FIBER OPTIC TECHNOLOGY
CALIBRATION LABORATORY

# OFT-850
# Loss Test Set

## *INSTRUCTION MANUAL*


Revision 1.0


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# Contents

# 1 Introduction

The OFT-850 set consists of SMPTE SOURCE and SMPTE TESTER unit. The hybrid cable tester is designed for testing of loss in optical fibers and checking of continuity of copper pairs in hybrid cables. It combines optical light source on one side, optical power meter on other side and copper wires checker.

It is ideal for testing large spaces of LEMO SMPTE Hybrid System for Broadcast Infrastrucutre Networks.

The ruggedized aluminium case makes the unit ideal for field operation. The memory capacity allows storage and uploading of more than 1000 measurements including cable number, result of metalic wires check and optical power value or insertion loss. The tester supports memory download and test report generating. The Lithium rechargeable battery ensures long term working with minimal operation costs.

# 2 Features

- Hybrid cables – fiber optic testing and copper pairs checking
- Ruggedized aluminium case
- MM or SM applications
- Simultaneous testing of 2 fibers
- Manual operation alows individual fiber or wire check
- Auto operation mode with optical loss pass/fail indication and „ALL OK, SHORT, PINOUT message for metalic wires check
- Able to detect incorrect fiber and wire connection, disconnection and short circuit connection
- Internal memory
- Displayed units: dBm, dB
- High dynamic range
- Built-in charger, battery status indicator
  Easy to use with menu navigation

# 3 Application

- IL and RL measurement
- Broadcast infrastructure networks measurement
- SMPTE compatible HDTV system
- Suitable for SM and MM applications

# 4 Accessories

## 4.1 Standard

- Power charging adaptor
- USB connection cable
- Carrying case

## 4.2 Optional

- Reference patchcord

# 5 Specifications

| **General specifications** | | **Note:** |
|---|---|---|
| Dimensions | 145 x 145 x 56 mm | without connectors |
| Weight | 400 g | with battery |
| Temperature operating<br>storage<br>Humidity (non condensing) | -10 to +50 °C<br>-40 to +70 °C<br>0 to 95% | |
| IP rating | IP 54 | |
| Battery working time | > 20 hrs | between battery charging |
| **Light Source** | | |
| Output power | | |
| 850 nm, 1300 nm | -26 dBm (62.5/125 µm fiber) | typ. value |
| 1310, 1490, 1550, 1625 nm | -16 dBm | typ. value |
| Stability (1 hour, delta/2): | | tested after 20 min warm up<br>temperature 23 ± 1° |
| 850 nm, 1300 nm | ± 0.03 dB | |
| 1310, 1490, 1550, 1625 nm | ± 0.05 dB | |
| **Power Meter** | | |
| Photodetector | 1 mm InGaAs | |
| Working wavelengths | MM: 850, 1300 nm<br>SM: 1310, 1490, 1550, 1625 nm | can be customized |
| Dynamic range: Standard | -60 dBm to +10 dBm<br>-53 dBm to +17 dBm | 1300, 1310, 1490, 1550, 1625 nm<br>850 nm |
| Uncertainty | ± 12% | 1310, 1550 nm @ -20 dBm |
| Resolution | 0.01 | |
| **Electrical wires checking** | | |
| Electrical wires continuity | | |
| Short circuit | | |
| Isolation | | |
| Pins interconnection | | |

# 6 Safety information

OFT-850 Light source 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, provided that magnifying devices are not used.

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

**WARNING!**

The OFT-850 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.

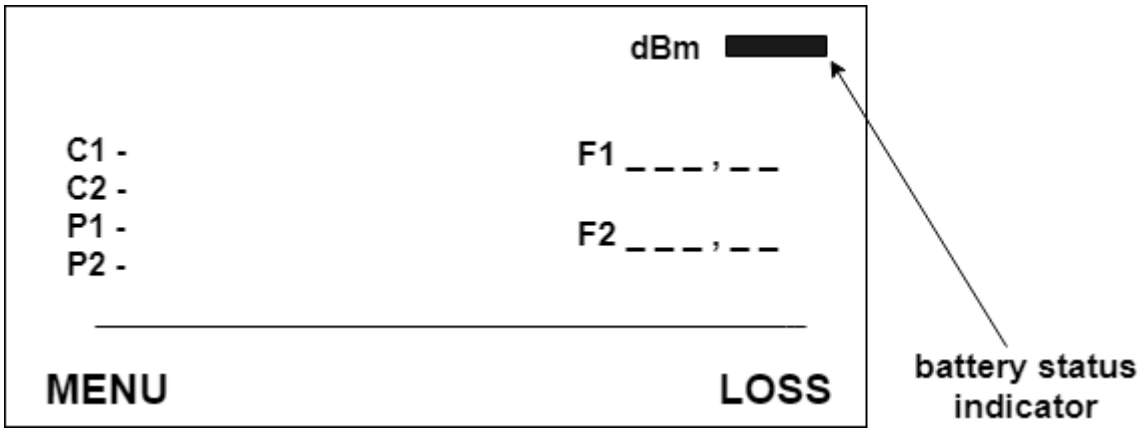
- Never use magnifying devices to inspect optical fiber ends unless you are certain that no optical power is being emitted.
- Only use magnifying devices with a built-in infra-red filter to ensure safety.
- During operation, testing or maintenance of a fiber optic system, never look into an active fiber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

