ADDENDUM

This information applies only to the PM-1100 Optical Power Meter user guide.

GPIB Commands and Queries

➤ The FORM:READ:DATA? query does not exist.

➤ The MMEM:ACQ:DATA:RECA:VALUE? query should be defined as follows:

MMEMory:ACQuisition:DATA:RECAll:VALUE?	
Description	This query returns the measurement saved in the <data> memory location.
Syntax	MMEM:ACQ:DATA:RECA:VALUE?<space><data>
Parameters	The <data> parameter represents the memory location where measurement data is stored (out of the 1024 available).
Response	Measurement data saved in the specified memory location in the "±999.999E±99" format.
Notes	➤ Use the MMEM:ACQ:DATA:RECA:UNIT? query to get the corresponding measurement units. ➤ Use the MMEM:ACQ:DATA:RECA:WAVE? query to get the wavelength at which the measurement was taken.
Example	MMEM:ACQ:DATA:RECA:VALUE? 1021

➤ The MMEM:ACQ:DATA:RECA:WAV? query should be named and defined as follows:

MMEMory:ACQuisition:DATA:RECAll:WAVElength?

Description	This query returns the wavelength corresponding to the last value fetched with the MMEM:ACQ:DATA:RECA:VALUE? query.
Syntax	MMEM:ACQ:DATA:RECA:WAVE?
Response	A wavelength in the "9999 nm" format.
Notes	➤ Use the MMEM:ACQ:DATA:RECA:UNIT? query to get the corresponding measurement units.
	➤ Use the MMEM:ACQ:DATA:RECA:WAVE? query to get the wavelength at which the measurement was taken.
Example	MMEM:ACQ:DATA:RECA:WAVE?

➤ The MMEM:ACQ:SAMP command should be defined as follows:

MMEMory:ACQuisition:SAMPles

Description	This command changes the samples parameter for the acquisition setup.
Syntax	MMEM:ACQ:SAMP<space><samples>
Parameters	The <samples> parameter is the number of samples to be set for the acquisition setup. If an invalid parameter is entered, the closest valid parameter will be entered instead.
Note	The duration of the acquisition directly affects the values that can be set for the number of samples
	D x R = S
	where
	➤ D = duration parameter set with the MMEM:ACQ:DURA command (in seconds)
	➤ R = any of the possible sampling rates in seconds^{-1} (get the complete list with the SENS:FREQ:CATA? query)
	➤ S = valid number of samples (MUST be an integer)
Example	MMEM:ACQ:SAMP 200

➤ The SENS:FREQ:CAT? query should be named and defined as follows:

SENSitivity:FREQuency:CATAlog?	
Description	This query returns a list of available sampling rates.
Syntax	SENS:FREQ:CATA?
Response	List of available sampling rates in the "40.0;20.0;10.0;5.0;1.0;0.5;0.1" format.
Example	SENS:FREQ:CATA?

➤ The SENS:POW:WAV command should be named and defined as follows:

SENSitivity:POWer:WAVElength	
Description	This command selects a new operating wavelength.
Syntax	SENS:POW:WAVE<space><numeric_value> [<space>NM]
Parameters	The <numeric_value> is an operating wavelength expressed in nanometers (nm). Any wavelength within the spectral range of the optical detector (at 1 nm resolution) may be selected. See the section on optical specifications in the user guide for the exact spectral range of each detector type.
Example	SENS:POW:WAVE 1310

➤ The SENS:POW:WAV? query should be named and defined as follows:

SENSitivity:POWer:WAVElength?	
Description	This query returns the currently selected calibrated wavelength.
Syntax	SENS:POW:WAVE?
Response	The current wavelength in nanometers (nm) in the "9999 nm" format.
Example	SENS:POW:WAVE?

➤ The UNIT:POW command should be named and defined as follows:

UNIT:POWer

Description This command changes the measurement display units.

Syntax UNIT:POW<space><units>

Parameters The <units> parameter can be

➤ W: measured value displayed in watts (pw, nw, μw, or mw)

➤ DBM: measured value displayed in dBm

➤ DB: measured value displayed in dB relative to the current reference

➤ DW: measured value displayed in watts relative to the current reference

Example UNIT:POW DBM

➤ The Quick Reference Command Tree should be modified as follows to reflect changes in GPIB commands:

Command					Parameter/ Response	Description
MMEM	ACQ	DATA	RECA	VALUE?	(0 to 1025)	Get acquired measurement
				WAVE?	(9999 nm)	Get wavelength
SENS	FREQ	CATA?			(99.9;99.9;...)	List sampling rates
	POW	WAVE			<9999> [NM]	Set wavelength
		WAVE?			(9999 nm)	Get wavelength
UNIT	POW				<W|DB|DBM|DW>	Set display unit

OPTICAL POWER METER ▌▌▌▌

PM-1100

USER GUIDE

www.EXFO.com
Telecom Test and Measurement

EXFO
EXPERTISE REACHING OUT

Trademarks

EXFO's trademarks have been identified as such. However, the presence or absence of such identification does not affect the legal status of any trademark.

Units of Measurement

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

Version number: 1.0.0

Contents

Contents

Certification Information

F.C.C. Information

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

C€ 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.

CSA Information

This unit is certified by the CSA (certificate number 162451) and was evaluated according to applicable CSA and UL standards (as confirmed by "C-US" mark) as well as applicable IEC standards for use in Canada, the United States, and other countries.

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.

Power Meter Performance Variation

In a 3 V/m radiated field (26 MHz to 1000 MHz, 80 % AM modulation with a 1 kHz sine wave) or with a conducted RF field of 3 V (0.15 MHz to 80 MHz, 80 % AM modulation with a 1 kHz sine wave), the emitted power may vary by $\pm$ 0.1 μW.

Certification Information

EXFO

DECLARATION OF CONFORMITY

Application of Council Directive(s):	73/23/EEC - The Low Voltage Directive
	89/336/EEC - The EMC Directive
Manufacturer's Name:	EXFO ELECTRO-OPTICAL ENG.
Manufacturer's Address:	400 Godin Avenue
	Quebec, Quebec Canada G1M 2K2
Equipment Type/Environment:	Industrial Scientific Equipment
Trade Name/Model No.:	PM-1100 Optical Power Meter

Standard(s) to which Conformity is Declared:

EN 55011:1993   **Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.**

EN 61010-1:1990   **Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.**

EN 61000-3-2:1995   **Electromagnetic Compatibility Part 3: Limits-Section 2: Limits for Harmonic Current Emissions.**

EN 61000-3-3:1994   **Electromagnetic Compatibility Part 3: Limits-Section 3: Limitation of Voltage fluctuations and Flicker in Low-Voltage Supply Systems.**

EN 50082-1:1992   **Generic Immunity for Residential, Commercial, and Light Industrial Environment**

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 19, 1998

1 Introducing the PM-1100 Optical Power Meter

The PM-1100 Optical Power Meter provides accurate power measurements over a wide dynamic range with high resolution and excellent linearity. It is particularly suitable for automated measurements.

The built-in memory lets you store up to 20 preselected wavelengths of the sources under test. The wavelength value is used both to correct power readings and tag stored results.

As many as 10 different user setups may be programmed, each allowing up to 20 wavelengths. You can manually store 512 readings (power level, wavelength, and offset), or 1024 readings using a programmed sequence.

Three models are available. The PM-1101 uses a Si detector for the 450 nm to 1100 nm range, and the PM-1103 uses an InGaAs detector to cover 800 nm to 1700 nm. Both offer a dynamic range of +9 dBm to -100 dBm. The high-power PM-1102X uses a selected germanium detector to cover 750 nm to 1700 nm from +25 dBm to -75 dBm.

The Optical Power Meter's large display can be easily read from a distance or in poor ambient lighting conditions.

Standard GPIB and RS-232 interfaces permit the Optical Power Meter to be controlled remotely from any compatible PC or test station. Optional rack mount is available.

Front Panel

Recall menu access

Store menu access

Arrow buttons for menu navigation and parameter setting

Display

Measurement units control

On/off button

Wavelength control

Relative mode access

New reference

Averaging mode

Offset nulling

Detector port

Setup menu access

Program menu access

Note: *Your Optical Power Meter may slightly differ from the illustration.*

Back Panel

GPIB port   Serial port (RS-232 DTE)   Fuse holder

Power inlet

GPIB IEEE 488.3

Serial Port

MODEL: GO

LR 107723-5, -9

NRTL/C

SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE

100-240 V
50/60 Hz
2A
F3AL250 V

P/N

Ver.

S/N

Mfg.
date

Made in Canada

QST-151B

EXFO
Electro-Optical Engineering
465 Godin Ave.
Vanier, QC, Canada G1M 3G7

Ground

Part number   P/N   PM-1101   A-1.0   Ver.   Version number

Dynamic range   +10 to -100 dBm   450 to 1100 nm   Spectral range

Serial number   S/N   12345-B   October 97   Mfg. date   Manufacturing date

Note: *Your PM-1100 may slightly differ from the illustration.*

RS-232 Connector Pinout

The RS-232 connector (serial port) at the back of the PM-1100 uses a DTE pinout configuration.
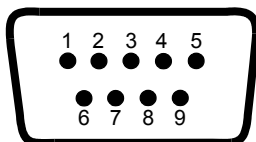
Pin	Description	Direction
2	Receive (Rx)	Input
3	Transmit (Tx)	Output
5	Signal ground (Gnd)	—

Conventions

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

WARNING

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

CAUTION

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

CAUTION

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

IMPORTANT

Refers to information about this product you should not overlook.

2 *Safety Information*

Laser Safety Information

WARNING

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

WARNING

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

Electrical Safety Information

This unit uses an international safety standard three-wire power cable. This cable serves as a ground when connected to an appropriate AC power outlet.

Note: *If you need to ensure that the unit is completely powered off, disconnect the power cable.*

WARNING

➤ **Insert the power cable plug into a power outlet with a protective ground contact. Do not use an extension cord without a protective conductor.**

➤ **Before powering on the unit, connect all grounding terminals, extension cords and devices to a protective ground via a ground socket. Any interruption of the protective grounding is a potential shock hazard and may cause personal injury. Whenever the ground protection is impaired, do not use the unit and secure it against any accidental operation.**

➤ **Do not tamper with the protective ground terminal.**

The color coding used in the electric cable depends on the cable. New plugs should meet the local safety requirements and include:

➤ adequate load-carrying capacity

➤ ground connection

➤ cable clamp

IMPORTANT

EXFO assumes no liability if you attempt to perform internal service on this unit.

WARNING

➤ **Use this unit indoors only.**

➤ **Position the unit so that the air can circulate freely around it.**

➤ **Operation of any electrical instrument around flammable gases or fumes constitutes a major safety hazard.**

➤ **Do not remove unit covers during operation.**

➤ **To avoid electrical shock, do not operate the unit if any part of the outer surface (covers, panels, etc.) is damaged.**

➤ **Only authorized personnel should carry out adjustments, maintenance or repair of opened units under voltage. A person qualified in first aid must also be present. Do not replace any components while power cable are connected.**

➤ **Use only fuses with the required rated current and specified type (IEC, 5 mm x 20 mm (0.197 in x 0.787 in), fast-blow, 250 V, 2 A). Do not use repaired fuses or short-circuited fuse holders.**

➤ **Capacitors inside the unit may be charged even if the unit has been disconnected from its electrical supply.**
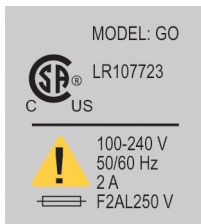
Safety Information

Electrical Safety Information

Equipment Ratings	
Temperature	
➤ Operation	0 °C to 40 °C (32 °F to 104 °F)
➤ Storage	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity[a]	0 % to 80 % non-condensing
Maximum operation altitude	2000 m (6562 ft)
Pollution degree	2
Installation category	II
Power supply rating[b]	100 V to 240 V (50 Hz/60 Hz) maximum input power 2 A

a.   Measured in 0 °C to 31 °C (32 °F to 87.8 °F) range, decreasing linearly to 50 % at 40 °C (104 °F).
b.   Not exceeding ± 10 % of the nominal voltage.

