



FIBER OPTIC TECHNOLOGY  
CALIBRATION LABORATORY

# PM-212-MPO

## Pocket Optical Power Meter

### *INSTRUCTION MANUAL*



Revision 1.2



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## 1 Introduction

The PM-212-MPO optical power meter is a small, pocket size low cost item. The small size does not prevent the optical meter fulfilling all the technical requirements for field equipment. The unit can be easily carried in the pocket or on a belt. It can be placed within rack mount ODF's with the display on the top or on the side. The NiMH rechargeable battery ensures a long term working time with a minimum life time of 5 years. The unit is able to store 100 measurements which can be uploaded to a PC and managed with SmartProtocol software.

The instrument can be used separately to measure absolute or relative optical power in optical networks which includes MPO connectors.

## 2 Features

- MPO/MTP connector
- Multimode applications
- Small size, light weight
- Absolute and Relative optical power measurement
- Internal two level memory structure
- Capacity up to 100 measurements
- SmartProtocol SW – generating of test reports
- USB port for:
  - Charging the battery
  - Data upload to PC
  - Firmware upgrade
- Built-in NiMH rechargeable battery pack
- Auto Off
- Battery status indicator

## 3 Application

- Absolute or relative optical power measurement.
- Optical network testing.
- Measurement output power of optical transmitters.
- Measurement input power at optical receivers.
- Measurement attenuation in fiber cabling, in conjunction with the Light Source
- Measurement loss of MPO connectors and patchcords
- Easy and quick identification of failure points in fiber optic networks
- Suitable for MM applications.

## 4 Accessories

### 4.1 Standard

- Power meter
- MPO input adapter
- Power charging adaptor
- Traceable calibration certificate
- Soft carrying case
- USB cable
- SmartProtocol SW

### 4.2 Optional

- Hybrid Master MPO patchcord<sup>1</sup>
- Hard carry case (TE-HC-01)

Note: 1) Hybrid MPO patchcord on request, please define connector type



Power charging adaptor



TE-HC-01

Hybrid patchcord (e.g. MPO to E2000)



## 7 Maintenance

### 7.1 Battery care

The PM-212 series comes equipped with a built-in charger and internal battery pack.

- Before using the PM-212-MPO for first time, charge fully battery pack.
- Use the USB charger, cable and USB port for charging.
- Charging is not recommended until battery status is 30% or less. Recommended charging time of battery pack is 10 to 12 hrs.
- Charge the battery pack fully before storing PM-212-MPO for a long period. The batteries will lose its charge during storage.
- If you are not going to use the PM-212-MPO for long period, charge the battery pack once every six months.
- The battery pack is a consumable. Repeated charging and discharging degrades battery pack life. Please contact OPTOKON for battery pack replacement.
- To extend battery pack life it is recommended that batteries be completely drained before re-charging – battery refresh. Otherwise the batteries lose its ability to fully recharge



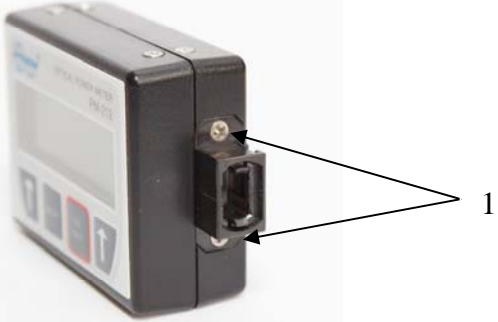

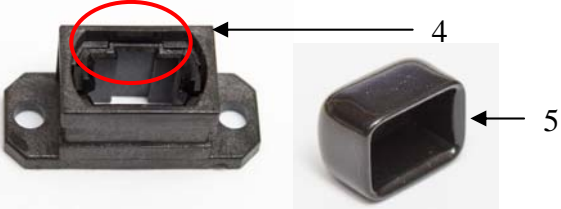
### 7.2 Instrument care

- 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.

### 7.3 Optical MPO connector care

- Cleanliness will affect the performance of an optical fiber system.
- All connectors and fiber end faces need to be clean prior to testing.
- Clean all connectors, adapters, and attenuators before making any connections.
- Use appropriate optical cleaning supplies to keep connectors and adaptors free from contamination.

