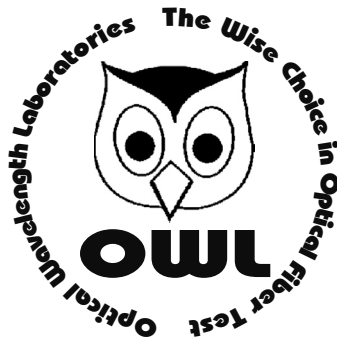


Operations Manual

Optical Return Loss Measurement

With

Fiber OWL ORL Test Kit



Optical Wavelength Laboratories

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Pictorial Checklist

Welcome to the OWL family of optical test equipment. Below is a pictorial checklist of items needed for compliant testing of fibers using the ANSI/TIA/EIA-455-107A-1995 (herein referred to as the FOTP-107A) Optical Return Loss (ORL) testing standard. There should be three handheld instruments contained in this kit: (1) Fiber OWL Optical Meter, (2) 1310 Laser Light Source, and (3) OWL WaveSplitter 50/50 optical coupler. Also included is an RCA to RS-232 download cable for the Fiber OWL Meter. The accessory pack includes: Index Matching Gel Block, 4 fiber optic jumpers named Cable 1 & 2 (SC-UPC), Cable 3 (SC-UPC to SC-APC) and Cable 3 (SC-APC to SC-APC).

Consumable Supply Replacement and/or Substitutes

You may replace these jumper cables and consumables with your preference of vendors. However, upon replacing cables special care must be taken to label the cables the same way the supplied cables are labeled. Also, it is strongly recommended that Cable 1 and Cable 2 are gently looped and zip tied for easy slack management. Do NOT remove the zip ties that come with your test jumpers for ease of jumper slack management. 99% Isopropanol alcohol is preferred for refills because of little water content.

FIBER OWL 2+ORL -
Designed with special firmware to store and calculate Optical Return Loss test results. Compliant with the FOTP-107A. The Fiber OWL also has the full capability of measuring fiber loss and optical power that the Fiber OWL Series does. This unit comes with OWL Reporter software for generation of certification reports.

Index Matching Hard Gel Block - From Nippon Telephone & Telegraph of Japan. The index matching block is for attenuating unwanted reflections when calibrating and running tests as required by the FOTP-107A.

RS-232 Download Cable -
This DB-9 cable is used to connect your Fiber OWL to your PC for report generation.



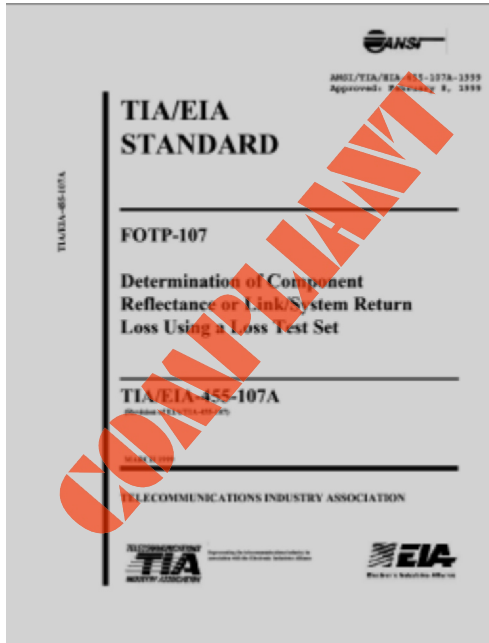
Accessory Pack - These test jumpers are labeled Cable 1, Cable 2, and Cable 3, with each opposite end also labeled A and B. This cable-and-end identification system is employed to help you follow the easy and error free menu driven Return Loss Wizard with pre-test calibration steps that are required by the FOTP-180 and FOTP-107A. Also, 4 various SC jumper test cables..



LASER OWL - NIST Traceable Stabilized Single Mode Laser Light Source. Designed with stabilized output energy to enhance reflection testing results.

OWL WaveSplitter Box - 50/50 8.3 Micron single mode coupler. Designed as required by the FOTP-107A. P1 and P2 use Ultra Polish Physical Contact (UPC) SC fiber connectors and P3 uses an Angle Physical Contact (APC) for connecting to the Device Under Test (DUT).





Optical Return Loss Testing

The Fiber OWL ORL Test Kit (part # KIT-FO+ORL) is designed to provide complete compliance with the world's most widely accepted Fiber Optic Test Procedure (FOTP) for ORL measurement. The standard being used is the FOTP-107A (formally known as the ANSI/TIA/EIA-455-107A-1995).

The importance of compliance to this procedure cannot have enough emphasis. This is especially true when possible contract liability and/or litigation may arise. Using full compliance to an industry wide standard such as the FOTP-107A is a strong defense of the quality of the work or testing done.

Some manufacturers of test equipment avoid full compliance to the FOTP-107A by embedding the optical coupler within the meter housing. Such coupler embedding makes it impossible for true and full compliance by test procedures mandated by the FOTP-107A.

This document can be purchased at:
<http://global.ihs.com>.

Pros & Cons

Another great drawback of having an embedded and fixed coupler is where the coupler fiber core is mismatched with the link or Device Under Test (DUT). This type of mismatch is impossible to calculate out of the ORL measurement.

Admittedly, complete adherence to the FOTP-107A may be somewhat cumbersome as opposed to unofficial methods. However, special firmware has been programmed into the Fiber OWL for ORL testing. This firmware helps ease the difficulty in keeping track of the coupler, the source, and the meter's pre-testing calibration (zeroing) procedure.

With OWL ORL firmware and properly labeled test jumpers even a child could follow and complete the otherwise difficult set up procedure in just minutes. And after the FOTP-107A setup is complete hundreds of readings can be taken and stored quickly and easily.

