

Optical Wavelength Laboratories

OPERATIONS GUIDE

OWLTrek II Series

Optical Time Domain Reflectometers (OTDR)

Singlemode: WTO2-S15 / WTO2-S13 / WTO2-S35
Multimode: WTO2-M85 / WTO2-M13 / WTO2-M83



Revision 3B

OWL-INC.COM

Optical Wavelength Laboratories (OWL)
N9623 Old US Hwy 12
Whitewater, WI 53190
Phone: 262-473-0643
Internet: OWL-INC.COM



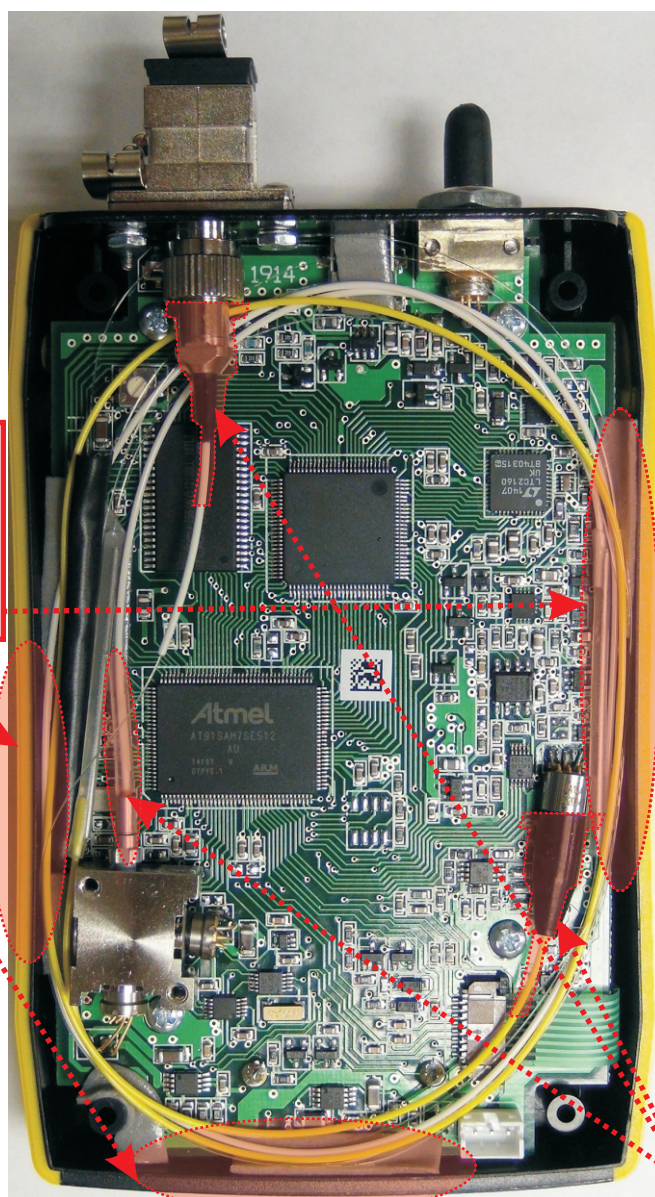
WARNING!!!

HANDLE WITH EXTREME CARE!

This device contains expensive, extremely fragile optical fibers, lasers, and photodiodes.

This device is **highly susceptible** to **damage** from **impact** – avoid dropping this device.

DO NOT OPEN THIS UNIT!



CRITICAL DAMAGE POINT
Fiber crush point near
enclosure's edge.

NOTE: This is an issue for
ALL SIDES of the enclosure
when re-sealing the unit

CRITICAL DAMAGE POINT
Fiber coupling to laser and photodiode

SECTION I: INTRODUCTION

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ABOUT THIS MANUAL

Throughout this manual you will find various symbols that assist with understanding the procedures outlined in this manual. Below is a list of these symbols and a short description of their purpose:



Helpful tip



Cautionary information



Potentially dangerous condition or operation

SECTION I: INTRODUCTION

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 or online courses.

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

OTDR basics

The above is especially true for Optical Time Domain Reflectometers (OTDRs). OTDRs are complicated technical devices, requiring a great amount of technical skill, knowledge, and expertise to operate. Proper setup and trace interpretation are paramount to a successful OTDR test, and the consequences of being inadequately trained could result in a significant amount of network down-time and repair costs.

