

3664

OPTICAL POWER METER

Contents

Introduction	1
Inspection	1
Safety Information	2
Operating Precautions	4

1 Overview **7**

1.1 Product Overview	7
1.2 Features	8
1.3 Names and Functions of Parts	9

2 Measurement Preparations **13**

2.1 Attaching the Strap	13
2.2 Supplying Power	14
2.2.1 Using the AC Adapter	14
2.2.2 Using the Batteries	15
2.3 Connecting the Optical Sensor	16
2.4 Connecting the Analog Output Cord	17
2.5 Turning the Power On and Off	18

3 Measurement **19**

3.1 Setting the Measurement Mode	20
3.2 Setting the Range	21
3.2.1 Auto Range	21
3.2.2 Manual Range	22
3.3 Setting the Wavelength	24
3.3.1 Setting an Arbitrary Measurement Wavelength	24
3.3.2 Retrieving the Wavelength Setting from the Measurement-Wavelength Memory	26
3.4 Starting Measurement	26
3.5 Setting Example	28
3.5.1 Optical-Power Measurement	28
3.5.2 Relative Measurement (Measured-value basis)	29
3.5.3 Relative Measurement (Input-value basis)	31

4 Functions 33

4.1 Scalling Function 33
 4.1.1 Turning ON the Scalling Function33
 4.1.2 Turning OFF the Scalling Function36
4.2 Maximum-Value Hold / Minimum-Value Hold
 / Averaging 37

5 Control by Computer 39

5.1 Overview of Control 40
5.2 Installing the Driver 41

6 Specifications 51

6.1 Measurement Specifications 51
6.2 General Specifications 53

7 Maintenance and Service 55

7.1 Cleaning 55
 7.1.1 Cleaning of the 366455
 7.1.2 Cleaning of the Optical Sensors56
7.2 Service 56
7.3 Error Display 57
7.4 Reset 59
 7.4.1 System Reset59
 7.4.2 Setting Data Reset59
 7.4.3 Measurement-Wavelength Memory Reset60
7.5 Replacing the Batteries 61

Appendix 63

Explanations 63
Options 64

Introduction

Thank you for purchasing the HIOKI "Model 3664 OPTICAL POWER METER." To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

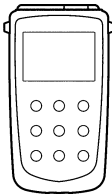
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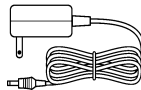
Inspection

- When you receive the instrument, 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.
- Use the original packing materials when transporting the instrument, if possible.

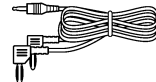
Verifying Package Contents



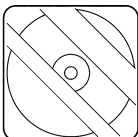
Model 3664 OPTICAL POWER METER (1)



Model 9445-02 AC ADAPTER or
Model 9445-03 AC ADAPTER (1)



Model 9094 OUTPUT CORD (1)



Driver CD-R (1)



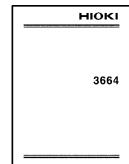
Strap (1)



LR6 alkaline batteries (4)



USB Cable (1)



Instruction Manual (1)

Options

Model 9246 CARRYING CASE	1
Model 9742 OPTICAL SENSOR	1
Model 9742-10 OPTICAL SENSOR	1


Safety Information





This instrument is designed to comply with 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 instrument. 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 instrument defects.

Safety Symbols

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

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



The  symbol printed on the instrument 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.



Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.



Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.



Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.



Indicates advisory items related to performance or correct operation of the instrument.

Other Symbols



Indicates the prohibited action.

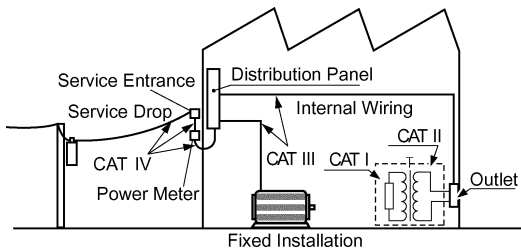


Indicates the location of reference information.

Overvoltage Categories (CAT)

To ensure safe operation of measurement instruments, IEC 60664 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called overvoltage 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 over-current 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.

Operating Precautions



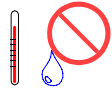
Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

CAUTION

Avoid the following



Direct
Sunlight




High Temperature
High Humidity

Observe the following to avoid damage to the instrument.

- Do not allow the instrument to get wet, and do not take measurements with wet hands. This may cause an electric shock.
- Do not use the instrument where it may be exposed to corrosive or combustible gases. The instrument may be damaged or cause an explosion.
- To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.
- Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.
- This instrument is designed for use indoors. It can be operated at temperatures between 0 and 40°C without degrading safety.

NOTE

- After use, always turn OFF the power.
- The “” indicator appears when battery voltage becomes low. Replace the batteries as soon as possible.
- Use the specified battery (AA alkaline battery) only. If a non-specified battery such as a manganese battery is used, the service hours may be shortened.
- When connecting the instrument to a PC with a USB cable, use a cable of 2 m or shorter to prevent the influence of noise.

Cords and Cables

CAUTION

- Avoid stepping on or pinching cables, which could damage the cable insulation.
- To avoid breaking the cables, do not bend or pull them.
- To avoid damaging the output cable, grasp the connector, not the cable, when unplugging the cable.

Optical Sensor

CAUTION

- Use only the specified optical sensor. Using a non-specified sensor may result in incorrect measurements due to poor connection or other reasons.
- To prevent damage to the instrument and sensor, never connect or disconnect a sensor while the power is on, or while the sensor is connected around a conductor.
- To avoid damaging the optical sensor and to ensure accurate measurements, avoid dropping or applying any physical shock to the optical sensor.
- Avoid touching the detector window with your bare hands. The detector window must be clean for the sensor to meet the specified performance parameters.
- Avoid scratching the detector window with sharp or pointed objects (e.g., the tips of tweezers) or against hard surfaces. Damage to the detector window may prevent the sensor from meeting specified performance parameters.
- Make sure no stress is applied to the repeater cable of the 9742-10 between the sensor main unit and its detector element.

NOTE

To prevent dust accumulation, stains, and damage, cover the detector window with the sensor cover when the sensor is not in use.

Care and Handling of CD-R

CAUTION

- Always hold the disc by the edges, so as not to make fingerprints on the disc 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 not 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.

Preliminary Checks

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

Overview

1

1

1.1 Product Overview

The 3664 OPTICAL POWER METER is an instrument for measuring the optical power of a spatial light. It is suitable for measurement of the optical power of a laser light source and an LED light source. The 3664 is a hand-held meter equipped with various measurement functions and interfaces that meet diversified measurement needs. The optical sensors (optional) for the power meter are interchangeable, as the sensitivity of each sensor is adjusted independently.

1.2 Features

- ◆ **Scaling function**

The reading of the 3664 OPTICAL POWER METER can be converted to the reading of another optical power meter by a simple operation.
- ◆ **Various measurement functions**

In addition to the optical power measurement (absolute-value measurement), the 3664 power meter has relative-measurement, maximum-value-hold, minimum-value-hold, and averaging functions. With all these functions, the display unit can be switched between W and dBm (dB).
- ◆ **Automatic correction of sensitivity through input of the measurement wavelength**

When the measurement wavelength is entered, the wavelength sensitivity of the sensor connected to the 3664 is automatically corrected for measurement display.
- ◆ **Interface with a computer**

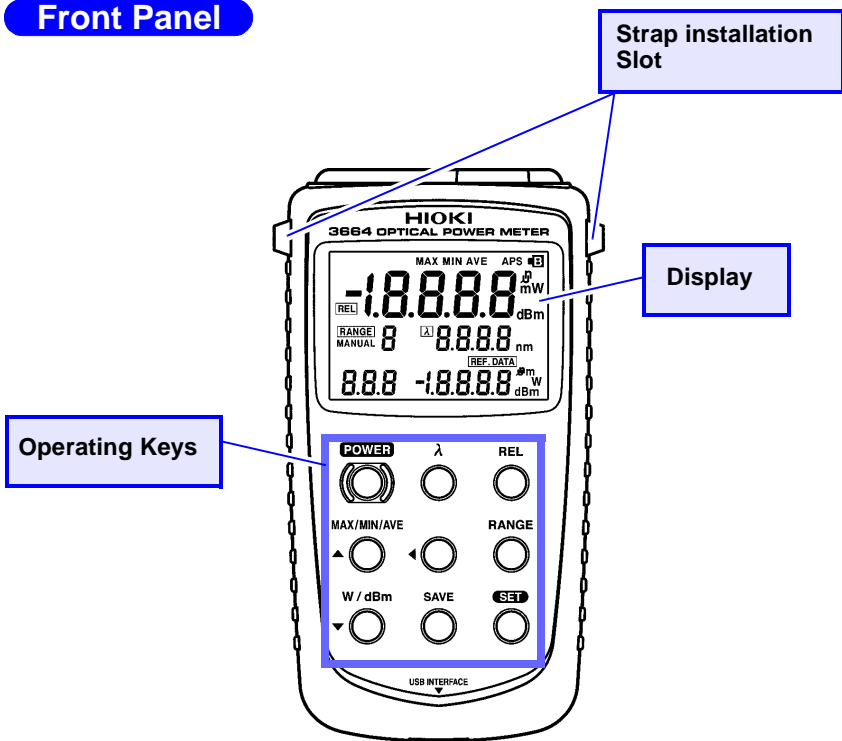
The USB interface is provided as standard equipment. The 3664 can be controlled on the PC, its settings can be edited on the PC, or its measurement data can be uploaded to the PC.
- ◆ **Analog output terminal**

