

WaveSeries

Operations Guide

WaveTester Optical Power Meter

WaveSource Light Sources



Optical Wavelength Laboratories

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Before You Begin

All personnel testing optical fibers should be adequately trained in the field of fiber optics before using any fiber optic test equipment.

If the user is not completely familiar with testing fiber optics, they should seek competent training. Such training can be acquired from a variety of sources, such as local hands-on training classes.

Valuable information about fiber optic testing can also be gathered from reading printed literature carefully or by thoroughly reading supplied operations manuals.

Fiber optic testers vary from other types of test equipment due to issues such as:

- 1) standards-based testing
- 2) proper fiber optic test procedures (FOTPs)
- 3) "zeroing" or referencing of power levels
- 4) determining the correct link budget to pass or fail by

Complete understanding of each of these issues is critical for performing proper fiber optic tests.

1.0 GENERAL

Thank you for your purchase of an Optical Wavelength Labs (OWL) WaveSeries fiber optic test kit, which includes a WaveTester optical power meter and one or more WaveSource fiber optic light sources.

The WaveTester is a lightweight hand-held test instrument designed to measure optical power in both multi-mode and single mode optical fibers. Each WaveTester comes with a protective rubber boot, a CD with OWL Reporter certification software and PDF manual, DB-9 download cable, and 9-volt battery.

The WaveTester uses a 2.5mm universal connector port that can accept many popular connector types, including ST, SC, and FC, without the need for changing and maintaining expensive adapter caps. A 1.25mm universal cap is also included for 1.25mm connectors, such as LC, MU, and other SFF connectors.

The WaveTester is NIST-traceable, with calibrated wavelengths of 850, 1300, 1310, 1490, and 1550nm, making it ideal for LAN, premise, CATV, and telco applications.

The various models of the WaveSource contain stabilized multimode and single-mode sources designed for accurate optical power and loss measurements in fiber optic links. Each WaveSource comes with a protective rubber boot, CD-ROM based operations manual, and a 9-volt battery.

Most WaveSource light source models are available with ST, SC, or FC connectors. They can also contain sources with 850 and/or 1300 nm for multi-mode, 1310 and/or 1550 nm for single mode, and/or visual fault locators. Please see the section at the end of this guide for a complete list of WaveSource configurations.

WaveSource light sources offer two output modes: continuous wave (CW) and modulated. CW mode is used for stabilized fiber optic power and loss tests.

Modulated mode has two functions. First, modulated signals can be used for fiber identification with a clamp-on adapter.

Also, when used with the OWL WaveTester optical power meter, the modulated signal is used to tell the WaveTester which wavelength is being emitted. Each wavelength has a distinct modulation frequency. When the WaveTester receives a modulated signal, it automatically switches to the corresponding wavelength. This automated test method saves time, especially when testing high fiber count installations.

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

2.0 FUNCTIONAL DESCRIPTIONS



Figure 1 - WaveTester
Optical Power Meter

2.1.1 CONNECTIONS

1. Battery Charging Port - If rechargeable 9-volt batteries are used in the WaveTester, the battery charging port is used to recharge them when used with an approved wall transformer. **NOTE: DO NOT USE BATTERY CHARGING PORT WITH NON-RECHARGEABLE BATTERIES. THERE IS THE POTENTIAL FOR EXPLOSION AND DAMAGE MAY OCCUR TO THE UNIT AND/OR THE USER.** Optionally, this port can contain a precision-coupled visual fault locator (VFL) for an additional charge. A VFL can be used for far-end visual fiber identification or for visual fault location in the launch end connector and splice tray.

2. Download Port - The download port is used to download stored data into a PC via the supplied serial cable.

3. Detector Port - The detector port is a fixed 2.5mm universal port, and connects to ST, SC, or FC connectors equally well without any loss of accuracy. There is no need to change or maintain expensive adapter caps.

2.1.2 DISPLAY

4. Tone Mode - When 'Hz' is visible on the display, the WaveTester is checking for the presence of a modulated optical signal. These modulated signals are used to automatically switch wavelengths when they are sent by an OWL light source with modulation capability.

5. Power Reading - The power reading displays the level of optical power being received by the photodetector, and is displayed in either dBm, dB, milliwatts, or microwatts.

6. Battery Indicator - The battery indicator shows the amount of life is remaining in the battery. Also, when the battery recharger is in use, the bars in the battery icon are animated to show that the recharger is active.

7. Data Indicator - This icon shows whether there is data stored in the WaveTester.

8. Units Indicator - The units indicator shows which units are being currently displayed. Units are shown in either dBm, dB, uW, or mW.

9. Wavelength Indicator - The wavelength indicator shows the currently selected wavelength in nanometers (nm).

2.1.3 BUTTONS

10. SAVE / DOWNLOAD button - To store a data point, press this button. Hold the button to download data points in comma-delimited format. This button can also be used to erase all stored data if it is held while the meter is being powered ON.

11. ON / OFF / Backlight button - When the unit is off, press this button to power on. When the unit is on, press this button to toggle the backlight on and off. When the unit is on, hold this button to power off.

NOTE: if the WaveTester has the optional unit installed, press this button to alternate between backlight, continuous wave VFL, flashing VFL, and backlight off.

12. λ / AUTO button - Press this button to change wavelengths. Hold this button to set the meter in AUTO mode. AUTO mode scans incoming power for modulated optical signals, and switches wavelengths automatically when a corresponding modulated signal is received.

13. UNITS / ZERO button - Press this button to change display units - either dBm, dB, uW or mW. Holding this button will set a ZERO reference for the currently selected wavelength.

2.0 FUNCTIONAL DESCRIPTIONS

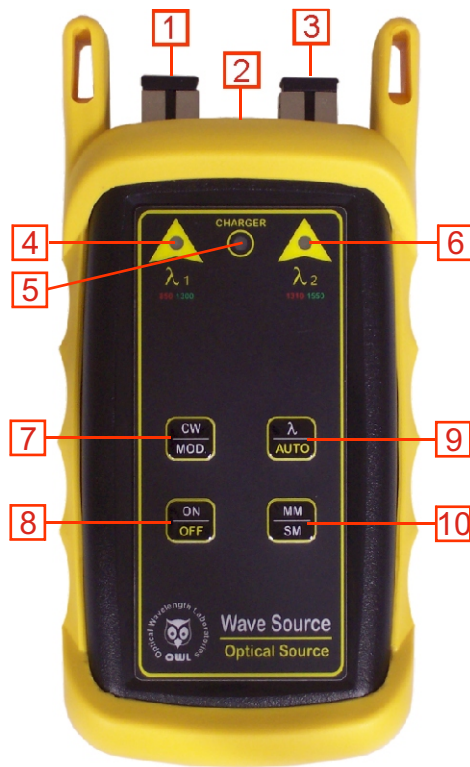


Figure 2 - WaveSource
Fiber Optic Light Source

2.2.1 CONNECTIONS

1. Optical connector (λ_1) - This port will typically be either a ST or SC connector, and can house a single- or dual-wavelength source. Other options are available. Please see the section at the end of this guide for a complete list of WaveSource configurations.

2. Battery charging port - If rechargeable 9-volt batteries are used in the WaveSource, the battery charging port is used to recharge them when used with an approved wall transformer. **NOTE: DO NOT USE BATTERY CHARGING PORT WITH NON-RECHARGEABLE BATTERIES. THERE IS THE POTENTIAL FOR EXPLOSION AND DAMAGE MAY OCCUR TO THE UNIT AND/OR THE USER.**

3. Optical connector (λ_2) - This port will typically be either a ST, SC, or FC connector, and can house a single- or dual-wavelength source. Other options are available. Please see the section at the end of this guide for a complete list of WaveSource configurations.

2.2.2 INDICATOR LEDS

4. Wavelength selection LED (λ_1) - This LED will either be **RED** or **GREEN** depending upon which wavelength is selected.

5. Battery charger LED - This LED will light up when the battery charging port is in use.

6. Wavelength selection LED (λ_2) - This LED will either be **RED** or **GREEN** depending upon which wavelength is selected.

2.2.3 BUTTONS

7. CW / MOD. button - Pressing this button will toggle the source between CW (continuous wave) and MOD. (modulated) mode.

8. ON / OFF button - Pressing this button while the source is off will power it on. Holding this button while the source is on will power it off.

9. λ / AUTO button - Pressing this button will toggle the unit between wavelengths in the selected port when there are two wavelengths in the same port. Holding this button will place the source into AUTO mode, where the source automatically switches wavelengths for automatic dual wavelength testing.

10. MM / SM button - Pressing this button will toggle the source between ports, usually MM (multimode) and SM (single-mode). Typically, λ_1 will be multimode and λ_2 will be single-mode; however, other options may be available. Please see the section at the end of this guide for a complete list of WaveSource configurations.

3.0 APPLICATIONS

3.1 PRECAUTIONS

3.1.1 Safety - Caution must be exercised when working with optical equipment. Most transmission equipment and light sources use light that is invisible to the human eye. High energy light is potentially dangerous, and can cause serious, irreparable damage to the eye. Thus, it is recommended to **NEVER** look into the connector port of a light source or the end of a fiber.

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

3.2 REQUIRED ACCESSORIES

3.2.1 Cleaning Supplies - It is recommended to clean fiber ferrules 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.

3.2.2 Patch Cords - Patch cords may be needed to connect the WaveTester to the system under test. The connector styles on the patch cord must match the type on the WaveTester and the type of the system under test. **NOTE: do NOT insert APC (Angled Physical Contact) connectors into the optical ports on the WaveSource as this may damage the light source inside the ports.**

3.2.3 Optical Fiber Adapters - Optical fiber adapters are used to connect two connectorized fibers together, and may be necessary to adapt your patch cords to the system under test.

3.3 TYPICAL APPLICATIONS

WaveSeries test kits can be used as diagnostic and measurement tools of optical transmission systems and fiber optic links. These applications can be found in several industries, including premise, LAN, CATV, and Telco.

Two types of measurements are available with WaveSeries fiber optic test kits: optical power and optical loss.

3.3.1 Optical Power Measurement - When displaying power in dBm mode, the WaveTester will measure the absolute amount of power being received in the 2.5mm Universal detector port. Absolute power is shown in dBm (decibels referenced to a milliwatt), meaning the power being received by the photodetector is compared to 1 milliwatt of optical energy. Optical power measurement is useful for checking the output power and/or stability of an optical transmission system or stabilized fiber optic light sources.

3.3.2 Optical Loss Measurement - When displaying power in dB mode, WaveSeries test kits can be used to measure the optical power through a fiber optic link relative to an optical reference point. Setting a reference point is also known as “zeroing” the meter with a light source. Optical loss measurements are useful for measuring the attenuation, or loss, of a fiber link. The loss value can then be compared to a pre-calculated link budget, which is used to determine if the fiber link will operate within the parameters of the transmission equipment.

The formula for calculating loss in a fiber link is:

$$L = P_a - P_r$$

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

Optical loss measurements can also be used for fiber optic link certification. Link certification is a process where optical loss measurements are compared to a link budget calculated using fiber optic cabling standards.

Data stored in the WaveTester can be downloaded into OWL Reporter certification report software. Fiber optic links can be certified against one of several popular fiber optic cabling standards or one of two user-configurable standards. Many fiber optic installation bids are requiring certification reports, which makes WaveSeries test kits an invaluable tool for fiber optic professionals.

3.4 OPTICAL POWER MEASUREMENT

a) Connect the WaveTester to the equipment under test (EUT). In the example below, the EUT is a WaveSource fiber optic light source.

