FIBER OPTIC TECHNOLOGY
CALIBRATION LABORATORY

OFT-820-POF
Loss Test Set

INSTRUCTION MANUAL

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Contents

1 Introduction

The OFT-820-POF series Loss Test Set is designed for POF – Plastic Optical Fiber network testing. It combines two optical test equipment – Light Source and Power Meter in the same box. The optical Light Source fulfills all the necessary technical requirements for field POF network measurements. The source sends optical light into output interface, available in working wavelength 650 nm. The optical Power Meter is designed to measure absolute or relative optical power in POF networks.

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 SmartProtocol PC evaluation software supports memory download and test report generating. The rechargeable battery ensures long term working with a minimum life time of 5 years.

The removable and changeable IN/OUT adapters allow easy maintenance and cleaning of both ports, making the tester to be universal in wide range of application with various POF connectors. Design of both input and output adapters is the same.

2 Features

- POF testing
- Small size, light weight
- Easy exchangeable adapters – source and power me
  - FC, SC, ST, HFBR, SMA connectors
  - Universal 2.5 mm ferrule connectors
  - Universal 2.2 mm POF cable
- High capacity memory
- SmartProtocol PC software
  memory download, reporting solution
- USB port
- Absolute and Relative optical power measurement
- Displayed units: dBm, dB, W
- Powered by built-in rechargeable battery
- Contrast display with backlight
- Auto Off
- Battery status indicator

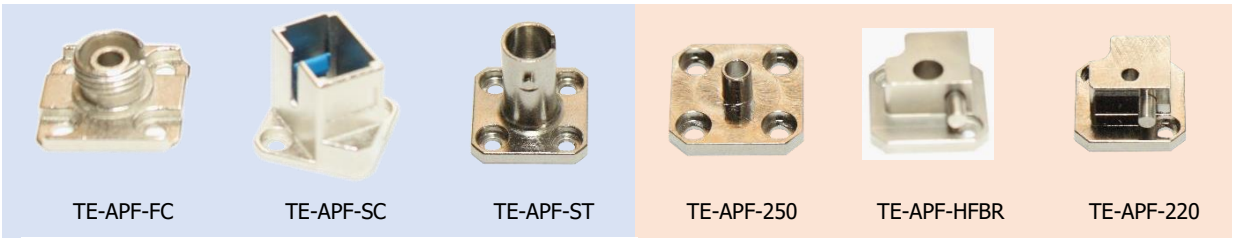
3 Application

- POF Optical network measurements
- Measurement output power of optical transmitters
- Measurement input power of optical receivers
- Measurement attenuation in POF cabling.
- Measurement loss in connectors, adapters, switches and other components
- Easy and rapid identification of failure points in fiber networks

4 Standard accessories

- SmartProtocol PC software
- Two IN/OUT adapters according to ordering code
- Power charging adapter
- Hard carrying case
- USB connection cable
- Calibration certificate

Optional IN/OUT adapters:



TE-APF-FC TE-APF-SC TE-APF-ST TE-APF-250 TE-APF-HFBR TE-APF-220

USB Power charging adapter
USB cable

IN/OUT ports with mounted adapters[1]

Note: 1) Adapters are compatible and changeable in two adapters holders versions (different sleeves)
- standard adapters style: FC, ST, SC
- POF adapters types: HFBR, SMA, universal 2.2. mm and 2.5 mm

5 Specifications

Power Meter		**Note:**
Photodetector	3 mm Si	
Working wavelengths	650 nm, 850 nm	can be customized
Uncertainty	± 5%	
Resolution	0.1	
Dynamic range	-65 dBm to +10 dBm	650 nm, 850 nm
Light Source		
Wavelength	650 nm, 850 nm	
Output power	0 dBm	tested with SC POF connector
Stability (1 hour, delta/2):	± 0.03 dB	tested after 20 min warm up temperature 23 ± 1°
Loss Test Set		
Dimensions	165 x 80 x 50 mm	with universal adapter
Weight	350 g	with battery
Temperature operating storage Humidity (non condensing)	-10 to +50 °C -40 to +70 °C 0 – 95%	
Battery working time	> 80 hrs	backlight off
Battery life time	> 2 years	3000 mAh LiPol

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

6 Safety information

OFT-820 Light source complies with the following safety classifications:
IEC825-1 and 21CFR1040: Class1

This applies to LED options up to 1 mW. Devices in this category are classified as safe for use by technicians under normal viewing, provided that magnifying devices are not used.

WARNING!

It is the responsibility of the user to acquire adequate training and familiarity with relevant safety issues and work practices before using this equipment.

The OFT-820 Power meter 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.

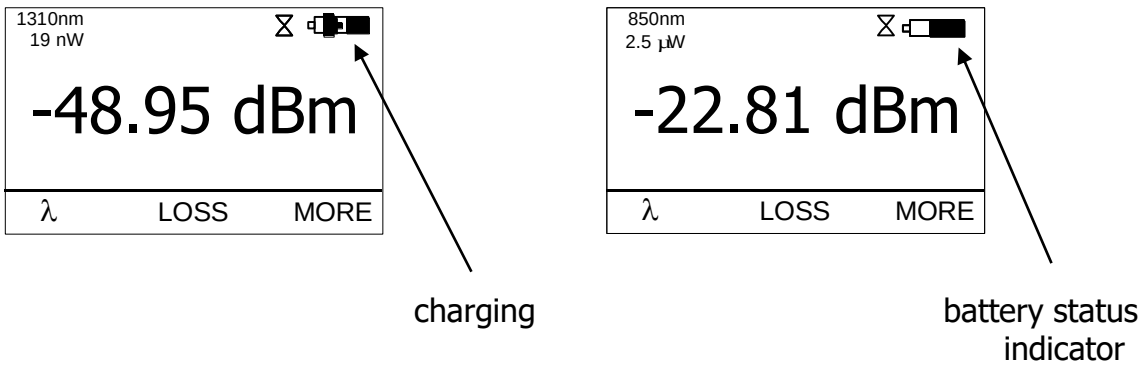
- Never use magnifying devices to inspect plastic optical fiber ends unless you are certain that no optical power is being emitted
- Only use magnifying devices with a built-in infra-red filter to ensure safety
- Avoid direct exposure to the beam.

7 Maintenance

7.1 Battery care

The OFT-820 comes equipped with a built-in charger and is powered by LiPol type battery (standard accessories).

- Charging – via USB port (PC) or by using external USB power charging adapter (standard accessories)
- Before using the OFT-820 for first time, charge fully the batteries.
- Use only supplied USB power charging adapter.
- Charging is not recommended until battery status indicator is 30% or less. Recommended charging time of batteries is 12 to 14 hrs.
- Charge the batteries fully before storing OFT-820 for a long period. The batteries will lose its charge during storage.
- If you are not going to use the OFT-820 for long period, charge the batteries once every six months.
- The batteries are a consumable. Repeated charging and discharging decreases batteries lifetime.
- To extend batteries lifetime it is recommended that batteries be completely drained before re-charging – battery refresh. Otherwise the batteries lose its ability to fully recharge.



