



FIBER OPTIC TECHNOLOGY
CALIBRATION LABORATORY

PM-240-MTP Multifiber Optical Power Meter

INSTRUCTION MANUAL



Revision:1.0



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1 Introduction

The **PM-240-MTP optical power meter** is designed to measure absolute or relative optical power in optical networks terminated with 12 – 24 multifiber MTP/MPO connectors. The tester can measure simultaneously optical power level in all up to 24 fibers of MTP/MPO connectors, it can recognize “live” and “dark” fibers. This eliminates the need of fan-out from multi to single fiber connectors. The memory capacity allows storage and uploading of up to 3000 measurements including memory position or fiber number, wavelength, absolute value or relative value and insertion loss.

The rechargeable battery ensures long term working with a minimum service life of 2 years. Batteries can be charged via a USB port or external AC/DC adaptor. The microprocessor controlled charging process ensures optimal battery status and extended operation time.

2 Features

- Easy measurement of multifiber connectors
- MTP/MPO input interface
- Absolute and Relative optical power measurement
- Displayed units: dBm, dB, mW
- Two functions:
- Portable power meter
- USB probe – accessory of Testing Workplace
- InGaAs or Si photodetector
- Detection of modulation 1 kHz
- Display backlight
- Firmware upgrade via USB
- Two levels high capacity memory:
- Cable No., Fiber No.
- SmartProtocol PC software
- memory download, reporting solution
- Battery charging via USB port
- Battery status indicator
- Powered by Li-Pol rechargeable battery

3 Application

- Absolute or relative optical power measurement
- Optical network measurements
- Measurement output power of optical transmitters
- Measurement input power of optical receivers
- Measurement attenuation in fibre cabling, in conjunction with the LS-240-MTP Optical light source
- Measurement loss in connectors, splices, adaptors, switches and other components
- Easy and rapid identification of failure points in fiber networks
- Suitable for SM and MM applications

4 Accessories

4.1 Standard

- Hard carrying case
- SmartProtocol PC software
- Data Exporter PC software
- Power charging adaptor
- Traceable calibration certificate
- USB connection cable

5 Optional

- Master MTP/MPO connector patchcord

6 Specifications

Parameter:		Note:
Photodetector	InGaAs	
Working wavelengths	850, 1300, 1310, 1490, 1550, 1625 nm	can be customized
Dynamic range:	-65 dBm to +10 dBm -57 dBm to +17 dBm	1300, 1310, 1490, 1550, 1625 nm 850 nm
Photodetector	Si	
Working wavelengths	850 nm	
Dynamic range	-40 dBm to +10 dBm	850 nm
Uncertainty	± 5%	1310, 1550 nm @ -20 dBm
Resolution	0.01	
AWD/Modulation Detection	-50 dBm -45 dBm	1300 – 1625 nm 850 nm
Dimensions	170 x 90 x 45 mm	W x H x D
Weight	0.5 kg	
Temperature operating	-10 to +50 °C	
storage	-40 to +70 °C	
Humidity (non condensing)	0 – 95%	
Battery working time	> 300 hrs	
Battery life time	> 2 years	3000 mAh Li-Pol

Compliant with RoHS-requirements (2002/95/EG, 27.01.2003)

7 Safety information

The PM-240-MTP instrument emits no optical power itself and does not create any hazards to the user. To ensure a high level of operator safety during installation, commissioning and operating the equipment, as well as ensuring that the equipment remains undamaged, it is necessary to consider the following general warnings and recommendations.

- Installation, commissioning, operation and service of equipments with high power level are only allowed to be carried out by an authorised person.
- Use only the equivalent connector types to those built into the instrument in order to avoid damage to the instrument components.
- Optical connectors must be clean, in case the connectors are not perfectly clean – please clean them according to the procedure described in the technical specification for the relevant connectors.
- Never use magnifying devices to inspect optical fiber ends unless you are sure that no optical power is being emitted.
- Use only magnifying devices with a built-in infra-red filter to ensure safety.
- During operation, testing or maintenance of a fiber optic system, never look into an active fiber optic cable. Infrared radiation may be present and permanent eye damage can result.
- Avoid direct exposure to the beam.
- Do not activate the laser when there is no fiber attached to the optical output connector.

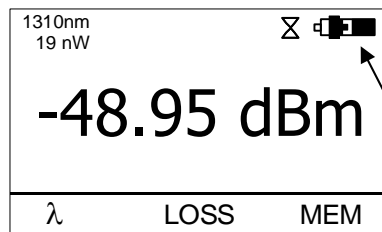
Under no circumstances should you look into the end of an optical cable attached to the optical output when the device is operational. The laser radiation can seriously damage your eyesight.

8 Maintenance

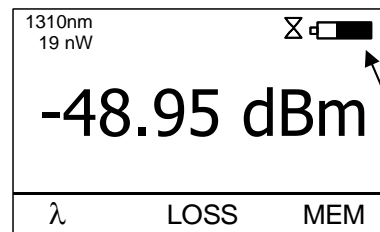
8.1 Battery care

The PM-240-MTP comes equipped with a built-in charger and is powered by Li-Pol rechargeable batteries (standard accessories).