The following label is located on the back panel of the unit:

3 *Getting Started with Your Optical Power Meter*

Turning On and Off the Optical Power Meter

Before turning the Optical Power Meter on, please read *Electrical Safety Information* on page 8. To turn the unit on and off, use the red button in the lower left corner of the front panel.

At power-up, the unit beeps twice and performs a self-test. Before taking any measurements, it is recommended that you null the detector offsets (see *scroll (left/right arrows) until EXIT is displayed, then press ENTER.* on page 12). When the unit is turned off, the following items remain in non-volatile memory:
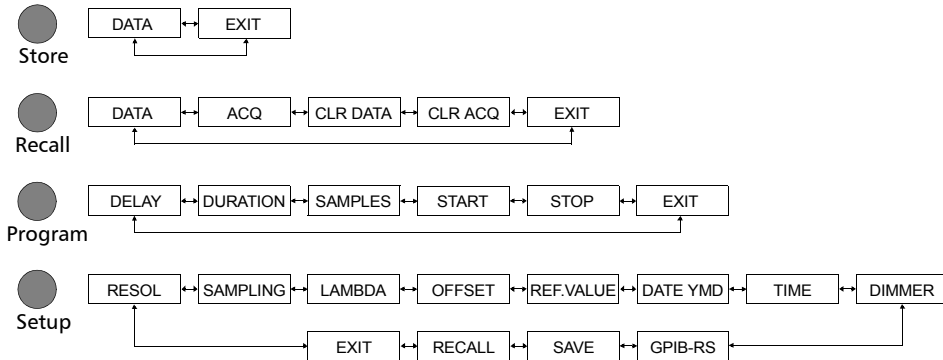
➤ manually stored data

➤ acquisition data

➤ reference values

➤ remote control settings

➤ shortlisted wavelengths

➤ customized settings

➤ saved configurations (up to 10)

Note: *The power cord is the most effective disconnect device. To ensure the power is completely turned off, disconnect the power cord.*

Selecting a Menu or a Menu Option

The blue buttons to the right of the display give access to single level menus: *Store*, *Recall*, *Program*, and *Setup*. The following diagram shows the menus and their items.

Store

```
DATA ←→ EXIT
```

Recall

```
DATA ←→ ACQ ←→ CLR DATA ←→ CLR ACQ ←→ EXIT
```

Program

```
DELAY ←→ DURATION ←→ SAMPLES ←→ START ←→ STOP ←→ EXIT
```

Setup

```
RESOL ←→ SAMPLING ←→ LAMBDA ←→ OFFSET ←→ REF.VALUE ←→ DATE YMD ←→ TIME ←→ DIMMER
EXIT ←→ RECALL ←→ SAVE ←→ GPIB-RS
```

To move (in loop) between the menu items, use the left/right arrows. To exit a menu:

➤ press the button that gave access to the menu, or

➤ scroll (left/right arrows) until *EXIT* is displayed, then press *ENTER*.

4 *Operating the Optical Power Meter*

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.*

Nulling Electrical Offsets

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

EXFO recommends performing a nulling before every test session. Since temperature and humidity variations affect the performance of electronic circuits and optical detectors, EXFO also recommends performing a nulling of the electrical offsets whenever environmental conditions change.

> # IMPORTANT
> **Light must not reach the detector when nulling offsets.**

To perform a nulling:

1. Place protective cap over detector port.

2. Push *Null*. The offset nulling process takes approximately 90 seconds. Once done, the unit returns to the previously active operation state.

If you are trying to perform an offset nulling with the protective cap improperly tightened on the detector port, the message **PUT CAP** will flash on the display. When **PUT CAP** is displayed, ensure the protective cap is properly tightened and press *Null* to resume the offset nulling process or press *ENTER* to cancel the offset nulling.

Note: *Offset nulling constants are retained until a new offset nulling is performed.*

Measuring Absolute Power

Press dBm/Watt to display the absolute power of the signal received at the detector port. dBm/Watt is also used to toggle between dBm and watts measurement units. When using watts measurement units, the Optical Power Meter will automatically use pW, nW, μW, or mW, according to the power of the signal. Press λ to toggle between the wavelengths in the shortlist (to edit the shortlist of wavelengths, see *Customizing the Shortlist of Wavelengths* on page 33).

Power measurement   Unit of measurement

-- 3.562   dBm

1310   nm

Current wavelength
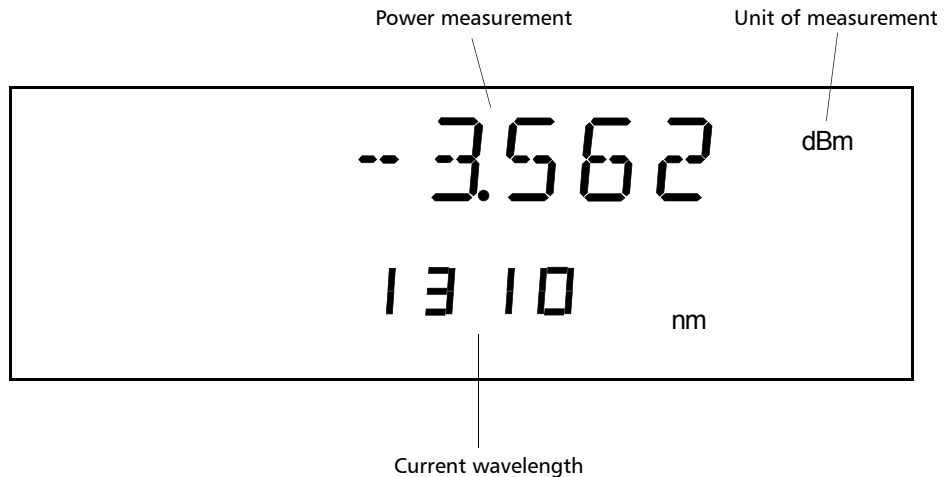
Note: *"– – – – – – –" indicates a reading below range. "+ + + + + + +" indicates a reading above range.*

Relative Power

In relative mode, the Optical Power Meter compares the power of the signal received at the detector port to a preset reference value in dBm or watts. The relative power is equal to the absolute power minus the reference value, therefore

➤ a negative measurement indicates that the received power is below the reference value, and

➤ a positive measurement indicates that the received power is above the reference value.

To activate relative mode, press *dB/ΔW*. Once in relative mode, pressing *dB/ΔW* switches between dBm and watt measurements units for the relative power and reference value. If necessary, press λ to toggle between the wavelengths in the shortlist (to edit the shortlist of wavelengths see *Customizing the Shortlist of Wavelengths* on page 33).
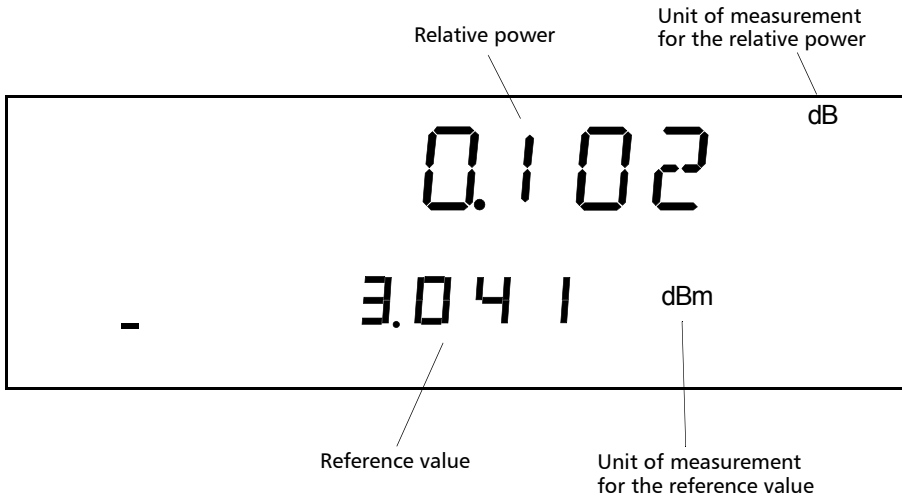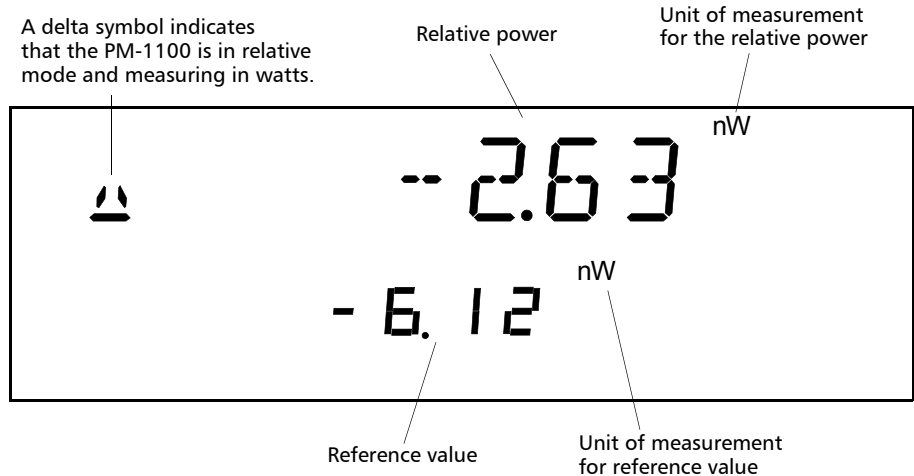
Relative power

Unit of measurement
for the relative power

dB

0.102

3.041 dBm

Reference value

Unit of measurement
for the reference value

A delta symbol indicates that the PM-1100 is in relative mode and measuring in watts.

Relative power

Unit of measurement for the relative power

nW

-- *2.63*

nW

- *6.12*

Reference value

Unit of measurement for reference value

When you access relative mode, the Optical Power Meterdisplays the last reference value entered at the current wavelength. One reference value can be stored for each wavelength in the shortlist and will remain in memory until a new reference value is stored at the same wavelength. However, if you use *dB/ΔW*, the reference value will be converted from dBm to watts (and vice versa) when the measurement unit of the relative power toggles between dB and watts.

Note: *If you set a reference while an offset is active, the reference measurement will take into account the offset (only when using dB measurement units).*

Entering the Current Power as the Reference Value

The power of the signal currently received at the detector can be stored as the reference value.

To enter the current power as the reference value:

1. Use λ to select the wavelength.

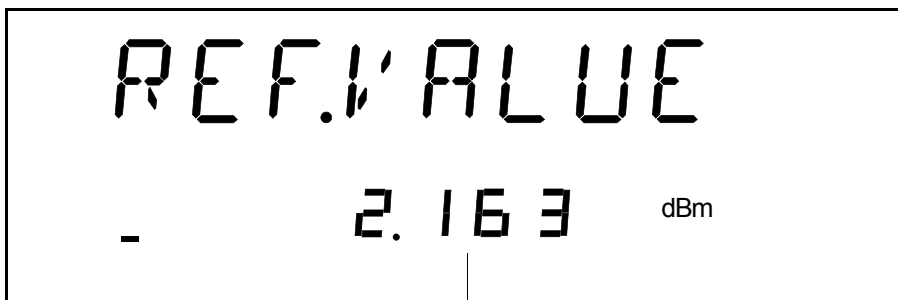*2.* Use *dBm/Watt* to select the measurement units.