The 3664 has an analog output terminal. It outputs in the voltage form the output signal of the optical sensor. Use this terminal, for example, when performing monitoring using a DMM or recording data for extended periods.
- ◆ **Auto-power-save function**

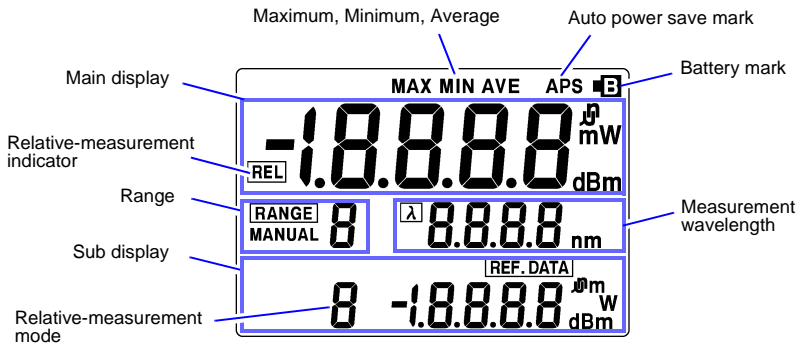
When the 3664 is running on the battery, if there is no key operation or USB communication for approximately 10 minutes, the power to the 3664 will be automatically turned off to conserve battery power.

1.3 Names and Functions of Parts

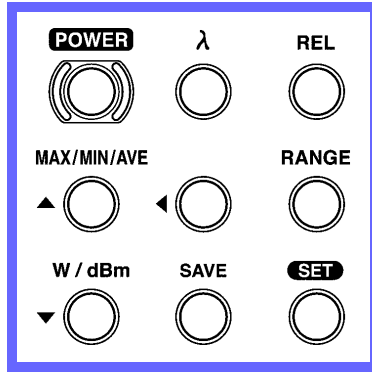
Front Panel



Display



Operating Keys



POWER	Turns ON/OFF power to the 3664. Power ON: Hold down the key for approximately 2 seconds to turn the power ON (auto-power-save function ON). Hold down the key for approximately 5 seconds to turn the power ON and the auto-power-save function is turned OFF. Power OFF: Hold down the key for approximately 1 second to turn the power OFF.
	Sets the measurement wavelength to the preset wavelength.
REL	Switches between optical-power measurement mode, relative-measurement mode (measured-value basis) and relative-measurement mode (input-value basis).
RANGE	Switches between auto range and manual range.
SET	Moves to the setting edit screen. "SEt" appears on the screen.
◀	Moves the digit to edit the setting (the digit blinks) during setting edit.
SAVE	Confirms the setting during setting edit and returns the meter to measurement mode.
W/dBm	Switches the unit of the reading between "W" and "dBm." In relative-measurement mode, the unit is switched between "W" and "dB." Decreases the number during setting edit.
MAX/MIN/AVE	Switches the value to be displayed between the measurement, maximum, minimum, and average value. Increases the number during setting edit.

Upper Panel

Analog output terminal

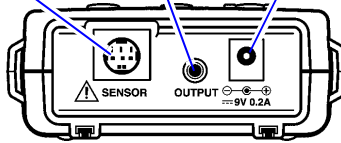
Connect the 9094 OUTPUT CORD included among the accessories to this terminal. Output signals from the optical sensor are converted to a voltage and output from this terminal.

AC-adapter terminal

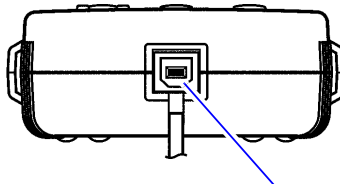
Connect the 9445-02 or 9445-03 AC ADAPTER included among the accessories to this terminal. When the AC adapter is used, power is supplied to the 3664 from a commercial power supply.

Optical-sensor terminal

Connect an optional optical sensor to this terminal.



Bottom Panel



USB terminal

Connect a USB cable to this terminal.



Measurement Preparations

2

2.1 Attaching the Strap

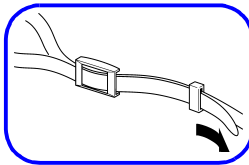
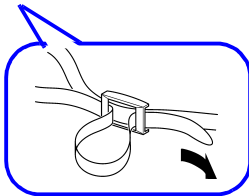
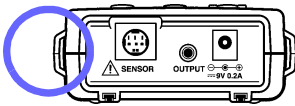
2

Use the strap to carry the 3664 power meter or hang it on a hook.



Be sure to attach the strap to the 3664 power meter in place (2 locations) properly. If the strap is not properly attached, the meter may drop and be broken.

Model 3664



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.

Confirm that the strap is not slackened or twisted.

2.2 Supplying Power

2.2.1 Using the AC Adapter

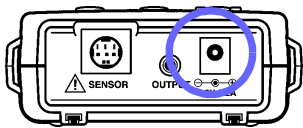
! WARNING

- Use only the specified Model 9445-02 ADAPTER (SA10-9010N, SINO-AMERICAN) or Model 9445-03 AC ADAPTER (CEE, SA10-9010G, SINO-AMERICAN) AC adapter input voltage range is 100 to 240 VAC (with $\pm 10\%$ stability) at 50/60 Hz. To avoid electrical hazards and damage to the instrument, do not apply voltage outside of this range.
- Turn the instrument off before connecting the AC adapter to the instrument and to AC power.

! CAUTION

To avoid damaging the cord, grasp the plug, not the cord, when unplugging it.

AC Adapter Connection Terminal



1. Connect the output plug of the AC adapter to the AC-adapter terminal.
2. Connect the AC adapter to an AC outlet.

NOTE


- When the AC adapter is connected and the battery is installed, the AC adapter is used. In case of power outage, the 3664 is automatically switched to the battery drive.
- Make sure the power is turned off before connecting or disconnecting the AC adapter.

2.2.2 Using the Batteries



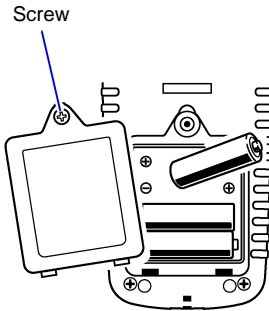
Do not mix old and new batteries, or different types of batteries. Also, be careful to observe battery polarity during installation. Otherwise, poor performance or damage from battery leakage could result.

NOTE

- The “” indicator appears when battery voltage becomes low. Replace the batteries as soon as possible.
- Do not use other than the specified type of batteries (LR6 alkaline batteries). Using manganese batteries will result in a shorter operating time than when using alkaline batteries.
- The 3664 power meter runs on battery or AC power. When the AC adapter is connected and the battery is installed, the AC adapter is used.

Tools and materials:

Four AA alkaline batteries (LR6) and a Phillips screwdriver



1. Confirm that the power to the 3664 is turned OFF.
2. Disconnect all cables.
3. Turn over the 3664 and loosen the screw on the battery cover.
4. Remove the battery cover.
5. Insert the four AA alkaline batteries (LR6) into the battery case, noting the correct polarity. (When replacing the batteries, replace all of them.)
6. Place the battery cover back on, and tighten the screw.

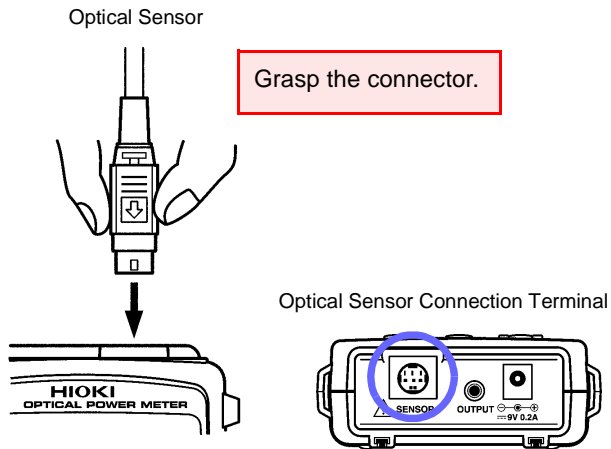
2.3 Connecting the Optical Sensor



CAUTION

- Use only the specified optical sensor. Using a non-specified sensor may result in incorrect measurements due to poor connection or other reasons.
- To prevent damage to the instrument and sensor, never connect or disconnect a sensor while the power is on, or while the sensor is connected around a conductor.
- To avoid damaging the sensor cable, grasp the plug, not the cable, when unplugging it.
- To avoid ensuring accurate measurements, avoid dropping or applying any physical shock to the optical sensor.

Insert an optical sensor, with the surface marked with an arrow facing upward, into the optical-sensor terminal of the 3664.



NOTE

Always grasp the connector with the arrow to connect or disconnect the optical sensor. (You must grasp the connector to disconnect the sensor.)

2.4 Connecting the Analog Output Cord

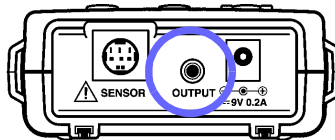
CAUTION

To avoid damage to the instrument, do not short-circuit the output terminal and do not input voltage to the output terminal.

2

By connecting the analog output cord to the analog output terminal, the optical power detected by the optical sensor can be converted to a voltage in order to monitor the signal.

Connect the analog output cord to the analog output terminal.