- Charging – via USB port (PC) or by an external USB power charging adaptor (standard accessories)
- Only use the supplied USB power charging adapter.
- Charge the batteries for 75% before storing the LS-215 for long periods (100 % is not recommended). The batteries will lose the charge during storage.
- The batteries are consumable. Repeated charging and discharging decreases the lifetime of the batteries.



charging

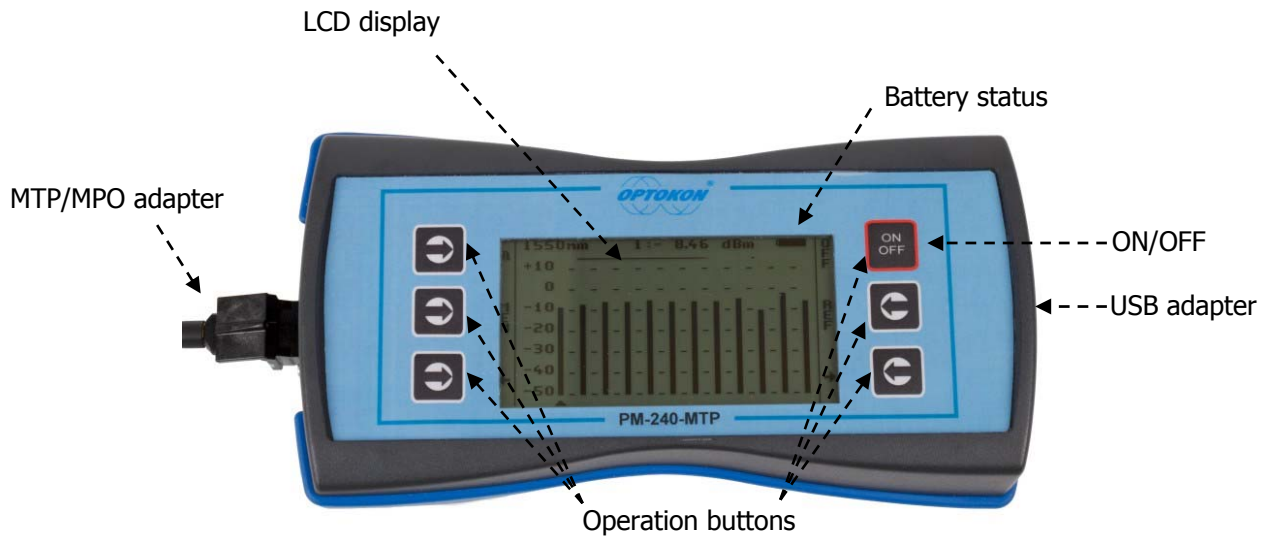


battery status
indicator

8.2 Instrument care

- During storage and transport keep the instrument in its carry case to protect against crushing, vibration, dust and moisture.
- Where possible keep the instrument away from strong sunlight.
- Clean the instrument housing using alcohol or other cleaning agents. Acetone or other active solvents may damage the case.
- The instrument is resistant to normal dust and moisture, however it is not waterproof. If moisture does get into instrument, dry it out carefully before using it again.

9 Instrument and button function description



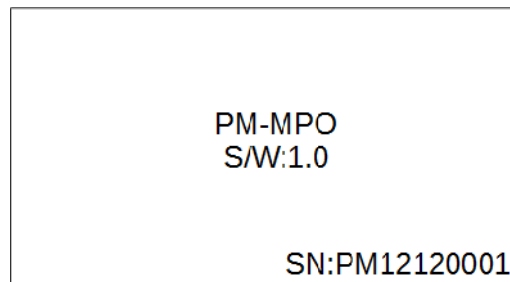
[ON/OFF]

Press to turn the unit on.

Hold ON/OFF (about 4 sec) to turn the unit on in backlight mode.

Press to turn the unit off.

After switching on, the type of device, serial number and firmware version will be displayed.



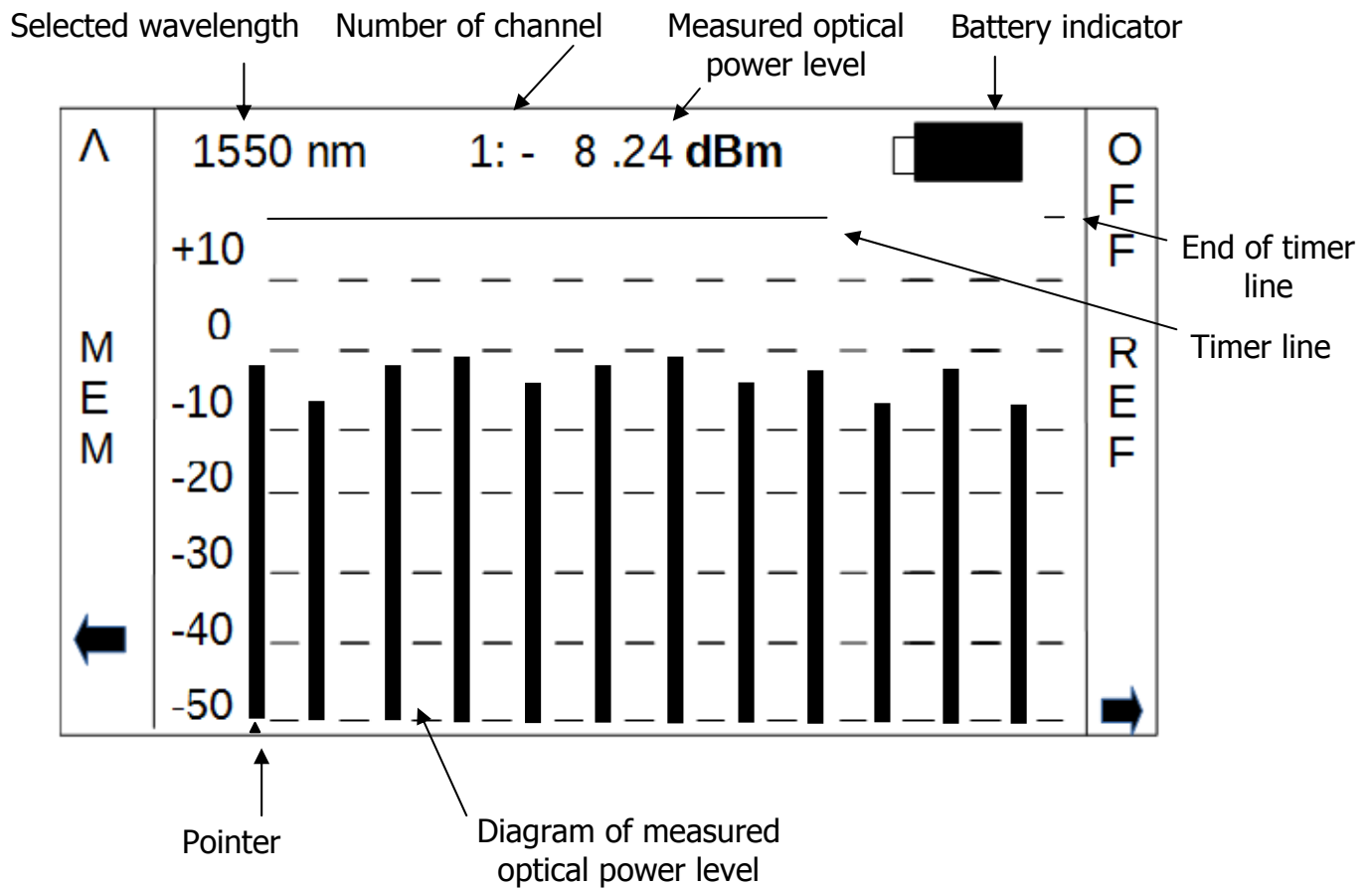
[⇄]