Scope of Manual

The purpose of this manual is not to teach the full power of your Fiber OWL meter. Rather, it is written to get you up and going by showing just the necessary steps to properly measure and print out documents of compliant ORL testing.

If you wish to use the full power of your Fiber OWL meter then please see the Fiber OWL PDF owners manual on the CD ROM disk supplied in the accessory pack. By doing so you will be able to fully utilize the many other optical power testing features found in the feature rich Fiber OWL optical power meter.

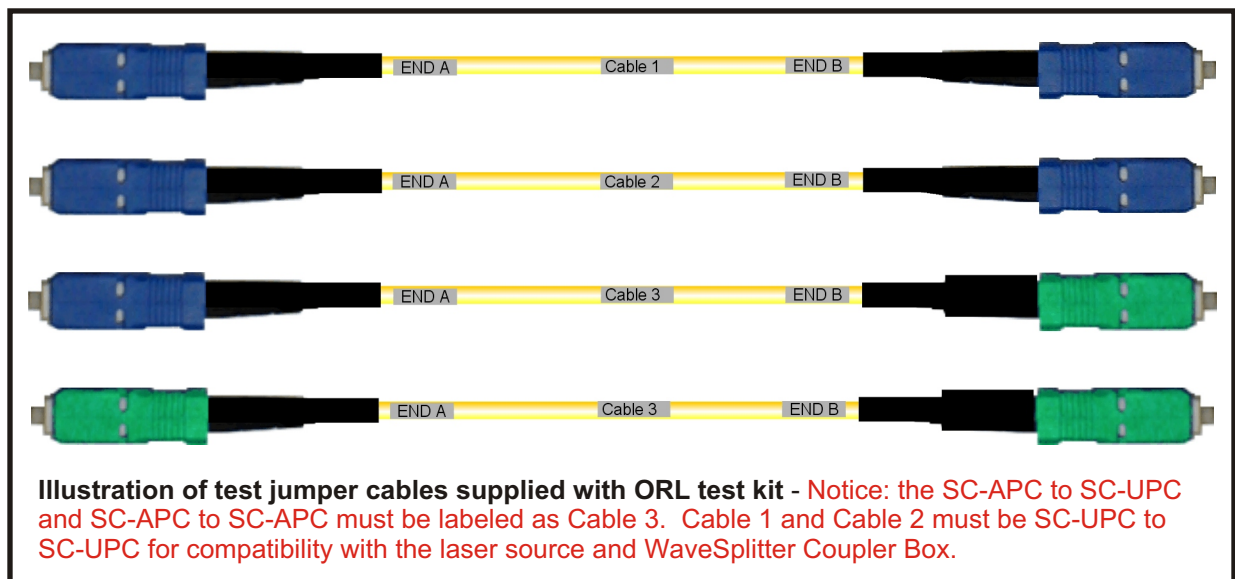
Optical Return Loss (ORL) Testing

ORL testing has become common place in the telco environment and customer-owned outside plant. The need to set ORL testing standards is to minimize optical laser energy from shining back into transmission equipment and creating noise and signal distortion.

In order to establish and maintain desired quality levels, the FOTP-107A is the industry defacto standard for measuring ORL. The FOTP-107A does not set a pass/fail limit for your test equipment. Setting a limit really depends on the data sheets of the laser diodes themselves. Laser diode performance and tolerance are often evolving way too rapidly for a standards organization to mandate pass/fail thresholds.

Hence, it is up to each telco vendor to determine from their own equipment and Quality Of Service (QOS) to set a pass/fail threshold. It is just the task of the FOTP-107A to give you a test procedure for measuring values of such telco equipment.

Therefore, you may need to consult with telco standards to determine the pass/fail threshold. In the past, telcos have typically used values of 50 to 55 dB as the ORL pass/fail threshold - whereas 40 to 50 dB is typically used for UPC (Ultra-polish Physical Contact) connectors, and 55 to 60 dB is typically used for APC (Angled-polish Physical Contact) connectors.



Testing with -APC vs -UPC

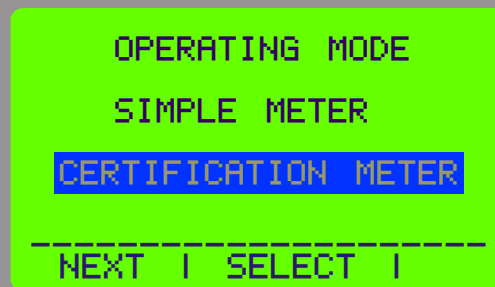
As noted previously, you may substitute test jumpers from your choice of vendors. However, it is very important to maintain the same labeling scheme as shown in the images above. Please note that each cable labeled with Cable 3 must always have an SC-APC connector for proper coupling to the WaveSplitter Box. Also, you may notice that END B on Cable 3 is green, whereas the other SC-UPC are blue. This is an industry convention to help prevent attempts to plug an APC connector into a UPC coupler sleeve.

As long as one end has an SC-APC on it, any Cable 3 can have your choice of connectors for inter-operability with most any industry connector (e.g. LC to SC-APC).

Booting Up Into Fiber Owl Certification Mode

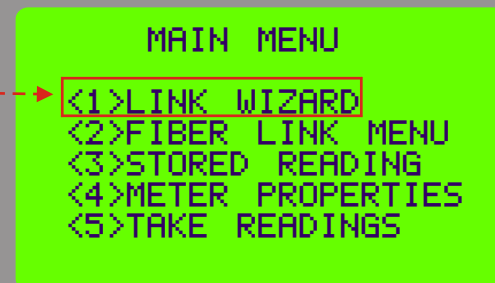
This first unit deals with simply turning on the Fiber OWL meter and selecting a ORL standard. Next with several Fiber OWL screens we are going to view prompts to show you how to: (1) "boot" into the required meter test mode, (2) enter the Link Wizard, (3) pick a link to be tested and (4) choose the optical return loss standard.