7.2 Device care

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

7.3 IN/OUT Adapter exchange

The OFT-820-POF comes equipped with an IN/OUT adapter set. The adapter set includes adapters specified in order according following ordering codes:

Optional adapters:


TE-APF-FC

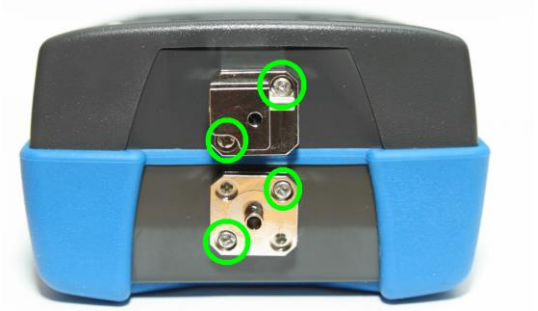

TE-APF-SC


TE-APF-ST


TE-APF250


TE-APF-HFBR


TE-APF-220

	IN / OUT adapters mounted • IN (top) – power meter port • OUT(bottom) – light source port
	For exchange IN (OUT) adapter loosen two screws • avoid loosing screws • carefully remove adapter out to prevent scratching of port covering glass • after removing adapters you can also make cleaning of power meter (IN) covering glass
	IN / OUT adapters removed • try to avoid any contact with both covering glass of ports • scratching, dirt or moisture can badly affect device certainty (mainly on power meter port)
	**IMPORTANT NOTE:** NEVER LOOSEN SCREWS UNDER ADAPTERS – it may cause DEVICE DAMAGE!

8 Device and button function description

8.1 General description

[ON/OFF]
Press to turn the unit on.
Press to turn the unit off.
After switching on, the type of device, serial number and firmware version will be displayed.

OFT-820P SW:1.2 S/N: OFT820450

OFT-820P SW:1.2 S/N: OFT820450

The unit will start up with "AUTO OFF" feature – symbol "⧖" will be diplayed.
For disable the AUTO OFF feature press and hold the ON/OFF key until symbol "⧖" disappear.
If activated, the unit will turn off after approximately 10 minutes of no activity.

[BL]
Turns the Display Backlight On and Off.

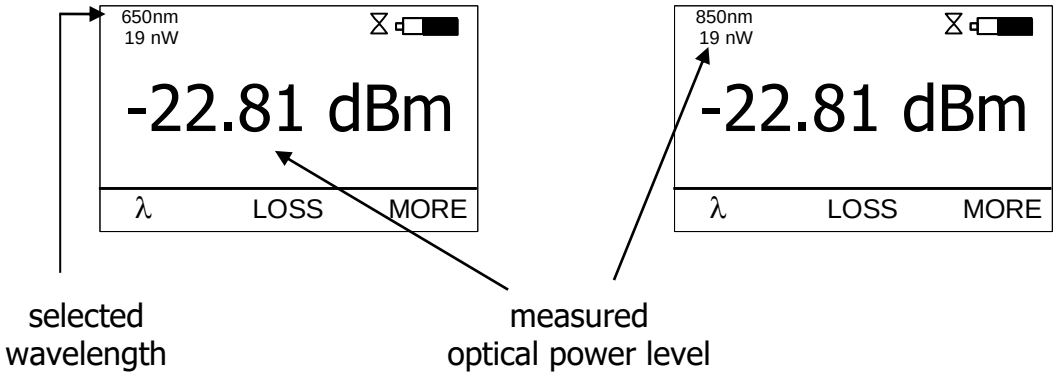
[⇧]
Meaning of these keys depends on current menu.

8.2 Power meter

8.2.1 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 device is switched on and information regarding the type of device, serial number and firmware version will appear.

Reading the display:



[λ]
Selects 650 or 850 nm wavelengths

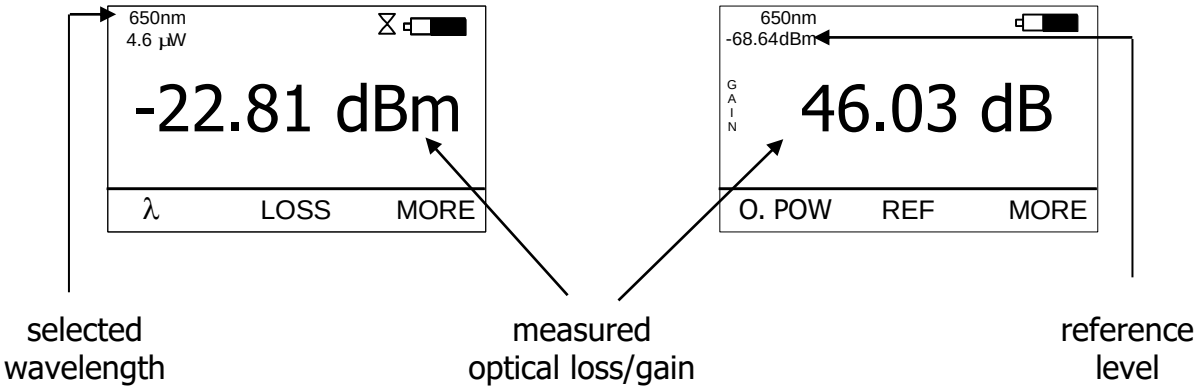
[LOSS]
Activates the relative power measurement mode (unit dB).
Recalls the last set reference for a selected wavelength.
Goes to menu #2.

[MORE]
Goes to navigation menu #3.

8.2.2 Menu #2 – Relative power measurement mode

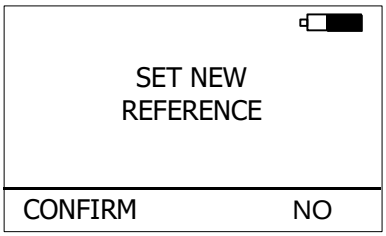
In the relative power measurement mode is on the value of optical insertion loss in dB units which corresponds to performed reference is shown on the display.

Reading the display:



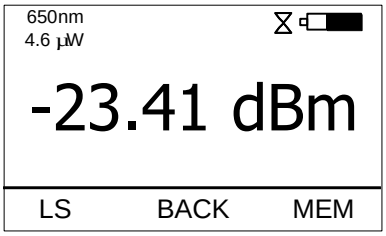
[O.POW]
Returns unit into absolute power measurement mode (unit dBm).
Goes to menu #1.

[REF]
Sets and stores the new reference for the selected wavelength
Note: The new reference must be confirmed by the following screen:



[MORE]
Goes to navigation menu #3.

8.3 Menu #3 – Navigation



[LS]
Goes to Light source menu#4.

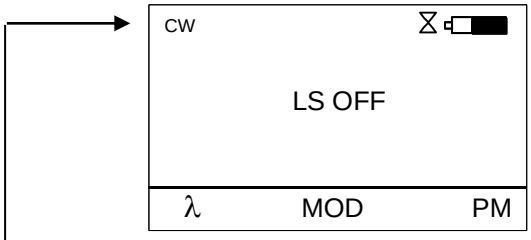
[BACK]
Returns unit into absolute or relative power measurement mode (unit dBm or dB).
Goes to the menu #1 or #2.

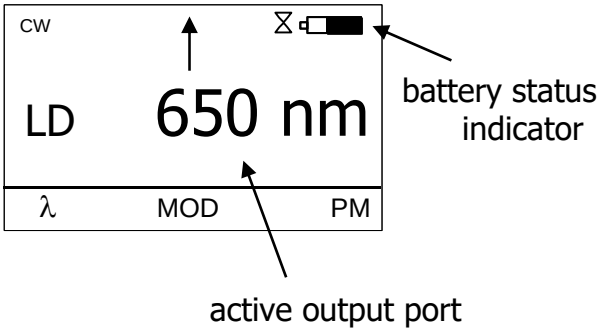
[MEM]
Goes to Memory menu #5.
Starts working with the internal memory.