Meaning of these keys depends on current menu.

9.1 Absolute power measurement mode

In the absolute power measurement mode the absolute value of the optical signal in dBm units is shown on the display. This screen will appear after the instrument is switched on and information regarding the type of device, serial number and firmware version will appear.

Reading the display:



[λ]
 Selects 850, 1300, 1310, 1490, 1550, 1625 nm

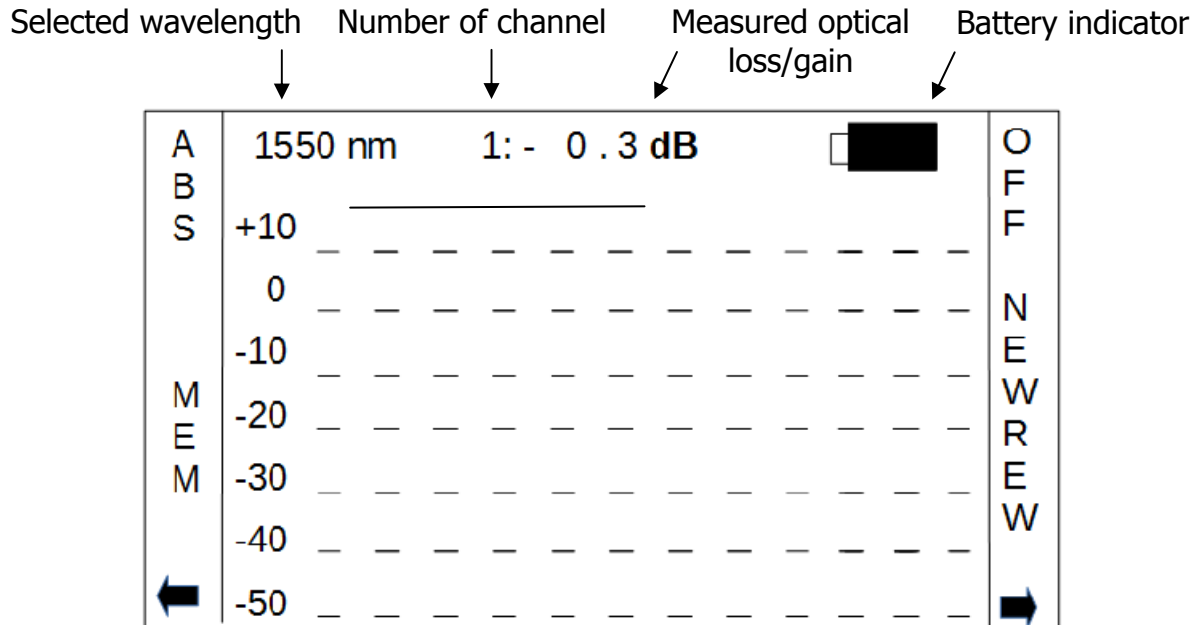
[REF]
 Activates the relative power measurement mode (unit dB).
 Recalls the last set reference for a selected wavelength.
 Goes to menu #1.

[MEM]
 Goes to Memory menu #2.
 Starts working with the internal memory.

9.2 Menu #1 – Relative power measurement mode

In the relative power measurement mode is on the value of optical insertion loss in dB units which corresponds to performed reference is shown on the display.

Reading the display:



[ABS]

Returns unit into absolute power measurement mode (unit dBm).

[REF]

Sets and stores the new reference for the selected wavelength.

[MEM]

Goes to Memory menu #2


Starts working with the internal memory.

9.3 Menu #2 – Working with the internal memory

The memory of PM-800 has a structured, two-level organization. The results are stored in memory positions (FIBER) in folders called Cable (CABLE). See table below:

CABLE001	FIBER001 FIBER002 FIBER003 FIBER004 FIBER005 FIBER006 FIBERXXX
CABLE002	FIBER001 FIBER002 FIBER003 FIBER004 FIBER005 FIBER006 FIBERXXX
.....	
CABLEXXX	FIBER001 FIBER002 FIBER003 FIBER004 FIBER005 FIBER006 FIBERXXX

This screen will appear after pressing [MEM] key from Menu#1 or Menu#2

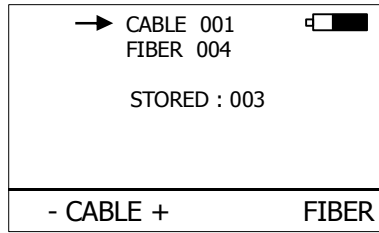
SAVE RESULT  → BROWSE RESULTS UPLOAD MEMORY ERASE MEMORY HOME
UP DOWN OK

[UP], [DOWN], [OK]

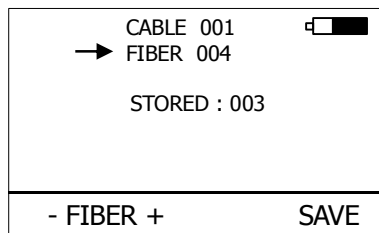
Use these buttons for selection appropriate submenu.

