Silicon ZOOM
Optical Power Meter
Operations Guide

Optical Wavelength Laboratories

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UNIT 1 Introduction

Description

This manual describes the operation of the Silicon ZOOM - Zeroed Output Optical Meter.

The Silicon ZOOM is a very economical option for measuring the optical power of multimode fibers. It is NIST-calibrated at 850nm, and factory calibrated at 650 and 980nm. Reference values used for optical loss readings can be stored for each of these wavelengths .

Its user-friendly interface includes selector switches for power and wavelength selection, and a push button used for setting references and toggling between dBm (optical power) and dB (optical loss).

The ZOOM includes a 2.5mm universal connector, which is compatible with many popular fiber connectors, such as ST, SC, and FC.

The ZOOM is ideal for fiber optic professionals who need to quickly measure the loss in their fiber optic links and do not require data point storage.

Applications

Attenuation Measurements. After a fiber cable has been installed and terminated, it must be tested to determine if the fiber is installed according to standards and specifications. A comparison of the actual power measurement and the reference value determines if the installation will pass or fail.

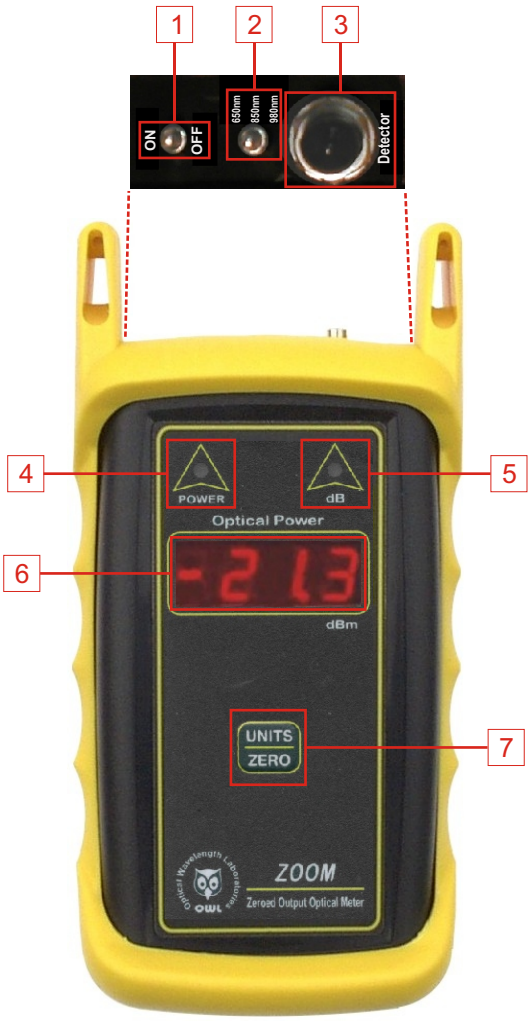
Fiber Continuity Testing. Continuity can be measured with the ZOOM by placing a calibrated light source on one end of the fiber and the ZOOM on the other end. This is also a simple way to measure the attenuation of the fiber.

Patch Cord Testing. Fiber links that are producing incorrect results may have bad patch cords. The ZOOM can be used to test the attenuation of a patch cord to see if it is usable, or should be replaced.

Active Equipment Optical Power Measurements. Active equipment needs to be measured periodically for correct power levels and stability. The transmitters in this equipment have a known power value. The ZOOM can be directly attached to this equipment via a patch cord to check whether the transmitter is stable and is within the manufacturer's specified power range.

UNIT 1 Introduction

General Features



1 ON / OFF selector switch - turns the unit on or off.

2 Wavelength selector switch - toggles the unit between 650nm, 850nm, and 980nm.

3 2.5mm universal connector port - accepts many popular 2.5mm ferrule connectors, including ST, SC, and FC.

4 Power Indicator LED - indicates the meter's power status, and also whether the battery power is sufficient to provide accurate readings.

5 Power Units LED - indicates whether the units displayed are in dBm or dB.

6 Optical Power Display - displays power units in dBm or dB with a resolution of 0.1 dB.

7 UNITS / ZERO Button - sets the reference for the selected wavelength, and also is used to toggle power readings between dBm and dB.

