save**.

To recall a configuration:

1. Select the **Configuration** function tab.
2. Click **Open**.
3. Select the configuration file you wish to recall and confirm your action.

You are returned to the application and the new parameters are set.

To revert to factory settings:

1. Select the **Configuration** function tab.
2. Click the **Reset Module to Factory Settings** button.



IMPORTANT

Reverting to the factory settings will interrupt any module operation in progress.



IMPORTANT

The operation may take a few seconds to complete.

Note: *Reverting to factory settings will not change the name given to the channels.*

5 **Preparing Your Power Meters for a Test**

Cleaning and Connecting Optical Fibers



IMPORTANT

To ensure maximum power and to avoid erroneous readings:

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

To connect the fiber-optic cable to the port:

1. Clean the fiber ends as follows:
 - 1a. Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol.
 - 1b. Use compressed air to dry completely.
 - 1c. Visually inspect the fiber end to ensure its cleanliness.
2. Carefully align the connector and port to prevent the fiber end from touching the outside of the port or rubbing against other surfaces.

If your connector features a key, ensure that it is fully fitted into the port's corresponding notch.
3. Push the connector in so that the fiber-optic cable is firmly in place, thus ensuring adequate contact.

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

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



IMPORTANT

To obtain optimal results with your IQS-1500 Calibration Power Meter, always use the FOA and patchcord included with the unit.

Nulling Offsets

Temperature and humidity variations affect the performance of electronic circuits and optical detectors, which can offset measurement results. To compensate for this offset, the unit is equipped with an offset nulling function.

Your unit is designed not to require offset nulling under normal operation, but you should perform it whenever environmental conditions change significantly or when measuring very low power values.

Your IQS-1100/IQS-1500 Power Meters automatically performs nulling of the offset each time you turn it on.

However, you might need to perform a manual nulling of the offset when environmental conditions change significantly or when you are measuring very low power.

Note: *The manual nulling offset is valid for the current test session only; it no longer applies when you turn off your power meter. The next time you turn it on, the automatic offset nulling is performed again. You will achieve better results if you perform the manual offset nulling at a temperature around 23 °C after a running period of 45 minutes.*

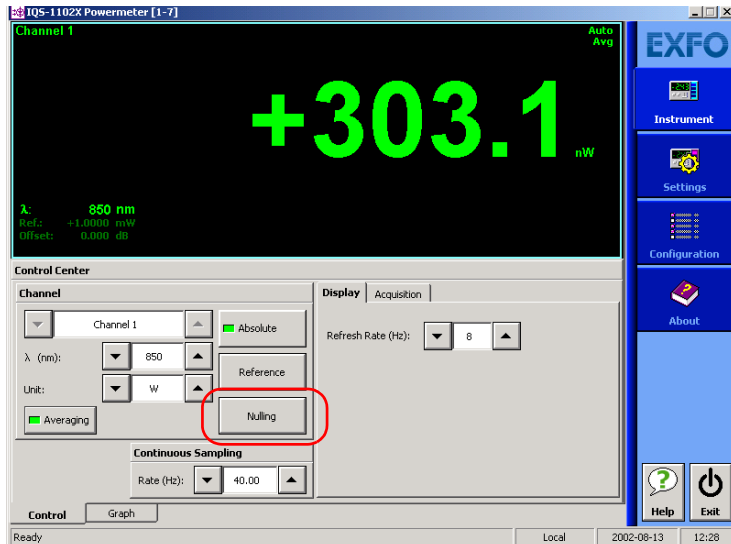


IMPORTANT

Light must not reach the detector when performing an offset nulling operation. Always use a protective screw cap. Do not use a soft rubber cover

To perform an offset nulling:

1. Install the protective cap over the detector port.
2. Under **Channel**, click the **Nulling** button. A message prompts you to ensure that the detector cap is properly installed.



3. Select **OK** to perform the offset nulling, or **Cancel** to exit.
A red message appears beneath the power value.

6 *Measuring Power*

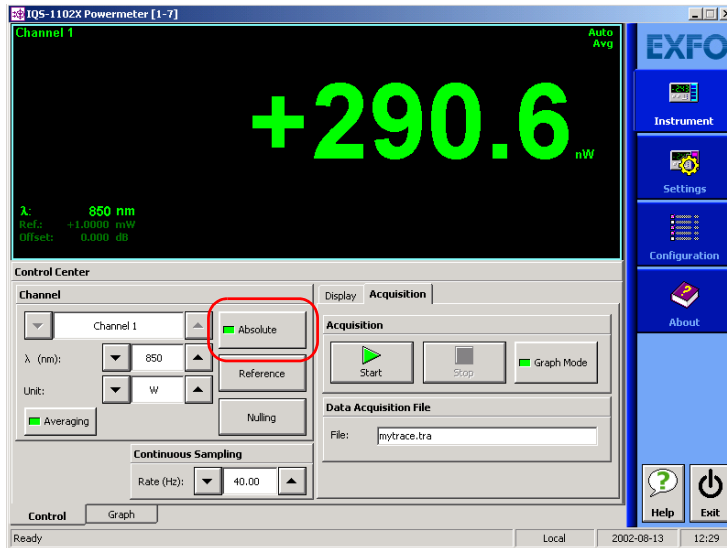
Power measurements can be displayed in two ways:

- absolute
- relative

It is also possible to add an offset value to your power measurement.

Displaying Absolute Power

When in absolute power, measured values are displayed in either dBm or W units (pW, nW, μ W, mW...) and the displayed value represents the absolute optical power reaching the detector within specified uncertainty.



Measuring Power

Displaying Absolute Power

To display absolute power:

1. Select the **Instrument** function tab or the **Channels** tab of the **Settings** function tab (you can use either).

Note: *Step 2 is not mandatory, but will help you achieve more precise results.*

2. Select the appropriate wavelength by using the arrow buttons next to the corresponding list.
3. Select the appropriate unit by using the arrow buttons next to the corresponding list (W or dBm).
4. If you are in the **Settings** function tab, click **Apply** to confirm your new setting.
5. Return to the **Instrument** function tab and click **Absolute** to activate the mode.

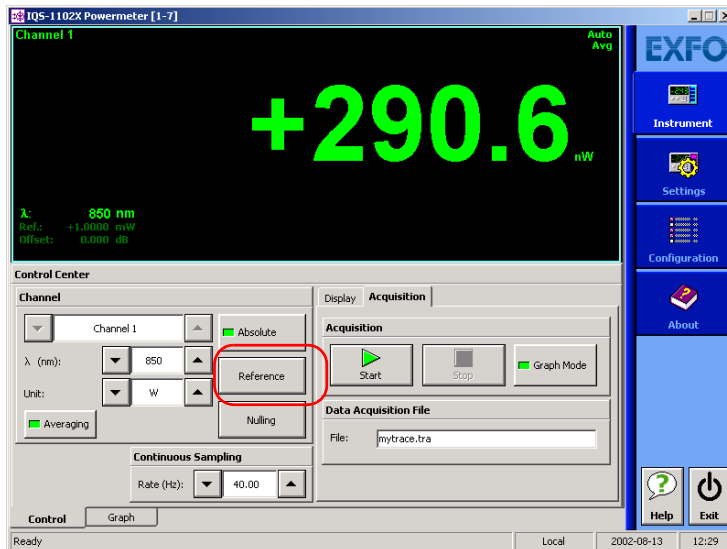
An absolute power measurement in negative W units indicates that the nulling of the offset was improperly done. If this happens, repeat the offset nulling operation (see *Nulling Offsets* on page 30).

Measuring Relative Power

Power measurements can be displayed as a deviation from an absolute reference value. The relative power is particularly useful when performing loss measurements.

Relative power is displayed in dB when the reference value is measured in dBm. In this case, the value will be either positive or negative, as the actual measured power is higher or lower than the reference power.

If the reference value is in W, the relative power will be displayed in W/W. In this case, the relative power is the deviation ratio from the reference and will always be a positive value (unless operation was improperly done).



To display significant relative power values, it is important to have an appropriate reference value, which you activate by clicking the **Reference** button in the **Instrument** function tab.

Measuring Power

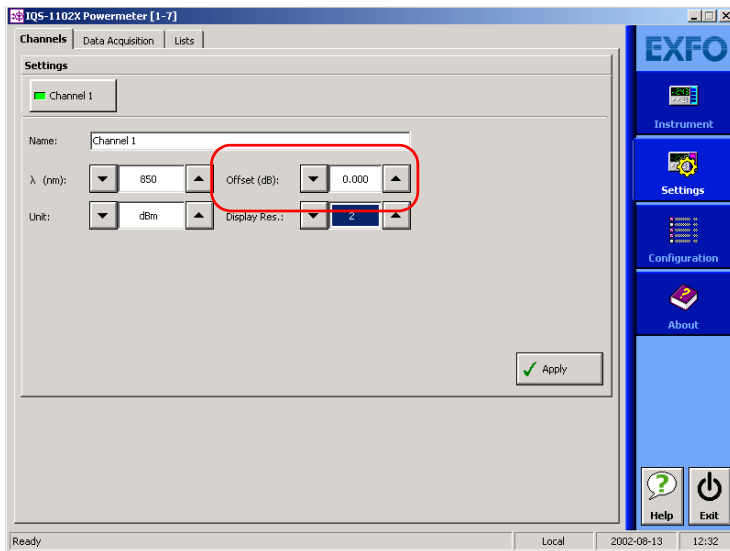
Using the Offset Function

Using the Offset Function

The offset function is used when you want to take into account, in the power displayed, a known gain or loss in the link that is not already included in the signal reaching the detector.

To enter an offset value:

1. From the **Settings** function tab, select the **Channels** tab.



2. From the **Offset** list, use the arrow buttons to adjust the value.
3. Click **Apply** to confirm your new setting.

Averaging Measurements

When the averaging function is enabled on the Power Meters, the eight most recent measurement samples are used to compute an unweighted average. This average is displayed as the measured value. You will notice the **AVG** marker at the right of the value, indicating that averaging is enabled.

In the case of the IQS-1100 Power Meter, you can benefit from an extended absolute power measurement range, up to -100 dBm if the following conditions are met:

- You must enable the averaging function.
- You must have a sampling rate of 0.1 or 0.5 samples per second.
- You must set the display resolution to Auto (see *Setting the Display Resolution* on page 24 for details).


To toggle between averaged and unaveraged power measurement:

Click the **Averaging** button to activate or deactivate it.

7 **Performing Acquisitions**

You can set a location where the acquisitions will be stored when you do your tests.

To select a path for storing your acquisitions:

1. From the **Settings** function tab, select the **Data Acquisition** tab.
2. Use  to select the folder to save your file.

Selecting the Sampling Type

You can perform different types of samplings with your power meter:

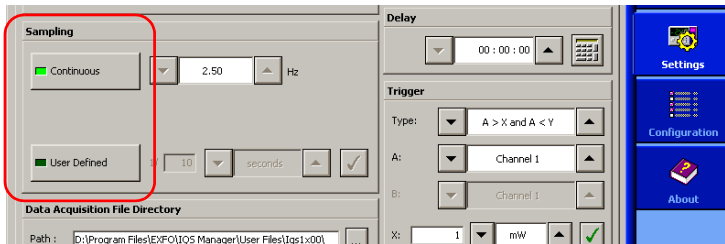
- **Continuous** sampling signifies that power measurements are constantly updated on the measurement display for an unlimited time period. You can select a rate that will optimize instrument flexibility and measurement stability as well as determine the quantity of data generated during data acquisition.
- **User Defined** sampling signifies that you can enter the rate and the time units you wish to use. The value you enter in the **1/** list is the number of time units the acquisition process will use. For example, if you enter a value of 10, and select seconds as the unit, an acquisition will be performed once every ten seconds; if you enter a value of 1 and select seconds as the unit, an acquisition will occur every second, etc.

Performing Acquisitions

Selecting the Sampling Type

To select a sampling type:

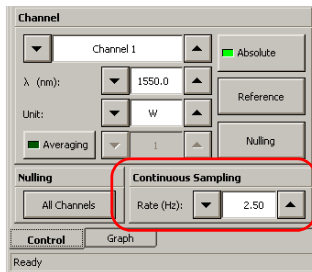
1. From the **Settings** function tab, select the **Data Acquisition** tab.



2. Select the sampling type by clicking the corresponding button.

If you select **Continuous**, select the rate to use with the arrow buttons.

You can also change the continuous sampling rate in the **Instrument** function tab in the same manner.



If you select **User Defined**, select the rate by entering a value in the **1/** list, then select a time unit using the arrow buttons. Remember to click to confirm your settings.

Note: Use a lower sampling rate with averaging set to active (see Averaging Measurements on page 37) for greater repeatability when measuring very low power.

Selecting the Acquisition Mode

You can use three data acquisition modes, regardless of the type of acquisition you are performing.

- **Timer:** the acquisition will last for the length of time you have previously set.
- **Trigger:** the power meter will wait for an incoming trigger signal before starting its next acquisition.
- **Delay:** the power meter will wait for a set length of time between acquisitions.

Note: *You can use one, several or all modes at the same time. If you use both the trigger and delay modes simultaneously, the power meter will first wait for the set delay time to elapse, then wait again for the incoming trigger signal. If you add the timer mode, the acquisitions will be performed during a set length of time, using both the trigger and delay modes.*

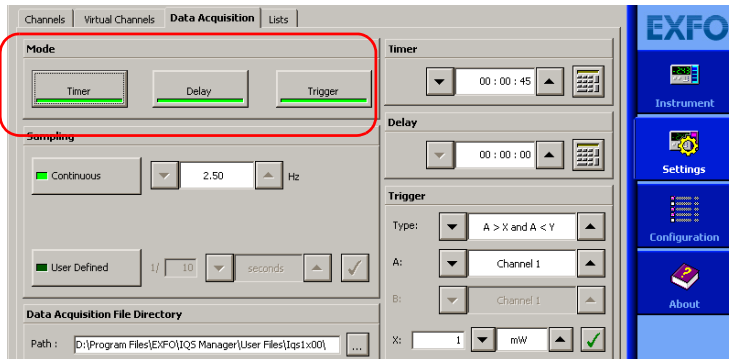
In each case, measurements are taken at the selected sampling rate and saved to a user-specified data file. The size of the data files created during acquisition is proportional to the sampling rate and duration of the acquisition. Higher sampling rates and longer durations generate larger quantities of data.

Performing Acquisitions

Selecting the Acquisition Mode

To select the acquisition mode:

1. From the **Settings** function tab, select the **Data Acquisition** tab.



2. From **Mode**, select the desired mode or combination of modes.

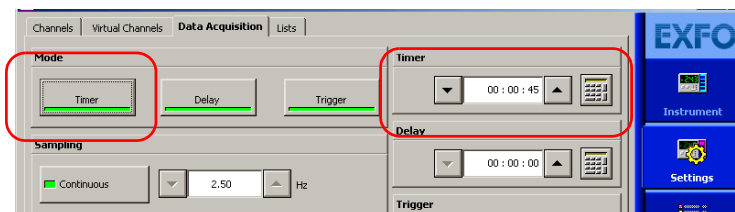
Setting Up Timed Acquisition Duration

A timed acquisition starts when you start the process, and continues for the time you have previously specified.

To set the duration for your acquisition:

Click inside the **Timer** edit box of the **Data Acquisition** tab and enter the value (or use the arrow buttons next to the list to adjust it).

If you are using the numeric box, enter the value in seconds (for example, 120 seconds if you want to enter two minutes).

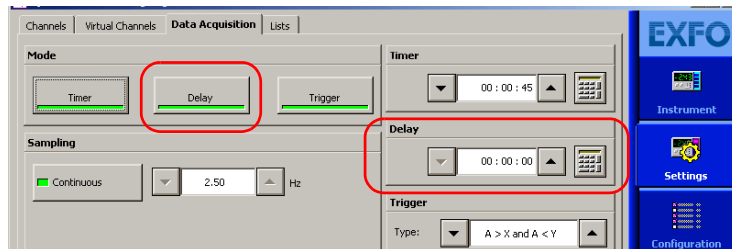


Setting Up Delayed Acquisition Delay

Delayed acquisition starts at a specified time after you start the process, and continues for the time you have previously specified if you have selected a combination of Timed and Delayed acquisition types.

To set a delay for your acquisition:

1. From the **Data Acquisition** tab, locate **Delay**.



2. Click inside the corresponding edit box and enter the value using the numeric box, or use the arrow buttons to adjust the value.

If you are using the numeric box, enter the value in seconds (for example, 120 seconds if you want to enter two minutes).