9.3.1 SAVE RESULT

1. By using [UP] [DOWN] select "SAVE RESULT" and press [OK].

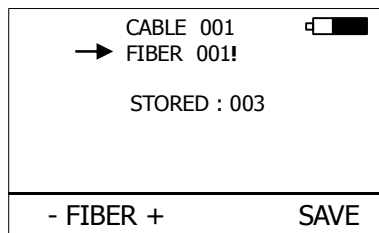


2. Select the cable (folder) using [- CABLE +], the unit will display the number of saved results under the selected cable, then press [FIBER].



3. The unit will suggest the FIBER position under the selected CABLE.
 Accept the suggested FIBER position and save the result by pressing [SAVE] or change the memory position using [- FIBER +], than press [SAVE] to save the result.

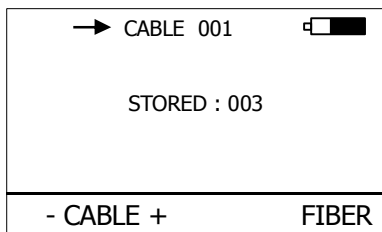
NOTE: If the selected memory position is already occupied, the "!" mark will appear on the display.



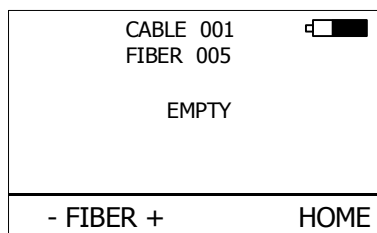
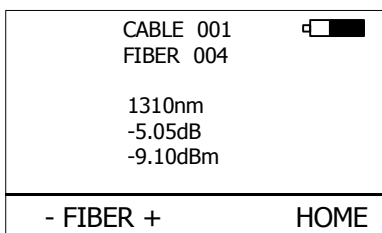
By pressing [SAVE], the new result will OVERWRITE the selected FIBER position and the old result will be discarded.

9.3.2 BROWSE RESULTS

1. By using [UP] [DOWN] select "BROWSE RESULTS" and press [OK]



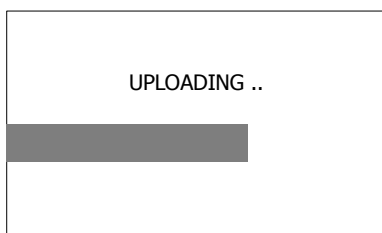
2. Select the cable (folder) using [- CABLE +], the unit will display the number of saved results under the selected cable, then press [FIBER].



3. Use [- FIBER +] to browse through the results.

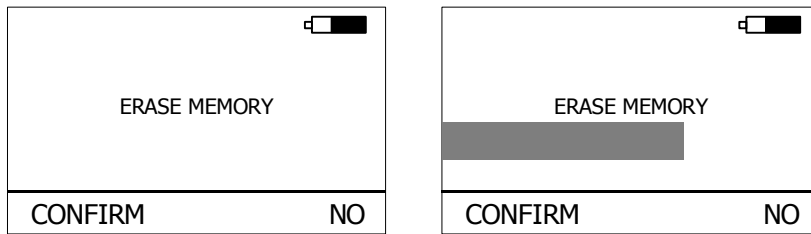
9.3.3 UPLOAD MEMORY

1. By using [UP] [DOWN] select "UPLOAD MEMORY".
2. Press [OK]. All memory content will be sent to the USB port. More information is contained in the chapter "setting up data transfer".



9.3.4 ERASE MEMORY

1. By using [UP] [DOWN] select "ERASE MEMORY" and press [OK].



2. Press [CONFIRM] to erase memory or [NO] for return to main screen.

9.3.5 HOME

1. By using [UP] [DOWN] select "HOME".
2. Press [OK] for return to main screen.

10 Measurement loss

10.1 Basic theory

Loss measures the signal degradation in a fiber optic cable. A light source injects an optical signal of the appropriate wavelength into the fiber and a power meter measures the received signal at the same wavelength.

There are two different measurement methods:

- Method 6
- Method 7

according to IEC 874-1 4.4.7.4.

Power measurement is the basis of optical testing and determines the power budget of the fiber optic link by comparing the power of the transmitter and the sensitivity of the receiver. This difference is the maximum acceptable loss. Power loss is caused by different phenomena such as attenuation of the fiber, dirty connector mating faces, connector misalignment, loss of splices and other issues such as sharp fiber bends. The "end to end" loss test is the most commonly used acceptance test of power loss in fiber optic links. The test is based on measurement the power difference at the input and output of the link.

The PM-800 and LS-800 are used for this test, where the light source (LS-800) acts as a transmitter and the optical power meter (PM-800) as a receiver.

The "end to end" test has two steps:

1. Setting the reference
2. Measurement the loss

Important

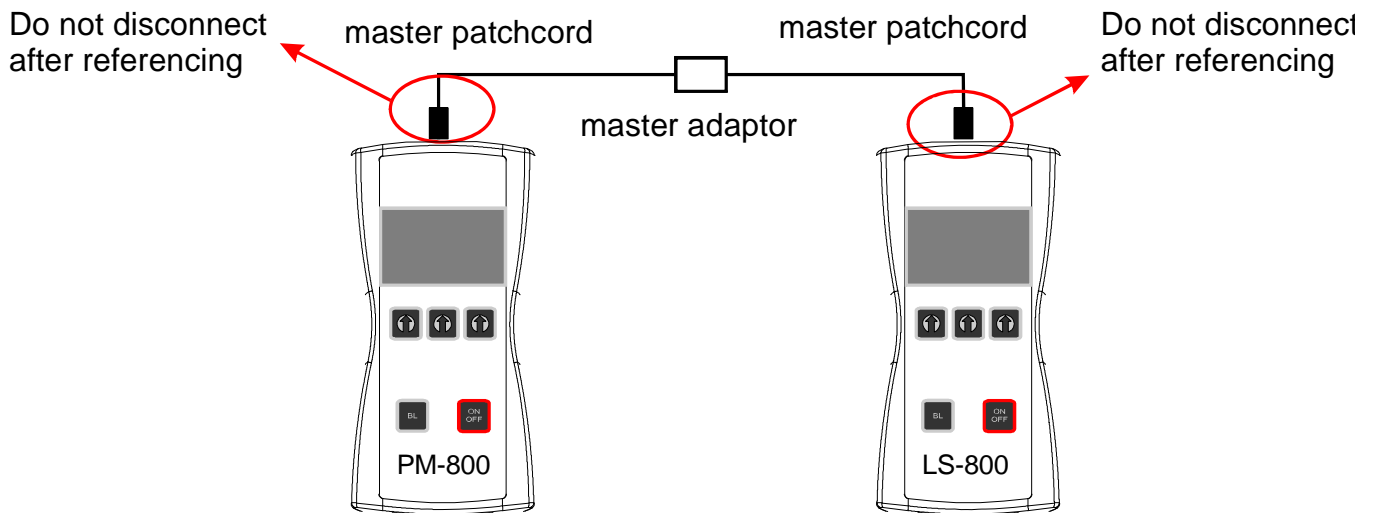
- All connectors and fiber end faces should be cleaned prior to testing (see chapter 7.3).
- The master cord used to set the reference should be the same type as the patchcords (cables) to be tested (MM:50/125, 62.5/125 or SM).
- It is very important that the connections are not disturbed after the reference value is established.

10.2 Method 6

For method 6 two master cords are used to set the reference. Method 6 cancels the effects of the master cords and one adaptor for all subsequent measurements.

10.2.1 Setting the reference

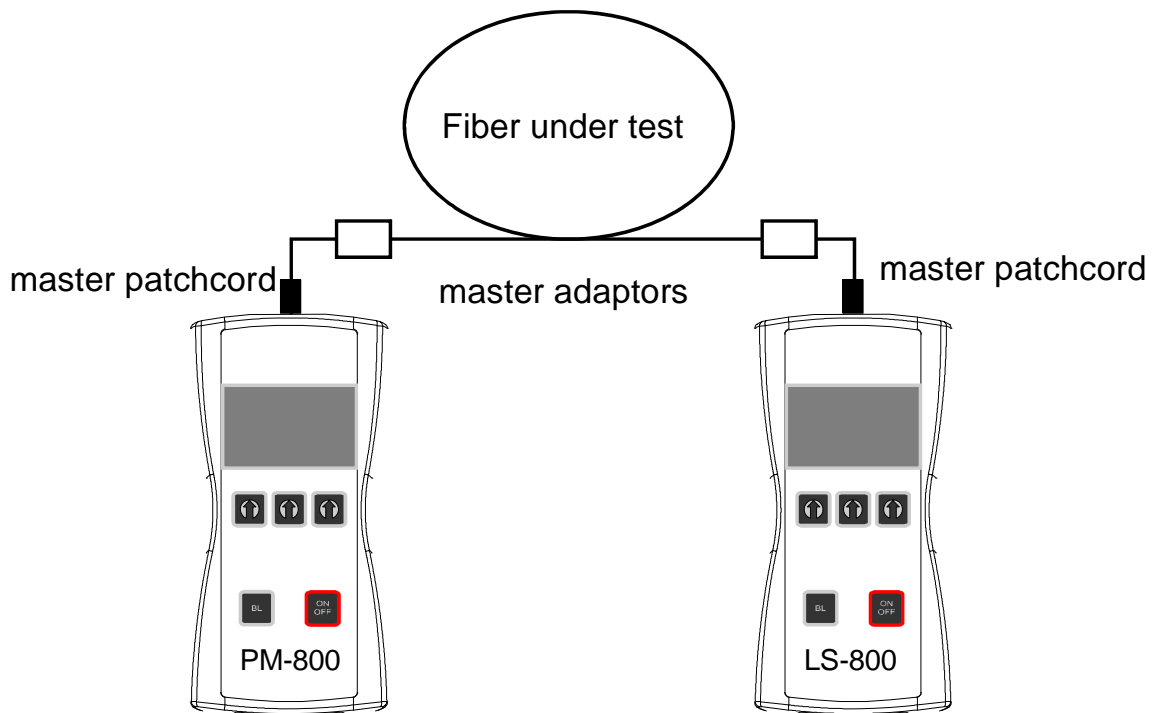
1. Connect the first master cord to the power meter (PM-800).
2. Connect the second master cord to light source (LS-800).
3. Use the master adaptor to connect the two fiber ends (pic.1).
4. Power on the light source and by pushing [λ] select the appropriate wavelength.
5. Power on the power meter and by pushing [λ] select the appropriate wavelength range.
6. On the power meter activate the relative power measurement mode - by pushing [LOSS].
7. Set and store the new reference for the selected wavelength - by pushing [REF] and than [CONFIRM].



(pic.1)

10.2.2 Measurement Loss

1. Do not disconnect the master cords from the light source and power meter.
2. Disconnect second master cord from the adaptor.
3. Connect the trace to be measured between the master cords. An extra master adaptor is required (pic.2).
4. The power meter display will simultaneously report the value with the message "LOSS" or "GAIN" in dB.
5. This value represents a difference between the reference and the performed measurement.
6. If the value will be displayed with the "LOSS" message, the trace to be measured has just this loss.
7. If the value will be displayed with the "GAIN" message, this means that the trace to be measured has been compared with the reference for this gain.
8. Value of loss (or gain) can be stored in the internal memory (see "SAVE RESULT" chapter).