## 7.4 Cleaning procedure description

	<ul style="list-style-type: none"> <li>• Loosen the screws (1) and remove the adaptor housing (2)</li> <li>• Wipe the entire surface of the sensor protective glass (3) with fine strokes into the corner by using lint-free cotton swab moistened with IPA</li> </ul>
	<ul style="list-style-type: none"> <li>• Try to stick impurities in the corner by using second (unused) side of cotton swab.</li> <li>• Let the IPA vaporized (few seconds).</li> <li>• Mount the adaptor housing and the screws back.</li> <li>• Tighten the screws gently.</li> </ul>
	<p>Note: the MPO connector key (4) should be oriented to front side of the instrument)</p> <p>Always use cover (5)</p>



## 8 Instrument and button function description



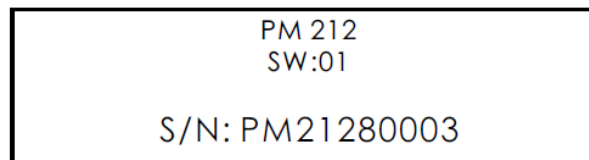
### [ON/OFF]

Press ON/OFF key to turn the unit on.

Press ON/OFF key to turn the unit off.

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

The unit always starts up with displaying the settings when it was switched off. For example, if absolute mode measurement, wavelength 850 nm and Auto Off is selected and the unit is switched off, after pressing the ON button, the unit will start up with the same settings.

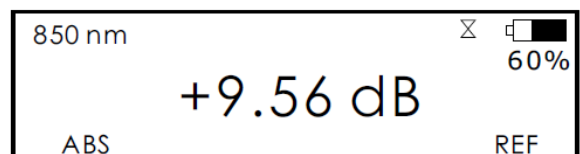


### [AUTO OFF]

Press and hold the ON/OFF key to Enable/Disable the AUTO OFF feature.

The unit will display "AUTOOFF CHANGED" and the symbol "⌘" will be displayed. (Auto OFF is enabled)

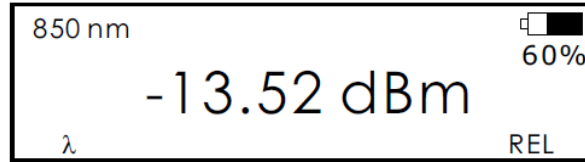
If Auto Off is enabled, the unit will switch off after 10 minutes of no activity.



### 8.1 Menu #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 (if the unit was switched off in the "absolute power measurement mode").



**[λ]**

PM-212-MPO works with 850 nm

**[REL]**

Activates the relative power measurement mode (unit dB).

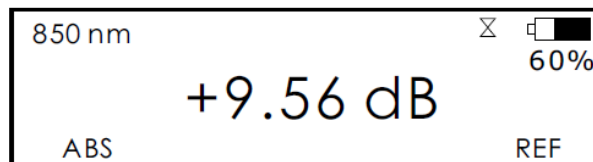
Recalls the last set reference for a selected wavelength.

Goes to menu #2.

### 8.2 Menu #2 – Relative power measurement mode

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

This screen is displayed after the instrument is switched on and information regarding the type of device, serial number and firmware version is described (if the unit was switched off in the "relative power measurement mode").



**[ABS]**

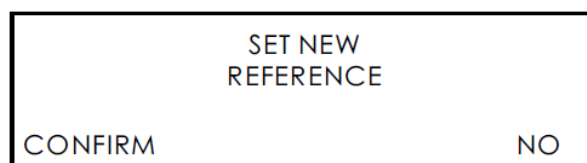
Returns unit to the absolute power measurement mode (unit dBm).

Goes to menu #1.

**[REF]**

Sets and stores the new reference for the selected wavelength.

Note: The new reference must be confirmed by the following screen:



## 9 Working with the internal memory

The PM-212-MPO memory has a structured, two-level organization. The results are stored in memory positions (MEM) in folders called Cable (CAB). See the table below:

CAB1	MEM1
	MEM2
	MEM3
	....
	MEM X
CAB2	MEM1
	MEM2
	MEM3
	....
	MEM Y
.....	MEM1
	MEM2
	....
	MEM Z
	CAB N
MEM2	
MEM3	
....	
MEM Q	

A maximum of 256 results can be stored in the memory, although the maximum number of CAB and MEM is 128. This means, if 128 CAB folders are used, each CAB folder can contain a maximum of two memory positions (MEM), and vice versa; if only two CAB folders are used, each folder can contain up to 128 memory positions (MEM).