NOTE: do NOT insert APC (Angled Physical Contact) connectors into the optical ports on the WaveSource as this may damage the light source inside the ports.

b) Power on the EUT, set it to the desired wavelength, and allow it to stabilize.

c) Power on the WaveTester, and set it to match the wavelength of the EUT.

d) Set the units to dBm. The resultant reading is the output power. (The example in Figure 3 shows an optical output power of -20.28 dBm).

This reading should be within the light source manufacturer's specified power level. If the reading is not within the specification, clean and check the connections and take another measurement.



Figure 3 - Optical Power Measurement

3.5 OPTICAL LOSS MEASUREMENT (SET REFERENCE)

Two patch cords are required for this procedure - one for the meter side and one for the light source side.

There are three methods to set a reference with WaveSeries test kits: Dual Wavelength, Auto Wavelength, and Manual.

3.5.1 - Dual Wavelength Method

NOTE: Dual Wavelength Method can only be used if the WaveSource ports are dual wavelength.

- a) Connect the WaveTester to the WaveSource using the first patch cord. **NOTE: do NOT insert APC (Angled Physical Contact) connectors into the optical ports on the WaveSource as this may damage the light source inside the ports.**
- b) Power on the WaveSource and allow it to stabilize.
- c) Power on the WaveTester, and set it to match the current wavelength of the WaveSource.
- d) Check to make sure the power level displayed on the WaveTester is approximately equal to the calibrated power level of the WaveSource. If it is good, then remove it from the WaveTester and WaveSource and set it aside. This will be the patch cord for the meter side.
- e) Connect the other patch cord to the WaveTester and WaveSource as shown in Figure 4. The example shows a reference setting procedure for multimode light sources. Notice the insertion of the mandrel. Mandrels are used to achieve EMD (Equilibrium Mode Distribution) when setting the reference from a multimode light source. EMD is achieved by wrapping the reference patch cord around the mandrel 5-7 times. Single-mode sources do not require a mandrel.
- f) Press and hold the λ / AUTO button on the WaveSource to set it to automatic mode. Notice the indicator LED begin to alternate flashing green then red. Each color signifies a distinct wavelength in the connector port. When the LED is flashing, it is sending a signal to the WaveTester telling it which wavelength it is emitting. When the LED is solid, it is sending stabilized power to the WaveTester.
- g) Press and hold the λ / AUTO button on the WaveTester to set it to automatic mode. Notice that the wavelength display will alternate in synch with the two wavelengths being sent by the WaveSource. Also notice a 'Hz' icon appear periodically in the upper left of the display. This means that the WaveTester is receiving a signal from the light source telling it to change wavelengths.

When the 'Hz' icon is not displayed, the WaveTester is taking an optical measurement.

- h) Both units are now in automatic mode. Press and hold the UNITS / ZERO button on the WaveTester. This will set the reference for both wavelengths. The display will switch to show dB units, and should show approximately 0.00 dB for each wavelength when the 'Hz' icon is not displayed. The WaveTester is now 'zeroed', and is ready to test fiber links.

NOTE: DO NOT REMOVE THE PATCH CORD FROM THE LIGHT SOURCE, AS THIS WILL MAKE THE OPTICAL REFERENCE INVALID.



3.5.2 - Auto Wavelength Method

NOTE: Auto Wavelength Method is the same as Dual Wavelength Method, except that the light source wavelength is manually changed.

- a) Connect the WaveTester to the WaveSource using the first patch cord.
- b) Power on the WaveSource and allow it to stabilize.
- c) Power on the WaveTester, and set it to match the current wavelength of the WaveSource.
- d) Check to make sure the power level displayed on the WaveTester is approximately equal to the calibrated power level of the WaveSource. If it is good, then remove it from the WaveTester and WaveSource and set it aside. This will be the patch cord for the meter side.
- e) Connect the other patch cord to the WaveTester and WaveSource as shown in Figure 4. The example shows a reference setting procedure for multimode light sources. Notice the insertion of a mandrel. Mandrels are used to achieve EMD (Equilibrium Mode Distribution) when setting the reference from a multimode light source. EMD is achieved by wrapping the reference patch cord around the mandrel 5-7 times. Single-mode sources do not require a mandrel.

NOTE: do NOT insert APC (Angled Physical Contact) connectors into the optical ports on the WaveSource as this may damage the light source inside the ports.

- f) Press and hold the λ / AUTO button on the WaveTester to set it to automatic mode. Notice the 'Hz' icon appear periodically in the upper left of the display. This means that the WaveTester is receiving a signal from the light source telling the WaveTester to set to a certain wavelength.
- g) Press the λ / AUTO button on the WaveSource to set it to the appropriate wavelength. The indicator LED will flash, then turn solid. When the LED is flashing, it is sending a signal to the WaveTester telling it which wavelength it is emitting. When the LED is solid, it is sending stabilized power to the WaveTester.
- h) Press and hold the UNITS / ZERO button on the WaveTester. This will set the reference for the currently selected wavelength. The display will switch to show dB units, and should show approximately 0.00 dB.

If there is a second wavelength to 'zero', repeat steps g and h. The indicator LED will change colors for the second wavelength.

The WaveTester is now 'zeroed', and is ready to test fiber links.

NOTE: DO NOT REMOVE THE PATCH CORD FROM THE LIGHT SOURCE, AS THIS WILL MAKE THE OPTICAL REFERENCE INVALID.

3.5.3 - Manual Method

NOTE: Manual Method requires manual operation on both the WaveTester and WaveSource.

- a) Connect the WaveTester to the WaveSource using the first patch cord.
- b) Power on the WaveSource and allow it to stabilize.
- c) Power on the WaveTester, and set it to match the current wavelength of the WaveSource.
- d) Check to make sure the power level displayed on the WaveTester is approximately equal to the calibrated power level of the WaveSource. If it is good, then remove it from the WaveTester and WaveSource and set it aside. This will be the patch cord for the meter side.
- e) Connect the other patch cord to the WaveTester and WaveSource as shown in Figure 4. The example shows a reference setting procedure for multimode light sources. Notice the insertion of a mandrel. Mandrels are used to achieve EMD (Equilibrium Mode Distribution) when setting the reference from a multimode light source. EMD is achieved by wrapping the reference patch cord around the mandrel 5-7 times. Single-mode sources do not require a mandrel.

NOTE: do NOT insert APC (Angled Physical Contact) connectors into the optical ports on the WaveSource as this may damage the light source inside the ports.

- f) Press the λ / AUTO button on the WaveTester to set it to the desired wavelength.
- g) Press the λ / AUTO button on the WaveSource to set it to match the wavelength on the WaveTester. The indicator LED will flash, then turn solid. When the LED stops flashing, it is sending stabilized power to the WaveTester, and is ready to be zeroed.
- h) Press and hold the UNITS / ZERO button on the WaveTester. This will set the reference for the currently selected wavelength. The display will switch to show dB units, and should show approximately 0.00 dB.

If there is a second wavelength to 'zero', repeat steps f through h. The indicator LED will change colors for the second wavelength.

The WaveTester is now 'zeroed', and is ready to test fiber links.

NOTE: DO NOT REMOVE THE PATCH CORD FROM THE LIGHT SOURCE, AS THIS WILL MAKE THE OPTICAL REFERENCE INVALID.

3.6 OPTICAL LOSS MEASUREMENT

- a) Leaving the patch cord attached to the WaveSource, remove the patch cord from the WaveTester optical power meter.
- b) Connect the WaveTester and WaveSource to opposite ends of the link under test.
- c) The WaveTester will show the amount of loss in the link (in dB). Figure 5 shows a power level of -2.45 dB. This means that the optical power being received by the meter is 2.45 dB below the optical reference, which is the same as saying there is 2.45 dB of optical loss in the link.

Optical loss measurements are compared to a pre-calculated link budget. If the optical loss does not exceed the link budget calculation, the link will perform as installed within the specifications shown on the link budget.

The following section will explain how to store data in the WaveTester.

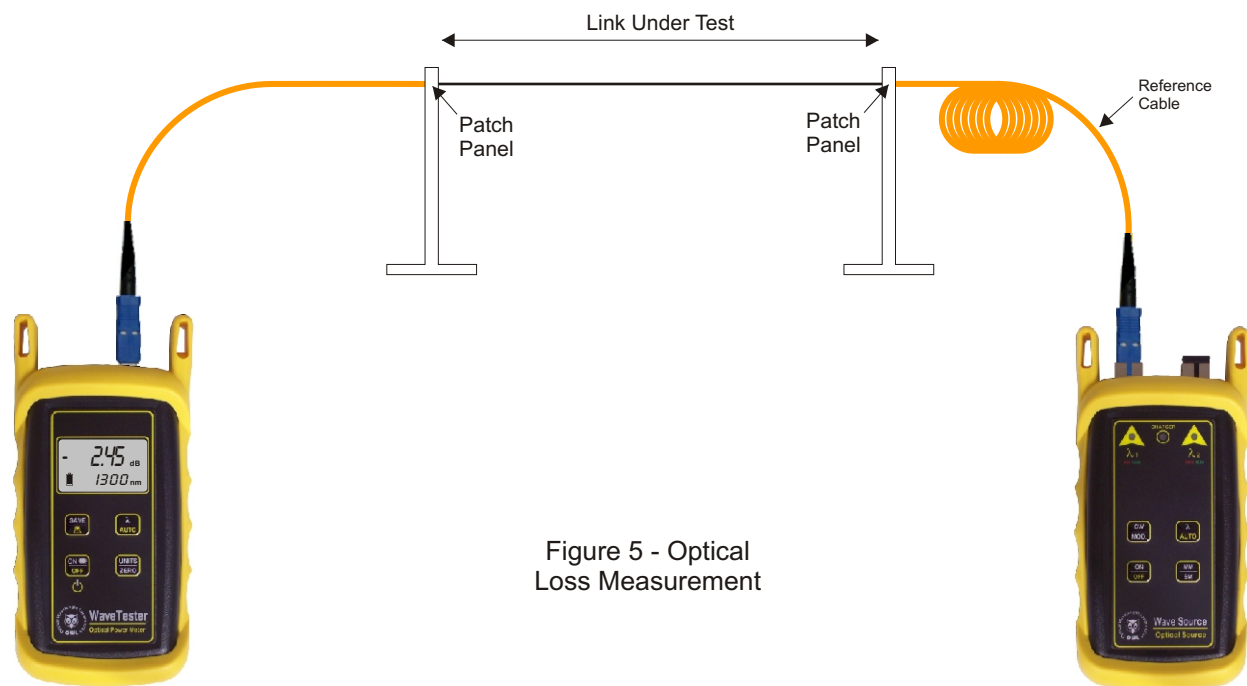



Figure 5 - Optical Loss Measurement

3.7 DATA STORAGE

When the WaveTester and WaveSource are in automatic mode, simultaneous dual-wavelength test can be performed, and the power readings can be stored automatically.

- Ensure that the WaveTester and WaveSource are in automatic mode (see steps f and g in the SET REFERENCE section).
- Connect each unit to opposite ends of the link under test.
- Press the SAVE / DOWNLOAD button. The WaveTester will store a data point for each wavelength, and will briefly show the number of data points currently stored in place of the wavelength. The presence of the data storage icon () shows that there is data stored in the meter. From time to time, an error code may appear. These error codes and descriptions are located later in this manual.
- Connect the units to the next fiber in the link, and repeat step c. Notice the number of data points will increment by 2 (one data point per wavelength).

