



FIBER OPTIC TECHNOLOGY
CALIBRATION LABORATORY

LS-800 Optical Light Source

INSTRUCTION MANUAL



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1 Introduction

The LS-800 optical Light Source is a small size, low cost item which fulfils all necessary technical field equipment requirements and is available in seven working wavelengths - 850, 1300, 1310, 1490, 1550, 1625 nm and a visible 650 nm laser source. The modulation and AWD (Auto Wavelength Detection) functions are available when interacting with the PM-800 Power meter. The rechargeable battery ensures long term working with a minimum life time of five 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.

The changeable connector/adaptor design allows the simple exchange of optical PC or APC connectors (FC, SC or ST) and easy cleaning of the output connector ferrule after removing the connector adaptor. LC/PC and LC/APC are also available.

2 Features

- Small size, lightweight
- Modulation CW, 270 Hz, 1 kHz, 2 kHz
- AWD function (Auto Wavelength Detection)
- Changeable output connectors
- Battery status indicator
- Up to 7 light source combinations
- Premium type – high power source
- Powered by 3 AA batteries
- Battery charging via USB port, μ P controlled
- 10 min Auto Off

3 Application

- Optical network testing
- Fiber continuity testing
- Measurement attenuation in fiber cabling and connection with PM-800 Optical power meter
- Testing of connectors, splices, adaptors, switches and other components
- Easy and fast identification of failure points in fiber networks
- Suitable for SM and MM applications

4 Accessories

4.1 Standard

- FC adaptor type
- USB power charging adaptor
- Traceable calibration certificate
- Warranty certificate
- Soft carrying case
- USB cable
- Rechargeable NiMH batteries - 3



USB Power charging adaptor

4.2 Optional

- Master patchcords
- Master adaptors
- Hard carrying case (for two instruments)
- FC adaptor set TE-ALS-FC
- SC adaptor set TE-ALS-SC
- ST adaptor set TE-ALS-ST



TE-ALS-FC



TE-ALS-SC



TE-ALS-ST

5 Specifications

| | | |
|--------------------------------|----------------------------------|--|
| Output power | | Note: |
| LD 650 nm | 0 dBm | Visible laser |
| LD 850 nm, LED 850 nm, 1300 nm | -20 dBm | typ. value |
| LD 1310, 1490, 1550, 1625 nm | -9 dBm Standard 0 dBm Premium | |
| Stability (1 hour, delta/2): | | tested after 20 min warm up temperature 23 ± 1° |
| LD 850 nm, LED 850, 1300 nm | ± 0.03 dB | |
| LD 1310, 1490, 1550, 1625 nm | ± 0.05 dB | |
| Dimensions | 165 x 80 x 40 mm | without adaptor |
| Weight | 340 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 | > 100 hrs | between battery charging |
| Battery life time | > 5 years | 2700 mA/h NiMH |

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, 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!

- 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

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.

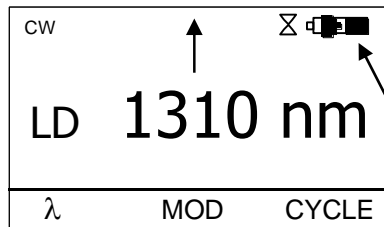
7 Maintenance

7.1 Battery care

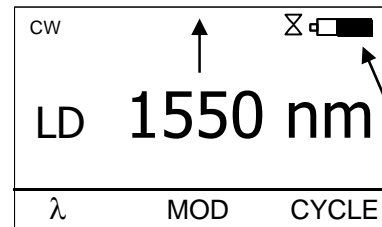
The LS-800 comes equipped with a built-in charger and is powered by three NiMH AA batteries (standard accessories).

Never use alkaline batteries!

- Charging – via USB port (PC) or by an external USB power charging adaptor (standard accessories)
- Before using the LS-800 for first time, fully charge the batteries.
- Only use the supplied USB power charging adaptor.
- Charging is not recommended until the battery status indicator is 30% or less. The recommended charging time for the batteries is 12 to 14 hrs.
- Fully charge the batteries before storing the LS-800 for long periods. The batteries will lose the charge during storage.
- If you are not going to use the LS-800 for long periods, charge the batteries once every six months.
- The batteries are consumable. Repeated charging and discharging decreases the lifetime of the batteries.
- To extend the batteries lifetime it is recommended that the batteries be completely drained before re-charging – battery refresh. Otherwise, the batteries lose the ability to fully recharge.



charging



battery status
indicator

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 gets into the instrument, dry it out carefully before using it again.

7.3 Recommended cleaning and mating instructions

Cleanliness affects the performance of an optical fiber system. You should perform the following procedures prior to installation: Clean all connectors, adapters and attenuators before making any connections. The following cleaning materials are recommended and should form part of your cleaning kit:

- ◆ Lint-free laboratory wipes.
- ◆ Isopropyl alcohol in a pressurized dispenser
- ◆ Lint free pipe cleaners
- ◆ Clean, dry, oil-free compressed air

CLEANING

Connectors/Terminators:

1. Fold a clean, new wipe into a pad 2" by 2" square.
2. Moisten, but do not saturate the pad with alcohol making a spot approximately 1/2" in diameter.
3. Open the protective cap (E2000 only).
4. Press the ferrule and face into the wet spot on the wipe. Using force, twist the ferrule so that a hard wiping action occurs. Repeat twice, using a clean alcohol-moistened pad each time.
5. Press the ferrule end face into a dry spot on the wipe. Using force, twist the ferrule so that a hard wiping action occurs.
6. Close the cap (E2000 only).
7. Discard the used pad.