Performing Acquisitions

Selecting the Acquisition Mode

Setting Trigger Acquisition Parameters

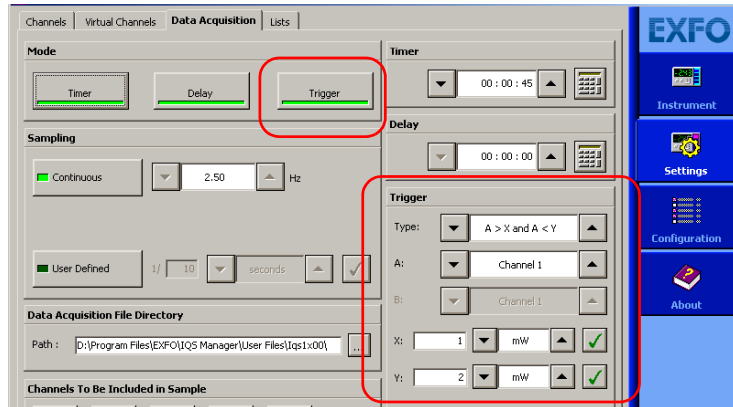
Conditional data acquisition can be performed using a triggered acquisition, meaning that data recording begins when a specified condition is met. Different trigger conditions are available, which are explained in the following table, where **A** and/or **B** represent the channel on which the condition is to be met, and **x** and/or **y** represent the desired power level threshold.

Trigger	Description
$A > x$	Acquisition will start when measured power is greater than the specified x value.
$A < x$	Acquisition will start when measured power is lower than the specified x value.
$A > x$ AND $A < y$	Acquisition will start when measured power in channel A is inside the interval set by the values x and y .
A or $B < x$	Acquisition will start when power in either channel A or channel B is lower than the specified x value.
$x < A$ or $B < y$ (multichannel power meters only)	Acquisition will start when measured power in channel A goes over a specified value ($A > x$). OR Acquisition will start when measured power in channel B falls under a specified value ($B < y$).
$A < B$ (multichannel power meters only)	Acquisition will start when measured power of channel A is lower than measured power of channel B.

Note: *The trigger defines the condition for starting data acquisition. Once begun, acquisitions will continue for the specified duration, regardless of the measured power.*

To set up the power level trigger condition:

1. From **Trigger** of the **Data Acquisition** tab, use the arrow buttons next to the **Type** list to select the desired condition.



Note: The **X** and **Y** values are displayed in the currently selected unit.

2. Enter the appropriate **X** or **Y** values in the corresponding lists.
3. Click to confirm your setting.

Performing Acquisitions

Starting the Acquisition

Starting the Acquisition

Once you have set your parameters, you can start the acquisition.

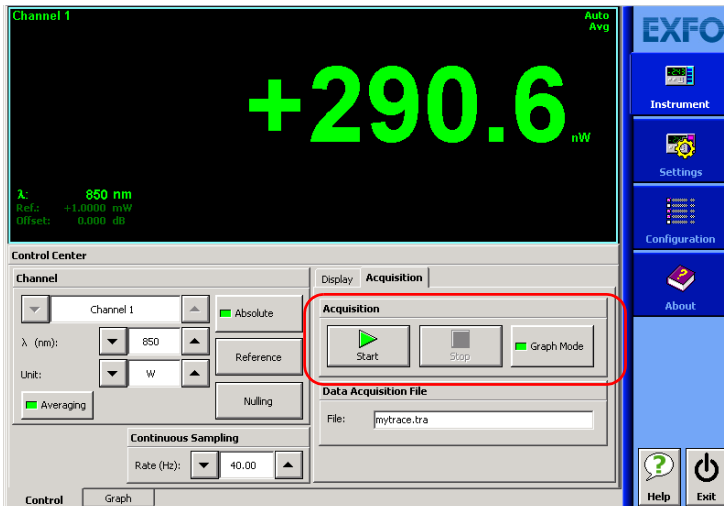
To start an acquisition:

1. Select the **Instrument** function tab.
2. From the **Acquisition** tab, press **Start**.

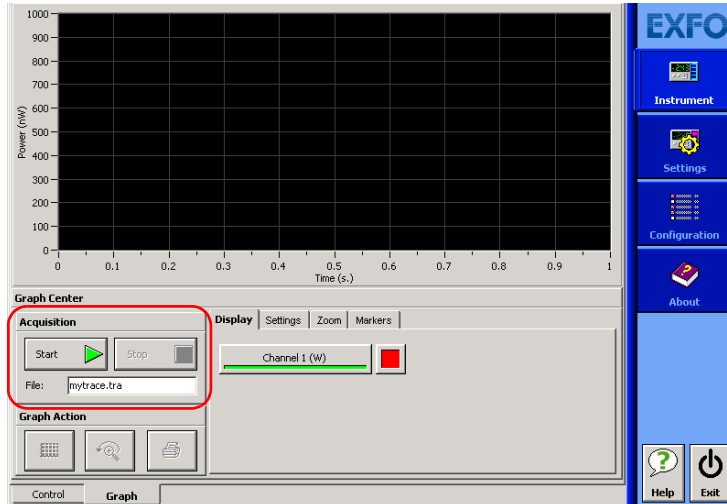
Data acquisition can be terminated at any time by clicking **Stop**. The accumulated data is available in the data file.

If you want to start a graph acquisition at the same time, you must enable the **Graph** function in the same tab (for more information on the graph acquisition and visualization mode, see *Performing and Analyzing Graph Acquisitions* on page 53).

Note: You cannot activate **Graph** mode after the acquisition has already been started.



You can also start the acquisition in the **Graph** tab by clicking the **Start** button the same way you would in the **Control** tab.



IMPORTANT

If you change units on the channel using Relative or Absolute mode and that you had enabled Graph mode, the Graph and Start buttons might automatically disable themselves if the resulting changes are not compatible with the base unit used in the graph.

To enter a name for your acquisition, type it in the **File** box of **Data Acquisition File**. The default extension is *.tra*.

Performing Acquisitions

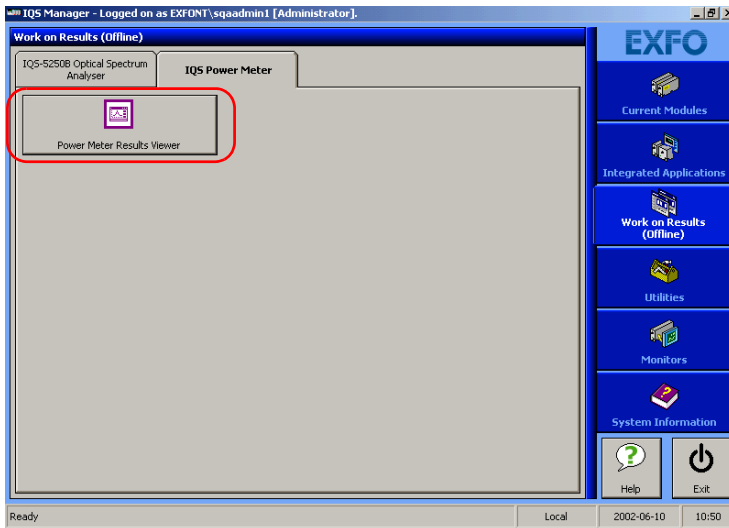
Consulting Acquired Data


Consulting Acquired Data

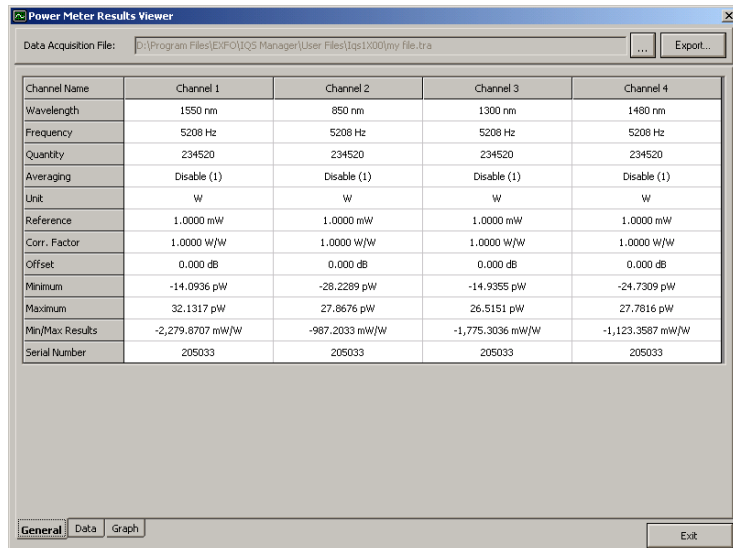
Once you have acquired data, it is possible to view the results in IQS Manager.

To view data previously acquired:

1. In IQS Manager, select the **Work on Results (Offline)** function tab.
2. Click the tab, then click the button corresponding to the application for which you want to see information.



3. In the viewer, retrieve the corresponding file using the  button.
 - To view the details pertaining to the channels used for the acquisition, select the **General** tab.



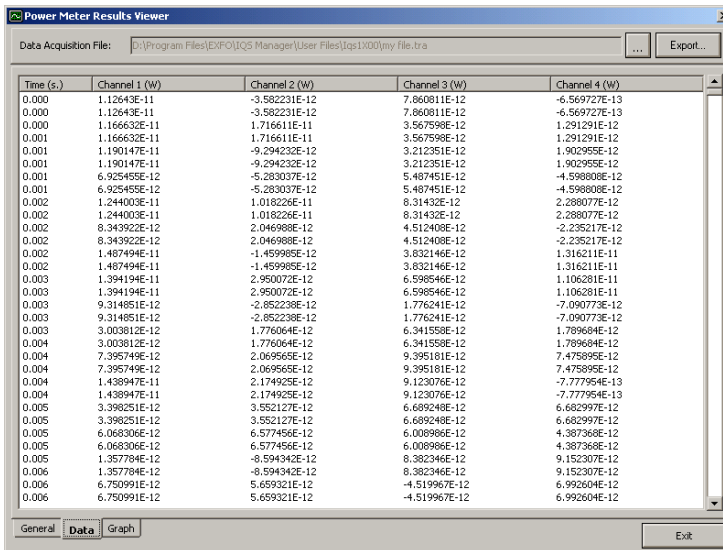
The screenshot shows the 'Power Meter Results Viewer' window. At the top, there is a 'Data Acquisition File:' field with a file path and an 'Export...' button. Below this is a table with 5 columns: 'Channel Name', 'Channel 1', 'Channel 2', 'Channel 3', and 'Channel 4'. The table contains various parameters such as Wavelength, Frequency, Quantity, Averaging, Unit, Reference, Corr. Factor, Offset, Minimum, Maximum, Min/Max Results, and Serial Number. At the bottom of the window, there are tabs for 'General', 'Data', and 'Graph', with 'General' selected. An 'Exit' button is also present.

Channel Name	Channel 1	Channel 2	Channel 3	Channel 4
Wavelength	1550 nm	850 nm	1300 nm	1480 nm
Frequency	5208 Hz	5208 Hz	5208 Hz	5208 Hz
Quantity	234520	234520	234520	234520
Averaging	Disable (1)	Disable (1)	Disable (1)	Disable (1)
Unit	W	W	W	W
Reference	1.0000 mW	1.0000 mW	1.0000 mW	1.0000 mW
Corr. Factor	1.0000 W/W	1.0000 W/W	1.0000 W/W	1.0000 W/W
Offset	0.000 dB	0.000 dB	0.000 dB	0.000 dB
Minimum	-14.0936 pW	-28.2289 pW	-14.9355 pW	-24.7309 pW
Maximum	32.1317 pW	27.8676 pW	26.5151 pW	27.7816 pW
Min/Max Results	-2,279.8707 mW/W	-987.2033 mW/W	-1,775.3036 mW/W	-1,123.3587 mW/W
Serial Number	205033	205033	205033	205033

Performing Acquisitions

Consulting Acquired Data

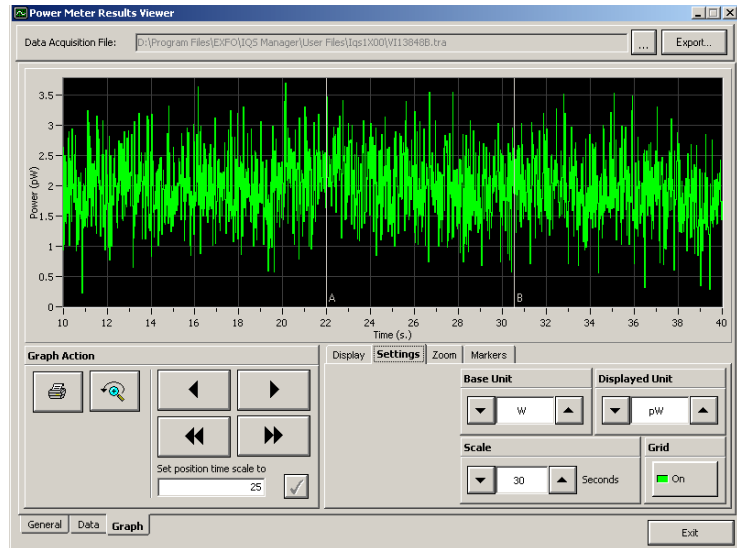
- To view your acquisition data, select the **Data** tab.



The screenshot shows the 'Power Meter Results Viewer' window. The title bar reads 'Power Meter Results Viewer'. Below the title bar, there is a 'Data Acquisition File:' field containing the path 'D:\Program Files\ExpO\UQS Manager\User Files\Iqs1300\my file.tta'. To the right of this field are three buttons: an ellipsis button, an 'Export...' button, and an 'Exit' button. The main area of the window is a table with the following columns: 'Time (s.)', 'Channel 1 (W)', 'Channel 2 (W)', 'Channel 3 (W)', and 'Channel 4 (W)'. The table contains 25 rows of data. At the bottom of the window, there are four tabs: 'General', 'Data', 'Graph', and 'Exit'. The 'Data' tab is currently selected and highlighted.

Time (s.)	Channel 1 (W)	Channel 2 (W)	Channel 3 (W)	Channel 4 (W)
0.000	1.12643E-11	-3.582231E-12	7.860811E-12	-6.569727E-13
0.000	1.12643E-11	-3.582231E-12	7.860811E-12	-6.569727E-13
0.000	1.166632E-11	1.716611E-11	3.567598E-12	1.291291E-12
0.001	1.166632E-11	1.716611E-11	3.567598E-12	1.291291E-12
0.001	1.190147E-11	-9.294232E-12	3.212351E-12	1.902955E-12
0.001	1.190147E-11	-9.294232E-12	3.212351E-12	1.902955E-12
0.001	6.925455E-12	-5.283037E-12	5.487451E-12	-4.598808E-12
0.001	6.925455E-12	-5.283037E-12	5.487451E-12	-4.598808E-12
0.002	1.244003E-11	1.018226E-11	8.31432E-12	2.288077E-12
0.002	1.244003E-11	1.018226E-11	8.31432E-12	2.288077E-12
0.002	8.343922E-12	2.046988E-12	4.512408E-12	-2.235217E-12
0.002	8.343922E-12	2.046988E-12	4.512408E-12	-2.235217E-12
0.002	1.487494E-11	-1.459985E-12	3.832146E-12	1.316211E-11
0.002	1.487494E-11	-1.459985E-12	3.832146E-12	1.316211E-11
0.003	1.394194E-11	2.950072E-12	6.598546E-12	1.106281E-11
0.003	1.394194E-11	2.950072E-12	6.598546E-12	1.106281E-11
0.003	9.314851E-12	-2.852238E-12	1.776241E-12	-7.090773E-12
0.003	9.314851E-12	-2.852238E-12	1.776241E-12	-7.090773E-12
0.003	3.003812E-12	1.776064E-12	6.341558E-12	1.789684E-12
0.004	3.003812E-12	1.776064E-12	6.341558E-12	1.789684E-12
0.004	7.395749E-12	2.069565E-12	9.395181E-12	7.475895E-12
0.004	7.395749E-12	2.069565E-12	9.395181E-12	7.475895E-12
0.004	1.438947E-11	2.174925E-12	9.123076E-12	-7.777954E-13
0.004	1.438947E-11	2.174925E-12	9.123076E-12	-7.777954E-13
0.005	3.398251E-12	3.552127E-12	6.689248E-12	6.682997E-12
0.005	3.398251E-12	3.552127E-12	6.689248E-12	6.682997E-12
0.005	6.068306E-12	6.577456E-12	6.008986E-12	4.387368E-12
0.005	6.068306E-12	6.577456E-12	6.008986E-12	4.387368E-12
0.005	1.357784E-12	-8.594342E-12	8.382346E-12	9.152307E-12
0.006	1.357784E-12	-8.594342E-12	8.382346E-12	9.152307E-12
0.006	6.750991E-12	5.659321E-12	-4.519967E-12	6.992604E-12
0.006	6.750991E-12	5.659321E-12	-4.519967E-12	6.992604E-12

- To view the graph corresponding to your acquisition data, select the **Graph** tab.



To move along the time scale, use the arrow buttons.

The single arrow buttons will move by increments or decrements representing 10 % of the current trace scale value.

The double arrow buttons will move by increments or decrements of the current screen display (for example, the 10 to 40 seconds display would become 40 to 70 seconds in the figure above).

To center on a specific value, type it in the **Set position time scale to box**.

The other buttons and tabs are identical to those found in your power meter application's **Graph** tab. See *Performing and Analyzing Graph Acquisitions* on page 53 for details.

Performing Acquisitions

Consulting Acquired Data

If you want to save your acquisition file as a text file, use the **Export** button located on the upper right-hand corner of the window. Save the file as you would any other text file, then confirm your choice. You can now view your data in any word processing program.

Note: *If your acquisition file is too large for the viewer, you will be notified by a pop-up message. Only the first part of your acquisition file will be displayed in the viewer; to see complete results, you must export the file and view it in a word processing program.*

To exit the window and return to IQS Manager, click **Exit**.