NOTE: the WaveTester can store up to 200 data points. It is highly recommended to download the stored data periodically using OWL Reporter software.

3.8 DOWNLOADING DATA INTO A PC WITH OWL REPORTER

Once testing is complete or the WaveTester's memory is full, the stored data points may be downloaded to a PC running OWL Reporter software.

A Pentium PC (or better) running Windows 95 or later operating system is required for OWL Reporter. Please use the included CD to install the software. Insert the CD to begin the installation. Follow the on-screen steps to install. Once OWL Reporter is installed on the PC, it is ready to download the data points from the WaveTester.

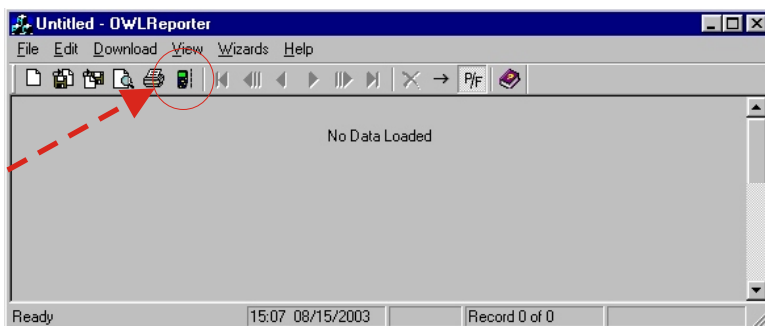
Connect the WaveTester to the PC COM port via the supplied download cable.

First, prepare the WaveTester for download to PC. Follow the steps below:



With the WaveTester powered ON, run OWL Reporter. The shortcut is located in the Start Menu, under Programs, OWL, and is named OWL Reporter. There may also be a shortcut on the desktop.

Begin the data download by pressing the download button which is highlighted on the screen shot at the right. The software automatically downloads all that is stored in the meter. First, the software searches for the meter, then it transfers the data, then gives a confirmation of download success.

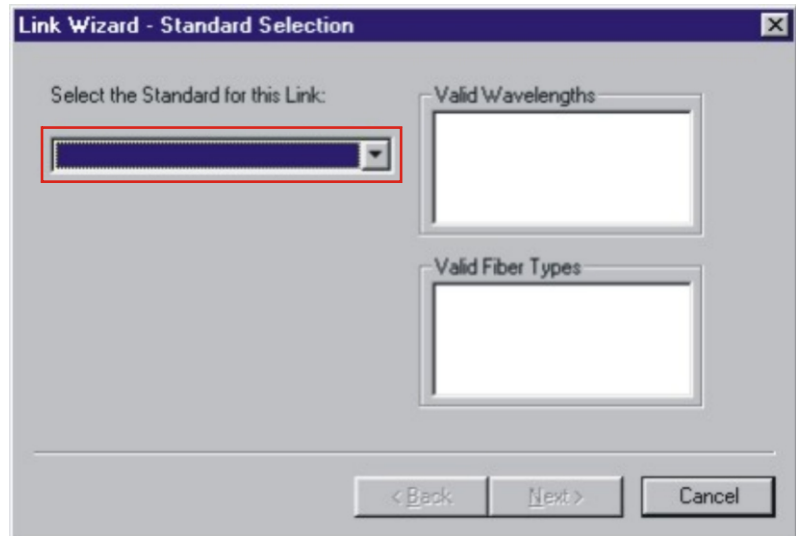


If the download fails, communications cannot continue and no data will download into the PC. Check the cable connections, test the current COM port, and/or try a different COM port or try a different PC.

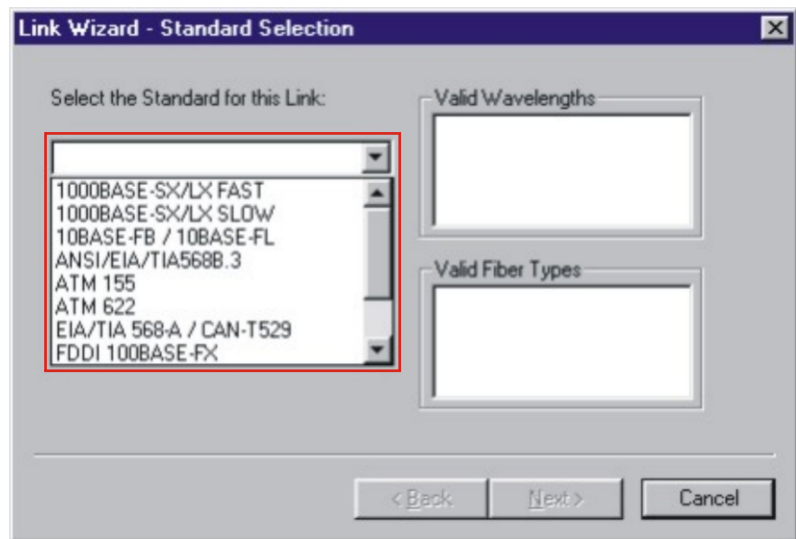
The following pages explain the steps of the Link Wizard in OWL Reporter. This will allow certification of fiber links using a fiber cabling standard.

3.8.1 - Standard Selection

3.8.1.1 - View the list of cabling standards. The list will appear when you click the down arrow.

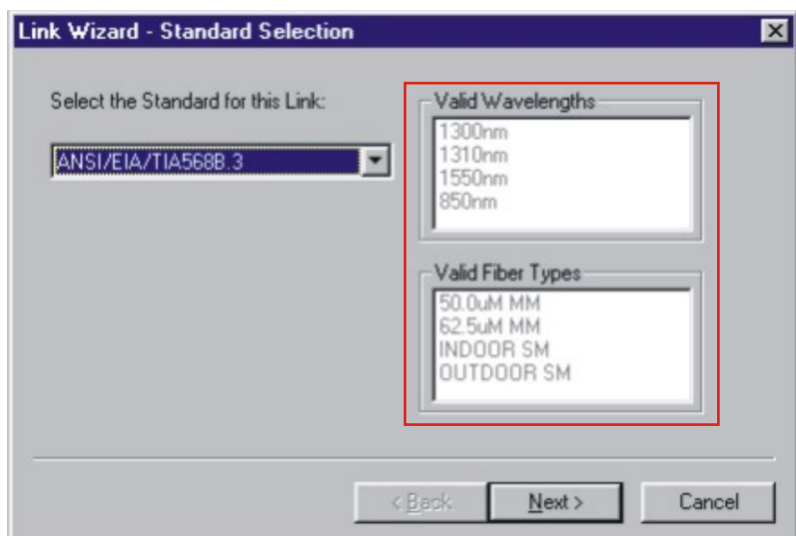


3.8.1.2 - Select the cabling standard from the drop-down list.



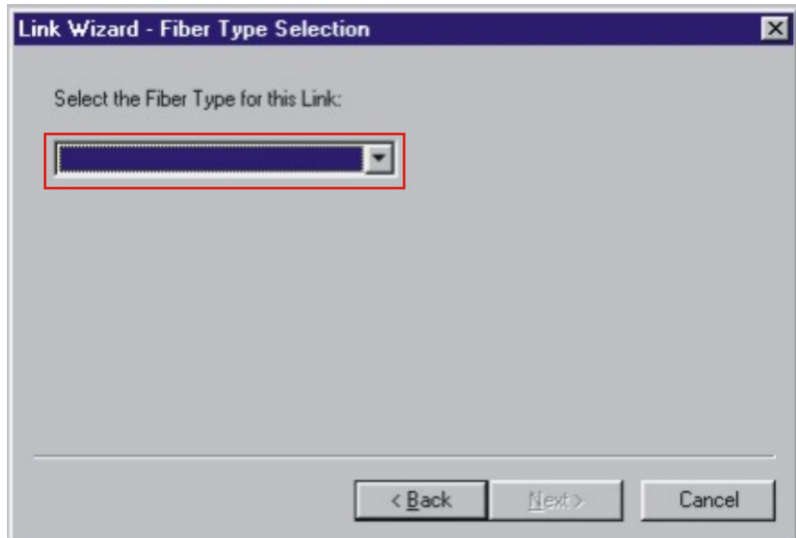
3.8.1.3 - Once the the cabling standard has been chosen, the wavelengths and fiber types that the standard supports appear in the boxes on the right.

Click Next to continue.

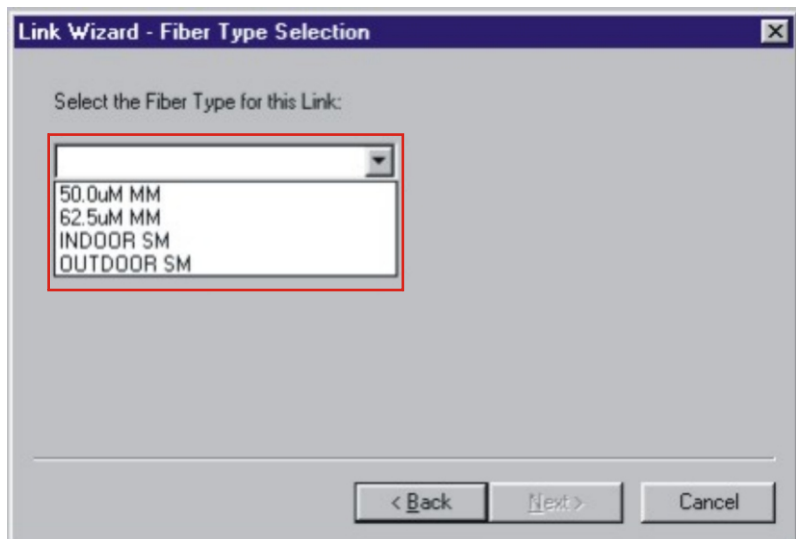


3.8.2 - Fiber Type Selection

3.8.2.1 - View the list of available fiber types. The list will appear when the down arrow is clicked.

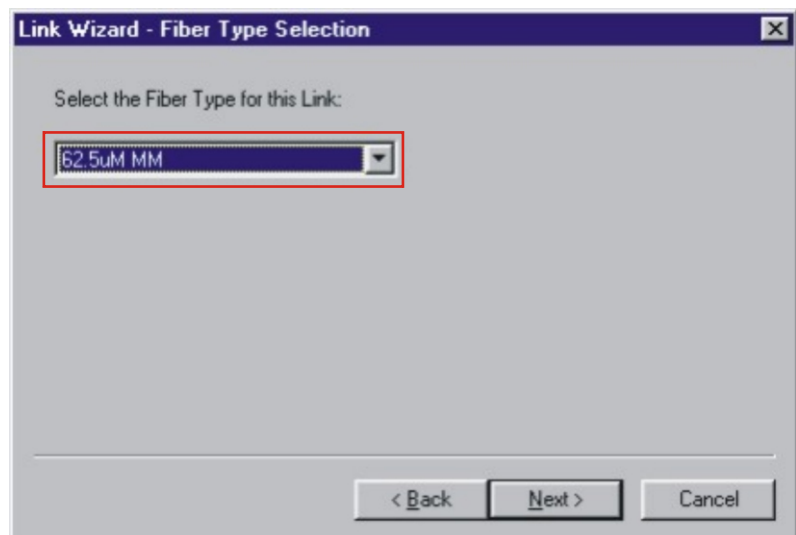


3.8.2.2 - Select the fiber type from the list. The selected fiber type should match the type of fiber of the link under test.



3.8.2.3 - Once the fiber type has been chosen, it appears in the drop-down box.