8.4 Light source

8.4.1 Menu #4 – Light source menu

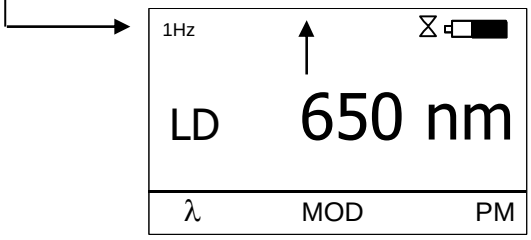
Reading the display:





[λ]
Press the button to start / stop light source

[MOD]
Selects the modulation:
CW – Continuous wave
1Hz – 1Hz Modulation



press λ to start / stop emitting light

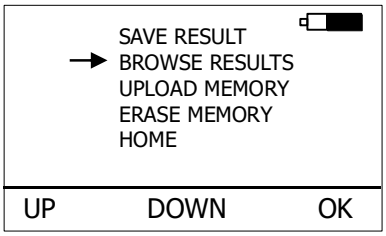
[PM]
Returns unit into absolute or relative power measurement mode (unit dBm or dB).
Goes to menu #1 or #2.

8.5 Menu #5 – Working with the internal memory

The memory of OFT-820 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

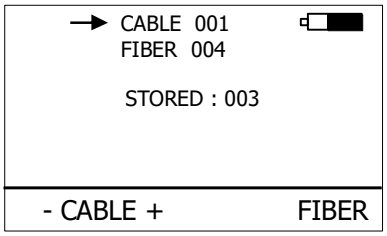
This screen will appear after pressing [MORE] key from Menu#1 or Menu#2 then [MEM].



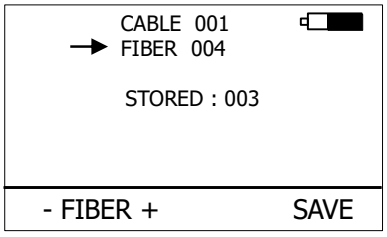
[UP], [DOWN], [OK]
Use these buttons for selection appropriate submenu.

8.5.1 Save results

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

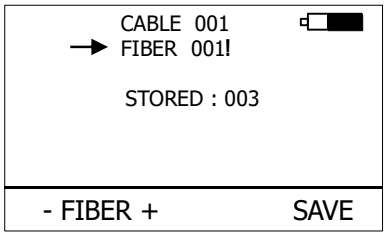


2. Select the cable (folder) using [- CABLE +], the unit will display the number of saved results under the selected cable, then press [FIBER].



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.

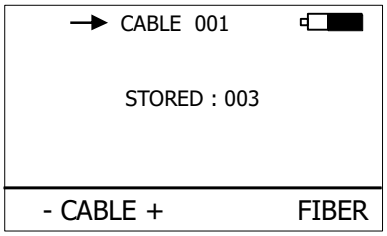
NOTE: If the selected memory position is already occupied, the "**!**" mark will appear on the display.



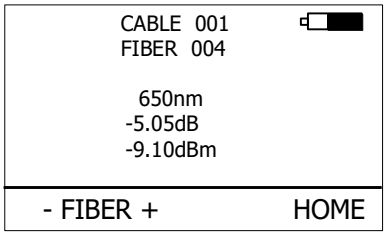
By pressing [SAVE], the new result will OVERWRITE the selected FIBER position and the old result will be discarded.

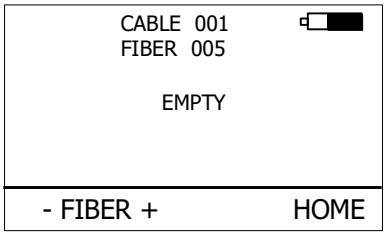
8.5.2 Browse results

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].



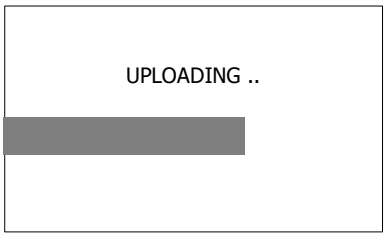


3. Use [- FIBER +] to browse through the results.

8.5.3 Upload memory

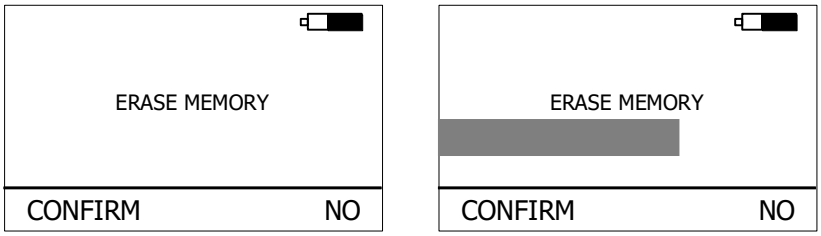
1. By using [UP] [DOWN] select "UPLOAD MEMORY".

2. Press [OK]. All memory content will be sent to the USB port. More information is contained in the chapter "setting up data transfer".



8.5.4 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.

8.5.5 Home

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

9 Measurement loss

9.1 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 according to EN 61300-3-4

- Method C2 – insertion method with direct coupling to the power meter
- Method C3 – insertion method with additional test patchcord

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 OFT-820 Power Meter and OFT-820 Light Source are used for this test, where the Light Source acts as a transmitter and the optical Power Meter as a receiver.

The "end to end" test includes two steps:

1. Setting the reference
2. Measurement the loss

Important

- Eventual connectors and plastic fiber cleaves fiber 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: 9/125).
- It is very important that the connections are not disturbed after the reference value is established.

9.2 Method C3 - two devices

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

9.2.1 Setting the reference

1. Connect first Master cord to Light source port of first OFT-820 device.
2. Connect second Master cord to Power meter port of second OFT-820 device.
3. Use Master adapter to connect the two fiber ends.
4. Power on first OFT-820 device (light source).
5. Push **[MORE], [LS].**
6. By pushing **[·]** activate light source.
7. Power on second OFT-820 device (power meter).
8. By pushing **[·]** select appropriate wave-length range.
9. Activate relative power measurement mode - by pushing **[LOSS].**
10. Set and store the new reference for selected wave-length - by pushing **[REF], [CONFIRM]**.

Do not disconnect
after referencing

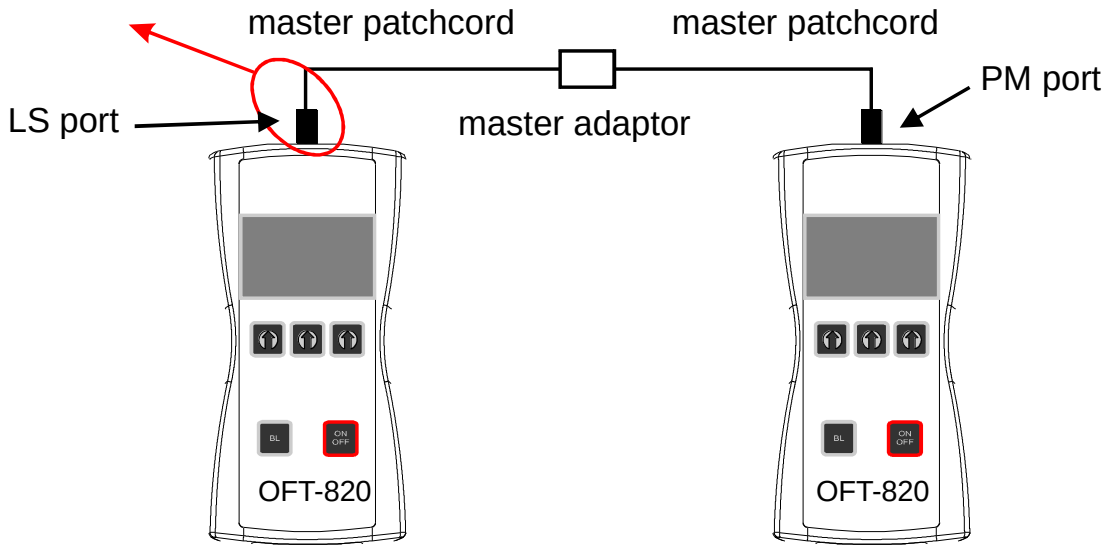


Fig. 1: Settings of reference.