3. Press *Ref.*

Entering a Specific Reference Value

To enter a specfic reference value:

1. Use λ to select the wavelength.

2. Select the measurement unit using *dBm/Watt*.

3. Press *Setup*.

4. Scroll (left/right arrows) to **REF.VALUE**.

```
REF.VALUE
           2.163      dBm
```

Current reference value for the
selected wavelength and in the
selected measurement unit

5. Press *ENTER*. The first segment of the current reference value will start flashing.

6. Enter a new reference value. Use the up/down arrows to change the flashing segment and left/right arrows to activate the next segment.

7. Press *ENTER*.

Note: *Any value outside the Optical Power Meter measurement range will be rejected. The unit will beep and you will be prompted to enter a new value.*

**8.** To exit the **Setup** menu, press *Setup*.

Average Mode

Choose *Avg* in order for the displayed power measurement to be averaged or not. When the average mode is enabled, the eight most recent measurement samples are used to compute an unweighted average. This average is displayed as the measured value. *Avg* is also displayed in the upper right corner, indicating that the average mode is enabled.

Storing Data Manually

The Optical Power Meter has 512 memory registers to manually store absolute or referenced measurements.

To store a measurement:

1. With the desired measurement on the screen, press *Store*. A register number will be suggested (flashing).
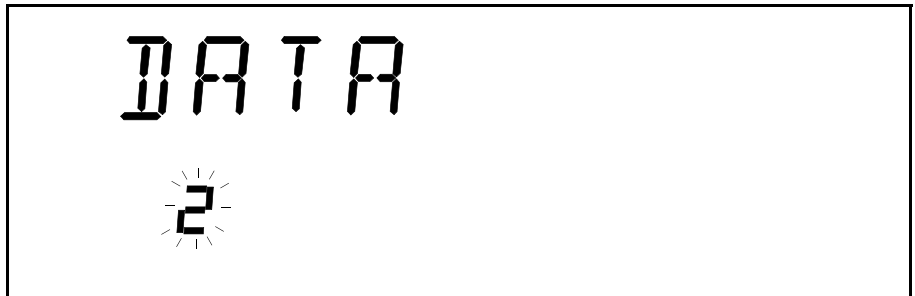
Note: *The suggested register number automatically increments each time you store a measurement.*

Note: *You can select another register number using the up/down arrows.*

2. Press *ENTER* to store the measurement in the flashing register. The unit automatically returns to measurement mode.
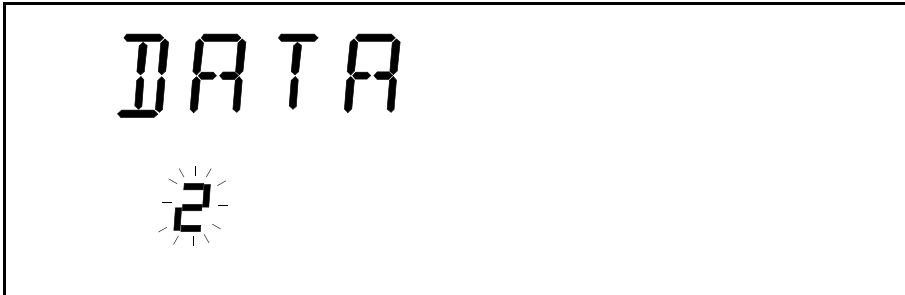
Recalling Manually Stored Data

The data you stored manually (see *Storing Data Manually* on page 19) can be recalled one register at a time.

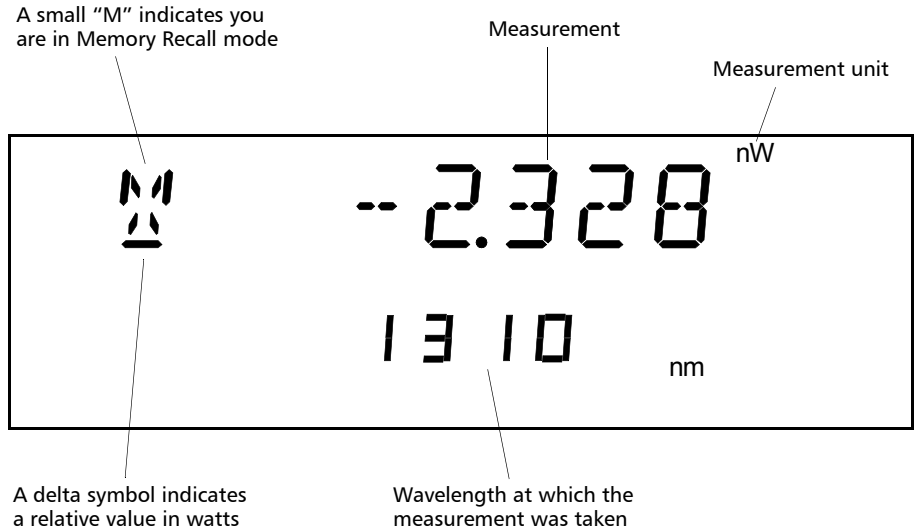### To recall the manually stored data:

1. Press *Recall*. You will see the following display with a register number flashing.

```
DATA

   2
```

2. Using the up/down arrows, scroll to the register number you want to view.

3. Press *ENTER*. The selected register will be displayed.

A small "M" indicates you
are in Memory Recall mode

Measurement

Measurement unit

nW

M

-- 2.328

1310

nm

A delta symbol indicates
a relative value in watts

Wavelength at which the
measurement was taken

Note: *A dashed line with no unit of measurement indicates an empty register. A dashed line with the wavelength and the units of measurement indicates a reading below range. "++++++++" indicates a reading above range.*

➤ To view another register, press *ENTER*. The next register will be suggested (flashing). If necessary, scroll (up/down arrows) to the desired register number. Press *ENTER* again to display the contents of the register.

Note: *You can press ENTER repeatedly to quickly scan the measurements in adjacent registers.*

➤ To exit the *Recall* menu, press *Recall*.

Erasing Manually Stored Data

The manually stored data (up to 512) can only be erased as a group.

To erase the manually stored data:

1. Press *Recall*.

2. Scroll (left/right arrows) to *CLR DATA*.

IMPORTANT

After you press *ENTER*, all the manually stored data in the 512 registers will be deleted without any other warning.

3. Press *ENTER*.

4. To exit the *Recall* menu, press *Recall*.

Programming an Acquisition

You can program the PM-1100 to automatically acquire absolute or referenced measurements. The following program parameters may be set:
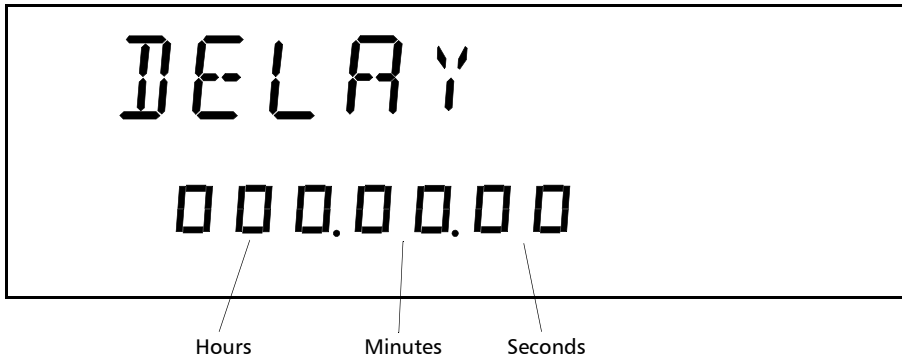
➤ delay: the beginning of the program may be delayed by up to 999 hours, 59 minutes, and 59 seconds;

➤ duration: the program can last up to 999 hours, 59 minutes, and 59 seconds;

➤ number of samples: up to 1024 samples can be taken (depending on the selected duration).

To program an acquisition:

1. Press *Program*. You will see the following display:

```
DELAY

000.00.00
```

Hours   Minutes   Seconds

2. Set a delay (if you do not want the acquisition to be delayed, leave the delay value at *000.00.00*).

2a. Press *ENTER*. The first digit will start flashing. Use the up/down arrows to change the flashing digit and the left/right arrows to activate the next digit.

2b. Once the delay is set, press *ENTER*.

3. Press the right arrow. You will get the following display.

```
DURATION

000.00.00
```

Hours   Minutes   Seconds
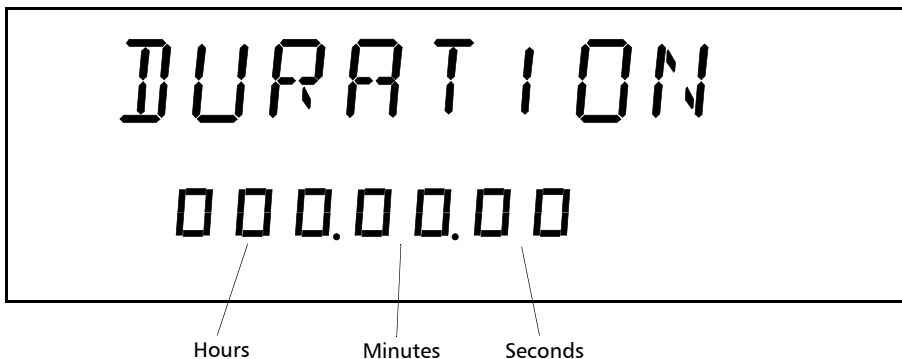
4. Set the duration of the acquisition.

    4a. Press *ENTER*. The first digit will start flashing. Use the up/down arrows to change the flashing digit and the left/right arrows to activate the next digit.

    4b. Once the duration is set, press *ENTER*.

5. Press the right arrow. You will see the following display.

```
  SAMPLES

      0
```
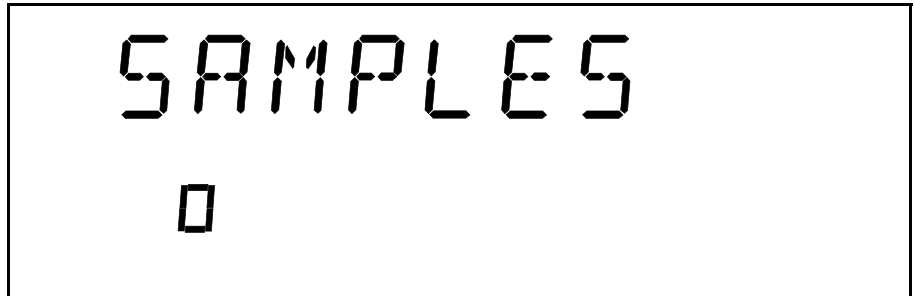
6. Set the number of samples to be taken during the acquisition.

    6a. Press *ENTER*. The digit will start flashing. Use the up/down arrows to toggle between the possible number of acquisitions (the number of acquisitions the PM-1100 can store depends on the duration you set at step 4).

    6b. Once the number of samples is set, press *ENTER*.

7. To exit the *Program* menu, press *Program*.

Starting the Acquisition

When you start an acquisition, data is acquired in the current measurement mode; that is, at the current wavelength, with the current measurement unit, and with or without an offset and a reference. Therefore, before starting an acquisition, you should set these parameters as required. You can choose one of the following procedures.

Set measurement parameters	→	Program acquisition	→	Start acquisition

Program acquisition	→	Set measurement parameters	→	Start acquisition
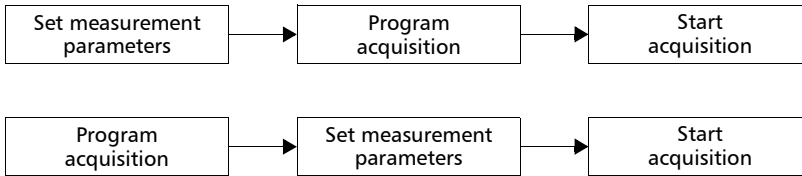
> ## IMPORTANT
> **Starting an acquisition erases all acquisition data in memory.**

Whenever you are ready to start the acquisition, press *Program*, scroll (left/right arrows) to *START*, then press *ENTER*.

➤ If no delay was set, the acquisition will start immediately.

