WaveSeries
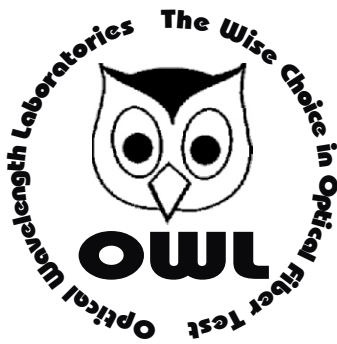## Operations Guide
WaveTester Optical Power Meter

Optical Wavelength Laboratories

CONTENTS   PAGE

FIGURES

1.0 GENERAL

Thank you for your purchase of an Optical Wavelength Labs (OWL) WaveTester optical power meter.

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.

NIST calibrated wavelengths include 850, 1300, 1310, and 1550nm, making it ideal for LAN, premise, CATV, and telco applications. An InGaAs version of the WaveTester is available for testing optical fibers at 1625nm.

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

2.0 FUNCTIONAL DESCRIPTIONS - ALL MODELS EXCEPT WTUFX-V

Figure 1 - WaveTester
Optical Power Meter

2.0.1 CONNECTIONS

1.   Battery Charging Port - If rechargeable 9-volt batteries are used in the WaveTester, the battery charging port is used to re-charge 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.**

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.

2.0.2 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 photodector, 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).

2.0.3 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.

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 (for use with WaveSource light sources only.)

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.

- 3 -

2.0 FUNCTIONAL DESCRIPTIONS - WTUFX-V (integrated VFL version)

Figure 1 - WaveTester
Optical Power Meter

2.0.1 CONNECTIONS

1. Visual Fault Locator Port - This port houses a bright red laser source used for visual fault finding or visual fiber identification. **NOTE: EXTREME CAUTION MUST BE EXERCISED WHEN OPERATING THIS VFL. LASERS SUCH AS THE ONES IN THE WTUFX-V PRODUCE INTENSE BEAMS OF LASER LIGHT THAT ARE HARMFUL TO THE EYE.**

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.

2.0.2 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 photodector, 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).

2.0.3 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.

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 (for use with WaveSource light sources only.)

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.

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.

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 possible   with the WaveTester   optical power meter: 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, the WaveTester 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 the WaveTester 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 fiber optic light source.

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 2 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 2 - 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.

a)   Connect the WaveTester to a light source using the first patch cord.

b)   Power on the light source and allow it to stabilize according to the manufacturer's specifications.

c)   Power on the WaveTester, and set it to match the current wavelength of the light source.

d)   Check to make sure the power level displayed on the WaveTester is approximately equal to the calibrated power level of the light source (see Figure 2 on the previous page). If it is good, then remove it from the WaveTester and light source and set it aside. This will be the patch cord for the meter side.

e)   Connect the other patch cord to the WaveTester and light source as shown in Figure 3. 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.

f)   Press the λ / AUTO button on the WaveTester to set it to the desired wavelength.

g)   Set the light source to the match the wavelength on 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 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.

mandrel	62.5/125uM	0.7 in.
	50/125uM	0.9 in.

Figure 3 - Setting an
Optical Reference

3.6 OPTICAL LOSS MEASUREMENT

a)   Leaving the patch cord attached to the light source, remove the patch cord from the WaveTester optical power meter.

b)   Connect the WaveTester and light source to opposite ends of the link under test.

