HIOKI

Instruction Manual

3661-20

OPTICAL POWER METER

HIOKI E. E. CORPORATION

October 2008 Revised edition 3 3661A981-03 08-10H

Contents

Introduction

Thank you for purchasing the HIOKI “3661-20 OPTICAL POWER METER”. To obtain maximum performance from the product, please read this manual first, and keep it handy for future reference.

- Windows is a registered trademark of Microsoft Corporation.
- Excel is a registered trademark of Microsoft Corporation.

Inspection

When you receive the product, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories, panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Accessories

3853 CARRYING CASE 1
CD-R of application software 1
LR6 alkaline battery 4
USB cable (1 m)..... 1
Strap 1
Instruction manual..... 1

Before using the product

- Before using the product, make sure that the insulation on the cable is undamaged and that no bare conductors are improperly exposed. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for repair.
- Before using the product the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.

Safety Notes

⚠ DANGER This product is designed to conform to IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the product. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from product defects.

This manual contains information and warnings essential for safe operation of the product and for maintaining it in safe operating condition. Before using the product, be sure to carefully read the following safety notes.

Safety Symbols

In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the product.

The ⚠ symbol printed on the product indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function.

The following symbols in this manual indicate the relative importance of cautions and warnings.

DANGER	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
WARNING	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the product.
NOTE	Advisory items related to performance or correct operation of the product.

Other Symbols

	Indicates the prohibited action
❖	Indicates the reference

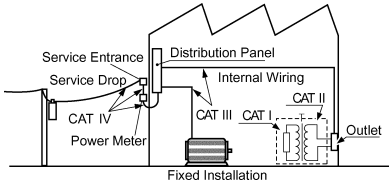
Measurement categories (Overvoltage categories)

To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.

CAT I	Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar device.
CAT II	Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)
CAT III	Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.
CAT IV	The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement device designed for CAT III environments can endure greater momentary energy than a device designed for CAT II.
Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Never use a CAT I measuring instrument in CAT II, III, or IV environments.

The measurement categories comply with the Over-voltage Categories of the IEC60664 Standards.

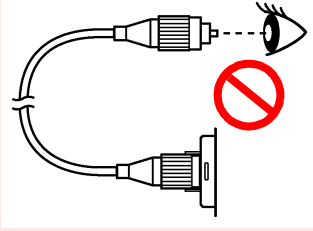


Usage Notes

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

⚠WARNING

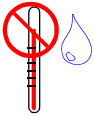
- When cleaning the connector of a optical fiber cable, never look directly into the end of the optical fiber cable or observe it through a magnifying glass if the cable is connected to an operating optical output device as this can lead to eye damage or visual impediment.



- To avoid a shock hazard, disconnect the USB cable before replacing the batteries.

⚠CAUTION

Direct sunlight



High temperature
High humidity

Dust

- Do not store or use the product where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the product may be damaged and insulation may deteriorate so that it no longer meets specifications.
- To avoid damage to the product, do not allow the product to get wet, and do not use it when your hands are wet.
- Do not use the product where it may be exposed to corrosive or combustible gases. The product may be damaged.
- To avoid damage to the product, protect it from vibration or shock during transport and handling, and be especially careful to avoid dropping.
- The mating portions of the detector and of the connector adapter are high-precision machined parts. Make sure that these portions are free of dust or other foreign matter when connecting them. In particular, the detector window requires meticulous care. If there is dust in the interface or a scratch on the detector window, the meter may not satisfy performance specifications.

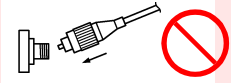
NOTE

- After use, always turn OFF the power.
- Be sure to replace the cap to protect the device from dust when the meter is not in use.
- The "B" indicator appears when battery voltage becomes low. Replace the batteries as soon as possible.
- Use the specified battery (LR6 alkaline battery) only. Other batteries (manganese batteries, for example) run out more quickly than alkaline batteries.

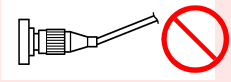
Handling Optical Fiber Cable

⚠CAUTION Follow the precautions below to prevent damage to the optical fiber cables.

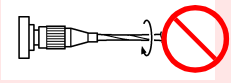
- Do not insert at an angle.



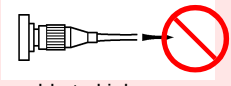
- Do not bend the cable at the neck of the connector.



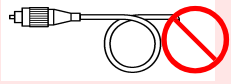
- Do not bend or twist.



- Do not pull forcefully.



- Do not allow cable to kink.



- Do not touch the end face (ferrule).

Care and handling of CD-R

⚠CAUTION

- Always hold the disc by the edges, so as not to make fingerprints on the label side or scratch the printing.
- Never touch the recorded side of the disc. Do not place the disc directly on anything hard.
- Do not wet the disc with volatile alcohol or water, as there is a possibility of the label printing disappearing.
- To write on the disc label surface, use a spirit-based felt pen. Do not use a ball-point pen or hard-tipped pen, because there is a danger of scratching the surface and corrupting the data. Do not use adhesive labels.
- Do not expose the disc directly to the sun's rays, or keep it in conditions of high temperature or humidity, as there is a danger of warping, with consequent loss of data.
- To remove dirt, dust, or fingerprints from the disc, wipe with a dry cloth, or use a CD cleaner. Always wipe radially from the inside to the outside, and do no wipe with circular movements. Never use abrasives or solvent cleaners.
- Hioki shall not be held liable for any problems with a computer system that arises from the use of this CD-R, or for any problem related to the purchase of a Hioki product.

Overview Chapter 1

1.1 Product Overview

The 3661-20 OPTICAL POWER METER is an optical power measuring instrument for optical fiber cables. The meter has two measurement modes: optical-power measurement mode and optical-loss measurement mode. In optical-loss measurement mode, the meter calculates optical loss by using the measurement and the reference value stored in the memory.
Memory functions and a USB interface are provided so that saved measurement values can be transferred to a PC using the supplied software.

1.2 Features

Two Measurement Modes

(Optical power measurement mode)
Measures the optical power of the cable connected to the meter.
(Optical loss measurement mode)
Stores a reference measurement in advance, then takes a measurement and calculates optical loss from the measurement and the reference.

Measurement wavelengths are programmable in 5 nm steps

Using the supplied software, practically any wavelength can be programmed for measurement in 5 nm steps. Up to eight programmed wavelengths are stored in internal memory, and optical power can be measured at each stored wavelength.

Supports Two Types of Optical Connectors

Supports both FC and SC type optical connectors; use an appropriate connector adapter (a second adapter is optional).

Memory Function

Saves measurements in the built-in memory; up to 1000 measurements per programmed measurement wavelength can be stored.

Transferring Data to PC

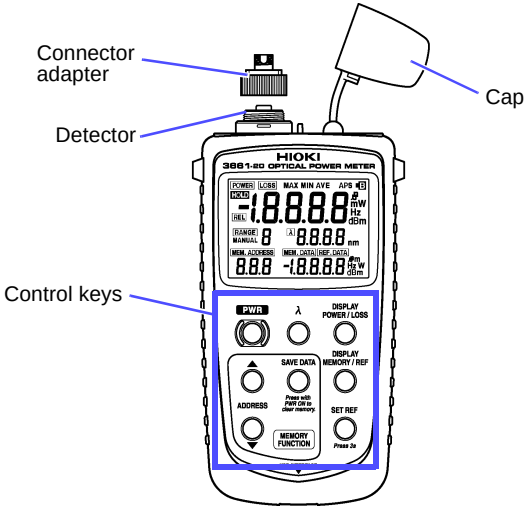
The provided USB interface enables saved data to be transferred to a PC using the supplied software.