Precautions

Operational. In order to ensure accurate and reliable readings, it is vitally important to clean ferrules containing optical fibers. If dirt, dust, and oil is allowed to build up inside the connector, this may scratch the surface of the photodetector, producing erroneous results. Replace dust caps after each use.

Required Accessories

Cleaning Supplies. Fiber ferrules should be cleaned before each insertion with 99% or better isopropyl alcohol and a lint free cloth. A can of compressed air should be available to dry off the connector after wiping, and to blow out dust from bulkheads.

Patch Cords. A patch cord is required to connect the ZOOM to the system under test. The connector styles and fiber type of the patch cord must match the type on the ZOOM and the type of the system under test for accurate results.

UNIT 1 Introduction

Applications

Optical Power Measurement Description. When displaying power in dBm mode, the ZOOM will measure the absolute amount of power being received in the 2.5mm Universal detector port.

Optical Loss Measurement Description. When displaying power in dB mode, the ZOOM will measure the optical power being received in the detector port relative to the reference point that was set. The formula for calculating loss in a fiber link is:

$$L = P_r - P_a$$

where L is the amount of optical loss in dB, P_r is the reference power in dBm, and P_a is the absolute power in dBm.

Both of these tests requires a light source at the other end of the fiber under test.

Typical systems include telecommunications networks, data networks, cable television, and industrial equipment control.

UNIT 2 Operation

Optical Power Measurement

The ZOOM can be used to measure the actual amount of power being received by the detector. This is useful for checking the power level of a light source or for testing patch cords.

Use the following steps for measuring absolute optical power:

1 - Connect the ZOOM and your light source to the fiber under test.

2 - Power ON and set the light source to the wavelength you are using for your measurement. Remember to allow the light source to warm up according to manufacturer specifications.

3 - Power ON and set the wavelength selector switch on the ZOOM to the match the wavelength of your light source.

4 - Set the power units mode on the ZOOM to dBm, or absolute mode. Absolute mode is active when the Power Units LED is OFF.

The resultant reading is the absolute optical power being received by the ZOOM. Repeat these steps for each wavelength to be measured.

Optical Loss Measurement

The Silicon ZOOM is also capable of measuring the loss of a fiber link. This is done by setting a “zero” reference point, then measuring the power through the link. A simple calculation gives you the actual loss in the link. This loss is then compared to the link budget to see if the link passes or fails.

You will need two identical patch cords for optical loss measurement. Follow the steps below:

1 - Power ON and set the light source to the wavelength you are measuring. Remember to allow the light source to warm up according to manufacturer specifications.

2 - Power ON and set the wavelength selector switch on the Silicon ZOOM to the wavelength you are measuring. Make sure that the wavelength on the meter matches the wavelength on the light source.

3 - Connect one of the patch cords to the Silicon ZOOM and to the light source you are using for the test. This patch cord will be used on the meter side of the link under test. If the power level shown on the Silicon ZOOM is close to the power level of the light source, this patch cord is good. If it is not, replace it with a good patch cord. Once you have verified that the meter side patch cord is good, disconnect it from the meter and light source, and set it aside.

4 - Connect the second patch cord to the Silicon ZOOM and to the light source you are using for the test. This patch cord will be used for the light source side of the test. NOTE: if you are testing a multimode fiber link, you must wrap this patch cord 5 to 7 times around a mandrel (0.7 in. for 62.5/125uM core, and 0.9 in. for 50/125uM core) to achieve Equilibrium Mode Distribution (EMD). The purpose of a mandrel is to remove “high-order” modes of light, or light that would not ordinarily travel the full length of a fiber link. If this excess optical energy is not removed, it will cause the power meter to set an incorrect reference and will throw off the final loss readings.

Optical Loss Measurement, cont.

5 - Press and hold the UNITS / ZERO button for two seconds to “zero” the Silicon ZOOM. The Silicon ZOOM will automatically switch to display optical power in dB, and should display approximately 0.00 dB. Press the UNITS / ZERO button to switch back to dBm mode. Record the number on the display as your reference value.