8 **Performing and Analyzing Graph Acquisitions**

The Graph mode of your power meter allows you to view your acquisition as it is performed, and analyze it once it has been completed.

Setting Up Graph Parameters

Before acquiring data, you should set the parameters that will help you achieve a better viewing afterwards.

To select which type of display to use during the acquisition:

Go to the **Settings** tab of the **Graph Center** and click the button corresponding to your choice:

- **Continuous Scroll:** The display will scroll along to the right as the acquisition progresses.
- **Wraparound:** Once the acquisition has reached the end of the screen to the right, it will begin on the left again and cover the previous trace.

Performing and Analyzing Graph Acquisitions

Setting Up Graph Parameters

To change the base unit of the acquisition (dBm or watts):

Use the arrow buttons in the **Settings** tab to toggle between them.

If you set the base unit before performing an acquisition, you will have the choice between W, dBm, dB, and W/W. If you change the unit while an acquisition is in progress, you will only have the choice between absolute units (dBm or W) or relative units (dB or W/W), depending on your base unit at the start of the acquisition.

If you have selected either W or W/W as the base unit, the **Displayed Unit** list becomes available, and you can change it during the acquisition using the arrow buttons, depending on the sub-unit that suits the current situation. For example, if at the beginning of the acquisition, no light goes through, the display will be in pW. When light goes through, you might want to switch to μ W or nW to get a more appropriate reading.

To change the displayed time scale:

Use the arrow buttons in the **Settings** tab to increase or decrease the value. The display will change accordingly.



IMPORTANT

If you change the base unit after acquiring data, you will lose the graph you have obtained, as well as the data acquired. Ensure you set your values before acquiring data.



IMPORTANT

If you change the base unit, the channels in the Display tab will automatically change when you switch from a relative unit to an absolute unit or vice versa.

To show or hide the grid in the background of the graph display:

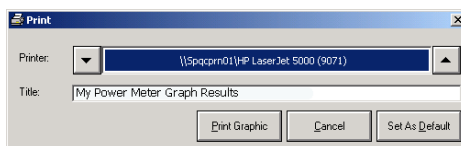
Click the corresponding button in the **Settings** tab.

Printing Graph Results

Once you have acquired data and displayed a graph, it is possible to print out this information.

To print your graph results:

Click  in the **Graph Center**.



Use the arrow buttons to select the printer to use. You can enter a title for your document in the corresponding box. The **Print Graphic** button will start the printout, the **Cancel** button will bring you back you to the **Graph** tab, and the **Set As Default** button will keep the selected printer for future printouts.

The button will be disabled if no graph is displayed.

Clearing Graph Display

The graph display will automatically clear itself when you start a new acquisition. However, you can also clear the graph display manually.

To clear the graph display:

Click  in the **Graph Center**.

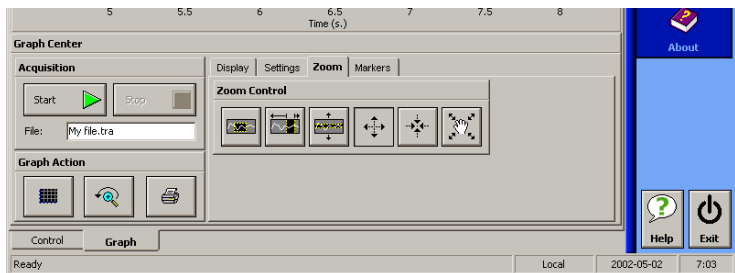
Note: *Changing items such as the units or display options will also clear the graph display. Ensure that you have set your parameters beforehand.*






Using the Zoom Function

Once you have performed an acquisition, you can use various zooming tools to help you analyze it.

To access and use the zoom tools:


Click the **Zoom Control** tab of the **Graph Center**.




-  allows you to enlarge a precise portion of the trace by dragging a zone over it. Simply drag the cursor to cover the area you wish to see and release the mouse button to enlarge the area.
-  allows you to enlarge a precise portion of the trace horizontally, meaning that the time scale will enlarge and the power scale will remain the same.
-  allows you to enlarge a precise portion of the trace vertically, meaning that the power scale will enlarge and the time scale will remain the same.
-  allows you to enlarge the trace display at the precise location where you click. Click the area repeatedly until you reach the desired zoom factor.
-  allows you to reduce the trace display at the precise location where you click. Click the area repeatedly until you reach the desired zoom factor.

Performing and Analyzing Graph Acquisitions

Using the Zoom Function

- ▶  allows you to move around the trace to view areas not currently displayed. You can pan upwards and downwards, as well as to the left and right.

Note: *You can only pan to the right and left if the time scale length is larger than the portion displayed on the screen.*

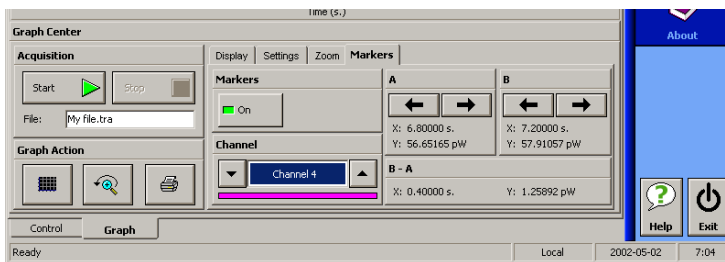
To revert to the original trace size, click  in the **Graph Center**.

Displaying and Moving Markers

Once you have acquired a trace, you can use markers to take precise measurements.

To enable the markers:

1. Select the channel you want to use from the **Channel** pull-down list in the **Markers** tab.



2. Click the **On** button.

The two markers, **A** and **B**, will appear on the display.

You can move the markers to the desired position by clicking them and dragging them to the left or right; or you can use the arrow buttons next to each marker to move them. The markers will move automatically to the next available point when you move them either by dragging or with the arrow buttons.

Note: *If you have enabled the markers and you move to another tab (than the **Zoom** tab), the markers will still be visible, but you cannot move them. You must return to the **Markers** tab to do so.*

You will notice that the difference between the markers ($B - A$) is automatically refreshed on the lower part of the tab as you move the markers.

9

Calibrating Other Power Meters with the IQS-1500

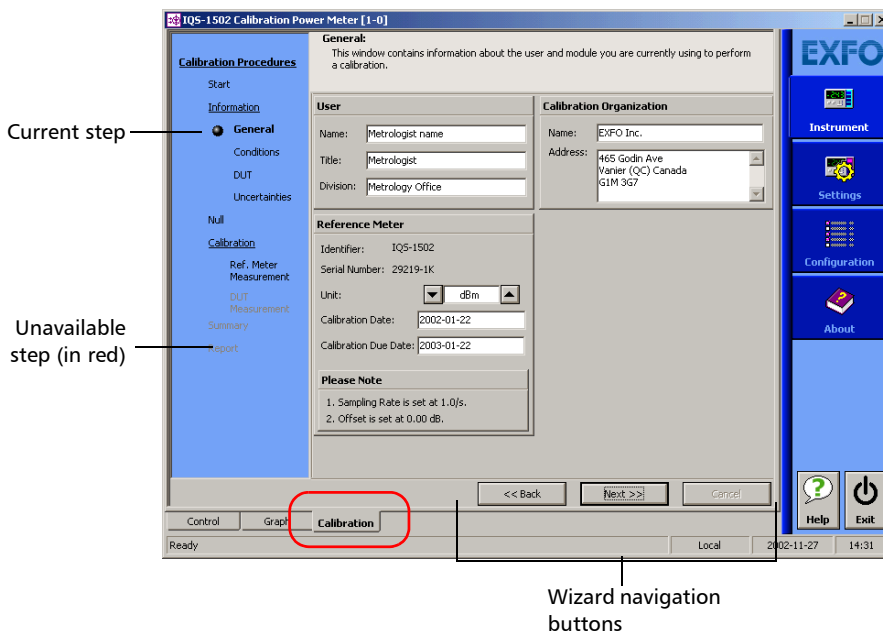
In addition to performing usual power meter functions, your IQS-1500 Calibration Power Meter can be used to calibrate other power meters. This is performed through a step-by-step wizard.

As you move along the steps, you will notice that the current step is identified on the left by a circle.

Steps in red are not available at this moment in the calibration process. For example, the **Report** step is not available until you have taken measurements.

To access the Calibration mode:

Select the **Calibration** tab in the lower part of the **Instrument** function tab.



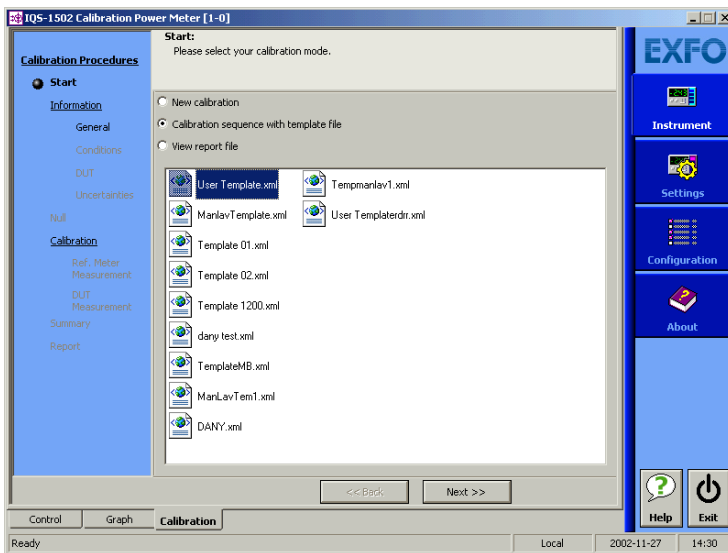
To navigate between the wizard steps:

Use the **Back**, **Next**, and **Cancel** buttons at the bottom of the window.

Selecting the Calibration Option

When you access the **Calibration** tab of your IQS-1500 Calibration Power Meter, you can select from three different options.

- Starting a calibration from scratch
- Using a template you have previously saved (see *Saving a Template File* on page 71 for details)
- Viewing an existing report file



To select the calibration option:

Select the option button corresponding to your choice.

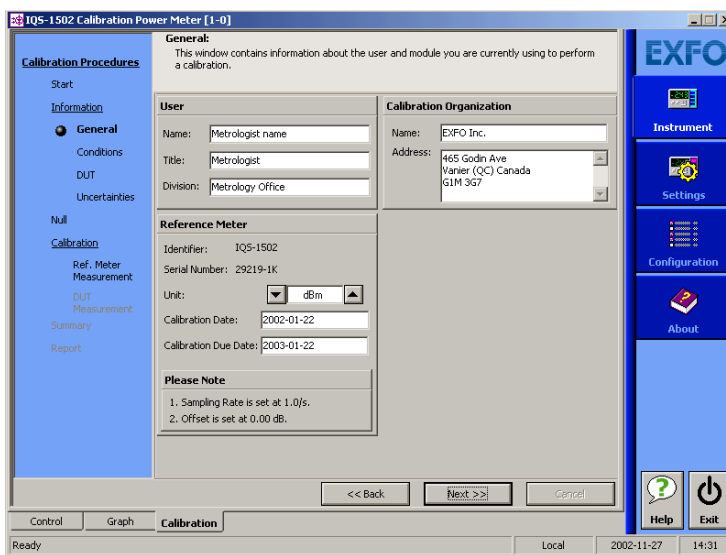
If you selected **View report file**, the different reports are now available; click the desired file once to select it.

Click **Next** to proceed to the following step, or to view the report, according to what you have chosen.

Entering General Calibration Information

The **General** window allows you to enter information pertaining to the person performing the calibration (the user), the company employing this person, and details pertaining to the Calibration Power Meter used to perform the calibration.

Note: *This information is kept in memory when using the template option, as explained in Selecting the Calibration Option on page 60.*



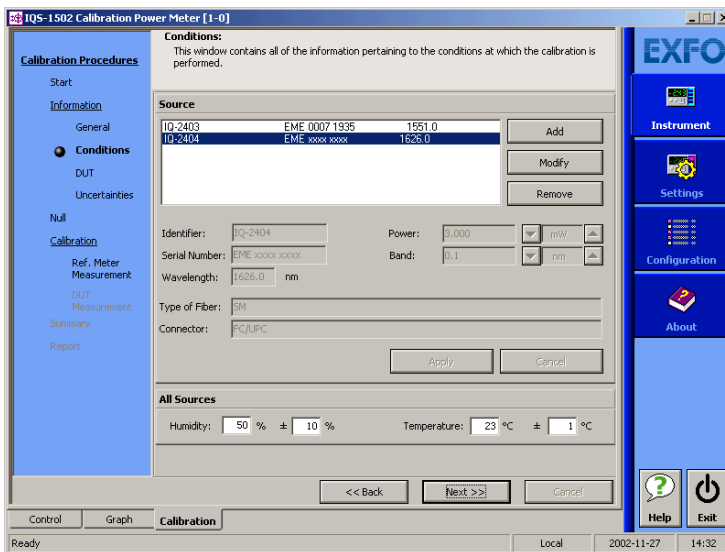
Fill in the corresponding information, including the calibration date and due date. Do not forget to select the power unit to be used by your Calibration Power Meter.

Once you are done, click **Next** to continue.

Entering Calibration Conditions

The **Conditions** window allows you to define the calibration conditions. This is also where you enter information pertaining to the source or sources used in your calibration process, as well as for the environmental conditions in which the calibration will be performed.

Note: *This information is kept in memory when using the template option as explained in Selecting the Calibration Option on page 60.*



To select a source already in the list:

Click it once in the list of available modules.

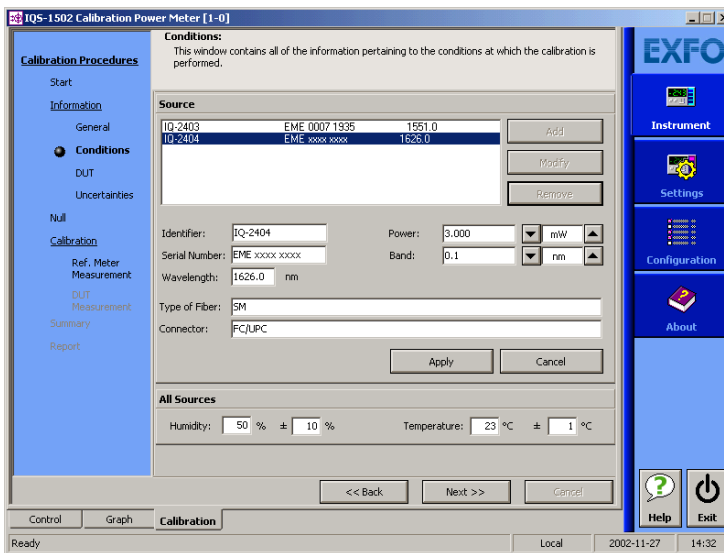
Since you do not need to enter additional information at this point, the lower part of the window is grayed out.

Once you have selected the source you want to use, click **Next**.

To add a source to the list:

1. Click Add.

The lower part of the window becomes available.



2. Enter the information pertaining to the new source, including the humidity and temperature values.

Note: The humidity and temperature values are the same for all sources in your list.

3. Click **Apply** to add the source to the list.

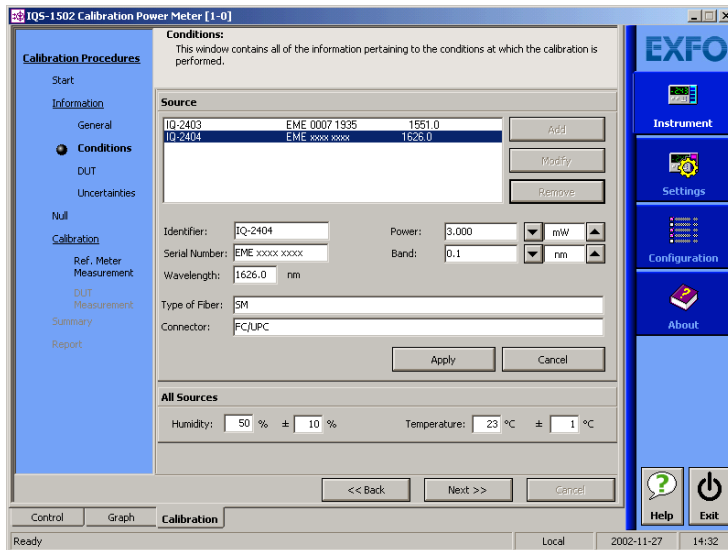
Calibrating Other Power Meters with the IQS-1500

Entering Calibration Conditions

To modify an already existing source:

1. Select the source you want to modify by clicking it once.
2. Click **Modify**.

The lower part of the window is now available.