To begin Optical Return Loss (ORL) testing, power up the Fiber OWL by pressing the **ON** key on the meter as you normally would. In order to have a clear view of the Fiber OWL meter screen you may want to activate the back-light feature by pressing the **BACK LIGHT** key. After the graphics logo "boots" up you will see the screen like the one shown at the right. Press the **F1** key in order to move to **CERTIFICATION METER**, then press the **F2** key to **SELECT**.



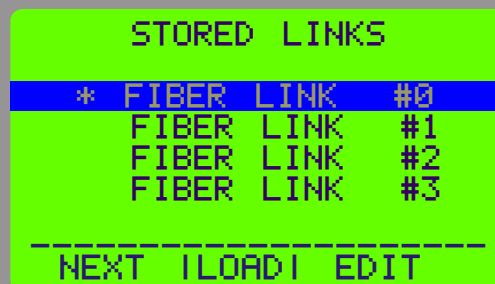
Next, the **MAIN MENU** will appear as shown here. You will need to press the **1** key on the keypad in order to select **<1>LINK WIZARD**.

Menu options **2** thru **5** are for editing or managing stored links data after links have been stored and tested, and other meter functions. These other menus are explained in detail in the Fiber OWL PDF owners manual CD disk.



Once you have started the LINK WIZARD you will see the screen that is titled **STORED LINKS**. First time users will see **FIBER LINK #0** thru **FIBER LINK #3** (which scrolls through down to **FIBER LINK #7**). Otherwise the link names may appear different. The asterisk (*) in front of the LINK NAME shows the link currently loaded in memory.

You may rename the **FIBER LINK** name by pressing the **F3** key to **EDIT**. Press **F1** **NEXT** to scroll through available links. Press **F2** to **LOAD** the selected name.



Below are the steps for conditional overwrite protection and Optical Return Loss standard selection.

The next screen only appears if someone has already stored data in the particular link name you choose. If you accidentally choose a link that has previously stored fiber runs then you may avoid overwriting by pressing **F3** key for **NEW LINK**. Only press **F1 CONTINUE** if you want to overwrite the job saved in the selected link!

```
READINGS ARE STORED
FOR FIBER LINK #1
CHANGING THE LINK
CONFIGURATION MAY
EFFECT THESE RESULTS
```

```
-----
CONT |      | NEW
INUE |      | LINK
```

If no data has been previously saved in the link then the screen to the right will appear. In order to do Optical Return Loss testing (FOTP-107A) you must select option **<4> RETURN LOSS** by pressing **4** key on your

```
SELECT A TEST METHOD
```

```
<1>USE A STANDARD TO
CERTIFY LINK
```

```
<2>MANUAL REFERENCE
```

```
<3>ZERO LIGHT SOURCE
```

```
<4>RETURN LOSS
```

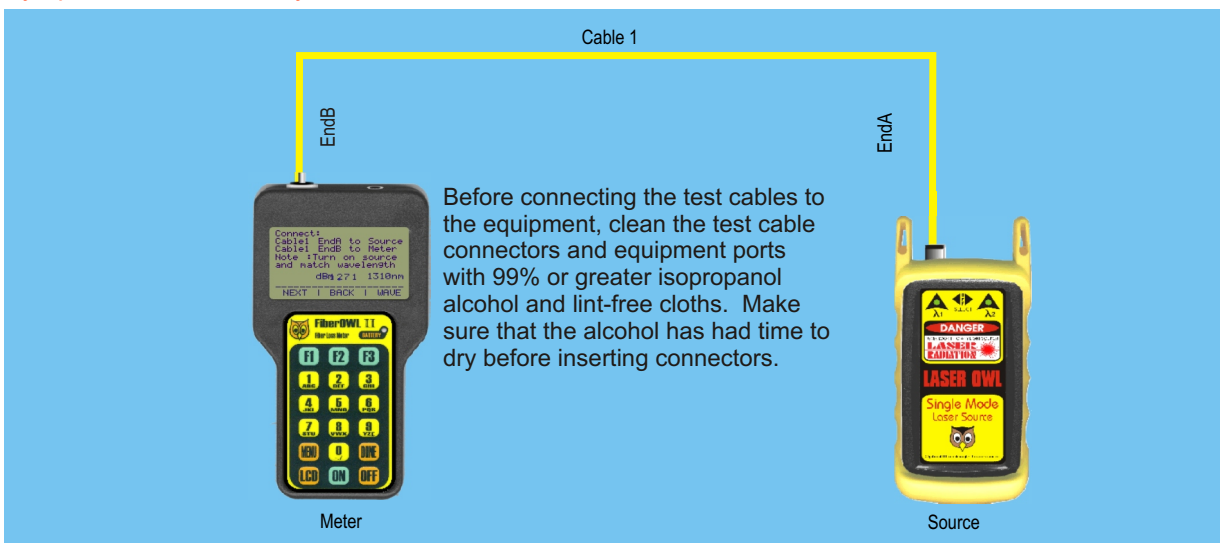

Procedure Required by the FOTP-107A

In order to be compliant with the FOTP-107A, several steps must be taken to "pre-calibrate" the equipment. To make an otherwise cumbersome calibration procedure simple and easy to follow, your test cables have been labeled Cable1, Cable2, and Cable3. The ends of each cable have also been marked A and B to distinguish one end from the other. Please do NOT remove the zip ties on Cables 1 or Cable 2.



The photo at right shows the equipment with the test jumpers. It is highly recommended to leave the laser source, meter, and coupler in the carrying case during the complete test procedure in the positions as illustrated in the photo. Keeping the test equipment physically stable is very important for accurate tests, and it makes the equipment much easier to handle. You may find it as a safety precaution to lean the light source and WaveSplitter box towards the back of the carrying case.