### [MEM]

To access the memory, press the MEM key.

Use [↑] or [↓] keys for selecting the appropriate function.

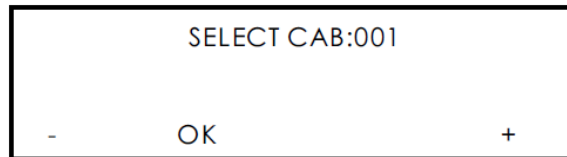


## 9.1 SAVE RESULT

1. Press [MEM].



2. Use [+] or [-] keys for selecting "SAVE RESULT" and press [MEM].



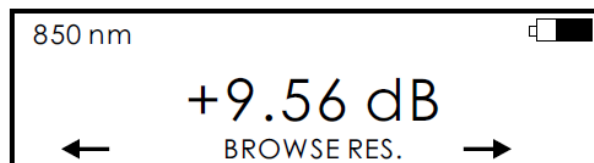
3. Use [+] or [-] keys for selecting the appropriate CAB and press [OK].



4. Use [+] or [-] keys for selecting the appropriate MEM and press [OK].
5. The measurement value will be saved into the selected memory position.

## 9.2 BROWSE RESULT

1. Press [MEM].



2. Use [+] or [-] keys for selecting "BROWSE RES." and press [MEM].



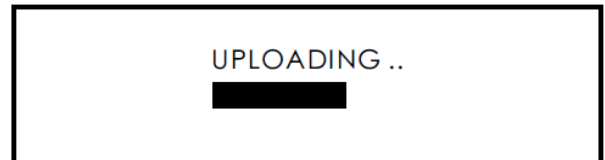
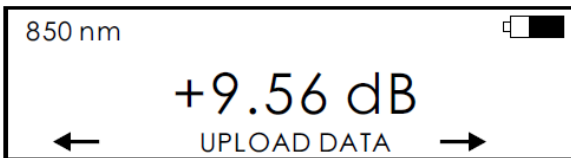
3. Use [+] or [-] keys for selecting the appropriate CAB and press [OK].



4. Use [+] or [-] keys for selecting the appropriate MEM.
5. Measurement value (reference) will be displayed.
6. Press [OK] to return to Menu#1 or #2.

### 9.3 UPLOAD DATA

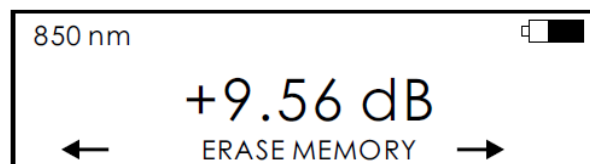
1. Press [MEM].



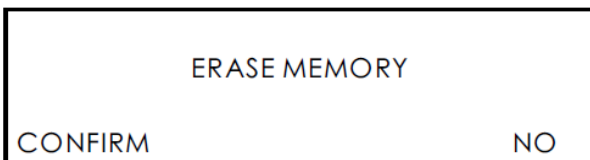
2. Use [+] or [-] keys for selecting "UPLOAD DATA" and press [MEM].
3. Saved data will be uploaded through the USB port into a PC.
4. For creating measurement protocol use "SmartProtocol" PC software.

### 9.4 ERASE MEMORY

1. Press [MEM].



2. Use [+] or [-] keys for selecting "ERASE MEMORY" and press [MEM].
3. Press [CONFIRM] or [NO].



4. After confirmation all memory contents will be erased.

## 9.5 EXIT MEMORY



1. Use [+] or [-] keys for selecting " EXIT MEMORY" and press [MEM].
2. Press [MEM].
3. Display will return to Menu#1 or #2.

## 10 Insertion Loss Measurement

### 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 for 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-212-MPO and LS-800 are used for this test, where the light source (LS-800) acts as a transmitter and the optical power meter (PM-212-MPO) as a receiver.