3. Modify the details about this source.
4. Click **Apply** to confirm your changes.

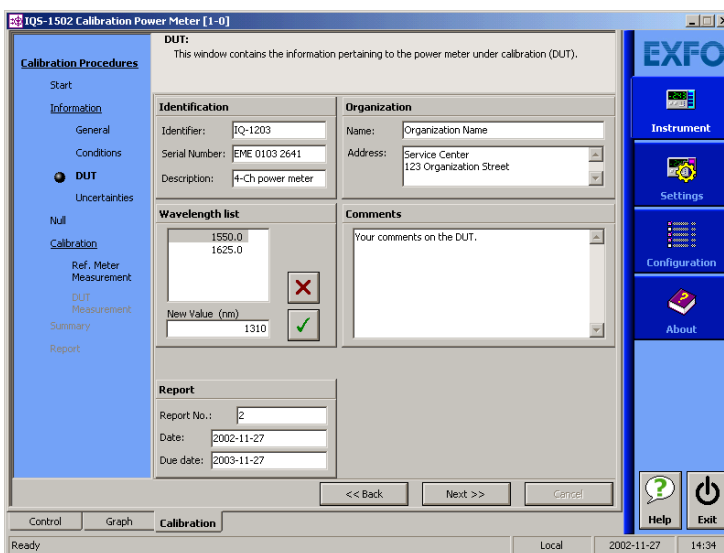
To remove a source from the list:

1. Select the source from the list by clicking it once.
2. Click **Remove**.

Entering DUT Information

The **DUT** window allows you to enter information about the calibrated DUT (power meter), including details on the DUT (serial number, description, etc.), on the company owning the DUT, plus any useful comment.

Note: *This information is kept in memory when using the template option as explained in Selecting the Calibration Option on page 60.*




The **Wavelength List** allows you to enter any wavelength or wavelengths at which the DUT will be calibrated.

To add a wavelength to the list:

Enter the value in the **New Value (nm)** box, then click .

To remove a wavelength from the list:

Select it by clicking it once, then click .

Once you have entered the information about the DUT and managed the wavelength list, click **Next** to proceed to the next step.

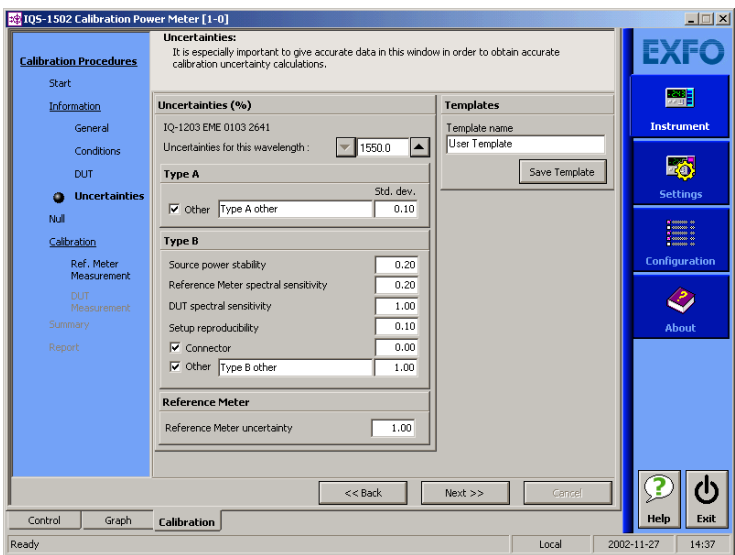
Entering Calibration Uncertainties

The **Uncertainties** window allows you to enter the values that will be used for calibration uncertainty calculations.

Note: This information is kept in memory when using the template option as explained in *Selecting the Calibration Option on page 60*.

To establish total uncertainty, the components are divided into the following:

- The Calibration (Reference) Power Meter uncertainty
- Type A uncertainties
- Type B uncertainties



The Calibration (or Reference) Power Meter uncertainty is provided in the IQS-1500 Power Meter's calibration report and must be at a 95 % (2σ) confidence level. For example, if the confidence level is specified at 68 % (1σ), you must multiply the uncertainty by a factor of 2.

Type A uncertainties are characterized by taking a series of measurements and calculating the standard deviation. The standard deviation of the calibration factor for the DUT is automatically calculated and displayed in the **Standard Deviation** box of the calibration summary (see *Viewing Calibration Summary* on page 76).

Type B uncertainties must be half width, U_{Bi} , of a rectangular distribution from $-U_{Bi}$ to $+U_{Bi}$ (in percentage).

The **Source power stability** is very important since the calibration is sequential; that is, measurements are first taken on the IQS-1500 Calibration Power Meter, and then on the power meter under test (DUT). This first error source can be evaluated by measuring the variation of the source power on the Calibration Power Meter over the time of calibration at one wavelength (about 30 seconds).

The **Reference Meter spectral sensitivity** slope, in %/nm, around the wavelength of the source influences calibration because of the uncertainty about the exact knowledge of the source wavelength. If not already known, the slope can be calculated using the following procedure:

To calculate the reference meter spectral sensitivity slope:

1. With a stable light illuminating the detector, set the IQS-1500 to the wavelength of the source, for instance, 1550.0 nm, and record the displayed power, for instance 1.000 mW.
2. Increase the wavelength of the IQS-1500 by the uncertainty of the wavelength of the source, for instance, if ± 0.1 nm, set 1550.1 nm.
3. Record the second displayed power, for instance, 1.001 mW.
4. Calculate the slope. In this case, the variation is $([1.001-1.000]/1.000)/0.1 \text{ nm}=1 \text{ \%/nm}$; the uncertainty is then 0.1 %.

The **DUT spectral sensitivity** slope has a similar effect. It can be evaluated the same way if the spectral resolution of the DUT is also 0.1 nm. If not, an estimate can be obtained by setting the second wavelength as close as possible, for instance, 1540 nm. The evaluation will then be less precise, and judgment is important to have a good estimate.

Calibrating Other Power Meters with the IQS-1500

Entering Calibration Uncertainties

If a fiber different than the one used for the calibration of the IQS-1500 is used, a large error can occur, especially because of the connector. Even though the same fiber is used, the repeatability of the connection on both power meters must be measured and taken into account.

The **Setup reproducibility** also has to be measured and recorded. Movements of the fibers are mainly responsible for this error type.

Note: *APC connectors should be avoided at the detector port because of their sensitivity to polarization.*

In addition, any other systematic error may be entered and included in the total uncertainty calculation.

Type B uncertainty components are assumed to be independent and have rectangular distributions. The following sources of information may be helpful in evaluating these Type B uncertainties:

- Previous measurement data
- Manufacturer's specifications
- Data provided in calibration and other reports

Type A uncertainties are also assumed to be independent, but normally distributed; therefore, they can be estimated by performing a series of measurements and calculating a standard deviation.

The total uncertainty is calculated by adding (using the root of the sum of the squares) the Type B, Type A and Reference Meter uncertainties and multiplying the results by a factor of two to obtain a confidence level of 95 %, as shown in the following equation:

$$U_t = 2 \times \sqrt{\sum_i \left(\frac{U_{Bi}^2}{3}\right) + \sum_i \left(\frac{U_{Ai}^2}{N}\right) + \left(\frac{U_{1500}}{2}\right)^2}$$

where

U_t = total uncertainty

U_{Bi} = Type B uncertainties

U_{Ai} = Type A uncertainties

U_{1500} = IQS-1500 calibration uncertainty

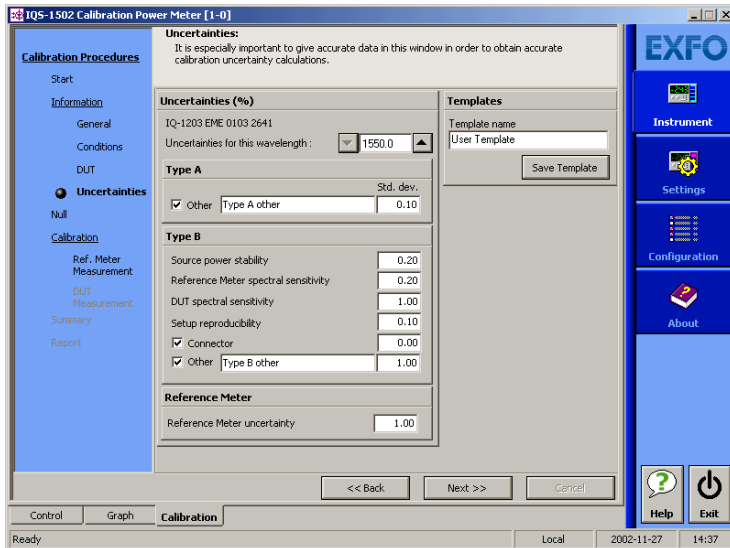
The mandatory Type B uncertainties are:

- Source power stability
- Reference Meter spectral sensitivity
- DUT spectral sensitivity
- Setup reproducibility

Calibrating Other Power Meters with the IQS-1500

Entering Calibration Uncertainties

The remaining uncertainties are optional, but to have the best possible estimation, all uncertainties must be considered.



To set the uncertainties values for your calibration test:

1. Select the wavelength for which you want to enter uncertainties.
2. Enter the Type A uncertainty contribution in the box if needed.
3. Select the **Other** check box so that the entry is included in the calculations.
4. Enter the Type B uncertainty values according to the calculations performed earlier.
5. Enter the Reference Meter expanded uncertainty in the corresponding box.

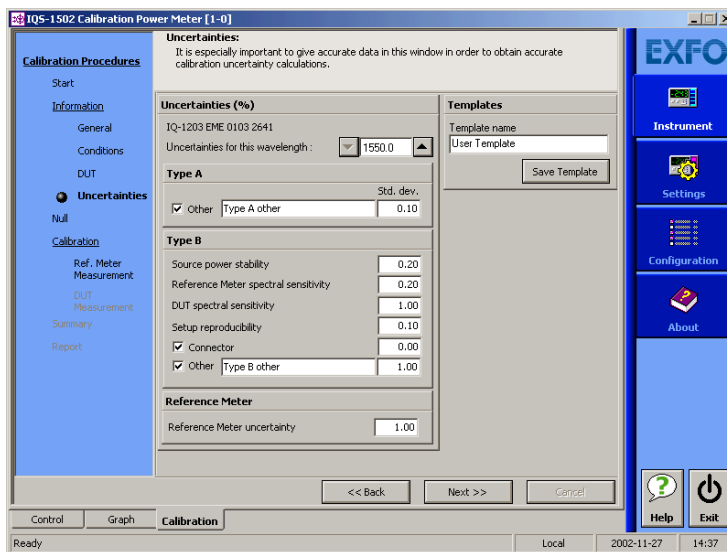
Once you are done entering the uncertainty values, click **Next** to proceed to the next step.

Saving a Template File

At this point of the wizard step, you might want to save all the information you have entered in order to reuse it for other calibrations.

To save a template for a later use:

1. In the **Uncertainties** window, type in the name you want to use for your template in the **Template Name** box.

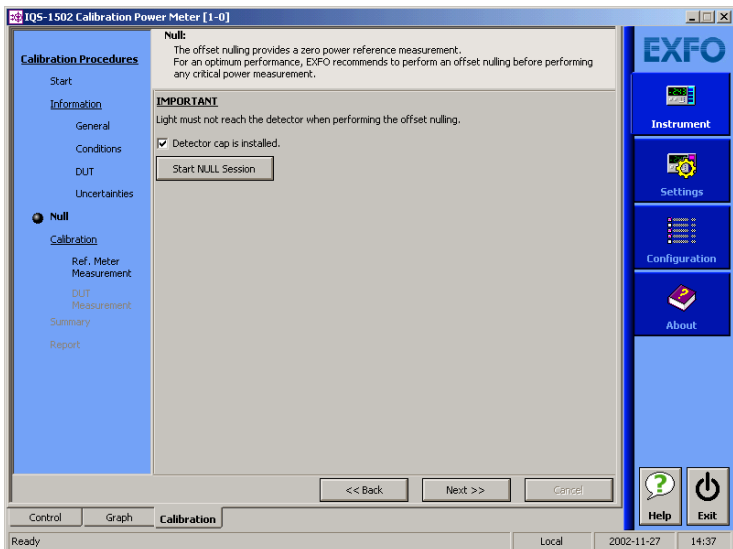


2. Click **Save Template**.

The next time you start a calibration session, you can select this template from the **Start** window (see *Selecting the Calibration Option* on page 60).

Nulling Offsets for Calibration

The **Null** window allows you to perform an offset nulling on your modules (both the Calibration Power Meter and the DUT Power Meter). This will provide you with a “clean” measurement, with no electrical offsets to impede your calibration process.



To perform an offset nulling on your modules:

1. Place a protective cap on the detector ports.
2. Confirm that you have used the protective caps by checking the corresponding box in the window.
3. Click **Start NULL Session** to start the process.

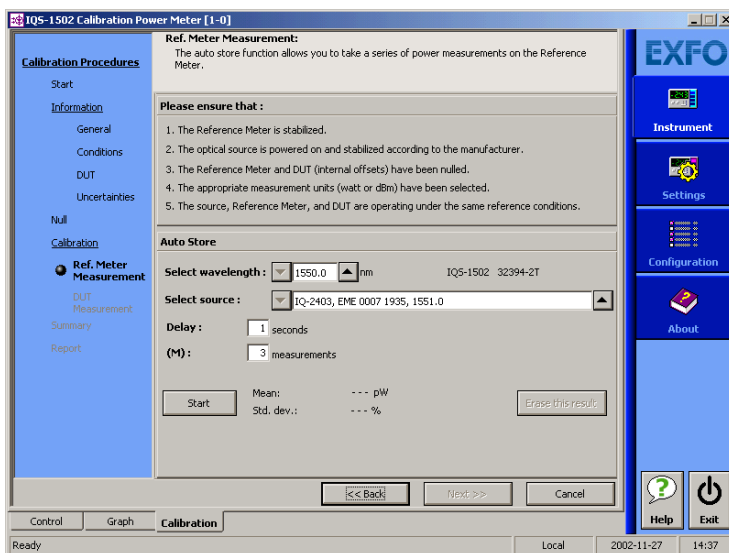
Storing Reference Power Meter Measurements Automatically

The **Ref. Meter Measurement** window allows you to take a series of power measurements automatically on your Calibration Power Meter. You can specify the number of power measurements you want to take, and the time interval between each measurement.

This window is there to help you by:

- Avoiding repetitive power measurements
- Calculating the standard deviation of the power measurements taken on the IQS-1500.

This value is a good indication of the stability of the source used for calibration. When the standard deviation exceeds 1%, a message will appear warning you that the source might not be stable enough.



Calibrating Other Power Meters with the IQS-1500

Storing Reference Power Meter Measurements Automatically

To enter auto-store details and start the associated calculations:

- 1.** Select the wavelength at which you want to perform the calibration using the arrow buttons on each side of the **Select Wavelength** box.
- 2.** Select the source you want to use for your calibration using the arrow buttons on each side of the **Select Source** box.
- 3.** Type in the delay (in seconds) you want the power meter to wait between measurements.
- 4.** Type in the number of measurements to be performed in the **(M)** box.
- 5.** Click **Start** to start the calculations.

If this result is not satisfactory, you can start over by clicking **Erase this result**. You must then restart the calculation with **Start**.

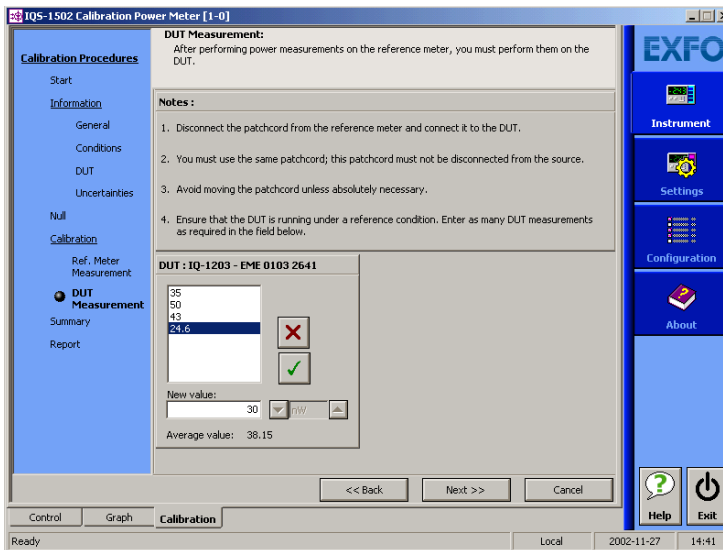
Once you are satisfied with your results, proceed to the next step by clicking **Next**.


Entering DUT Measurements

After taking the measurements on your reference power meter, you must take them on the DUT, in the **DUT Meter Measurement** window. You can enter as many measurements as needed.

To add DUT measurements to your calibration procedure:

1. Refer to the DUT display and read the power value.
2. In the **DUT Meter Measurement** window, enter this value in the **New Value** box, then select the proper units using the up and down arrow buttons.



3. Add the value to the list by clicking .

Note: At this point, the unit selection will be grayed out so as not to change it by mistake in another entry.

4. Repeat steps 1 through 3 for each measurement you want to add.

Calibrating Other Power Meters with the IQS-1500

Viewing Calibration Summary

The average value for your measurements will automatically be updated below the **New Value** box.

If you want to remove a value from the list, click .

Once you have entered all of the DUT measurements, proceed to the next step by clicking **Next**.

Viewing Calibration Summary

Once your calibration is complete, you can view a summary of the results in the **Summary** window. This is also where you can manage the results you have obtained. You can delete erroneous results, or go back to a previous step to obtain more measurements.