➤ If a delay was set, choosing *START* will initiate the countdown. The acquisition will automatically start once the countdown has expired.

Program is displayed on the left side of the display while the acquisition is in process. All functions are deactivated during the countdown and the acquisition.

Note: *Once you have started the acquisition, the display returns to measurement mode. If you want to know how much time is left in the delay (before the acquisition starts), press Program, and then scroll (left/right arrows) to DELAY. If you want to know how much time is left in the acquisition, press Program, then scroll (left/right arrows) to DURATION.*

Stopping the Acquisition

Once the acquisition starts, it continues until the set duration has expired. When the acquisition is over, the unit beeps, *PRG STOP* is displayed, and the data is stored automatically. You can also terminate the acquisition before the set duration has elapsed.

IMPORTANT

If you stop the acquisition before it ends, only the samples that were taken before you stopped the acquisition will be saved.

To stop the acquisition:

1. While the acquisition is in process, press *Program*.

2. Scroll (left/right arrows) to *STOP.*

3. Press *ENTER*.
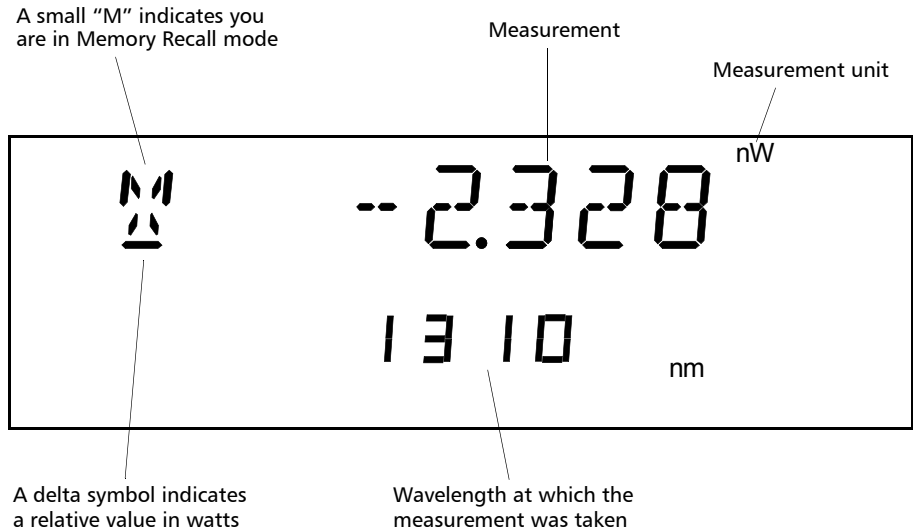
Recalling Acquisition Data

The data stored during a programmed acquisition (see *Programming an Acquisition* on page 23) can be recalled one sample at a time. Each sample is stored in a memory register.

To recall acquisition data:

1. Press *Recall*.

2. Scroll (let/right arrows) to *ACQ*. A register number will flash.

3. Using the up/down arrows, scroll to the register number you want to view.

4. Press *ENTER*. The selected register will be displayed.

A small "M" indicates you are in Memory Recall mode

Measurement

Measurement unit

nW

M -- 2.328

13 10

nm

A delta symbol indicates a relative value in watts

Wavelength at which the measurement was taken

Note: *A dashed line with no wavelength indicates an empty register. A dashed line along with a wavelength indicates a reading below range. "++++++++" indicates a reading above range.*

➤ To view another register, press *ENTER*. The next register will be suggested (flashing). If necessary, scroll (up/down arrows) to the desired register number. Press *ENTER* again to display the register.

Note: *You can press ENTER repeatedly to quickly scan the measurements in adjacent registers.*

➤ To exit the *Recall* menu, press *Recall*.

Erasing Acquisition Data

The data stored through a programmed acquisition (up to 1024) can only be erased as a group.

To erase acquisition data:

1. Press *Recall*.

2. Scroll (left/right arrows) to *CLR ACQ*.

IMPORTANT

After you press *ENTER*, all the acquisition data in the 1024 registers will be deleted without any other warning.

3. Press *ENTER*.

4. To exit the *Recall* menu, press *Recall*.

Customizing Your Optical Power Meter

Customized settings are kept in non-volatile memory and are, therefore, saved when the PM-1100 is turned off. Settings for a specific use or user may also be saved (up to 10 configurations can be saved). See *Saving a Configuration* on page 39.

Changing the Resolution

You can set the Optical Power Meter to display 0, 1, 2, or 3 digits after the decimal point. An automatic resolution is also available, where the number of digits after the decimal point is determined by the actual power level being measured.

Note: *Higher power levels can be more accurately measured and, therefore, displayed with a greater resolution.*

To change the resolution:

1. Press *Setup*. You will see the following screen:

RESOL

3
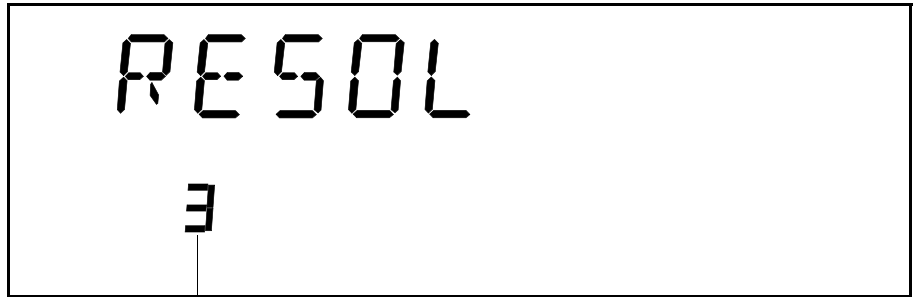
Current
resolution setting

2. Press *ENTER*. The current resolution setting starts flashing.

3. Scroll (up/down arrows) to select a new resolution setting (0, 1, 2, 3, or Auto).

4. Press *ENTER*.

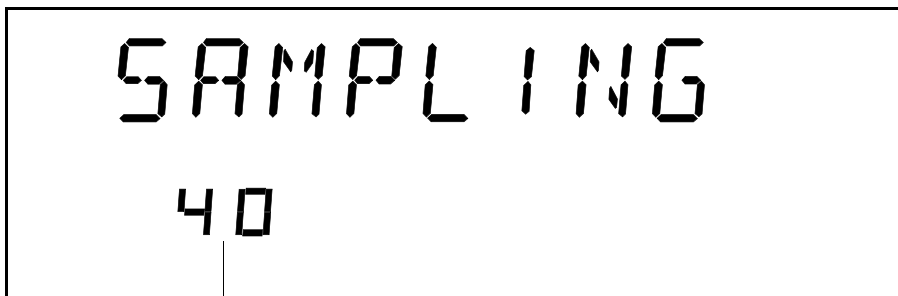***5.*** To exit the *Setup* menu, press *Setup*.

Changing the Sampling Rate

You can set the number of samples taken by the PM-1100 every second: 0.1 (1 every 10 seconds), 0.5 (1 every 2 seconds), 1, 5, 10, 20, or 40.

Note: *The maximum display refresh rate of the PM-1100 is 5 values every second, no matter what sampling rate is selected.*

To change the sampling rate:

1. Press *Setup*.

2. Scroll (left/right arrows) to *SAMPLING*.

```
SAMPLING
    40
```

Current
sampling rate

3. Press *ENTER*. The current sampling rate starts flashing.

4. Scroll (up/down arrows) to select a new sampling rate (0.1, 0.5, 1, 5, 10, 20, or 40 per second).

5. Press *ENTER*.

6. To exit the *Setup* menu, press *Setup*.

Customizing the Shortlist of Wavelengths

The Optical Power Meter detector port can measure optical power at many wavelengths. The accepted wavelengths (spectral range, see *Technical Specifications* on page 65) depend on the type of detector with which the Optical Power Meter is equipped. Store the wavelengths you use the most often in a shortlist so you can quickly access them by pressing λ during a test session. The shortlist includes up to 20 wavelengths.

To add a wavelength to the shortlist:

1. Press *Setup*.

2. Scroll (left/right arrows) to *LAMBDA*.
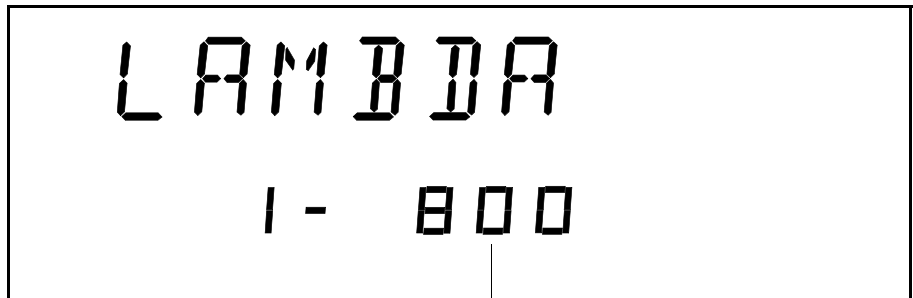
You can scroll up or down to see all the wavelengths in the shortlist.

3. Scroll (up/down arrows) to *Add*.

4. Press *ENTER*. A wavelength will be suggested, first digit flashing.

5. Use the up/down arrows to change the flashing digit and the left/right arrows to activate the next digit.

6. Once the digits are set, press *ENTER*.

7. To exit the *Setup* menu, press *Setup*.

To erase one wavelength from the shortlist:

1. Press *Setup*.

2. Scroll (left/right arrows) to *LAMBDA*.

3. Scroll (up/down arrows) until the wavelength you want to delete appears in the lower portion of the display.

4. Press *ENTER*. The wavelength will start flashing.

5. Set all the wavelength digits to zero (use the up/down arrows to change the flashing digit and left/right arrows to activate the next digit).

Note: *The wavelength that is currently active in absolute mode cannot be erased.*

6. Press *ENTER*.

7. To exit the *Setup* menu, press *Setup*.

To erase all wavelengths from the shortlist:

1. Press *Setup*.

2. Scroll (left/right arrows) to *LAMBDA*.

3. Scroll (up/down arrows) until *DEL ALL* appears in the lower portion of the display.

4. Press *ENTER*.

5. To exit the *Setup* menu, press *Setup*.

Note: *The wavelength that is currently active in absolute mode cannot be erased.*

Setting an Offset

An offset can be applied to any measurement that is displayed in either dB or dBm. The offset value, which can be positive or negative, is always expressed in dB and is added to the measured power. *Offset On* appears to the left of the display when an offset is being used. Offsetting the measured power is useful when compensating for known power losses or applying a calibration offset.

Note: *The offset is only applied when dB or dBm units are selected.*

To set an offset:

1. Press *Setup*.

2. Scroll (left/right arrows) to *OFFSET*.

$$OFFSET$$

$$+ \quad 0 0.0 0 0 \qquad dB$$
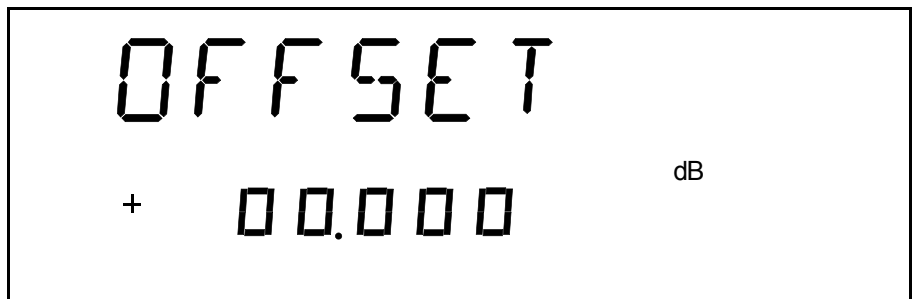
3. Press *ENTER*. The offset symbol (- or +) will start flashing.

4. Set a new offset (use the up/down arrows to change the flashing segment and the left/right arrows to activate the next segment).

