



FIBER OPTIC TECHNOLOGY
CALIBRATION LABORATORY

OFT-920

Ruggedized Optical Loss Test Set

USER MANUAL



Revision 3.2



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s/w: 3.2

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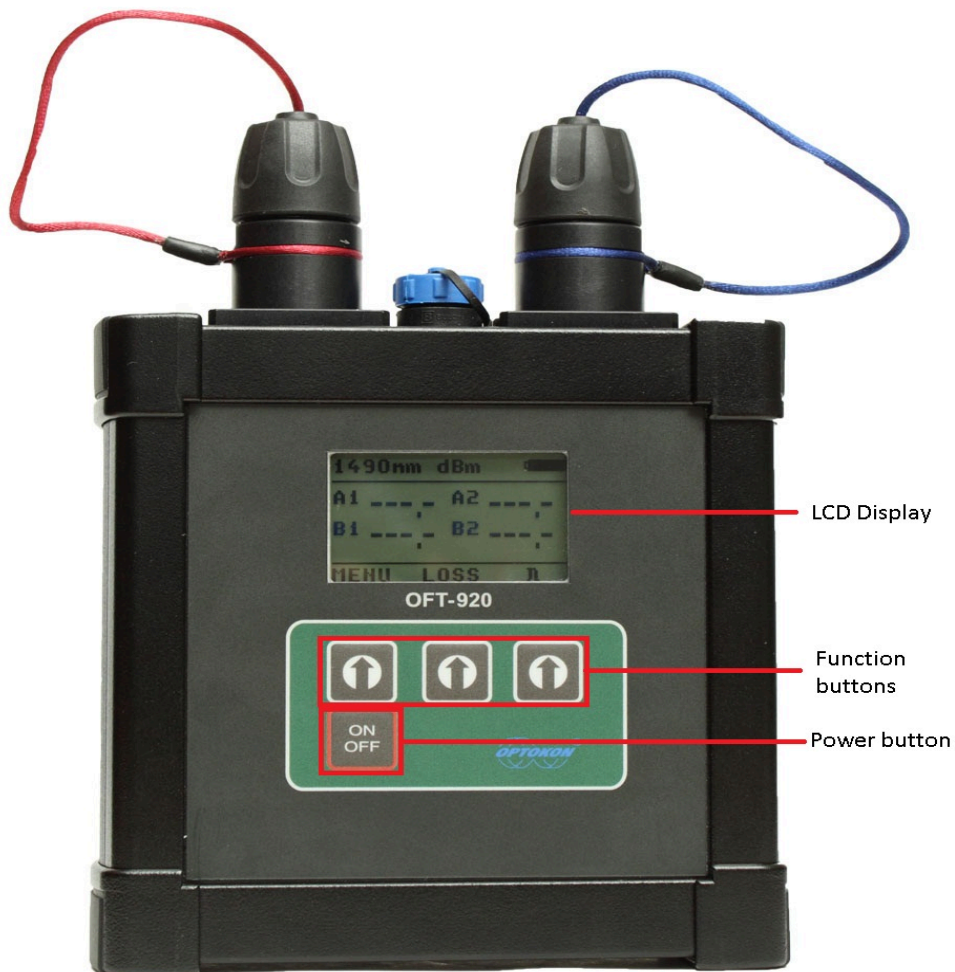
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1 Introduction

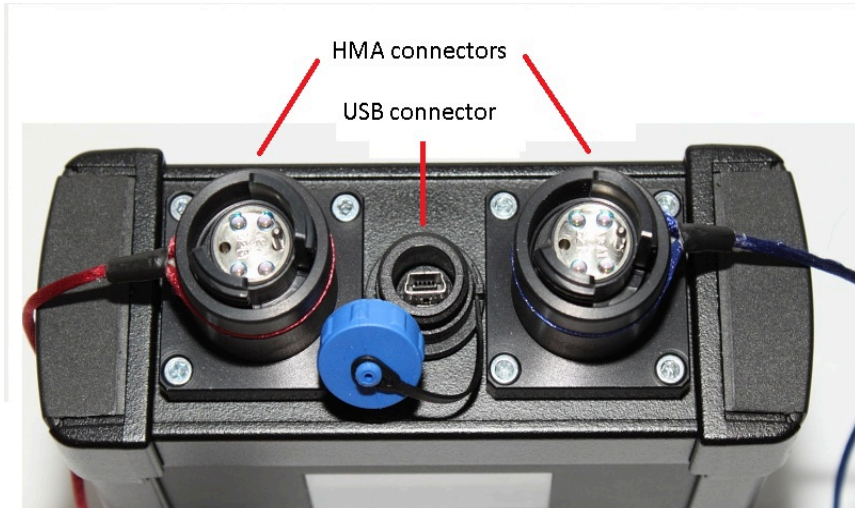
The OFT-920 optical test set is designed for testing optical networks terminated with connectors operating in harsh environments. It combines both a light source and optical power meter in one common box. The OFT-920 test set is designed to meet the tactical military and broadcast industry demand. The ruggedized aluminum case makes the unit ideal for field operation.



General description:
-front view



-top view:



-rear view:



2 Features

- Expanded Beam and ferrule harsh environmental connectors
- Ruggedized aluminum case
- Multimode (MM) or single mode (SM) applications
- Simultaneous testing of all 2/4 fibers
- Internal memory: up to 2000 measurements
- Displayed units: dBm, dB
- High dynamic range
- Up to 4 light source combinations
- Built-in charger, battery status indicator
- Easy to use with menu navigation

3 Application

- Optical network measurements
- Fiber continuity testing

4 Accessories

4.1 Standard

- Power charging adaptor
- Soft carrying case
- USB Cable
- Cleaning swabs

4.2 Options:

- Reference patchcord

5 Specifications

5.1 Light Source

Light Source:		
Output power		Note:
LD 850 nm, LED 850, 1300 nm	-26 dBm (62.5/125 μ m fiber)	typ. value
LD 1310, 1490, 1550, 1625 nm	-16 dBm	
Stability (1 hour, delta/2):		tested after 20 min warm up temperature 23 \pm 1°C
LD 850 nm, LED 850, 1300 nm	\pm 0.03 dB	
LD 1310, 1490, 1550, 1625 nm	\pm 0.05 dB	

5.2 Power Meter

Power Meter:		
Photo detector	InGaAs	
Working wavelengths	Multimode: 850, 1300 nm Singlemode: 1310, 1490, 1550, 1625 nm	can be customized
Uncertainty	\pm 12%	1310, 1550 nm @ -20 dBm
Resolution	0.1	
Dynamic range	-55 dBm to +10 dBm -53 dBm to +17 dBm	1300, 1310, 1490, 1550, 1625 nm 850 nm

5.3 Loss Test Set

Optical Test Set		
Dimensions	145 x 145 x 56 mm	without connectors
Weight	400 g	with battery
Temperature operating	-10 to +50 °C	
storage	-40 to +70 °C	
Humidity (non condensing)	0 to 95%	
Operating temperature	-10 to +50 °C	
Battery working time	> 20 hrs	One source operation
Battery life time	> 2 years (1000 cycles)	

6 Safety information

This equipment complies with the following safety classifications:
IEC825-1 and 21CFR1040: Class1

This applies to laser and LED options up to 1 mW, above 700 nm. Devices in this category are classified as safe for use by technicians under normal viewing, as long as magnifying devices are not used.