Analog Output Cord

NOTE

Signals output from the analog output terminal are detected by an optical sensor, with its wavelength sensitivity uncorrected. This signal, therefore, is not proportional to the measurement displayed on the screen.

2.5 Turning the Power On and Off

Power On

Hold down the **POWER** key for approximately 2 seconds. The screen lights up and the power is turned ON.

NOTE

If the battery indicator appears ("B") at the top right of the screen) after the power has been turned ON, the battery is running down. Replace the battery (when the 3664 is running on the battery).

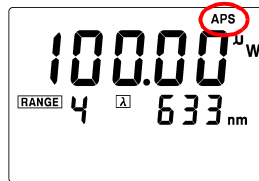
❖ See Section 7.5 "Replacing the Batteries" (61 page)

Power OFF

Hold down the **POWER** key for approximately 1 second. The screen goes out and the power is turned OFF.

Auto-power-save function

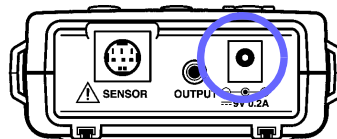
- This function automatically turns OFF the power to the 3664 if there is no key operation or USB communication for approximately 10 minutes, when it is running on the battery. (The indication "**APS**" lights up at the top right of the screen.)
- To turn OFF the auto-power-save function, hold down the **POWER** key for 5 seconds when turning ON the power. "**APS**" goes out and the auto-power-save function is turned OFF.
- When the 3664 is running on AC power, the auto-power-save function is automatically turned OFF and the function is not available.



NOTE

- While power is supplied from the battery, when the power is turned ON, the auto-power-save function is turned ON.
- When the USB is used, use the AC adapter for the power supply.
- After use, always turn OFF the power.

AC Adapter Connection Terminal



Measurement

3

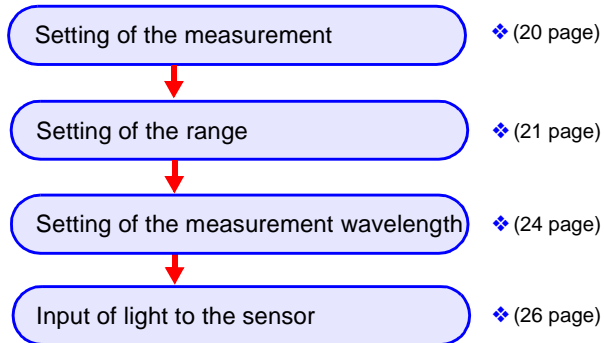
- Optical-power measurement and relative measurement of special light are performed using the 3664 power meter.
- The measurement wavelength may be set to an arbitrary wavelength.
- The measurement wavelength may also be set to a previously set wavelength.

NOTE

Connect an optional optical sensor to the 3664. To operate the 3664, an optical sensor must be connected to it.

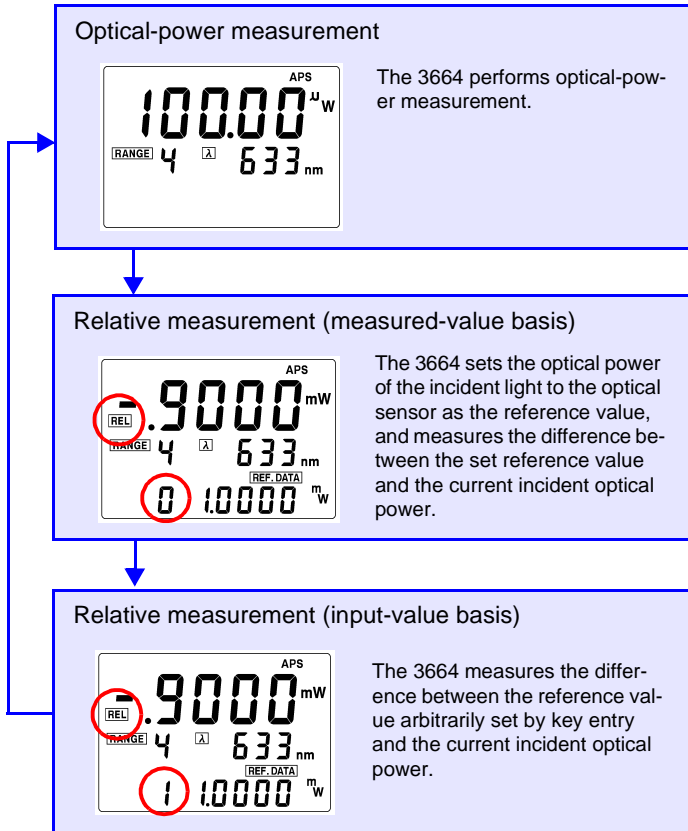
3

Flow of measurement



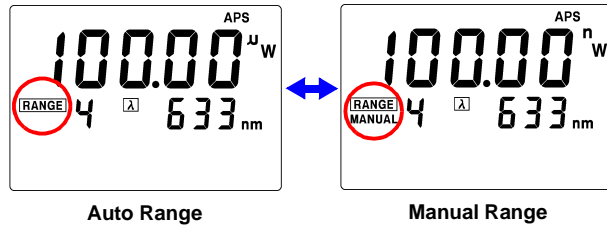
3.1 Setting the Measurement Mode

Each time the **REL** key is pressed, the measurement mode changes as shown below.



3.2 Setting the Range

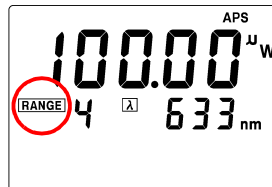
Each time the **RANGE** key is pressed, auto range and manual range alternate.



3

3.2.1 Auto Range

The appropriate range for the incident optical power is automatically selected. The range display area will appear as shown below.

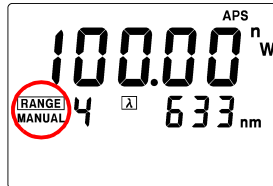


NOTE

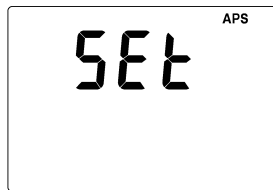
When the **RANGE** key is pressed, "**MANUAL**" appears in the range display area and the range is fixed to that displayed.

3.2.2 Manual Range

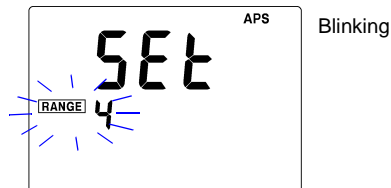
The range is set manually. "MANUAL" appears in the range display area.



1. Press the **SET** key to display the setting edit screen.



2. Press the **RANGE** key to display the setting edit screen for the manual range. The range display area will blink.

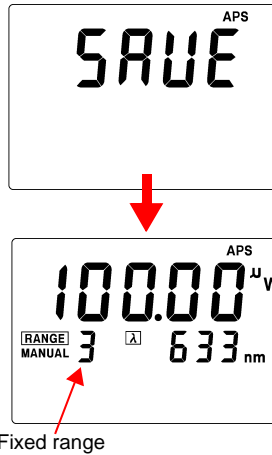


3. Use the **▲** and **▼** keys to change the range setting.
 - ▲ : Increases the sensitivity range by one increment
 - ▼ : Decreases the sensitivity range by one increment

NOTE

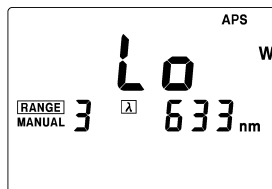
The range No. displayed on the screen is the range No. of the internal circuit. The range is divided into seven levels, from 1 (lowest sensitivity) to 7 (highest sensitivity).

4. Press the **SAVE** key to save the setting. "**SAVE**" is displayed; the 3664 will return to the measurement screen. The range is now fixed.

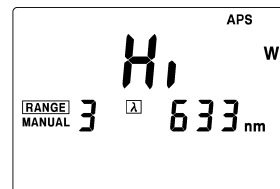


NOTE

When the range is fixed through manual range setting, the measurement display shows "**Lo**" if the incident optical power falls below the measurement range, and it shows "**Hi**" if the power exceeds the range.



"Lo" Display



"Hi" Display

3.3 Setting the Wavelength

The following two methods can be used:

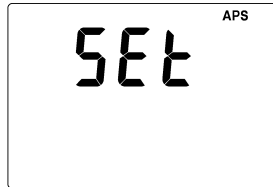
- Set an arbitrary measurement wavelength.
- Retrieve a wavelength from the measurement-wavelength memory, and set it as the measurement wavelength.

NOTE

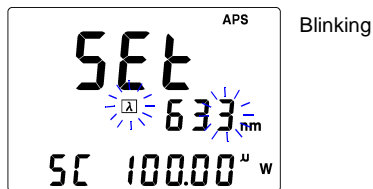
- The selectable wavelength range depends on the specification of the optical sensor connected to the 3664.
- To ensure proper measurement, set the wavelength to the wavelength of the light used.