5. Press *ENTER*.

6. To exit the *Setup* menu, press *Setup*.

Note: *To deactivate the offset, you must set it to 0. Offset On will no longer appear in the lower left portion of the display.*

Setting the Date

The date must be entered according to the year-month-day format.

To set the date:

1. Press *Setup*.

2. Scroll (left/right arrows) to *DATE YMD*.

$$\text{DATE YMD}$$
$$\text{97.06.16}$$

Year   Month   Day
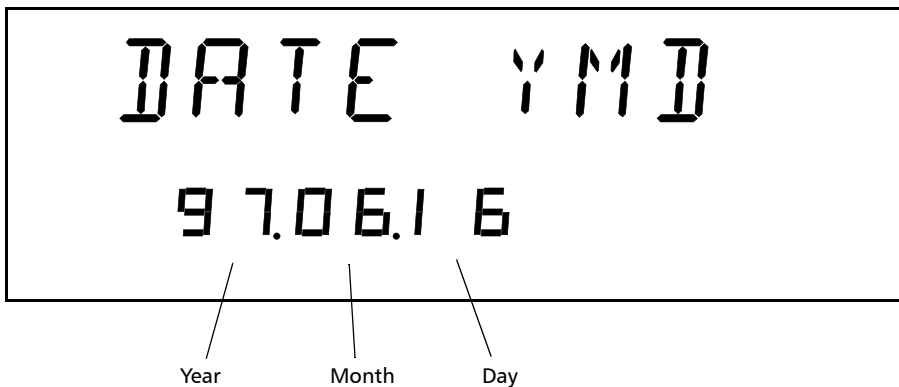
3. Press *ENTER*. The first digit will start flashing.

4. Set a new date (use the up/down arrows to change the flashing digit and the left/right arrows to activate the next digit).

5. Press *ENTER*.

6. To exit the *Setup* menu, press *Setup*.

Setting the Clock

The time must be entered according to the 24-hour format.

To set the clock:

1. Press *Setup*.

2. Scroll (left/right arrows) to *TIME*.

```
TIME

13.07.53
```
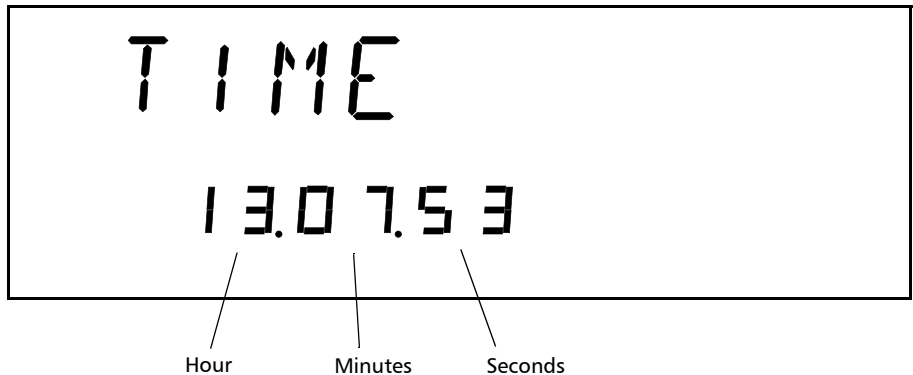
Hour   Minutes   Seconds

3. Press *ENTER*. The first digit will start flashing.

4. Set a new time (use the up/down arrows to change the flashing digit and the left/right arrows to activate the next digit).

5. Press *ENTER*.

6. To exit the *Setup* menu, press *Setup*.

Setting the Display Intensity

Display intensity may be set to high or low. You can also turn off the display without turning off the unit.

To set the display intensity:

1. Press *Setup*.

2. Scroll (left/right arrows) to *DIMMER*.

$$DIMMER$$

$$HI$$

Current dimmer state

3. Press *ENTER*. The current dimmer state will start flashing.

4. Use the up/down arrows to modify the dimmer: *LO*, *HI*, or *OFF*.

5. Press *ENTER*.

Note: *Setting the dimmer to OFF turns off the display. Press any key to turn the display back on.*

6. To exit the *Setup* menu, press *Setup*.

Saving a Configuration

Once the PM-1100 is customized for a specific application or user, it is possible to save the configuration. Saved parameters are:

➤ resolution

➤ sampling rate

➤ current wavelength and corresponding reference

➤ offset

Up to ten configurations can be saved and recalled as needed.

To save a configuration:

1. Customize the PM-1100 as required.

2. Press *Setup*.

3. Scroll (left/right arrows) to *SAVE*.
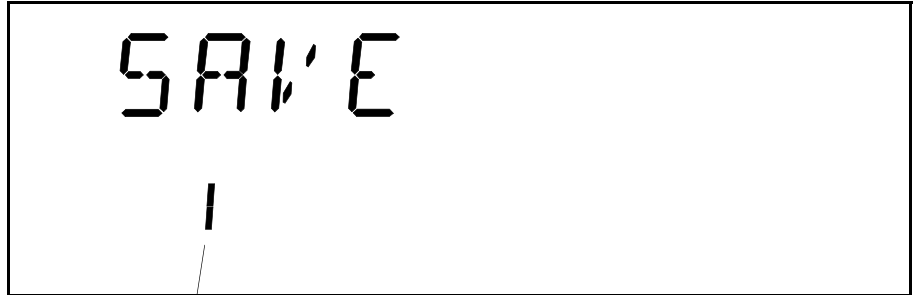
Configuration number

4. Press *ENTER*. The current configuration number will start flashing.

5. Use the up/down arrows to modify the configuration number.

6. Press *ENTER*.

7. To exit the *Setup* menu, press *Setup*.

Recalling a Configuration

Once you have saved a configuration (see *Saving a Configuration* on page 39), you can recall it any time.

To recall a configuration:

1. Press *Setup*.

2. Scroll (left/right arrows) to *RECALL*.
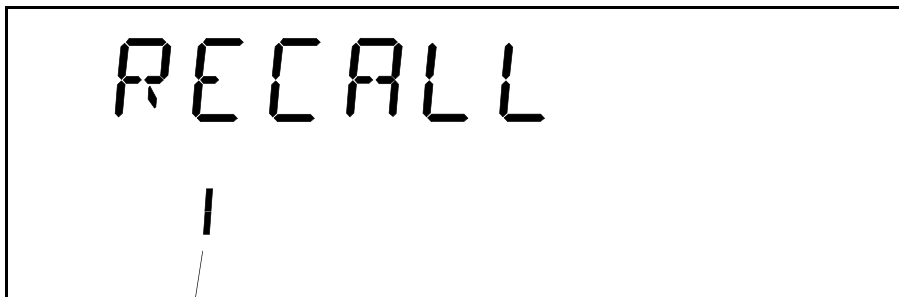
RECALL

Configuration number

3. Press *ENTER*. The configuration number (bottom of the screen) will start flashing.

4. Use the up/down arrows to select the number of the configuration you want to recall.

5. Press *ENTER*.

6. To exit the *Setup* menu, press *Setup*.

5 *Controlling Your Optical Power Meter Remotely*

➤ The Optical Power Meter can be remotely controlled either by

➤ a GPIB interface (through a GPIB cable connected to the GPIB port); or

➤ an RS-232 interface (through a serial cable connected to the serial port).

The commands used in both protocols are the same and are described in the following pages. When the Optical Power Meteris being remotely controlled, *Remote* appears in the lower left corner of the display.

Note: *If you have already designed a GPIB program to control a power meter from EXFO's IQ Series (IQ-1100, IQ-1200, or IQ-1500), you can reuse sections for the PM-1100 Optical Power Meter.*

Setting the Optical Power Meter for Remote Control

To remotely control the Optical Power Meter, you need to set a GPIB address or activate the RS-232 port.

To set the Optical Power Meter for remote control:

1. Press *Setup*.

2. Scroll (left/right arrows) to *GPIB-RS*.

```
GP1B-RS
    10
```
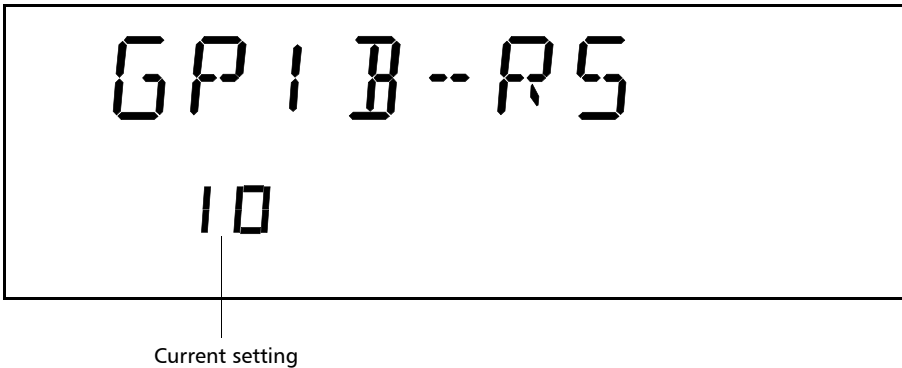
Current setting

3. Press *ENTER*. The current setting will start flashing.

4. Using the up/down arrows, enter a new setting.

➤ a numbered setting represents a GPIB address (between 1 and 30)

➤ for RS-232 control, scroll (up/down arrows) to RS-232 (before setting 1 or after setting 30).

5. Press *ENTER*.

6. To exit the *Setup* menu, press *Setup*.

Communication Parameters

For GPIB Communication	
Terminate Read on EOS	Yes
Set EOI with EOS on Writes	Yes
Type of compare on EOS	8-bits
EOS byte	0Ah
Sens EOI at end of Writes	Yes
GPIB Primary address	See *Setting the Optical Power Meter for Remote Control* on page 42
GPIB Secondary address	None

For RS-232 Communication	
EOS bytes	0Ah
Baud rate	9600 bps
Parity	None
Data bits	8 bits
Stop bits	1 bits
Flow Control	None
Activation	See *Setting the Optical Power Meter for Remote Control* on page 42

Note: *EOS means "End of String". EOI means "End or Identify".*

Standard Status Data Structure

The figure shown hereafter illustrates the four common status and enable registers as defined by IEEE 488.2. This diagram is a useful aid in understanding the general commands and how a service request (SRQ) is generated. The four registers are

➤ Standard Event Status Register (ESR)

➤ Standard Event Status Enable Register (ESE)

➤ Status Byte Register (STB)

➤ Service Request Enable Register (SRE)

Bit	ESR	ESE	STB	SRE
0	Operation Complete	Operation Complete	N/A	N/A
1	Request Control	Request Control	N/A	N/A
2	Query Error	Query Error	Error Bit	Error Summary Bit
3	Device Dependent Error	Device Dependent Error	Questionable Status	Questionable Status
4	Execution Error	Execution Error	Message Available	Event Status Summary Bit
5	Command Error	Command Error	Event Status Summary Bit	Message Available
6	User Request	User Request	Master Summary Status	Request Service / Master Summary Status
7	Power On	Power On	Operation Status	Operation Status

PON	URQ	CME	EXE	DDE	QYE	RQC	OPC	Standard Event Status
7	6	5	4	3	2	1	0	Register (ESR)

OR

&

7	6	5	4	3	2	1	0	Standard Event
PON	URQ	CME	EXE	DDE	QYE	RQC	OPC	Status Enable Register (ESE)

Output Queue not Empty

◄··· read by serial poll

	RQS	ESB	MAV		EB			Status Byte
7	6	5	4	3	2	1	0	Register (STB)
	MSS							

Service Request Generation

◄··· read by *STB?

OR

&

7		5	4	3	2	1	0	Service Request Enable
		ESB	MAV					Register (SRE)

An SRQ is forced when a bit is set in the STB and at the same time the corresponding SRE bit is set. When the SRQ is generated, the RQS bit is set to 1 and remains set until read by a serial poll. Once the RQS is read, it returns to 0.