9.2.2 Measuring Loss

1. Do not disconnect the Master cords from devices.
2. Disconnect one Master cord from adapter.
3. Connect the trace to be measured between the Master cords. An extra Master adapter is needed.
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).

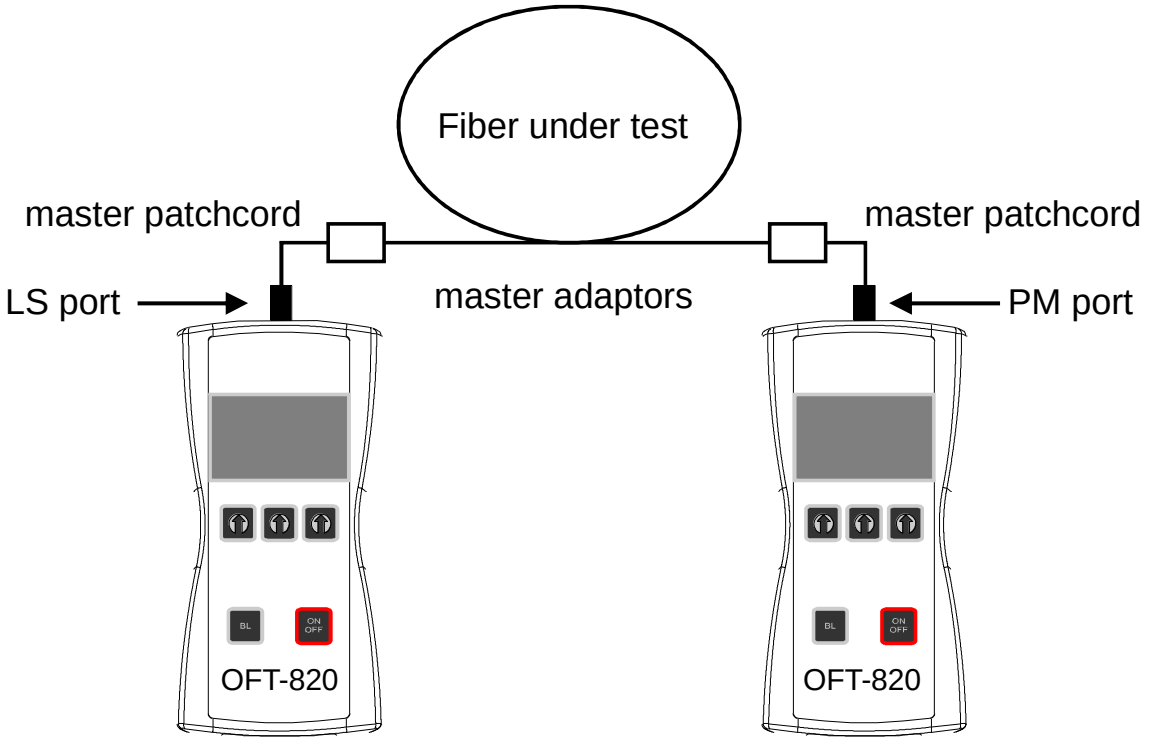


Fig. 2: Measurements of loss – with two devices and two master patchcords.

9.3 Method C3 - one device

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

9.3.1 Setting the reference

1. Connect first Master cord to Light source port.
2. Connect second Master cord to Power meter port.
3. Use Master adapter to connect the two fiber ends.
4. Power on OFT-820 device.
5. Push **[MORE], [LS].**
6. By pushing **[·]** activate light source (650 nm).
7. Push **[PM]** and select appropriate wave-length range - by pushing **[·]** (power meter).
8. Activate relative power measurement mode - by pushing **[LOSS].**
9. Set and store the new reference for selected wave-length - by pushing **[REF], [CONFIRM].**

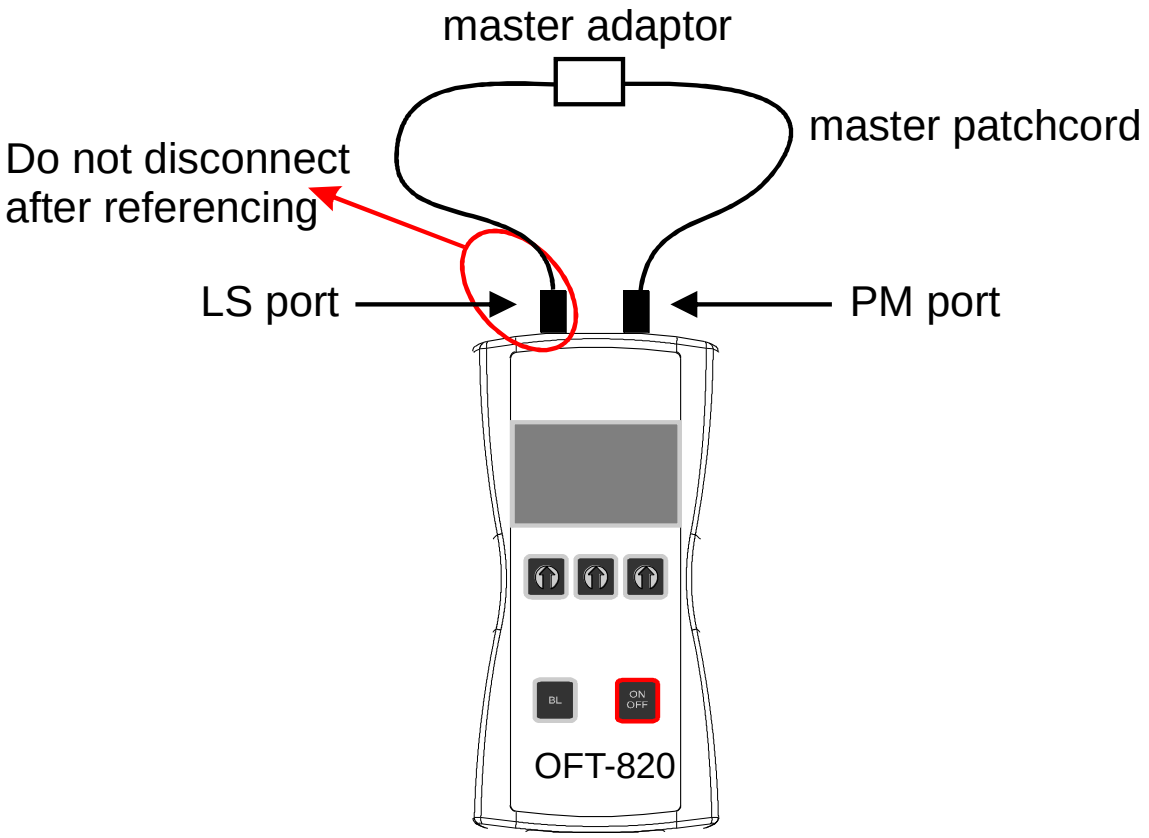


Fig. 3: Settings of reference – with one device and two master patchcords.