c)   The WaveTester will show the amount of loss in the link (in dB). Figure 4 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.
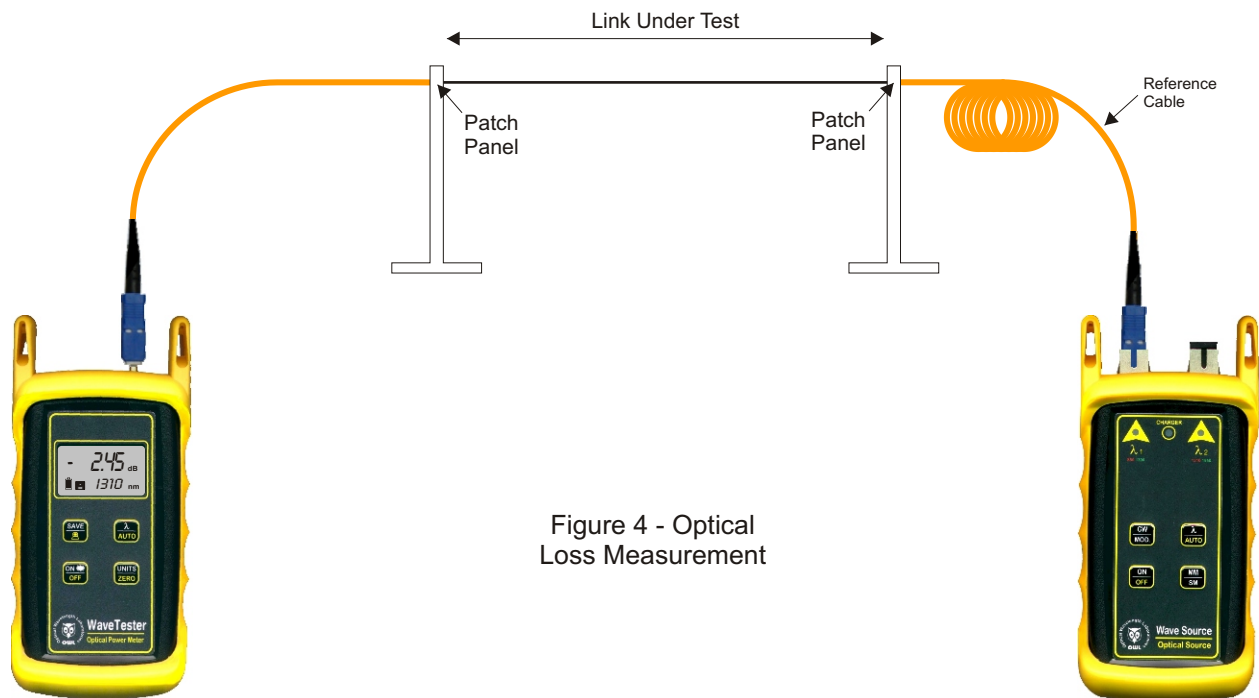
Figure 4 - Optical
Loss Measurement

3.7 DATA STORAGE

b)   Connect the WaveTester and light source to opposite ends of the link under test.

c)   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.

d)   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:

RS-232 to RCA
Serial Download Cable

OWL CD
With Manuals
& Reporter Software

WaveTester Meter

Windows Pentium based PC

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.
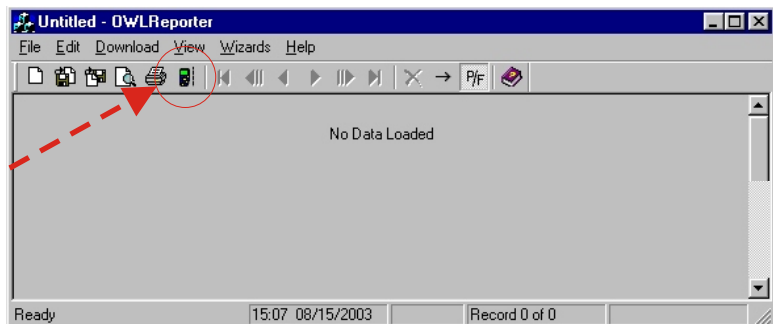

If the download fails, communications cannot continue and no data will download into the PC. Check the cable connections, test the current COM port, and/or try a different COM port or try a different PC.
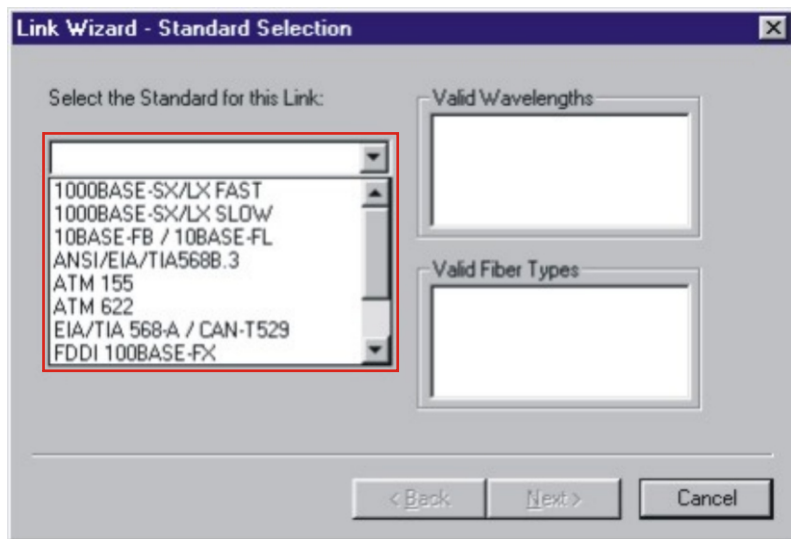
The following pages explain the steps of the Link Wizard in OWL Reporter. This will allow certification of fiber links using a fiber cabling standard.