DANGER and WARNING! Any port connected correctly or accidentally incorrectly to the laser source can become a very dangerous source of invisible and permanently blinding LASER RADIATION. Only professionally trained telco personnel should attempt these test procedures. Always wear appropriate eye protection with safety filters.

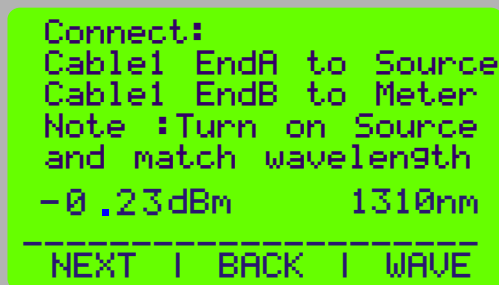


This is the screen that should appear after completing the steps on the previous pages. You are now ready to start pre-test calibration.

Place the test jumper cables as indicated in the diagram and the Fiber OWL screen. Press **F3** key to match the **WAVE** length on the meter with the wavelength of the light source you are using.

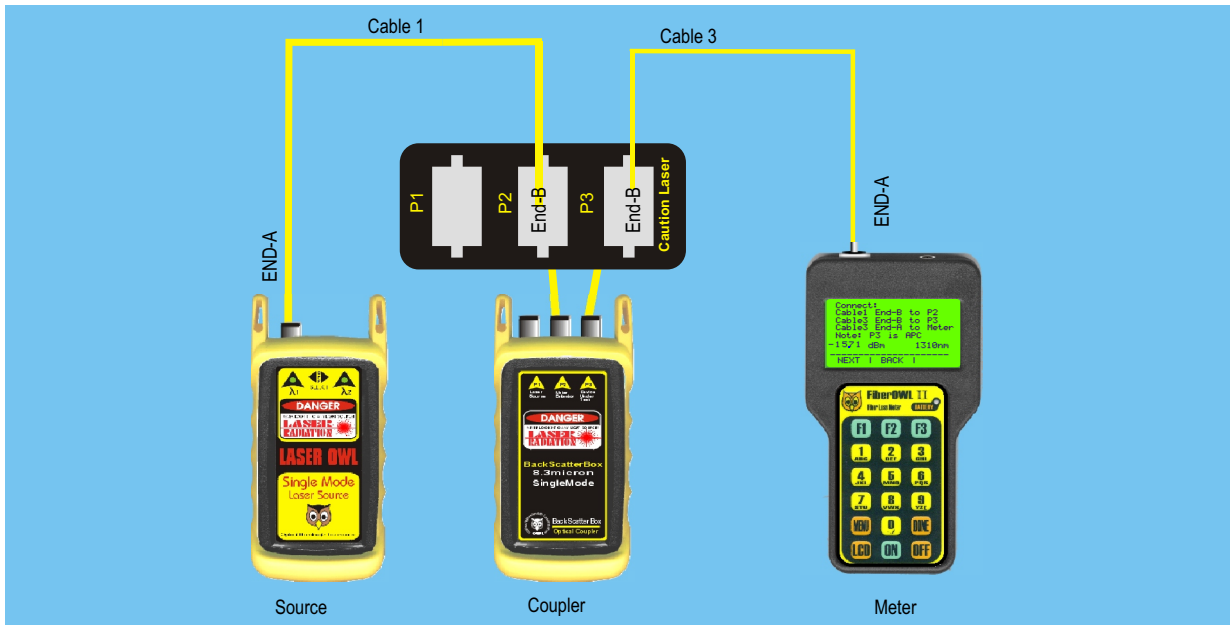
With the warning above well in mind turn on the laser source. As in several TIA testing standards it is normal to turn any laser light source on for 10 to 15 minutes before actual testing to allow for stabilization. However, most field technicians wait about 3 minutes.

After connecting the cables as shown in the diagram, press the **F1 NEXT** key to continue.



The TOP plate of the coupler is enlarged and turned sideways to help visually aid the jumper cables connecting diagram.

Place the test jumper cables as indicated in the diagram and the Fiber OWL screen. **CAUTION:** make sure you do **NOT** remove Cable1, End-A from the light source; otherwise you will need to start over at the beginning to reset the reference.



This is the screen that should appear after completing the steps on the previous page.

If you need to set a pass/fail threshold, see the box below for instructions. Once you have set the reference, you will return to this screen.

After connecting the cables as shown in the diagram, press **F1 NEXT** key to continue.

```

Connect:
Cable1 End-B to P2
Cable2 End-B to P3
Cable3 End-A to Meter
Note: P3 is APC
-15.71 dBm      1310nm
-----
NEXT |  BACK  |SET REF
    
```

On this screen, notice that the **F3** key says SET REF. The purpose of this button is to allow the user to set the PASS/FAIL threshold for the link. Pressing **F3** will bring you to this screen.

In the entry field, enter the PASS/FAIL threshold. For example, if you need a return loss of 55 dB or better, then enter 55.00 in the entry field.