The "end to end" test includes two steps:

1. Setting the reference
2. Measurement the loss

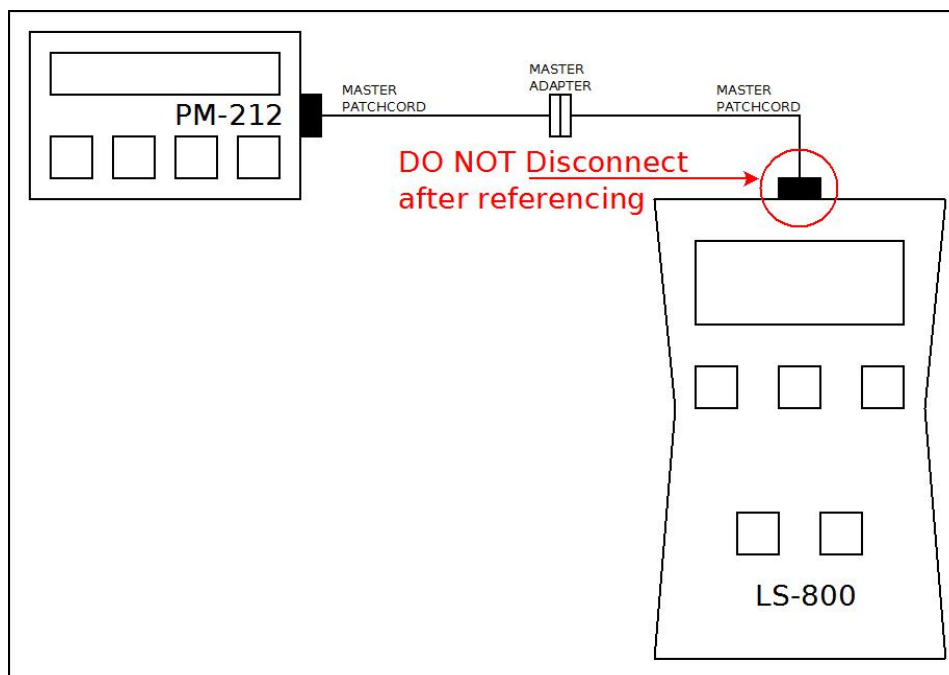
## 10.2 Method 6

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 (hybrid patchcord MPO<->FC)<sup>1</sup> to the power meter (PM-212).
2. Connect the second master cord (patchcord FC<->FC) to the light source LS-800.
3. Use the master adaptor to connect the two fiber ends (FC+FC) (fig.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 [REL].
7. Set and store the new reference for the selected wavelength - push [REF], [CONFIRM].

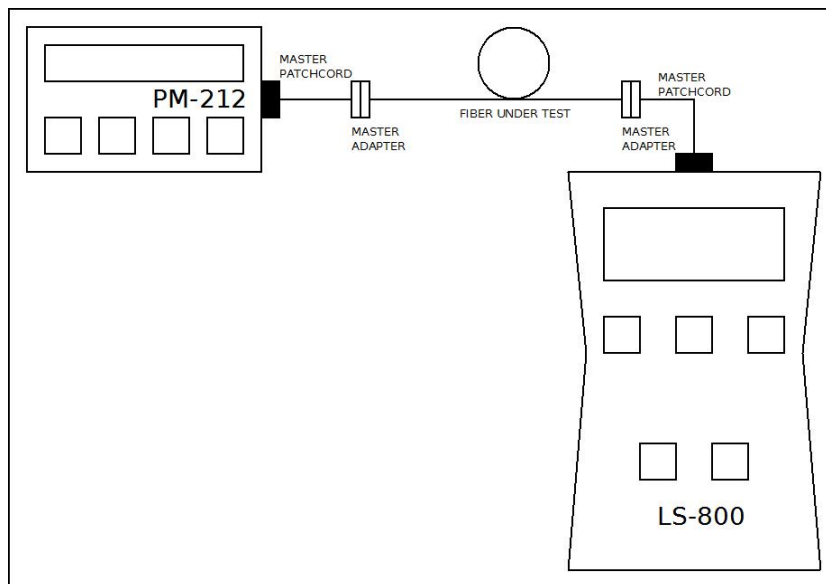
Note: 1) example of hybrid master patchcord, different connector and adaptor types must be used in relation with LS-800 output adaptor type – e.g. if LS-800 contains SC adaptor, hybrid SC<->MPO patchcord and SC adaptor must be used



(fig.1)

### 10.2.2 Measurement Loss

1. Do not disconnect the master cord (hybrid patchcord MPO<->FC) from the light source (FC) and the power meter (MPO).
2. Disconnect one master cord from the adaptor.
3. Connect the trace to be measured between the master cords. An extra master adaptor is required (fig.2).
4. The power meter display will report the loss in dB.