Auto Power Save Function

If there is no key operation for more than approximately ten minutes, the power of the meter is automatically turned off. This prevents the meter from being left on unintentionally and minimizes battery consumption.

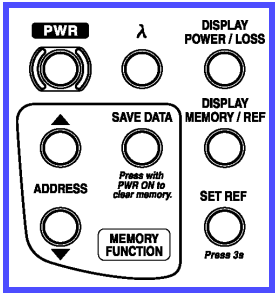
1.3 Parts Names and Functions

Front



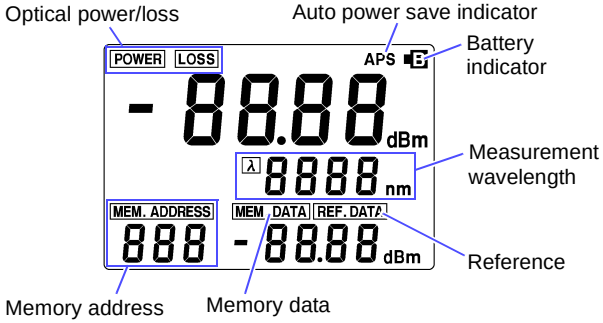
Connector Adapter	Attach the connector adapter to the detector. Choose the FC or SC type according to the type of cable connector to be connected (a second adapter is optional).
Detector	Receives an optical signal.
Cap	Protects and dust-proofs the detector and the connector adapter. Be sure to replace the cap when the meter is not in use.

Control Keys



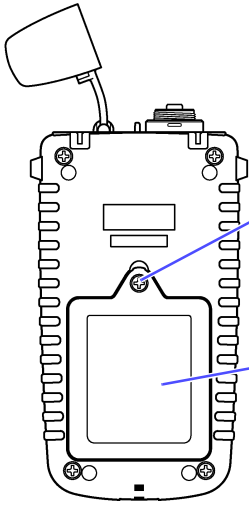
PWR (Power switch)	Turns the power of the meter on and off. **Power ON**: Hold down the key for approximately two seconds to turn the power on. If it is depressed for approximately five seconds, the auto power save function is disabled. **Power OFF**: Hold down the key for approximately one second to turn the power off.
λ (Wavelength select)	Selects the measurement wavelength. The measurement wavelength setting changes as shown below each time the key is pressed. 1310 nm→1550 nm→ 850 nm →1310 nm →..
DISPLAY POWER/LOSS	Selects optical power measurement mode or optical loss measurement mode.
DISPLAY MEMORY/REF	• Optical power measurement mode Allows the memory data to be displayed. • Optical loss measurement mode Allows either the memory data or reference value to be displayed.
SET REF	Hold down the key for approximately three seconds to store the optical power measurement as a reference value.
ADDRESS	Press this key while the memory data is displayed to change the memory address.
SAVE DATA	Press this key while the memory data is displayed to store the measurement. By holding down this key while turning the power ON, all data stored in memory are deleted.

Display (LCD)



Optical Power/ Loss	Display the measurement mode. **POWER** : Optical power measurement mode **LOSS** : Optical loss measurement mode
Auto Power Save Indicator	Lights when the auto power save function is enabled. If there is no key operation for more than approximately ten minutes, the power of the meter is automatically turned off. To disable the function, hold down the power switch key for approximately five seconds when turning on the power.
Battery Indicator	Lights when the charge level in the battery is low.
Measurement Wavelength	Displays the measurement wavelength.
Reference	Displays the stored reference value. Stores one reference value for every wavelength.
Memory Data	Displays the measurement stored in the memory with the specified address.
Memory Address	Displays the memory address.

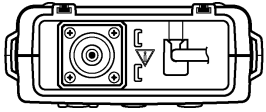
Rear



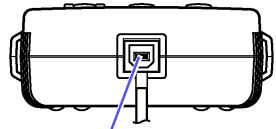
Setscrew
Setscrew to fasten the battery cover

Battery cover
Cover for the battery
❖7.1 "Battery Replacement" (63 page)

Upper



Lower

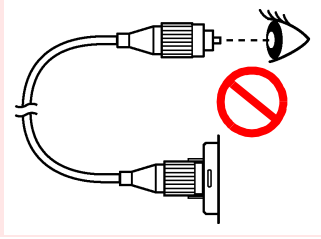


USB connection terminal
Terminal to connect a USB cable.

Measurement Preparations Chapter 2

2.1 Connecting Connectors

⚠WARNING When cleaning the connector of a optical fiber cable, never look directly into the end of the optical fiber cable or observe it through a magnifying glass if the cable is connected to an operating optical output device as this can lead to eye damage or visual impediment.



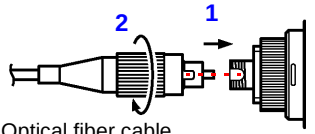
⚠CAUTION Make sure that the mating portions are free of dust or other foreign matter when connecting a optical fiber cable to the meter. In particular, the end face (ferrule) requires meticulous care. If there is dust in the interface or a scratch on the end face, the measurement may not be accurate.

NOTE Always clean the optical connector end face (ferrule) of the optical fiber cable before connecting.

2.1.1 Connecting FC-Type Connector

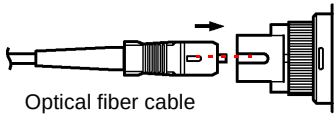
1. Insert the end face (ferrule) of the optical fiber cable into the connector adapter on the meter. Make sure that the protrusion on the cable's optical connector fits into the slot on the connector adapter.

2. Rotate the knurled nut (connecting nut) to tighten.



2.1.2 Connecting SC-Type Connector

Insert the end face (ferrule) of the optical fiber cable into the connector adapter on the meter.
Fit the protrusion on the cable's optical connector into the slot on the connector adapter. Push the connector in until it clicks.



NOTE The 9735, 9736, and 9737 (optional) are optical fiber cables with ordinary optical connectors, not a master connector.

9735/9736/9737 OPTICAL FIBER CABLE Specifications

Cable	1.3 μm-band single-mode optical fiber cable
Connection loss	0.5 dB or less
Return loss	45.0 dB or more
Minimum bending radius	30 mm (Do not allow to remain bent for a long time.)

2.2 Turning ON/OFF Power

Power ON

Hold down the **PWR** key for approximately two seconds.
The LCD screen lights and the power is turned on.

NOTE If the battery indicator (B in top right corner) is on when the power is turned on, the battery is running low. Replace it with a new battery.

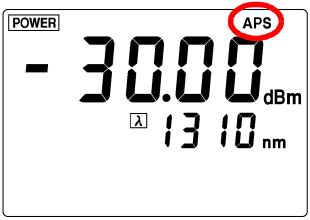
❖ 7.1 "Battery Replacement" (63 page)

Power OFF

Hold down the **PWR** key for approximately one second. The LCD screen goes out and the power is turned off.