Attenuators:

1. For an exposed ferrule (in-line type), see the connector cleaning procedure, blow the other end dry with clean compressed air.
2. Clean bulkhead attenuators only by blowing with clean compressed air.

Adapters:

1. Moisten one end of a lint-free pipe cleaner with alcohol.
2. Remove any excess alcohol from the pipe cleaner with a clean wipe.
3. Insert the moistened pipe cleaner into either end of the adapter and scrub it in and out so that the inside surface of the adapter is wiped with the pipe cleaner. Repeat this step for the opposite end.
4. Insert the dry end of the pipe cleaner into either end of the adapter to remove any

residual alcohol. For oversized adapters (biconic), slightly blow the middle of the pipe cleaner for better surface contact. Repeat this step for the opposite end.

5. Blow the adapter dry with clean compressed air.

MATING

SC, MT-RJ, LC:

1. Align the housing key with the slot in the adapter.
2. Push the connector into the adapter until a click is heard/felt indicating the latching system is engaged. When the SC connector is fully engaged, the white stripes on the side of the housing should be hidden inside the adapter.

FC:

1. Insert the ferrule tip into the adapter.
2. Align the key with the slot in the adapter.
3. Push the connector into the adapter until the coupling nut reaches the adapter housing.
4. Screw the coupling nut clockwise into the adapter.

E 2000:

1. Align slots with the key on the adapter.
2. Push the connector into the adapter until it clicks.

ST:

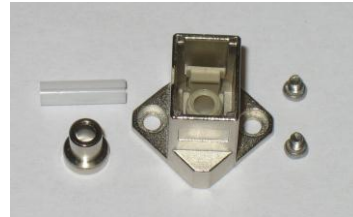
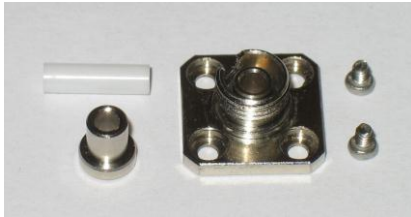
1. Align the ferrule hub key with the slot in the adapter.
2. Insert the connector into the adapter until the coupling nut reaches the adapter housing.
3. Align the bayonet slots on the coupling nut with the pins on the outside of the adapter.
4. Push the coupling nut into the adapter while rotating the coupler nut clockwise to lock the bayonet and secure the connection.

Infrared radiation is invisible and can seriously damage the retina of the eye. Never look into the ends of any optical fiber.

7.4 Adaptor set exchange

The LS-800 comes equipped with an adaptor set (FC, SC or ST adaptor). The adaptor set includes:

- adaptor body with flange
- two screws
- adaptor sleeve
- adaptor nut.



For exchanging the adaptor or cleaning the ferrule end face please use the following instructions:

1. Loosen the two adaptor flange screws



2. Carefully remove the adaptor body, be careful of the sleeve



3. Using the optical connector ferule, carefully remove the adapter sleeve



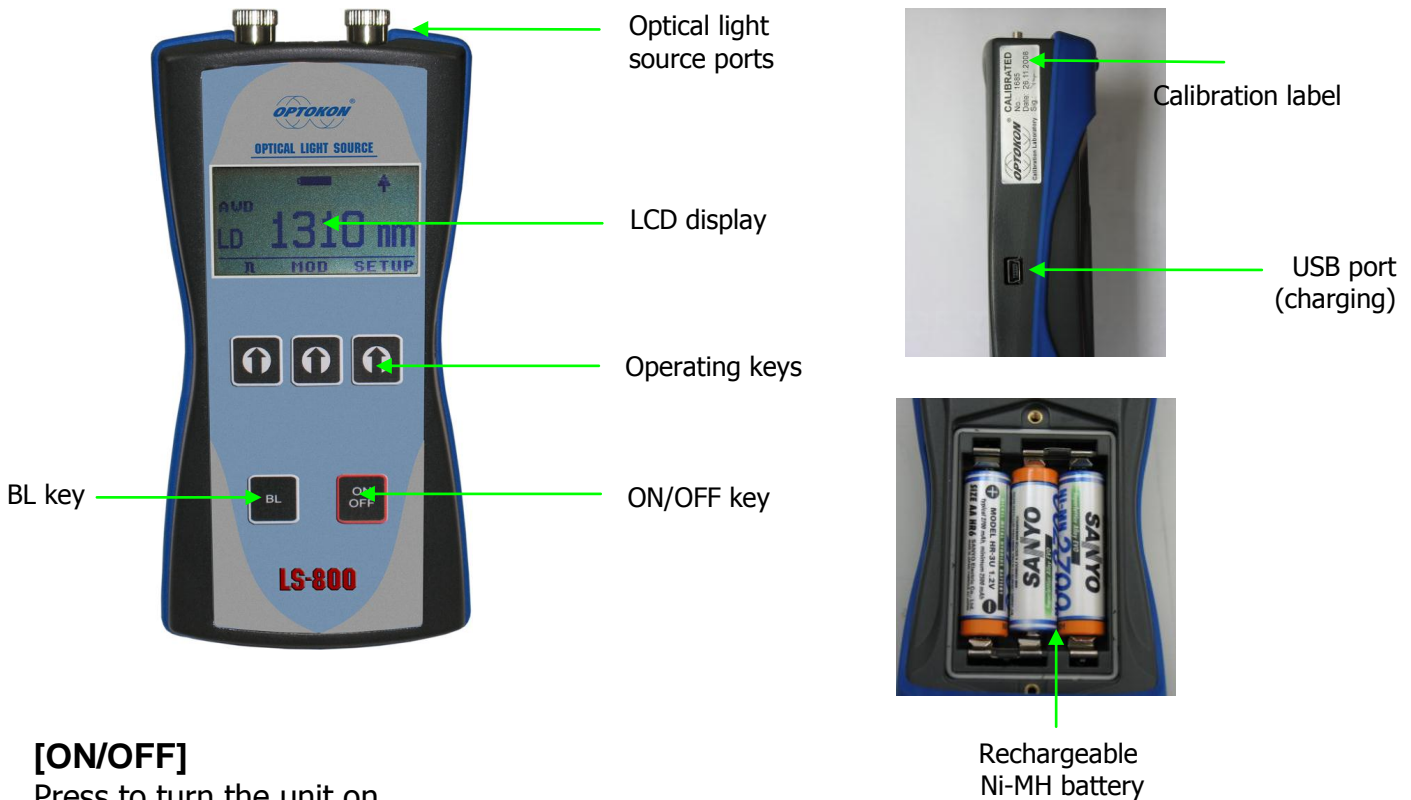
4. Remove the adaptor nut. Now the adaptor set is fully removed.