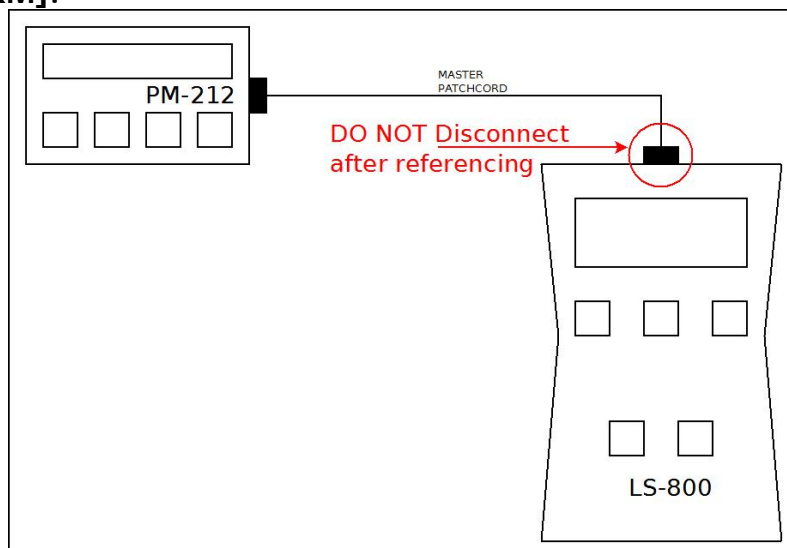
(fig.2)

### 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 (hybrid patchcord MPO<->FC) to the power meter (PM-212-MPO).
2. Connect the second end of the master cord to the light source (LS-800, fig.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 **[REL]**.
6. Set and store the new reference for the selected wavelength - push **[REF]**, **[CONFIRM]**.

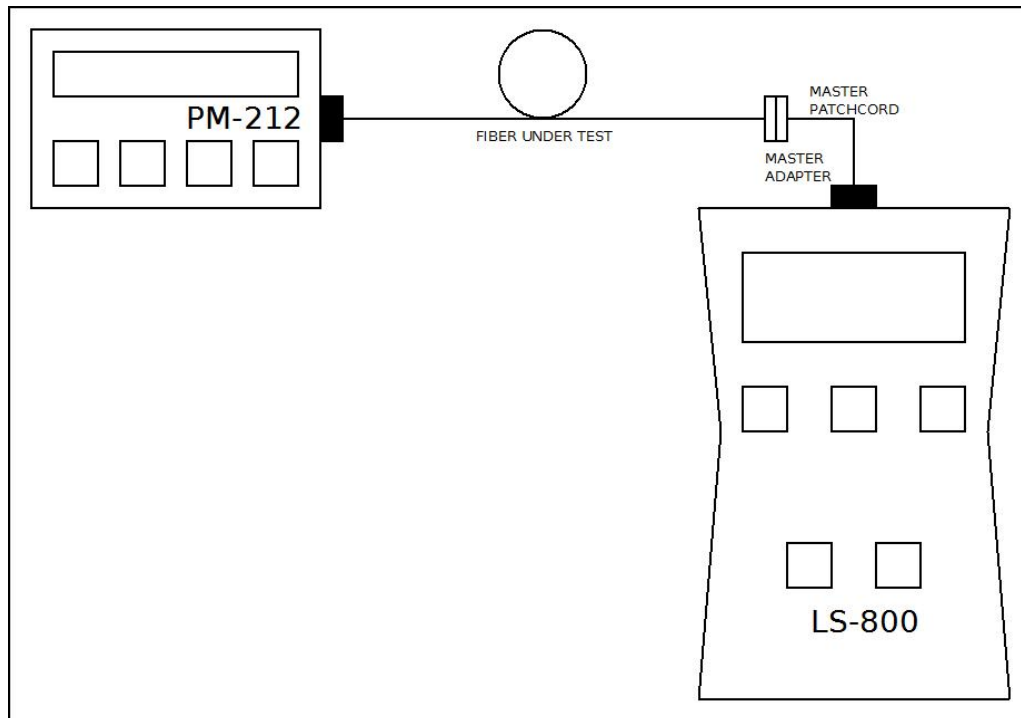


(fig.3)