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

WARNING!

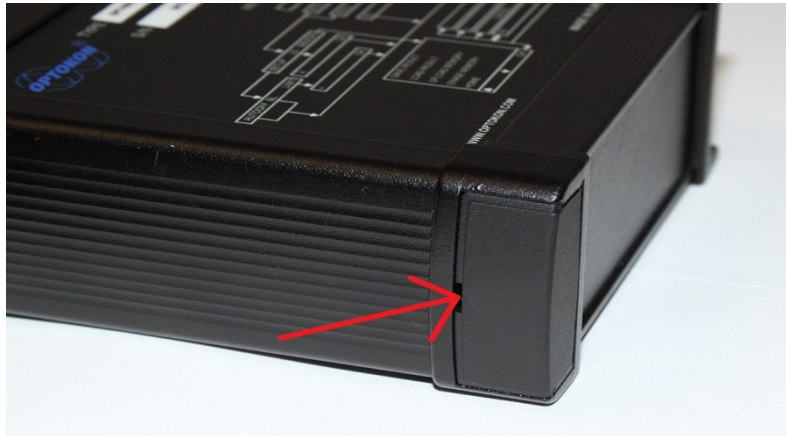
- Never use magnifying devices to inspect optical fiber ends unless you are sure that no optical power is being emitted.
- Use only magnifying devices with a built-in infra-red filter to ensure safety.
- During operation, testing or maintenance of a fiber optic system, never look into an active fiber 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.

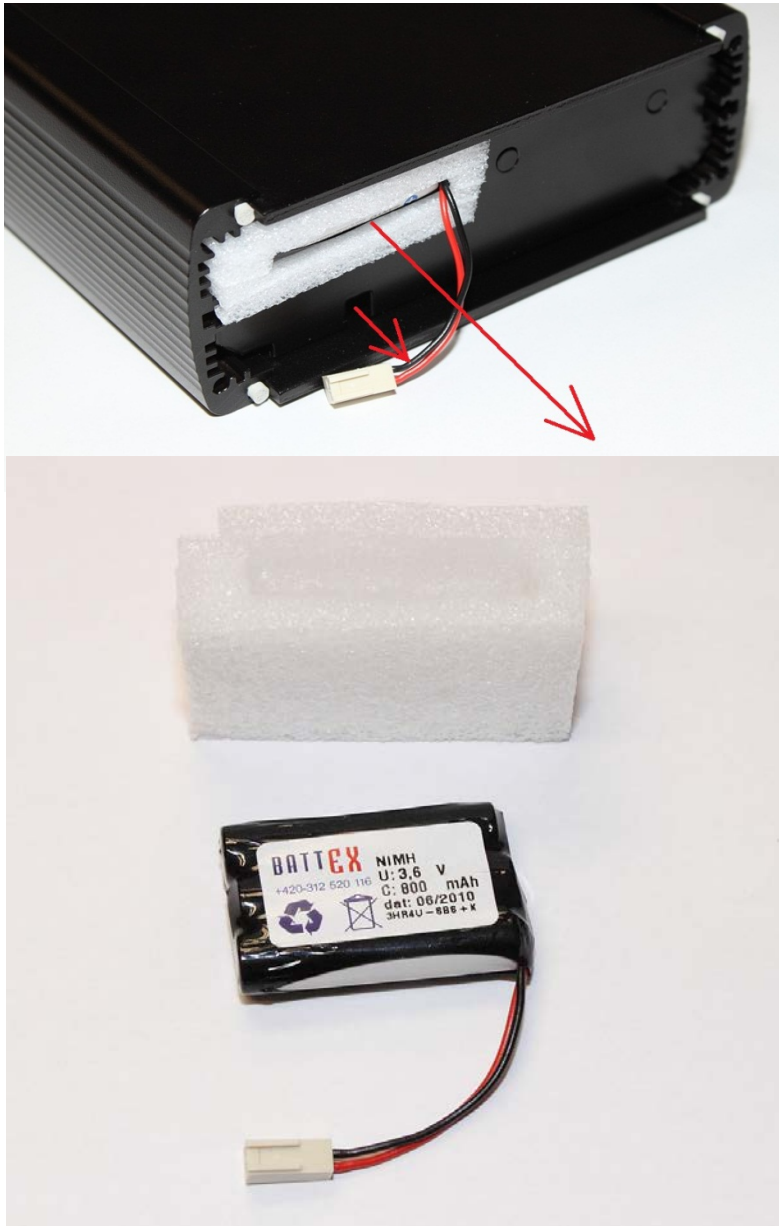
7 Maintenance

7.1 Battery care and replacement

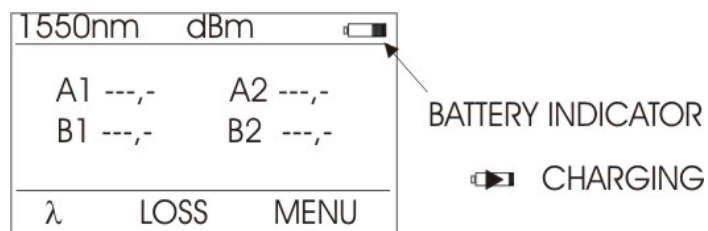
OFT-920 is equipped with a charger and powered by built-in, three-cell, NIMH battery pack. Rated voltage is 3.6 V, recommended capacity is 800 [mAh] (for 20 hrs operation). Use only the charger supplied by OPTOKON (DC 5 V, USB connector). Recommended charge time is 12 to 14 hours. For replacement of the battery must be removed bottom cover (by losing 4 screws under rubber covers):



After opening disconnect battery connector and remove battery pack:



Insert new battery and connect the battery connector (be careful for polarity). Take back the bottom panel, tighten all screws and insert back the rubber covers.



7.2 Instrument care

- During storage and transport keep the instrument in its carrying 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 gets into instrument, dry it out carefully before using it again.