In addition, OTDRs are delicate scientific instruments, and should be treated as such. Great care should be taken to ensure that all optical ports are kept clean and free from debris. The reasons for this are two-fold: 1) a clean OTDR produces accurate and precise results; and 2) if debris is allowed to build up in the OTDR test port, over time connector insertions will grind the debris into the OTDR port endface, resulting in scratches or “pits” that require extensive and costly repairs.

The main purpose of an OTDR is to locate faults in an optical fiber that exhibits unacceptable amounts of optical loss, or is no longer functioning properly. These faults are commonly called “events” and include anomalies such as breaks, shatters, connector endfaces, patch panels, splices, macro-bends, and micro-bends. By knowing the precise distance to an event, the technician can determine the nature of the event and quickly restore the network to its former working state.

There are two types of events detectable by an OTDR: Fresnel (reflective) and backscatter (non-reflective).

Fresnel events are caused by “glass-to-air” boundaries in the optical fiber, which causes a high amount of light to be reflected directly back toward the OTDR. Common Fresnel events include breaks, shatters, connector endfaces, patch panels, or even the end of the fiber. End-of-fiber detection can also be used to measure the end-to-end length of the fiber.

Backscatter events are caused by the intrinsic properties of the optical fiber. The make-up of the optical fiber scatters the light in all directions, including a small amount that gets scattered back towards the OTDR. Common backscatter events are splices (either fusion or mechanical), macro-bends, and micro-bends. Backscatter can also be used to measure the attenuation (loss) on a certain section of an optical fiber.

OPM basics

Optical power meters (OPM) are designed to measure the amount of optical power (i.e. the “brightness” of light) exiting an optical fiber. OPMs calibrated against government calibration standards such as NIST ensure these power measurements are accurate. OPMs have two main functions:

Output power measurement. Connect directly to a transmitter port to verify the output power of active equipment or test light sources is within specification. Connect to the far end of a link to: 1) ensure continuity and connector polarity; or 2) measure output power from active equipment to ensure receiver sensitivity.

Optical loss measurement. When used with a test light source, an OPM can be “zeroed out” to measure the end-to-end loss of a fiber link.

SECTION I: INTRODUCTION

DESCRIPTION

Upholding OWL's commitment to high-quality, yet affordable, fiber optic test equipment, the OWLTrek II OTDR enables fiber optic professionals to quickly and easily troubleshoot and locate optical faults in multimode and singlemode fibers.

The OWLTrek II is truly a hand-held unit, being one of the smallest OTDRs on the market today – easily able to fit into a shirt pocket – yet having capabilities of other OTDRs costing thousands of dollars more.

Optical fiber traces are displayed on a high-resolution color LCD display which implements state-of-the-art display technology to allow the OTDR's high-resolution color LCD display to "flip" between portrait or landscape mode automatically simply by rotating the device 90°. By "flipping" from portrait to landscape, the user sees a wider viewing area, displaying more trace information on the high-resolution color LCD, and allowing for greater viewing detail.

Important OTDR trace parameters such as pulse width, index of refraction, and data point averaging are fully user-configurable, and are accessible through an intuitive menu system. A minimum of 65 traces using the longest trace distance can be stored in the OWLTrek II's internal memory.

Powering the OWLTrek II is a re-chargeable Lithium-polymer battery that allows for up to 20 hours of normal usage.

The OWLTrek II is equally suited to testing multimode and singlemode fibers in many test environments, including LAN, MAN, WAN, FTTH, Telco, CATV, Manufacturing, and Laboratory.

Some models also include an optical power meter port used for optical power and optical loss measurement.

PERFORMANCE EXPECTATIONS AND LIMITATIONS

REFLECTIVE EVENTS

Fault Location. The main function of the OWLTrek II OTDR is to detect the presence of highly reflective events, otherwise known as Fresnel events, such as breaks, shatters, patch panels, or the end of the fiber link. The distance to an event is shown as a spike on the OTDR trace, allowing the technician to quickly locate the problem and restore the network.

Fiber Length Measurement. The OWLTrek II can give the operator a general idea of the length of the optical fiber by placing the cursors at the first and last reflective events, although the last reflective event is not guaranteed to be the end of the fiber. For example, a severe enough break mid-span could prevent the OTDR from detecting other events beyond the break, or the OTDR trace could show echoes or ghosts of previous Fresnel events.