# 7 Maintenance

## 7.1 Battery maintenance

The OFT-850 comes equipped with a built-in charger and is powered by Li-Pol type battery (standard accessories).

- Charging – via USB port (PC) or by using external USB power charging adaptor (standard accessories)
- Before using the OFT-850 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.
- Charge the batteries fully before storing the tester for a long period. The batteries will lose its capacity during storage.
- If you are not going to use the OFT-850 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.




## 7.2 Instrument maintenance

- 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 connector type

- 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 Instrument and button function description

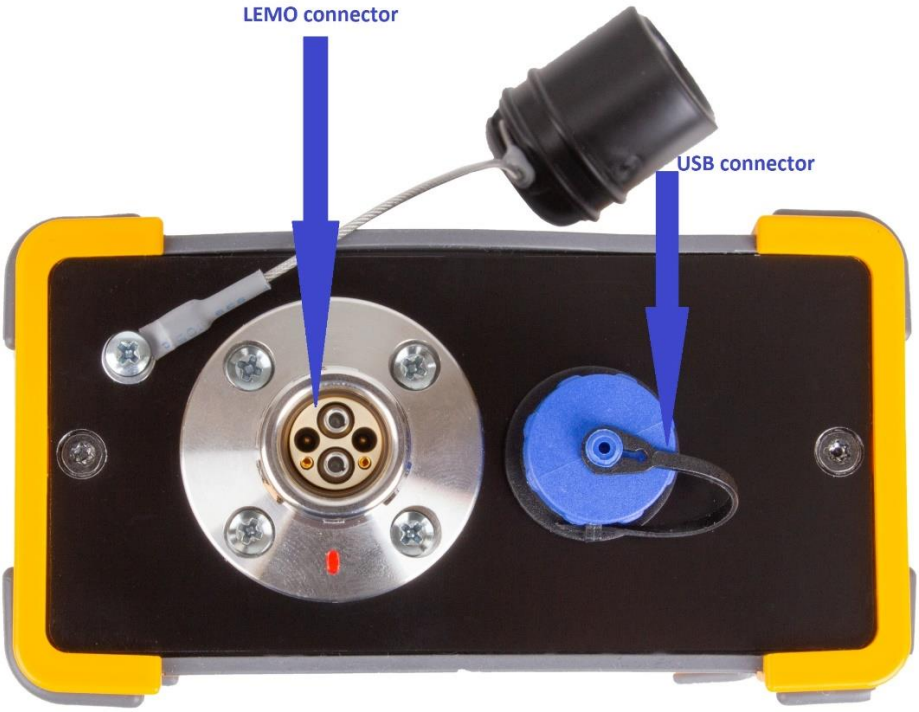
## 8.1 General description


**SMPTE source front view**


**SMPTE source back view**


**SMPTE tester front view**


**SMPTE tester front view**




**SMPTE top view**


LCD display
LOSS TEST SET
OPTICAL
ON
OFF
POWER button
FUNCTION buttons

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

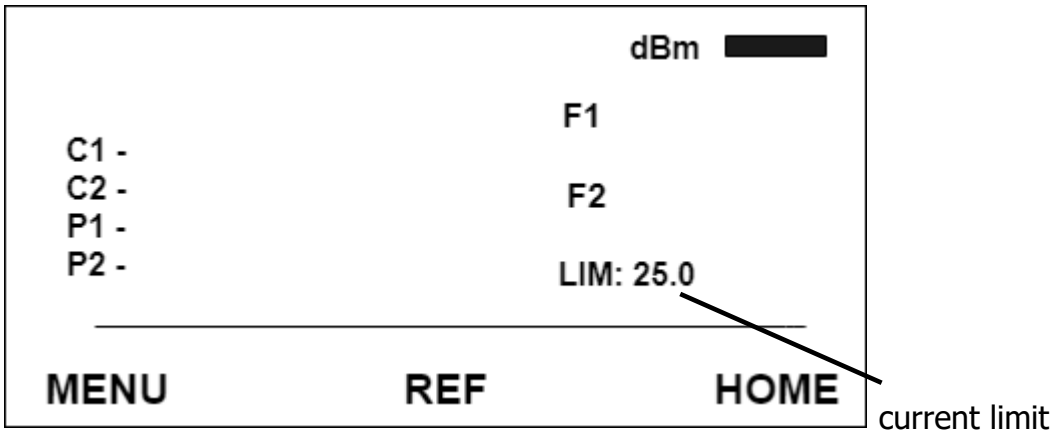
| | | |
|---|---|---|
| OFT - 850<br>SMPTE TESTER<br>S/W: 1.1<br>S/N: OFT850xxxx | | OFT - 850<br>SMPTE SOURCE<br>S/W: 1.1<br>S/N: OFT850xxxx |

### 8.1.1 Menu #1


**[MENU]**
-starts menu
-goes to menu #3

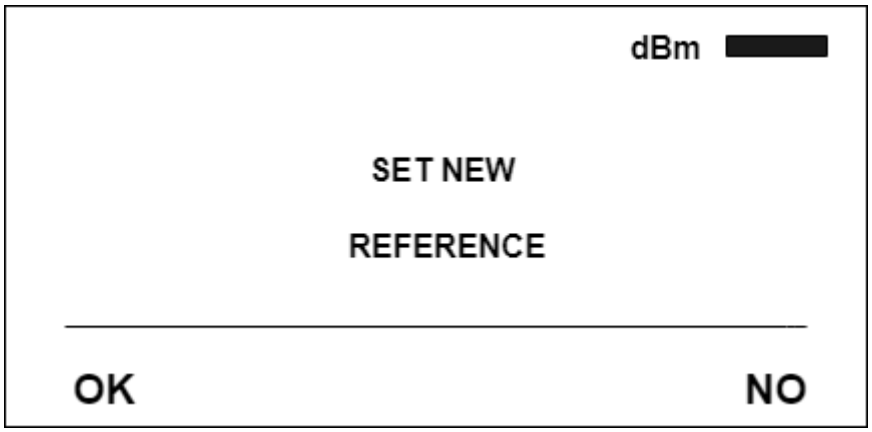
**[LOSS]**
-activates the relative power measurement mode (dB)
-recalls the last set reference for selected wavelength
-goes to menu #2