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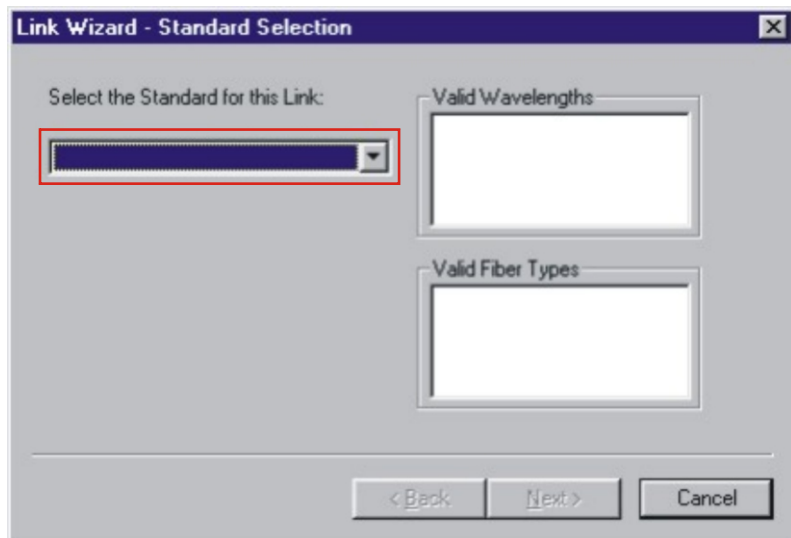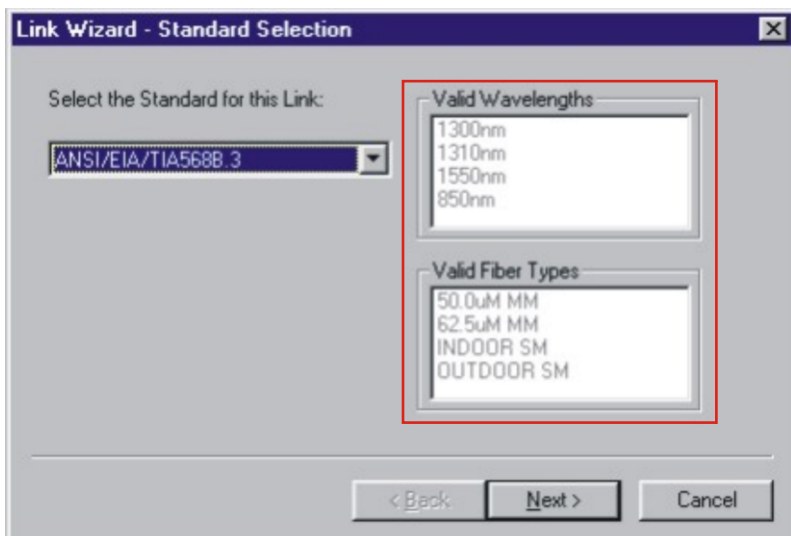
3.8.1.2 - Select the cabling standard from the drop-down list.

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.
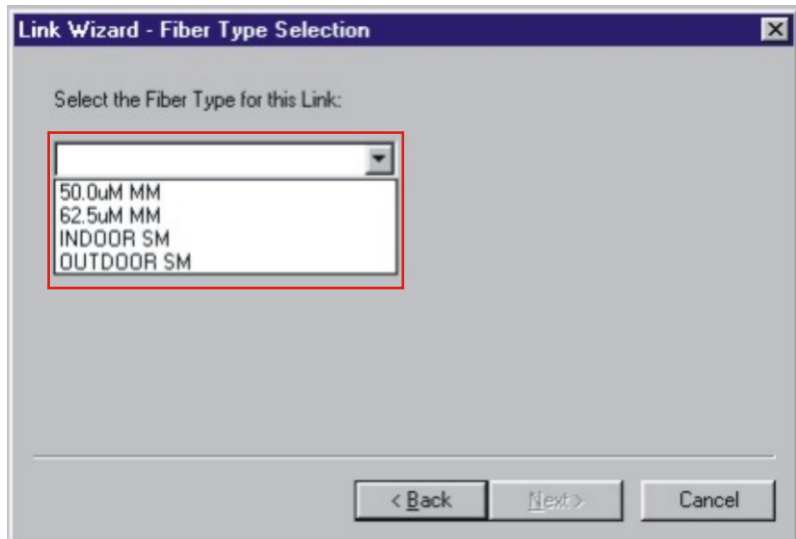
Click Next to continue.

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.