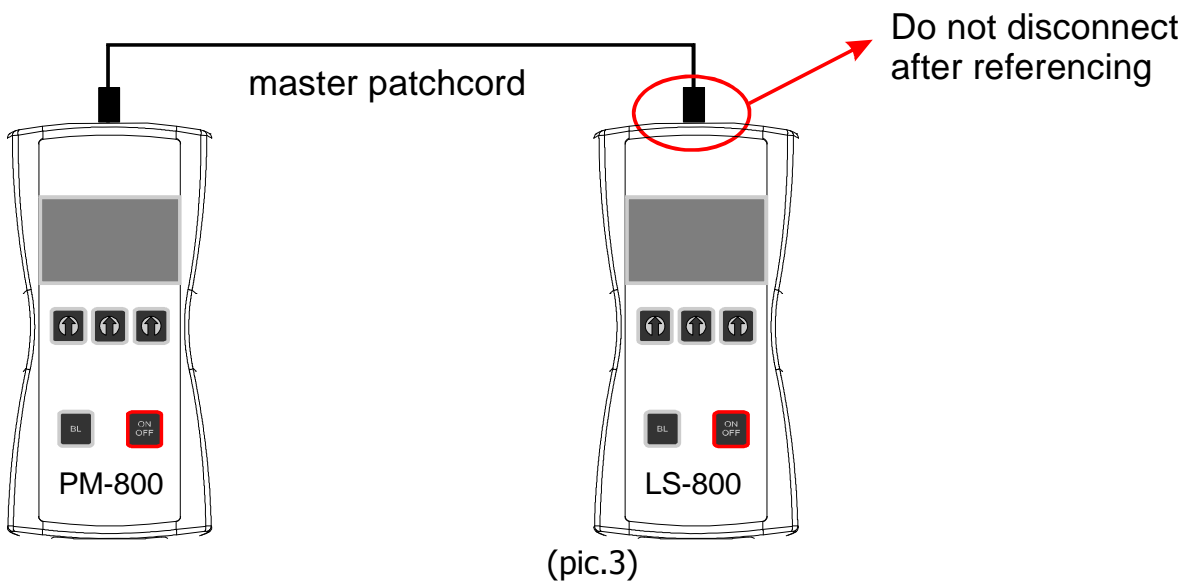
(pic.2)

10.3 Method 7

For method 7, one master cord is used to set the reference. The master cord will be cancelled for all subsequent measurements.

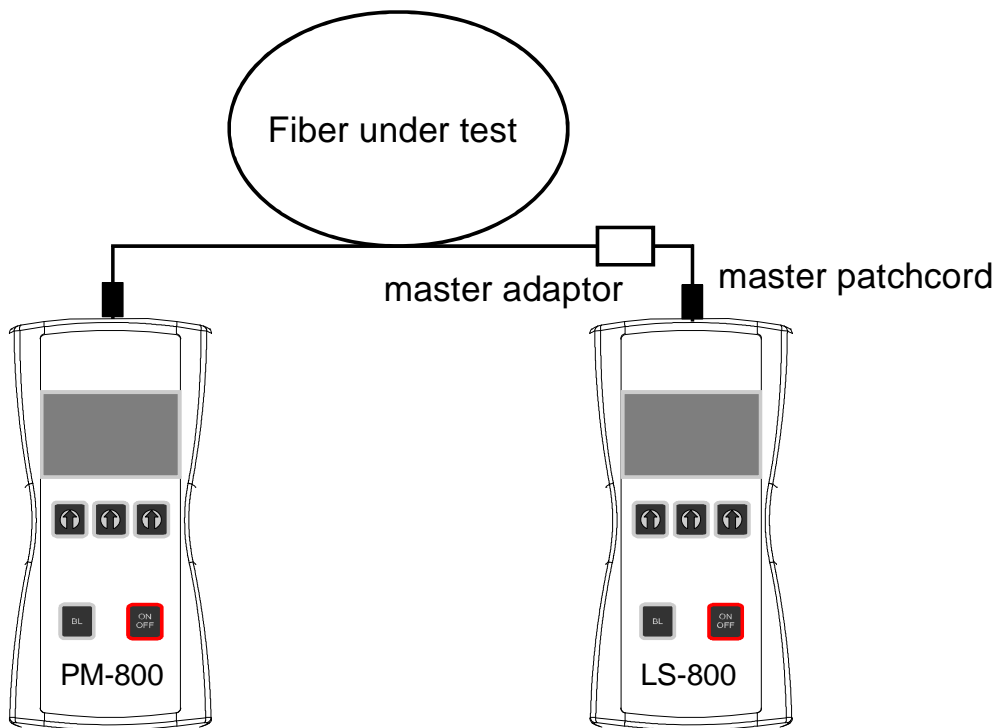
10.3.1 Setting the reference

1. Connect the master cord to the power meter (PM-800).
2. Connect the second end of the master cord to the light source (LS-800, pic.3).
3. Power on the light source and select the appropriate wavelength - by pushing [λ].
4. Power on the power meter and select the appropriate wavelength range - by pushing [λ].
5. On the power meter activate the relative power measurement mode - by pushing [LOSS].
6. Set and store the new reference for the selected wavelength - by pushing [REF] and than [CONFIRM].



10.3.2 Measurement Loss

1. Do not disconnect the master cord from the light source.
2. Disconnect the master cord from the power meter port.
3. Connect the trace to be measured between the power meter port and the master cord that is attached to the light source. An extra master adaptor is required (pic.4)
4. The power meter display will report the value simultaneously with the message "LOSS" or "GAIN" in dB.
5. This value represents the difference between the reference and the performed measurement.
6. If the value will be displayed with the message "LOSS", the trace to be measured has just this loss.
7. If the value will be displayed with the message "GAIN", this means that the trace to be measured has been compared with the reference for this gain.
8. The value of the loss can be stored in the internal memory (see "SAVE RESULT" chapter).