### 8.1.2 Menu #2



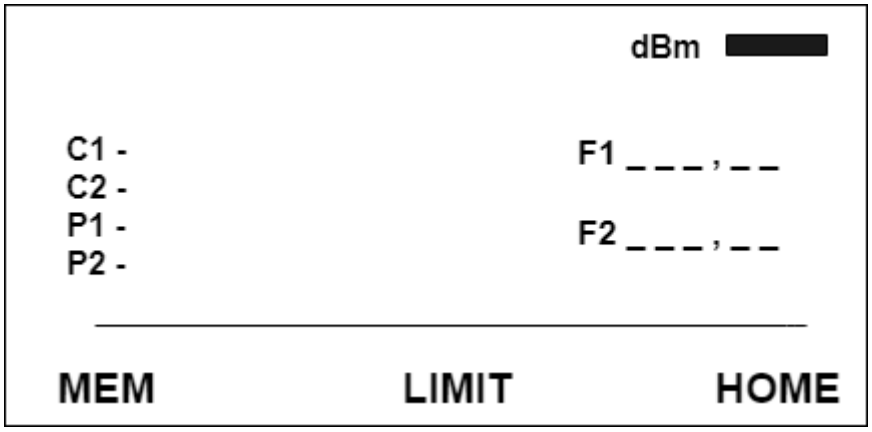

**[HOME]**
-return unit into absolute power measurement mode (dBm)
-goes to menu #1

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



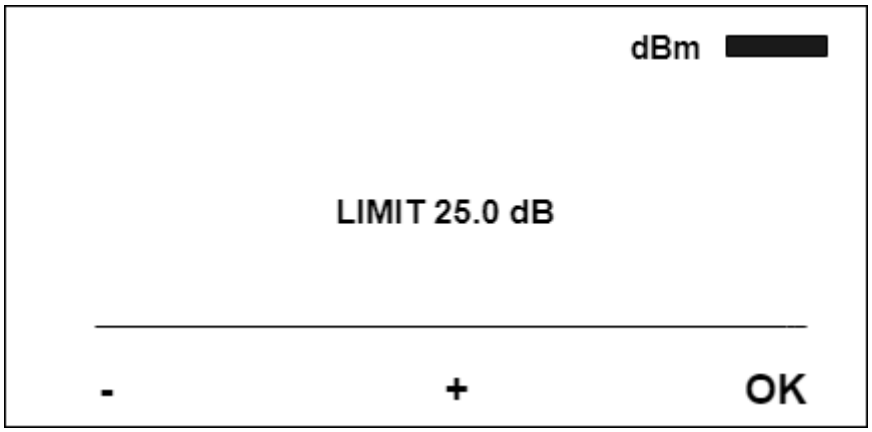

**[MENU]**
-starts menu
-goes to menu #3

### 8.1.3 Menu #3




**[MEM]**
-start work with the internal memory
-goes to menu #4

**[LIMIT]**

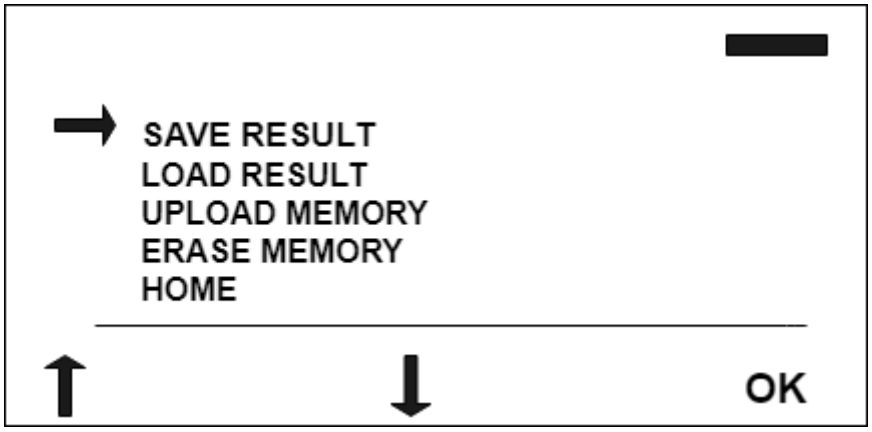



-sets limit (dB) for measured fibers
-by using **+** and **–** keys set limit, and confirm "OK"
minimum value is 0.5 dB, maximum 25 dB, step 0.5 dB.
-for measuring without limit set "OFF"

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

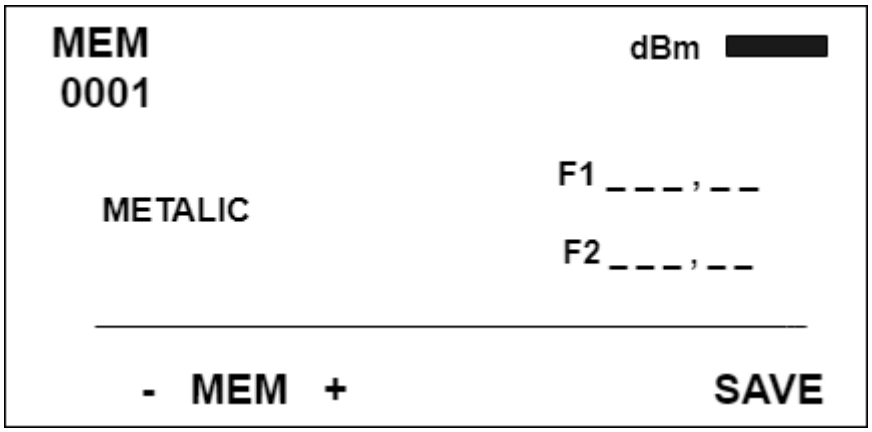
**[HOME]**
-return unit into absolute power measurement mode (dBm)
-goes to menu #1