BACKSCATTER EVENTS

Backscatter Events. The OWLTrek II has some ability to locate and measure backscatter events. Tweaking pulse-width and averaging settings may enhance the OWLTrek II's ability to detect backscatter events. However, even with optimal settings, low loss backscatter events will become less detectable as the event gets farther away from the beginning of the fiber, especially on longer fibers.

Backscatter events are also more difficult to measure and interpret. Proper cursor placement is vital to the accurate measurement of backscatter events. Only individuals with OTDR training and expertise should attempt backscatter event measurement. Interpreting OTDR traces will be covered in more detail later in this manual.

Attenuation Measurement. Backscatter can be used to measure the attenuation (or loss) of certain sections of an optical fiber by placing the cursors at the beginning and end of the segment of fiber to be measured.

If available, however, a Power Meter / Light Source (PMLS) test kit or Optical Loss Test Set (OLTS) should always take precedence over an OTDR for end-to-end attenuation measurements.

SECTION I: INTRODUCTION

PRECAUTIONS

Eye Safety



NEVER look into the connector port of any fiber optic test or transmission equipment, patch cable, fiber link, or other installed fiber. Always assume that active laser equipment is attached to optical fibers, and is powered on.



Do not run a test on the OTDR unless it is connected to the fiber under test, or the dustcap is firmly in place.

Electrical Safety



Only use appropriate AC adapters for charging this device. Use of inappropriate power adapters could cause damage to the device, and could cause harm to the user from fire and electrical shock.

Operational



Keep connector ferrules and optical connector ports clean to prevent irreparable damage to the OTDR port. For best results, replace dust caps after each use.

Connector



For best results, do NOT insert APC (Angled Physical Contact) connectors into the OTDR and OPM ports.

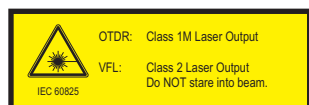
Service



There are no user-serviceable parts in this device. Unauthorized attempts to service this product will void the product warranty.

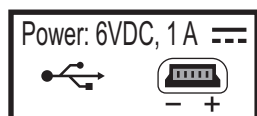
LABEL INFORMATION

On the back of each OWLTrek II OTDR is a label similar to the one shown here containing model number, serial number, power requirements, and special cautionary information.

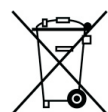


OTDR port Class 1M Laser Output

VFL port Class 2 Laser Output. Do NOT stare into beam.

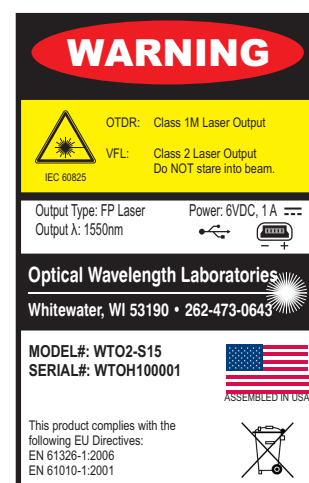


USB port 6VDC, 1A



Directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE)

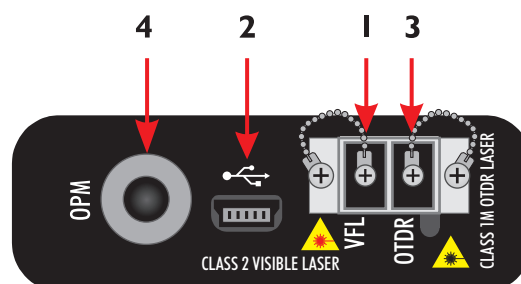
EU Directives EN 61326-1:2006 (EMC) and EN 61010-1:2001 (Safety)



SECTION I: INTRODUCTION

PORTS

- 1 **Visual Fault Locator Port (VFL)** – LC connector port; Visual Fault Locator port for troubleshooting
- 2 **USB Download Port** () – downloads data from the OTDR to the PC for software trace analysis and digital data storage; also used for battery charging
- 3 **OTDR Port** – LC connector port; connects the OTDR to the fiber under test;
- 4 **OPM port (optional)** – OTDRs that include an integrated OPM use a universal port system that includes a 2.5mm adapter (for SC, ST, and FC) and a 1.25mm adapter (for LC)