Link Wizard - Fiber Type Selection

Select the Fiber Type for this Link:

[Back] [Next >] [Cancel]
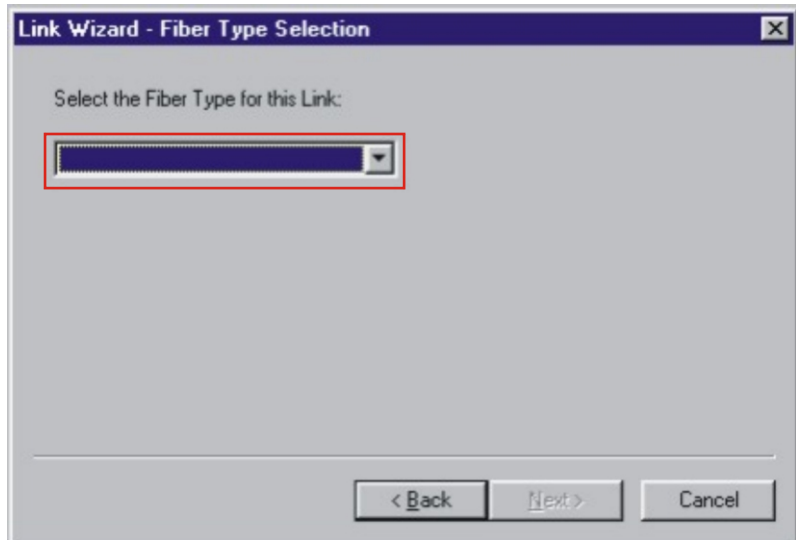
3.8.2.2 - Select the fiber type from the list. The selected fiber type should match the type of fiber of the link under test.

Link Wizard - Fiber Type Selection

Select the Fiber Type for this Link:

50.0uM MM
62.5uM MM
INDOOR SM
OUTDOOR SM

[Back] [Next >] [Cancel]

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

Click Next to continue.

Link Wizard - Fiber Type Selection

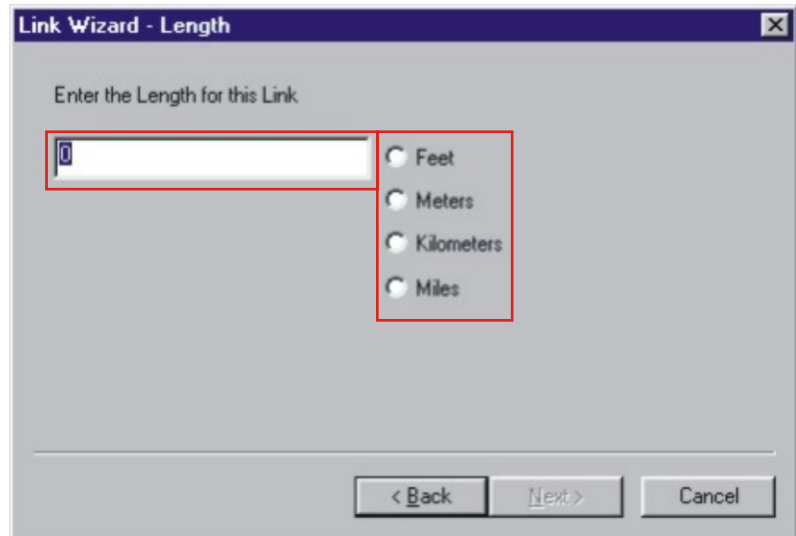Select the Fiber Type for this Link:

62.5uM MM

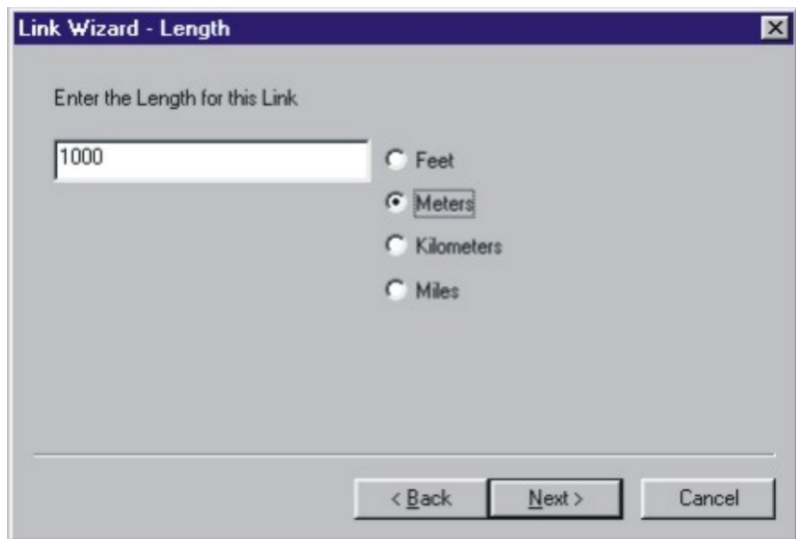[Back] [Next >] [Cancel]
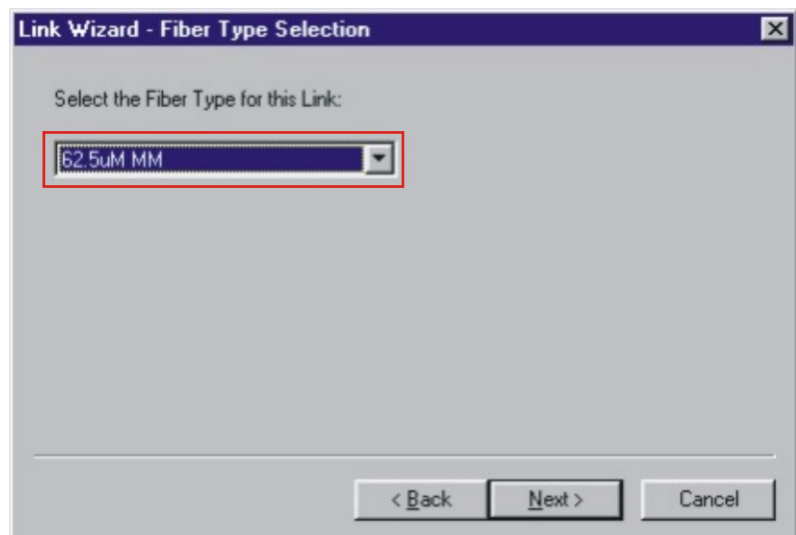
3.8.3 - Fiber Length Input