3.3.1 Setting an Arbitrary Measurement Wavelength


1. Press the **SET** key to display the setting edit screen.

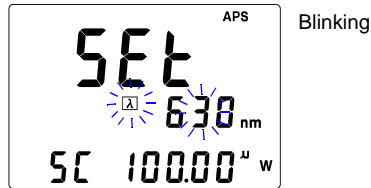


2. Press the **λ** key to display the setting edit screen for the measurement wavelength.



3. Use the **▲** and **▼** keys to change the measurement wavelength.
 - ▲ : Increases the number
 - ▼ : Decreases the number

4. Press the  key to change the blinking digit.

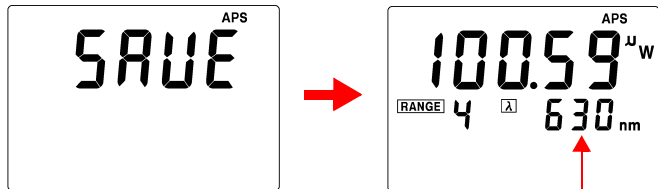


Repeat steps 3 and 4 above to set the measurement wavelength.

3

5. Press the **SAVE** key to complete setting.

"**SAVE**" appears; the 3664 will then return to the measurement screen. The measurement wavelength is now set.



The measurement wavelength set

NOTE

- An arbitrarily set measurement wavelength is automatically saved in the measurement-wavelength memory.
- The measurement-wavelength memory holds up to 10 wavelengths (including preset wavelengths for each optical sensor).
- Each optical sensor has preset wavelengths. These preset wavelengths cannot be edited.
- Through the setting operation for the arbitrary measurement wavelength, the setting data is automatically saved in the measurement-wavelength memory. When it is necessary to save a new measurement wavelength to the measurement-wavelength memory when the memory already contains 10 wavelengths, the oldest data is deleted in order to make space for the new data.
- To reset the data in the measurement-wavelength memory, perform measurement-wavelength-memory reset. This will return the memory to its default state for each sensor.
 - ❖ See Section 7.4.3 "Measurement-Wavelength Memory Reset" (60 page)

3.3.2 Retrieving the Wavelength Setting from the Measurement-Wavelength Memory

Each time the \square key is pressed, the measurement wavelengths stored in the memory are retrieved individually in order.

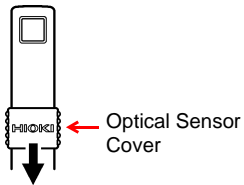
NOTE

To reset the data in the measurement-wavelength memory, perform measurement-wavelength-memory reset. This will return the memory to its default state for each sensor.

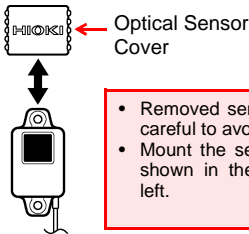
❖ See Section 7.4.3 "Measurement-Wavelength Memory Reset" (60 page)

3.4 Starting Measurement

Model 9742 OPTICAL SENSOR



Model 9742-10 OPTICAL SENSOR



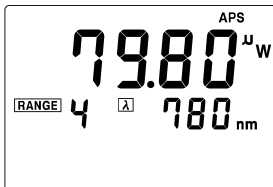
- Removed sensor cover (Be careful to avoid misplacing.)
- Mount the sensor cover as shown in the figure to the left.

1. When using the 9742 OPTICAL SENSOR, slide the sensor cover of the optical sensor until it clicks to lock the cover. When using the 9742-10 OPTICAL SENSOR, remove the optical-sensor cover.

When using the 9742-10 OPTICAL SENSOR, remove the cover of the optical sensor.

2. Inject light.

3. The 3664 displays the measured optical power.



NOTE

- To ensure accurate measurements, make sure the detector window is free of dust, stains, and any damage.
- Confirm that the light to be measured fits completely within the detector window.
- If the optical power is too intense for the unit area, such as when a condensed beam on the focus plane is measured, the optical sensor may be saturated and the 3664 may not be able to conduct accurate measurement. This problem can be solved by changing the distance between the light source and the detector window of the optical sensor.
- The operation of the light source may become unstable due to the reflection of light from the detector window of the optical sensor. This problem can be solved by angling the detector window slightly to prevent the reflection from returning to the light source.
- If background light, sunlight, illumination light, or any other light than the light to be measured is overly intense, the 3664 may not be able to conduct accurate measurement. Take appropriate light-shielding measures.

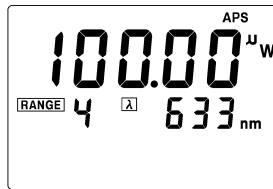
3.5 Setting Example

3.5.1 Optical-Power Measurement

The 3664 performs optical-power measurement.

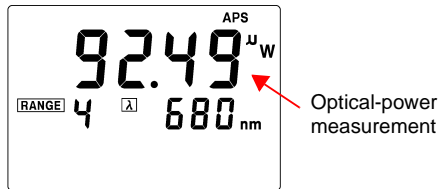
- (1) Set the measurement mode.

Press the **REL** key to select the optical-power measurement mode.



- (2) Set the measurement wavelength.

Set the measurement wavelength to an arbitrary wavelength or one retrieved from the memory. The sensitivity is corrected by the set measurement wavelength, and the 3664 displays the measured value adjusted in accordance with the corrected sensitivity.



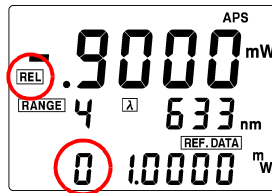
NOTE

Set the measurement wavelength to the wavelength of the light used. If the wavelengths differ, the 3664 is not able to conduct accurate measurement.

3.5.2 Relative Measurement (Measured-value basis)

The 3664 sets the optical power of the incident light to the optical sensor as the reference value, and measures the difference between the set reference value and the current incident optical power.

- (1) Set the measurement mode.
Press the **REL** key to select the relative-measurement (measured-value basis) mode.



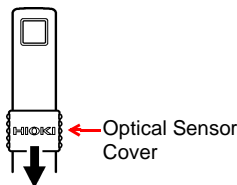
- (2) Set the measurement wavelength.
Set the measurement wavelength to an arbitrary wavelength or one retrieved from the memory.

NOTE

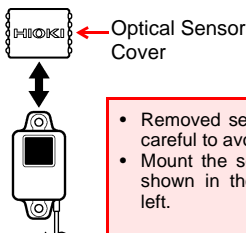
Set the measurement wavelength to the wavelength of the light used. If the wavelengths differ, the 3664 is not able to conduct accurate measurement.

- (3) Loading the reference value/relative measurement (when the optional 9742 or 9742-10 OPTICAL SENSOR is used)

Model 9742 OPTICAL SENSOR



Model 9742-10 OPTICAL SENSOR



1. When using the 9742 OPTICAL SENSOR, slide the sensor cover of the optical sensor until it clicks to lock the cover. When using the 9742-10 OPTICAL SENSOR, remove the optical-sensor cover.

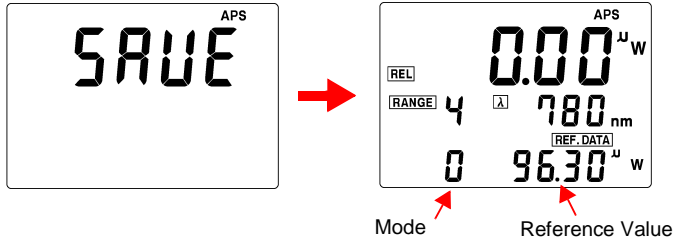
When using the 9742-10 OPTICAL SENSOR, remove the cover of the optical sensor.

2. Inject light.

3. In the relative-measurement (measured-value basis) mode, hold down the **SAVE** key for approximately 3 seconds.

- Removed sensor cover (Be careful to avoid misplacing.)
- Mount the sensor cover as shown in the figure to the left.

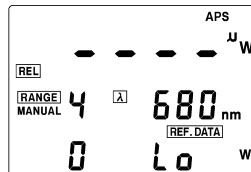
4. "SAVE" is displayed on the screen, and the relative-measurement result is then displayed. The result is saved as the optical-power measurement reference value.



5. "0" appears on the left side of the sub-display area, indicating the relative-measurement (measured-value basis) mode, and the saved reference value is displayed on the right side of the sub-display area. The main display area shows the relative-measurement value. In the relative-measurement (measured-value basis) mode, the value shown below is displayed. (Current measurement) - (measurement set as the reference value)

NOTE

- Only one reference value is saved, regardless of the wavelength setting. When a different measurement wavelength is used, set a new reference value.
- When the maximum-value-hold, minimum-value-hold, or averaging function is ON, "(calculation result) - (reference value)" is displayed.
- When the scaling function is ON, "(value after scaling) - (reference value)" is displayed.
- When the reference value is input, if the main display area shows "Lo" or "Hi," Lo or Hi is saved as the reference value. The relative measurement is not calculated, and "----" is displayed on the screen.

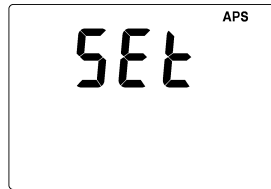


3.5.3 Relative Measurement (Input-value basis)

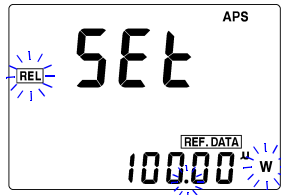
The 3664 measures the difference between the reference value arbitrarily set by key entry and the current incident optical power.