9.3.2 Measuring Loss

1. Do not disconnect the Master cords from device.
2. Disconnect one Master cord from adapter.
3. Connect the trace to be measured between the Master cords. An extra Master adapter is needed.
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).

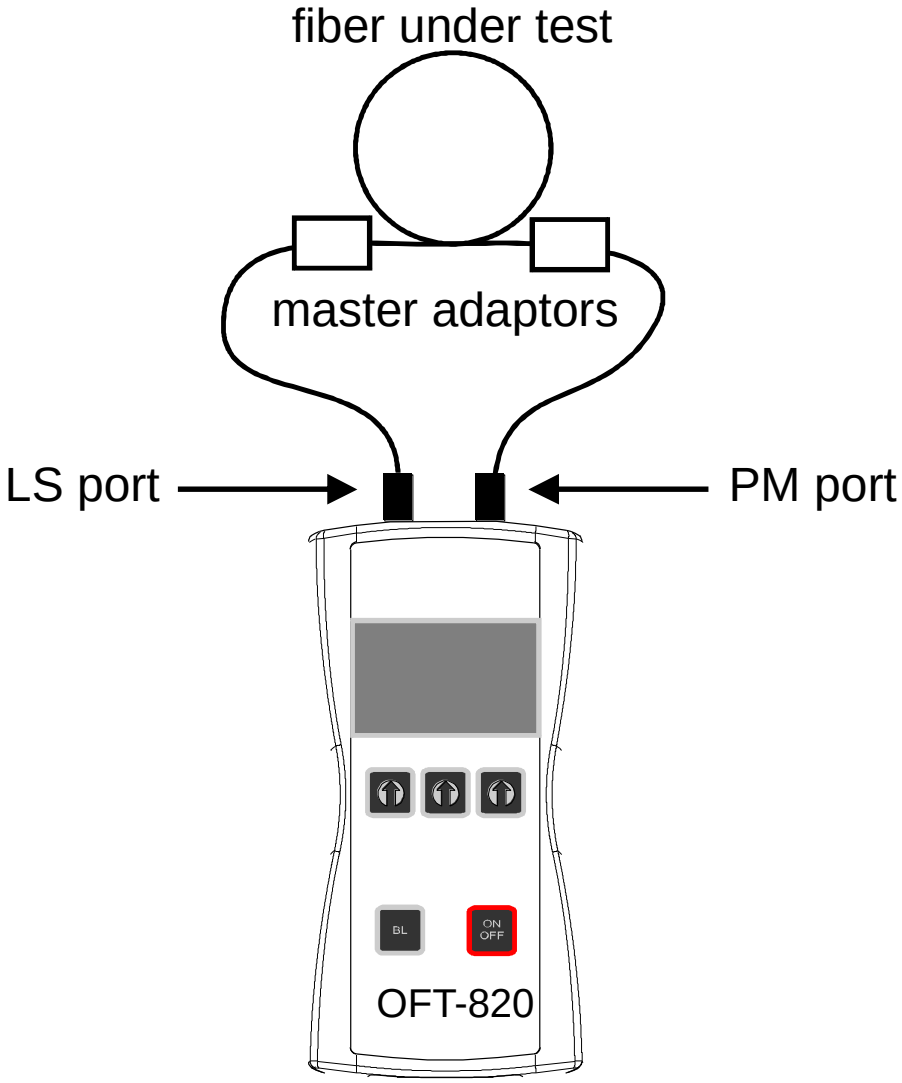


Fig. 4: Measurements of loss – with one device and two master patchcords.

9.4 Method C2 - two devices

For method 7 one Master cord are used to set reference. Master cord will be cancelled out for all subsequent measurements.

9.4.1 Setting the reference

1. Connect Master cord to Light source port of first OFT-820 device.
2. Connect second end of Master cord to Power meter port of second OFT-820 device.
3. Power on first OFT-820 device (light source).
4. Push **[MORE], [LS].**
5. By pushing **[·]** activate light source (650 nm).
6. Power on second OFT-820 device (power meter).
7. By pushing **[·]** select appropriate wave-length range.
8. Activate relative power measurement mode - by pushing **[LOSS].**
9. Set and store the new reference for selected wave-length - by pushing **[REF], [CONFIRM]**.

Do not disconnect
after referencing

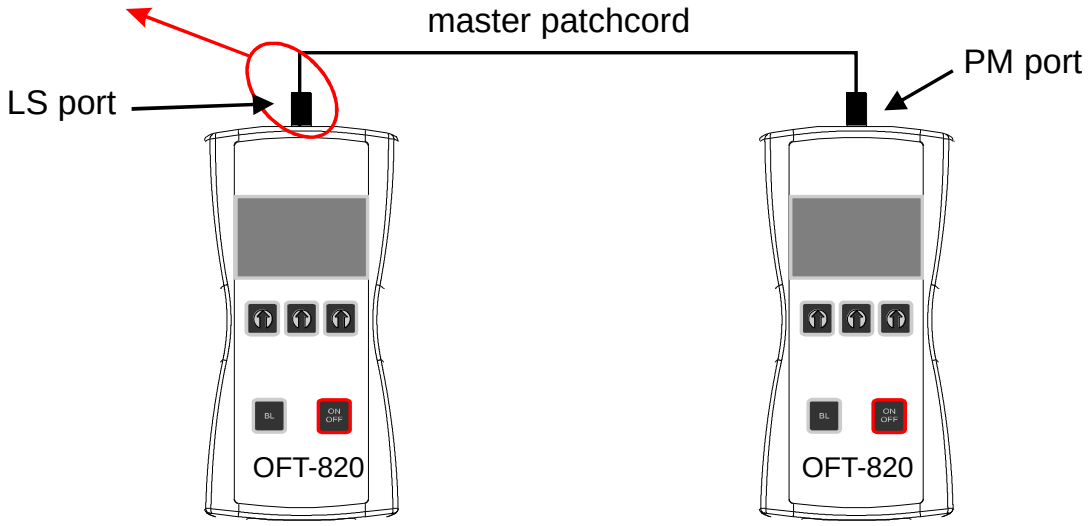


Fig. 5: Settings of reference – with two devices and one master patchcord.

9.4.2 Measuring Loss

1. Do not disconnect the Master cord from Light source port.
2. Connect the trace to be measured between the Power meter port and the Master cord that is attached to Light source. An extra Master adapter is needed.
3. The power meter display will simultaneously report the value with the message "LOSS" or "GAIN" in dB.
4. This value represents a difference between the reference and the performed measurement.
5. If the value will be displayed with the "LOSS" message, the trace to be measured has just this loss.
6. 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.
7. Value of loss (or gain) can be stored in the internal memory (see "SAVE RESULT" chapter).