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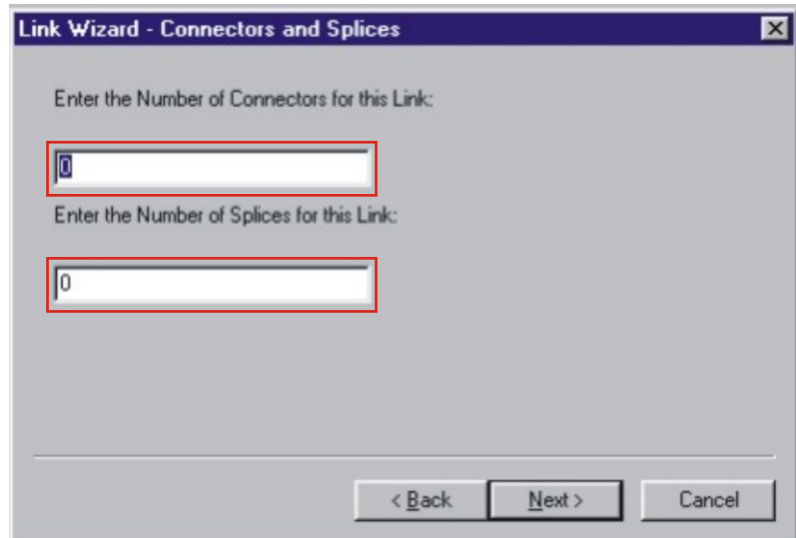
3.8.3.2 - Once the fiber link length and the length units are entered, click Next to continue.

3.8.4 - Connectors and Splices Input

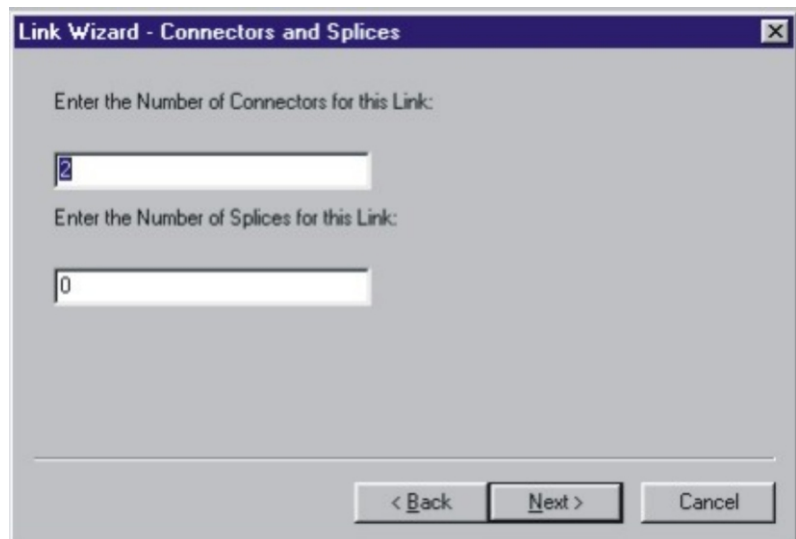3.8.4.1 - If there are any connections or splices in the link, enter them into the input boxes.

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

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.