Entering the Reference Value Using the Keys/Relative Measurement

1. Press the **SET** key to display the setting edit screen.

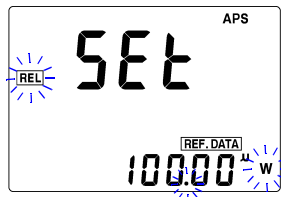


2. Press the **REL** key to display the reference-value input screen.



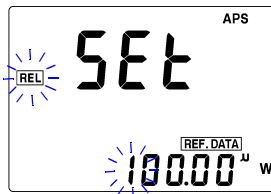
Blinking

3. Use the **▲** and **▼** keys to change the position of the decimal point and the unit.
 - ▲** : Increases the number
 - ▼** : Decreases the number



Blinking

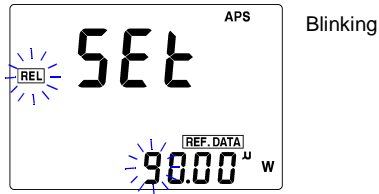
4. Press the **◀** key to change the blinking digit.



Blinking

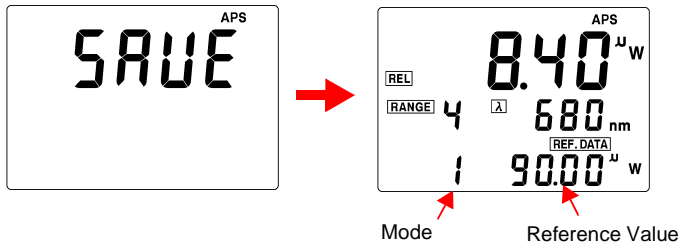
3.5 Setting Example

5. Use the \leftarrow and \rightarrow keys to change the blinking number.
 \rightarrow : Increases the number
 \leftarrow : Decreases the number



Repeat steps 4 and 5 above to set the reference value.

6. Press the **SAVE** key to complete setting.
"SAVE" appears and then the 3664 returns to the measurement screen. The measurement wavelength is now set and the relative-measurement result is displayed.



The number "1" appears on the left side of the sub-display area, indicating the relative-measurement (input-value basis) mode, and the saved reference value is displayed on the right side of the sub-display area.

The main display area displays the relative-measurement value. In the relative-measurement (input-value basis) mode, the value shown below is displayed.

(Current measurement) - (value entered using the keys as the reference value)

NOTE

- Only one reference value is saved regardless of the wavelength setting.
- When a different measurement wavelength is used, set a new reference value.
- The values that can be entered using the keys as the reference value range from 0.001 nW to 1.9999 W (-90.00 dBm to 33.0 dBm).
- When the maximum-value-hold, minimum-value-hold, or averaging functions is ON, "(calculation result) - (reference value)" is displayed.
- When the scaling function is ON, "(value after scaling) - (reference value)" is displayed.

Functions

4

- Using the scaling function, a measured value can be converted to an arbitrary value and the converted value displayed.
- The maximum-value-hold, minimum-value-hold, and averaging functions are available.

4.1 Scalling Function

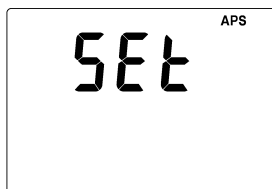
- A measured value is converted by scaling to an arbitrary value and displayed. When the scaling function is turned ON, "(measured value) x (internal coefficient)" is displayed.
- The internal scaling coefficient for each wavelength is saved in the memory.
- When the display value after scaling is set, the internal coefficient is automatically calculated and saved.

4


4.1.1 Turning ON the Scalling Function

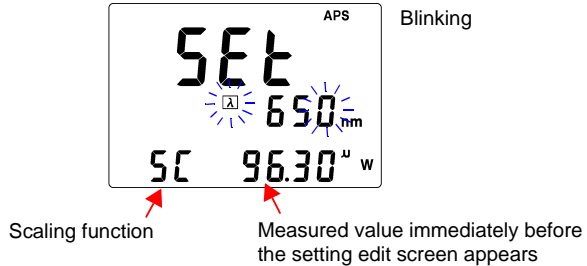
Save the internal scaling coefficient, and turn ON the scaling function.

1. Input the light to be measured to the optical sensor.
2. Press the **SET** key to display the setting edit screen.




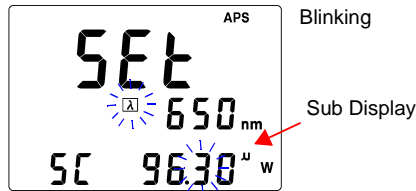
4.1 Scaling Function





3. Press the  key to display the setting edit screen for the measurement wavelength.



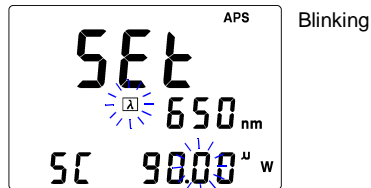
The value displayed first in the sub-display area is the display value with the scaling OFF (internal coefficient of 1.000).

4. Use the  key to move the cursor to a digit in the sub-display area.

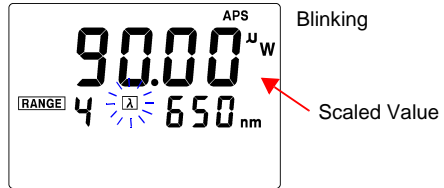


5. Use the  and  keys to change the blinking number.
-  : Increases the number
 -  : Decreases the number

Repeat steps 4 and 5 above to set the display value after scaling.



6. Press the **SAVE** key to save the setting. "SAVE" is displayed, and the 3664 then returns to the measurement screen. The scaling coefficient is automatically calculated and saved as an internal setting.
7. The indicator " " starts blinking and the scaled value is displayed.



NOTE

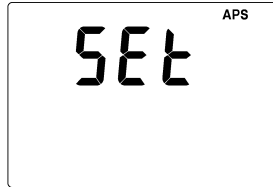
- While the scaling function is ON, the indication " " blinks.
- The internal scaling coefficient ranges from 0.100 to 10.000.

The scaling function is not available under the following conditions, and "Hi" or "Lo" appears instead of the display value after scaling (in the sub-display area).

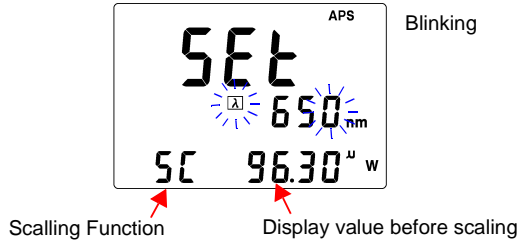
- The measured value is displayed as "Hi" or "Lo" in the manual range.
- The measured value is very large or very small in the auto range.

4.1.2 Turning OFF the Scaling Function

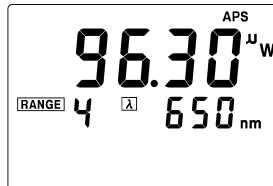
1. Press the **SET** key to display the setting edit screen.



2. Press the **λ** key to display the setting edit screen for the measurement wavelength.



3. Press the **SAVE** key without changing the display value before scaling.
 "SAVE" is displayed, and the 3664 then returns to the measurement screen. A scaling coefficient of 1.000 is set as an internal setting, and the scaling function is turned OFF.
4. The indication "λ" remains ON as a solid light, and the measured value that is not scaled is displayed.

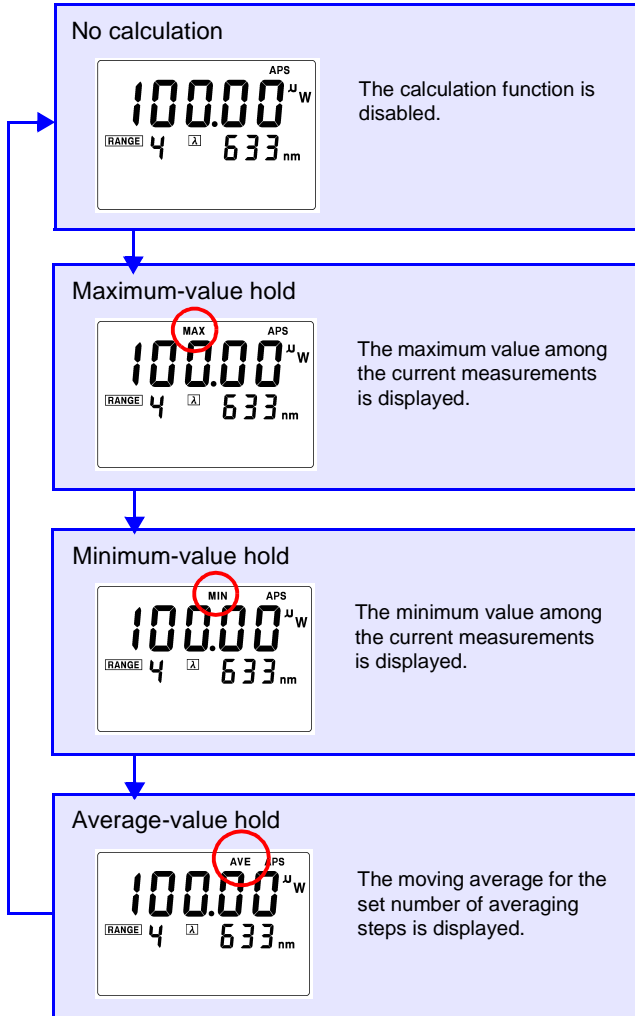


NOTE

To return to the measurement screen with the scaling ON: Do not press the **SAVE** key in step 4 above; instead, press the **SET** key twice.

4.2 Maximum-Value Hold / Minimum-Value Hold / Averaging

Each time the **MAX/MIN/AVE** key is pressed, the calculation setting changes as shown below.

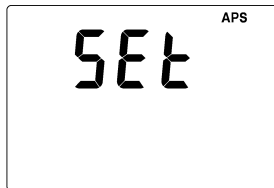


NOTE

To reset the display value, press the **MAX/MIN/AVE** key again and start calculation again.