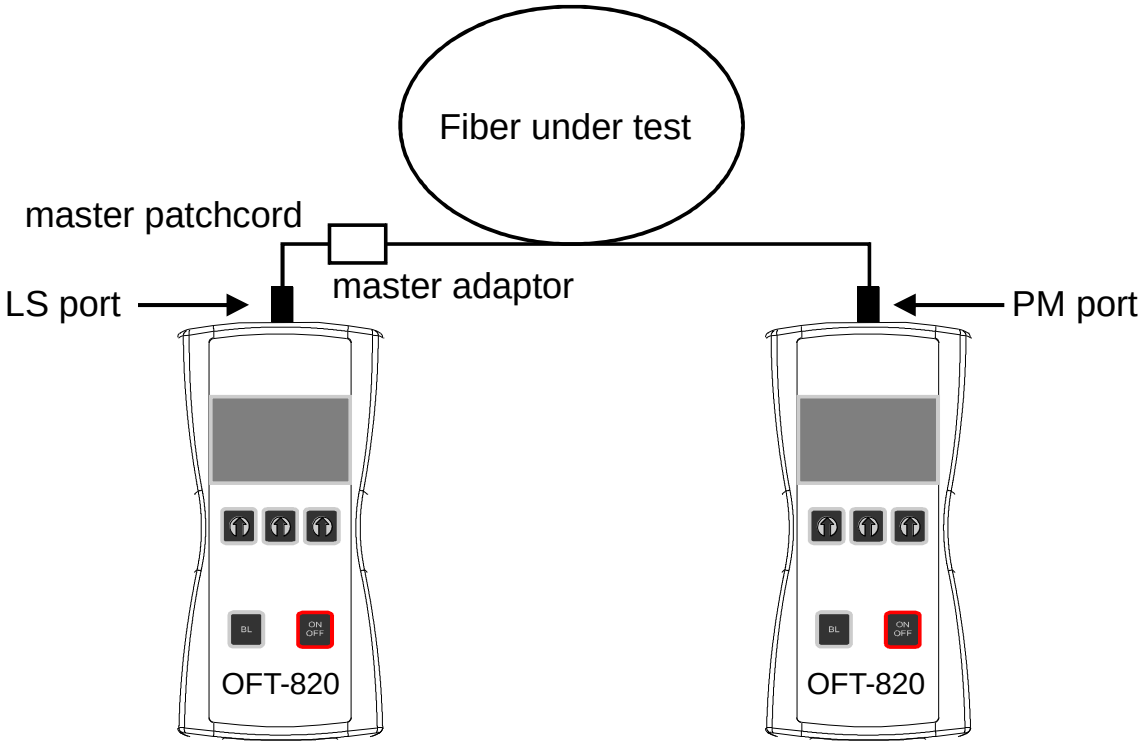


Fig. 6: Measurements of loss – with two devices, one master patchcord and one test fiber.

9.5 Method C2 - one device

For method 7 one Master cord are used to set reference. Master cord will be cancelled out for all subsequent measurements.

9.5.1 Setting the reference

1. Connect Master cord to Light source port.
2. Connect second end of Master cord to Power meter port.
3. Power on OFT-820 device.
4. Push **[MORE], [LS].**
5. By pushing **[·]** activate appropriate wave-length (light source).
6. Push **[PM]** and select appropriate wave-length range - by pushing **[·]** (power meter).
7. Activate relative power measurement mode - by pushing **[LOSS].**
8. Set and store the new reference for selected wave-length - by pushing **[REF], [CONFIRM].**

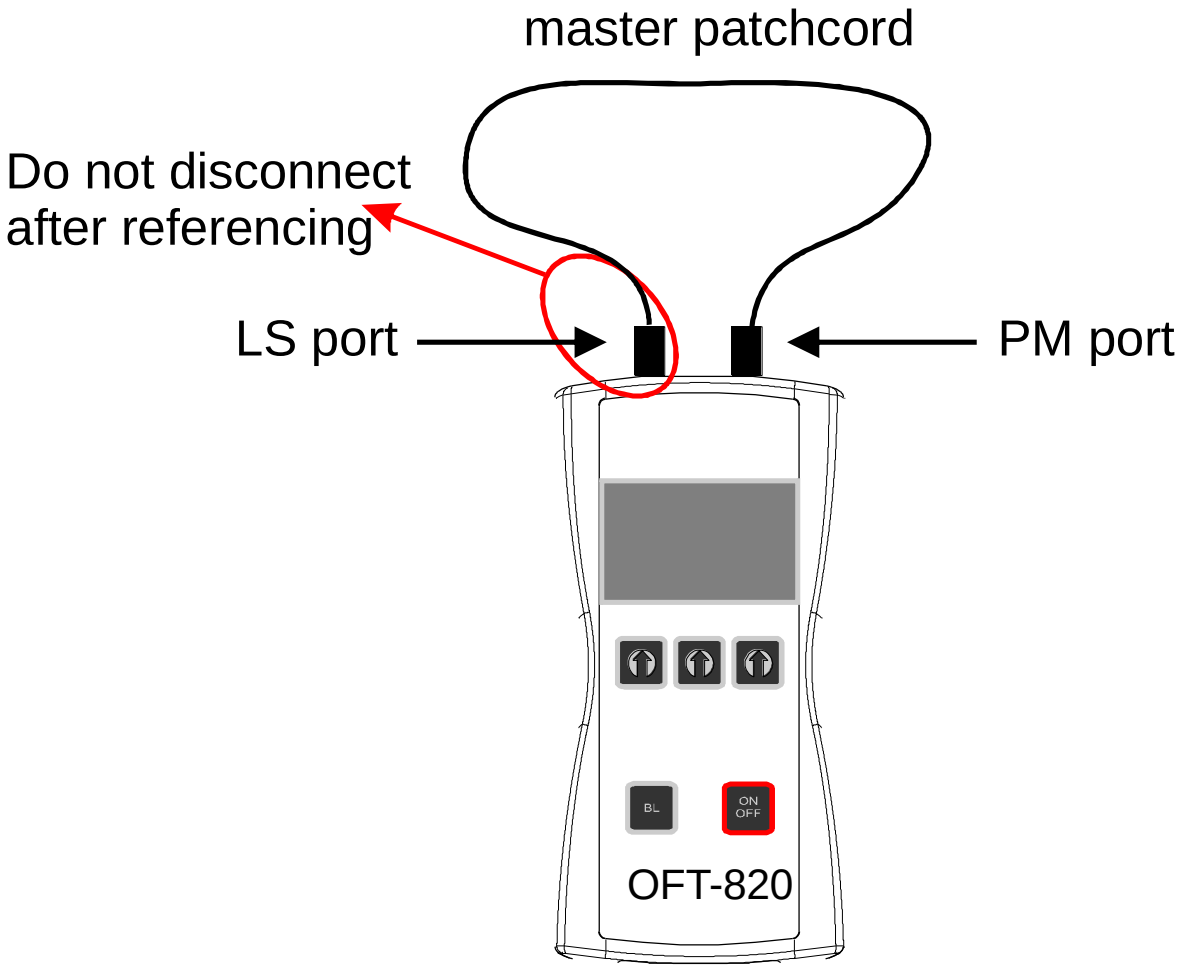


Fig. 7: Settings of reference – with one device and one master patchcord.

9.5.2 Measuring Loss

1. Do not disconnect the Master cord from Light source port.
2. Connect the trace to be measured between the Power meter port and the Master cord that is attached to Light source. An extra Master adapter is needed.
3. The power meter display will simultaneously report the value with the message "LOSS" or "GAIN" in dB.
4. This value represents a difference between the reference and the performed measurement.
5. If the value will be displayed with the "LOSS" message, the trace to be measured has just this loss.
6. 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.
7. Value of loss (or gain) can be stored in the internal memory (see "SAVE RESULT" chapter).