(pic.4)

10.4 High power measurement

For measurement up to +13 dBm is intended PM-800:
 -70 dBm to +13 dBm for 1300, 1310, 1490, 1550, 1625 nm
 (standard measurement methods 6 or 7 described above)

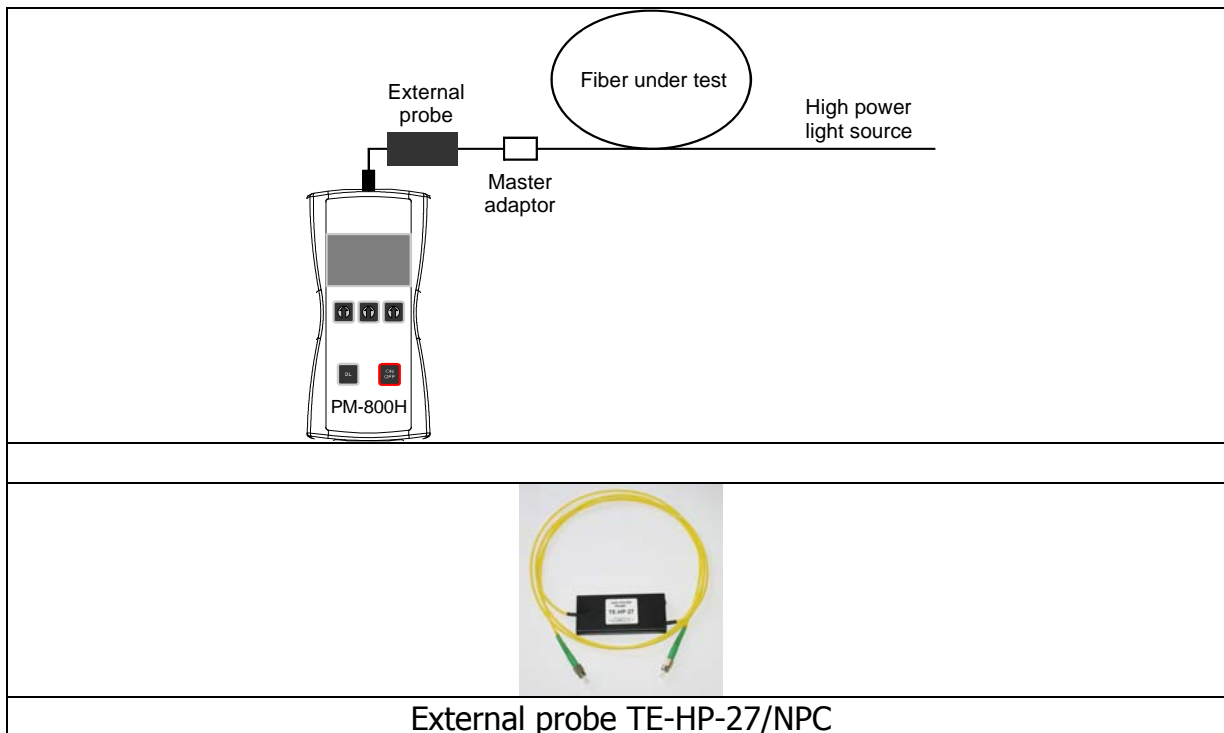
For high power measurement is intended PM-800H:
 -40 dBm to +17 (max +20¹) dBm for 1300, 1310, 1490, 1550, 1625 nm
 or PM-800H with external probe:
 -40 dBm až +27² (max +30^{1,2}) dBm pro 1300, 1310, 1490, 1550, 1625 nm

Note: 1) Short term application
 2) Measurement with external probe

Warning !!!

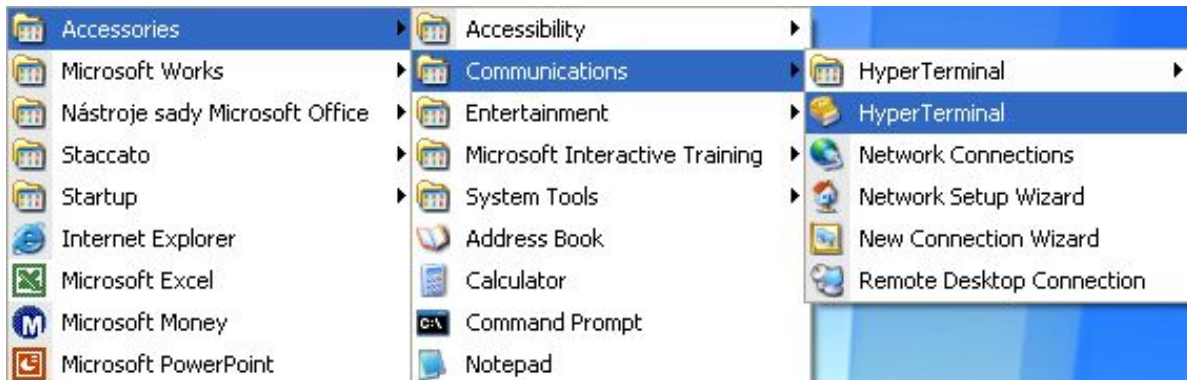
Never use PM-800 for high power measurement above +13 dBm. The high power can destroy optical interface and damage instrument. For high power measurement above +13 dBm use only PM-800H and PM-800H with external probe for measurement above +17 dBm.