Press **DONE** to return to the previous screen.

```

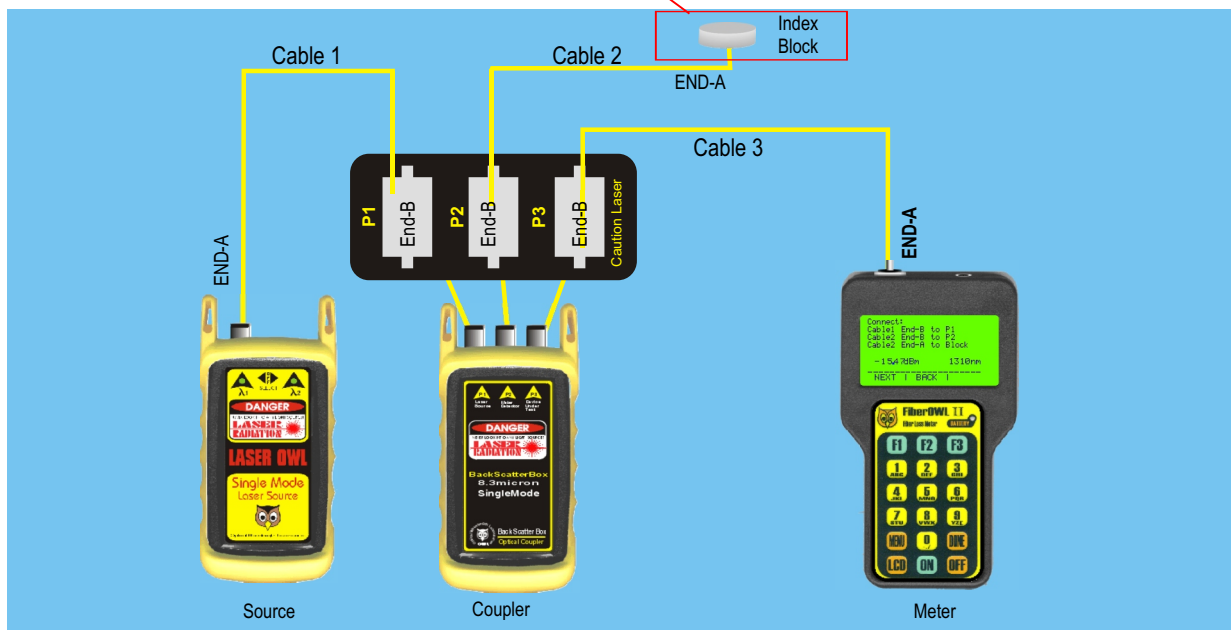
Minimum Required
Return Loss (dB)
[50.00]
-----
<--- | SHIFT | --->
    
```

FOTP-107A 5.3 Method B. Determination of Link Return Loss Using One Detector

Please note the **Index Block** formally know as an Index Matching Hard Gel Block. The purpose of this Block is to attenuate unwanted reflections that are not part of the back reflection calculations.

The fiber end has to be pushed with "sufficient force" (too much force will damage the block and too little force will not sufficiently attenuate excess energy) to make sure the fiber end is fully coupled into the semi-hard gel on top the block. Also, make sure that the block has been lightly rinsed and dried with 99% cleaning alcohol before and after test sessions.

Move around the fiber end on various locations on the block until you find a high degree of attenuation. Please note that Index Matching blocks are expensive to replace.



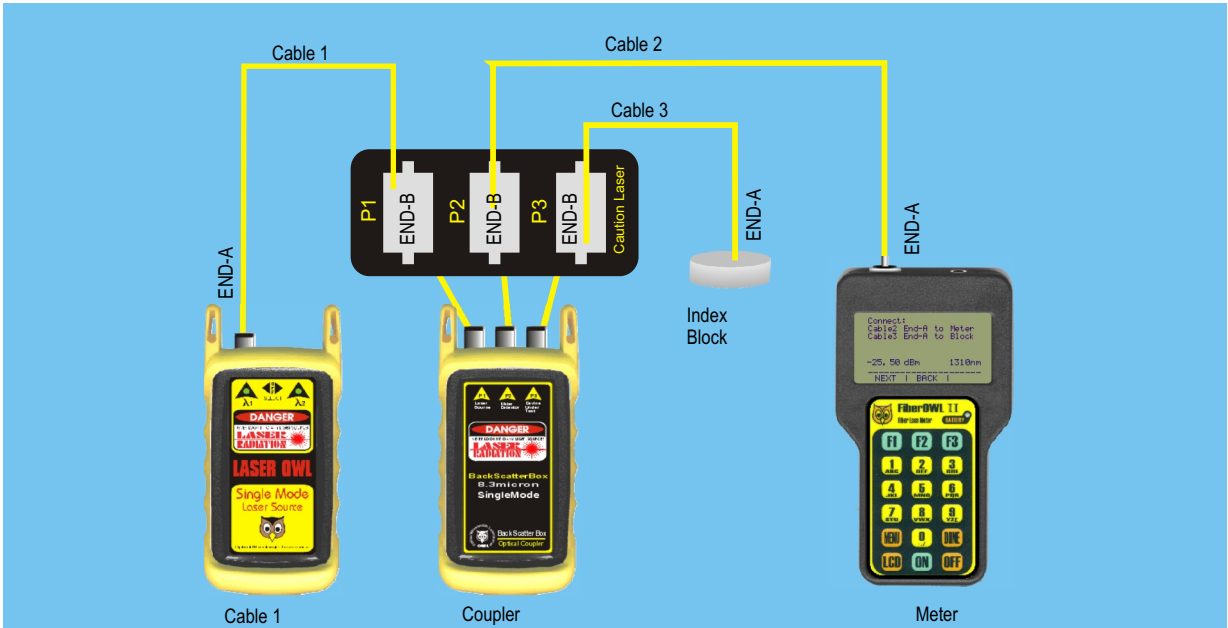
This is the screen that should appear after completing the steps on the previous page.

After connecting the cables as shown in the diagram, press **F1 NEXT** key to continue.

```

Connect:
Cable1 End-B to P1
Cable2 End-B to P2
Cable2 End-A to Block
-1547 dBm      1310nm
-----
NEXT | BACK | SET REF
    
```

The diagram and fiber owl screen prompt the final pre-test calibration steps before test reading can begin..



This is the screen that should appear after completing the steps on the previous page.