Auto Power Save Function

This function automatically turns off the power if there is no key operation for more than ten minutes. ("**APS**" lights up in top right corner of the screen.)



NOTE
- The auto power save function is enabled when the power is turned on in the normal procedure.

- **Disabling Auto Power Save Function**
  Hold down the **PWR** key for approximately five seconds when turning on the power. "**APS**" goes out and the auto power save function is disabled.

2.3 Measurement Wavelength Programming

Wavelengths to be used for measurement are programmed in the meter before measuring.

- Measurement wavelengths are programmed using the supplied software.

❖ Programming measurement wavelengths → 5.5 "Programming Measurement Wavelengths" (55 page)

- Any measurement wavelength can be programmed in 5 nm steps.

- Up to eight wavelengths can be programmed for measurement (or fewer by deleting unneeded wavelengths).

- The factory default (pre-programmed) wavelengths are 850, 1300, 1310, 1470, 1490,1550, 1625 and 1650 nm, which can be restored by executing a system reset.

❖ 7.6 "System Reset" (71 page)

- Pressing the λ (Wavelength select) key displays the currently programmed wavelengths.

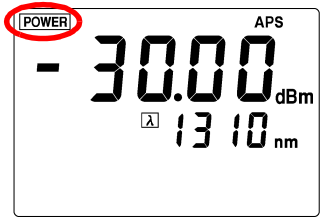
Measurement Chapter 3

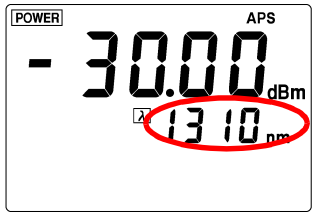
Performing optical power measurement and optical power loss measurement using a optical fiber cable.

3.1 Optical Power Measurement

Perform optical power measurement using a optical fiber cable.

1. Press the **DISPLAY POWER/LOSS** key to select optical power measurement mode. "**POWER**" appears in the top left corner of the screen.





NOTE

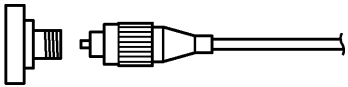
- For proper measurements, the measurement wavelength has to match that of the light source.
- If the appropriate measurement wavelength is not already programmed, program it using the supplied software.

❖ 5.5 "Programming Measurement Wavelengths" (55 page)

2. Pressing the λ (Wavelength select) key repeatedly loads and displays each programmed wavelength.

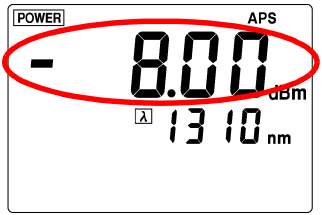
3. Connect the cable to be measured to the meter.

❖2.1 "Connecting Connectors" (17 page)



3661-20 Cable to be measured

4. The optical power measurement appears on the LCD.



3.2 Optical Loss Measurement

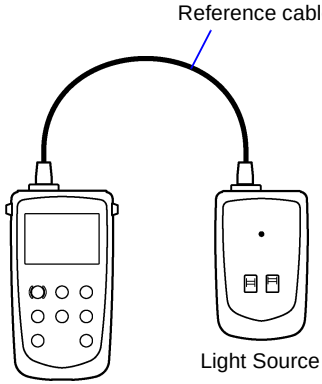
Measures the optical loss of a optical fiber cable.

NOTE For optical loss measurement of a optical fiber cable, the cable may be connected in several ways. This section explains one of them as an example.

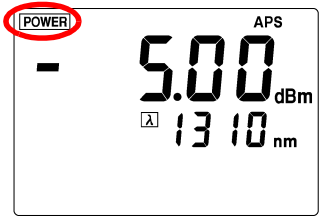
3.2.1 Saving Reference Value

Store a measurement to be used as a reference for optical loss measurement.

1. Connect the light source and the meter using the reference cable (a optical fiber cable used as a reference).
   ❖2.1 "Connecting Connectors" (17 page)



2. Press **DISPLAY POWER/LOSS** key to select optical power measurement mode.
"**POWER**" appears in the top left corner of the screen.

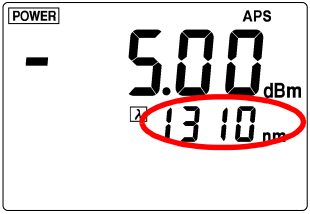


NOTE

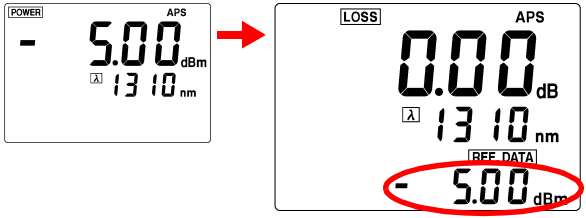
- For proper measurements, the measurement wavelength has to match that of the light source.
- If the appropriate measurement wavelength is not already programmed, program it using the supplied software.

❖ 5.5 "Programming Measurement Wavelengths" (55 page)

3. Pressing the λ (Wavelength select) key repeatedly loads and displays each programmed wavelength.



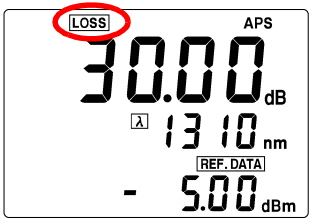
4. Hold down the **SET REF** key for approximately three seconds.
   "**REF.DATA**" starts blinking and the measured optical power is stored as a reference value.

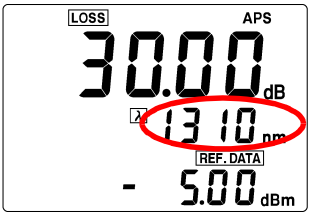


The measurement mode changes from optical power to optical loss and the measurement reading becomes approximately 0.00 dB. (It may not show exactly 0.00 dB depending on the stability of the light source for measurement or connection condition of the reference cable.)
A reference value is stored for every wavelength.

3.2.2 Optical Loss Measurement

1. Press the **DISPLAY POWER/LOSS** key to select optical loss measurement mode.
   "**LOSS**" appears in the top left corner of the screen.





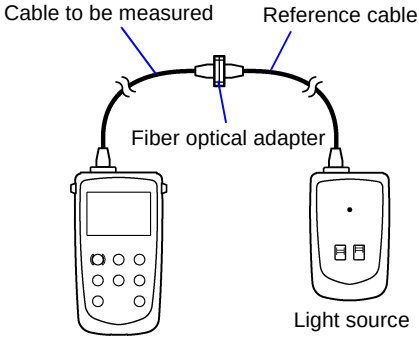
NOTE

- For proper measurements, the measurement wavelength has to match that of the light source.
- If the appropriate measurement wavelength is not already programmed, program it using the supplied software.

❖ 5.5 "Programming Measurement Wavelengths" (55 page)

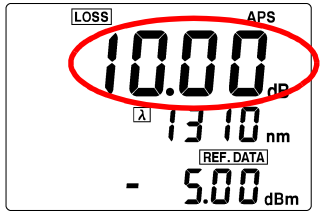
2. Pressing the λ (Wavelength select) key repeatedly loads and displays each programmed wavelength.

3. Leave the reference cable connected to the light source and connect one end of the cable to be measured to the meter connector.
   Connect the other end via the fiber optical adapter to the reference cable connected to the light source.