7.3 Optical 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.
- The following cleaning materials are recommended and should form part of your cleaning kit:
 - Lint-free laboratory wipes.
 - Isopropyl alcohol in pressurized dispenser
 - Lint free pipe cleaners
 - Clean, dry, oil-free compressed air

8 Button function 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.

```
OFT920
s/w: 3.2
S/N: OFT920 xxxx
```

8.1 Menu #1

1550nm	dBm	
A1 ---,-	A2 ---,-	
B1 ---,-	B2 ---,-	
MENU	LOSS	λ

[MENU]

- starts menu
- goes to menu #3


[LOSS]

- activates the relative power measurement mode (dB)
- recalls the last set reference for selected wavelength
- goes to menu #2

[λ]

- selects the wavelength (multimode - 850, 1300 nm, single mode -1310, 1490, 1550 or 1625 nm)

8.2 Menu #2

1550nm	dB	
A1 ---,-	A2 ---,-	
B1 ---,-	B2 ---,-	
MENU	REFF	HOME

[HOME]

- return unit into absolute power measurement mode (dBm)
- goes to menu #1

[REFF]

- sets and stores the new reference for the selected wavelength
- requires confirmation [OK]

SET NEW REFERENCE	
OK	NO

[MENU]

- starts menu
- goes to menu #3

8.3 Menu #3

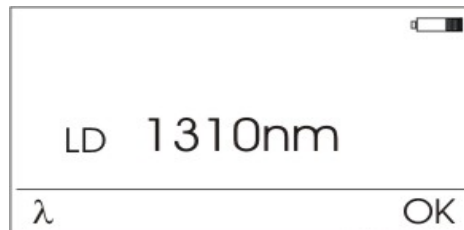


[SETUP]

- goes to menu #4
- allows to activate / deactivate Auto Off and Backlight

[LS]

- goes to Light Source screen



- press λ to select the wavelength
- press OK to return to Power Meter screen

[MEMORY]

- start work with the internal memory
- goes to menu #5

8.4 Menu #4

1550nm	dBm		
A1 ---,-	A2 ---,-		
B1 ---,-	B2 ---,-		
AOFF	B/L	LIMIT	

→ AUTO OFF

[AOFF]

-activates or deactivates Auto Off feature.

If activated, the unit will turn off after approximately 10 minutes of no activity.

[B/L]

-turns the Display Backlight On and Off

[LIMIT]

-sets limit (dB) for measured fibers - A1, A2, B1, B2

-by using + and - keys set limit, and confirm "OK"

minimum value is 0.5 dB, maximum 25 dB, step 0.5 dB.

-for measuring without limit set "OFF"

-when the limit is set, and unit is in relative power measurement mode, the screen shows:

1550nm	3.5dB	
A1 ✓	A2 ✗	
B1 ✓	B2 ✓	
O.POW	REF	MENU

CURRENT LIMIT
 ✓ PASS
 ✗ FAIL
 ! OVERPOWER

pass – the loss is lower than the limit

fail – the loss is higher than the limit

overpower – indicates gain, clean the connectors and make a reference again

8.5 Menu #5

→ SAVE RESULT	[Battery Icon]	
LOAD RESULT		
UPLOAD MEMORY		
ERASE MEMORY		
HOME		
UP	DOWN	OK

[UP], [DOWN], [OK]

Use these buttons to select an appropriate submenu.

SAVE RESULT

1550nm	dB	MEM
		001
A1 ---,-	A2 ---,-	
B1 ---,-	B2 ---,-	
+ MEM -	SAVE	

[+ MEM -]

-selects the memory cell

[SAVE]

-saves the result into the selected memory cell and exits the menu

NOTE: Memory cell number is automatically INCREMENTED BY 1 after [save] command.

LOAD RESULT

1550nm	dB	MEM
		001
A1 ---,-	A2 ---,-	
B1 ---,-	B2 ---,-	
+ MEM -	HOME	

[+ MEM -]

-browses through memory cells

[HOME]

-exit menu, return to Power Meter screen

UPLOAD MEMORY

-sends the whole content of the internal memory to a PC via USB

ERASE MEMORY



-erases the whole internal memory

HOME

-exit menu, return to Power Meter screen

9 Measuring loss

9.1 Basic theory

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

There are two different measuring 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. The power loss is caused by different phenomena such as attenuation of the fiber, dirty connector mating faces, connector misalignment, loss of splices and other events as sharp bends of fiber...

The "end to end" loss test is the most often used acceptance test of power loss in fiber optic links. The test is based on measuring the power difference at the input and output of the link.

One or two OFT-920 instruments are used for this test, where the light source port acts as a transmitter and the optical power meter port as a receiver.

The "end to end" test has two steps:

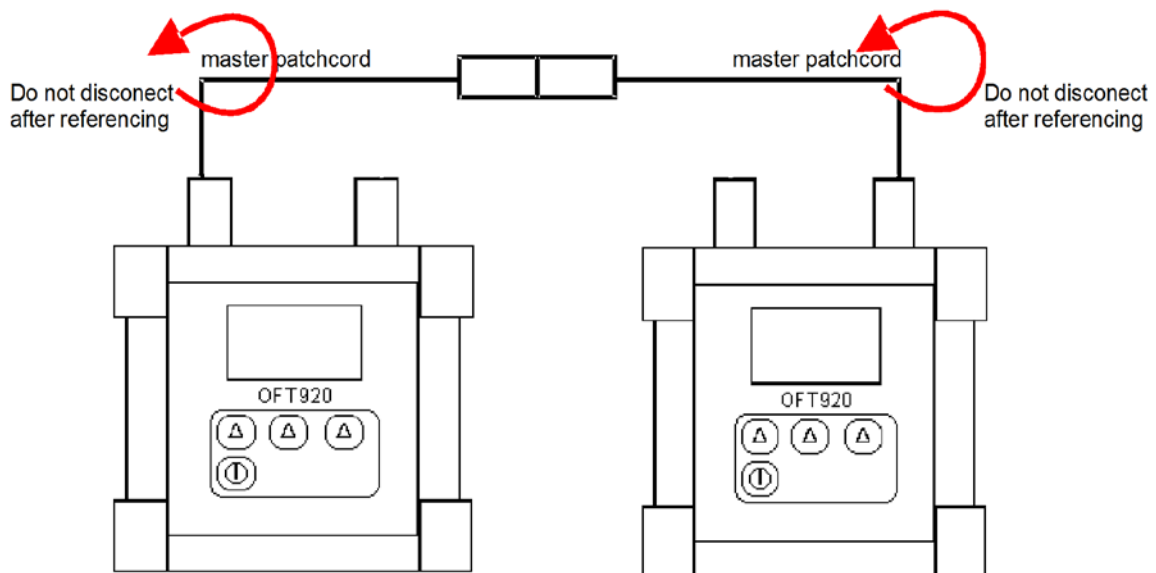
1. Setting the reference
2. Measuring the loss