The calibration factor (CF) is calculated using the following equation:

$$CF = \left(\frac{P_{1500}(W)}{P_{DUT}(W)} \right)$$

where

P_{1500} = IQS-1500 measured power

P_{DUT} = DUT measured power

The standard deviation (all wavelengths) of the mean calibration factor (CF) is calculated using the following equation:

$$\text{Std. Dev.} = \sqrt{\left(\frac{\left(\sum_i (CF_i^2) - \frac{1}{N} \left(\sum_i CF_i \right)^2 \right)}{(N - 1)} \right)} \times \frac{100}{CF} \quad (\%)$$

The **Single Wavelength** tab allows you to see the results for each series of measurements taken on the DUT on a particular wavelength.

The screenshot shows the 'IQS-1502 Calibration Power Meter [1-0]' window. The 'Summary' tab is active, displaying a table of measurement results for a single wavelength of 1550.0 nm. The table has four columns: 'N', 'Source (nm)', 'Mean Power', and 'Calib. Factor'. The first row shows '1', '1551.0', '-100.0dbm', and '0.0000'. The interface includes a left sidebar with navigation options like 'Calibration Procedures', 'Information', 'General', 'Conditions', 'DUT', 'Uncertainties', 'Null', 'Calibration', 'Ref. Meter Measurement', 'DUT Measurement', and 'Summary Report'. A right sidebar contains 'EXFO Instrument', 'Settings', 'Configuration', and 'About'. At the bottom, there are buttons for '<< Back', 'Next >>', and 'Cancel', along with 'Control', 'Graph', and 'Calibration' tabs. The status bar at the bottom indicates 'Ready', 'Local', '2002-11-27', and '14:42'.

Annotations on the screenshot:

- Sequential number of calibration factor measurement series**: Points to the 'N' column header.
- Source wavelength**: Points to the 'Source (nm)' column header.
- Calibration factor**: Points to the 'Calib. Factor' column header.
- Average power measured on IQS-1500**: Points to the 'Mean Power' column header.

To switch between wavelengths in the tab:

Use the up and down arrows next to the wavelength list. The tab will be updated accordingly.

If you want to sort the columns using a particular criterion, simply click on the header of the corresponding columns. A first click will display the list in alphabetical order, a second click will reverse the order.

Calibrating Other Power Meters with the IQS-1500

Viewing Calibration Summary

To delete erroneous values:

If you need to delete values in the list, select them, then click **Delete the selected items**.

The **All Wavelengths** tab allows you to see all of the wavelengths for the particular power meter under test.

Source wavelength (may differ slightly from DUT)

Wavelength of the power meter under test (DUT)

Average power measured on IQS-1500

Number of calibration factor measurement sets

Total uncertainty of the calibration factor

Standard deviation of the calibration factor

Mean calibration factor by which the DUT readings must be multiplied

Source Wavelength (nm)	DUT Wavelength (nm)	Mean Power	N	Calibration Factor	Standard Deviation (%)	Expanded Uncertainty (%)
1551.0	1550.0	-100 dbm	1	0.0000	---	---

To sort the results according to a precise criterion:

Click the corresponding header.

A first click will sort the columns alphabetically, while a second click will reverse the order.

To add more measurements to your test:

In either tab, click **Loop for more measurements**.

This will return you to the **Ref. Meter Measurement** step (see *Storing Reference Power Meter Measurements Automatically* on page 73 for details).

Managing Calibration Reports

Once your calibration is complete, you can view the corresponding report on screen in the **Report** window. This report is available as a short and long form, the difference between the two being that in the short report, you will not see more detailed information pertaining to uncertainties.

You can store your report for further use or consultation from this window, as well as print it if a printer is connected to your IQS platform (refer to the corresponding user guide for more information on how to connect and use a printer with your system).

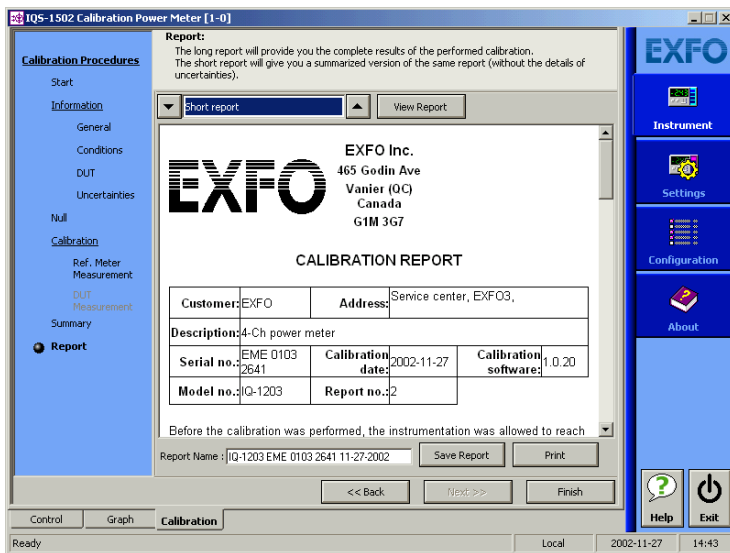
You can also personalize your reports by adding your own company logo.

Calibrating Other Power Meters with the IQS-1500

Managing Calibration Reports

To toggle between the long and short report forms:

1. In the **Report** window, select the type of report you want to view by using the up and down arrow buttons.



2. Click **View Report** to update the report window and see the type of report you have chosen.

To save the report for a later use:

1. Type the name of the report in the **Report Name** box.
2. Click **Save Report**.

You will be prompted to navigate to the desired location for storing the file.

3. Confirm your choice. You will be returned to the **Report** window.

To print the report:

Click **Print**.

A standard Windows print dialog box appears and allows you to select the printing details pertaining to your setup.

To change the logo on your report:

1. Locate where your report files are stored.

The usual path should be *[drive where IQS Manager is installed]/IQS Manager/User Files/Iqs 1x00/Res/*. If not, use Windows Explorer to locate the files.

2. Replace the *Logo.jpg* file by the picture file of your choice.

The reports will now print with your chosen picture file.

10 **Monitoring Power Meter Modules**

When using your IQS-1100/IQS-1500 Power Meters module, either alone or with other modules in a test setup, you can view module data and status using its monitor window in IQS Manager.

Using Monitor Windows

Monitor windows display basic data about modules. A combination of resizable windows allows you to create an integrated data display (refer to the platform user guide).

From the monitor window, you can change module parameters either by:

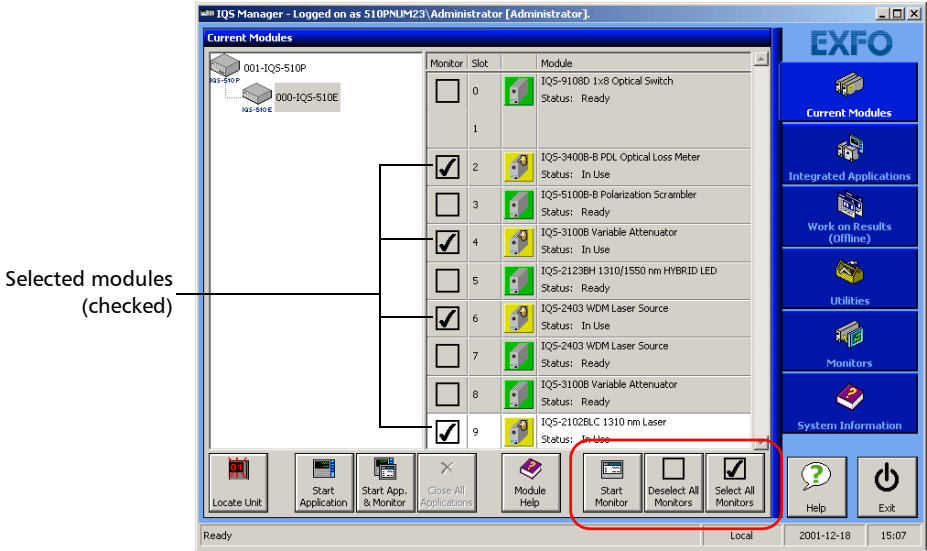
- opening the module application to access all the functions
- OR
- using the QuickTools utility, which provides frequently used functions from the application.

Monitoring Power Meter Modules

Using Monitor Windows

To select modules and display their monitor windows:

1. On the **Current Modules** function tab, select the controller or expansion unit containing the modules you want to monitor.



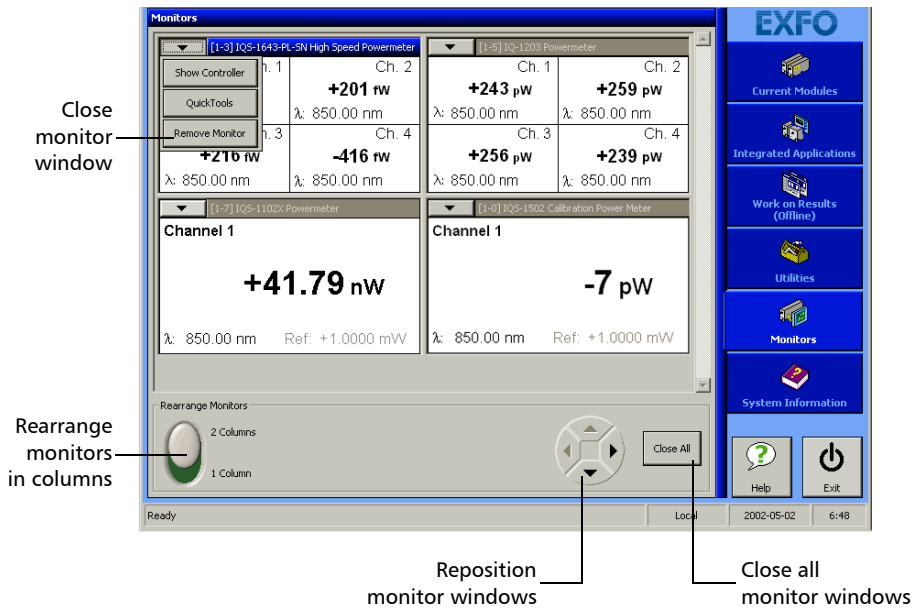
2. In the **Monitor** column, select the box next to each module you want to monitor.

If you want to monitor all the modules *in the current unit*, click **Select All Monitors**. If you want to clear your choices, click **Deselect All Monitors**.

3. Click **Start Monitor** to apply your selection.

IQS Manager will display the selected monitor windows on the **Monitors** function tab.

Note: To start the highlighted module's corresponding application at the same time, click **Start App. & Monitor**. The application will appear in a different window.



Monitoring Power Meter Modules

Using QuickTools

Using QuickTools

With QuickTools, you can fine-tune your module directly, while keeping an eye on your entire test setup.

Note: You can only access QuickTools if the module's monitor window is selected from the **Monitors** function tab and is currently active.

To start QuickTools:

1. From the **Monitors** function tab, elect the monitor window of the module you wish to control.
2. Using the arrow button in the upper left corner, select **QuickTools**.

The corresponding monitor window flashes when QuickTools is activated.

Note: If you want to open the actual application for your module rather than QuickTools, click **Show Controller**.



IQS-1100



IQS-1500

To close QuickTools:

Click the **Close** button located at the top of the window.

OR

Click outside the QuickTools window.

To close a monitor window:

Click the button on the upper left of the monitor window and select **Remove Monitor**.

OR

Click the **Close All** button at the bottom of the window.

11 Maintenance

To help ensure long, trouble-free operation:

- Always clean fiber-optic connectors before using them.
- Keep the unit free of dust.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store unit at room temperature in a clean and dry area. Keep the unit out of direct sunlight.
- Avoid high humidity or significant temperature fluctuations.
- Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, turn off the power immediately and let the unit dry completely.



WARNING

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

Cleaning Fixed Connectors

Regular cleaning of connectors will help maintain optimum performance. *Do not try to disassemble the unit. Doing so would break the connector.*

To clean fixed connectors:

1. Fold a lint-free wiping cloth in four to form a square.
2. Moisten the center of the lint-free wiping cloth with *only one drop* of isopropyl alcohol.



IMPORTANT

Alcohol may leave traces if used abundantly. Avoid contact between the tip of the bottle and the wiping cloth, and do not use bottles that distribute too much alcohol at a time.

3. Gently wipe the connector threads three times with the folded and moistened section of the wiping cloth.



IMPORTANT

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

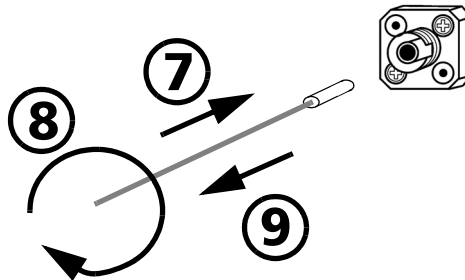
4. With a dry lint-free wiping cloth, gently wipe the same surfaces three times with a rotating movement.
5. Throw out the wiping cloths after one use.
6. Moisten a cleaning tip (2.5 mm tip) with *only one drop* of isopropyl alcohol.



IMPORTANT

Alcohol may leave traces if used abundantly. Avoid contact between the tip of the bottle and the cleaning tip, and do not use bottles that distribute too much alcohol at a time.

7. Slowly insert the cleaning tip into the connector until it reaches the ferrule inside (a slow clockwise rotating movement may help).



8. Gently turn the cleaning tip one full turn.
9. Continue to turn as you withdraw the cleaning tip.
10. Repeat steps 7 to 9, but this time with a dry cleaning tip (2.5 mm tip provided by EXFO).

Note: *Make sure you don't touch the soft end of the cleaning tip and verify the cleanliness of the cotton tip.*

11. Throw out the cleaning tips after one use.

Cleaning Detector Ports

Regular cleaning of detectors will help maintain measurement accuracy.



IMPORTANT

Always cover detectors with protective caps when unit is not in use.

To clean detector ports:

1. Remove the protective cap and adapter (FOA) from the detector.
2. If the detector is dusty, blow dry with compressed air.
3. Being careful not to touch the soft end of the swab, moisten a cleaning tip with *only one drop* of isopropyl alcohol.



IMPORTANT

Alcohol may leave traces if used abundantly. Do not use bottles that distribute too much alcohol at a time.

4. While applying light pressure (to avoid breaking the detector window), gently rotate the cleaning tip on the detector window.
5. Repeat step 4 with a dry cleaning tip or blow dry with compressed air.
6. Discard the cleaning tips after one use.

Recalibrating the Unit

Manufacturing and service center calibrations are based on the ISO/IEC 17025 Standard, which states that calibration documents must not contain a recommended calibration interval, unless this has been previously agreed upon with the customer.

Validity of specifications depends on operating conditions. For example, the calibration validity period can be longer or shorter depending on the intensity of use, environmental conditions and unit maintenance. You should determine the adequate calibration interval for your unit according to your accuracy requirements.

Under normal use, EXFO recommends calibrating your unit every year.

Maintenance

Recycling and Disposal (Applies to European Union Only)

Recycling and Disposal (Applies to European Union Only)



Recycle or dispose of your product (including electric and electronic accessories) properly, in accordance with local regulations. Do not dispose of it in ordinary garbage receptacles.



This equipment was sold after August 13, 2005 (as identified by the black rectangle).

- Unless otherwise noted in a separate agreement between EXFO and a customer, distributor or commercial partner, EXFO will cover costs related to the collection, treatment, recovery, and disposal of end-of-lifecycle waste generated by electronic equipment introduced after August 13, 2005 to an European Union member state with legislation regarding Directive 2002/96/EC.
- Except for reasons of safety or environmental benefit, equipment manufactured by EXFO, under its brand name, is generally designed to facilitate dismantling and reclamation.

For complete recycling/disposal procedures and contact information, visit the EXFO Web site at www.exfo.com/recycle.

12 Troubleshooting

Solving Common Problems

Problem	Probable Cause	Recommended Action
LED push button does not illuminate.	Power is not on.	Check AC power cord and turn on the Intelligent Test System units.
	Module is not properly inserted.	Turn off the Intelligent Test System units, then remove and reinsert the module.
	Unit has locked up.	Reboot the Intelligent Test System.
	LED is burnt out.	Call EXFO.
Pressing LED push button does not open the module application's main window.	Computer has locked up.	Reboot the Intelligent Test System.
Power meter does not respond to new commands.	IQS Intelligent Test System still processing remaining commands. «Processing» is displayed in the status bar.	New commands will be executed after completion of current processing.
----- is displayed as power value.	Power level is below the minimum detectable power.	Select an appropriate manual measurement range (lower range) or Autorange.
+++++++ is displayed as power value.	Power level is above the maximum detectable power (saturation).	Select an appropriate manual measurement range (higher range).
		Turn the source off.