3661-20

4. The optical loss of the cable to be measured appears on the LCD.



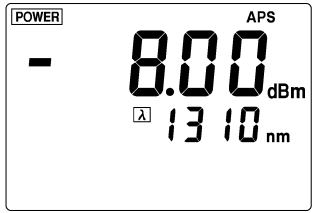
Saving/Deleting Measurement Data (Memory Function) Chapter 4

- The optical power measurements/optical loss measurements are stored in the memory.
- Up to 1000 measurements (addresses 000 to 999) per measuring wavelength are stored.
- Data can be transferred to a PC using the bundled application software.
  ❖5.3 "Transferring Measurement Data" (52 page)

4.1 Storing Measurement Data

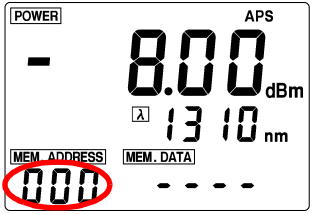
- Stores a measurement in the memory.
- Saves a measurement to a specified address.

1. Performs optical power or optical loss measurement.

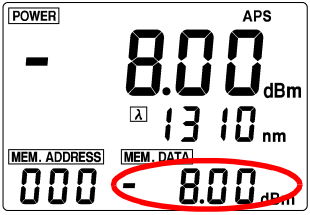


2. Press the **DISPLAY MEMORY/REF** key to display data in the memory.
("**MEM.ADDRESS**" and "**MEM.DATA**" appears on the LCD.)

3. Press the **ADDRESS** key to set the address of the memory to be stored.
▲: Moves to lower numbers.
▼: Moves to higher numbers.



4. Press the **SAVE DATA** key.
"**MEM.DATA**" starts blinking and the measurement is stored in the memory.



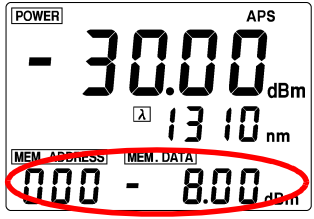
NOTE When data is already stored at the address you have specified, the old data is replaced with the new data.

4.2 Viewing Stored Measurement Data

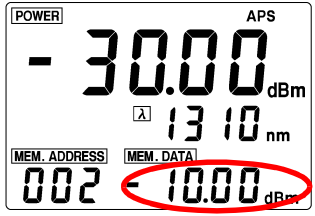
View measurement data stored for a wavelength.

1. Press the λ (Wavelength select) key to select the measurement wavelength of which you wish to view the data.

2. Press the **DISPLAY MEMORY/REF** key to display data in the memory.
("**MEM.ADDRESS**" and "**MEM.DATA**" appear on the LCD.)



3. Press the **ADDRESS** key to select the address at which the data is stored. The stored measurement data appears under "**MEM.DATA**."

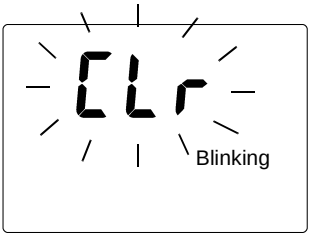


4.3 Deleting All Measurement Data

- Deletes all the measurements stored for a measurement wavelength. (All Delete)
- A complete deletion of the measurement data can be also performed using the bundled data transter software.
  ❖5.4 "Erasing Measurement Data" (54 page)

1. Turn on the power while holding down the **SAVE DATA** key.

2. "**CLr**" starts blinking and all the measurements are deleted. The LCD shows the measurement mode screen.



NOTE The programmed measurement wavelengths and each reference value is not deleted.
To delete the programmed measurement wavelengths and reference values, perform a system reset.
❖ 7.6 "System Reset" (71 page)

Using the Supplied Software Chapter 5

The following operations are available using a PC connected with the USB cable and running the supplied software:

- Transfer measurement data saved in the meter's memory to the PC
- Erase all measurement data from the meter's memory
- Program different measurement wavelengths into the meter

5.1 Installation

Install the supplied driver and application program on the PC.

Recommended System Requirements

OS	Windows 98, Windows Me, Windows 2000, Windows XP The hardware, such as CPU, RAM, and display, must meet the requirements recommended by the OS.
HDD space	Ten megabytes or more of free disk space
Interface	USB Ver.1.1 or later (Only one meter can be connected to a PC at a time.)

Contents of CD-R

English	Installation setup file for English OS
Japanese	Installation setup file for Japanese OS
hi3661.inf	Driver installation file
hiusb36.sys	Device driver for the 3661-20's USB

5.1.1 Installing Driver

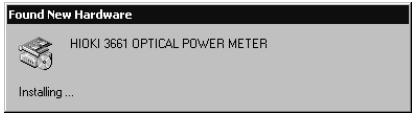
1. Turn on the meter.

2. Connect the meter to the PC using the supplied USB cable.

NOTE

- Only one meter can be connected to a PC at a time.
- Do not connect or disconnect the USB cable while the meter is in operation.
- When a meter with a different serial number is connected, the instrument may indicate that a new device has been detected. In such case, install the device driver by following the instructions appearing on the screen.

3. When the meter is connected to a PC for the first time, the PC automatically detects the meter. The message "**New Hardware Found**" appears on the screen and the hardware detection wizard starts.
   The steps of the wizard may vary from OS to OS; follow the on-screen instructions and install the device driver.



The driver installation procedure is explained for each OS as below.

WindowsXP

1. Insert the bundled CD-R Hioki 3661 USB Utility into the CD-ROM drive.

2. The "**Found New Hardware Wizard**" dialog box appears.
   Check "Install the software automatically" and then click the [**NEXT**] button.

3. Click the [**Continue Anyway**] button.
   After the button is clicked, Windows starts to copy the files.
   When the software is scanned by the OS, a warning saying that this software has not been certified by Microsoft is appear. Ignore the warning and continue the installation.

4. Click the [**Finish**] button.

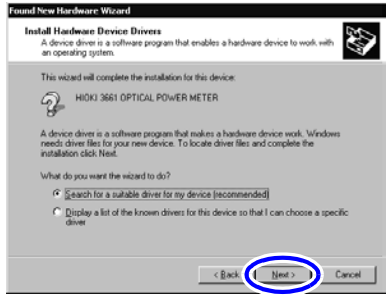
5. When the "**Found New Hardware Wizard**" dialog box has disappeared, remove the CD-R from the CD-ROM drive.

Windows2000

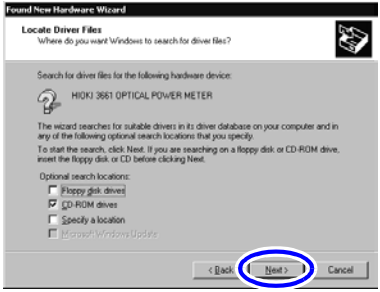
1. The "**Found New Hardware Wizard**" dialog box appears.
   Click the [**NEXT**] button.

2. Insert the bundled CD-R Hioki 3661 USB Utility into the CD-ROM drive.

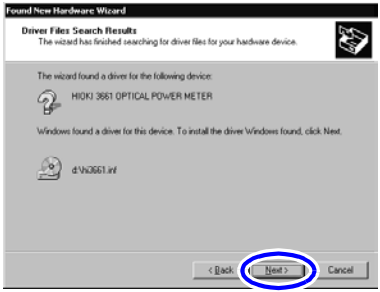
3. Check "**Search for a suitable driver for my device**" and click the [**Next**] button.