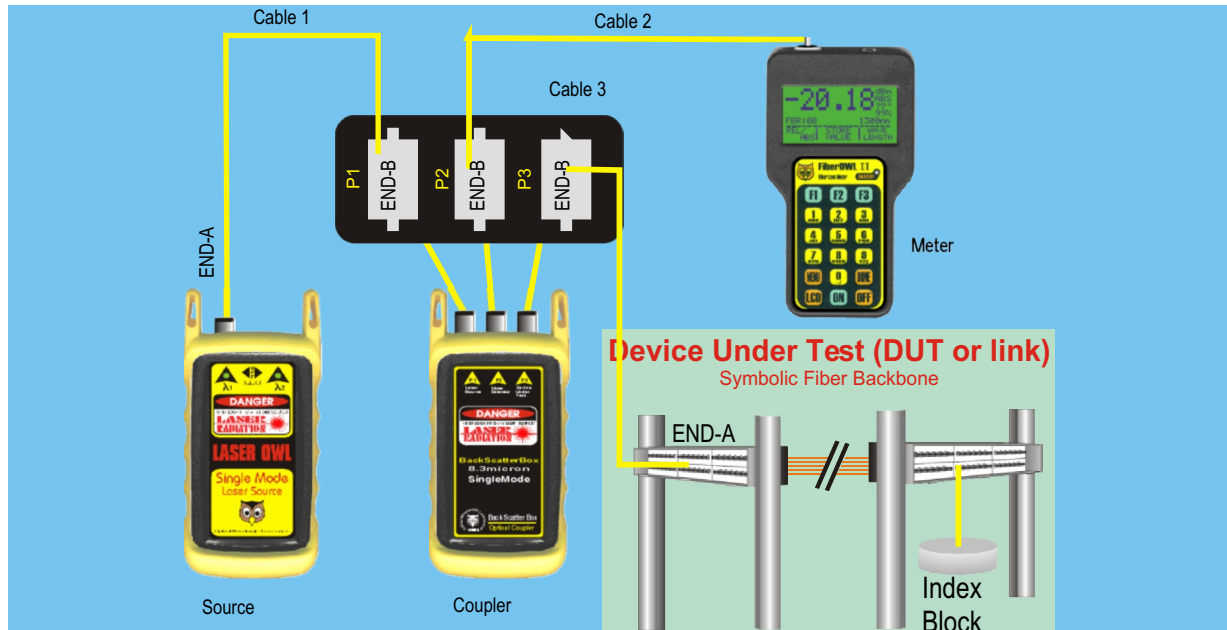
After connecting the cables as shown in the diagram press the **F1 NEXT** key to continue.

```
Connect:
Cable2 End-A to Meter
Cable3 End-A to Block

-25.50 dBm      1310nm
-----
NEXT | BACK | SET REF
```

Begin Taking Readings

You are now ready to take readings with Cable 3 End-A to the near end of the link (DUT) and the Index Block at the far end of the link (DUT).



The first screen should appear after completing the steps on the previous page.

After connecting the cables as shown in the diagram press **F1 NEXT** key to continue.

```

Connect:
Cable3 End-A to DUT
Note:Place GEL Block
at end of DUT before
taking readings
-12.71 dBm      1310nm
-----
NEXT | BACK | SET REF
    
```

This screen appears after you have completed the steps above for the FOTP-107A.

This screen titled BEGIN TAKING READINGS is to indicate that pre-calibration is complete, and that you are ready to begin taking test readings. Press **F1** key to indicate **YES**.

```

BEGIN TAKING READINGS
FOR LINK:
    
```

```

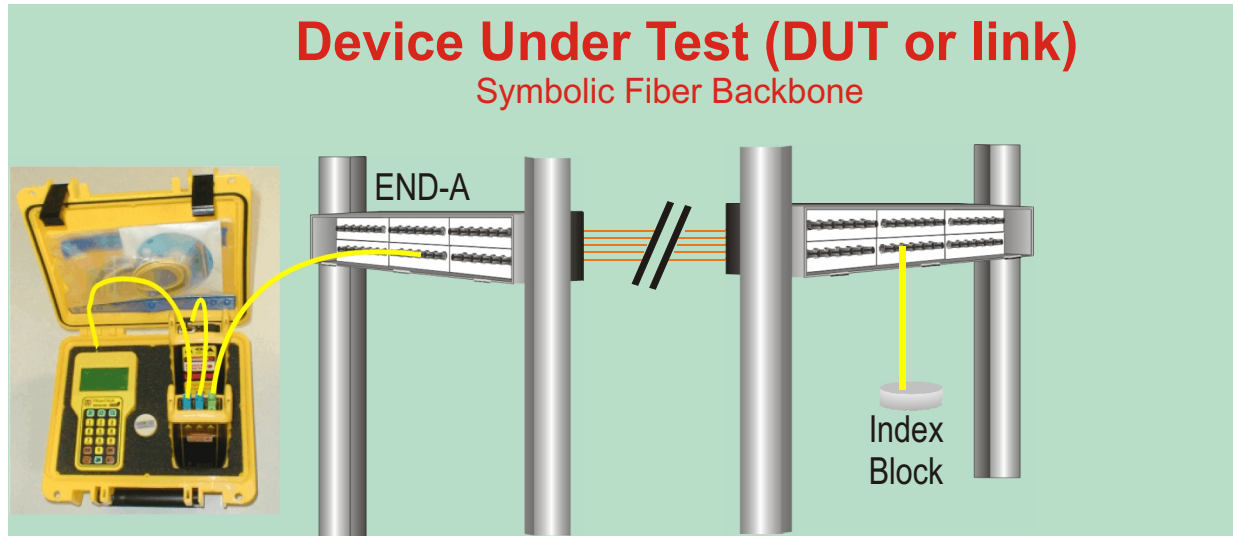
FIBER LINK #1
    
```

```

-----
YES |      | NO
    
```