9.2 Method 6 - two instruments

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

9.2.1 Setting the reference

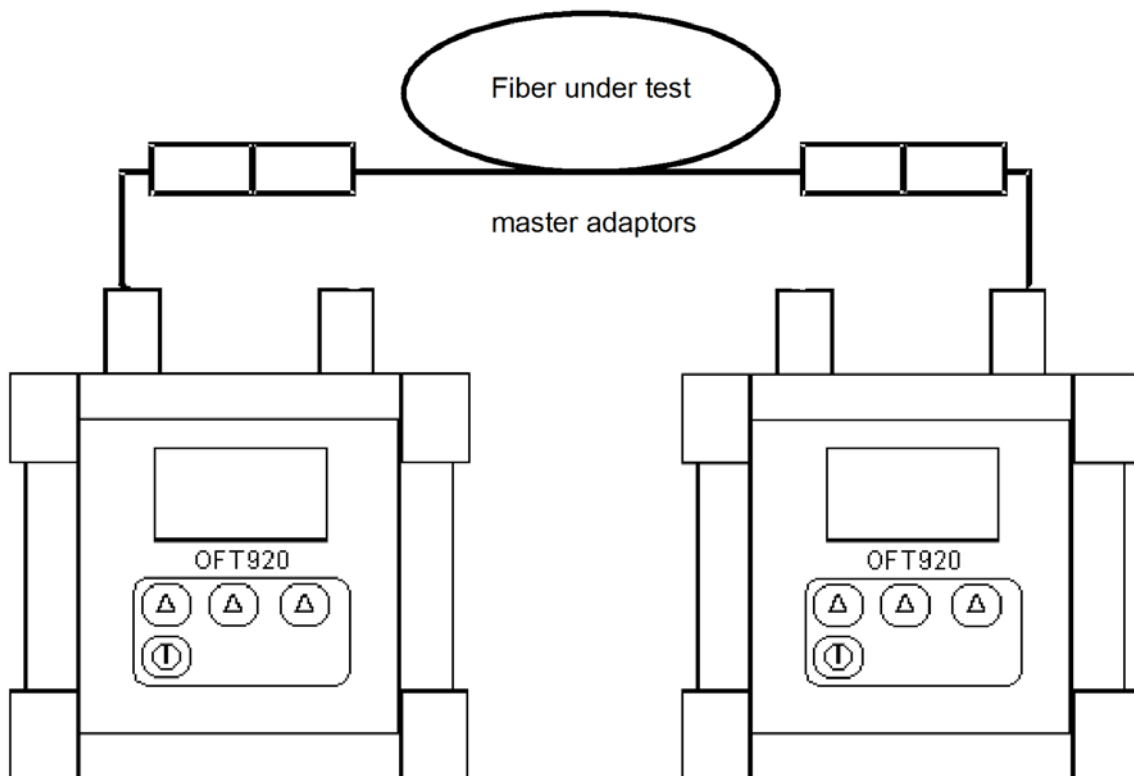
1. Connect the first master cord to the light source port of first OFT-920 instrument.
2. Connect the second master cord to the power meter port of a second OFT-920 instrument.
3. Connect two cable ends.
4. Power on the first OFT-920 instrument (light source).
5. Push [MENU], [LS].
6. By pushing [λ] select the appropriate wavelength.
7. Power on the second OFT-920 instrument (power meter).
8. By pushing [λ] select the appropriate wavelength range.
9. Activate relative power measurement mode - by pushing [LOSS].
10. Set LIMIT if necessary – push [MENU], [SETUP], [LIMIT] and after setting the appropriate value (by + and – keys) confirm by [OK].
11. Set and store the new reference for the selected wavelength - by pushing [REF], confirm by [OK].



(pic.1)

9.2.2 Measuring Loss

1. Do not disconnect the master cords from the instruments.
2. Disconnect both master cords.
3. Connect the trace to be measured between the master cords.
4. The display of the second instrument (power meter) will report the negative numbers in dB for the appropriate fiber (A1, A2, B1, B2) or PASS/ERR in the case of measurement with the setting LIMIT.
5. This number represents a power drop, therefore loss of the tested link is defined as: "loss = - (power drop)". In the case of measurement with setting LIMIT- PASS this means that this fiber is complied with the set LIMIT and ERR means that fiber overreached the set LIMIT.
6. Value of loss is possible to store into the OFT-920 internal memory by pushing [MENU], [MEMORY]. [SAVE], [+,-], [SAVE].



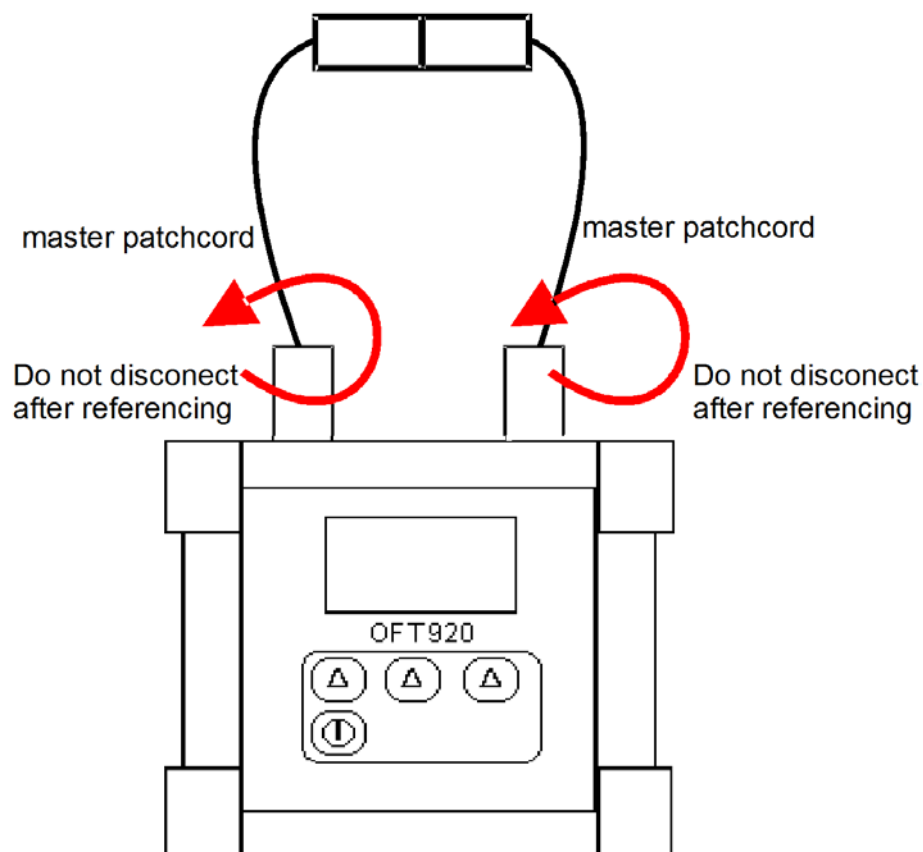
(pic.2)