## 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 (fig.4).
4. The power meter display will report the loss in dB.

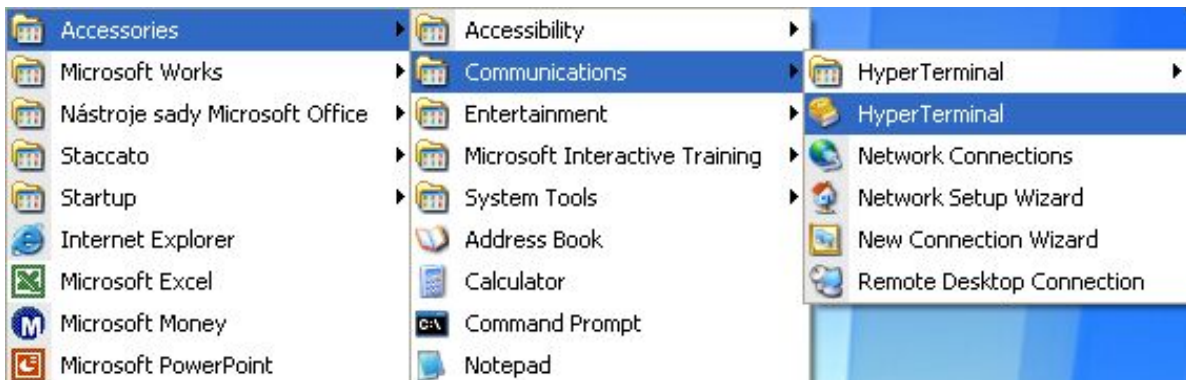


(fig.4)

## 11 Setting up data transfer

### 11.1 Data download

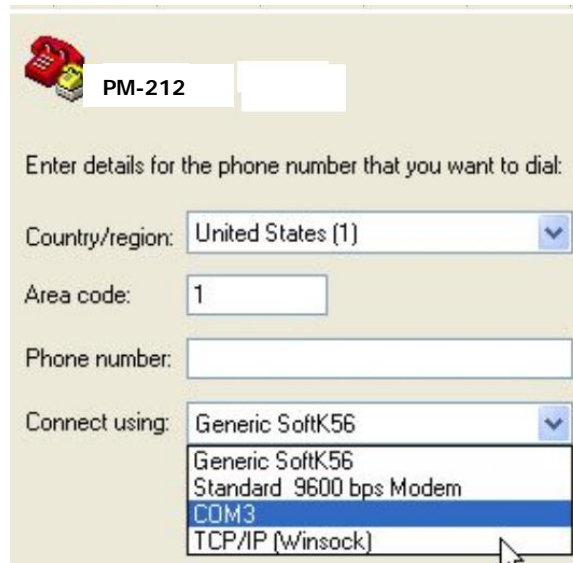
1. Connect the PM-212 MPO to a PC using the USB cable provided and turn the PM-212-MPO on. The PC will prompt you to install the drivers for new hardware. Use the drivers on the CD provided by OPTOKON. These drivers will create a virtual serial com port.
2. Start the Hyper Terminal.  
Start >> Programs >> Accessories >> Communication >> Hyper Terminal.



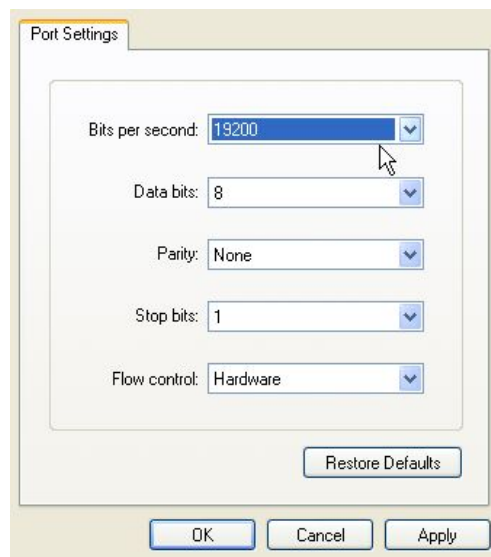
3. Enter the name of a connection, then click on OK.