Fiber OWL Data Storage

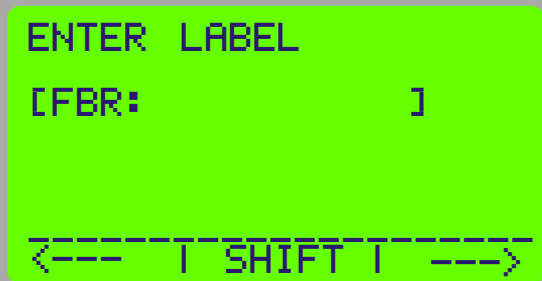
Remember to keep the test equipment as shown in this photo. This will make handling easy and keep a high degree of test equipment stability. Some sort of stand or rack shelf would also be useful to stabilize the test equipment as the test cables simply move from port to port. You may find it as a safety precaution to lean the light source and WaveSplitter box towards the back of the carrying case.



The screen at the right shows the amount of return loss in the Device Under Test (DUT or link). The second line shows whether the link passes or fails when compared to the PASS/FAIL threshold. To store the data in the Fiber OWL meter, press the **F2 STORE** button on the keypad.



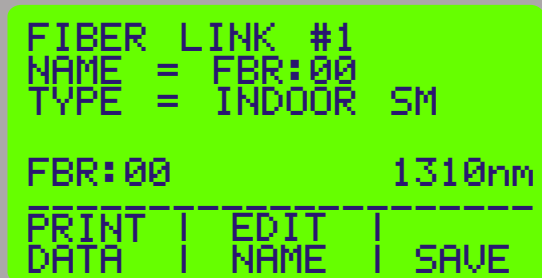
If no data has been stored using this link name, then the screen at right will appear. Press **DONE** to continue.



The screen at the right is a preview of the stored data point. Press **F3 SAVE** to store the data point. You will then be returned to the Return Loss reading screen.

Move the test cables to the next link (DUT) port(s)..

Repeat the previous two data storage steps for each link (DUT) you wish to test.



Downloading data into a PC with OWL Reporter

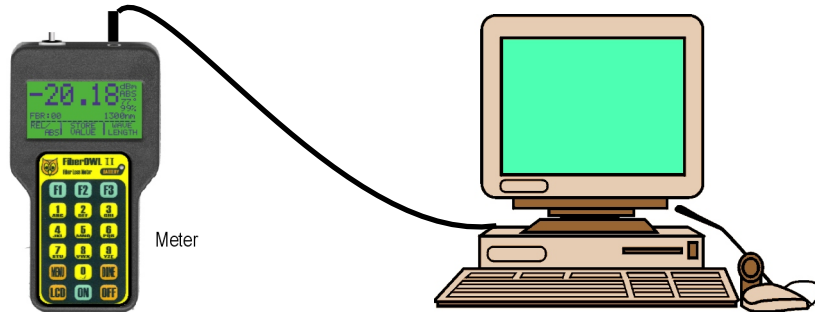
Once you are done testing all of the links, you may download the stored data points to a PC running OWL Reporter software.

You will need a Pentium PC (or better) running Windows 95 or greater operating system. Please use the included CD to install OWL Reporter software. Insert the CD to begin the installation. Follow the on-screen steps to install. Once OWL Reporter is installed on your PC, you are ready to download the data points from your Fiber OWL meter.

Connect the Fiber OWL to your PC COM port via the supplied download cable.



First, you must prepare the Fiber OWL for download to PC. Follow the steps below:



The screen at left shows the MAIN MENU. You may set up the Fiber OWL to download its data into your PC by pressing the **3** key in order to enter **<3>STORED READINGS**.

```
MAIN MENU
<1>LINK WIZARD
<2>FIBER LINK MENU
<3>STORED READINGS
<4>METER PROPERTIES
<5>TAKE READINGS
```

This screens shows the STORED READINGS menu. Press **4** to enter **<4>DOWNLOAD DATA** to show your download options.

```
STORED READINGS
<1>VIEW/EDIT/LOAD/PRN
<2>PRINT READINGS
<3>DELETE READINGS
<4>DOWNLOAD DATA
BYTES FREE = 1771
```

This screen shows your download options. Press **1** to **<1>USE OWL REPORTER** to download your data into your PC.

```
DOWNLOAD OPTIONS
<1>USE OWL REPORTER
<2>MANUAL DOWNLOAD
```

This screen tells you that you are ready to download data from the Fiber OWL.

Leave the Fiber OWL at this screen during the download process.

```

WAITING FOR
CONNECTION TO PC

RUN OWL REPORTER NOW

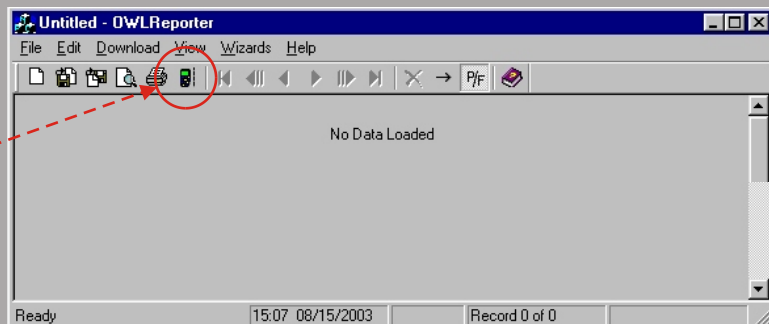
-----
ABORT | |
DOWNLOAD | |
    
```

With the Fiber OWL meter at the screen as shown above, run OWL Reporter. The shortcut is located in the Start Menu, under Programs, OWL, and is named OWL Reporter.

Begin the data download by pressing the download button which is highlighted on the screen shot at the right. The software automatically downloads all data

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.