9.3 Method 6 - one instrument

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

9.3.1 Setting the reference

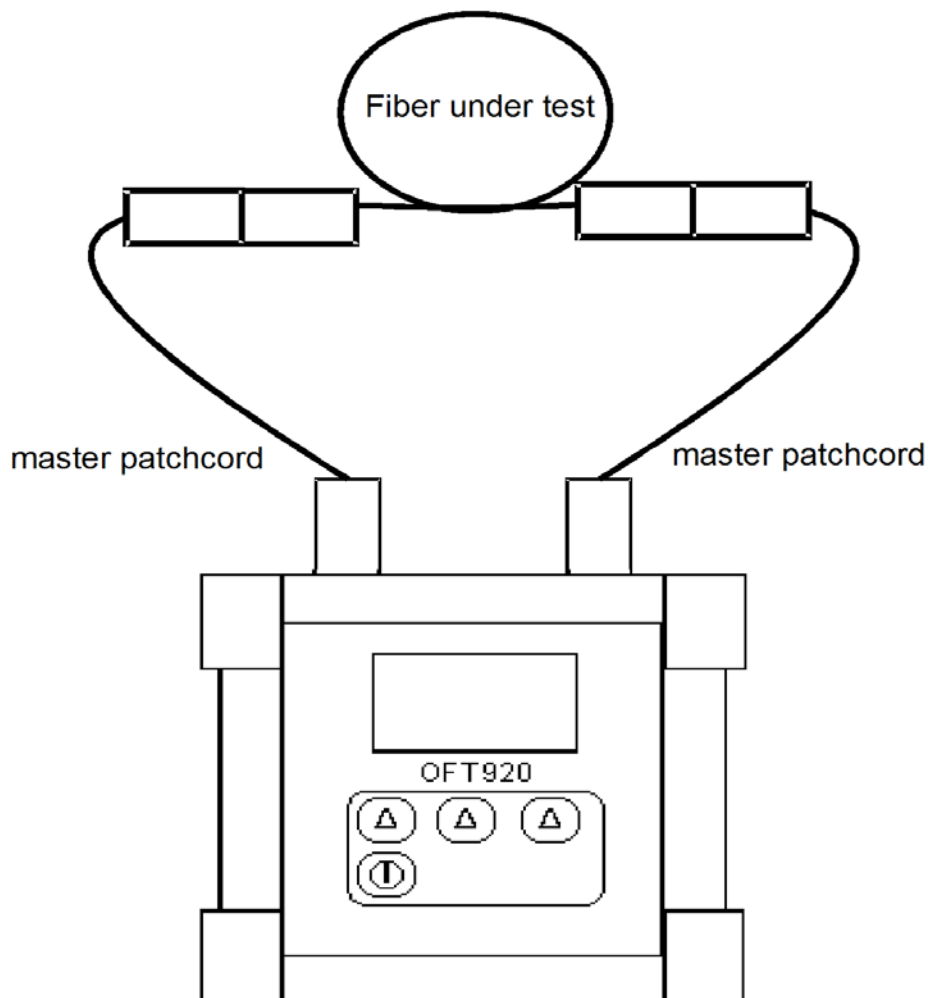
1. Connect the first master cord to the OFT-920 Light source port.
2. Connect the second master cord to the OFT-920 Power meter port.
3. Connect two cable ends.
4. Power on OFT-920 instrument.
5. Push **[MENU]**, **[LS]**.
6. By pushing **[λ]** select the appropriate wavelength.(Light source)
7. Push **[HOME]** and select the appropriate wavelength range - by pushing **[λ]** .(Power meter)
8. Activate relative power measurement mode - by pushing **[LOSS]**.
9. Set the LIMIT if necessary – push **[MENU]**, **[SETUP]**, **[LIMIT]** and after setting the appropriate value (by + and – keys) confirm by **[OK]**.
10. Set and store the new reference for the selected wavelength - by pushing **[REF]**, confirm by **[OK]**.



(pic.3)

9.3.2 Measuring Loss

1. Do not disconnect the master cords from the instrument.
2. Disconnect one master cord from the other.
3. Connect the trace to be measured between the master cords.
4. Display of instrument (power meter) will report the negative numbers in dB for appropriate fiber (A1, A2, B1, B2) or PASS/FAIL/OVERPOWER in the case of measurement with set LIMIT.
5. This number represents a power drop, therefore loss of the tested link is defined as: "loss = -(power drop)". In the case of measurement with the setting LIMIT- PASS, this means that this fiber is complied with the set LIMIT and ERR means that the fiber overreached set LIMIT.
6. Value of loss can be stored into the OFT-920 internal memory by pushing [MENU], [MEMORY]. [SAVE], [+,-], [SAVE].



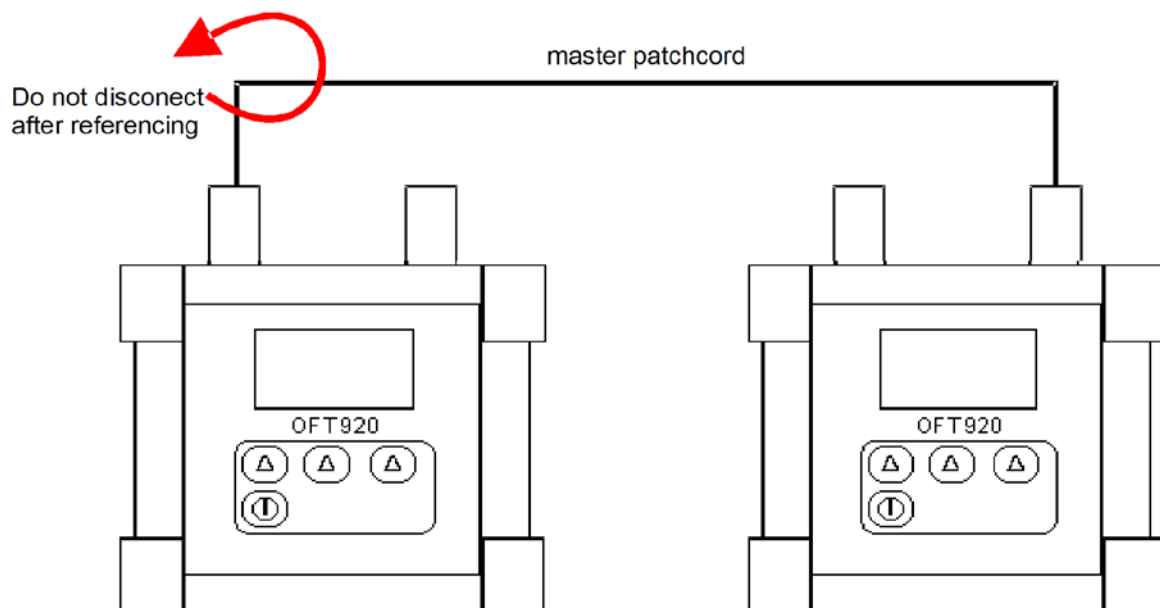
(pic.4)