4. Check "**CD-ROM drive**" (leave all other boxes blank). Click the [**Next**] button.



5. Click the [**Next**] button.



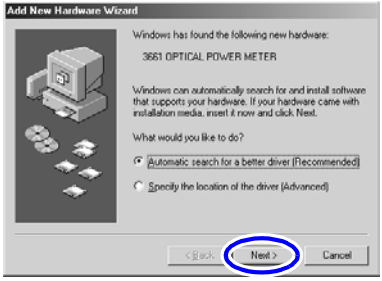
6. Click the [**Finish**] button.

7. When the "**Found New Hardware Wizard**" dialog box has disappeared, remove the CD-R from the CD-ROM drive.

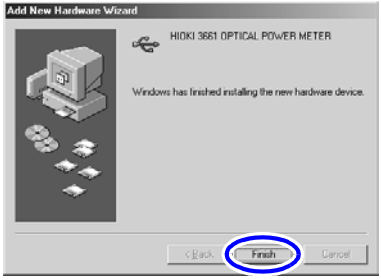
WindowsMe

1. Insert the bundled CD-R Hioki 3661 USB Utility into the CD-ROM drive.

2. The "**Add New Hardware Wizard**" dialog box appears.
   Check "**Automatic search for a better driver**" and click the [**Next**] button.



3. Click the [**Finish**] button.



4. When the "**Add New Hardware Wizard**" dialog box has disappeared, remove the CD-R from the CD-ROM drive.

Windows98

1. The "**Add New Hardware Wizard**" dialog box appears.
   Click the [**Next**] button.

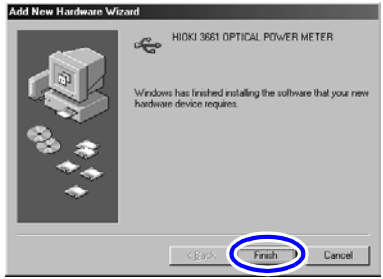
2. Check "**Search for the best driver for your device**" and click the [**Next**] button.

3. Insert the bundled CD-R Hioki 3661 USB Utility into the CD-ROM drive.

4. Check "CD-ROM drive" (leave all other boxes blank). Click the [**Next**] button.

5. Click the [**Next**] button.
   After the button is clicked, Windows starts to copy the files.

6. After a short time, the screen below appears; click the [**Finish**] button.



7. When the "Add New Hardware Wizard" dialog box has disappeared, remove the CD-R from the CD-ROM drive.

5.1.2 Installing Application Software

Installing

1. Close all currently active applications on the PC.

2. Insert the CD-R Hioki 3661 USB Utility supplied with the instrument into the CD-ROM drive.

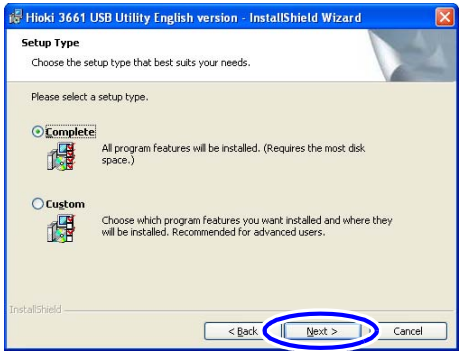
3. Open the folder [**English**] included on the CD-R, then execute Setup.exe.

   This activates the installer and open the "**Hioki 3661 USB Utility**" window.

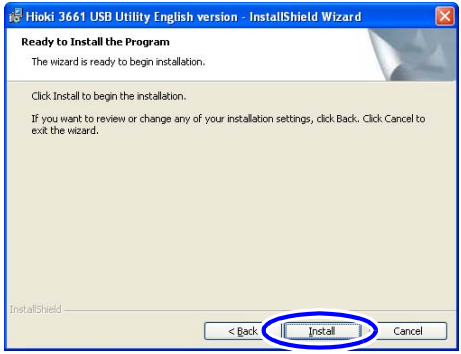
4. Click [**Next**].

5. To set up the installing destination:
   Select [**Custom**] and click [**Next**].
   Click [**Change**] in the "**Custom Setup**" window, then specify the installing destination folder.

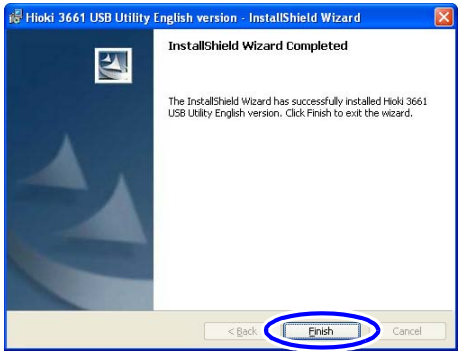
   To install by default:
   Select [**Complete**] and click [**Next**].



6. Click [**Install**].



7. When installation ends, click [**Finish**] in the checking window.



Installation is now complete.
Select [**Program**] - [**HIOKI**] - [**Hioki 3661 USB Utility**] from the [**Start**] menu of Windows to activate the application.

Uninstallation

1. Select [**Setup**] - [**Control Panel**] from the [**Start**] menu, then click [**Add/Remove Programs**].

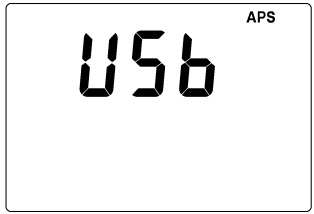
2. Select "**Hioki 3661 USB Utility**," then click [**Remove**] or [**Change/Remove**].

3. Uninstall the program by following the procedure appearing on the screen.

5.2 Connecting the Meter to a PC

1. Turn on the meter.

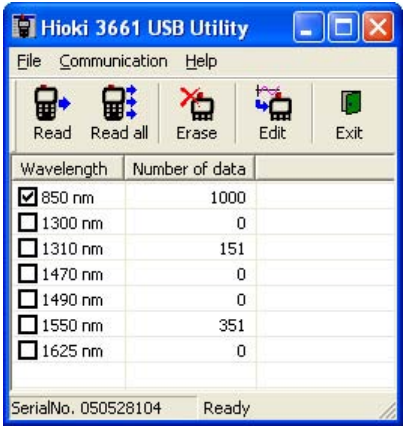
2. Connect the meter to the PC using the supplied USB cable (insert the plugs firmly).
   The meter displays "**USb**", and all keys except **PWR** are disabled.



NOTE The APS (auto power save) function is effective even when the meter is connected to a PC with the USB cable. When the APS function is on, if there is no communication for approximately ten minutes the power of the meter is automatically turned off.

3. Start the Hioki 3661 USB Utility.

4. The list of measurement wavelengths and measured values is displayed.



NOTE

- If, as shown below, the list of measurement wavelengths and measured values does not appear, verify the USB connections.

- Do not disconnect the meter from the PC while the application program is running.
- Exit the application program before disconnecting the meter from the PC. Avoid connecting and disconnecting the meter from the PC unnecessarily, as this could reduce battery charge capacity.
- When conforming the connection of the 3661 with the PC, select [**Communication**]-[**Check connection**] on the Hioki 3661 USB Utility menu bar.