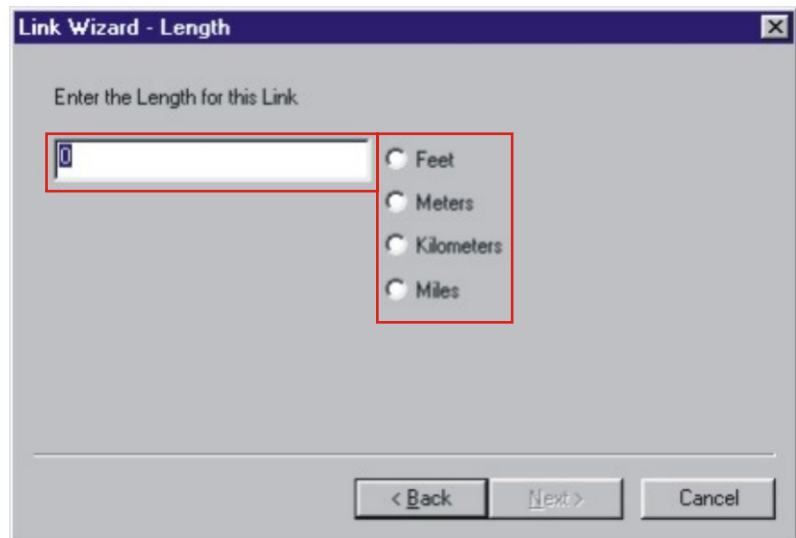
Click Next to continue.



3.8.3 - Fiber Length Input

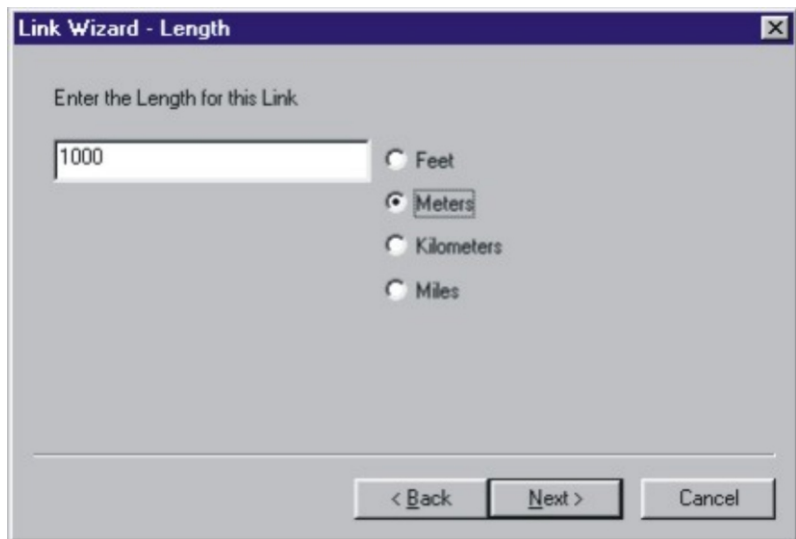
3.8.3.1 - Enter the length of the fiber link under test. This length will apply to all of the data points downloaded from the WaveTester.

Type the length in the input box, and select the length units at the right.



The dialog box is titled "Link Wizard - Length". It contains the instruction "Enter the Length for this Link". Below this, there is a text input field containing the number "0". To the right of the input field are four radio button options: "Feet", "Meters", "Kilometers", and "Miles". The "Feet" option is selected. At the bottom of the dialog box are three buttons: "< Back", "Next >", and "Cancel".

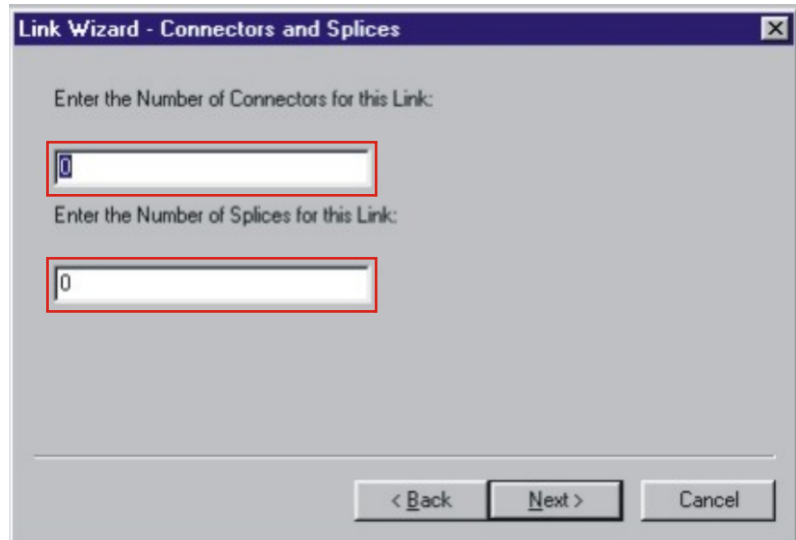
3.8.3.2 - Once the fiber link length and the length units are entered, click Next to continue.



The dialog box is titled "Link Wizard - Length". It contains the instruction "Enter the Length for this Link". Below this, the text input field now contains the number "1000". The radio button options are the same, but now the "Meters" option is selected. The "Next >" button is highlighted, indicating it is the next step in the process.

3.8.4 - Connectors and Splices Input

3.8.4.1 - If there are any connections or splices in the link, enter them into the input boxes.



Link Wizard - Connectors and Splices

Enter the Number of Connectors for this Link:

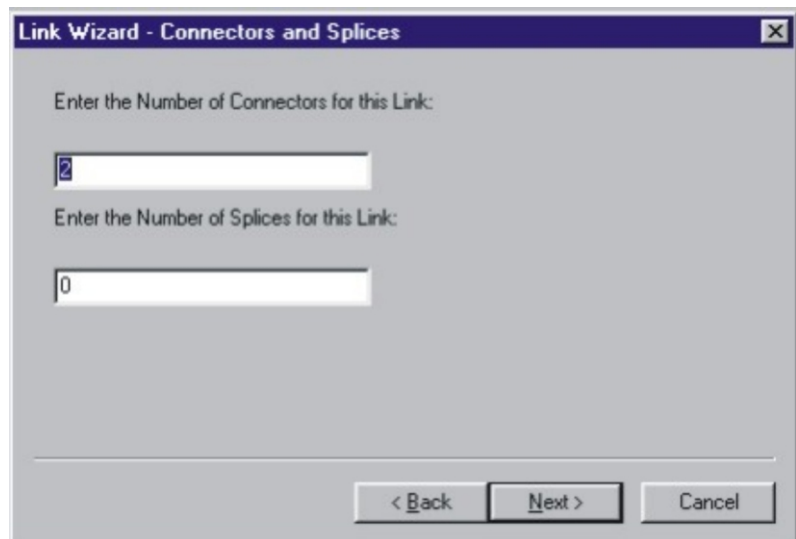
0

Enter the Number of Splices for this Link:

0

< Back Next > Cancel

3.8.4.2 - Once the number of connections and splices have been entered, click Next to continue.



Link Wizard - Connectors and Splices

Enter the Number of Connectors for this Link:

2

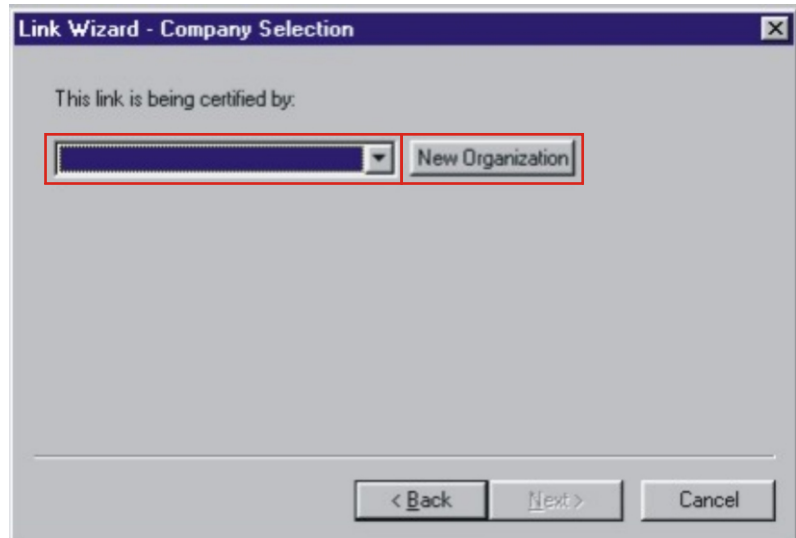
Enter the Number of Splices for this Link:

0

< Back Next > Cancel

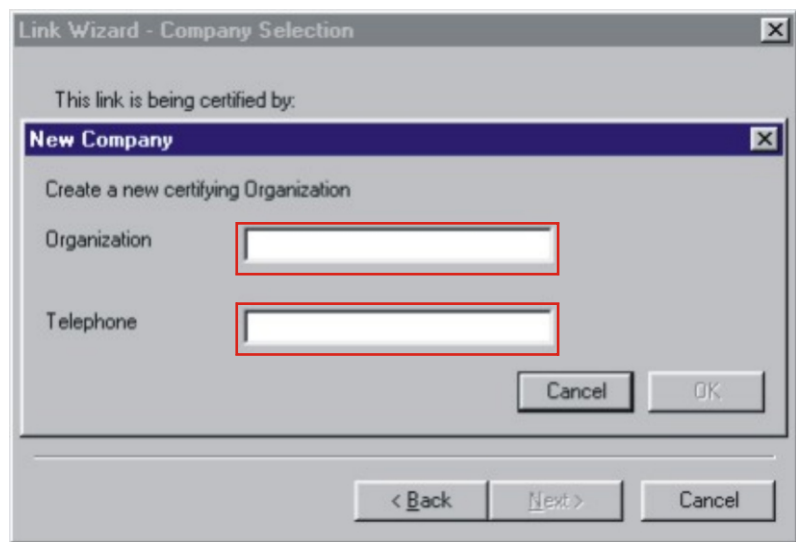
3.8.5 - Company Selection

3.8.5.1 - Select the company name from the drop-down list. If it is not listed, click the New Organization button.



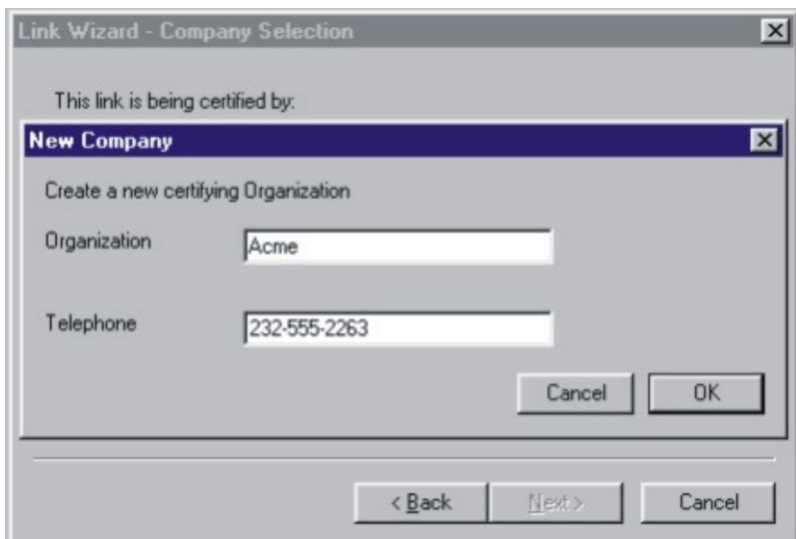
The dialog box is titled "Link Wizard - Company Selection". It contains the text "This link is being certified by:". Below this text is a drop-down menu and a button labeled "New Organization". Both the drop-down menu and the "New Organization" button are highlighted with red rectangles. At the bottom of the dialog box are three buttons: "< Back", "Next >", and "Cancel".