Link Wizard - Company Selection ☒

This link is being certified by:

[▼] [New Organization]

[< Back] [Next >] [Cancel]
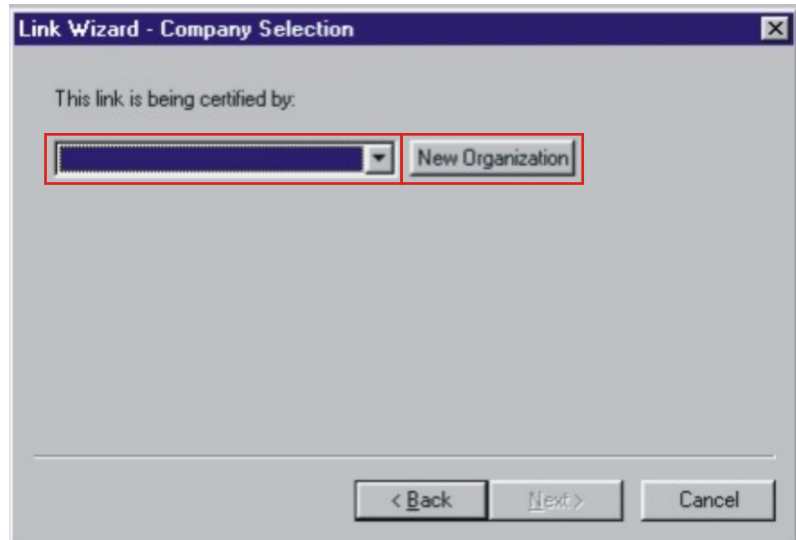
3.8.5.2 - Type in the organization's name and telephone number into the input boxes.

Link Wizard - Company Selection ☒

This link is being certified by:

New Company ☒

Create a new certifying Organization

Organization [   ]

Telephone [   ]

[Cancel] [OK]

[< Back] [Next >] [Cancel]
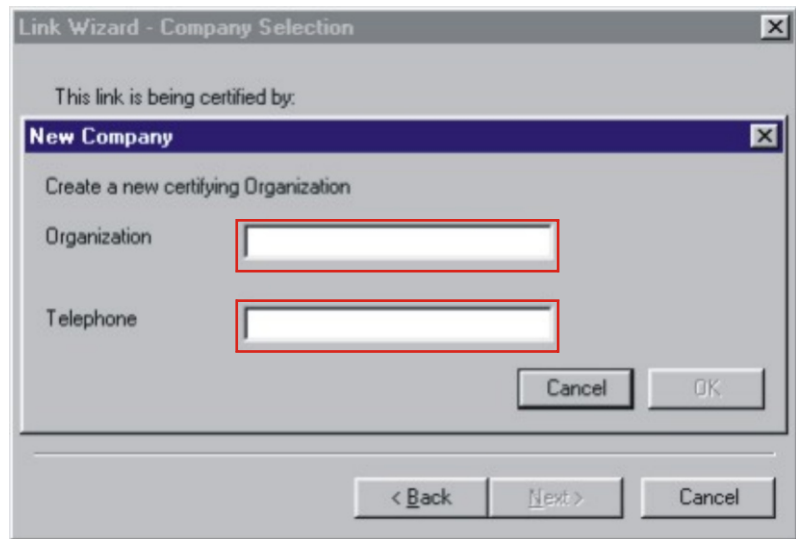
3.8.5.3 - Once the organization's name and telephone number have been entered, click OK to continue.

Link Wizard - Company Selection ☒

This link is being certified by:

New Company ☒

Create a new certifying Organization

Organization [Acme]

Telephone [232-555-2263]

[Cancel] [OK]

[< Back] [Next >] [Cancel]
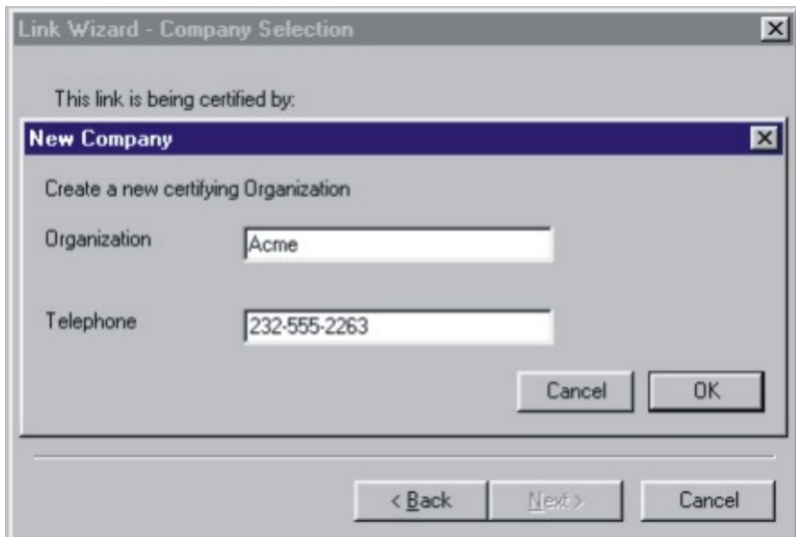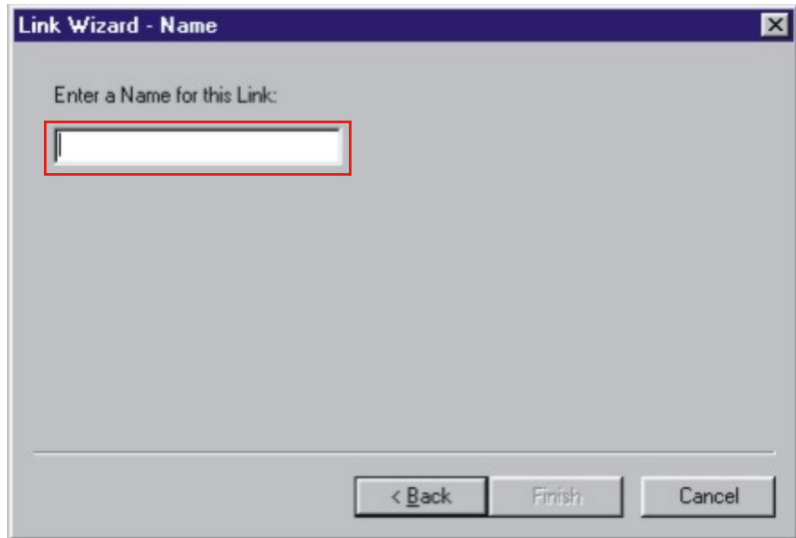
3.8.5.4 - The organization name should now appear in the drop-down box. Click Next to continue.