Command Structure

The GPIB and RS-232 commands follow the guidelines determined by the Standard Commands for Programmable Interface (SCPI) consortium. For example, the command syntax

FORM:READ[:DATA]<space><digits>

is used to change the measurement display resolution (number of digits after the decimal point) of a Optical Power Meter.

In this particular example,

➤ FORM identifies that the command is a part of the SCPI FORMat subset of commands;

➤ READ and DATA are keywords that define the function of the command;

➤ [ ] indicates that a keyword or a parameter is optional;

➤ <space> indicates that a space is required; and

➤ <digits> is the command parameter.

For example, the typical FORM:READ:DATA 1 command instructs the PM-1100 to display a power measurement with 1 digit after the decimal point.

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

Error Messages

The Optical Power Meter can manage both system and device-specific errors. The generic format for error messages is illustrated below.
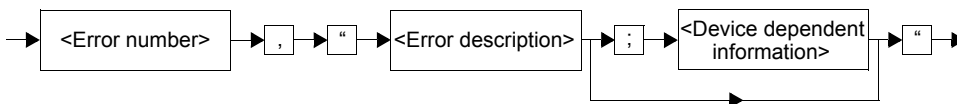
As shown in the above figure, the message contains three parts: the error number, error description, and device dependent information. All error messages are stacked in a FIFO buffer. When there is at least one message in the buffer, bit 2 of the Status Byte Register is set to 1. Use the SYST:ERR? query to read the most recent message. The error message buffer is initialized when starting the Optical Power Meter, when executing the *CLS command, or by reading the last message stored in the buffer.

6   *Maintenance*

To help ensure long, trouble-free operation:

➤ Keep the unit free of dust.

➤ 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 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.

Replacing Fuses

The PM-1100 Optical Power Meter contains two F2.0L250V-type fuses (IEC, 5 mm x 20 mm (0.197 in x 0.787 in), fast-acting, low breaking capacity, 250 V). The fuse holder is located at the back of the Optical Power Meter, just beside the power inlet.

To replace a fuse:

1. Turn off the unit and unplug the power cord.

2. Using a flat-head screwdriver as a lever, pull out the fuse holder.
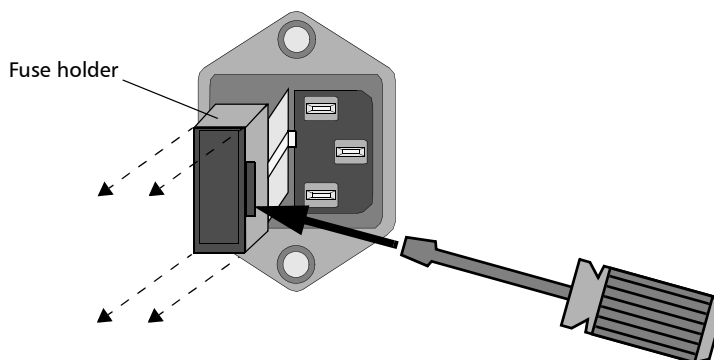
Fuse holder

3. Check and replace the fuses, as necessary.

4. Insert the new fuses into the fuse holder.
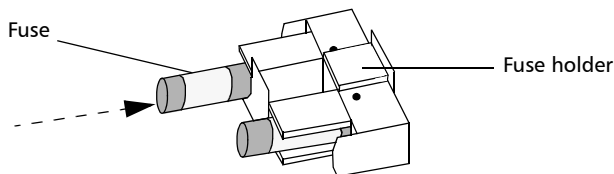
Fuse   Fuse holder

5. Make sure the fuses are placed firmly in the holder prior to reinsertion.

6. Firmly push the fuse holder back into place.

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.

Upgrading the Embedded Software

To upgrade the Optical Power Meter embedded software, you will need to obtain the upgrade files from EXFO's Technical Support Group. You will also need a null-modem cable.

IMPORTANT

You may upgrade software in DOS, Windows 3.1, Windows 9x, or Windows 2000. With some notebook computers, you may need to be in a DOS environment. If problems occur, contact EXFO.

To upgrade the embedded software:
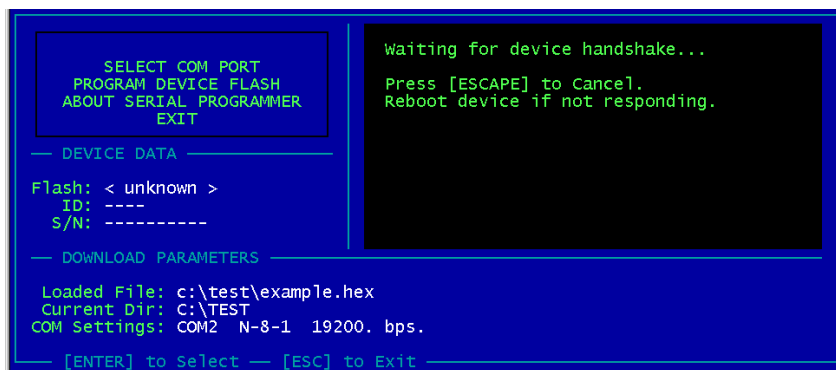
1. Turn off the Optical Power Meter.

2. Connect a null-modem cable to the Optical Power Meter RS-232 port and to an unused serial communication port on your computer.

3. On your computer's hard disk, create a folder named "Test" (C:\Test).

4. Unzip or copy the upgrade files into the newly created folder.

5. If the software upgrade is performed in Windows 98, you must restart your computer in DOS mode before launching the upgrade program. In other cases, simply exit to DOS.

6. Go to the "C:\Test" folder and launch the upgrade program by typing the following line (spaces are required between parameters):

    Lo0006.exe   /C:2   /F:c:\test\filename.hex   /S:19200

Parameters can be decoded as follows:

➤ /C: serial port number (COM2 in the above example)

➤ /F: file to copy on your unit (replace "filename" with the actual name of the .hex file on your hard disk)

➤ /S: computer-to-unit transfer speed (if "19200" does not work, try "56700")

```
            SELECT COM PORT            Waiting for device handshake...
         PROGRAM DEVICE FLASH
         ABOUT SERIAL PROGRAMMER       Press [ESCAPE] to Cancel.
                  EXIT                  Reboot device if not responding.

    ─ DEVICE DATA ─────────

    Flash: < unknown >
       ID: ----
      S/N: ----------

    ─ DOWNLOAD PARAMETERS ─────

     Loaded File: c:\test\example.hex
     Current Dir: C:\TEST
    COM Settings: COM2  N-8-1  19200. bps.

     ── [ENTER] to Select ── [ESC] to Exit ──
```

7. When the **Waiting for device handshake** message appears, turn on the Optical Power Meter.

The unit display remains off, the unit beeps once and the upgrade program starts automatically. A progress bar on the computer screen indicates the upgrade status. Once the software upgrade is complete, the **Reboot device for self-test** message appears.

8. If the software upgrade was performed in Windows 2000, an error message is displayed: "*LO0006 NTVDM has encountered a System Error. The parameter is incorrect. Choose 'Close' to terminate the application.*". Click on **Close** to hide the dialog box.

9. Turn the Optical Power Meter off, and then on again.

   Some units will display the new version number at start-up, otherwise press the up and right arrow keys together while the unit is turned on.

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.

7 Troubleshooting

Finding Information on the EXFO Web Site

The EXFO Web site provides answers to frequently asked questions (FAQs) regarding the use of your PM-1100 Optical Power Meter.

To access FAQs:

1. Type http://www.exfo.com in your Internet browser.

2. Click on the **Support** tab.

3. Click on **FAQs** and follow the on-screen instructions. You will be given a list of questions pertaining to your subject.

The EXFO Web site also provides the product's most recent technical specifications.

Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact EXFO at one of the following numbers. The Technical Support Group is available to take your calls from Monday to Friday, 7:30 a.m. to 8:00 p.m. (Eastern Time in North America).

Technical Support Group

400 Godin Avenue   1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2   Tel.: 1 418 683-5498
CANADA   Fax: 1 418 683-9224
                                           support@exfo.com

To accelerate the process, please have information such as the name and the serial number (see the product identification label—an example is shown below), as well as a description of your problem, close at hand.
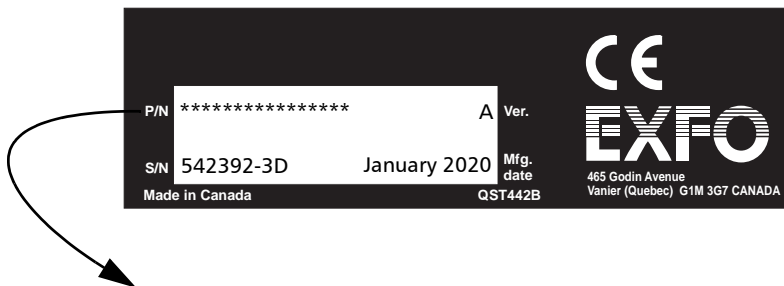
PM-110X-FOA-XX

Detector

Connector adapter

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 shock and vibration.

8 *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.

IMPORTANT
The warranty can become null and void if:

➤ **unit has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel.**

➤ **warranty sticker has been removed.**

➤ **case screws, other than those specified in this guide, have been removed.**

➤ **case has been opened, other than as explained in this guide.**

➤ **unit serial number has been altered, erased, or removed.**

➤ **unit has been misused, neglected, or damaged by accident.**

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

Liability

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

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

Exclusions

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

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

IMPORTANT

EXFO will charge a fee for replacing optical connectors that were damaged due to misuse or bad cleaning.

Certification

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

Service and Repairs

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

To send any equipment for service or repair:

1. Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 64). 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 64).

EXFO Service Centers Worldwide

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

EXFO Headquarters Service Center

400 Godin Avenue	1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2	Tel.: 1 418 683-5498
CANADA	Fax: 1 418 683-9224
	quebec.service@exfo.com

EXFO Europe Service Center

Omega Enterprise Park, Electron Way	Tel.: +44 2380 246810
Chandlers Ford, Hampshire S053 4SE	Fax: +44 2380 246801
ENGLAND	europe.service@exfo.com

**EXFO China Service Center/
Beijing OSIC**

Beijing New Century Hotel	Tel.: +86 (10) 6849 2738
Office Tower, Room 1754-1755	Fax: +86 (10) 6849 2662
No. 6 Southern Capital Gym Road	beijing.service@exfo.com
Beijing 100044	
P. R. CHINA	

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*.