3.8.5.2 - Type in the organization's name and telephone number into the input boxes.



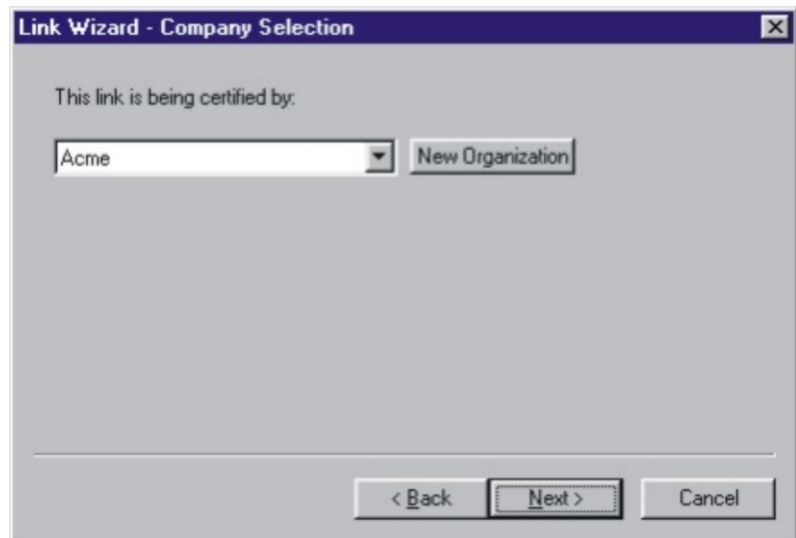
The dialog box is titled "Link Wizard - Company Selection". It contains the text "This link is being certified by:". Below this text is a sub-dialog box titled "New Company". The sub-dialog box contains the text "Create a new certifying Organization". Below this text are two input fields: "Organization" and "Telephone". Both input fields are highlighted with red rectangles. To the right of the input fields are two buttons: "Cancel" and "OK". At the bottom of the main dialog box are three buttons: "< Back", "Next >", and "Cancel".

3.8.5.3 - Once the organization's name and telephone number have been entered, click OK to continue.



The dialog box is titled "Link Wizard - Company Selection". It contains the text "This link is being certified by:". Below this text is a sub-dialog box titled "New Company". The sub-dialog box contains the text "Create a new certifying Organization". Below this text are two input fields: "Organization" and "Telephone". The "Organization" field contains the text "Acme" and the "Telephone" field contains the text "232-555-2263". To the right of the input fields are two buttons: "Cancel" and "OK". At the bottom of the main dialog box are three buttons: "< Back", "Next >", and "Cancel".

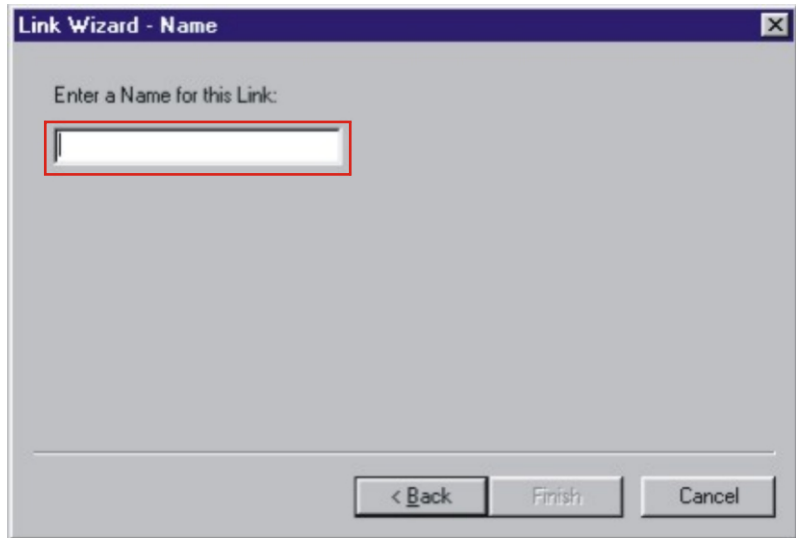
3.8.5.4 - The organization name should now appear in the drop-down box. Click Next to continue.



The image shows a Windows-style dialog box titled "Link Wizard - Company Selection". The dialog has a light gray background and a dark blue title bar with a close button (X) in the top right corner. The main text inside the dialog reads "This link is being certified by:". Below this text, there is a horizontal line. Under the line, on the left, is a drop-down menu with the word "Acme" selected. To the right of the drop-down menu is a button labeled "New Organization". At the bottom of the dialog, there are three buttons: "< Back", "Next >", and "Cancel". The "Next >" button is highlighted with a black border.

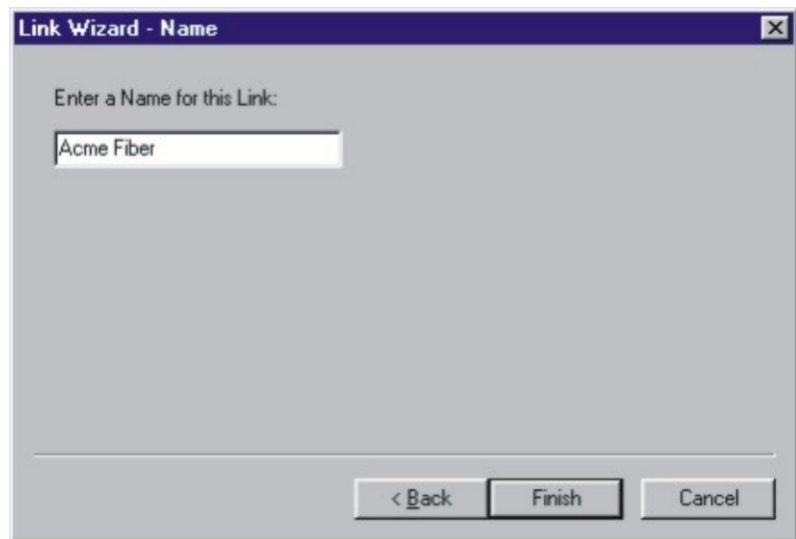
3.8.6 - Name Input

3.8.6.1 - Enter a descriptive name for the link into the input box.



The image shows a Windows-style dialog box titled "Link Wizard - Name". Inside the dialog, the text "Enter a Name for this Link:" is displayed above a text input field. The input field is currently empty and is highlighted with a red rectangular border. At the bottom of the dialog, there are three buttons: "< Back", "Finish", and "Cancel".

3.8.6.2 - Once the link name has been entered, click Finish to continue.



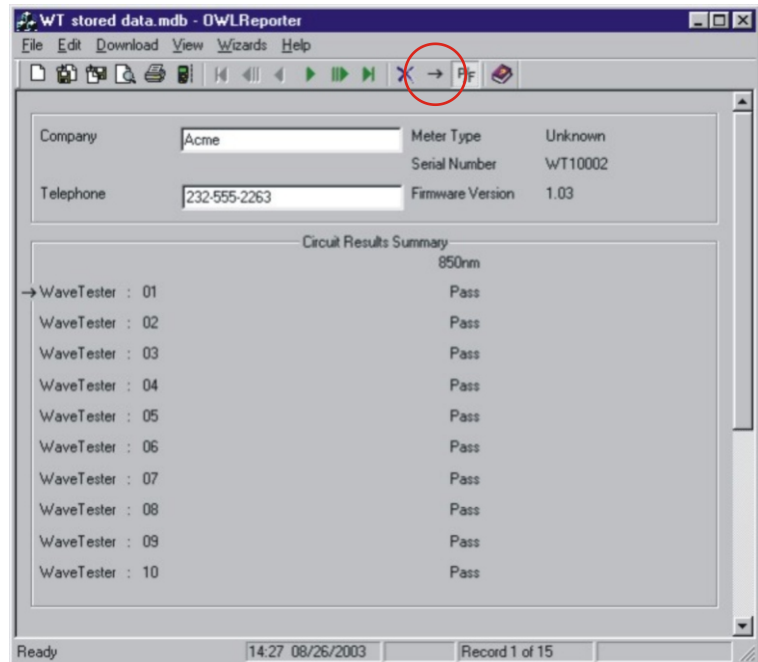
The image shows the same "Link Wizard - Name" dialog box. The text "Enter a Name for this Link:" is still present. The text input field now contains the text "Acme Fiber". The "Finish" button at the bottom is highlighted with a black border, indicating it is the next step in the process. The "< Back" and "Cancel" buttons remain visible.

3.8.7 - Summary View

By default, OWL Reporter opens up into Detail View. However, Summary view may be more useful for fiber loss test evaluation.

To switch between Summary View and Detail View, press the button that looks like an arrow, highlighted at the right. After you press this button, the view will change to look like the screen shot at the right.

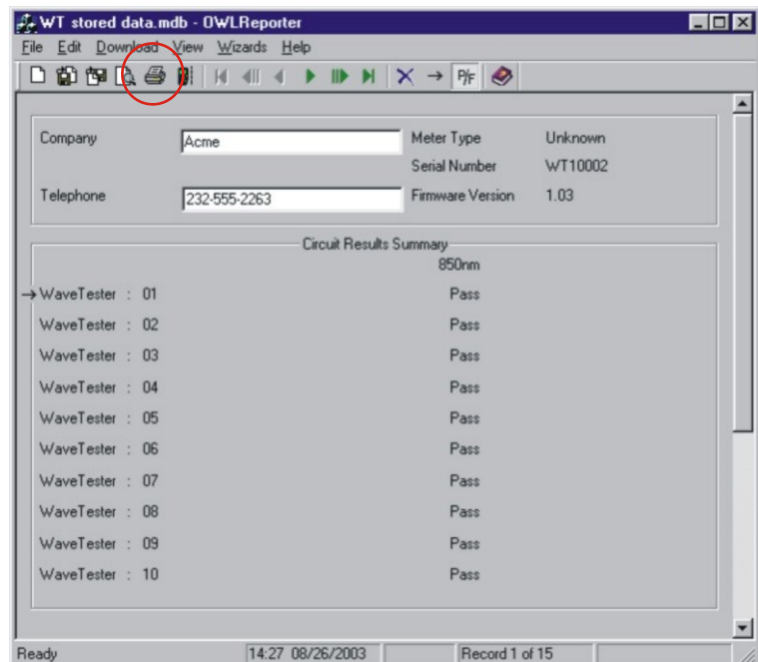
This screen shows the Link ID, each stored data point, and whether the test passed or failed.



3.8.8 - Report Printing

To print the current view to a PC printer, press the print button highlighted at right to print the Summary report.

The printed report will look very much like the screen. See an example report on the next page.