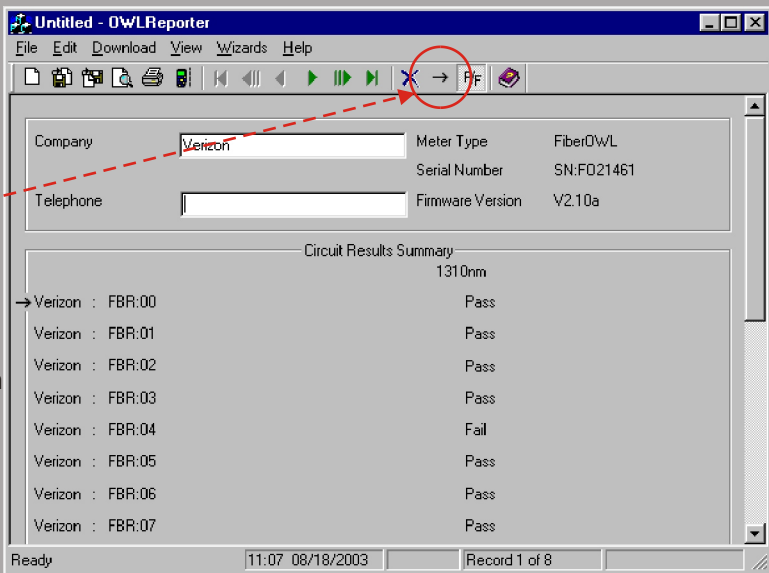


Summary View

By default, OWL Reporter opens up into Detail view. However, you may find Summary view more useful for ORL test evaluation.

To switch to Summary 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.

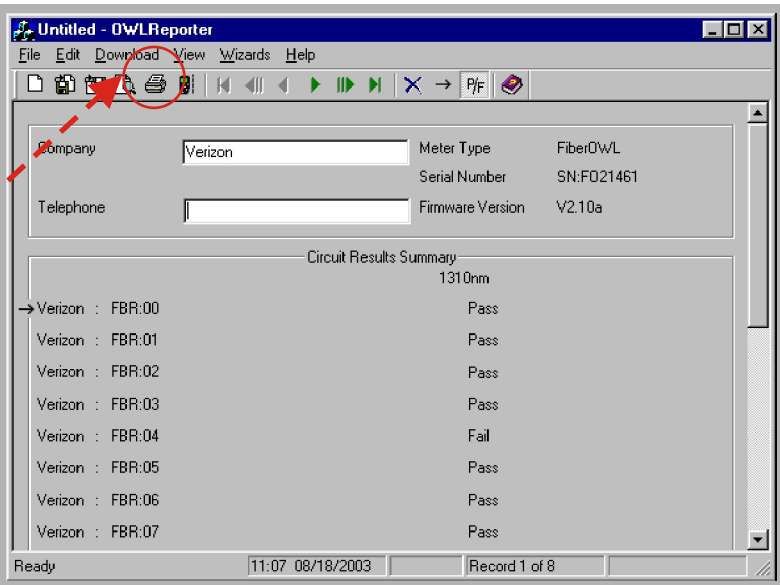
This screen shows the Link ID, each stored data point, and whether the test passed or failed.



Printing ORL Reports

You may 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 below.



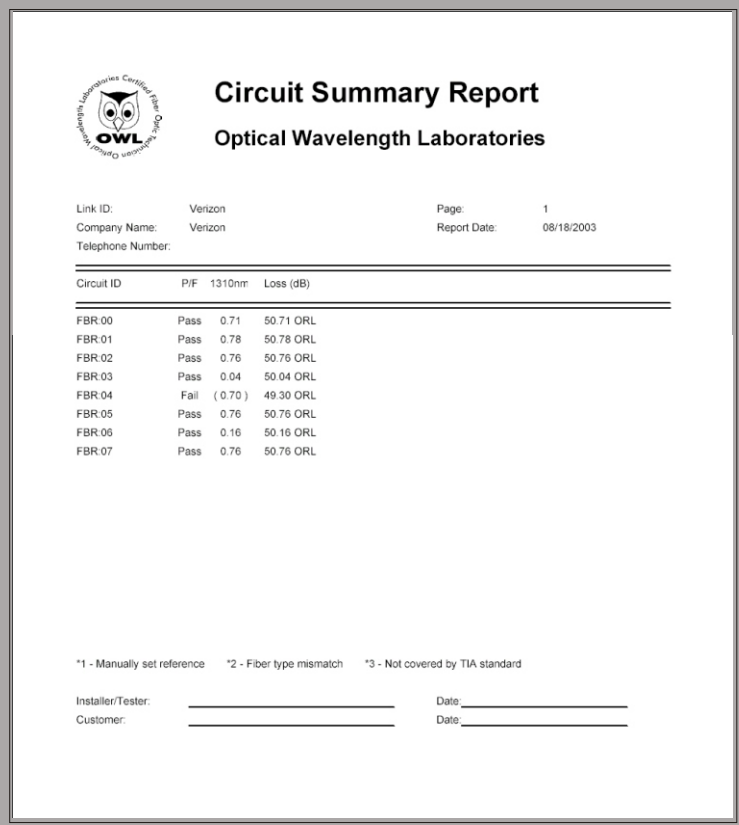
At right is an example of the Circuit Summary Report. Below are descriptions of the columns:

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

P/F - shows whether the test passed or failed

1310nm - shows the amount by which the test passed or failed by at the wavelength tested

Loss (dB) - shows the amount of ORL



Similarly, you may run a detail report using the same steps as above, except that you need to first switch back to Detail view. Detail reports show pertinent information for each link that you tested. Remember to learn more about Fiber OWL features see the PDF manual on the supplied CD-ROM disk.