6 - Disconnect the patch cord from the Silicon ZOOM without disturbing the connection to the light source. NOTE: it is vitally important that you leave this patch cord connected to the light source for the duration of the test. Disconnecting the light source before you have finished testing will invalidate the optical reference you set.

7 - Take the light source to the other end of the fiber link, and connect it to the first fiber under test.

8 - Connect the Silicon ZOOM to the first fiber under test. Record both the absolute power (dBm) and loss value (dB). Compare the dB value to the loss value on your link budget. The link will PASS if the number on the ZOOM is less than the loss value on the link budget. Record the dB and dBm values for future reference. Repeat this step for each fiber under test.

Repeat steps 4 through 8 for each wavelength you are testing.

Remember, pressing the UNITS / ZERO button easily switches the display between dBm and dB.

UNIT 3 Appendix

MAINTENANCE AND CALIBRATION PROCEDURES

Repair. Repair of this unit by unauthorized personnel is prohibited, and will void any warranty associated with the unit.

Battery Replacement. The battery compartment is covered by a sliding plate on the back of the unit. Remove the rubber boot to expose the back of the unit. One 9v battery is required for operation.

Cleaning. For accurate readings, the optical connectors on the Silicon ZOOM and the connectors on the patch cords should be cleaned prior to attaching them to each other. Minimize dust and dirt buildup by replacing the dust caps after each use.

Calibration. It is recommended to have Optical Wavelength Laboratories calibrate this unit once per year.

Warranty. The Silicon ZOOM comes standard with a **two-year** factory warranty, which covers manufacturer defect and workmanship only.

CONTACT INFORMATION

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USE OF SC CONNECTORS WITH 2.5MM UNIVERSAL PORT

Take extra care when inserting SC connectors into the 2.5mm universal port as the spring-loading action of the SC connector may cause improper insertion. Call OWL at (262) 473-0643 with any questions.

SPECIFICATIONS

Detector Type:	1mm Silicon
Calibrated Wavelengths:	650nm, 850nm, 980nm
Measurement Range:	+3 to -52 dBm
Measurement Units:	dBm (absolute) dB (relative)
Accuracy:	± 0.24 dB
Resolution:	0.1 dB
Battery Life:	15+ hours (9v)
Connector Type:	2.5mm Universal
Operating Temperature:	-10 to 55º C
Storage Temperature:	-30 to 70º C
Size:	2.75”W x 4.94”H x 1.28”D
Weight:	116g
Low Battery Indicator:	Yes
NIST Traceable:	Yes

Link Budget Calculation Worksheet

Operating Wavelength _____ Fiber Type _____

Calculate System Attenuation

Fiber Loss at Operating Wavelength (Distance x Fiber Loss)

Total Cable Distance		km
Individual Fiber Loss (at operating wavelength)		dB/km
Total Fiber Loss		dB

Connector Loss (Connector Loss x Connector Pairs)

Individual Connector Loss		dB
Number of Connector Pairs		
Total Connector Loss		dB

Splice Loss (Splice Loss x Splices)

Individual Splice Loss		dB
Number of Splices		
Total Splice Loss		dB
Other Components		dB
Total System Attenuation		dB

Calculate Link Loss Budget

Determine System Gain (Avg. Transmitter Power - Receiver Sensitivity)

Average. Transmitter Power		dBm
Receiver Sensitivity		dBm @ 10^{-9} BER
System Gain		dB

Power Penalties (Operating Margin + Receiver Power Penalties + Repair Margin # Splices at 0.3dB each)

Operating Margin		dB
Receiver Power Penalties		dB
Repair Margin		dB
Total Power Penalty		dB

Determine Link Loss Budget (System Gain - Power Penalty)

System Gain		dB
Total Power Penalty		dB
Total Link Loss Budget		dB

Verify Performance

Verify Adequate Power (Total Link Loss Budget - Total System Attenuation)

Total Link Loss Budget		dB
Total System Attenuation		dB
System Performance Margin*		dB

* System Performance Margin must be greater than 0 dB in order for the system to operate using the specified electronics.