For high power measurement is necessary to use following measurement configuration:



11 Setting up data transfer

1. Connect the PM-800 to a PC using the USB cable provided and turn the PM-800 on. The PC will prompt you to install the drivers for new hardware. Use the drivers provided by OPTOKON. These drivers will create a virtual serial com port.
2. Start the Hyper Terminal
Start >> Programs >> Accessories >> Communication >> Hyper Terminal



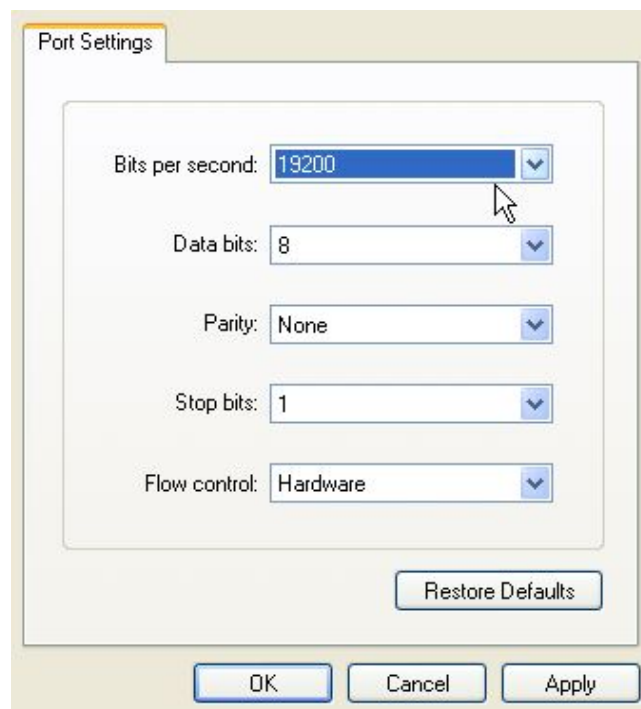
3. Enter the name of a connection, then click on OK.



4. Choose the virtual serial port the PM-800 is connected to, then click on OK

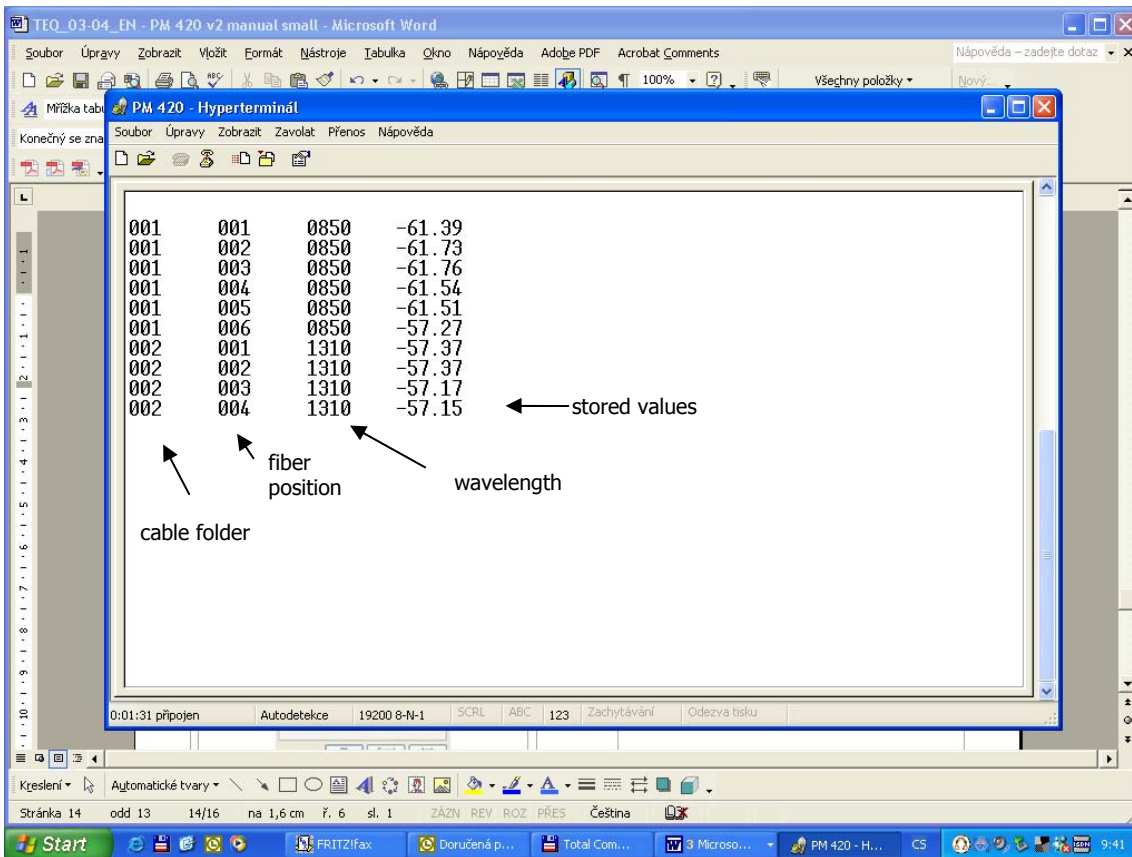


5. Set "Bits per second" to 19200, then click on OK



6. Go to the menu in PM-800 and push [MEM], select [UPLOAD MEMORY], [OK].

The stored data will be transferred to the PC in this format:



The data from this window can be easily copied to any other application.

12 Power loss and decibels

Loss (dB)	% Loss	dBm	Power (mW)
0	0.0	-50	0.00001
0.1	2.3	-40	0.0001
0.2	4.5	-30	0.001
0.3	6.7	-20	0.01
0.4	8.8	-10	0.10
0.5	10.9	-9	0.13
0.6	12.9	-8	0.16
0.7	14.9	-7	0.20
0.8	16.8	-6	0.25
0.9	18.7	-5	0.32
1	20.6	-4	0.40
2	36.9	-3	0.50
3	49.9	-2	0.63
4	60.2	-1	0.79
5	68.4	0	1.00
6	74.9	1	1.26
7	80.0	3	2.00
8	84.2	5	3.16
9	87.7	7	5.01
10	90.0	10	10.00
12	93.7	12	15.84
15	96.8	15	31.62
20	99.0	17	50.12
30	99.9	20	100.00

13 Notes

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14 Calibration, service center

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