### 8.1.4 Menu #4




**[UP], [DOWN], [OK]**
Use these buttons to select an appropriate submenu.

**SAVE RESULT**




**[+ MEM -]**
- selects the memory cell (0-1024)

**[SAVE]**
-saves the result into the selected memory cell and exits the menu

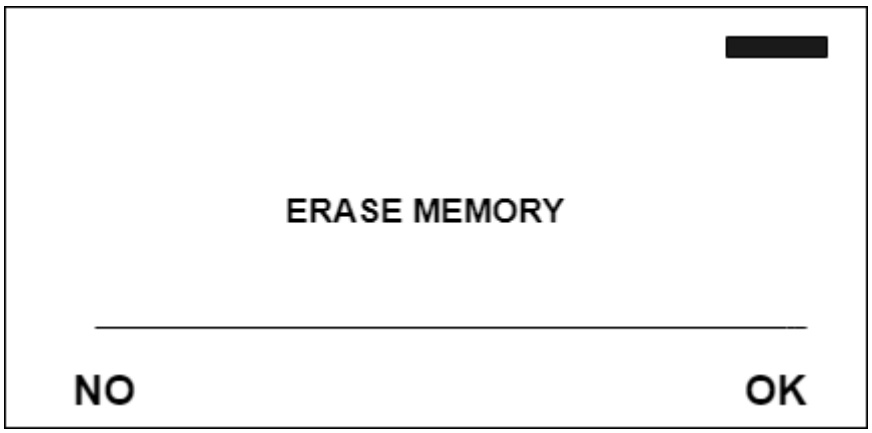
*NOTE: Memory cell number is automatically INCREMENTED BY 1 after [save] command.*

## LOAD RESULT


**[+ MEM -]**
-browses through memory cells

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

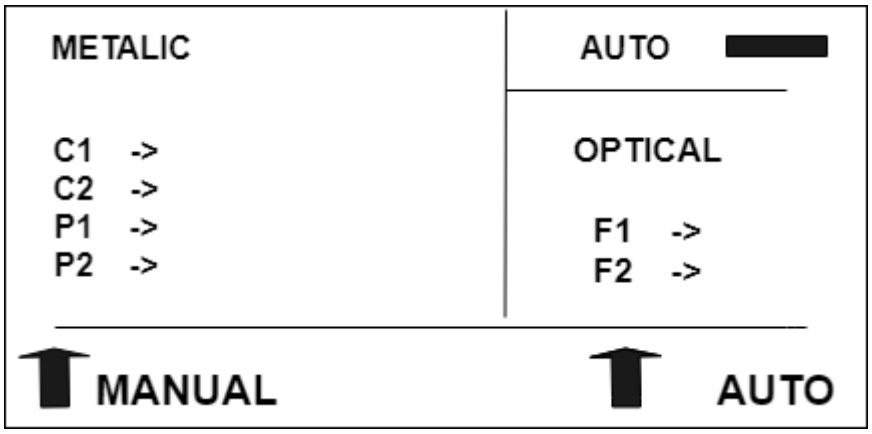
## ERASE MEMORY




-erases the whole internal memory

## HOME
-exit menu, return to Power Meter screen

## 8.2 Light source




**MANUAL**
-manual channels settings

**AUTO**
-automatic channels settings

# 9 Measuring loss

## 9.1 Basic theory

Loss measures the signal degradation in a fiber optic cable. A light source sends 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.

The selection of appropriate testing method depends of type measurement:

- Testing Fiber Optic Cable Plant, Method 6
  This test will measure the loss of an installed fiber optic cable plant, single mode or multimode, including the loss of all fiber, splices and connectors.

- Testing Patchcords, Method 7
  This test will measure the loss of a fiber optic cable, singlemode or multimode, including connectors on each end individually - one at a time. For short cables, e.g. patchcords, with negligible fiber loss, the measured loss may be considered the loss of the connector mated to the reference connector. Reversing the cable tests the connector on the other end of the cable. Patchcords may also be tested both ends at once using the cable plant test method shown above.

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.
One or two units OFT-850 are used for this test, where Light source port is acting as transmitter and Optical power meter port as 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.
- 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.