5.3 Transferring Measurement Data

Stored measurement data (measured optical power and loss values) for each programmed measurement wavelength is transferred from the meter to the PC in CSV format.

1. Connect the meter to the PC using the supplied USB cable.

2. Start the Hioki 3661 USB Utility.
❖ 5.2 "Connecting the Meter to a PC" (49 page)

3. Transfer measurement data from the meter's memory.

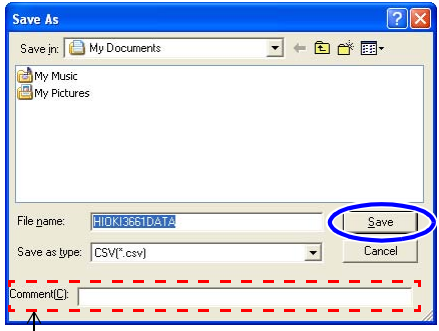
- **To transfer data for a specific wavelength:**
  After clicking the check box for the measurement wavelength of the data to transfer, select [**Communication**]-[**Read**] on the Hioki 3661 USB Utility menu bar, or left click 

(Read) on the tool bar.
- **To transfer data for all programmed wavelengths:**
  Select [**Communication**]-[**Read all**] on the Hioki 3661 USB Utility menu bar, or left click 

(Read All) on the tool bar.

NOTE Do not disconnect the USB cable while transferring.

4. Decide the destination to save the data, and click [**Save**].



A comment can be attached to the file.

Example of Transferred Data (Excel display)

	A	B	C	D	E
1	HIOKI 3661 Measurement Data				
2	Comment:Hioki 3661 Example				
3	Hioki 3661 Serial No:05052804				
4	Wavelength	Number of data			
5	850nm	1000			
6	1300nm	0			
7	1310nm	151			
8	1470nm	0			
9	1490nm	0			
10	1550nm	351			
11	1625nm	0			
12	1650nm	0			
13					
14		850nm			1300nm
15	Address	Power[dBm]	Loss[dB]	Reference[dBm]	Power[dBm]
16	0		3.52	1.55	
17	1		2.85	1.55	
18	2		3.21	1.55	
19	3		Lo	1.55	
20	4		4.11	1.55	
21	5		3.65	1.55	

5. Exit the Hioki 3661 USB Utility.

6. Disconnect the USB cable from the meter and the PC.

5.4 Erasing Measurement Data

All measurement data stored in the meter can be erased (Erase All).

1. Connect the meter to the PC using the supplied USB cable.

2. Start the Hioki 3661 USB Utility.
   ❖5.2 "Connecting the Meter to a PC" (49 page)

3. Select [**Communication**]-[**Erase**] on the Hioki 3661 USB Utility menu bar, or left click 

(Erase) on the tool bar.

NOTE

Deleted measurement data cannot be restored. Because erased measurement data cannot be recovered, transfer needed measurement data before erasing.
❖ 5.3 "Transferring Measurement Data" (52 page)

4. Exit the Hioki 3661 USB Utility.

5. Disconnect the USB cable from the meter and the PC.

5.5 Programming Measurement Wavelengths

Measurement wavelengths are programmed in the meter.

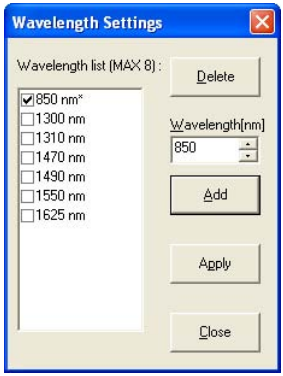
- Any measurement wavelength can be programmed in 5 nm steps.
- Up to eight wavelengths are programmed for measurement (or fewer by deleting unneeded wavelengths).

1. Connect the meter to the PC using the supplied USB cable.

2. Start the Hioki 3661 USB Utility.
   ❖5.2 "Connecting the Meter to a PC" (49 page)

3. Select [**Communication**]-[**Edit**] on the Hioki 3661 USB Utility menu bar, or left click 

(Edit) on the tool bar to display the Wavelength Settings screen.



Screen Description

Delete	Deletes selected wavelength data from the "**Wavelength list**".
Add	Adds the wavelength specified by "**Wavelength [nm]**" to the "**Wavelength list**". Asterisks (*) indicate added wavelengths. If a wavelength cannot be added, delete an existing wavelength first (a maximum of eight wavelengths can be programmed).
Apply	The wavelengths in the "**Wavelength list**" are programmed in the meter.
Close	Closes the Wavelength Settings screen.

4. Click the check box for the measurement wavelength of the data to delete from "**Wavelength list**", and left click [**Delete**].

5. Program the wavelength to add with "**Wavelength[nm]**", and left click [**Add**]. The wavelength is added to the "**Wavelength list**", and marked with an asterisk. Repeat to program multiple wavelengths.
6. Left click [**Apply**]. The wavelengths in the "**Wavelength list**" are programmed in the meter.

NOTE

- A wavelength is not programmed in the meter until you left click [**Apply**].
- Because measurement and reference value data for deleted wavelengths is erased, be sure to transfer needed measurement data before reprogramming wavelengths.

❖ 5.3 "Transferring Measurement Data" (52 page)

7. Left click [**Close**] to close the Wavelength Settings screen.
8. Exit the Hioki 3661 USB Utility.
9. Disconnect the USB cable from the meter and the PC.

Specifications Chapter 6

6.1 Measurement Specifications

Measurement function	Optical power measurement, optical loss measurement • Optical power measurement Measures the absolute value of input power. (Unit: dBm) • Optical loss measurement Uses optical power as a reference to automatically calculate the difference between that reference and the measurement undertaken. (Unit: dB)
Calibration wavelength	850 nm, 1310 nm, 1550 nm
Measurement wavelengths	800 to 1660 nm (up to eight wavelengths can be programmed in 5 nm steps) Pre-programmed measurement wavelengths: 850, 1300, 1310, 1470, 1490,1550, 1625 and 1650 nm (Programable in 5 nm steps)
Measuring range	-60 dBm to +9 dBm, auto-ranging
Measuring accuracy	±0.22 dB (±5%) (Conditions for guarantee) Wavelength: Hioki's standard wavelength for 1310 nm or 1550 nm* Power: -10 dBm, continuous wave (CW) Optical fiber: Single mode fiber, FC master connector, PC polishing

Operating temperature and humidity for guaranteed accuracy	23±5°C (73±41°F), 80%RH or less
Period of guaranteed accuracy	1 year
Resolution	Optical power measurement: 0.01 dBm Optical loss measurement : 0.01 dB
Maximum rating	+10 dBm
Detector type	InGaAs
Detector size	ϕ1 mm
Screen-updating rate	Approx. 350 ms
Display	LCD
Optical fiber	Single mode, multi mode (Core diameter ≦ 62.5 μm, NA ≦ 0.275)
Connector	FC, SC (Use the optional connector adapter.)
Memory function	• Memory storage Stores a measurement at an address of between 000 and 999; if there is already data at the specified address, the old data is replaced by the new data. • Memory deletion All data is deleted at once. (Press the **SAVE DATA** key when turning on power.) • Number of Memory Data 1000 measurements for every wavelength

Additional functions	• Auto power save Power is turned off automatically if there is no key operation for more than ten minutes. To disable the function, hold down the **PWR** key for more than five seconds when turning the power on. • Settings backup The settings at the time of shutdown are saved and the meter is started up with the saved settings when the power is turned on again. • Battery check If the battery voltage falls below 4 V, the battery indicator lights. (Accuracy is not guaranteed when the indicator is on.)
Interface	USB Ver1.1 Content of communications: Measurement data in the memory is transferred to a PC . Programming measurement wavelengths (using the bundled application software)

*: Hioki's Standard Wavelength
The term "Hioki's standard wavelength" is used to avoid ambiguity in the conditions for the measurement accuracy guarantee.
The calibration wavelength is a value inherent to a light source for adjustment and calibration. The sensitivity of a detector is usually dependent on wavelength, but varies from element to element. Furthermore, the output beam of a laser light source has a wavelength inherent to each light source. A fixed wavelength cannot be set for the sake of product maintenance.