SPECIFICATIONS[1]

MODEL	PM-1102X	PM-1613/1623	PM-1613W/1623W
Number of detectors	1	1/2	1/2
Detector type	GeX	InGaAs	InGaAs
Detector size (mm)	2	1	3
Wavelength range (nm)	750 to 1700	800 to 1700	800 to 1700
Power range (dBm)	20 to −75[2]	9 to −80[3]	8 to −70[3]
Uncertainty (%)	±5[4]	±5[5]	±5[5]
	(10 dBm to −35 dBm)	(0 dBm to −55 dBm)	(0 dBm to −50 dBm)
Linearity[6] (dB)	±0.015	±0.015	±0.015
	(0 dBm to −35 dBm)	(0 dBm to −55 dBm)	(0 dBm to −50 dBm)
Noise (peak-to-peak)[7] (pW)	–	3	20
Power resolution[5] (dB)	0.001 (20 dBm to −35 dBm)	0.001 (9 dBm to −40 dBm)	0.001 (8 dBm to −40 dBm)
Wavelength resolution (nm)	1	0.01	0.01
Stabilization time (ms)			
automatic range		12 (9 dBm to −80 dBm)	6 (8 dBm to −70 dBm)
automatic range		3 (9 dBm to −49 dBm)	3 (8 dBm to −49 dBm)
fixed range (1 to 4)		1	1
Sampling rate (sample/s/channel)			
fast acquisition mode		up to 4096	up to 4096
continuous measurement mode	up to 40	up to 256	up to 256
Fiber type (µm)	5/125 to 62.5/125	5/125 to 62.5/125	5/125 to 62.5/125
Analog output			
bandwidth[8] (Hz) (ranges 1 to 6)	N/A	700 k; 700 k; 30 k; 30 k; 150; 150 (typical)	50 k; 7.5 k; 5 k; 7 k; 1 k; 1 k (typical)
output voltage (V)		between 0 and 2.15 (typical)	between 0 and 2.15 (typical)
output impedance (Ω)		640 (typical)	640 (typical)
External trigger input voltage (V)	N/A	0 to 5 (TTL)	0 to 5 (TTL)

General Specifications

	PM-1102X	PM-1613/1623	PM-1613W/1623W
Size (H x W x D)	11.7 cm x 22.2 cm x 33.3 cm		(4 ⁵/₈ in x 8 ³/₄ in x 13 ¹/₈ in)
Weight	2.0 kg (4.5 lb)	2.8 kg (6.2 lb)	2.8 kg (6.2 lb)
Temperature operating	0 °C to 40 °C (32 °F to 104 °F)	0 °C to 40 °C (32 °F to 104 °F)	0 °C to 40 °C (32 °F to 104 °F)
storage	−40 °C to 70 °C (−40 °F to 158 °F)	−35 °C to 70 °C (−31 °F to 158 °F)	−35 °C to 70 °C (−31 °F to 158 °F)
Relative humidity	0 % to 80 % non-condensing	0 % to 80 % non-condensing	0 % to 80 % non-condensing

Notes

1. At 1310 nm (unless otherwise specified) with an FC/non-angled connector and a warmup time of 20 minutes (30 minutes for PM-16X3W), followed by an offset nulling.
2. From 0 °C to 30 °C.
3. From 18 °C to 32 °C.
4. At 23 °C ± 1 °C with an FOA-322 connector adapter, between 1000 nm and 1650 nm. Add 1 % to uncertainty below 1000 nm and 3 % over 1650 nm.
5. At 23 °C ± 1 °C with an FOA-322 connector adapter, between 1000 nm and 1640 nm. Add 1 % to uncertainty below 1000 nm and 6 % over 1640 nm.
6. Averaged measurement at constant temperature in 0 °C to 40 °C range.
7. Averaging time 0.25 s, observation time 50 s at 23 °C ± 1 °C, from 1200 nm to 1640 nm.
8. Bandwidth corresponds to each electrical scale from the lowest to the highest gain.
9. Measured in 0 °C to 40 °C range.

B Remote Control Commands

This section presents detailed information about the commands and queries supplied with your PM-1100 Optical Power Meter.

IEEE 488.2 Commands—Quick Reference

The Optical Power Meter recognizes the main commands identified in IEEE-488.2. The table below summarizes these commands. The commands are fully explained on the following pages.

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

a. This command can only be used with RS-232 communication.

*CLS

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

*ESE

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

*ESE?

Description	This query reads the contents of the Standard Event Status Enable Register (ESE).
Syntax	*ESE?
Response	A binary integer between 0 and 255.

*ESR?

Description	This query reads the contents of the Standard Event Status Register (ESR).
Syntax	*ESR?
Response	A binary integer between 0 and 255.

*IDN?

Description	This query reads the IQ system identification string.
Syntax	*IDN?
Response	"EXFO E.-O. Eng PM-1100 Vxx.xx", where xx.xx is the current product version.

*LOK

Description	This command is used to set the Remote Lockout programming state.
Syntax	*LOK
Notes	This command can only be used when working with RS-232 communication.

*OPC

Description	This command will cause the PM-1100 to generate the "Operation complete" message in the Standard Event Status Register (ESR) when all pending selected PM-1100 operations have been completed.
Syntax	*OPC
Example	*OPC;*IDN?

*OPC?

Description	This query puts an ASCII 1 in the output queue when the content of the input queue has been processed. This query is useful to prevent another command from being processed until the current command is complete.
Syntax	*OPC?
Response	"1"

*REM

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

*RST

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

1. Return to initial state before command was sent, and not necessarily to previous settings.

2. Force the device to enter into an Operation Complete Command Idle State (OCIS).

3. Force the device to enter into an Operation Complete Query Active State (OQAS).

4. Initialize previous responses unless there has been a program message terminator preceded by an *RST.

Syntax	*RST
Example	*IDN?;*RST<NL>

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

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

	*STB?
Description	This query returns the contents of the Status Byte Register (STB).
Syntax	*STB?
Response	A binary integer between 0 and 255.

	*TRG
Description	Not supported
Syntax	*TRG

*TST?

Description	This query initiates an internal self-test and returns a binary value indicating the results of the test.
Syntax	*TST?
Response	A binary value: "0" if the test is complete with no errors "1" if the test is complete with errors

*WAI

Description	Not supported
Syntax	*WAI

Product-Specific Commands—Quick Reference

The table below contains a summary of th ePM-1100 Optical Power Meter specific commands. Thes commands are fully explained on the following pages.

Command				Parameter/ Response	Description
ABOR				—	Stop continuous measurements
DISP	DIMM			<LO|HI|OFF>	Set display intensity
	DIMM?			(LO|HI|OFF)	Get display intensity
FETC	[SCAL]	POW	DC?	(±999.999E±99)	Get stored value
FORM	READ	[DATA]	*	<0|1|2|3|4>	Set display resolution
		[DATA]?	*	(0|1|2|3|4)	Get display resolution
INIT	CONT			<0|1>	Start/stop continuous measurements
	CONT?			(0|1)	Continuous measure-ments in progress?
	[IMM]			—	Store single measurement
	STOR			<0 to 513>	Initialize memory location
MMEM	ACQ			<0|1>	Start/stop acquisition

Command				Parameter/ Response	Description
MMEM	ACQ?			(0|1)	Acquisition in progress?
	ACQ	DATA?		(0 to 1025)	Get number of acquired measure-ment
		DATA	RECA	UNIT? (0|1|2|3)	Get measurement units
			VALU?	(0 to 1025)	Get acquired measurement
			WAV?	(9999 nm)	Get wavelength
		DEL		—	Clear memory locations
		DELA		<HHH,MM,SS>	Set delay
		DURA		<HHH,MM,SS>	Set duration
		SAMP		<0 to 1025>	Set number of samples
		SAMP?		(0 to 1025)	Get number of samples
READ	[SCAL]	POW	DC?	(±999.999E±99)	Store and get value
SENS	AVER	[STAT]	*	<0|1>	Set data averaging
		STAT?		(0|1)	Data averaging active?

Remote Control Commands

Product-Specific Commands—Quick Reference

Command					Parameter/ Response	Description
SENS	CORR	COLL	ZERO	*		Perform null measurement
		OFFS	[MAGN]		<99.999> [DB]	Set offset value
	FREQ			*	<value> [HZ]	Set sampling rate
	FREQ?				(99.9)	Get sampling rate
	FREQ	CAT?			(99.9;99.9;...)	List sampling rates
	POW	REF?			(+99.999 dBm)	Get reference value
		REF	DISP	*	—	Set reference
			STAT	*	<0|1>	Set absolute or relative
			STAT?		(0|1)	Get absolute or relative
		UNIT		*	<0|1|2|3>	Set power unit
		UNIT?			(0|1|2|3)	Get power unit
		WAV		*	<9999> [NM]	Set wavelength
		WAV?			(9999 nm)	Get wavelength
SYST	ERR?				Error code	Next error from error queue?
	VERS?				Current version	Identification string?
UNIT	POW			*	<WATT|DB|DBM| WATT>	Set display unit

* These commands are not executed if a data acquisition is in progress. The "Program running" message will be returned.

Product-Specific Commands—Description

ABORt

Description	This command stops any measurement in progress.
Syntax	ABOR(0..26)
Example	ABOR3

DISPlay:DIMMer

Description	This command is used to adjust the intensity of the PM-1100 display (high or low) or to turn off the display without turning off the unit.
Syntax	DISP:DIMM<space><data>
Parameters	The <data> parameter can be "HI", "LO", or "OFF".
Example	DISP:DIMM OFF
Note	When the display is turned off by this command, any key pressed on the PM-1100 keypad will return the display to high intensity. To prevent this, lock the PM-1100 keypad with the *LOK command.
See also	DISP:DIMM?, *LOK, and *LOK?

DISPlay:DIMMer?

Description	This query returns the intensity of the PM-1100 display (high, low, or off)
Syntax	DISP:DIMM?
Response	"HI" if the intensity is high "LO" if the intensity is low "OFF" if the display is off
Example	DISP:DIMM?

FETCh[:SCALar]:POWer:DC?

Description	This query returns the last stored value.
Syntax	FETC(0..26)[:SCAL]:POW:DC?
Response	A power measurement in the "±999.999E±99" exponential format in the selected units. The number of digits after the decimal point depends on the selected resolution.
Example	FETC3:SCAL:POW:DC?
See also	INIT:CONT, INIT:CONT?, INIT:IMM, and READ:SCAL:POW:DC?

FORMat:READings[:DATA]

Description	This command changes the resolution of the displayed power value, when dB or dBm is selected.
Syntax	FORM(0..26):READ[:DATA]<space><digits>
Parameters	The <digits> parameter can be: "0" -zero digit after the decimal point "1" -one digit after the decimal point "2" -two digits after the decimal point "3" -three digits after the decimal point "4" -auto-resolution, determined by the measured power level
Example	FORM3:READ:DATA 3

FORMat:READings[:DATA]?

Description	This query returns the current resolution of the displayed power value when dB or dBm units are selected.
Syntax	FORM:READ:DATA?
Response	"0" if there is zero digit after the decimal point "1" if there is one digit after the decimal point "2" if there are two digits after the decimal point "3" if there are three digits after the decimal point "4" if automatic resolution is set (determined by the measured power level)
Example	FORM:READ:DATA?

INITiate:CONTinuous

Description	This command starts or stops continuous mode. When continuous mode is activated, the latest value is continuously stored in the initialized memory location so it can be fetched at any time with the FETC[:SCAL]:POW:DC? query. Values can be power or loss measurements, depending on the current measurement mode of the PM-1100.
Syntax	INIT:CONT<space><boolean>
Parameters	The <boolean> value can be "0" to stop continuous mode "1" to start continuous mode
Example	INIT:CONT 1
Note	Use the INIT:STOR command to initialize a memory location.
See also	FETC:SCAL:POW:DC?, INIT:CONT?, INIT:IMM, INIT:STOR, and READ:SCAL:POW:DC?

INITiate:CONTinuous?

Description	This query returns a value indicating whether continuous mode is activated.
Syntax	INIT:CONT?
Response	"0" if continuous mode is stopped "1" if continuous mode is started
Example	INIT:CONT?
See also	FETC:SCAL:POW:DC?, INIT:CONT, INIT:IMM, and READ:SCAL:POW:DC?

INITiate[:IMMediate]

Description	This command stores a value in the initialized memory location so it can be fetched at any time with the FETC[:SCAL]:POW:DC? query. Values can be power or loss measurements, depending on the current measurement mode of the PM-1100.
Syntax	INIT[:IMM]
Parameters	N/A
Example	INIT:IMM
Note	Use the command INIT:STOR to initialize a memory location.
See also	FETC:SCAL:POW:DC?, INIT:CONT, READ:SCAL:POW:DC?