Setting the Number of Averaging Steps

1. Press the **SET** key to display the setting edit screen.

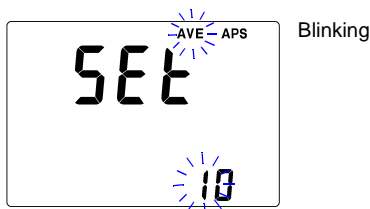


2. Press the **MAX/MIN/AVE** key to display the setting edit screen for the number of averaging steps.



3. Use the **▲** and **▼** keys to change the blinking number.
 - ▲ : Increases the number
 - ▼ : Decreases the number

A digit may be chosen by moving the cursor using the **◀** key.



4. Press the **SAVE** key to save the setting. "SAVE" is displayed, and the 3664 then returns to the measurement screen. The number of averaging steps is now set.

NOTE

- After returning to the measurement screen, "AVE" continues to blink until the number of averaging steps reaches the set number.
- The number of averaging steps is selectable between 2 and 100.
- If the **MAX/MIN/AVE** key, **▲** key, **RANGE** key, or **SET** key is pressed during measurement with the calculation function ON, the calculation is reset.

Control by Computer

5

By connecting the 3664 power meter to a PC, measurements can be read and the 3664 can be set up on the PC.

NOTE

When connecting the 3664 to a PC with a USB cable, use a cable of 2 m or shorter to prevent the influence of noise.

5.1 Overview of Control

- By connecting the 3664 power meter to a PC with a USB interface and calling API functions stored in the DLL from the application, the 3664 can be remotely controlled, and data can be exchanged between the 3664 and the PC.
- The table below shows a list of the API functions. For details, see the "API Instructions Manual (3664api.pdf)" on the supplied CD-R.
- To view the 3664api.pdf, Acrobat Reader must be installed on your PC. If it is not installed, first install the Acrobat Reader from the supplied CD-R.

API list

Name of function	Description
RESET functions	
ResetDeviceUSB()	Resets the communications function
ResetAllData()	Resets the setting data
ResetAllWave()	Resets the measurement wavelength
SET functions	
SET_Rel0()	Sets the reference value for relative measurement (measured-value basis)
SET_Rel1()	Sets the reference value for relative measurement (input-value basis)
QUES functions	
QUES_IDN()	Queries the device data
QUES_Sensor()	Queries the optical-sensor model No.
QUES_AllWave()	Queries all measurement wavelengths stored in the measurement-wavelength memory
QUES_MeasData()	Queries the measurement data
QUES_Rel()	Queries the reference value
SQ functions	
SQ_Mode()	Sets or queries the mode
SQ_Wave()	Sets (arbitrary setting) or queries the measurement wavelength
SQ_Ave()	Sets or queries the number of averaging steps
SQ_Range()	Sets or queries the range
SQ_Aps()	Sets or queries the APS (auto power save) function

NOTE

An application for controlling the 3664 shall be created by the user.

5.2 Installing the Driver

To connect the 3664 to a PC using the USB interface, the driver must be installed.

System requirements

OS	Windows 98SE, Windows Me, Windows 2000, Windows XP Hardware requirements, such as those involving the CPU, RAM, and display monitor, shall conform to the system requirements of the OS.
HDD space	10 MB or more of free disk space
Interface	USB Ver. 1.1 or higher (connectable to only one PC)

CD-R contents

HiUsbSgl.inf	File for driver installation
HiUsbSgl.sys	Device driver for the USB of the 3664

CAUTION

Do not plug in or unplug the USB cable while the instrument is operating.

NOTE

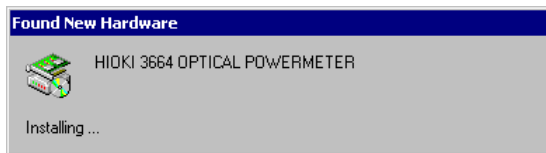
- The PC and 3664 should be connected on a one-on-one basis. Multiple 3664 units cannot be connected to the PC at a time.
- When a 3664 unit with a different serial No. is connected, the instrument may indicate that a new device has been detected. In such case, install the device driver by following the instructions appearing on the screen.

1. Turn on the power of the instrument.
2. Connect the PC on which you intend to install the driver and the 3664 by using the USB cable supplied with the instrument.

(PC side)

The 3664 will be recognized by the device name of "**HIOKI 3664 OPTICAL POWER METER.**"

After displaying "**Found New Hardware**" on the screen, the PC starts the "**Found New Hardware Wizard.**"



The "**Found New Hardware Wizard**" requires different procedures depending on the OS.

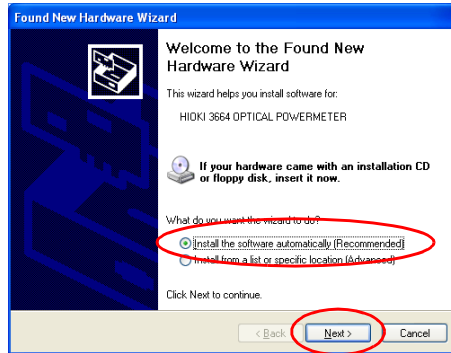
Insert the CD-R into the PC according to instructions given in the dialog box, then install the driver.

The following describes how to install the driver for each type of OS.

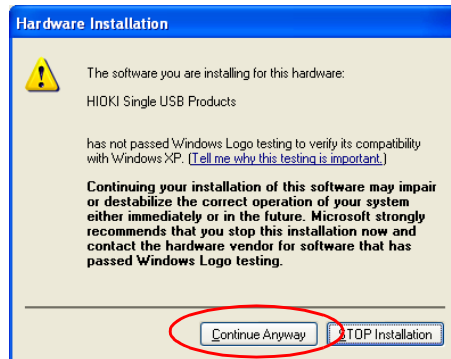
- ❖ See Section "For Windows XP" (page 43)
- ❖ See Section "For Windows 2000" (page 45)
- ❖ See Section "For Windows Me" (page 47)
- ❖ See Section "For Windows 98SE" (page 48)

For Windows XP

1. Insert the CD-R supplied with the instrument into the CD-ROM drive. The "**Found New Hardware Wizard**" window appears.
2. Check "**Install the software automatically,**" then click the [**Next**] button.

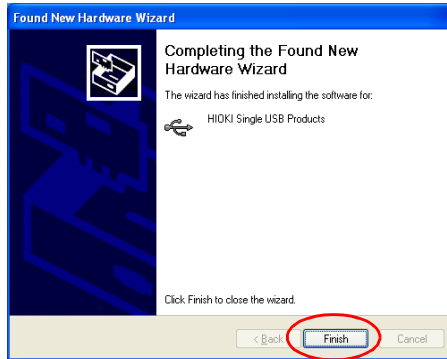


3. Click the [**Continue Anyway**] button.



Clicking the button initiates copying of the file. When this software is recognized, the screen will display a message stating that the software is not authorized by Microsoft. Ignore the message and continue operation.

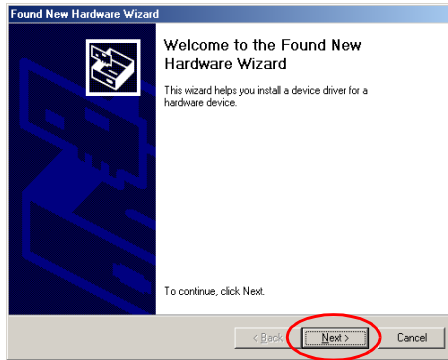
4. Click the **[Finish]** button.



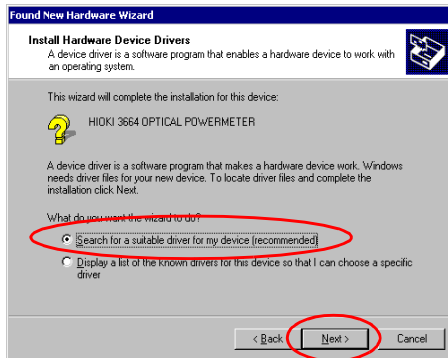
5. When the "**Found New Hardware Wizard**" window closes, remove the CD-R from the CD-ROM drive.

For Windows 2000

1. When the "Found New Hardware Wizard" window appears, click the [Next] button.

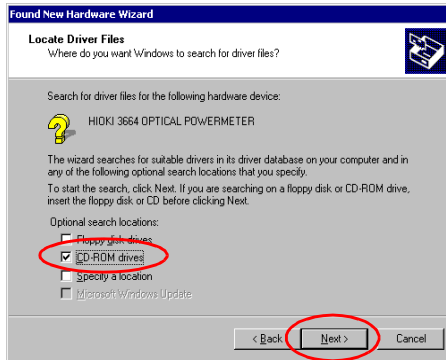


2. Insert the CD-R supplied with the instrument into the CD-ROM drive.
3. Check "Search for a suitable driver for my device," then click the [Next] button.