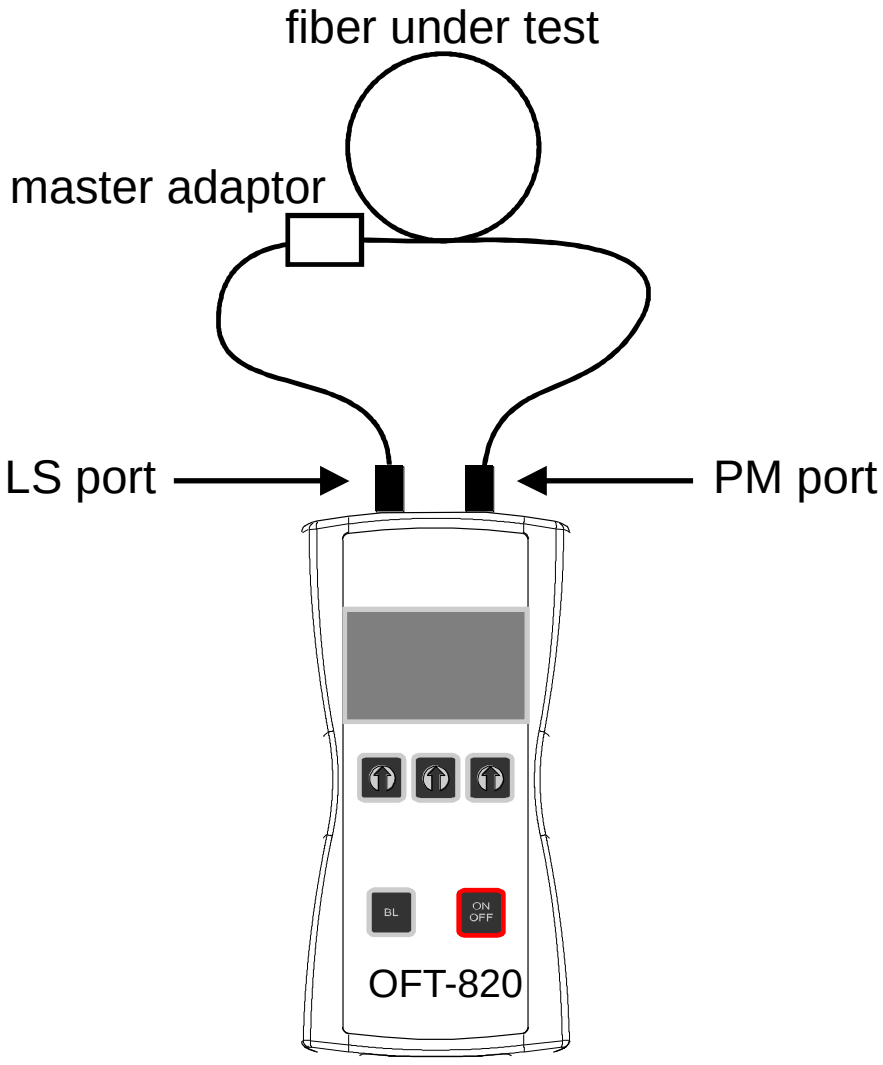


Fig. 8: Measurements of loss – with one device, one master patchcord and one test fiber.

10 Setting up data transfer

10.1 Data transfer via HyperTerminal

1. Connect the OFT-820 to a PC using the USB cable provided and turn the OFT-820 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 HyperTerminal
   Start >> Programs >> Accessories >> Communication >> HyperTerminal

Fig. 9: Way to the HyperTerminal.

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

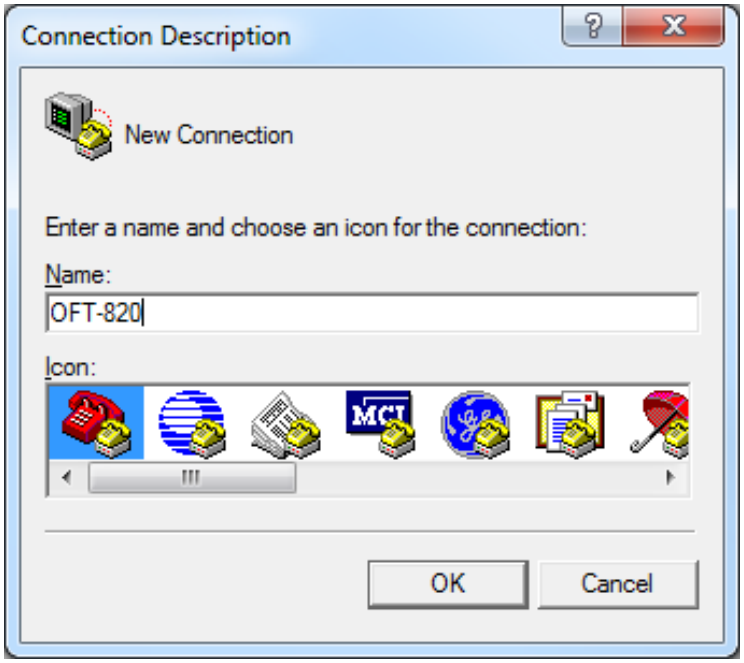


Fig. 10: Description of the connection.

4. Choose the virtual serial port the OFT-820 is connected to, then click on OK

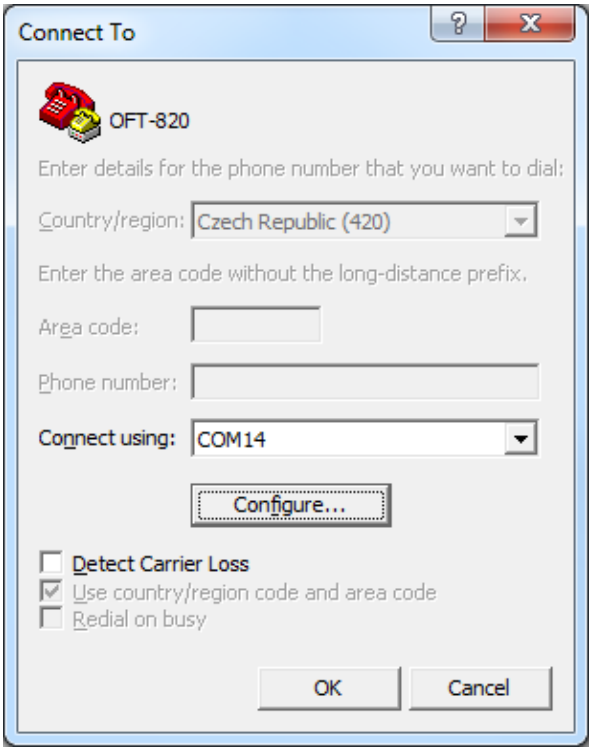


Fig. 11: Settings of COM port.

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

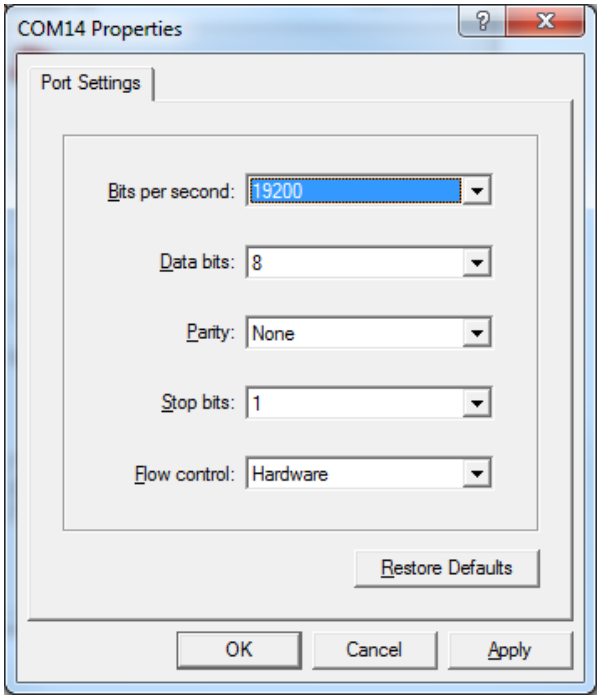


Fig. 12: Port settings.