Troubleshooting

Solving Common Problems

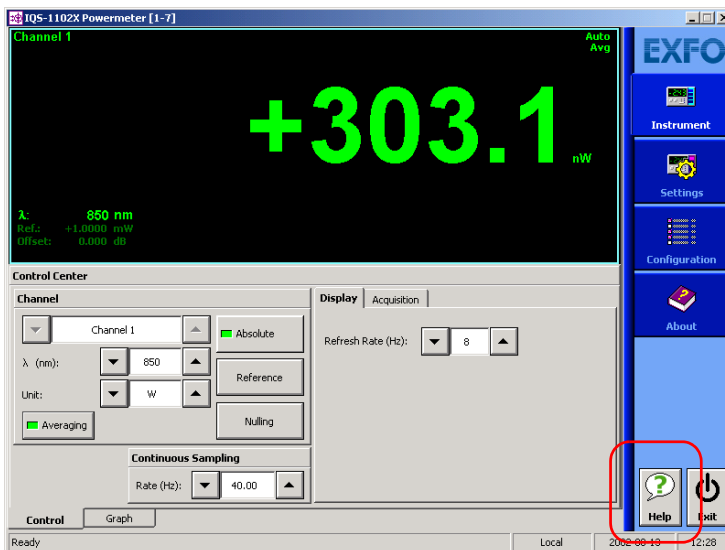
Problem	Probable Cause	Recommended Action
Questionable readings displayed.	The detector or optical connectors are dirty.	Clean the detector and all optical connections.
	The wavelength selection is improper.	Switch to the correct wavelength on all instruments being used.
	The offset nulling is incorrect.	Perform an offset nulling with protective cap installed.
	The optical source is unstable.	Wait for source to stabilize (at least 60 minutes).
	The correction factor is incorrect.	Reset the correction factor to 0.000 dB or 1.000 W/W.

Viewing Online Documentation

An online version of the IQS-1100/IQS-1500 Power Meters user guide is available at all times from the application.

To access the online user guide:

Click **Help** in the function bar.



Troubleshooting

Contacting the Technical Support Group

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, 8:00 a.m. to 7:00 p.m. (Eastern Time in North America).

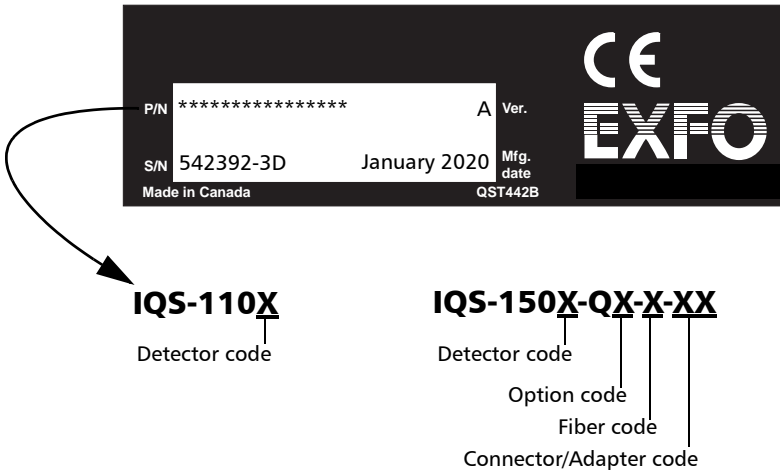
For detailed information about technical support, visit the EXFO Web site at www.exfo.com.

Technical Support Group

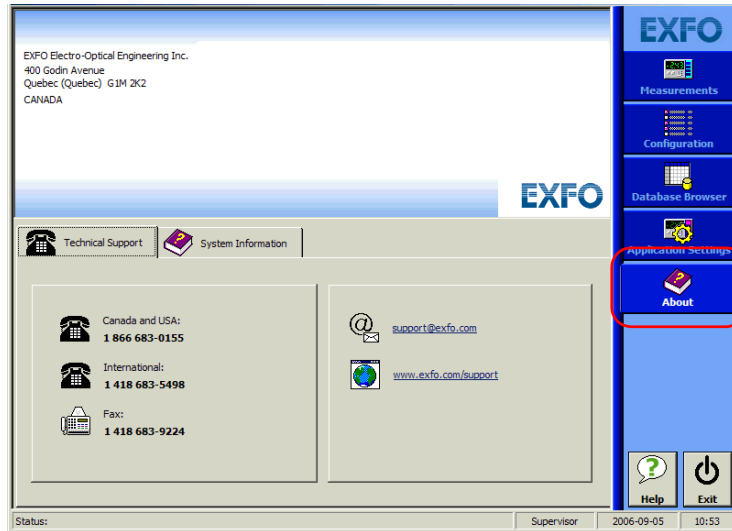
400 Godin Avenue
Quebec (Quebec) G1M 2K2
CANADA

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

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



You may also be requested to provide software and module version numbers. This information, as well as technical support contact information, can be found in the **About** function tab.



- Select the **Technical Support** tab to view phone numbers and active Internet links to EXFO's Technical Support Group. Use these links to send an information request by email or to access EXFO's web site.
- Select the **Module Information** tab to view the module identification, serial number and firmware version.

Transportation

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

- Pack the unit in its original packing material when shipping.
- Avoid high humidity or large temperature fluctuations.
- Keep the unit out of direct sunlight.
- Avoid unnecessary shocks and vibrations.

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 verify and adjust the product free of charge should the equipment need to be repaired or if the original calibration is erroneous. If the equipment is sent back for verification of calibration during the warranty period and found to meet all published specifications, EXFO will charge standard calibration fees.

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

Liability

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

EXFO shall not be liable for damages resulting from improper usage or unauthorized modification of the product, its accompanying accessories and software.

Warranty

Exclusions

Exclusions

EXFO reserves the right to make changes in the design or construction of any of its products at any time without incurring obligation to make any changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps, batteries and universal interfaces (EUI) used with EXFO products are not covered by this warranty.

This warranty excludes failure resulting from: improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the product or other factors beyond EXFO's control.

Certification

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

Service and Repairs

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

To send any equipment for service or repair:

1. Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 104). Support personnel will determine if the equipment requires service, repair, or calibration.
2. If equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) number and provide an address for return.
3. If possible, back up your data before sending the unit for repair.
4. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.
5. Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the RMA number on the shipping slip. *EXFO will refuse and return any package that does not bear an RMA number.*

Note: *A test setup fee will apply to any returned unit that, after test, is found to meet the applicable specifications.*

After repair, the equipment will be returned with a repair report. If the equipment is not under warranty, you will be invoiced for the cost appearing on this report. EXFO will pay return-to-customer shipping costs for equipment under warranty. Shipping insurance is at your expense.

Routine recalibration is not included in any of the warranty plans. Since calibrations/verifications are not covered by the basic or extended warranties, you may elect to purchase FlexCare Calibration/Verification Packages for a definite period of time. Contact an authorized service center (see *EXFO Service Centers Worldwide* on page 104).

Warranty

EXFO Service Centers Worldwide

EXFO Service Centers Worldwide

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

EXFO Headquarters Service Center

400 Godin Avenue
Quebec (Quebec) G1M 2K2
CANADA

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

EXFO Europe Service Center

Omega Enterprise Park, Electron Way
Chandlers Ford, Hampshire S053 4SE
ENGLAND

Tel.: +44 2380 246810
Fax: +44 2380 246801
europe.service@exfo.com

EXFO China Service Center/ Beijing OSIC

Beijing New Century Hotel
Office Tower, Room 1754-1755
No. 6 Southern Capital Gym Road
Beijing 100044
P. R. CHINA

Tel.: +86 (10) 6849 2738
Fax: +86 (10) 6849 2662
beijing.service@exfo.com

A Technical Specifications



IMPORTANT

The following technical specifications can change without notice. The information presented in this section is provided as a reference only. To obtain this product's most recent technical specifications, visit the EXFO Web site at www.exfo.com.

Model	IQS-1102X	IQS-1103
Detector type	GeX	InGaAs
Detector size (mm)	2	1
Wavelength range (nm)	750 to 1700	800 to 1700
Power range ² (dBm)	20 to -75	9 to -100
Uncertainty ³ (dB)	± 5 % (1000 to 1650 nm) (+10 to -35 dBm)	± 5 % (1000 to 1640 nm) (0 to -60 dBm)
Linearity ⁴ (dB)	± 0.015 (10 to -35 dBm)	± 0.015 (0 to -60 dBm)
Power resolution ⁴ (dB)	0.001 (20 to -35 dBm)	0.001 (9 to -60 dBm)
Wavelength resolution (nm)	1	1
Fiber type (µm)	5/125 to 62.5/125	5/125 to 62.5/125

Instrument Drivers

LabVIEW™ drivers, SCPI commands and COM/DCOM libraries

Remote Control

With IQS-500: GPIB (IEEE-488.1, IEEE-488.2) Ethernet and RS-232.

Standard Accessories

User Guide; one fiber-optic adapter per channel; Certificate of Compliance; Certificate of Calibration.

General Specifications

IQS-1100

Dimensions (H x W x D)	12.5 cm x 3.6 cm x 28.2 cm (4 15/16 in x 1 7/16 in x 11 1/8 in)
Weight	0.63 kg (1.4 lb)
Temperature (operating)	0 °C to 40 °C (32 °F to 104 °F)
(storage)	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity ⁵	0 % to 80 % non-condensing

Notes

- All power specifications are at 1310 nm unless otherwise specified, and after a warmup period of 20 minutes followed by an offset nulling.
- From 0 °C to 30 °C.
- At 23 °C ± 1 °C with FOA-222. For GeX detectors, add 1 % to uncertainty below 1000 nm, and 3 % over 1650 nm. For InGaAs detectors, add 1 % to uncertainty below 1000 nm and 6 % over 1640 nm. All uncertainties were valid on the day of calibration.
- For a temperature that is stable within ± 1 °C in the 0 °C to 40 °C range.
- Measured in the 0 °C to 40 °C range.

Technical Specifications

Model	IQS-1502-Q0	IQS-1502-Q1
Detector type	Ge	Ge
Detector size (mm)	5	5
Power range ¹ (dBm)	+5 to -60	+5 to -60
Wavelength range (nm)	750 to 1800	750 to 1800
Linearity ² (dB)	± 0.01 (+5 dBm to -50 dBm)	± 0.01 (+5 dBm to -50 dBm)
Uncertainty ³	± 2 % ^b (at 1310.0 ± 0.1 nm and 1550.0 ± 0.1 nm) (0 dBm to -10 dBm CW)	≤ ± 0.9 % ^a at 3 λ (-10 dBm CW)
	± 3 % ^c (750 nm to 1700 nm) (-30 dBm to -40 dBm CW)	± 3 % ^d (750 nm to 1700 nm) (-30 dBm to -40 dBm CW)
Power resolution (dB)	0.001	0.001
Wavelength resolution (nm)	0.1	0.1
Applicable fiber type (μm)	9/125 (B); 50/125 (C); 62.5/125 (D)	9/125 (B); 50/125 (C); 62.5/125 (D)
Connector type ⁵	B: 89	B: 58; 88; 89; 90; 91 C/D: 50; 54; 74

GENERAL SPECIFICATIONS

Size (H × W × D)	12.5 cm × 3.6 cm × 28.2 cm	(4 ⁹ / ₁₆ in × 1 ⁷ / ₁₆ in × 11 ¹ / ₁₆ in)
Weight	0.63 kg	(1.4 lb)
Temperature operating	23 °C ± 5 °C	(73 °F ± 9 °F)
storage	-40 °C to 70 °C	(-40 °F to 158 °F)
Relative humidity	0 % to 80 % non-condensing	

Notes

- At 1310 nm and 1550 nm.
- At a ± 1 °C constant temperature.
- Q0 option, uncertainty at EXFO reference conditions:
 - ± 2 % uncertainty at (1310.0 ± 0.1) nm and (1550.0 ± 0.1) nm, with 9/125 μm (B) fiber, and source spectral width (FWHM) < 10 nm.
 - ± 3 % uncertainty from 750 nm to 1700 nm, with 62.5/125 μm (D) fiber, and source spectral width (FWHM) ≤ 12 nm.
- FC/UPC connector (ceramic ferrule) with FOA-322.
- Q1 option, calibration at NIST
 - ± 0.9 % uncertainty at three user-specified wavelengths within the following ranges at NIST reference conditions:
 - 786 nm ± 0.5 nm (840 to 860) nm ± 0.25 nm (1280 to 1330) nm ± 0.25 nm (1520 to 1625) nm ± 0.25 nm
 - 9/125 to 62.5/125 μm (B to D) fiber.
 - FC, ST or SC connector.
 - Fiber-optic adapter (FOA) used at NIST.
 - Source spectral width (FWHM) < 10 nm.
- ± 3 % uncertainty from 750 nm to 1700 nm, 62.5/125 μm (D) fiber, source spectral width (FWHM) < 12 nm, and FC/UPC connector (ceramic ferrule) with FOA-322.
- See Ordering Information for details.
- All uncertainties are valid on the day of calibration after a warm-up time of 20 minutes, and specified with a 95 % confidence level.
- Test jumper FC/UPC only
- Singlemode only
- Multimode only

B SCPI Command Reference

This appendix presents detailed information on the commands and queries supplied with your IQS-1100/IQS-1500 Power Meters.



IMPORTANT

Since the IQS controllers and expansion units can house many instruments, you must explicitly specify which instrument you want to remotely control.

You must add the following mnemonic *at the beginning of any command or query* that you send to an instrument (except for IEEE 488.2 and platform commands):

LINstrument<LogicalInstrumentPos>:

where *<LogicalInstrumentPos>* corresponds to the identification number of the instrument.

IQS controller or expansion unit
identification number (for example, 001)



Instrument slot number (0 to 9)

For information on modifying unit identification, refer to your platform user guide.

Quick Reference Command Tree

Command						Parameter(s)	P.
ABORt[1..n]							110
FETCh[1..n]	[SCALar]	POWer	DC?				111
FORMat[1..n]	[DATA]					<FormatData>	112
	[DATA]?						113
INTiate[1..n]	[IMMediate]						114

SCPI Command Reference

Quick Reference Command Tree

Command					Parameter(s)	P.
	CONTinuous				<ContinuousAcquisition>	115
	CONTinuous?					116
MMEMory[1..n]	ACQquisition				<StartStop>,CONT	117
	ACQquisition?					119
	ACQquisition	DURation			<TimeHour>,<TimeMinute>,<TimeSecond>	120
		DURation?				121
	FNAME				<FileName>	122
	FNAME?					123
READ[1..n]	[SCALar]	POWER	DC?			124
SENSe[1..n]	AVERage	[STATe]			<AverageState>	126
		[STATe]?				127
	CORRection	COLLect	ZERO			128
				ALL		129
				ASYNchronous		130
					ALL	131
		OFFSet	[MAGNitude]		<CorrectionOffset[<wsp>W/W DB]> MAXimum MINimum DEFault	132
			[MAGNitude]?		[MINimum MAXimum DEFault]	133
	FREQuency	CONTinuous			<ContinuousRate[<wsp>HZ]>	135
		CONTinuous?				136
		CONTinuous	CATalog?			137
	POWER	[DC]	REFerence?			138
			REFerence	ALL		139

SCPI Command Reference

Quick Reference Command Tree

Command				Parameter(s)	P.
			DISPlay		140
			STATe	<ReferenceState>	141
			STATe?		142
		UNIT		DBM W	143
		UNIT?			144
		WAVelength		<Wavelength> MAXimum MINimum DEFault	145
		WAVelength?		[MINimum MAXimum DEFault]	147
SLINstrument	CATalog?				149
	CATalog	FULL?			150
SNUMber?					151
STATus?					152
STATus	OPERation	BIT[1..n]	CONDition?		153
UNIT[1..n]	POWer			DB DBM W W/W WATT WATT/WATT	154
	POWer?				155

Product-Specific Commands—Description

:ABORt[1..n]	
Description	This command is used to stop the acquisition currently in progress.
Syntax	:ABORt[1..n]
Parameter(s)	None
Example(s)	INIT:CONT ON ABOR
See Also	INITiate:CONTinuous INITiate:CONTinuous? INITiate:IMMediate MMEMory:ACQuisition MMEMory:ACQuisition?

:FETCh[1..n][:SCALAr]:POWer:DC?

Description	This query returns the stored value on the specified channel. To fetch a specific channel, enter the channel number as a suffix of the FETC keyword. The maximum channel is device-dependent. Channel 1 is always used by default.
Syntax	:FETCh[1..n][:SCALAr]:POWer:DC?
Parameter(s)	None
Response Syntax	<PowerMeasurement>
Response(s)	<i>PowerMeasurement:</i> The response data syntax for <PowerMeasurement> is defined as a <NR3 NUMERIC RESPONSE DATA> element. It is the stored value on the specified channel. The number of digits after the decimal point depends on the selected resolution. To know the current measurement unit, use the SENS:POW:DC:UNIT
Example(s)	INIT:IMM FETC1:POW:DC?
See Also	READ:SCALAr:POWer:DC? SENS:POW:DC:UNIT?

SCPI Command Reference

Product-Specific Commands—Description

:FORMat[1..n][:DATA]

Description	This command changes the resolution of the power value when dB or dBm is selected for the specified channel.
Syntax	:FORMat[1..n][:DATA] <wsp> <FormatData>
Parameter(s)	<p><i>FormatData:</i></p> <p>The program data syntax for <FormatData> is defined as a <DECIMAL NUMERIC PROGRAM DATA> element.</p> <p>Changes the data format. The <FormatData> parameter can be :</p> <ul style="list-style-type: none">0 -Zero digit after the decimal point1 -One digit after the decimal point2 -Two digit after the decimal point3 -Three digit after the decimal point4 -Four digit after the decimal point5 -Autoresolution
Example(s)	FORM:DATA 3
See Also	FORMat[:DATA]?