If necessary, carefully clean the ferrule end face using alcohol and lint-free laboratory wipes.

5. Insert the adaptor nut and the sleeve back.
6. Attach the appropriate adaptor body and tighten the screws again.

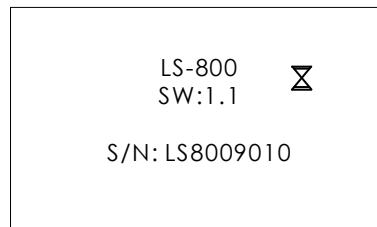
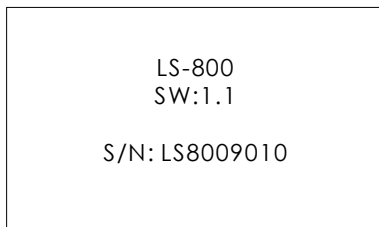
8 Instrument and button function description



[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.



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

[BL]

Turns the Display Backlight On and Off.

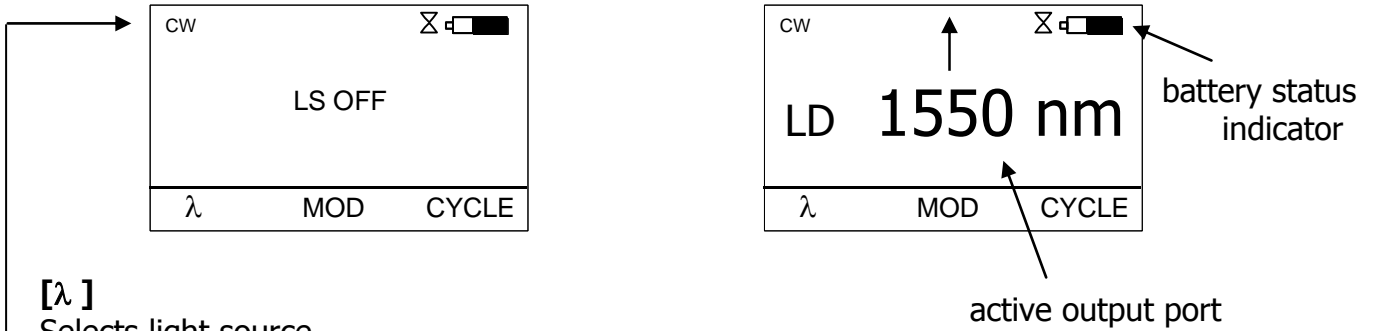
[↑]

The meaning of these keys depends on the current menu.

The following screen will appear after the instrument is switched on and information regarding the type of device, serial number and firmware version will display.

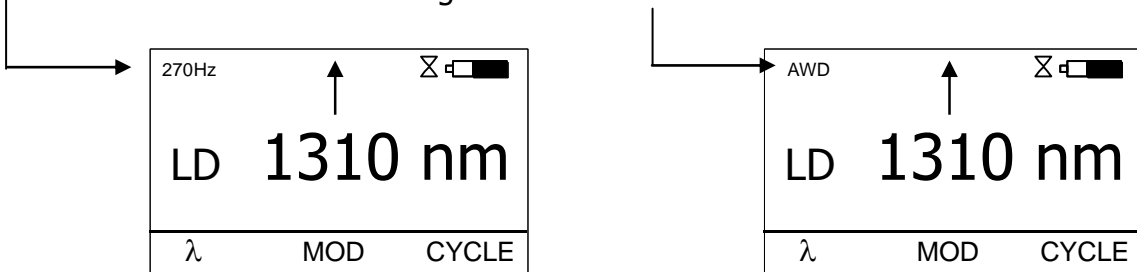
On the display is the light source description, battery status and an arrow pointing to the active output port.

Reading the display:

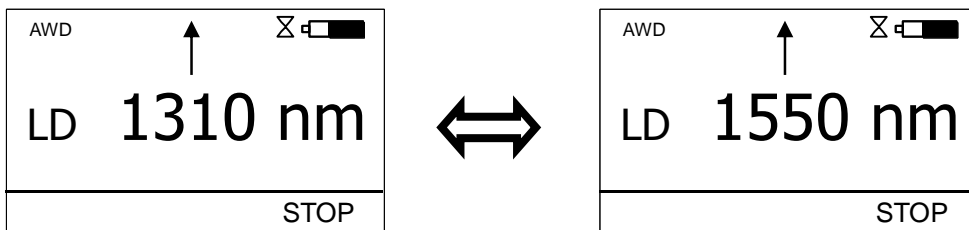


[λ]
 Selects light source
 For available source configurations, see chapter 10.