9.4 Method 7 - two instruments

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

9.4.1 Setting the reference

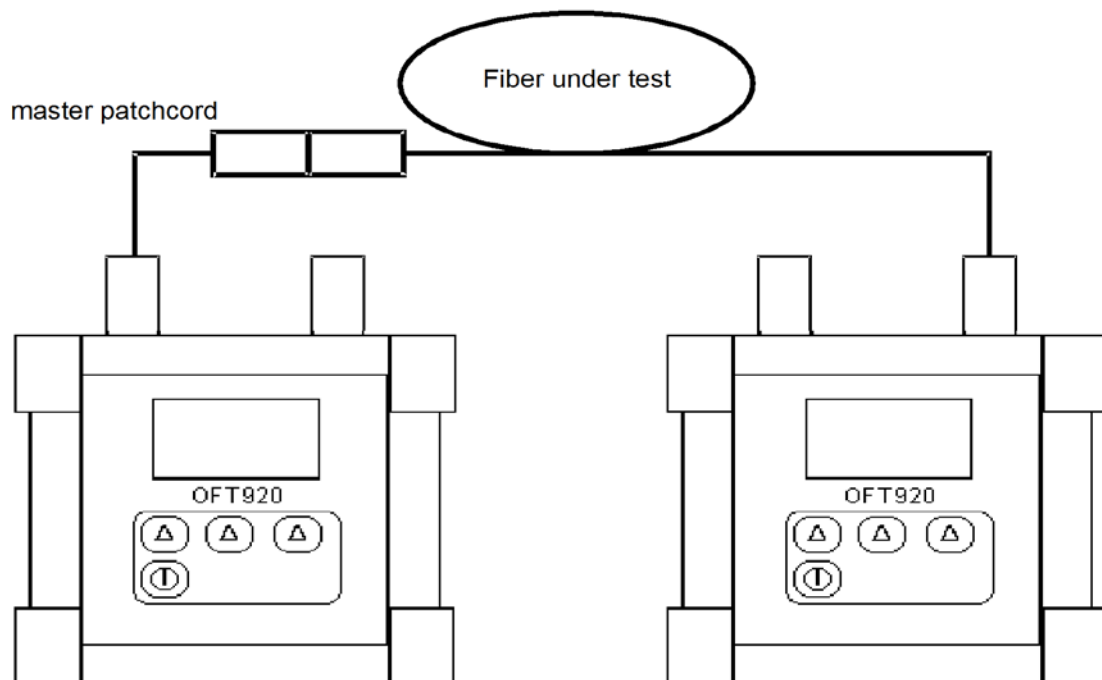
1. Connect the master cord to the light source port of the first OFT-920 instrument.
2. Connect the second end of the master cord to the power meter port of the second OFT-920 instrument.
3. Power on the first OFT-920 instrument (light source).
4. Push **[MENU]**, **[LS]**.
5. By pushing **[λ]** select the appropriate wavelength.
6. Power on the second OFT-920 instrument (power meter).
7. By pushing **[λ]** select the appropriate wavelength range.
8. Activate relative power measurement mode - by pushing **[LOSS]**.
9. Set the LIMIT if necessary – push **[MENU]**, **[SETUP]**, **[LIMIT]** and after setting the appropriate value (by + and – keys) confirm by **[OK]**.
10. Set and store the new reference for the selected wavelength - by pushing **[REF]**, confirm by **[OK]**.



(pic.5)

9.4.2 Measuring Loss

1. Do not disconnect the master cord from the first instrument.
2. Disconnect the master cord from the power meter port of the second instrument.
3. Connect the trace to be measured between the master cord and the power meter port of the second instrument.
4. The display of the second instrument (power meter) will report the negative numbers in dB for the appropriate fiber (A1, A2, B1, B2) or PASS/ERR in the case of measurement with setting LIMIT.
5. This number represents a power drop, therefore loss of the tested link is defined as: "loss = - (power drop In the case of measurement with setting the LIMIT- PASS, this means that this fiber complies with the set LIMIT and ERR means that the fiber overreached the set LIMIT.
6. Value of loss can be stored into the OFT-920 internal memory by pushing [MENU], [MEMORY]. [SAVE], [+,-], [SAVE].