6.2 General Specifications

Rated power supply	DC1.5 V X 4 LR6 alkaline battery 1.5 V X 4
Maximum rated power	0.5 VA
Operating time	Continuous measurement: Approx. 40 hours (Ambient temperature of 23°C (73°F))
Size	Approx. 85W X 192H X 35D mm (3.35"W X 7.56"H X 1.38"D) (excluding projections)
Weight	Approx. 300 g(10.6 oz.) (excluding batteries)
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80%RH or less (no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562 feet)
Applicable standards	Safety EN61010 Pollution Degree 2 EMC EN61326
Accessories	3853 CARRYING CASE..... 1 CD-R of application software ..... 1 LR6 alkaline battery ..... 4 USB cable (1 m)..... 1 Strap..... 1 Instruction manual..... 1
Options	9730 CARRYING CASE 9731 FC CONNECTOR ADAPTER 9732 SC CONNECTOR ADAPTER 9735 FC-FC OPTICAL FIBER CABLE 9736 SC-SC OPTICAL FIBER CABLE 9737 SC-FC OPTICAL FIBER CABLE 9738 OPTICAL CONNECTOR CLEANER 9739 SPARE CLEANER

Maintenance and Service Chapter 7

⚠CAUTION Never modify the instrument. Only Hioki service engineers should disassemble or repair the instrument. Failure to observe these precautions may result in fire, electric shock, or injury.

7.1 Battery Replacement

⚠WARNING

- To avoid a shock hazard, disconnect the USB cable before replacing the batteries.
- After replacing the batteries, replace the cover and screws before using the product.
- Do not mix old and new batteries, or different types of batteries. Also, be careful to observe battery polarity during installation. Otherwise, poor performance or damage from battery leakage could result.
- To avoid the possibility of explosion, do not short circuit, disassemble or incinerate batteries.
- Handle and dispose of batteries in accordance with local regulations.

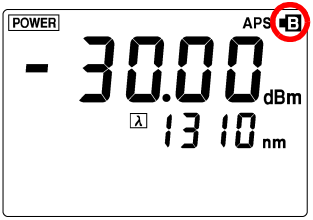
⚠CAUTION

- To avoid corrosion from battery leakage, remove the batteries from the product if it is to be stored for a long time.
- If a optical fiber cable is bent or twisted, this may result in damage to the cable. Be sure to disconnect the optical fiber cable before replacing the battery.

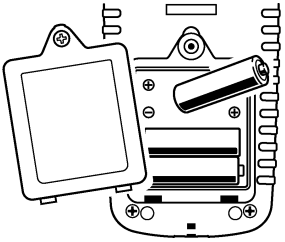
NOTE

- The "B" indicator appears when battery voltage becomes low. Replace the batteries as soon as possible.
- Use the specified battery (LR6 alkaline battery) only. Other batteries, (manganese batteries, for example) run out more quickly than alkaline batteries.

If the "B" indicator is blinking when power is turned on, the battery is running low. Replace with a new battery.



1. Turn off power and disconnect the optical fiber cable from the meter.
2. Remove the setscrew and open the battery cover.
3. Replace four batteries.
4. Replace the battery cover and tighten the setscrew.

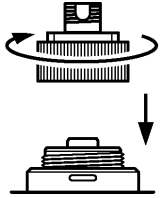


7.2 Attaching/Detaching Connector Adapter

⚠CAUTION The mating portions of the detector and the connector adapter are machined to a high degree of precision. Make sure that those portions are free of dust or other foreign substances before connecting them. In particular, the detector window needs meticulous care; if there is dust in the interface or a scratch on the detector window, the meter may not satisfy performance specifications.

Attaching Procedure

Fit the connector adapter onto the detector and rotate it clockwise. Tighten it by hand.



Detaching Procedure

Rotate the connector adapter counter-clockwise to remove it.

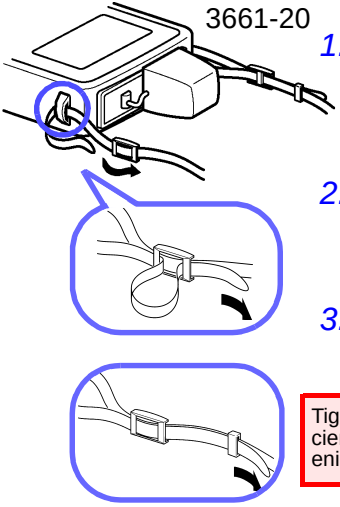
NOTE Be sure to replace the cover to the main device and the adapter's dust cap for protection against damage and dust when the meter is not in use.

7.3 Attaching the Strap

Use the strap to carry the instrument, or to hang it up at the installation location.

⚠CAUTION Attach both ends of the strap securely to the instrument. If insecurely attached, the instrument may fall and be damaged when carrying.

Attaching the strap



1. Insert each end of the strap through an installation slot on the instrument.
2. Feed each end of the strap through its clasp.
3. Feed each end through its stopper.

Tighten the strap sufficiently to prevent loosening or twisting.

7.4 Cleaning

7.4.1 Cleaning the Product

To clean the product, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

7.4.2 Cleaning Detector Window

⚠CAUTION

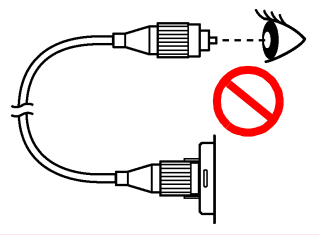
- Do not touch the detector window. If the detector window is not clean, the meter may not satisfy performance specifications.
- Do not use organic solvents other than ethyl alcohol as they may damage the detector window.
- Be sure not to damage the detector window with a sharp object (e.g., the tip of a pair of tweezers) or hard surface. If the detector window is damaged, the meter may not satisfy performance specifications.

1. Remove the connector adapter.
2. Gently wipe the detector window using a lens cleaning paper or other lint-free material.
   If fibers are left on the detector window, blow them off using a blower brush designed for optical lenses.
   If necessary, gently clean the surface with a lens cleaning liquid or ethyl alcohol.

7.4.3 Cleaning Cable Connector

Use the 9738 OPTICAL CONNECTOR CLEANER to clean the connector of the optical fiber cable.

⚠WARNING When cleaning the connector of a optical fiber cable, never look directly into the end of the optical fiber cable or observe it through a magnifying glass if the cable is connected to an operating optical output device as this can lead to eye damage or visual impediment.