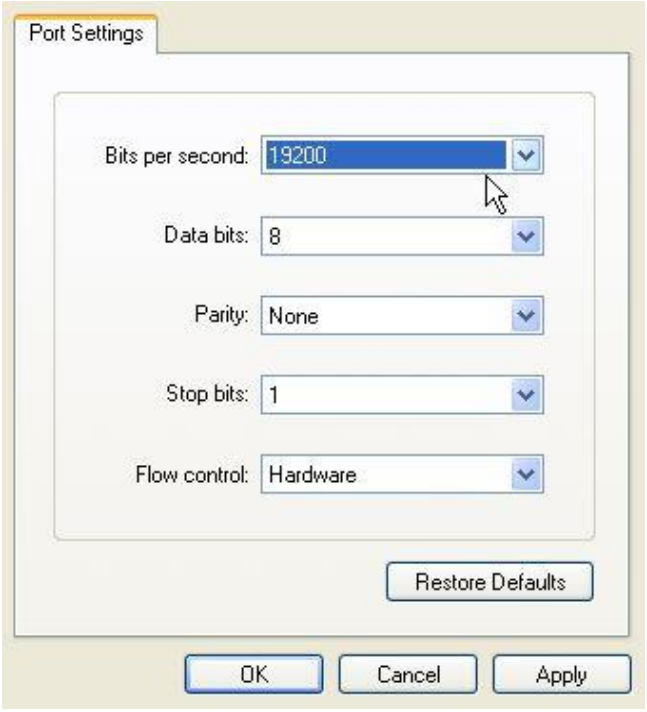
# 10 Setting up data transfer

1. Connect the OFT-850 to a PC using the USB cable provided and turn the OFT-850 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.

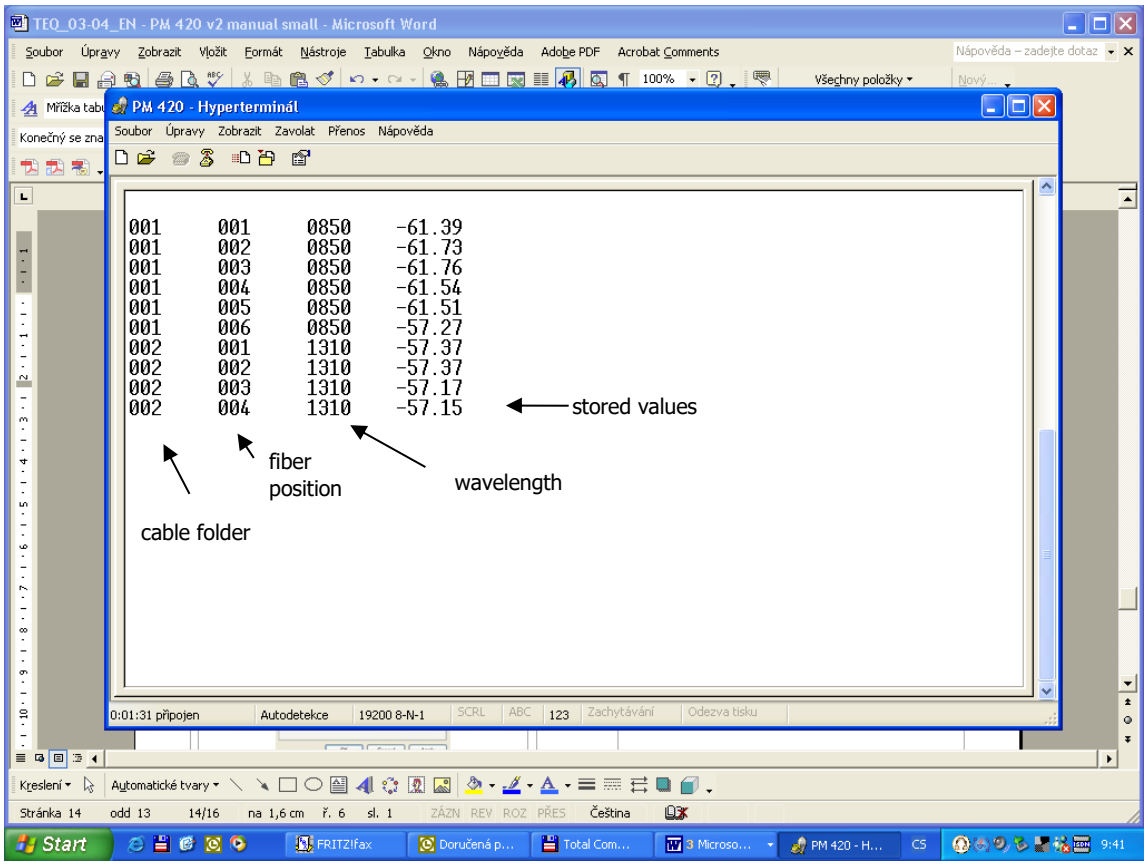
4. Choose the virtual serial port the OFT-850 is connected to, then click on OK


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



6. Go to the menu in OFT-850 and push [MORE], [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.

# 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 |

# 12 Notes

# 13 Calibration, service center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