BUTTONS

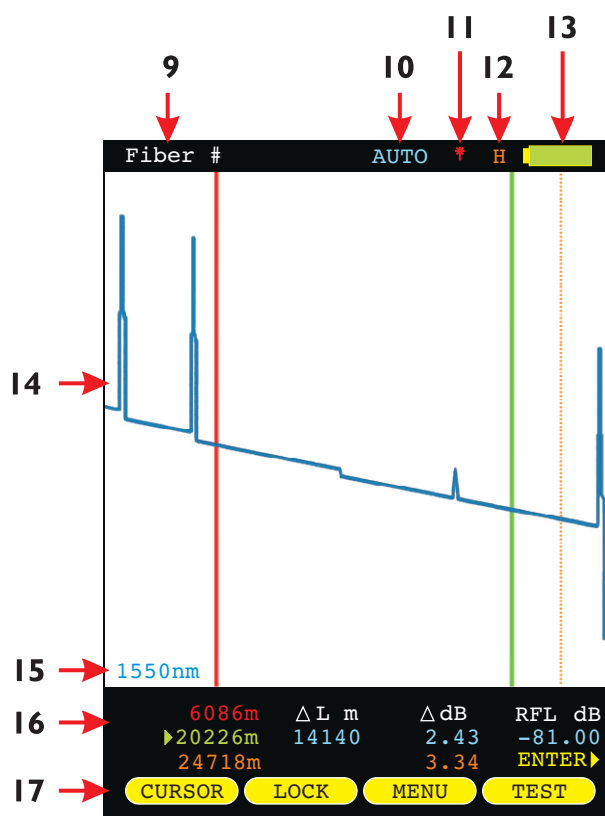
- 5 **Menu Buttons** – activates the associated menu option
- 6 **Navigation Buttons** – moves cursors or menu options in the direction of the button, or are used to zoom in or out on cursor placement
- 7 **Power Button** – powers the OTDR on; press and hold to power off; also, while the OTDR is on, brief press will activate other functions
- 8 **Enter Button** – from the trace screen, this button changes the function options menu at the bottom of the screen. Also activates menu options while in the menu system



SECTION I: INTRODUCTION

DISPLAY

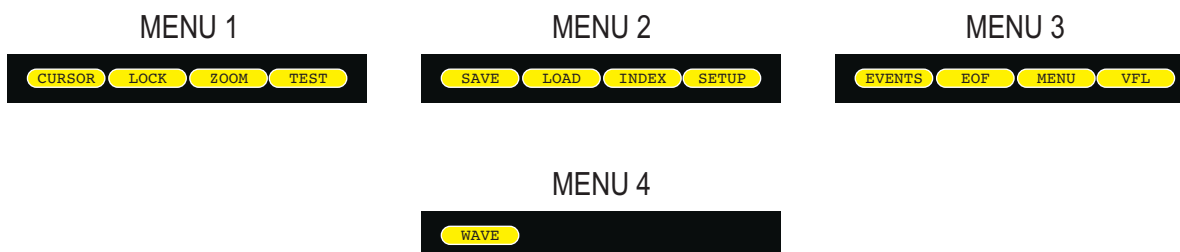
- 9 **Fiber ID** – name of the currently loaded fiber trace
- 10 **OTDR Test Mode** – shows which test mode the OTDR is in – AUTO, USER, SEMI, or FILT
- 11 **VFL Indicator** – shows the current VFL mode: blank = OFF; red = ON continuous; pink = ON flashing
- 12 **Zoom Indicator** – displays “H” for horizontal zooming, and “V” for vertical zooming
- 13 **Battery Life Indicator** – displays the remaining battery life
- 14 **Trace Viewing Area** – displays the results of the OTDR trace(s), which users can zoom in on for more detailed trace analysis
- 15 **Trace Wavelength** – shows the wavelength(s) of the traces displayed in the trace viewing area. The active trace wavelength will be listed on the left.



If more than one wavelength is present, the color of the trace corresponds with the color of the wavelength number

- 16 **Trace Information** – displays the relative position and power levels at and between the red and green cursors for the currently active trace.
- 17 **Function Options Menu** – displays the on-screen menu options for trace control

Depending upon model number, there could be three or four sets of Function Options Menus. The Enter key () is used to toggle between these menus:



NOTE: the WAVE option will only be displayed if more than one wavelength is present

SECTION I: INTRODUCTION

INDICATOR LEDs

- 18** **CHARGING STATUS** – will be lit when charging through a transformer or USB port