:FORMat[1..n][:DATA]?

Description	This query returns the resolution of the power value when dB or dBm is selected for the specified channel.
Syntax	:FORMat[1..n][:DATA]?
Parameter(s)	None
Response Syntax	<FormatData>
Response(s)	<p><i>FormatData:</i></p> <p>The response data syntax for <FormatData> is defined as a <NR3 NUMERIC RESPONSE DATA> element.</p> <p>This query returns the data format. The <FormatData> parameter can be :</p> <ul style="list-style-type: none"> 0 -Zero digit after the decimal point 1 -One digit after the decimal point 2 -Two digit after the decimal point 3 -Three digit after the decimal point 4 -Four digit after the decimal point 5 -Autoresolution
Example(s)	FORM:DATA?
See Also	FORMat[:DATA]

SCPI Command Reference

Product-Specific Commands—Description

:INITiate[1..n][:IMMEDIATE]

Description	This command stores one value in the buffer for all channels.
Syntax	:INITiate[1..n][:IMMEDIATE]
Parameter(s)	None
Example(s)	INIT:IMM FETC1:POW:DC? or INIT FETC1:POW:DC?
See Also	FETCh[:SCAL]:POWer:DC? READ[:SCAL]:POWer:DC? ABORt INITiate:CONTinuous MMEMory:ACQuisition

:INITiate[1..n]:CONTInuous

Description	Sets continuous acquisition mode and starts or stops the acquisition.
Syntax	:INITiate[1..n]:CONTInuous <wsp> <Continuous Acquisition>
Parameter(s)	<p><i>ContinuousAcquisition:</i></p> <p>The program data syntax for <ContinuousAcquisition> is defined as a <Boolean Program Data> element. The <ContinuousAcquisition> special forms ON and OFF are accepted on input for increased readability. ON corresponds to 1 and OFF corresponds to 0.</p> <p>This parameter changes the continuous acquisition status: 0 or OFF - Stops continuous acquisition. 1 or ON - Starts continuous acquisition.</p>
Example(s)	<pre>INIT:CONT ON INIT:CONT OFF</pre>
See Also	<pre>ABORt INITiate:CONTInuous? MMEMory:ACQuisition MMEMory:ACQuisition?</pre>

:INITiate[1..n]:CONTInuous?

Description	This query returns a value indicating if a continuous acquisition is in progress.
Syntax	:INITiate[1..n]:CONTInuous?
Parameter(s)	None
Response Syntax	<ContinuousAcqState>
Response(s)	<i>ContinuousAcqState:</i> The response data syntax for <ContinuousAcqState> is defined as a <NR1 NUMERIC RESPONSE DATA> element. This parameter allows to set the state of continuous acquisition. 0 - Continuous acquisition is stopped. 1 - Continuous acquisition is running.
Example(s)	INIT:CONT?
See Also	ABORt INITiate:CONTInuous MMEMory:ACQquisition MMEMory:ACQquisition?

:MMEMory[1..n]:ACQquisition

Description	<p>This command initiates a data acquisition. Acquires data at the selected sampling rate. The acquisition will be saved to the system hard disk in the file : <filename to specified> The acquisition will continue for the duration specified in the MMEM:ACQ:DUR command.</p>
Syntax	:MMEMory[1..n]:ACQquisition<wsp><StartStop> ,CONT
Parameter(s)	<p>➤ <i>StartStop:</i></p> <p>The program data syntax for <StartStop> is defined as a <Boolean Program Data> element. The <StartStop> special forms ON and OFF are accepted on input for increased readability. ON corresponds to 1 and OFF corresponds to 0.</p> <p>This parameter allows to change the state of an acquisition: 0 or OFF - Stops the acquisition. 1 or ON - Starts the acquisition.</p> <p>➤ <i>AcqType:</i></p> <p>The program data syntax for the second parameter is defined as a <CHARACTER PROGRAM DATA> element. The allowed <CHARACTER PROGRAM DATA> element for this parameter is CONT.</p>

:MMEMory[1..n]:ACQquisition

The acquisition state can be modified with:
CONT -sets the Continuous acquisition rate.

Example(s)

MMEM:ACQ 1, CONT
MMEM:ACQ?
MMEM:ACQ 0, CONT

See Also

MMEMory:ACQquisition?
MMEMory:ACQquisition:DURation
MMEMory:ACQquisition:DURation?
ABORt
INITiate:CONTinuous
INITiate:IMMEDIATE

:MMEMory[1..n]:ACQquisition?

Description	This query returns the acquisition flag. 0 - No memory acquisition running. 1 - Memory acquisition running.
Syntax	:MMEMory[1..n]:ACQquisition?
Parameter(s)	None
Response Syntax	<AcqOnOff>
Response(s)	<i>AcqOnOff</i> : The response data syntax for <AcqOnOff> is defined as a <NR1 NUMERIC RESPONSE DATA> element.
Example(s)	This query returns the current memory acquisition state: 0 - Memory acquisition is off. 1 - Memory acquisition is on. MMEM:ACQ 1, CONT MMEM:ACQ? MMEM:ACQ 0, CONT MMEM:ACQ?
See Also	MMEMory:ACQquisition MMEMory:ACQquisition:DURation MMEMory:ACQquisition:DURation? ABORt INITiate:CONTinuous INITiate:IMMEDIATE

:MMEMory[1..n]:ACQquisition:DURation

Description	This command is used to set the duration of an acquisition.
Syntax	:MMEMory[1..n]:ACQquisition:DURation<wsp><TimeHour>,<TimeMinute>,<TimeSecond>
Parameter(s)	<p>➤ <i>TimeHour</i>: The program data syntax for <TimeHour> is defined as a <DECIMAL NUMERIC PROGRAM DATA> element.</p> <p>Used to set the duration of acquisition in hours.</p> <p>➤ <i>TimeMinute</i>: The program data syntax for <TimeMinute> is defined as a <DECIMAL NUMERIC PROGRAM DATA> element.</p> <p>Used to set the duration of acquisition in minutes.</p> <p>➤ <i>TimeSecond</i>: The program data syntax for <TimeSecond> is defined as a <DECIMAL NUMERIC PROGRAM DATA> element.</p> <p>Used to set the duration of acquisition in seconds.</p>
Example(s)	MMEM:ACQ:DUR 1,1,1
See Also	MMEMory:ACQquisition:DURation? MMEMory:ACQquisition INITiate:CONTinuous

:MMEMory[1..n]:ACQquisition: DURation?

Description	This query returns the duration of the acquisition.
Syntax	:MMEMory[1..n]:ACQquisition:DURation?
Parameter(s)	None
Response Syntax	<AcqTime>
Response(s)	<p><i>AcqTime:</i></p> <p>The response data syntax for <AcqTime> is defined as a <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA> element.</p> <p>This query returns the duration for the acquisition in hour, minute, second format.</p>
Example(s)	MMEM:ACQ:DUR?
See Also	MMEMory:ACQquisition:DURation MMEMory:ACQquisition INITiate:CONTinuous

SCPI Command Reference

Product-Specific Commands—Description

:MMEMory[1..n]:FNAME

Description	This command is used to set the acquisition file's name and storage location.
Syntax	:MMEMory[1..n]:FNAME<wsp><FileName>
Parameter(s)	<i>FileName:</i> The program data syntax for <FileName> is defined as a <STRING PROGRAM DATA> element. Changes the file name and storage location. Example: PmACQ.tra or D:IQS ManagerUser FilesIqs1x00PmACQ.tra
Example(s)	MMEM:FNAME PmACQ.tra
See Also	MMEMory:FNAME?

:MMEMory[1..n]:FNAME?

Description	This query returns the acquisition file's name and storage location.
Syntax	:MMEMory[1..n]:FNAME?
Parameter(s)	None
Response Syntax	<FileName>
Response(s)	<p><i>FileName:</i></p> <p>The response data syntax for <FileName> is defined as a <STRING RESPONSE DATA> element.</p> <p>This query returns the files name and storage location. Response format: D:IQS ManagerUser FilesIqs1x00PmACQ.tra</p>
Example(s)	MMEM:FNAME?
See Also	MMEMory:NAME

SCPI Command Reference

Product-Specific Commands—Description

:READ[1..n][:SCALAr]:POWER:DC?

Description	<p>This query performs an "initiate and fetch" on the specified channel. A measurement value is stored and returned.</p> <p>To read a specific channel, enter the channel number as a suffix of the READ keyword. The maximum channel is device-dependent. Channel 1 is always used by default.</p>
Syntax	:READ[1..n][:SCALAr]:POWER:DC?
Parameter(s)	None
Response Syntax	<PowerMeasurement>
Response(s)	<p><i>PowerMeasurement:</i></p> <p>The response data syntax for <PowerMeasurement> is defined as a <NR3 NUMERIC RESPONSE DATA> element.</p> <p>This query returns the current power. If the returned value is:</p> <p>9221120237577961472, power is under range 9221120238114832384, power is over range 9221120238651703296, power is invalid 9221120239188574208, channel is inactive</p>

:READ[1..n][:SCALar]:POWer:DC?

Example(s)

READ:SCAL:POW:DC? Returns -1.254000E+001
 READ:SCAL:POW:DC? Returns
 9221120237577961472 (UNDERRANGE)
 READ:SCAL:POW:DC? Returns
 9221120238114832384 (OVERRANGE)

READ:SCAL:POW:DC? Returns
 9221120238651703296 (INVALID)
 READ:SCAL:POW:DC? Returns
 9221120239188574208 (INACTIVE)

See Also

INITiate:IMMediate
 FETCh:SCALar:POWer:DC?

SCPI Command Reference

Product-Specific Commands—Description

:SENSe[1..n]:AVERAge[:STATe]

Description	This command turns the averaging ON or OFF.
Syntax	:SENSe[1..n]:AVERAge[:STATe] <wsp> <Average State>
Parameter(s)	<i>AverageState:</i> The program data syntax for <AverageState> is defined as a <Boolean Program Data> element. The <AverageState> special forms ON and OFF are accepted on input for increased readability. ON corresponds to 1 and OFF corresponds to 0. State of averaging: 0 or OFF -Disables Averaging 1 or ON -Enables Averaging
Example(s)	SENS:AVER:STAT ON
See Also	SENSe:AVERAge:STATe?

:SENSe[1..n]:AVERAge[:STATe]?	
Description	This query returns the current averaging state.
Syntax	:SENSe[1..n]:AVERAge[:STATe]?
Parameter(s)	None
Response Syntax	<AverageState>
Response(s)	<p><i>AverageState:</i></p> <p>The response data syntax for <AverageState> is defined as a <NR1 NUMERIC RESPONSE DATA> element.</p> <p>State of averaging. 0 -Averaging is disabled 1 -Averaging is enabled</p>
Example(s)	SENS:AVER:STAT?
See Also	SENSe:AVERAge:STATe

:SENSe[1..n]:CORRection:COLLect: ZERO

Description	This command performs an synchronous offset nulling on the specified channel.
Syntax	:SENSe[1..n]:CORRection:COLLect:ZERO
Parameter(s)	None
Example(s)	SENS1:CORR:COLL:ZERO
Notes	This command is not executed if a data acquisition is in progress. In that case, the "acquisition in progress" message will be returned. This command will take at least 30 seconds to complete.
See Also	SENSe:CORRection:COLLect:ZERO:ALL SENSe:CORRection:COLLect:ZERO:ASYNchronous SENSe:CORRection:COLLect:ZERO:ASYNchronous:ALL

**:SENSe[1..n]:CORRection:COLLect:
ZERO:ALL**

Description	This command performs an synchronous offset nulling measurement on all channels.
Syntax	:SENSe[1..n]:CORRection:COLLect:ZERO:ALL
Parameter(s)	None
Example(s)	SENS:CORR:COLL:ZERO:ALL
Notes	This command is not executed if a data acquisition is in progress. In that case, the "acquisition in progress" message will be returned. This command will take at least 30 seconds to complete.
See Also	SENSe:CORRection:COLLect:ZERO SENSe:CORRection:COLLect:ZERO:ASYNchronous SENSe:CORRection:COLLect:ZERO:ASYNchronous:ALL

SCPI Command Reference

Product-Specific Commands—Description

:SENSe[1..n]:CORRection:COLLect: ZERO:ASYNchronous

Description	This command performs an asynchronous offset nulling on the specified channel.
Syntax	:SENSe[1..n]:CORRection:COLLect:ZERO:ASYNchronous
Parameter(s)	None
Example(s)	SENS1:CORR:COLL:ZERO:ASYN
Notes	This command is not executed if a data acquisition is in progress. In that case, the "acquisition in progress" message will be returned. This command will take at least 30 seconds to complete.
See Also	SENSe:CORRection:COLLect:ZERO SENSe:CORRection:COLLect:ZERO:ALL SENSe:CORRection:COLLect:ZERO:ASYNchronous:ALL

:SENSe[1..n]:CORRection:COLLect:ZERO:ASYNchronous:ALL

Description	This command performs an asynchronous offset nulling measurement on all channels.
Syntax	:SENSe[1..n]:CORRection:COLLect:ZERO:ASYNchronous:ALL
Parameter(s)	None
Example(s)	SENS:CORR:COLL:ZERO:ASYN:ALL
Notes	This command is not executed if a data acquisition is in progress. In that case, the "acquisition in progress" message will be returned. This command will take at least 30 seconds to complete.
See Also	SENSe:CORRection:COLLect:ZERO SENSe:CORRection:COLLect:ZERO:ALL SENSe:CORRection:COLLect:ZERO:ASYNchronous

**:SENSe[1..n]:CORRection:OFFSet
[:MAGNitude]**

Description	This command sets an offset value. The units are w/w by dEfault. If no channel was specified, the default channel used is 1.
Syntax	:SENSe[1..n]:CORRection:OFFSet[:MAGNitude] <wsp> <CorrectionOffset [<wsp> W/W DB] > MAXimum MINimum DEFault
Parameter(s)	<p><i>CorrectionOffset:</i></p> <p>The program data syntax for <CorrectionOffset> is defined as a <numeric_value> element followed by an optional <SUFFIX PROGRAM DATA> element. The allowed <SUFFIX PROGRAM DATA> elements are: W/W DB. The <CorrectionOffset> special forms MINimum, MAXimum and DEFault are accepted on input.</p> <p>MINimum allows to set the instrument to the smallest supported value. MAXimum allows to set the instrument to the greatest supported value.</p> <p>DEFault allows the instrument to select a value for the <CorrectionOffset> parameter.</p> <p>Sets the offset for the specified channel.</p>
Example(s)	SENS:CORR:OFFS:MAGN 2.0
See Also	SENSe:CORRection:OFFSet:[MAGNitude]?

:SENSE[1..n]:CORREction:OFFSet [:MAGNitude]?

Description	This query returns the offset value in W/W. If no channel was specified, the default channel used is 1.
Syntax	:SENSE[1..n]:CORREction:OFFSet[:MAGNitude]?[<wsp>MINimum MAXimum DEFault]
Parameter(s)	<p><i>Parameter 1:</i></p> <p>The program data syntax for the first parameter is defined as a <CHARACTER PROGRAM DATA> element. The allowed <CHARACTER PROGRAM DATA> elements for this parameter are: MINimum MAXimum DEFault.</p> <p>MINimum is used to retrieve the instrument's smallest supported value. MAXimum is used to retrieve the instrument's greatest supported value. DEFault is used to retrieve the instrument's default value.</p>
Response Syntax	<CorrectionOffset>

:SENSE[1..n]:CORRection:OFFSet [:MAGNitude]?

Response(s)	<i>CorrectionOffset:</i> The response data syntax for <CorrectionOffset> is defined as a <NR3 NUMERIC RESPONSE DATA> element. This query returns the offset for the specified channel
Example(s)	SENS:CORR:OFFS:MAGN?
See Also	SENSe:CORRection:OFFSet:[MAGNitude]

:SENSe[1..n]:FREQuency:CONTInuous

Description	This command sets the continuous acquisition rate in Hz.
Syntax	:SENSe[1..n]:FREQuency:CONTInuous <wsp> <ContinuousRate[<wsp>HZ]>
Parameter(s)	<p><i>ContinuousRate:</i></p> <p>The program data syntax for <ContinuousRate> is defined as a <DECIMAL NUMERIC PROGRAM DATA> element followed by an optional <SUFFIX PROGRAM DATA> element. The allowed <SUFFIX PROGRAM DATA> element is HZ.</p> <p>The <numeric_value> parameter is the Continuous acquisition rate.</p>
Example(s)	SENS:FREQ:CONT 5
Notes	This command is not executed if a data acquisition is in progress. In that case, the "acquisition in progress" message will be returned.
See Also	<p>SENSe:FREQuency:CONTInuous?</p> <p>SENSe:FREQuency:CONTInuous:CATalog?</p>

:SENSe[1..n]:FREQuency:CONTInuous?

Description	This query returns the current continuous acquisition rate in Hz.
Syntax	:SENSe[1..n]:FREQuency:CONTInuous?
Parameter(s)	None
Response Syntax	<ContinuousRate>
Response(s)	<i>ContinuousRate</i> : The response data syntax for <ContinuousRate> is defined as a <NR2 NUMERIC RESPONSE DATA> element.
	This query returns the current continuous acquisition rate.
Example(s)	SENS:FREQ:CONT?
See Also	SENSe:FREQuency:CONTInuous SENSe:FREQuency:CONTInuous:CATalog?