3.8.9 - Example Printout

Below is an example of the Circuit Summary Report. Below are descriptions of the columns:

Circuit ID - this is the name of the fiber that was tested

P/F - shows whether the test passed or failed

850nm - shows the amount by which the test passed or failed by at the wavelength tested

Circuit Summary Report
Optical Wavelength Laboratories

Link ID: WaveTester Page: 1
Company Name: Acme Report Date: 08/26/2003
Telephone Number: 232-555-2263

Circuit ID	Date	P/F	850nm
01	08/22/2003	Pass	1.47dB
02	08/22/2003	Pass	4.45dB
03	08/22/2003	Pass	2.67dB
04	08/22/2003	Pass	5.10dB
05	08/22/2003	Pass	3.53dB
06	08/22/2003	Pass	5.61dB
07	08/22/2003	Pass	4.49dB
08	08/22/2003	Pass	4.98dB
09	08/22/2003	Pass	3.17dB
10	08/22/2003	Pass	1.74dB
11	08/22/2003	Pass	5.28dB
12	08/22/2003	Pass	2.51dB
13	08/22/2003	Pass	4.50dB
14	08/22/2003	Pass	3.19dB
15	08/22/2003	Pass	1.20dB

*1 - Manually set reference *2 - Fiber type mismatch *3 - Not covered by TIA standard

Installer/Tester: _____ Date: _____
Customer: _____ Date: _____

NOTE: if you are interested in creating a PDF file of your printouts, there is a shareware program called PDF995 that installs a PDF printer onto your system. Print the file as normal, and save the PDF file to the folder of your choice. See <http://pdf995.com> for more information.

3.9 - CLEARING DATA

After data has been downloaded to the PC with OWL Reporter, it is recommended to save the data to a file, and clear the memory from the WaveTester.

To clear data from the WaveTester, press and hold the SAVE / DOWNLOAD button while the WaveTester is powered ON. The  icon will disappear from the display when the data has been successfully erased.

3.10 INTERPRETING OWL REPORTER SCREENS AND REPORTS

The following list of terms appear on the OWL Reporter software screen and/or printed report.

- Connector Loss
- Fiber Loss
- Light Source Reference Power
- Measured Power
- Operating Margin (%)
- Optical Loss
- Pass/Fail
- Splice Loss
- System Overhead
- System Reference Power
- Total Allowable System Loss

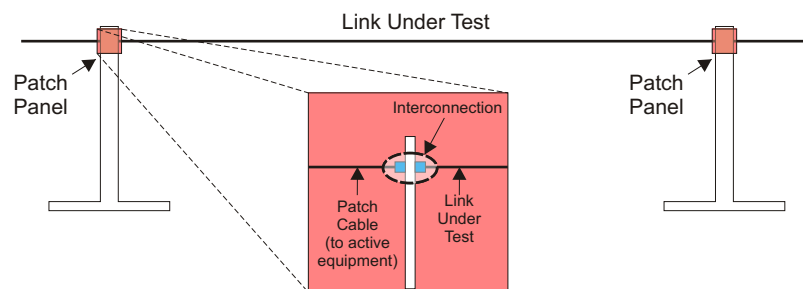
Descriptions for each of these terms are listed on the following pages.

Connector Loss

Definition: during the calculation of an optical loss budget, the amount of optical loss attributed to interconnections in the link under test. An interconnection is the junction between two fiber connectors; e.g. the ports on a patch panel or a fiber optic adapter. Connector loss is specified by cabling standards that base link budget calculation on the passive components of the link under test; examples of this type of standard are the TIA-568 and the ISO IEC 11801.

Units: dB per connection

Calculation: (Number of interconnections) x (dB loss per connection)

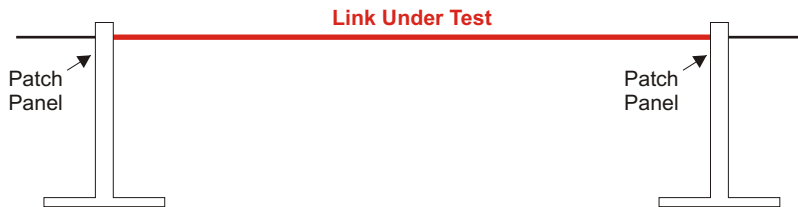


Fiber Loss

Definition: during the calculation of an optical loss budget, the amount of optical loss attributed to the optical fiber in the link under test. Fiber loss is specified by cabling standards that base link budget calculation on the passive components of the link under test; examples of this type of standard are the TIA-568 and the ISO IEC 11801.

Units: dB per kilometer; loss values are different for different wavelengths and different fiber types

Calculation: (fiber length in kilometers) x (dB loss per kilometer)



Light Source Reference Power

Definition: the amount of absolute optical power being received directly from the light source by the power meter during the setting of the optical reference. Light Source Reference Power is used as a reference, or starting point, on which a standards-based optical reference is set.

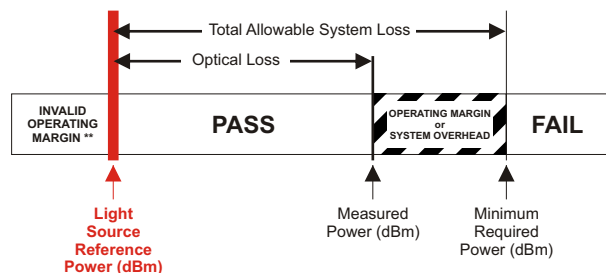
Units: dBm

Calculation: none; Light Source Reference Power is measured via a single patch cord of the appropriate type.



NOTE: testing standards require multimode reference cables to be wrapped around a device called a mandrel, which is used to filter high-order modes and achieve EMD, or Equilibrium Mode Distribution (shown here).

Singlemode test jumpers do NOT require this mandrel.

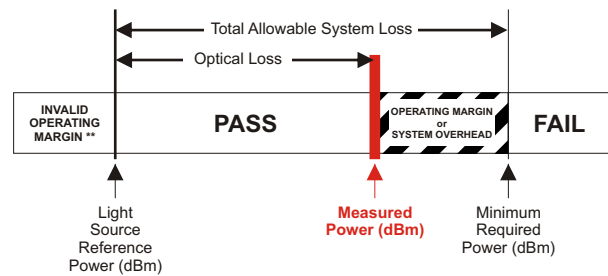
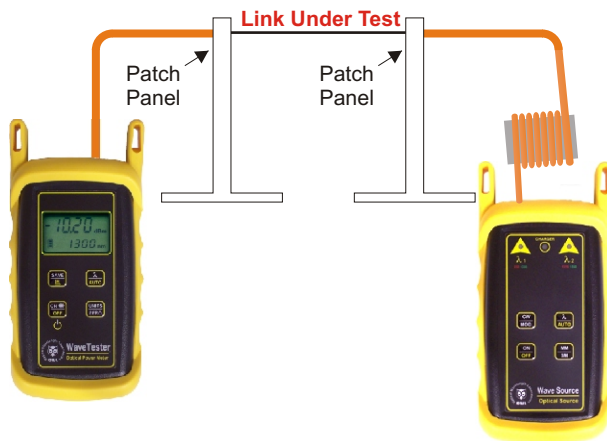


Measured Power

Definition: the amount of absolute optical power being received from the light source by the power meter after they have been connected to the link under test. Measured Power is compared to the System Reference Power for Pass/Fail analysis; if Measured Power is greater than the System Reference Power, the link passes; likewise if Measured Power is less than the System Reference Power, the link fails.

Units: dBm

Calculation: none

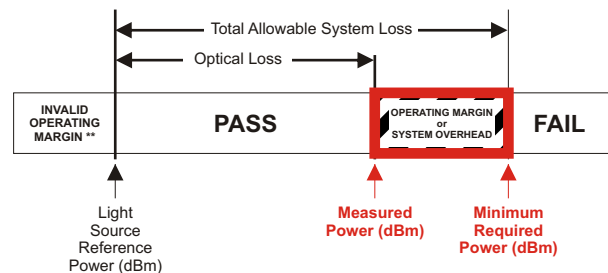


Operating Margin % (only appears on printed circuit detail reports)

Definition: the difference between the Measured Power and the System Reference Power, also known as headroom, expressed as a percentage.

Units: percentage (%)

Calculation: none

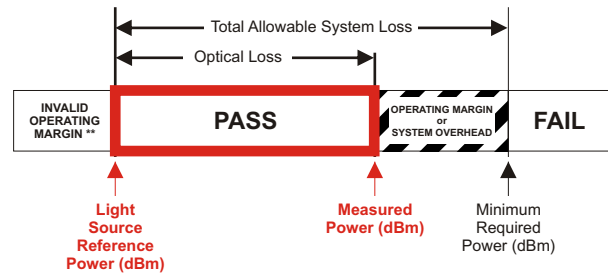


Optical Loss

Definition: the amount of optical power that is lost through the link under test due to the attenuation of the passive components of the link (i.e. optical fiber, interconnections, and splices).

Units: dB

Calculation: (Light Source Reference Power) - (Measured Power)

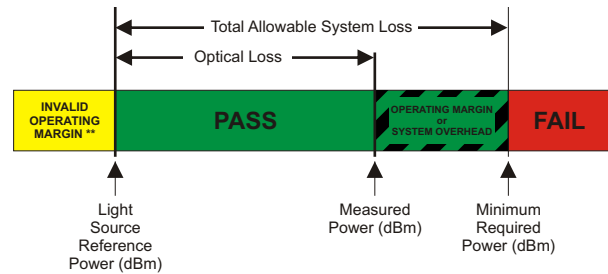


Pass/Fail

Definition: the rating a link receives when its Measured Power is compared to its System Reference Power, based upon the attenuation parameters or loss values specified by cabling standards. A link passes when Measured Power is greater than the System Reference Power. A link fails when Measured Power is less than the System Reference Power.

Units: N/A

Calculation: N/A



** If the Measured Power is greater than the Light Source Reference Power, then the circuit will receive an Invalid Operating Margin error, indicating an invalid test condition. Circuit test results receiving this error should be considered as a FAIL.

In other words, more light is received through the whole link from end to end than was received through the single reference patch cable. This is physically impossible since this would indicate GAIN in the system rather than LOSS.

This condition usually occurs when the reference was set up incorrectly. The correct sequence of steps to set a reference follow:

- 1) MULTIMODE ONLY - wrap the reference cable seven (7) times around a 0.7" mandrel (0.7" for 62.5um, and 0.9" for 50um) and secure.
- 2) Connect the ends of the reference cable to the power meter detector port and the appropriate light source port.
- 3) Power ON and set the units to the same wavelength.
- 4) Set the reference (or "ZERO") in the power meter using the procedure in the operations guide.

The most important part of certification testing is to ensure that the integrity of the reference (or "ZERO") is maintained. Two factors to keep in mind are:

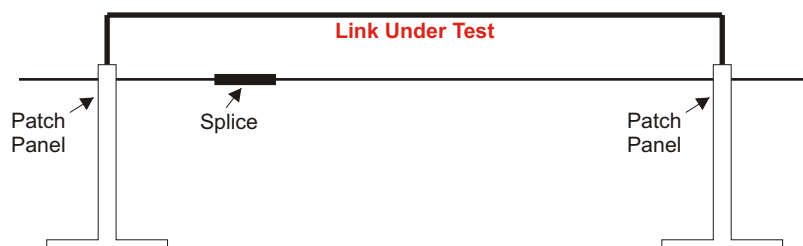
- Do NOT remove the patch cord from the light source port until all tests have been completed
- MULTIMODE ONLY - do NOT allow the patch cord to unwrap from the mandrel

Splice Loss

Definition: during the calculation of an optical loss budget, the amount of optical loss attributed to splices in the link under test. Splice loss is specified by cabling standards that base link budget calculation on the passive components of the link under test; examples of this type of standard are the TIA-568 and the ISO IEC 11801. Splices can be either mechanical or fusion, and can be located anywhere along the link under test.