[MOD]
 Selects the modulation:
 CW – Continuous wave
 270Hz – 270kHz Modulation
 1KHz – 1kHz Modulation
 2KHz – 2kHz Modulation
 AWD – Auto Wavelength Detection – Modulation



[CYCLE]
 Cycles all light sources available in the unit. Each light source is switched on for approximately 5 seconds.
 This feature is enabled only if the AWD modulation is on.



Press [STOP] to return to normal Light Source operation.

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:

- 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 of 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 of the loss

Important

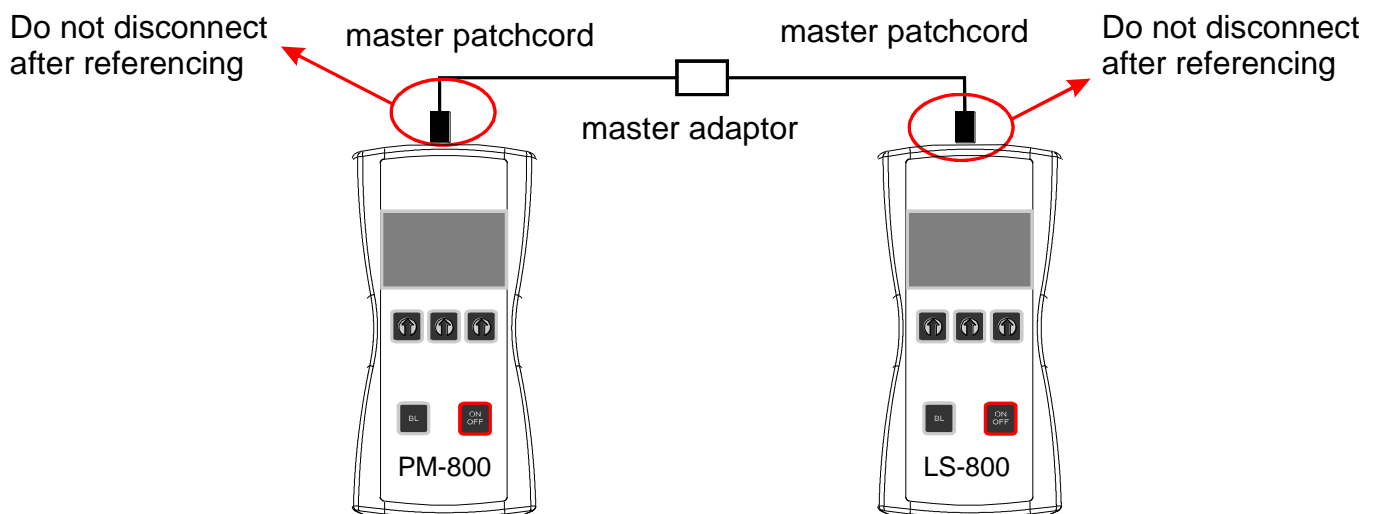
- All connectors and fiber end faces should be cleaned prior to testing (see chapter 7.3).
- The master cord used to set the reference should be the same type as the patchcords (cables) to be tested (MM: 50/125, 62.5/125 or SM).
- It is very important that the connections are not disturbed after the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

9.2 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.

9.2.1 Setting the reference

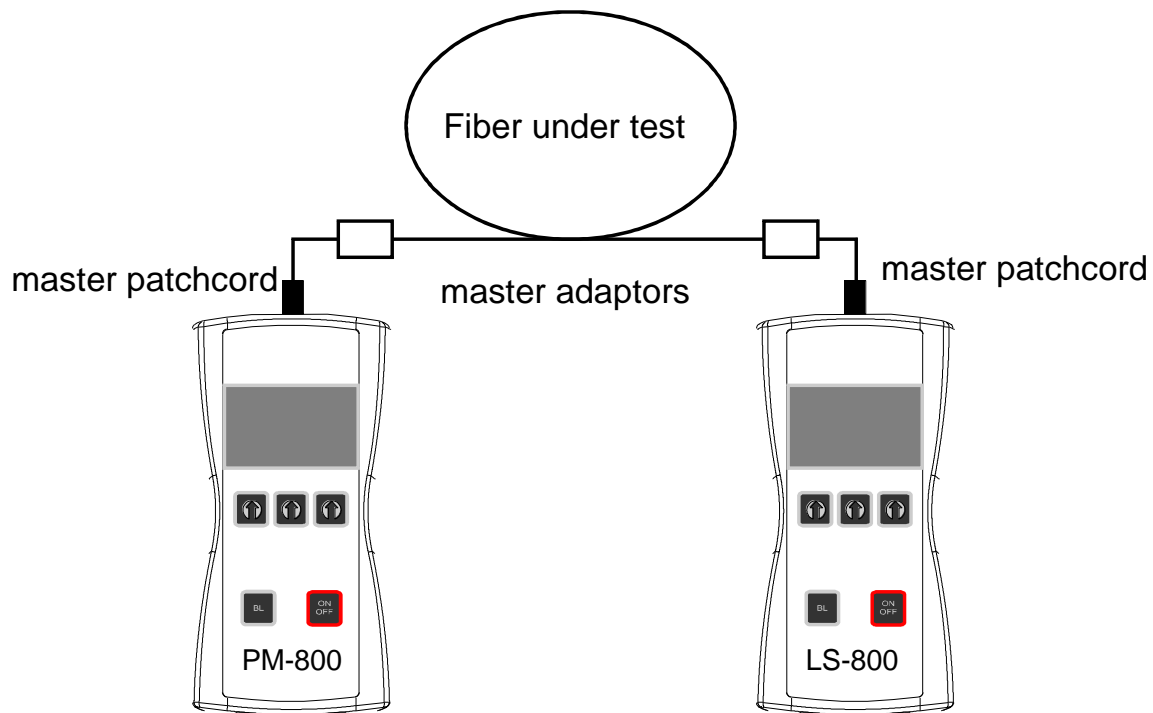
1. Connect the first master cord to the power meter (PM-800).
2. Connect the second master cord to light source (LS-800).
3. Use the master adaptor to connect the two fiber ends (pic.1).
4. Power on the light source and by pushing [λ] select the appropriate wavelength.
5. Power on the power meter and 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)