4. Choose the virtual serial port that the PM-212-MPO is connected to, then click on OK.

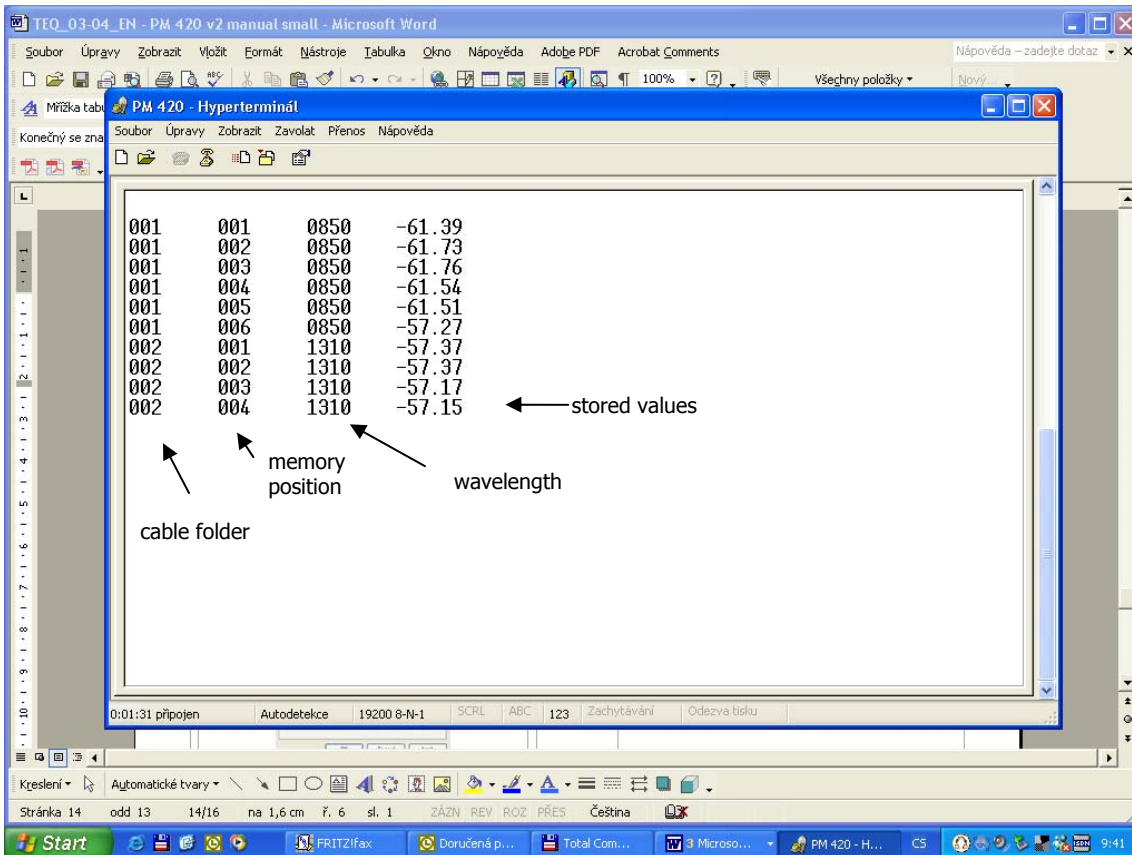


5. Set "Bits per second" to 19200, then click on OK.



- Go to menu in PM-212-MPO and push [MEM], use [↑] or [↓] keys for selecting "UPLOAD DATA", push [MEM].

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. For creating measurement protocol use "SmartProtocol" PC software.

## 11.2 Control via Hyperterminal

Control is performed by entering commands that are written to the window of HyperTerminal.

Note: Commands for PM-212-MPO are the same as for PM-212, OFT-820

Command	Significance	Notes
v	Actual value of display	This commands are shown in the window of HyperTerminal
r	Reference	
l	Actual wavelength	
n	Type and serial number	
1	Simulation of pushing first button	This commands are shown on the display of device
2	Simulation of pushing second button	
3	Simulation of pushing third button	
0	Reset device	

Basic commands for HyperTerminal.

## 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 Calibration, service center

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