Link Wizard - Company Selection

This link is being certified by:

| Acme | ▼ | New Organization |

< Back | Next > | Cancel
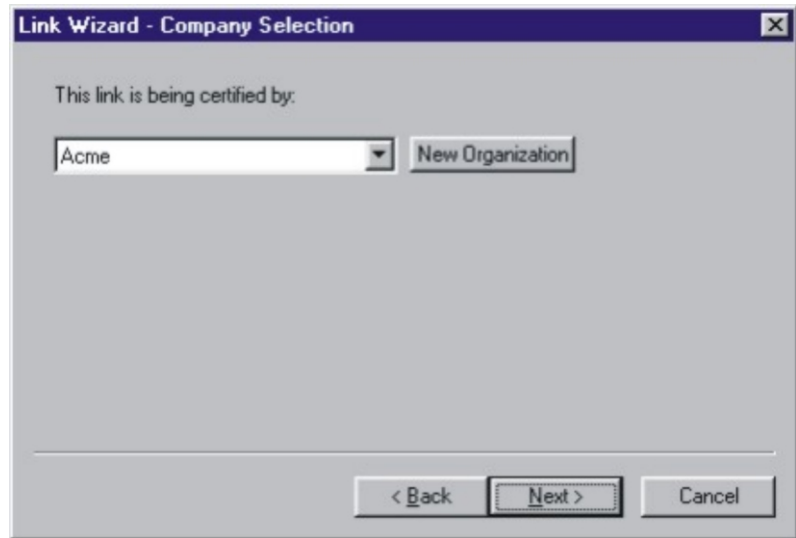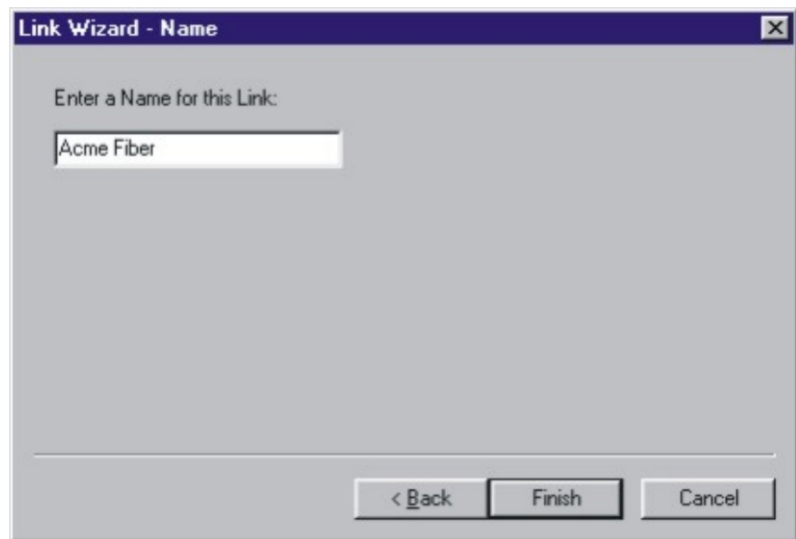
3.8.6 - Name Input

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

Link Wizard - Name ☒

Enter a Name for this Link:

[   ]

| < Back | Finish | Cancel |

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

Link Wizard - Name ☒

Enter a Name for this Link:

Acme Fiber

| < Back | Finish | Cancel |

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.
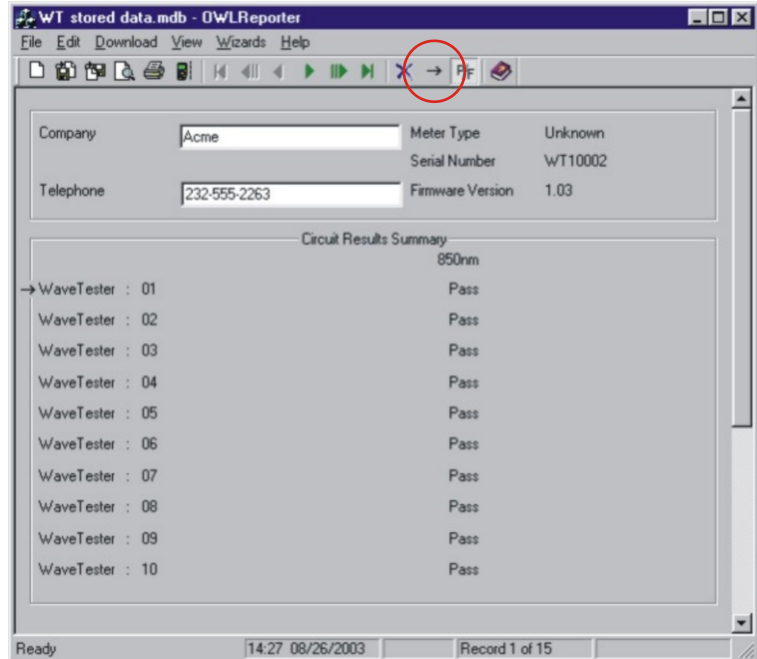
3.8.8 - Report Printing

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

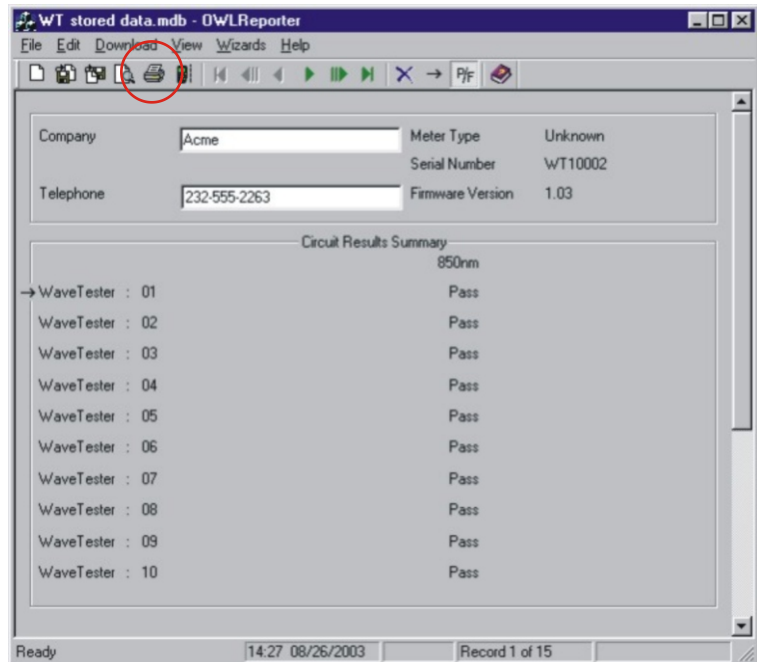| Link ID: | WaveTester | | | Page: | 1 |
| Company Name: | Acme | | | Report Date: | 08/26/2003 |
| Telephone Number: | 232-555-2263 | | | | |

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, while the unit is OFF, press and hold the SAVE / DOWNLOAD button and press the ON / OFF / Backlight button. The 💾 icon will disappear from the display when the data has been successfully erased.

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: info.request@owl-inc.com
Phone: 262-473-0643
Fax: 262-473-8737

7.0 SPECIFICATIONS

Optical Specifications

Detector Type	Germanium (WT-1)
	InGaAs (WT-1I)
Calibrated Wavelengths (nm)	850, 1300, 1310, 1550 (WT-1)
	850, 1300, 1310, 1550, 1625 (WT-1I)
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

8.0 WAVETESTER DATA STORAGE ERROR CODES

ERR - This error code will appear when the user has not waited long enough for the meter to acquire power readings for the wavelengths associated with the selected fiber type (850 and 1300nm for MM; 1310 and 1550nm for SM). This error will only occur when the WaveTester power meter and WaveSource light source are both in AUTO mode, and could occur during data storage or setting reference.

HZ - This error code will appear when the user attempts to store data and the meter is NOT in AUTO mode, but is receiving a modulated tone from the light source.

BAD - This error code will appear when the user attempts to store data at too many wavelengths. The WaveTester can only store data for a maximum of 3 different wavelengths.

FUL - This error code will appear when the storage memory is full, and no more data can be stored. The WaveTester can store up to 200 data points.

9.0 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