9.2.2 Measurement Loss

1. Do not disconnect the master cords from the light source and power meter.
2. Disconnect the 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 the difference between the reference and the performed measurement.
6. If the value will be displayed with the "LOSS" message, the trace to be measured only has 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. The value of the loss (or gain) can be stored in the internal memory (see "SAVE RESULT" chapter).



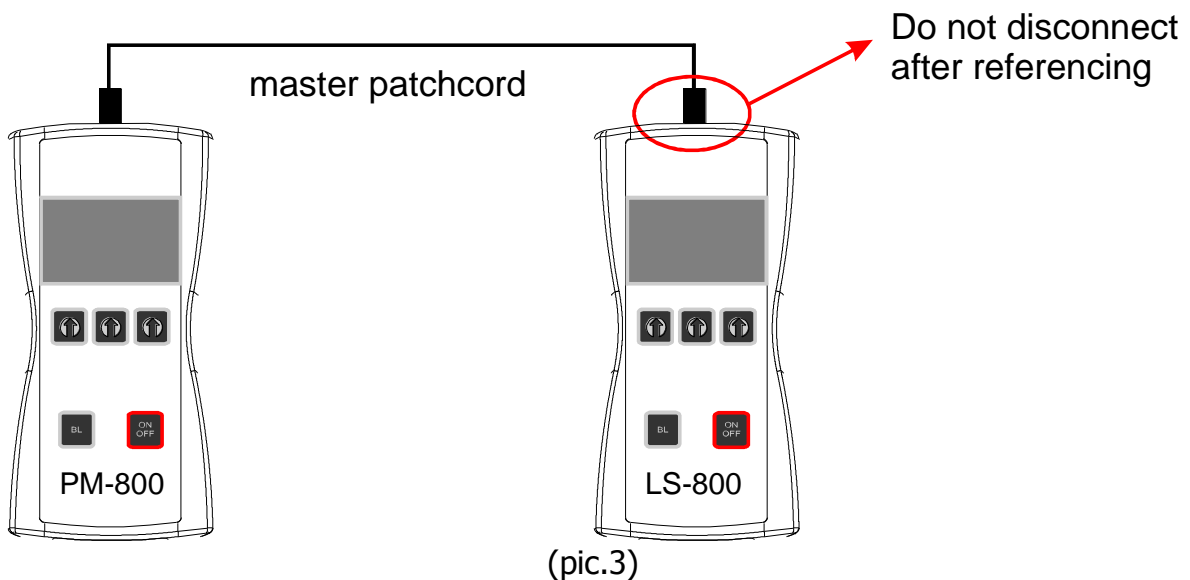
(pic.2)