GREEN battery fully charged

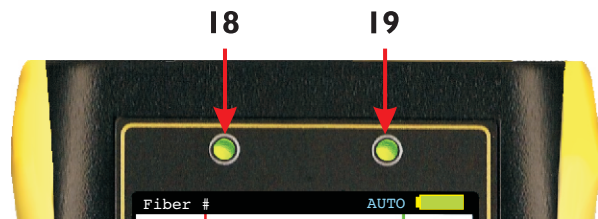
ORANGE battery charging

RED problem with battery and/or charger; contact OWL for service

- 19** **STANDBY STATUS**

Normal operation **GREEN** blinking

STANDBY **RED** solid; press any key to “wake up” the device



SECTION 2: OTDR TESTING

POWER ON/OFF

POWER ON

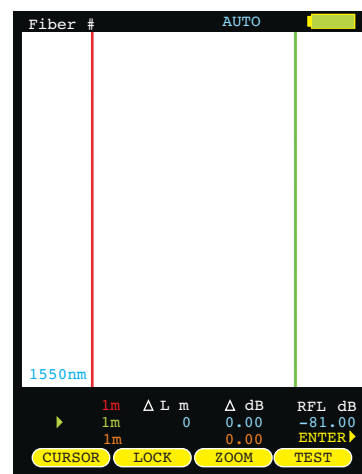
Press  to power on the OTDR.

When the OTDR has completed startup, the trace area will either be blank, as shown at right, or will show the previously viewed trace.

Continue below for more information about running a new OTDR trace.

POWER OFF

The OTDR may be powered off from any screen by holding .



KEY OTDR TRACE PARAMETERS

Below is a descriptive list of key OTDR trace parameters.

WAVELENGTH – range of values: **Multimode: 850, 1300, BOTH; Singlemode: 1310nm, 1550nm, BOTH.** Allows the user to select one or two wavelength(s) used for testing. Wavelength selection only applies to dual-wavelength OTDR.

INDEX OF REFRACTION – range of values: **1.4000 to 1.6000.** To ensure the most accurate distance to events, Index of Refraction (IoR) should be set to the fiber manufacturer's refractive index specification for the fiber under test. If unknown, set IoR to:

SINGLEMODE – 1.4681 (as this value falls within 99% of the IoR values for most singlemode optical fibers)

MULTIMODE – 1.4920

CAPTURE MODE – range of values: **AUTO, SEMI, USER, FILT, LIVE.**

AUTO all trace options are determined automatically, except dead zone length.

SEMI same as AUTO except the pulse width is not automatically determined.

USER all user configured options are used when capturing the trace.

FILT same as USER plus the software will filter (smooth) the trace to remove noise. This will help produce a cleaner trace with less averaging required.

LIVE uses the user-defined trace settings to continuously update the trace on the screen. The trace will be updated after the user-defined number of averages is completed. The cursors and zoom functions work in LIVE mode. To start and exit LIVE mode, press the TEST function button.

NOTE: if connected to a PC running OWLView software, LIVE mode also updates the software trace area

PULSE WIDTH – range of values: **Multimode: 1, 2, 5, 10, 20, 50, 100 m; Singlemode: 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 m.** Pulse width offers a trade-off between the ability to measure longer cable distances (longer pulse width) versus the ability to see two events that are closely spaced (shorter pulse width). This is otherwise known as an OTDR's event dead zone (i.e. the minimum distance between two events where they both can be measured).

NUMBER OF AVERAGES – range of values: **256, 512, 1024, 2048, 4096.** Increasing the number of averages allows the OTDR to have better display resolution (events are easier to see, especially near the noise level), but also increases the trace acquisition time.

DEAD ZONE LENGTH(m) – range of values: **0 to 1500.** Allows the user to enter the length of a dead-zone box (a.k.a. pulse suppressor), if one is being used. If a value is entered for dead zone, the dead zone portion of the OTDR trace will be grayed out. The active portion of the trace will begin where the dead zone ends.

RANGE – range of values: **1, 2, 5, 10, 25, 50, 65, 128 km.** Allows the user to manually enter the total length of the trace. NOTE: for best results, this value should be set to the next highest value from the actual length of the fiber under test.


STEP – range of values: **1, 2, 4 m.** Trace sample spacing. Smaller steps produce more accurate distance to events, but trace acquisition takes longer.

SECTION 2: OTDR TESTING

SETTING TEST PARAMETERS

SET WAVELENGTH

When using a dual-wavelength OTDR, traces can be run at either one or two wavelengths.