6. Go to the menu in OFT-820 and push [MORE], [MEM], select [UPLOAD MEMORY], [OK].

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

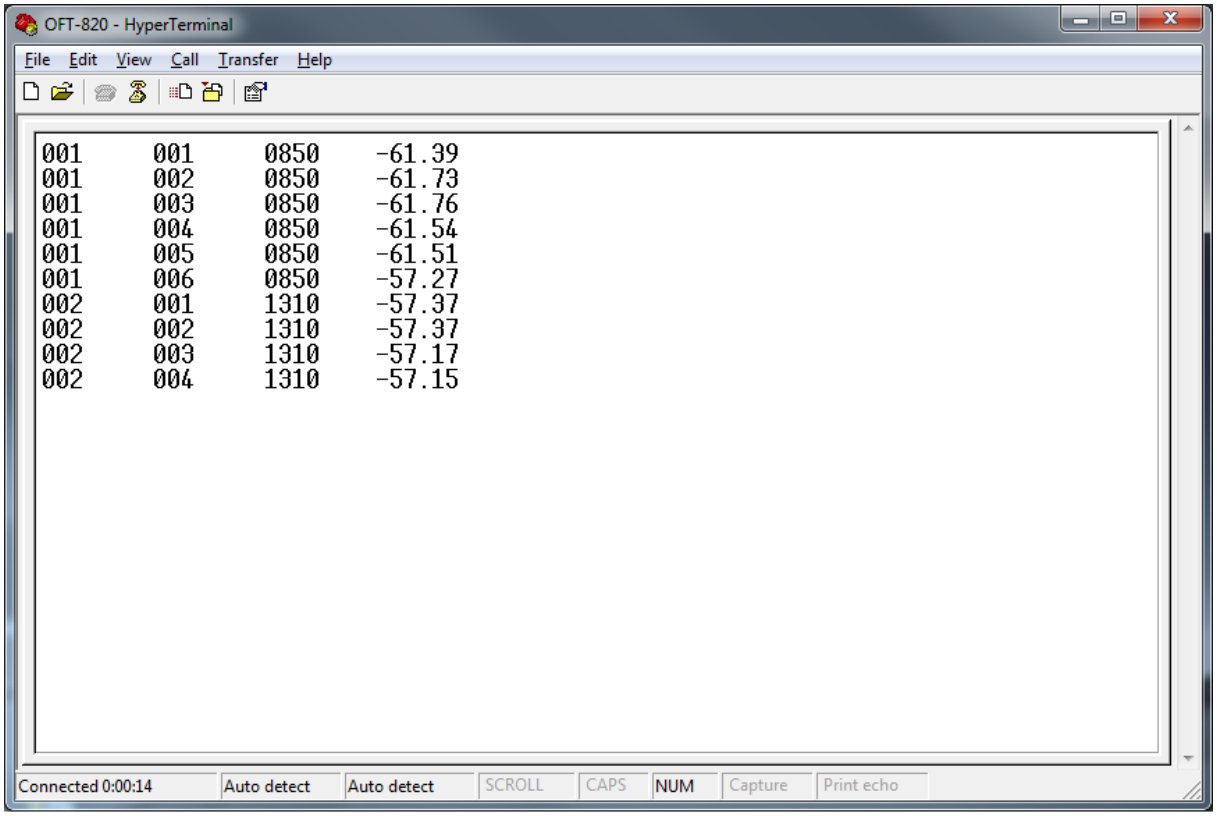


Fig. 13: Reading from the memory device.

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

10.2 Control via HyperTerminal

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

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	

Tab. 1: Basic commands for HyperTerminal.

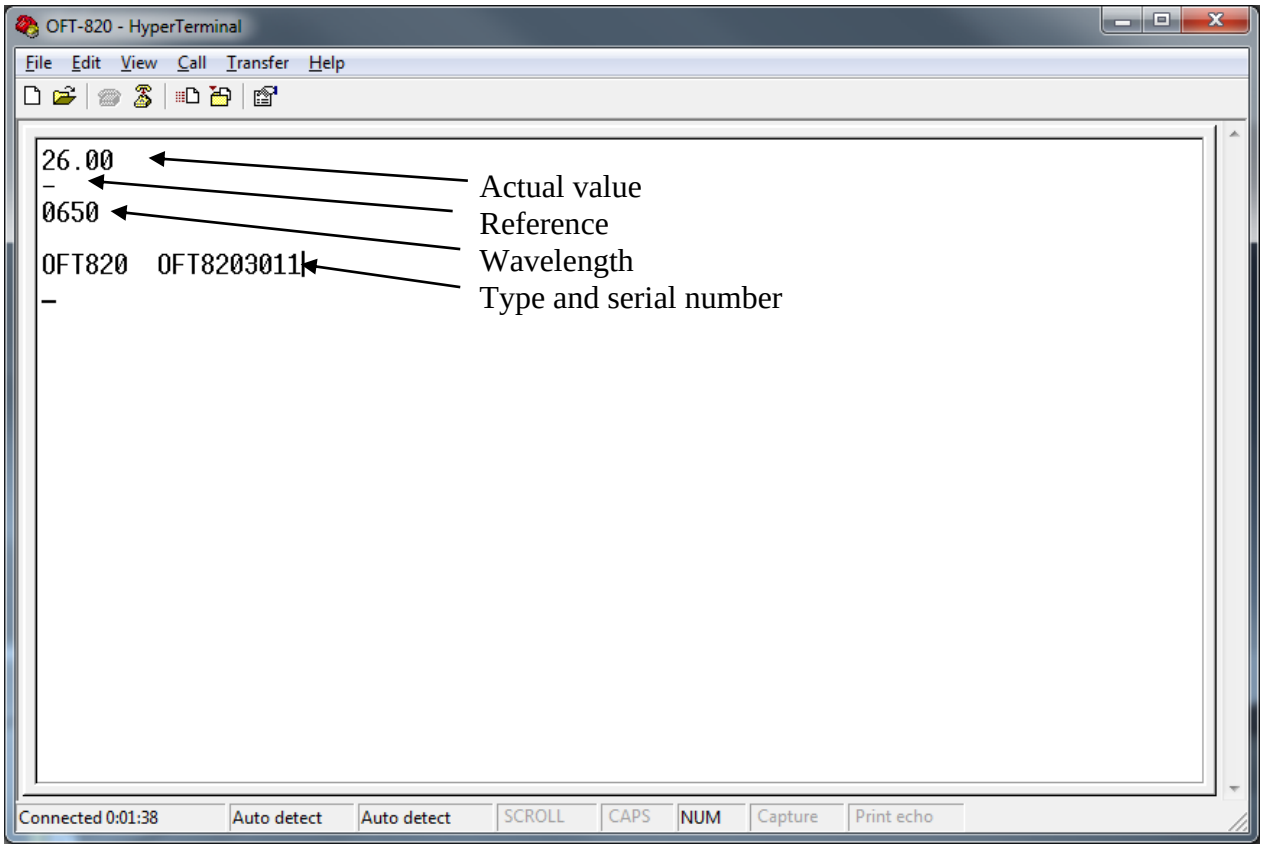


Fig. 13: Window of HyperTerminal with basic command.

10.3 Data transfer via SmartProtocol

Procedure, how to handle with SmartProcotol software, please see document:

TEQ_02-07_EN-SmartProtocol-M

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

11 Notes

12 Calibration, service center

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