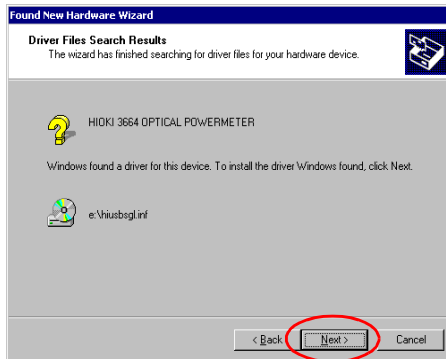


5.2 Installing the Driver

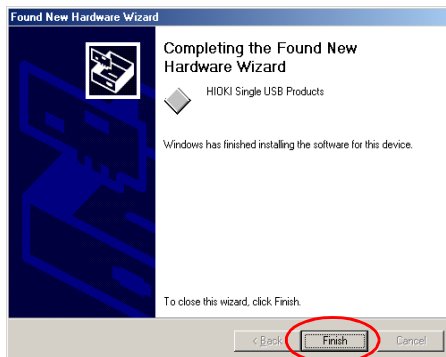
4. Check "CD-ROM drives" (thus deselecting the other items), then click the [Next] button.



5. Click the [Next] button.



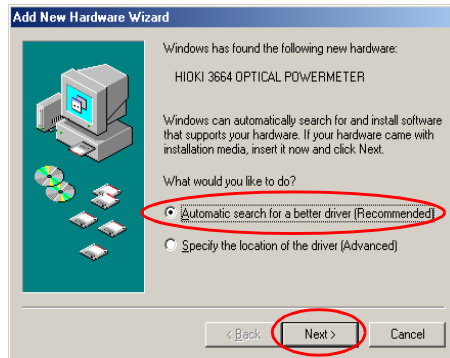
6. Click the [Finish] button.



When the "Add New Hardware Wizard" window closes, remove the CD-R from the CD-ROM drive.

For Windows Me

1. Insert the CD-R supplied with the instrument into the CD-ROM drive.
The "Add New Hardware Wizard" window appears.
2. Check "Automatic search for a better driver," then click the [Next] button.



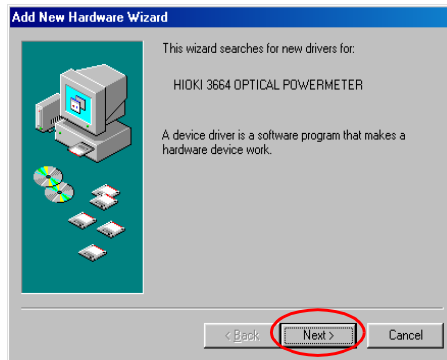
3. Click the [Finish] button.



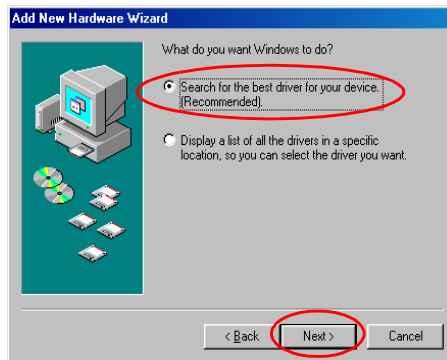
4. When the "Add New Hardware Wizard" window closes, remove the CD-R from the CD-ROM drive.

For Windows 98SE

1. When the "Add New Hardware Wizard" window appears, click the [Next] button.

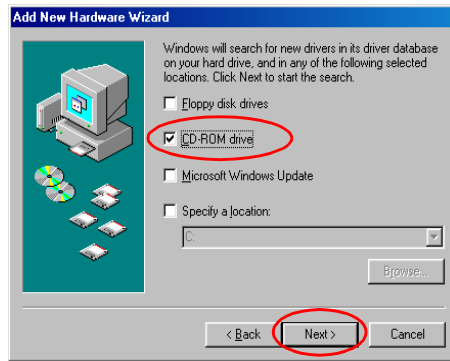


2. Check "Search for the best driver for your device," then click the [Next] button.



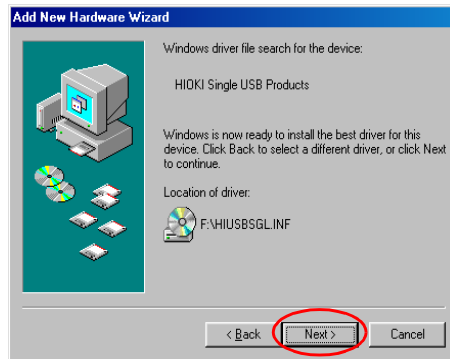
3. Insert the CD-R supplied with the instrument into the CD-ROM drive.

4. Check "CD-ROM drive" (thus deselecting the other items), then click the [Next] button.



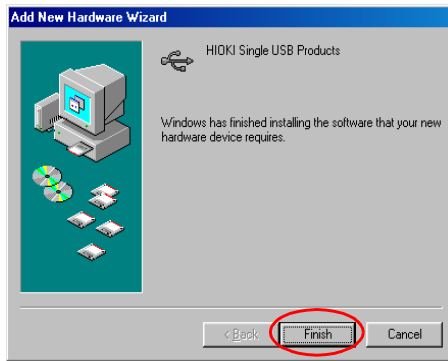
5. Click the [Next] button.

5



Clicking the button initiates copying of the file.

6. When the following window subsequently appears, click the **[Finish]** button.



7. When the "Add New Hardware Wizard" window closes, remove the CD-R from the CD-ROM drive.

Specifications

6

6.1 Measurement Specifications

Optical-power measurement	Unit: W/dBm
Range selection	Automatic and manual
Accuracy	$\pm 0.7\%$ ($\pm 5\%$ in combination with an optional optical sensor)
Maximum-value hold	Displays the maximum value among the current measurements
Minimum-value hold	Displays the minimum value among the current measurements
Average-value display	Displays the moving average for the set number of averaging steps The number of averaging steps is selectable between 2 and 100.
Wavelength sensitivity correction	The setting is editable every 1 nm. The sensitivity of the sensor is corrected automatically. Up to 10 wavelengths can be preset (each sensor has unchangeable presets).
Scaling	[Display value] = [Measured value] x [internal setting] The internal setting is set for each wavelength and is selectable between 0.1 and 10. The resolution is the same as that for optical-power measurement.
Relative measurement	Displays a relative value to a measured or set value [Display value] = [Measured value] - [Reference value] The reference value is set based on the measured value or through key entry by the user. The selectable value ranges from 0.001 nW to 1.9999 W (-90.00 dBm to 33.00 dBm).
Display update rate	Approx. 330 ms
Analog output	Output level: Approx. 1 V at the sensor calibration point * Output resistance: $50 \Omega \pm 5\%$ Connector: ϕ 3.5 Mini-jack * The calibration point of the sensor is determined based on the calibration wavelength and the calibration power specified in the specification of the optional optical sensor.

Display monitor	Monitor: LCD Measurement display: 4-1/2 digits in the unit of nW, μ W, mW, dBm, or dB Wavelength display: 4 digits in the unit of nm
Communications function	Communications data: Output of measured values at the request of the PC Change in setting at the command of the PC Interface: USB Ver. 1.1
Functions	<ul style="list-style-type: none">• Auto power save Automatically turns OFF the power if there is no key operation or USB communication for approximately 10 minutes. To turn OFF the function, hold down the POWER key for 5 sec. when turning ON the power. The auto-power-save function is available only when the 3664 is running on the battery.• Setting backup Saves the settings when the power is turned OFF, and starts up the 3664 with the saved settings when the power is turned ON again.• Battery check Displays the battery indicator when the supply voltage falls below 4.0 V

6.2 General Specifications

Rated supply voltage	<ul style="list-style-type: none"> • 1.5 V DC × 4 (LR6 alkaline batteries × 4) • AC Adapter 9 V DC, 0.2 A Model 9445-02 AC ADAPTER or Model 9445-03 AC ADAPTER: Rated supply voltage: 100 to 240 V AC (Voltage fluctuations of ±10% from the rated supply voltage are taken into account.), 50/60 Hz, Maximum rated current 250 mA)
Maximum rated power	1.6 VA
Operating time	<ul style="list-style-type: none"> • With maximum load Approx. 9 hours (Ambient temperature 23°C(74°F) reference value) • Specified measurement state Approx. 60 hours (Ambient temperature 23°C(74°F) reference value)
Dimensions	Approx. 85W × 160H × 35D mm (3.35"W × 6.30"H × 1.38"D) (excluding projections)
Mass	Approx. 270 g (9.5 oz.) (without batteries)
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Accuracy guarantee for temperature and humidity	23 ± 5°C (73 ± 9°F), 80%RH or less (non-condensating)
Guaranteed accuracy period	One year
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety : EN61010-1:2001 Pollution degree II EMC : EN61326:1997+A1:1998+A2:2001+A3:2003 EN61000-3-2:2000 EN61000-3-3:1995+A1:2001

Accessories	Model 9445-02 AC ADAPTER (UL, SA10-9010N, SINO-AMERICAN) or Model 9445-03 AC ADAPTER (CEE, SA10-9010G, SINO-AMERICAN)	1
	Model 9094 OUTPUT CORD	1
	Driver CD-R	1
	LR6 alkaline batteries	4
	USB cable	1
	Strap	1
	Instruction manual.....	1
Options	Model 9246 CARRYING CASE	1
	Model 9742 OPTICAL SENSOR.....	1
	Model 9742-10 OPTICAL SENSOR	1

Maintenance and Service

7



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 Cleaning

7.1.1 Cleaning of the 3664

To clean the instrument, 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.

7.1.2 Cleaning of the Optical Sensors

CAUTION

- Avoid touching the detector window with your bare hands. The detector window must be clean for the sensor to meet the specified performance parameters.
- With the exception of ethyl alcohol, avoid using organic solvents to clean the detector window. These solvents can damage the detector window.
- Avoid scratching the detector window with sharp or pointed objects (e.g., the tips of tweezers) or against hard surfaces. Damage to the detector window may prevent the sensor from meeting specified performance parameters.