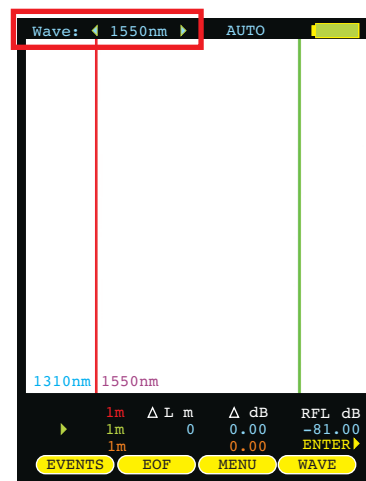
To set the trace wavelength(s), press  from the trace screen until the following menu options appear:



allows the user to select one or both wavelengths to be used for testing. Arrow keys scroll through three options: 1310nm, 1550nm, BOTH. Press key again to exit.


The selected wavelength(s) will appear at the bottom of the trace screen. If two wavelengths are present on the trace screen, they will be displayed as either **blue** or **brown**.

The cursor information below the trace screen applies to the wavelength listed in **blue**.



If the OTDR only has one wavelength installed, the WAVE option will not appear.

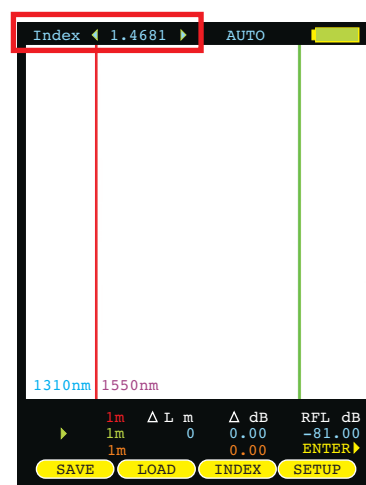
SET INDEX OF REFRACTION

To set the index of refraction, press  from the trace screen until the following menu options appear:



allows the user to change the index of refraction; setting will appear at the top of the trace screen. Press key again to exit.

Index of refraction should be set to the optical fiber manufacturer's index of refraction specification. If unknown, use the suggested values below.



Suggested index of refraction values:


SINGLEMODE – 1.4681

MULTIMODE – 1.4920

SECTION 2: OTDR TESTING

SETTING TEST PARAMETERS, cont.

SETTING TRACE OPTIONS

To see an additional menu of trace options, press  from the trace screen until the following menu options appear:



opens the TRACE OPTIONS menu



selects the next or previous trace option



changes the value in the selected trace option

CAPTURE MODE – Range of values: AUTO, SEMI, USER, FILT, LIVE

Capture Mode should be set to **AUTO** mode for a majority of testing scenarios, so the OTDR can automatically determine the best set of trace parameters based on the fiber link under test.



USER, SEMI, FILT, and LIVE require the user to understand the consequences of setting trace parameters manually.

Only trained fiber optic professionals who are experienced with operating OTDRs should manually set trace parameters. Suggestions for setting these parameters are given below.

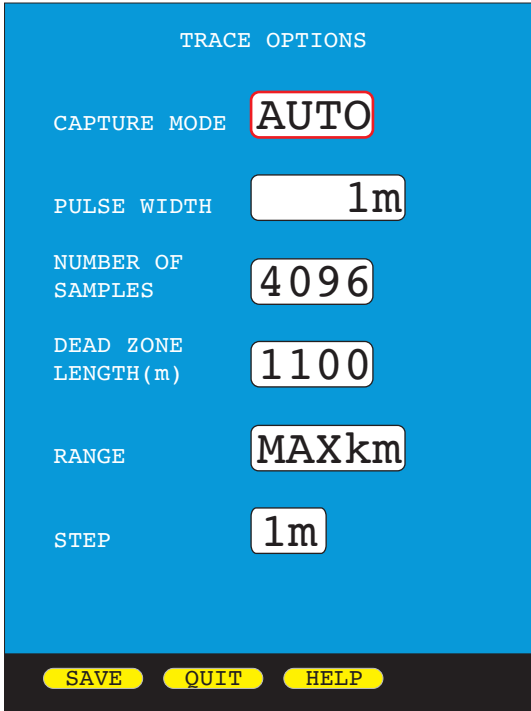
PULSE WIDTH – range of values: Multimode: 1, 2, 5, 10, 20, 50, 100 m; Singlemode: 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 m. Pulse width should be set to the shortest setting that allows multiple closely-spaced events to be clearly defined, while preventing any of the trace from reaching the noise floor.