9.3 Method 7

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

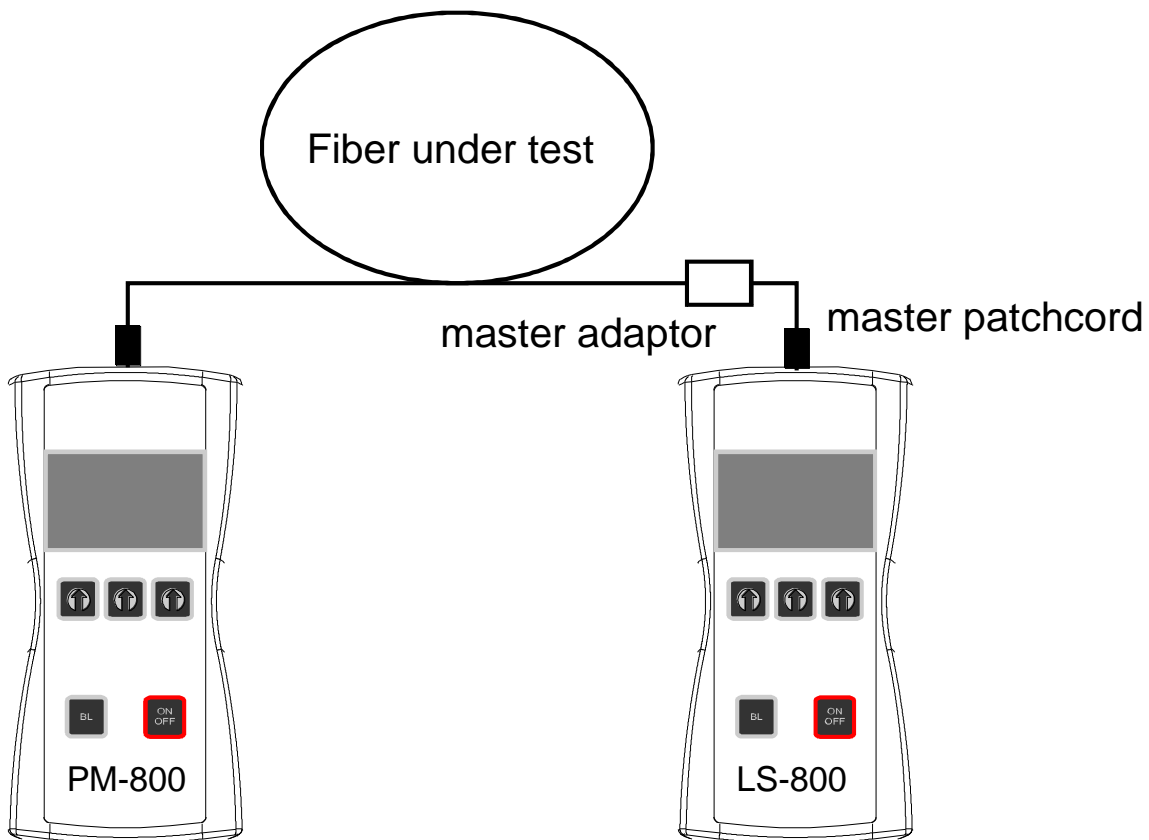
9.3.1 Setting the reference

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 then [CONFIRM].



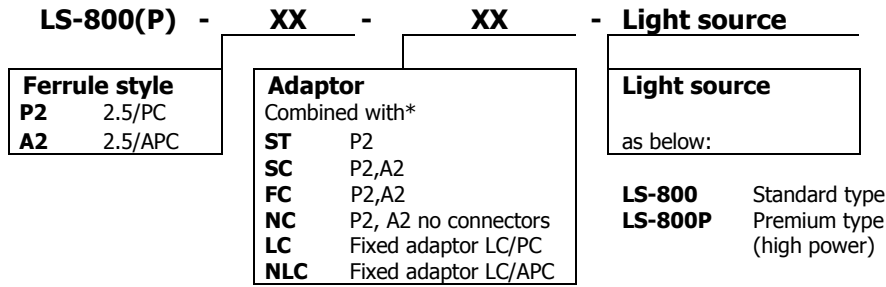
9.3.2 Measurement Loss

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 only has 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 Ordering information



*) LC type – fixed adaptor, not removable
 Other interface on request

| light source code | description | ports | application |
|----------------------------|---|-------|-----------------------|
| LD650 | 650 nm visible laser | 1 | visual checking |
| LD850 | 850 nm LD - VCSEL laser | 1 | MM fiber testing |
| LED850 | 850 nm LED | 1 | |
| LD850/LD650 | 850 nm LD / 650 nm visible laser | 2 | |
| LED30 | 1300 nm LED | 1 | |
| LED30/LD650 | 1300 nm LED / 650 nm visible laser | 2 | |
| LD850-LED30 | 850 nm LD + 1300 nm LED | 1 | |
| LD850/LED30 | 850 nm LD / 1300 nm LED | 2 | |
| LD31 | 1310 nm LD | 1 | SM fiber testing |
| LD31/LD650 | 1310 nm LD / 650 nm visible laser | 2 | |
| LD55 | 1550 nm LD | 1 | |
| LD55/LD650 | 1550 nm LD / 650 nm visible laser | 2 | |
| LD31-55 | 1310 + 1550 nm LD | 1 | |
| LD31/LD55 | 1310 nm LD/1550 nm LD | 2 | |
| LD55/LD62 | 1550/1625 nm LD | 2 | |
| LD850/LD31 | 850 nm LD / 1310 nm LD | 2 | MM + SM fiber testing |
| LD850/LD31-55 | 850 nm LD / 1310 + 1550 nm LD | 2 | |
| LD850-LED30/LD31-55 | 850 nm LD+1300 nm LED / 1310+1550 nm LD | 2 | |

