O.W.L. MANUFACTURER OF QUALITY OPTICAL FIBER TEST EQUIPMENT

OPTICAL WAVELENGTH LABORATORIES

ZOOM
Zeroed Output Optical Meter

Operations Manual
Version 1.0
June 13, 2002
OWL Part ZO-1

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GENERAL

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

The ZOOM (Zeroed Output Optical Meter) is a very economical option for measuring the optical power of both multi-mode and single mode fibers. NIST calibrated wavelengths include 850, 1300/1310, and 1550nm, and reference values used for optical loss readings are 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.

FUNCTIONAL DIAGRAM

Power Units LED

Indicates whether the units displayed are in dBm or dB

Power Indicator LED

Indicates the meter's power status, and also whether the battery power is sufficient to provide accurate readings

ON / OFF Switch

Toggles the meter between the OFF and ON state

Optical Power Display

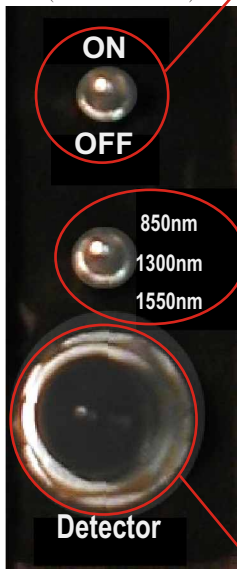
Displays power units in dBm or dB with a resolution of 0.1 dB

SET Button

Sets the reference for the selected wavelength, and also is used to toggle between dBm and dB

Front View

(Left side of meter)



(Right side of meter)

Top View

Wavelength Selector Switch

Toggles the meter between 850, 1300, and 1550nm

2.5mm Universal Port

Universal port supports standard 2.5mm connector types - ST, SC, and FC

OPERATION

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.

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:

$$\mathbf{L = P_a - P_r}$$

where **L** is the amount of optical loss in dB, $\mathbf{P_a}$ is the absolute power in dbm, and $\mathbf{P_r}$ is the reference 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.

Figure 1 - Optical Power Measurement

Optical Power Measurement Instructions - 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 the total power being transmitted through a fiber link.

Follow these steps below for each wavelength you are setting a reference for.
Step 1 - Connect the ZOOM to the fiber under test as shown in Figure 1. In this example, we are measuring the output power of a light source.
Step 2 - Power ON and set the light source to the wavelength you are measuring. Remember to allow the light source to warm up.
Step 3 - Power ON and set the wavelength selector switch on the ZOOM to the wavelength you are measuring. Make sure that the wavelength on the meter matches the wavelength on the light source.
Step 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 Instructions - The 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.

Follow these steps below for each wavelength you are setting a reference for.

Step 1 - Connect the ZOOM to a light source via a patch cord as shown in Figure 2. Notice the patch cord wrapped around a mandrel. This is required by popular testing standards on multi-mode patch cords 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.

Figure 2 - Setting an Optical Reference

Step 2 - Power ON and set the light source to the wavelength you are measuring. Remember to allow the light source to warm up.
Step 3 - Power ON and set the wavelength selector switch on the ZOOM to

the wavelength you are measuring. Make sure that the wavelength on the meter matches the wavelength on the light source.

Step 4 - Press and hold the SET Button for two seconds to "zero" the ZOOM (see Figure 3). The ZOOM will automatically switch to display optical power in dB, and should display approximately 0.00 dB. Press the SET button to switch back to dBm mode. Record the number on the display as your reference value.

Figure 3 - SET Button

Press and hold for 2 seconds to set reference.

Step 5 - Disconnect the patch cord from the ZOOM without disturbing the connection to the light source.

Step 6 - Have your testing partner take the light source to the other end of the fiber link, and have them connect it to a fiber under test.

Step 7 - Connect the ZOOM to a 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 these steps for each wavelength you are testing.

Remember, pressing the SET button easily switches the display between dBm and dB.

Step 7 - Connect the ZOOM to a 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 these steps for each wavelength you are testing.

Remember, pressing the SET button easily switches the display between dBm and dB.

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 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 ZOOM comes standard with a one-year factory war ranty, which covers manufacturer defect and workmanship only.

CONTACT INFORMATION

Address:
Optical Wavelength Laboratories
N9623 Hwy 12
Whitewater, WI 53190

Phone:
(262) 473-0643

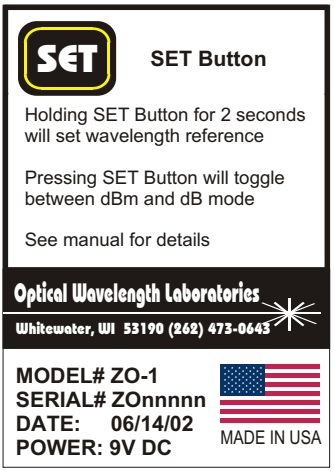
Web:
http://owl-inc.com

SPECIFICATIONS

Detector Type:	1mm Germanium
Calibrated Wavelengths:	850, 1300/1310, 1550nm
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 55° C
Storage Temperature	-30 to 70° C
Size:	2.75"W x 4.94"H x 1.28"D
Weight:	116g
Low Battery Indicator:	Yes
NIST Traceable:	Yes

SERIAL NUMBER INFORMATION

The serial number and model number can be found on the back of the unit.



Link Budget Calculation Worksheet

Operating Wavelength ____

Fiber Type ____

Passive Cable 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**
(Fiber Loss + Connector Loss + Splice Loss + Other Components)

Calculate Link Loss Budget

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

- Avg. 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.