NUMBER OF AVERAGES – Range of values: 256, 512, 1024, 2048, 4096. Use the maximum number of averages unless traces are taking too long to acquire.

DEAD ZONE LENGTH (m) – Range of values: 0 to 1500. Set this value to '0000' if not using a dead-zone box (a.k.a. pulse suppressor box). If using a dead-zone box, and you want to highlight the dead-zone box length on the trace, enter the length of the dead-zone box in meters.

RANGE – range of values: 1, 2, 5, 10, 25, 50, 65, 128 km. Set to the next highest value from the actual length of the fiber under test. If fiber length is unknown, select MAX km.

STEP – Range of values: 1, 2, 4 m. Use shortest STEP value for most accurate distance to events, unless trace acquisition time is too long.



TRACE OPTIONS

CAPTURE MODE **AUTO**

PULSE WIDTH **1m**

NUMBER OF SAMPLES **4096**

DEAD ZONE LENGTH (m) **1100**


RANGE **MAXkm**

STEP **1m**

SAVE QUIT HELP

SECTION 2: OTDR TESTING

STARTING AN OTDR TRACE

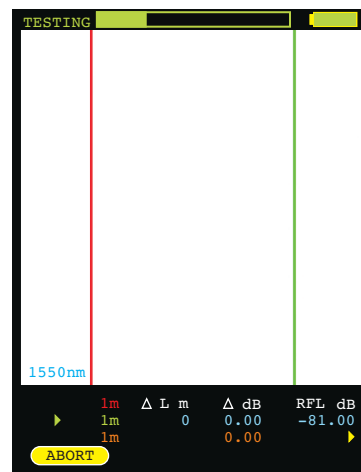
Once the OTDR parameters have been set, an OTDR trace can be run. Press  from the trace screen until the following menu options appear:



 starts an OTDR trace based upon the current OTDR parameters

During the OTDR test (as shown at right):

- the ABORT soft-key appears (used to abort an OTDR trace)
- all soft-keys are disabled
- a bar graph appears at the top of the screen showing the progress of the OTDR test
- dual-wave test will run a separate trace automatically for each wavelength




- ✓ starting a new trace will replace the old trace on the display with the new trace after a few seconds (depending upon the trace length).

CURSOR NAVIGATION

Once the OTDR trace is complete, the OTDR trace will appear on the screen, and the OTDR information – distance and optical power – will be updated.

- ✓ two color coded traces will appear on the screen if a dual-wavelength trace was run

Trace information is color-coded. **Red** and **green** refer to the cursors. **Blue** text refers to the difference between the two cursors. **Orange** text refers to the perceived end of the fiber link (the position of the **orange** dotted line).

 sets the active cursor – no cursor, **red**, **green**, or both **red** and **green**

 locks the active cursor at its current location; unlocks a locked cursor

When a cursor is locked, a colored padlock symbol will appear next to the appropriate cursor information

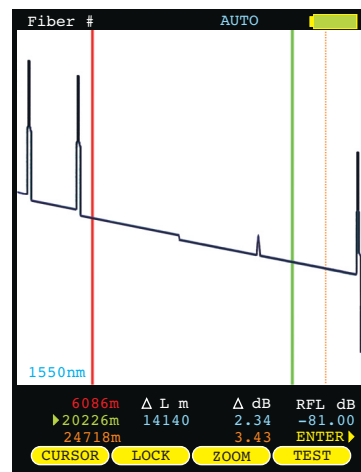
 sets the ZOOM mode to Horizontal (H) or Vertical (V)

  **WHEN ONE OR MORE CURSORS ARE SELECTED:** moves the cursor(s) left or right; holding these buttons speeds up the cursor movement

WHEN NO CURSOR IS SELECTED: screen pans left and right

  **WHEN ONE OR MORE CURSORS ARE SELECTED:** zooms in or out on the active cursor(s)

WHEN NO CURSOR IS SELECTED: zooms in and out on the center of the screen



SECTION 3: TRACE ANALYSIS

OVERVIEW

This section will provide a basic overview about how to analyze an OTDR trace, and will cover the different types of information that can be gathered from an OTDR trace, including:

- event location;
- fiber length measurement;
- fiber attenuation (loss); and
- reflectance measurement.



proper interpretation of OTDR test results requires a significant amount of technical skill, knowledge, and expertise. Proper trace interpretation is paramount to a successful OTDR test, and the consequences of interpreting a trace incorrectly could result in a significant amount of network down-time and repair costs.