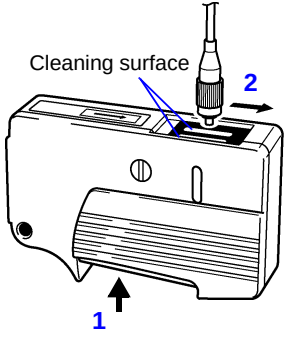


⚠CAUTION When cleaning the end of the optical connector, do not apply too much force with the cleaning cloth. This may result in damage to the connector and the meter may consequently fail to satisfy performance specifications.

1. Squeeze the lever of the 9738 OPTICAL CONNECTOR CLEANER and the shutter opens, revealing the cleaning cloth.

2. While squeezing the lever, gently press the end of the optical connector against the cleaning surfaces (cleaners held in the slot shown) at a right angle. Slide the connector once in the direction of the arrow marked on the cleaners.

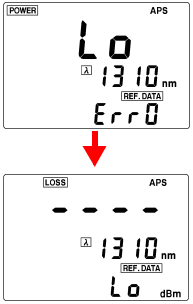
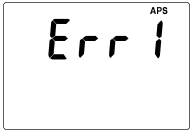
3. Slide the connector once per cleaning surface. There are two cleaning surfaces; thus slide the connector a total of two times. Release the lever and the shutter shuts.



NOTE Always clean the optical connector end face (ferrule) of the optical fiber cable before connecting.

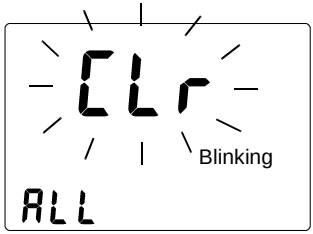
7.5 Error Indication

When an error occurs, an error indication appears on the LCD as shown below.

Err0 	"**Err0**" appears when an inappropriate value is stored as a reference. If you store a measurement as a reference when the measurement is "**Lo**" or "**Hi**" in optical power measurement, "**REF.DATA**" blinks and "**Err0**" appears. (The reference value is updated.) Press any key except the **PWR** key, and "**Lo**" (or "**Hi**") is shown for the reference data. The optical loss measurement shows "**----**." If the measurement data is stored, "---- dB" is stored, but not transffered to the PC. (It is included in the number of data.)
Err1 	The calibration value may be corrupted. All the keys except for the **PWR** key are disabled and you cannot perform measurement. (Data transfer by USB communications is not available either.) The meter may be malfunctioning. Contact your vender or nearest Hioki office.

7.6 System Reset

Turn on the power while holding down the **ADDRESS** key ▲ + ▼. The screen shown below is displayed. After the system reset has been completed, the optical power measurement mode screen appears.



Details of System Reset

System reset initializes the following (returns them to default setting).

Measurement mode:
Optical power measurement mode

Measurement wavelength: 1310 nm

Pre-programmed measurement wavelengths:
850 nm, 1300 nm, 1310 nm, 1470 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm

Reference:
0 dBm (for all the measurement wavelengths)

Memory: No data (All the addresses for all the measurement wavelengths)

7.7 Service

- If the product seems to be malfunctioning, confirm that the batteries are not discharged, and that the USB cable, optical fiber cable are not open circuited before contacting your dealer or Hioki representative.
- When sending the product for repair, remove the batteries and pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.

Appendix Chapter 8

8.1 Explanations

Optical Power Measurement

Assuming the energy of the input light to be measured is "E" [mW], the measurement "P" is obtained as below.

$$P\ [dBm] = 10\log_{10}\frac{E\ [mW]}{1\ [mW]}$$

P: Measurement [dBm]
E: Energy of input light [mW]

Optical Loss Measurement

Loss of optical energy "Ploss" is calculated from the equation below, using the value obtained by reference measurement "Pref" [dBm] and the measurement "P."

Ploss [dB] = Pref [dBm] - P [dBm]

$$= 10\log_{10}\frac{Eref\ [mW]}{1\ [mW]} - 10\log_{10}\frac{E\ [mW]}{1\ [mW]}$$

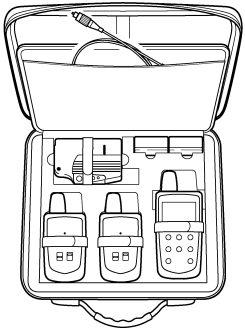
$$= -10\log_{10}\frac{E}{Eref}$$

Ploss: Optical loss [dB]
Pref : Reference [dBm]
P : Measurement [dBm]
Eref : Energy of light input through the reference cable
E : Energy of light input through the cable to be measured

8.2 Options

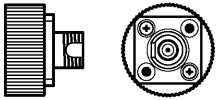
9730 CARRYING CASE

The carrying case houses the 3661-20 OPTICAL POWER METER, 3662/3663 LASER LIGHT SOURCE, connector adapters, reference cable, and 9738 OPTICAL CONNECTOR CLEANER.



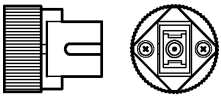
9731 FC CONNECTOR ADAPTER

FC connector adapter for the 3661-20 OPTICAL POWER METER (with dust-cap attached)



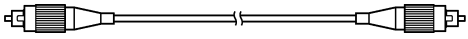
9732 SC CONNECTOR ADAPTER

SC connector adapter for the 3661-20 OPTICAL POWER METER (with dust-cap attached)



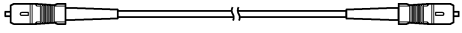
9735 FC-FC OPTICAL FIBER CABLE

FC-to-FC reference cable (Length: 2 m)



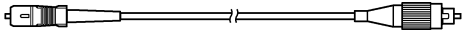
9736 SC-SC OPTICAL FIBER CABLE

SC-to-SC reference cable (Length: 2 m)



9737 SC-FC OPTICAL FIBER CABLE

SC-to-FC reference cable (Length: 2 m)



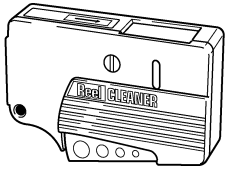
Hioki's optional optical fiber cables (9735, 9736 and 9737) are optical fiber cables with an ordinary optical connector. (They are not equipped with a master optical connector.)

9735/9736/9737 OPTICAL FIBER CABLE Specifications

Cable	1.3 µm-band single-mode optical fiber cable
Connection loss	0.5 dB or less
Return loss	45.0 dB or more
Minimum bending radius	30 mm (Do not allow to remain bent for a long time.)

9738 OPTICAL CONNECTOR CLEANER

Cleaner for optical fiber cable connector



9739 SPARE CLEANER

Refill for the 9738 OPTICAL CONNECTOR CLEANER (6-rolls)

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	OPTICAL POWER METER
Model Number:	3661-20
Options:	9731 FC CONNECTOR ADAPTER 9732 SC CONNECTOR ADAPTER 9735 FC-FC OPTICAL FIBER CABLE 9736 SC-SC OPTICAL FIBER CABLE 9737 SC-FC OPTICAL FIBER CABLE

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326-1:2006 ClassB equipment Portable test and measurement equipment

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 2004/108/EC, but is not applicable to the Low Voltage Directive 2006/95/EC.

HIOKI E.E. CORPORATION

1 October 2008

Atsushi Mizuno

Atsushi Mizuno

Director of Quality Assurance

3661A999-02

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