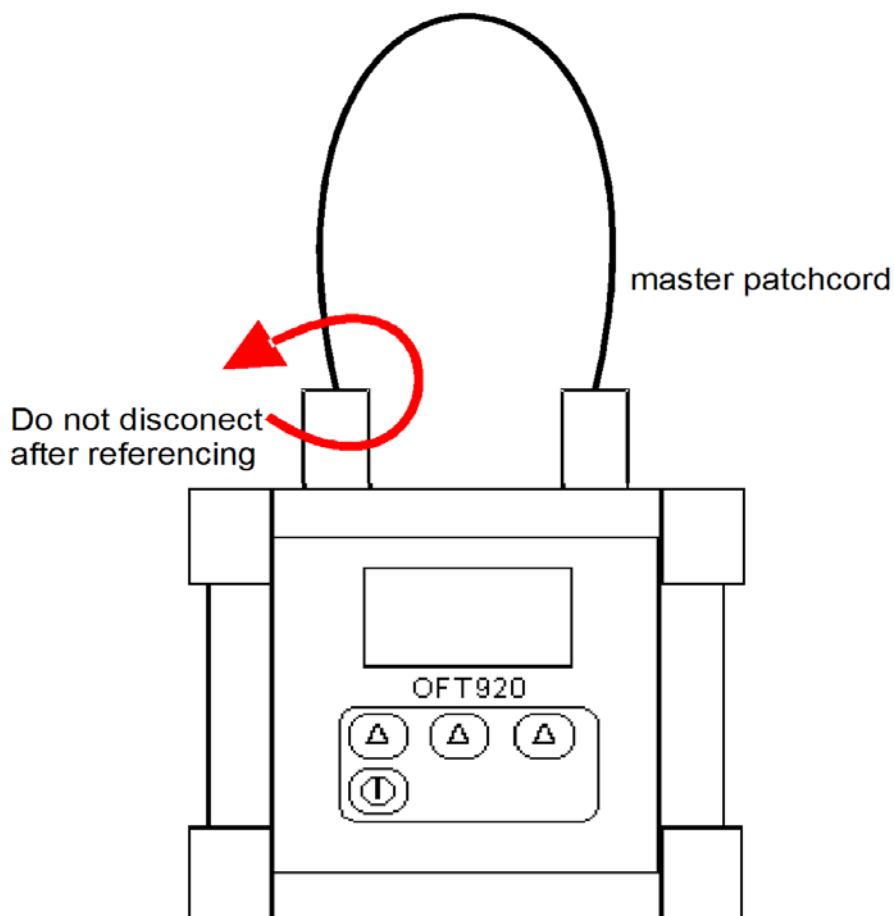
pic. 6

9.5 Method 7 - one instrument

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

9.5.1 Setting the reference

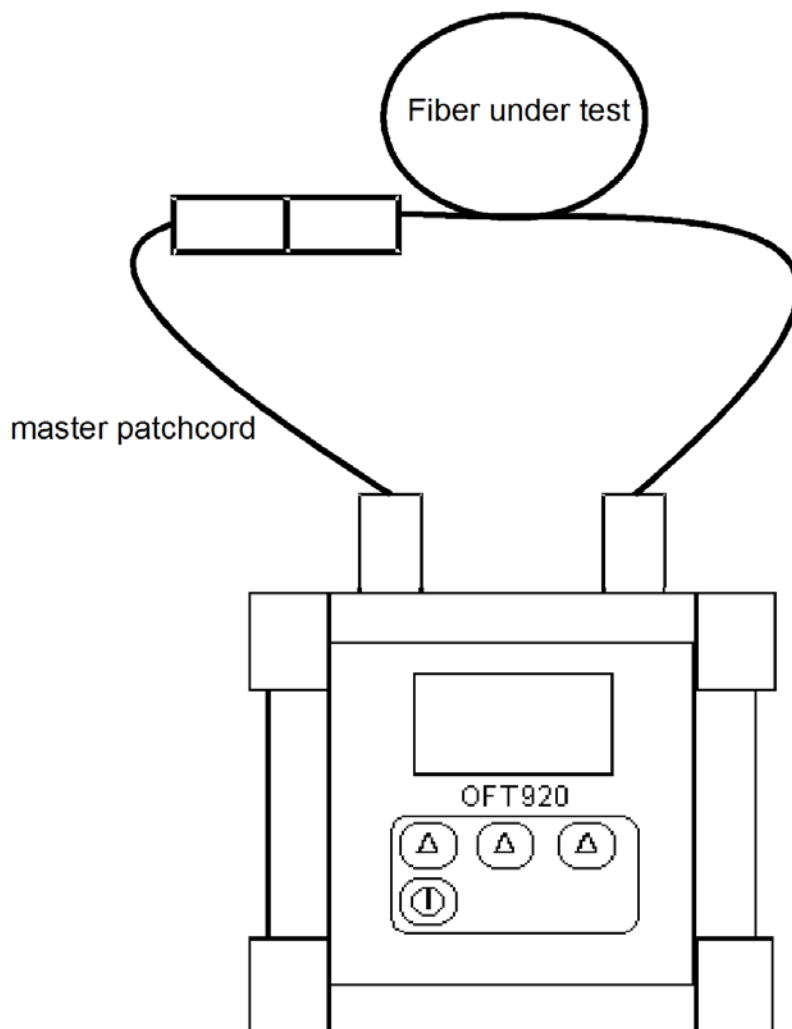
1. Connect the master cord to the light source port.
2. Connect the second end of the master cord to the power meter port.
3. Power on the OFT-920 instrument.
4. Push **[MENU]**, **[LS]**.
5. By pushing **[λ]** select the appropriate wavelength. (Light source)
6. Push **[HOME]** and select the appropriate wavelength range - by pushing **[λ]** . (Power meter)
7. Activate the relative power measurement mode - by pushing **[LOSS]**.
8. Set the LIMIT if necessary – push **[MENU]**, **[SETUP]**, **[LIMIT]** and after setting the appropriate value (by + and – keys) confirm by **[OK]**.
9. Set and store the new reference for the selected wavelength - by pushing **[REF]** again.



(pic.7)

9.5.2 Measuring Loss

1. Do not disconnect the master cord from the light source port.
2. Connect the trace to be measured between the power meter port and the master cord that is attached to the light source.
3. The display of the instrument (power meter) will report negative numbers in dB for the appropriate fiber (A1, A2, B1, B2) or PASS/FAIL/OVERPOWER in the case of a measurement with setting the LIMIT.
4. This number represents a power drop, therefore loss of the tested link is defined as: "loss = - (power drop)". In the case of measurement with setting the LIMIT- PASS, this means that this fiber is complied with the set LIMIT and ERR means that the fiber overreached set LIMIT.
5. Value of loss can be stored into the OFT-920 internal memory by pushing [MENU], [MEMORY]. [SAVE], [+,-], [SAVE].



pic. 8

10 Ordering information

Ordering Code:

OFT-920 - XX - XXXX - XXX

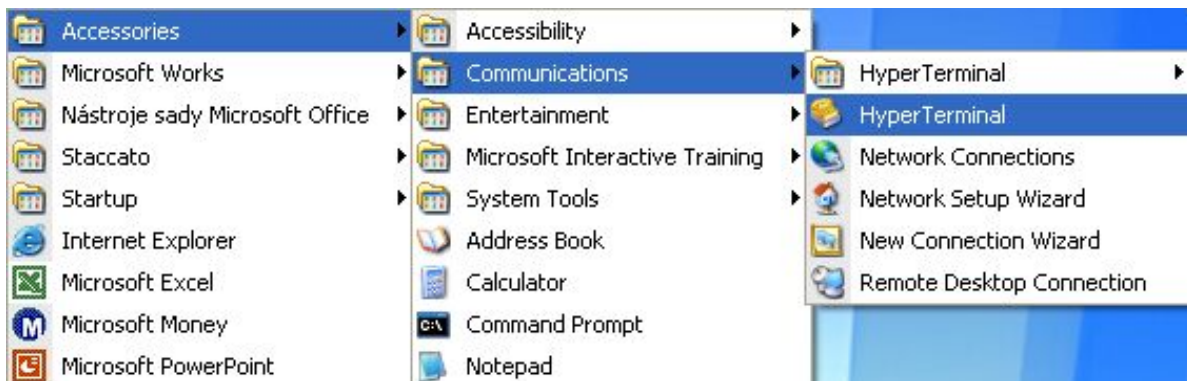
MM - multimode SM - single mode		Source wavelength as below
Connector type		
HMA2	HMA Expanded Beam connector	
HMA4	(non-contact optics), 2/4 fibers	

light source code	description	application
LD650	650 nm visible laser	visual checking
LD850 LED850 LED30 LD850-LED30	850 nm LD (VCSEL) 850 nm LED 1300 nm LED 850 nm LD + 1300 nm LED	MM fiber testing
LD31 LD55 LD62 LD31-55	1310 nm LD 1550 nm LD 1625 nm LD 1310 + 1550 nm LD	SM fiber testing

Note: 1) further wavelengths and port combinations on request

10. Setting up data transfer

1. Connect OFT-920 to a PC using the USB cable provided and turn the OFT-920 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



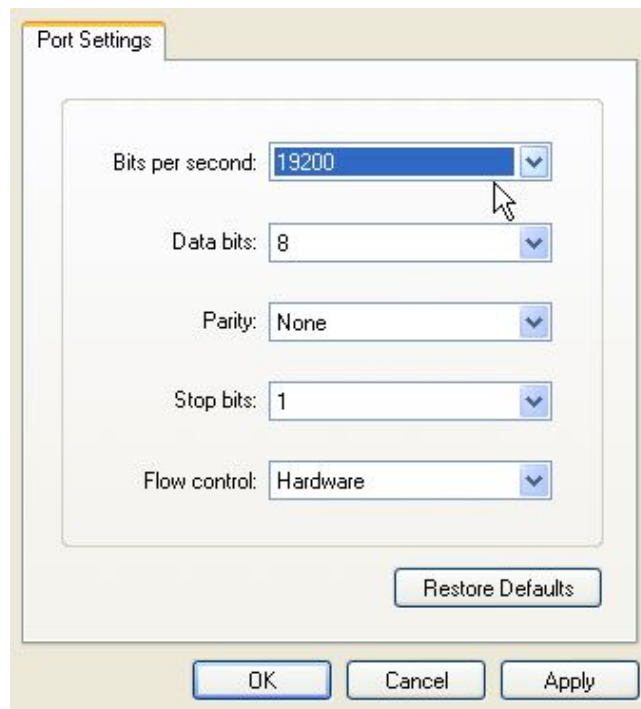
3. Enter the name of a connection, then OK.



4. Choose the virtual serial port the OFT-920 is connected to, then OK

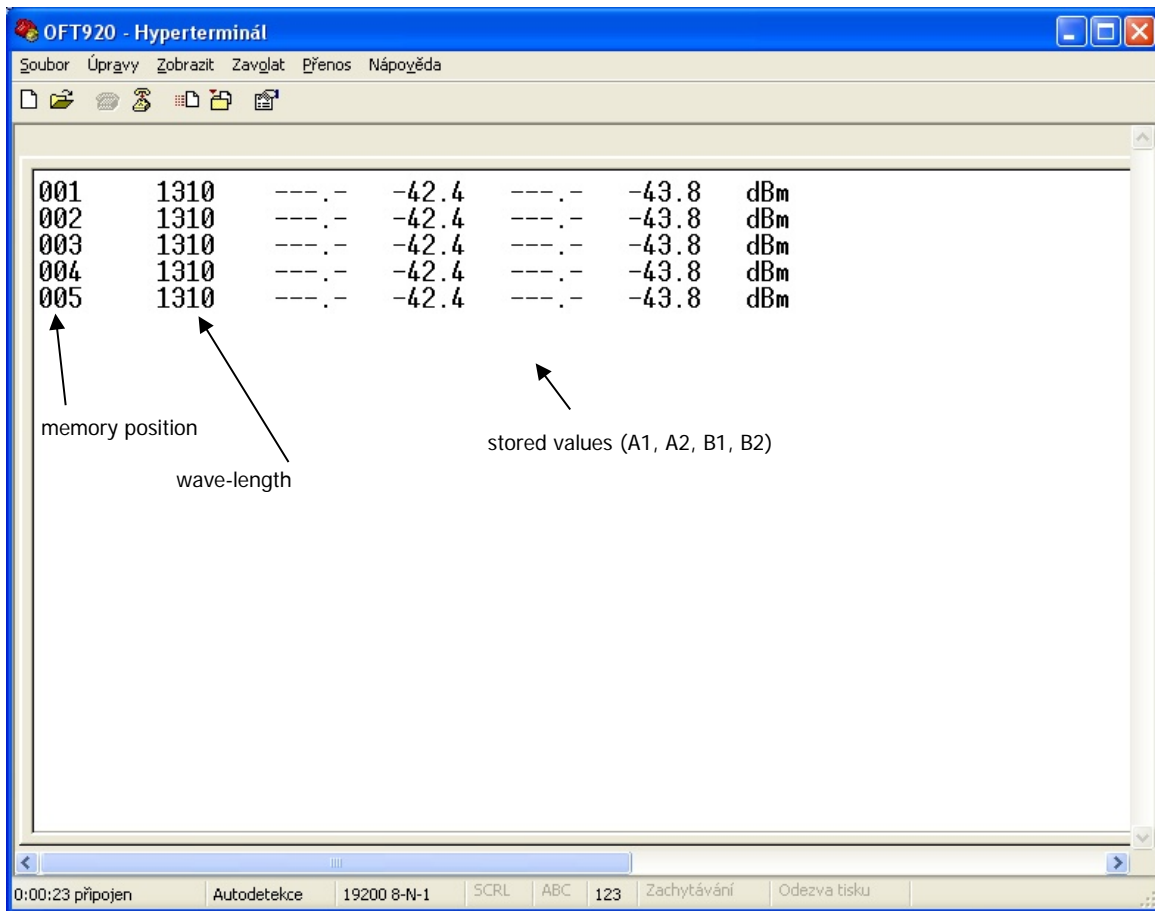


5. Set "Bits per second" to 19200, click on OK



- Go to the **menu in OFT-920** and push [MENU], [MEMORY], [MORE], [SEND].

Stored data will be transferred to the PC in this format:



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

11. 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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