INITiate:STORage

Description	This command allows you to initialize a memory location (out of the 512 available) before storing or recalling an absolute or referenced measurement.
Syntax	INIT:STOR<space><data>
Parameters	The <data> parameter is a memory location. This value can be any value between 1 and 512, inclusive.
Example	INIT:STOR 99
Note	Use the INIT:CONT or INIT:IMM commands to store a value in the initialized memory location. Use the FETC[:SCAL]:POW:DC command to fetch the value currently in the initialized memory location.
See also	INIT:IMM, INIT:CONT, and FETC[:SCAL]:POW:DC

MMEMory:ACQuisition

Description	This command initiates a data acquisition with the currently set parameters (delay, duration, number of samples). The acquisition will continue until the duration elapses or until an acquisition stop (MMEM:ACQ 0) command is sent.
Syntax	MMEM:ACQ<space><boolean>
Parameters	The <boolean> parameter can be "1" start the data acquisition "0" stop the data acquisition
Example	MMEM:ACQ 1

MMEMory:ACQuisition?

Description	This query returns a value indicating whether data acquisition is in progress.
Syntax	MMEM:ACQ?
Response	The response is in the format "1" data acquisition is in progress "0" data acquisition is not in progress
Example	MMEM:ACQ?

MMEMory:ACQuisition:DATA?

Description	This command returns the number of data saved by the last acquisition.
Syntax	MMEM:ACQ:DATA?
Response	Number of acquired data saved in memory locations in the "600" format.
Example	MMEM:ACQ:DATA?

MMEMory:ACQuisition:DATA:RECAll:UNIT?

Description	This query returns the measurement units corresponding to the last value fetched with the MMEM:ACQ:DATA:RECA:VALUE? query.
Syntax	MMEM:ACQ:DATA:RECA:UNIT?
Response	The measurement units in the format "0" for dBm "1" for watt "2" for dB "3" for delta watt
Example	MMEM:ACQ:DATA:RECA:UNIT?

MMEMory:ACQuisition:DATA:RECAll:VALUE?

Description	This command returns the measurement saved in the <data> memory location.
Syntax	MMEM:ACQ:DATA:RECA:VALUE?<space><data>
Parameters	The <data> parameter represents the memory location from which to recall the measurement data (out of the 1024 available).
Response	Measurement data saved in the specified memory location in the "±999.999E±99" format.
Note	Use the MMEM:ACQ:DATA:RECA:UNIT? query to get the corresponding measurement units. Use the MMEM:ACQ:DATA:RECA:WAV? query to get the wavelength at which the measurement was taken.
Example	MMEM:ACQ:DATA:RECA:VALUE? 1021

MMEMory:ACQuisition:DATA:RECAll:WAVelength?

Description	This query returns the wavelength corresponding to the last value fetched with the MMEM:ACQ:DATA:RECA:VALUE? query.
Syntax	MMEM:ACQ:DATA:RECA:WAV?
Response	A wavelength in the "9999 nm" format.
Example	MMEM:ACQ:DATA:RECA:WAV?

MMEMory:ACQuisition:DELete

Description	This command clears the 1024 memory locations reserved for the acquisition data.
Syntax	MMEM:ACQ:DEL

MMEMory:ACQuisition:DELAy

Description	This command changes the delay parameter for the acquisition setup.
Syntax	MMEM:ACQ:DELA<space><delay>
Parameters	The <delay> parameter is the delay before the acquisition starts in the "HHH,MM,SS" format (the maximum delay is 999 hours, 59 minutes, 59 seconds).
Example	MMEM:ACQ:DELA 000,01,50

MMEMory:ACQuisition:DURAtion

Description	This command changes the duration parameter for the acquisition setup.
Syntax	MMEM:ACQ:DURA<space><duration>
Parameters	The <duration> parameter is the duration of the acquisition setup in the "HHH,MM,SS" format (the maximum duration is 999 hours, 59 minutes, 59 seconds).
Example	MMEM:ACQ:DURA 000,01,50

MMEMory:ACQuisition:SAMPles

Description	This command changes the samples parameter for the acquisition setup.
Syntax	MMEM:ACQ:SAMP<space><samples>
Parameters	The <samples> parameter is the number of samples to be set for the acquisition setup. If an invalid parameter is entered, the closest valid parameter will be entered instead.
Note	The duration of the acquisition has a direct effect on the values that can be set for the number of samples. D x R = S where D = duration parameter set with the MMEM:ACQ:DURA command (in seconds) R = any of the possible sampling rates in sec^{-1} (get the complete list with the SENS:FREQ:CAT? query) S = valid number of samples (MUST be a whole number)
Example	MMEM:ACQ:SAMP 200

MMEMory:ACQuisition:SAMPles?

Description	This command returns the current number of samples for the acquisition setup.
Syntax	MMEM:ACQ:SAMP?
Response	Current number of samples in the "1" format
Example	MMEM:ACQ:SAMP?

READ[:SCALar]:POWer:DC?

Description	This query returns the measurement currently read by the PM-1100 (whether the unit is in absolute power or relative mode).
Syntax	READ[:SCAL]:POW:DC?
Response	A measurement in the "±999.999E±99" format. To know the current measurement units, use the SENS:POW:UNIT? query.
Example	READ:SCAL:POW:DC?
See also	FETC:SCAL:POW:DC?, INIT:CONT, INIT:CONT?, and INIT:IMM

SENSitivity:AVERage[:STATe]

Description   This command activates or deactivates data averaging.

Syntax   SENS:AVER[:STAT]<space><boolean>

Parameters   The < boolean > parameter can be
"0" averaging is disabled
"1" averaging is enabled

Example   SENS:AVER:STAT 1

SENSitivity:AVERage:STATe?

Description   This query returns a value indicating whether data averaging is enabled or disabled.

Syntax   SENS:AVER:STAT?

Response   "0" averaging is disabled
"1" averaging is enabled

Example   SENS:AVER:STAT?

SENSitivity:CORRection:COLLect:ZERO

Description   This command performs an offset nulling measurement.

Syntax   SENS:CORR:COLL:ZERO

Example   SENS:CORR:COLL:ZERO

SENSitivity:CORRection:OFFSet[:MAGNitude]

Description	This command sets an offset value that is applied when dB or dBm units are selected.
Syntax	SENS:CORR:OFFS[:MAGN]<space><numeric_value> [<space>DB]
Parameters	The <numeric_value> is an offset with dB units in the ±99.999 format.
Example	SENS:CORR:OFFS:MAGN 22.105

SENSitivity:FREQuency

Description	This command selects a data sampling rate.
Syntax	SENS:FREQ<space><numeric_value>
Parameters	The <numeric_value> is the sampling rate with sec^{-1} units. 0.1, 0.5, 1, 5, 10, 20, 40 samples per second.
Example	SENS:FREQ 20

SENSitivity:FREQuency?

Description	This query returns the current sampling rate.
Syntax	SENS:FREQ?
Response	Returns the current sampling rate in samples/second units.
Example	SENS:FREQ?

SENSitivity:FREQuency:CATalog?

Description	This query returns a list of available sampling rates.
Syntax	SENS:FREQ:CAT?
Response	List of available sampling rates in the "40.0;20.0;10.0;5.0;1.0;0.5;0.1" format
Example	SENS:FREQ:CAT?

SENSitivity:POWer:REFerence?

Description	This query returns the reference power for the current wavelength.
Syntax	SENS:POW:REF?
Response	The current reference value in dBm, which can be any value within the power range of the power meter in the "99.999 dBm" format.
Example	SENS:POW:REF?

SENSitivity:POWer:REFerence:DISPlay

Description	This command performs a new reference measurement for the current wavelength and changes the display to read relative power (dB units).
Syntax	SENS:POW:REF:DISP
Example	SENS:POW:REF:DISP

SENSitivity:POWer:REFerence:STATe

Description	This command selects whether absolute (dBm) or relative power measurements are performed.
Syntax	SENS:POW:REF:STAT<space><boolean>
Parameters	The <boolean> value represents either dB or dBm "0" to set absolute mode "1" to set relative mode
Example	SENS:POW:REF:STAT

SENSitivity:POWer:REFerence:STATe?

Description	This query returns a value indicating wheter the power meter is displaying absolute (dBm) or relative power values.
Syntax	SENS:POW:REF:STAT?
Response	"0" absolute mode is active (dBm or watt) "1" relative mode is active (dB or delta watt)
Example	SENS:POW:REF:STAT?

SENSitivity:POWer:UNIT

Description	This command changes the measurement units.
Syntax	SENS:POW:UNIT<space><value>
Parameters	The <value> can be "0" or "DBM" "1" or "W" "2" or "DB" "3" or "DW"
Example	SENS:POW:UNIT DBM

SENSitivity:POWer:UNIT?

Description	This query returns the current measurement units.
Syntax	SENS:POW:UNIT?
Response	The response will be "0" if units are dBm "1" if units are watt "2" if units are dB "3" if units are delta watt
Example	SENS:POW:UNIT?

SENSitivity:POWer:WAVelength

Description	This command selects a new operating wavelength.
Syntax	SENS:POW:WAV<space><numeric_value> [<space>NM]
Parameters	The <numeric_value> is an operating wavelength expressed in nanometers (nm). Any wavelength within the spectral range of the optical detector (at 1 nm resolution) may be selected. See *Technical Specifications* on page 65 for the exact spectral range of each detector type.
Example	SENS:POW:WAV 1310

SENSitivity:POWer:WAVelength?

Description	This query returns the currently selected calibrated wavelength.
Syntax	SENS:POW:WAV?
Response	The current wavelength in nanometers (nm) in the "9999 nm" format
Example	SENS:POW:WAV?

SYSTem:ERRor?

Description	This command returns the next error in the list. When an error is generated, an error number is sent to the error list. The error list is accessed with the SYST:ERR? query. If the list contains 20 errors and a new error occurs, the error will replace the first error in the list.
Syntax	SYST:ERR?
Response	See error list and descriptions in *Error Messages* on page 47.

SYSTem:VERSion?

Description   This query returns the current system software version.

Syntax   SYST:VERS?

Response   "EXFO E.O. Engineering PM-1100 Vxx.xx", where xx.xx is the current product version.

Note   The *IDN? and SYST:VERS? queries are equivalent. They give the same result.

UNIT:POWer

Description   This command changes the measurement display units.

Syntax   UNIT:POW<space><units>

Parameters   The <units> parameter can be
WATT   measured value displayed in watts (pw, nw, μw, or mw);
DB   measured value displayed in dB relative to the current reference;
DBM   measured value displayed in dBm; or
DWATT   measured value displayed in watts relative to the current reference.

Example   UNIT:POW DBM

C SCPI-Based Errors

Error Number	Description	Probable Cause
-100	"Command error."	An error occurred while validating a command.
-101	"Undefined header."	Unknown command.
-102	"Missing parameter."	A command parameter is missing.
-103	"Parameter not allowed."	An extra parameter is present.
-104	"Data type error."	Invalid parameter format.
-200	"Execution error."	An error occurred while executing a command.
-300	"Device dependent error."	A command has taken longer than expected to complete execution.
-300	"Light on detector."	Light reached the detector during the offset nulling.
-300	"Invalid wavelength."	The entered wavelength is out of range.
-300	"Parameter out of range."	The command parameter is out of range.
-300	"No stored data."	No data is stored in the specified location.
-300	"Program running."	An acquisition is already in progress.
-300	"Program duration not initialized."	No duration parameter is currently defined for the program.
-300	"No samples available."	No sample parameter is currently defined for the program.
-300	"No data."	No data to recall.
-300	"Invalid unit."	The requested measurement units are invalid.
-300	"Invalid resolution."	The requested resolution is invalid.

SCPI-Based Errors

Error Number	Description	Probable Cause
-300	"Invalid state."	The state of the PM-1100 is not compatible with the command sent.
-300	"Invalid sampling rate."	The requested sampling rate is invalid.
-300	"Invalid storage location."	The specified storage location is invalid.
-300	"Invalid delay value."	The entered delay value is invalid.
-300	"Invalid duration value."	The entered duration value is invalid.
-400	"Query error."	An error occurred while accessing the output queue.
-500	"System error."	System is out of memory.

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