:SENSe[1..n]:FREQuency:CONTInuous: CATalog?

Description	This query returns the list of available continuous acquisition rates in Hz.
Syntax	:SENSe[1..n]:FREQuency:CONTInuous:CATalog?
Parameter(s)	None
Response Syntax	<ContinuousList>
Response(s)	<p><i>ContinuousList:</i></p> <p>The response data syntax for <ContinuousList> is defined as a <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA> element.</p> <p>This query returns the list of available continuous acquisition rates.</p>
Example(s)	SENS:FREQ:CONT:CAT?
See Also	SENSe:FREQuency:CONTInuous SENSe:FREQuency:CONTInuous?

:SENSe[1..n]:POWer[:DC]:REFerence?

Description	This query returns the reference power in watts on specified channel.
Syntax	:SENSe[1..n]:POWer[:DC]:REFerence?
Parameter(s)	None
Response Syntax	<Reference>
Response(s)	<i>Reference:</i> The response data syntax for <Reference> is defined as a <NR3 NUMERIC RESPONSE DATA> element. This query returns the reference value for the specified channel.
Example(s)	SENS:POW:REF?
See Also	SENSe:POWer:[DC]:REFerence:ALL SENSe:POWer:[DC]:REFerence:DISPlay SENSe:POWer:[DC]:REFerence:STAtE SENSe:POWer:[DC]:REFerence:STAtE?

**:SENSe[1..n]:POWer[:DC]:REFerence:
ALL**

Description	This command performs a new reference measurement and changes the display to show relative power (dB or W/W) for all channels.
Syntax	:SENSe[1..n]:POWer[:DC]:REFerence:ALL
Parameter(s)	None
Example(s)	SENS:POW:REF:ALL SENS:POW:REF? SENS2:POW:REF?
Notes	This command is not executed if a data acquisition is in progress. In that case, the "Acquisition in progress" message will be returned.
See Also	SENSe:POWer:[DC]:REFerence? SENSe:POWer:[DC]:REFerence:DISPlay SENSe:POWer:[DC]:REFerence:STATe SENSe:POWer:[DC]:REFerence:STATe?

SCPI Command Reference

Product-Specific Commands—Description

:SENSe[1..n]:POWer[:DC]:REFerence: DISPlay

Description	This command performs a new reference measurement and changes the display to show relative power (dB or W/W) for the specified channel.
Syntax	:SENSe[1..n]:POWer[:DC]:REFerence:DISPlay
Parameter(s)	None
Example(s)	SENS:POW:REF:DISP SENS:POW:REF?
Notes	This command is not executed if a data acquisition is in progress. In that case, the "Acquisition in progress" message will be returned.
See Also	SENSe:POWer[:DC]:REFerence? SENSe:POWer[:DC]:REFerence:ALL SENSe:POWer[:DC]:REFerence:STATe SENSe:POWer[:DC]:REFerence:STATe?

:SENSe[1..n]:POWer[:DC]:REFerence: STATe

Description	This command selects whether absolute (dBm or W) or relative (dB or W/W) power measurements are performed.
Syntax	:SENSe[1..n]:POWer[:DC]:REFerence:STATe <wsp> <ReferenceState>
Parameter(s)	<p><i>ReferenceState:</i></p> <p>The program data syntax for <ReferenceState> is defined as a <Boolean Program Data> element. The <ReferenceState> special forms ON and OFF are accepted on input for increased readability. ON corresponds to 1 and OFF corresponds to 0.</p> <p>The <ReferenceState> parameter is a boolean value representing either dB and W, or dBm and W/W: 0 or OFF - selects absolute units (dBm or W). 1 or ON - selects relative units (dB or W/W).</p>
Example(s)	SENS:POW:REF:STAT 1
Notes	This command is not executed if a data acquisition is in progress. In that case, the "Acquisition in progress" message will be returned.
See Also	SENSe:POWer[:DC]:REFerence? SENSe:POWer[:DC]:REFerence:ALL SENSe:POWer[:DC]:REFerence:DISPlay SENSe:POWer[:DC]:REFerence:STATe?

:SENSe[1..n]:POWer[:DC]:REFerence:STATe?

Description	This query returns a value indicating whether the power meter is displaying absolute (dBm or W) or relative (dB or W/W) power values for the specified channel.
Syntax	:SENSe[1..n]:POWer[:DC]:REFerence:STATe?
Parameter(s)	None
Response Syntax	<ReferenceState>
Response(s)	<i>ReferenceState</i> : The response data syntax for <ReferenceState> is defined as a <CHARACTER RESPONSE DATA> element. Current reference mode, where: 0 - is the absolute mode(dBm or W). 1 - is the relative mode (dB or W/W).
Example(s)	SENS:POW:REF:STAT?
See Also	SENSe:POWer:[DC]:REFerence? SENSe:POWer:[DC]:REFerence:ALL SENSe:POWer:[DC]:REFerence:DISPlay SENSe:POWer:[DC]:REFerence:STATe

:SENSe[1..n]:POWer[:DC]:UNIT	
Description	This command changes the absolute measurement display unit: dBm or W for the specified channel.
Syntax	:SENSe[1..n]:POWer[:DC]:UNIT <wsp>DBM W
Parameter(s)	<p><i>Unit:</i></p> <p>The program data syntax for the first parameter is defined as a <CHARACTER PROGRAM DATA> element. The allowed <CHARACTER PROGRAM DATA> elements for this parameter are: DBM W.</p> <p>Power unit in dBm or Watt, where: DBM - sets the power display to dBm W WATT - sets the power display to Watt (pW,nW,uW,Mw...)</p>
Example(s)	SENS:POW:UNIT W
Notes	This command is not executed if a data acquisition is in progress. In that case, the "Acquisition in progress" message will be returned.
See Also	SENSe:POWer[:DC]:UNIT? UNIT:POWer UNIT:POWer?

SCPI Command Reference

Product-Specific Commands—Description

:SENSe[1..n]:POWer[:DC]:UNIT?

Description	This query returns the current absolute power measurement display unit for the specified channel.
Syntax	:SENSe[1..n]:POWer[:DC]:UNIT?
Parameter(s)	None
Response Syntax	<Unit>
Response(s)	<i>Unit:</i> The response data syntax for <Unit> is defined as a <CHARACTER RESPONSE DATA> element. Current power unit, either DBM or WATT.
Example(s)	SENS:POW:UNIT?
See Also	SENSe:POWer[:DC]:UNIT UNIT:POWer UNIT:POWer?

:SENSe[1..n]:POWer:WAVelength

Description	This command selects a new operating wavelength on the specified channel. If no channel was specified, the default value used is 1.
Syntax	:SENSe[1..n]:POWer:WAVelength<wsp> <Wavelength> MAXimum MINimum DEFault
Parameter(s)	<p><i>Wavelength:</i></p> <p>The program data syntax for <Wavelength> is defined as a <numeric_value> element. The <Wavelength> special forms MINimum, MAXimum and DEFault are accepted on input.</p> <p>MINimum allows to set the instrument to the smallest supported value. MAXimum allows to set the instrument to the greatest supported value. DEFault allows the instrument to select a value for the <Wavelength> parameter.</p> <p>The <wavelength> parameter is an operating wavelength using meter as units. Any wavelength within the spectral range of the instrument optical detector at 1 nm resolution (0.1 nm for the IQS-1500). See the power meter instruction manual for the exact spectral range for each detector type.</p>

SCPI Command Reference

Product-Specific Commands—Description

:SENSe[1..n]:POWER:WAVelength

Example(s)	SENS:POW:WAV 0.000001310 or SENS:POW:WAV 1310 nm
Notes	See the instrument's user guide for the exact spectral range for each detector type.
See Also	SENSe:POWER:WAVelength?

:SENSe[1..n]:POWer:WAVelength?

Description	This query returns the currently selected wavelength on the specified channel. If no channel was specified, the default value used is 1.
Syntax	:SENSe[1..n]:POWer:WAVelength? [<wsp>MINimum MAXimum DEFault]
Parameter(s)	<p><i>Parameter 1:</i></p> <p>The program data syntax for the first parameter is defined as a <CHARACTER PROGRAM DATA> element. The allowed <CHARACTER PROGRAM DATA> elements for this parameter are: MINimum MAXimum DEFault.</p> <p>MINimum is used to retrieve the instrument's smallest supported value. MAXimum is used to retrieve the instrument's greatest supported value. DEFault is used to retrieve the instrument's default value.</p>
Response Syntax	<Wavelength>

:SENSe[1..n]:POWer:WAVeLength?

Response(s)

Wavelength:

The response data syntax for <Wavelength> is defined as a <NR3 NUMERIC RESPONSE DATA> element.

This query returns the current wavelength in meters for the specified channel. Any wavelength within spectral range of the power meter optical detector at 1 nm resolution (0.1 nm for the IQS-1500)

Example(s)

SENS:POW:WAV?

See Also

SENSe:POWer:WAVeLength

:SLINstrument:CATalog?

Description	This query returns a comma-separated list of <STRING RESPONSE DATA>, which contains the names of all channels of the module. If no channels are defined, a single null <STRING RESPONSE DATA> is returned.
	This is not affected by a *RST command.
Syntax	:SLINstrument:CATalog?
Parameter(s)	None
Response Syntax	<Catalog>
Response(s)	<i>Catalog:</i> The response data syntax for <Catalog> is defined as a <STRING RESPONSE DATA> element. The list of <STRING RESPONSE DATA> contains the names of all channels in the module.
Example(s)	SLIN:CAT?
See Also	SLINstrument:CATalog:FULL?

:SLINstrument:CATalog:FULL?

Description	<p>This query returns a list of <STRING RESPONSE DATA> - <NR1 NUMERIC RESPONSE DATA> pairs. The <STRING RESPONSE DATA> contains the names of the channels. The immediately following <NR1 NUMERIC RESPONSE DATA> formatted number is the associated channel number. All response data elements are separated by commas. If no channels are defined, a null <STRING RESPONSE DATA> value, followed by a zero, is returned.</p> <p>This is not affected by a *RST command.</p>
Syntax	:SLINstrument:CATalog:FULL?
Parameter(s)	None
Response Syntax	<Catalog>
Response(s)	<p><i>Catalog:</i></p> <p>The response data syntax for <Catalog> is defined as a <STRING RESPONSE DATA> element.</p> <p>The list of <STRING RESPONSE DATA> contains the names of all channels in the module. The immediately following <NR1 NUMERIC RESPONSE DATA> formatted number is the associated channel number.</p>
Example(s)	SLIN:CAT:FULL?
See Also	SLINstrument:CATalog?

:SNUMber?	
Description	This query returns a value indicating the module's serial number.
Syntax	:SNUMber?
Parameter(s)	None
Response Syntax	<SerialNumber>
Response(s)	<p><i>SerialNumber:</i></p> <p>The response data syntax for <SerialNumber> is defined as a <STRING RESPONSE DATA> element.</p> <p>The <SerialNumber> response represents a string containing the modules serial number.</p>
Example(s)	SNUM? Returns "123456-AB"

SCPI Command Reference

Product-Specific Commands—Description

:STATus?	
Description	This query returns a value indicating the status of the module (READY, BUSY, etc.).
Syntax	:STATus?
Parameter(s)	None
Response Syntax	<Status>
Response(s)	<p><i>Status:</i></p> <p>The response data syntax for <Status> is defined as a <CHARACTER RESPONSE DATA> element.</p> <p>The <Status> response represents the module state, where:</p> <p>UNINITIALIZED, means the module is not initialized. INITINPROGRESS, means the module initialization is in progress, READY, means the module is ready, BUSY, means the module is busy, DISCONNECTED, means the module is disconnected,</p> <p>DEFECTIVE, means the module is defective and UNCONFIGURED, means the module is not configured.</p>
Example(s)	STAT? Returns READY (Module is ready.)

:STATus:OPERation:BIT[1..n]: CONDition?

Description	This query returns the state of a specific bit. For the moment, only bit <8> was developed. This bit is used to return the state of the module. If the bit = 0, the module is ready. If the bit = 1, the module is busy.
Syntax	:STATus:OPERation:BIT[1..n]:CONDition?
Parameter(s)	None
Response Syntax	<StatusOperation>
Response(s)	<p><i>StatusOperation:</i></p> <p>The response data syntax for <StatusOperation> is defined as a <NR3 NUMERIC RESPONSE DATA> element.</p> <p>This query returns the state of the module. If the response = 1, the module is busy, if the response = 0, the module is ready to receive commands.</p>
Example(s)	STAT:OPER:BIT8:COND?
See Also	MMEMemory:ACquisition?

SCPI Command Reference

Product-Specific Commands—Description

:UNIT[1..n]:POWer

Description	The parameter corresponds to the power units for the specified channel.
Syntax	:UNIT[1..n]:POWer<wsp>DB DBM W W/W WATT WATT/WATT
Parameter(s)	<i>Unit:</i> The program data syntax for the first parameter is defined as a <CHARACTER PROGRAM DATA> element. The allowed <CHARACTER PROGRAM DATA> elements for this parameter are: DB DBM W W/W WATT WATT/WATT. Set the power unit for the specified channel.
Example(s)	UNIT:POW DBM
Notes	This command is not executed if a data acquisition is in progress. In that case, the "Acquisition in progress" message will be returned.
See Also	UNIT:POWer? SENSe:POWer[:DC]:UNIT SENSe:POWer[:DC]:UNIT?

:UNIT[1..n]:POWER?

Description	This query returns the current power unit for the specified channel.
Syntax	:UNIT[1..n]:POWER?
Parameter(s)	None
Response Syntax	<PowerUnit>
Response(s)	<i>PowerUnit:</i> The response data syntax for <PowerUnit> is defined as a <CHARACTER RESPONSE DATA> element.
Example(s)	This response corresponds to the current power unit for the specified channel. UNIT:POW?
See Also	UNIT:POWER SENSe:POWER[:DC]:UNIT SENSe:POWER[:DC]:UNIT?

C Calibration Report Sample

Here is an example of long-form report. The short-form report will be similar, but contains less uncertainty-related information.

1 of 2



EXFO Inc.
465 Godin Ave
Vanier (QC) Canada
G1M 3G7

CALIBRATION REPORT

Customer:	EXFO	Address:	Service center, EXFO3,		
Description:	4-Ch power meter				
Serial no.:	EME 0103 2641	Calibration date:	2002-11-27	Calibration software:	1.0.19
Model no.:	IQ-1203	Report no.:	2		

Before the calibration was performed, the instrumentation was allowed to reach equilibrium with the surrounding test environment. The nullings were performed on the reference standard and on the DUT as specified by the manufacturer. The *Calibration conditions* are listed below.

Calibration conditions		
Condition	Value	
Temperature	23 oC +/- 1 oC	
Relative humidity	50 % +/- 10 %	
Source :	Fiber type	SM
	Connector	FC/UPC
IQ-2403 EME 0007 1935	Bandwidth	0.1 nm
	Wavelength	1551.0
Source :	Fiber type	SM
	Connector	FC/UPC
IQ-2404 EME xxxx xxxx	Bandwidth	0.1 nm
	Wavelength	1626.0

Standard used to establish traceability			
Description	Serial number	Calibration date	Calibration due date
IQS-1502 - Calibration power meter	29219-1K	2002-01-22	2003-01-22

The reference standard (calibration power meter) is traceable to NIST.

Calibration summary						
Dut wavelength (nm)	Source wavelength (nm)	Mean power	N	Calibration factor	Standard deviation (%)	Expanded uncertainty (%)
1550.0	1551.00	4.824 dBm	2	0.9802	2.87	5.55
1625.0	1626.0	2.076 dBm	2	0.9857	2.07	4.07

The *Expanded uncertainties* are expressed at approximately a level of confidence of 95 % using a coverage factor of $k = 2$. The DUT readings must be multiplied by the *Calibration factor* to have the correct value.

Calibration Report Sample

2 of 2



4-Ch power meter
 Model no.: IQ-1203
 Serial no.: EME 0103 2641
 Calibration date: 2002-11-27

Calibration uncertainties at DUT wavelength = 1550.0 nm			
Type A uncertainties (%)		Type B uncertainties (%)	
Standard deviation	2.87	Source power stability	1.00
Type A other	1.10	Reference meter spectral sensitivity	1.00
Reference meter calibration uncertainty (%)		DUT spectral sensitivity	1.00
		Setup reproducibility	1.00
Reference meter	2.00	Connector	1.00
		Type B other	1.00

Calibration uncertainties at DUT wavelength = 1625.0 nm			
Type A uncertainties (%)		Type B uncertainties (%)	
Standard deviation	2.07	Source power stability	0.00
Reference meter calibration uncertainty (%)		Reference meter spectral sensitivity	1.00
		DUT spectral sensitivity	1.00
Reference meter	2.00	Setup reproducibility	1.00

Comments:

Prepared by:

_____ 11/27/2002 _____
 Metrologist name Date
 Metrologist
 Metrology Office

Approved by:

_____ Date

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