output power of dual wavelengths port is 3 dB lower than specified

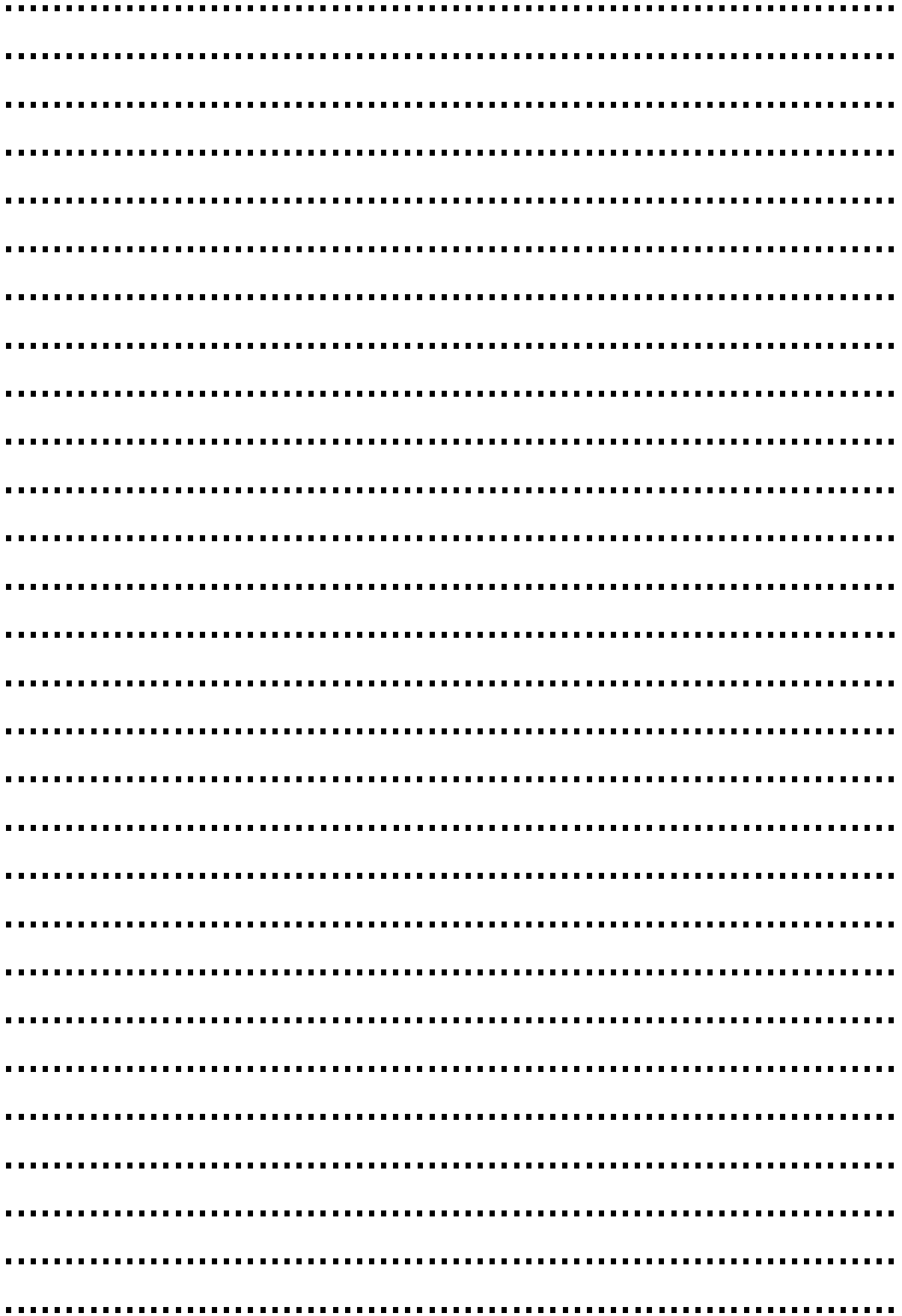
- 1) LD – Laser Diode (LD850 – VCSEL laser)
 LED – Light Emitting Diode
- 2) other wavelengths and port combinations available on request

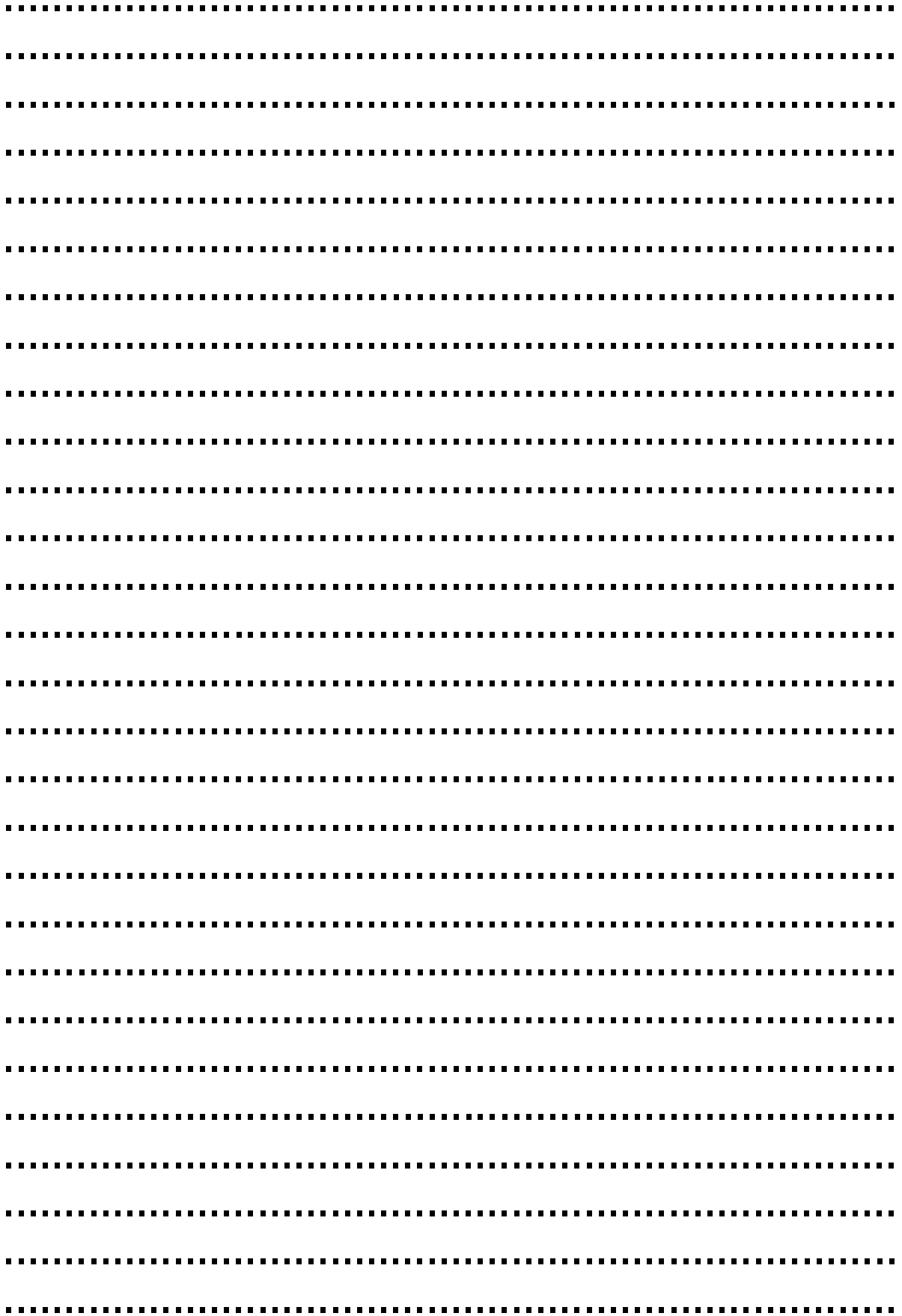
Ordering example:

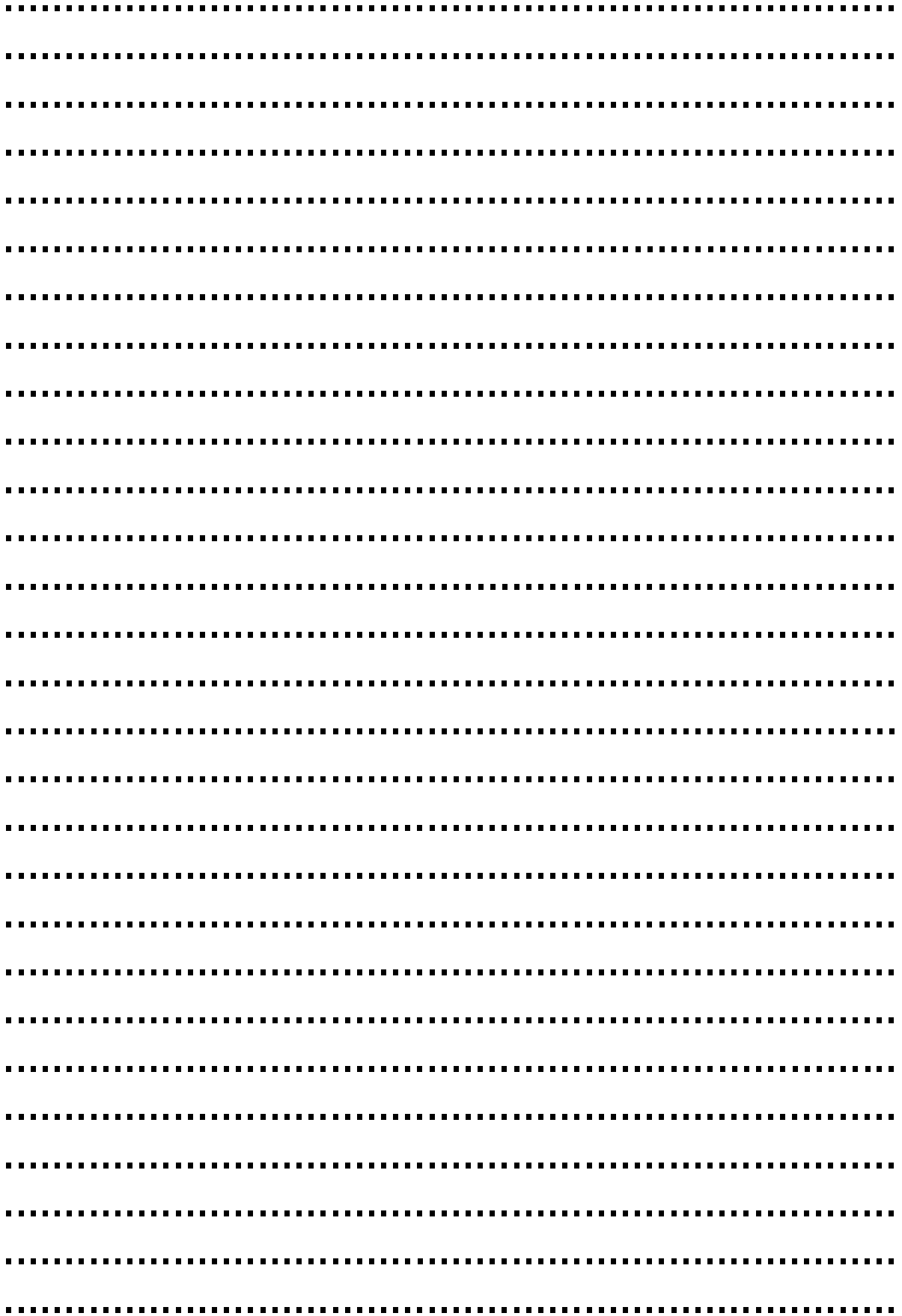
| | |
|----------------------------------|---|
| LS-800-P2-FC-LD850/LED30 | MM light source 850 and 1300 nm, 2 ports, FC connectors |
| LS-800P-P2-FC-LD31-55 | SM light source Premium, 1310 and 1550 nm, 1 port, FC connector |
| LS-800-P2-NC-LD850-LED30/LD31-55 | SM light source, MM+SM, 850, 1300, 1310 and 1550 nm, 2 ports, no connectors |

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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