Units: dB per splice

Calculation: (number of splices) x (dB loss per splice)



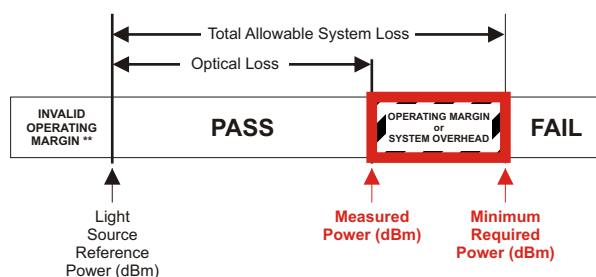
NOTE: some connectors use mechanical splice technology for fiber termination, such as the Unicam[®]-compatible. These connectors should be considered splices when calculating optical loss budgets.

System Overhead

Definition: the difference between the Measured Power and the Minimum Required Power. System Overhead is also known as headroom. With a PASS rating, System Overhead shows how much additional loss a link can bear before it will fail. With a FAIL rating, System Overhead shows how much optical loss must be overcome before it will pass.

Units: dB

Calculation: (Measured Power) - (Minimum Required Power)



System Reference Power

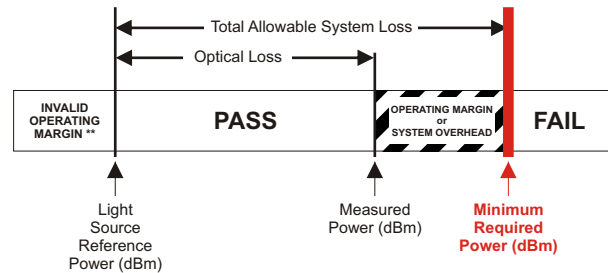
(shown as Minimum Required Power on Circuit Detail Reports)

Definition: the optical power level that determines whether a link passes or fails; a.k.a. Pass/Fail threshold. If the Measured Power is greater than the System Reference Power, the link will show PASS; likewise, if the Measured Power is less than the System Reference Power, the link will show FAIL.

NOTE: link measurements that are marginal (meaning that they are close to the System Reference Power, within the accuracy of the test equipment) should be evaluated further.

Units: dBm

Calculation: (Light Source Reference Power) + (Total Allowable System Loss)

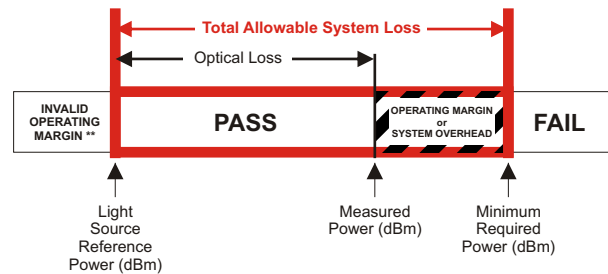


Total Allowable System Loss

Definition: the total amount of optical loss attributed to the passive components of the link (i.e. Fiber Loss, Connection Loss, and Splice Loss). Total Allowable System Loss is also known as a Link Budget. For generic cabling standards such as the TIA 568 or the ISO/IEC 11801, link budgets are calculated based upon the actual configuration of the link under test. Some standards (e.g. various Ethernets) have pre-defined link budget loss values based upon the upper limits of the link configuration.

Units: dB

Calculation: (Fiber Loss) + (Connection Loss) + (Splice Loss)



4.0 PC-BASED METER CONTROL

When connected to the RS-232 port on a PC using a terminal program (such as Hyperterminal), many of the WaveTester's functions can be activated from the PC keyboard. The list of functions follows:

Key: A
Function: Auto mode
Description: Pressing the 'A' key is the equivalent to holding the λ / AUTO button on the WaveTester. The wavelength display will begin toggling between the currently selected wavelength and 'AUO'. Auto mode scans incoming power for modulated optical signals, and switches wavelengths automatically when a corresponding modulated signal is received.

Key: C
Function: Clear memory
Description: Pressing the 'C' key is the equivalent to holding the SAVE / DOWNLOAD button on the WaveTester while the unit is powered ON. The data indicator icon will disappear from the display.

Key: D
Function: Download memory
Description: Pressing the 'D' key is the equivalent to holding the SAVE / DOWNLOAD button on the WaveTester. This will download all data into the PC in comma-delimited format. The display will say 'done' when the download is complete.

Key: M
Function: Monitor mode
Description: Pressing the 'M' key will cause the meter to send wavelength and power level information to the serial port. This data will appear in the terminal window. Monitor mode is useful for checking the stability and power level of a source over a long period of time. Most terminal programs have a data capture function. Data captured this way can be imported as a comma-delimited file into a spreadsheet for creating a chart.

Key: U
Function: Units set
Description: Pressing the 'U' key is the equivalent to pressing the UNITS / ZERO button on the WaveTester. Each time the 'U' key is pressed, the display units will change between dBm, dB, and uW or mW.

Key: W
Function: Wavelength set
Description: Pressing the 'W' key is the equivalent to pressing the λ / AUTO button on the WaveTester. Each time the 'W' key is pressed, the display wavelength will change between the WaveTester's calibrated wavelengths.

Key: Z
Function: Zero function
Description: Pressing the 'Z' key is the equivalent to holding the UNITS / ZERO button on the WaveTester. Once the WaveTester display changes to 'dB' units, an optical reference has been set for the currently selected wavelength, otherwise known as 'zeroed'.

Key: ?
Function: Firmware version display
Description: Pressing the '?' button will send the firmware version to the serial port.

5.0 MAINTENANCE / CALIBRATION

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

5.0.2 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.

5.0.3 For accurate readings, the optical connectors on the WaveTester 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.

5.0.4 It is recommended to have Optical Wavelength Laboratories calibrate the WaveTester once per year.

6.0 WARRANTY

6.0.1 Optical Wavelength Labs products have a **two-year** factory warranty, which covers manufacturer defect and workmanship only, valid from the date of shipment to the original customer.

6.0.2 Products found to be defective within the warranty will be either repaired or replaced, at the option of Optical Wavelength Labs.

6.0.3 This warranty does not apply to units that have been repaired or altered by anyone other than Optical Wavelength Labs, or have been subjected to misuse, negligence, or accident.

6.0.4 In no way will Optical Wavelength Labs liabilities exceed the original purchase price of the unit.

6.0.5 To return equipment under warranty, please contact Optical Wavelength Labs for a RMA number. To ensure quick turnaround, please include a short description of the problem and a phone number where you can be reached during normal business hours.

Optical Wavelength Labs
N9623 West US Highway 12
Whitewater, WI 53190
Internet: owl-inc.com
e-mail: owlinfo@owl-inc.com
Phone: 262-473-0643
Fax: 262-473-8737

7.0 SPECIFICATIONS

7.1 - WaveTester optical power meter

Optical Specifications (WT-1)

Detector Type	_____	InGaAs
Calibrated Wavelengths (nm)	_____	850, 1300, 1310, 1490, 1550
Measurement Range (dBm)	_____	+5 to -60
Accuracy (dB)	_____	±0.15
Resolution (dB)	_____	0.01

General Specifications

Battery Life	up to 250 hours (9-volt)
Optical Connector	2.5mm universal
Data Storage	200 storage points
Download	DB-9 serial
Software	OWL Reporter
Dimensions	4.94 x 2.75 x 1.28 in
Weight (with battery)	10 ounces

7.2 - WaveSource optical light source

Optical Specifications	Multimode	Single-mode	VFL
Source Type	LED	Laser	Laser
Calibrated Wavelengths	850, 1300nm	1310, 1550nm	650nm
Output Power (CW)	-20 dBm (into MM fiber)	-10 dBm (into SM fiber)	-2 dBm
Accuracy	±0.10 dB @ 25°C	±0.10 dB @ 25°C	
Light Source Drift (1 hour)	±0.05 dB (850nm) ±0.05 dB (1300nm)	±0.05 dB (1310nm) ±0.04 dB (1550nm)	
Spectral Width (FWHM)	50nm (850nm) 180nm (1300nm)	2nm (1310nm) 3nm (1550nm)	
Modulation Frequencies	300 Hz = 850nm 600 Hz = 1300nm	1 kHz = 1310nm 2 kHz = 1550nm	

General Specifications

Battery Life	35 hours (9-volt)
Optical Connector	varies with model
Operating Temperature	-20°C to +70°C
Storage Temperature	-40°C to +85°C
Dimensions	4.94 x 2.75 x 1.28 in
Weight (with battery)	10 ounces

8.0 CONFIGURATIONS

	Multimode ($\lambda 1$)		Single-mode ($\lambda 2$)		Part Number Legend
Part Number	Wavelengths	Connectors	Wavelengths	Connectors	WS-(M λ V)(S λ V)
WS-MDSD	850, 1300	ST, SC	1310, 1550	ST, SC	M λ V (corresponds to port $\lambda 1$ on the front of the unit) 850/1300nm = MD VFL = V
WS-MD	850, 1300	ST, SC	N/A	N/A	
WS-SD	N/A	N/A	1310, 1550	ST, SC	S λ V (corresponds to $\lambda 2$ on the front of the unit) 1310/1550nm = SD VFL = V
WS-VSD	650nm VFL*	ST, SC	1310, 1550	ST, SC	
WS-MDV	850, 1300	ST, SC	650nm VFL*	ST, SC	

* VFL stands for Visual Fault Locator. VFLs will work in both multimode or single-mode fibers.

9.0 WAVETESTER DATA STORAGE ERROR CODES

ERR - the user has not waited long enough to get data stored for both wavelengths

BAD - data can only be stored for a maximum of 3 wavelengths

FUL - memory is full, and no more data can be stored

10.0 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 it to insert improperly. Call OWL Tech Support at (262) 473-0643 with any questions about 2.5mm universal ports.

FREE FIRMWARE UPDATE PROGRAM

Thank you for your purchase of a WaveTesters optical power meter. This meter includes FREE firmware updates which can be "flash updated" by users in the field – no need to send them back for re-programming.

These updates are available for download from the following location on our website:

<http://owl-inc.com/support/sub/htm/firmwareupgrade.htm>

If you would like to be informed of these updates as they occur, there are three convenient ways to apply for this FREE service, which will also register your product with OWL:

- 1) call 262-473-0643; or
- 2) send an e-mail with the information listed below to updates@owl-inc.com; or
- 3) apply online at <http://owl-inc.com/support/sub/htm/autoupdate.htm>.

Users name & company

Phone number

Meter model & serial number

E-mail address

Supported Cabling Standards

The WaveTester supports the following fiber optic network cabling standards.

ITU G.983.3
10 Gigabit Ethernet
10Base-FL
ATM-622

EIA/TIA-568
1000Base-SX
10Base-FB
Fibre Channel

CAN-T529
1000Base-LX
FDDI
Token Ring

ISO/IEC 11801
100Base-FX
ATM-155
FTTH

10 Gigabit Ethernet Standard

Support for the IEEE 802.3ae 10-Gigabit Ethernet standard has been added to OWL Reporter, which means that WaveTester users can now certify their 10GbE networks.

With this new standard, users are given the option of choosing from one of several versions of this standard, based on the fiber type, wavelength, and 10GbE electronics used. Below is a summary of the various 10GbE standards.

In order to choose the correct 10GbE standard, it is important to know the specifications of the fiber under test, especially the fiber type and modal bandwidth.

If these specifications are unknown, contact the optical fiber manufacturer for more details.