Take the cleaning method of the 9742 OPTICAL SENSOR as an example.


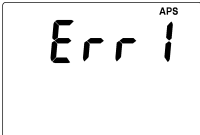
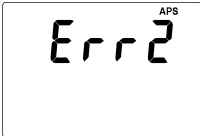
1. Open the sensor cover.
(When using the 9742-10 OPTICAL SENSOR, take care to avoid misplacing the sensor cover.)
2. Wipe the detector window of the sensor using lens cleaning paper or other lint-free material.
If lint remains on the detector window, blow off with an optical lens airbrush.
If the detector window is soiled, fluff the tip of a cotton swab. Moisten the cotton tip in ethyl alcohol and wipe the surface.

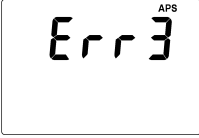
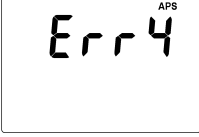
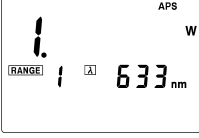
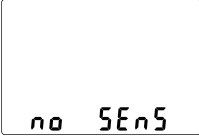
7.2 Service

- If the instrument seems to be malfunctioning, confirm that the batteries are not discharged, and that the USB cable is not open circuited before contacting your dealer or Hioki representative.
- When sending the instrument 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.

7.3 Error Display

In the event of an error, one of the following messages is displayed.

<p>Err0</p>  <p>The screenshot shows a digital display with 'REL' on the left, 'SAVE' in the center, and 'Err0' at the bottom. 'APS' is visible in the top right corner of the display area.</p>	<p>Reference-value save error</p> <p>An improper value has been saved as the reference value. If a reference value is saved while the measured value is "Lo" or "Hi" in the optical-power measurement mode, "REL" and "SAVE" remain on the screen and "Err0" is displayed. The reference value is then updated to Hi or Lo, and the relative measurement display shows "--".</p>
<p>Err1</p>  <p>The screenshot shows a digital display with 'Err1' in the center. 'APS' is visible in the top right corner of the display area.</p>	<p>Wavelength error</p> <p>There is a problem with the measurement-wavelength memory. Reset the measurement-wavelength memory.</p> <ul style="list-style-type: none"> ❖ See Section 7.4.3 Measurement-Wavelength Memory Reset (page 60) <p>If the measurement-wavelength-memory reset does not solve the problem, conduct a system reset.</p> <ul style="list-style-type: none"> ❖ See Section 7.4.1 System Reset (page 59) <p>If the system reset does not solve the problem, the 3664 may be malfunctioning. Contact your dealer or Hioki representative.</p>
<p>Err2</p>  <p>The screenshot shows a digital display with 'Err2' in the center. 'APS' is visible in the top right corner of the display area.</p>	<p>Setting-data error</p> <p>There is a problem with the setting data. Conduct a system reset.</p> <ul style="list-style-type: none"> ❖ See Section 7.4.1 System Reset (page 59) <p>If the system reset does not solve the problem, the 3664 may be malfunctioning. Contact your dealer or Hioki representative.</p>

<p>Err3</p> 	<p>Memory error</p> <p>There is a problem with writing into the memory. Conduct a system reset. ❖ See Section 7.4.1 System Reset (page 59)</p> <p>If the system reset does not solve the problem, the 3664 may be malfunctioning. Contact your dealer or Hioki representative.</p>
<p>Err4</p> 	<p>System error</p> <p>The 3664 may be malfunctioning. Contact your dealer or Hioki representative.</p>
<p>"1"</p> 	<p>Display over range</p> <p>The value displayed after wavelength sensitivity correction or scaling exceeds the upper limit that can be displayed by the 3664 (1.9999 W).</p>
<p>"no SEnS"</p> 	<p>Sensor disconnected</p> <p>A sensor is not connected. Connect a sensor. The 3664 cannot be operated without a sensor connected.</p>

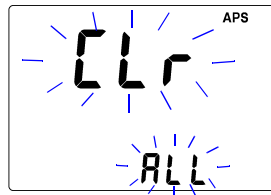
7.4 Reset

There are three types of reset operations for the 3664.

- System reset
Returns all settings to their defaults
- Setting-data reset
Returns all settings except those for the wavelength data to their defaults
- Measurement-wavelength memory reset
Returns the measurement-wavelength data stored in the measurement-wavelength memory to its default state.

7.4.1 System Reset

1. While holding down the **SET** key and ◀ key, turn ON the power.
2. "**CLr**" and "**ALL**" start blinking, and all settings are returned to their defaults.

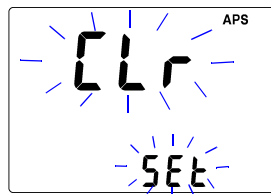


Blinking

7

7.4.2 Setting Data Reset

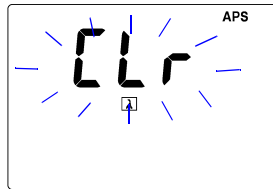
1. While holding down the **SET** key and **SAVE** key, turn ON the power.
2. "**CLr**" and "**SEt**" start blinking, and all setting data except those for the wavelength is returned to its defaults.



Blinking

7.4.3 Measurement-Wavelength Memory Reset

1. With an optional optical sensor connected to the 3664, while holding down the **SET** key and **▲** key, turn ON the power.
2. "CLr" and " " start blinking, and the measurement-wavelength data is returned to the default wavelength setting of the connected sensor.



Blinking

NOTE


The measurement-wavelength memory reset cannot be performed if a sensor is not connected to the 3664.

7.5 Replacing the Batteries

WARNING

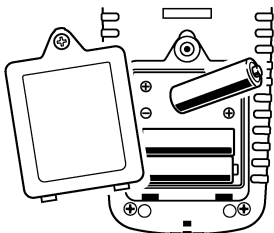
- To avoid electric shock, turn off the power switch and disconnect the USB cable before replacing the batteries.
- After replacing the batteries, replace the cover and screws before using the instrument.
- Do not mix old and new batteries, or different types of batteries. Also, be careful to observe 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.

NOTE

- The “” indicator appears when battery voltage becomes low. Replace the batteries as soon as possible.
- Use the specified battery (AA alkaline battery) only. If non-specified battery such as a manganese battery is used, the service hours may be shorter than when alkaline batteries are used.

Tools and materials:

Four AA alkaline batteries (LR6) and a Phillips screw-driver



1. Make sure the power to the 3664 is OFF.
2. Disconnect all cables.
3. Turn over the 3664 and loosen the screw on the battery cover.
4. Remove the battery cover.
5. Insert the four AA alkaline batteries (LR6) into the battery case, noting the correct polarity. (When replacing the batteries, replace all of them.)
6. Place the battery cover back on, and tighten the screw.



Appendix

Explanations

Optical-power measurement

Assuming that the energy of the input light measures E [mW], the measured value P is expressed as follows.

APP

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

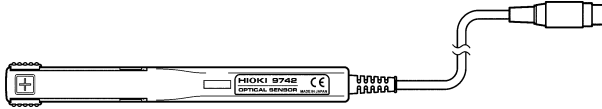
P: Measured value [dBm]

E: Energy of input light [mW]

Options

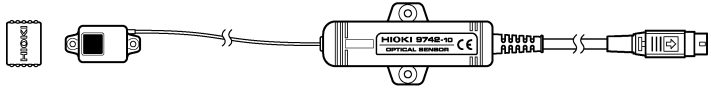
Model 9742 OPTICAL SENSOR

Optical sensor for the 3664



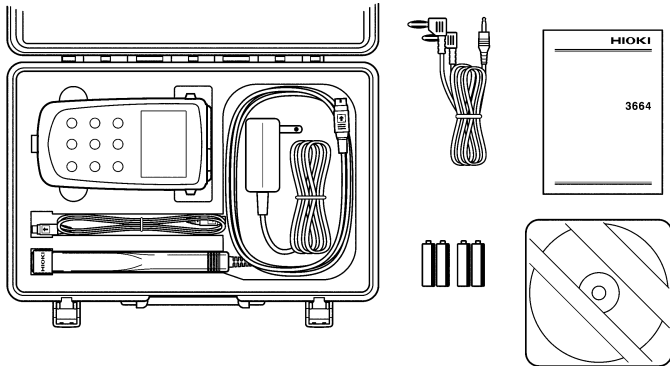
Model 9742-10 OPTICAL SENSOR

Optical sensor for the 3664



Model 9246 CARRYING CASE

Carrying case holding the 3664, the complete accessory set, and an optional optical sensor



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: 3664
Accessory: 9445-03 AC ADAPTER
Options: 9742 OPTICAL SENSOR
9742-10 OPTICAL SENSOR

The above mentioned products conform to the following product specifications:

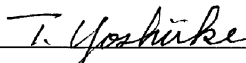
Safety: EN61010-1:2001
EMC: EN61326:1997+A1:1998+A2:2001+A3:2003
Class B equipment
Minimum immunity test requirement
EN61000-3-2:2000
EN61000-3-3:1995+A1:2001

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

15 September 2006



Tatsuyoshi Yoshiike
President

3664A999-01

HIOKI 3664 OPTICAL POWER METER
Instruction Manual

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