IEEE Standard Name	Link Wizard Name	Fiber Type	Modal Bandwidth	Wavelength	Loss (dB)	Maximum Distance (m)
10GBASE-S	10GBASE-S LEGACY	62.5/125 multimode	160 MHz • km	850nm	2.6	26
10GBASE-S	10GBASE-S OM1/OM2	62.5/125 multimode	200 MHz • km	850nm	2.5	33
10GBASE-S	10GBASE-S LEGACY	50/125 multimode	400 MHz • km	850nm	2.2	66
10GBASE-S	10GBASE-S OM1/OM2	50/125 multimode	500 MHz • km	850nm	2.3	82
10GBASE-S	10GBASE-S OM3	laser-optimized 50/125 multimode	2000 MHz • km	850nm	2.6	300
10GBASE-LX4	10GBASE-LX4 LEGACY	62.5/125 multimode	500 MHz • km	1300nm	2.5	300
10GBASE-LX4	10GBASE-LX4 LEGACY	50/125 multimode	400 MHz • km	1300nm	2.0	240
10GBASE-LX4	10GBASE-LX4	50/125 multimode	500 MHz • km	1300nm	2.0	300
10GBASE-LX4	10GBASE-LX4	50/125 multimode	2000 MHz • km	1300nm	2.0	300
10GBASE-LX4	10GBASE-LX4	singlemode	NA	1310nm	6.3	5000
10GBASE-L	10GBASE-L/E	singlemode	NA	1310nm	6.2	5000
10GBASE-E	10GBASE-L/E	singlemode	NA	1550nm	11.4	5000

Universal Port

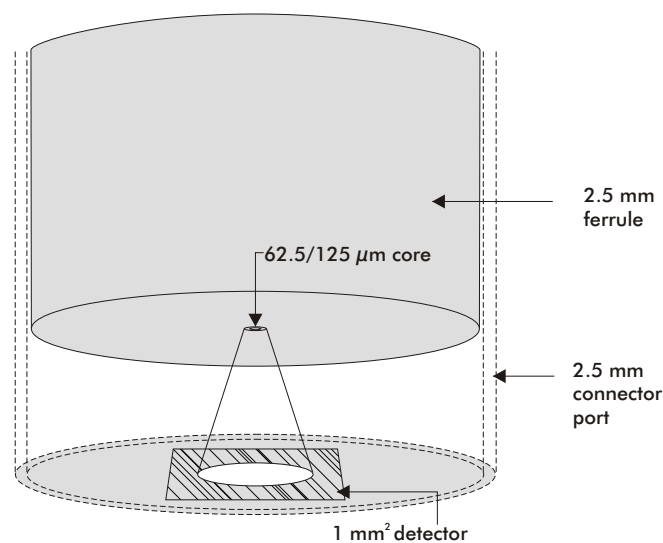
The Micro OWL 2 contains a universal connector port which allows for coupling to any fiber optic connector that uses a 2.5mm ferrule (e.g. ST, SC, FC, etc.).

What gives this port its flexibility is that only the ferrule is inserted into the port. Since there is no latching mechanism to speak of, any 2.5mm ferrule connector can be inserted into the same port without having to swap adapter ports. There is no longer the need to purchase or maintain additional adapter caps for each different connector type.

This detector port is designed so that the cone of acceptance falls completely onto the detector, regardless of how the connector may turn, twist, or wiggle in the port. Because of this, you can be assured that the connection will always produce an accurate reading as long as it is inserted completely into the port (see the diagram below).

Additionally, some connectors use a 1.25mm ferrule. The flexible universal port system on the Micro OWL 2 allows the user to remove the 2.5mm adapter and place a 1.25mm adapter (included with each meter) for connection to LC, MU, and other SFF connectors which use the 1.25mm ferrule.

Please call 262-473-0643 with any questions you may have about the universal port, or any other of our fiber optic test products.



Installing OWL USB Driver

STEP 1 Insert the OWL CD into your CD-ROM drive.

STEP 2 When the CD Installation panel appears on your screen, click the “**Install USB Drivers**” button.

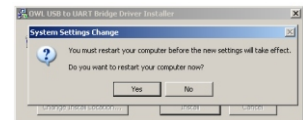
STEP 3 Click the “**Install**” button on the “**OWL USB to UART Bridge Driver Installer**” dialog box.



STEP 4 Click the “**Continue Anyway**” button on the “**Software Installation**” dialog box.



STEP 5 Once the software installation is complete, click “**Yes**” to reboot the computer.

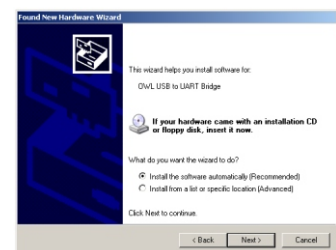


STEP 6 Connect the WaveTester optical power meter to a USB port on the PC using the supplied USB download cable. The computer will automatically detect the WaveTester.

STEP 7 If Windows asks you to use Windows update to search for the driver, click the radio button labeled “**No, not this time**”, then click “**Next**” to continue.

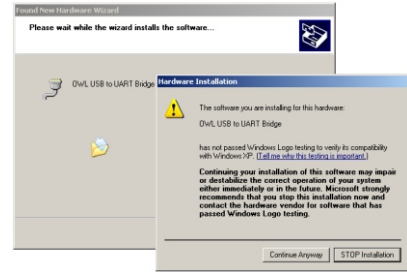


STEP 8 Click the radio button labeled “**Install the software automatically (Recommended)**”, then click “**Next**” to continue.

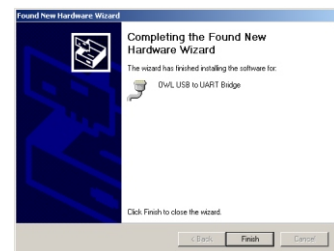


Installing OWL USB Driver, cont.

STEP 9 Click the “Continue Anyway” button on the “Software Installation” dialog box.



STEP 10 Once the drivers have been completely installed, click the “Finish” button.



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.

Procedure for Checking WaveTester Series Optical Power Meters For Proper Operation

USING OWL WAVESOURCE SERIES SINGLEMODE SOURCES

LIGHT SOURCE MODEL NUMBERS:

WS-SDxx
WS-VSDxx
WS-MSDxx

Checking WaveTester Series Optical Power Meters for Proper Operation

USING A WAVESOURCE SINGLEMODE LASER SOURCE

NOTE: thoroughly clean and inspect all patch cord connectors before making any connection.

STEP 1 - Connect WaveTester and WaveSource

Connect the WaveTester and WaveSource together with a yellow singlemode patch cable as shown below.



STEP 2 - Power ON the WaveTester

Press **ON** to power on the WaveTester.

After a few seconds, the WaveTester display should read 'LO', and will appear similar to the diagram shown at right.

NOTE: the wavelength and measurement units may be different from the display at right.



STEP 3 - Set the WaveTester to 'dBm'

Press **UNITS** until the measurement units read 'dBm' as shown at right. You may need to press the button several times.



STEP 4 - Set WaveTester to 1310nm

Press **WAVELENGTH** on the WaveTester until the wavelength display shows '1310nm' as shown at right. You may need to press the button several times.



STEP 5 - Power ON the WaveSource

Press **POWER** to power on the WaveSource.

The 1310nm indicator LED should now be lit as shown at right.



STEP 6 - Check optical power

The power reading displayed on the WaveTester will probably not be exactly -10.00 dBm as shown at right, but should be fairly close.



Repeat this procedure for each additional patch cable that needs testing.

NOTE: the following steps are only required if the optical power reading on the WaveTester is -12.00 dBm or below.

STEP 7 - Replace the patch cable

The easiest way to troubleshoot low power levels is to try another patch cable. Over time, patch cables can wear out or become damaged the more they are used for optical loss testing. Replacing the patch cable usually fixes the problem.

STEP 8 - Clean patch cables and optical ports

If the problem still exists after patch cable replacement, there may be some debris, such as dust, dirt, or finger oil, that has collected on the connector endface or in the equipment optical ports.

Thoroughly clean and inspect the optical ports of the WaveTester and the WaveSource, as well as the fiber connector endfaces, according to the brochures that have been included with this kit. Several cleaning cycles may be required.

If the power level is still below -12.00 dBm, even after a thorough cleaning and inspection and patch cable replacement, contact OWL technical support at 262-473-0643 for more information.

Procedure for Checking WaveTester Series Optical Power Meters For Proper Operation

USING OWL WAVESOURCE SERIES MULTIMODE SOURCES

LIGHT SOURCE MODEL NUMBERS:

WS-MDxx
WS-MDVxx
WS-MDSDxx

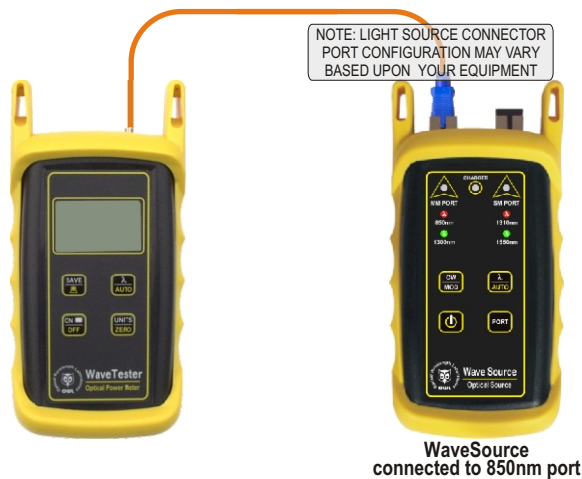
Checking WaveTester Series Optical Power Meters for Proper Operation

USING A WAVESOURCE MULTIMODE LIGHT SOURCE

NOTE: thoroughly clean and inspect all patch cord connectors before making any connection.

STEP 1 - Connect WaveTester and WaveSource

Connect the WaveTester and WaveSource together with an orange multimode patch cable as shown below.



STEP 2 - Power ON the WaveTester

Press **ON/OFF** to power on the WaveTester.

After a few seconds, the WaveTester display should read 'LO', and will appear similar to the diagram shown at right.

NOTE: the wavelength and measurement units may be different from the display at right.



STEP 3 - Set the WaveTester to 'dBm'

Press **UNITS ZERO** on the WaveTester until the measurement units read 'dBm' as shown at right. You may need to press the button several times.



STEP 4 - Set WaveTester to 850nm

Press **WAVELENGTH** on the WaveTester until the wavelength display shows '850nm' as shown at right. You may need to press the button several times.



STEP 5 - Power ON the WaveSource

Press **POWER** to power on the WaveSource.

The 850nm indicator LED should now be lit as shown at right.



STEP 6 - Check optical power

The power reading that appears on the WaveTester display will depend upon cable type. Consult the table below for a list of acceptable power readings.



Core Size	Acceptable Power Level	Replace at
62.5/125 μ M	-19.0 to -22.0 dBm	-22.00 dBm
50/125 μ M	-22.0 to -25.0 dBm	-25.00 dBm

NOTE: the following steps are only required if the optical power reading on the WaveTester is too low.

STEP 7 - Replace the patch cable

The easiest way to troubleshoot low power levels is to try another patch cable. Over time, patch cables can wear out or become damaged the more they are used for optical loss testing. Replacing the patch cable usually fixes the problem.

STEP 8 - Clean patch cables and optical ports

If the problem still exists after patch cable replacement, there may be some debris, such as dust, dirt, or finger oil, that has collected on the connector endface or in the equipment optical ports.

Thoroughly clean and inspect the optical ports of the WaveTester and the WaveSource, as well as the fiber connector endfaces, according to the brochures that have been included with this kit. Several cleaning cycles may be required.

If the power level is still too low, even after a thorough cleaning and inspection and patch cable replacement, contact OWL technical support at 262-473-0643 for more information.