EVENTS

The primary function of an OTDR is to locate events along the optical fiber. On an OTDR trace, events appear as deviations from an otherwise gently sloping line.

Below is a list of the different events shown in the example at right, including the type of event, and possible interpretations of the data:

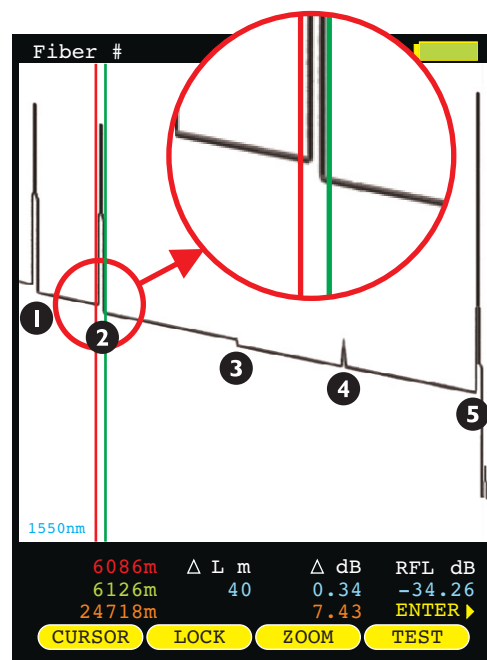
- | | | |
|----------|-------------|---|
| 1 | Fresnel | end of dead-zone box (pulse suppressor) |
| 2 | Fresnel | patch panel using flat polish connectors |
| 3 | Backscatter | fusion splice or macro-bend |
| 4 | Fresnel | patch panel using APC (angled physical contact) connectors |
| 5 | Fresnel | end of fiber link; could also indicate a severe break where no other events can be detected after the break |



If the slope of the trace appears to “dip” to a lower level after the event (events 1, 2, and 3), this could mean one of two things: 1) if the slope of the line changes, the refractive index of the fiber preceding the event is different from the refractive index of the fiber following the event, or 2) if the slope stays the same, then the event is simply a loss-inducing event.



Tall spikes usually indicate flat polish connections or other highly reflective events (breaks, shatters, end of fiber, etc.), while short spikes usually indicate angled polish connections.



CURSOR PLACEMENT

Proper cursor placement is critical in determining the exact distance to an event, as well as the relative effect the event has on optical power traveling through the event.

The **red** cursor should be placed right before the slope of the line begins to spike.

The **green** cursor should be placed after the event, at a point where the slope of the line returns to the normal backscatter level.

Cursor information is located below the trace. **Red** and **green** cursor information shows the distance to each cursor. The **blue** length information shows the distance between the cursors, and the **blue** dB number is the dB loss of the event being measured.

SECTION 3: TRACE ANALYSIS

FIBER LENGTH MEASUREMENT/LINK LOSS

By placing the cursors at the beginning and ending points of the fiber trace, the distance between the cursors will show a close approximation of the total length of the optical fiber link, as well as a close approximation of the total fiber link loss.

CURSOR PLACEMENT

Proper cursor placement is necessary to determine the end to end length and link loss of an optical fiber link. Refer to the diagram at right when placing cursors for fiber length measurement.

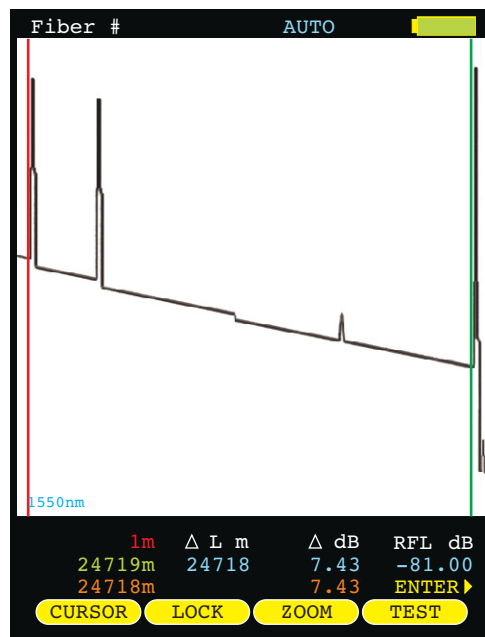
The **red** cursor should be placed directly before the first reflective event, before the slope of the line begins to spike.

The **green** cursor should be placed directly before the last event, before the slope of the line begins to spike.

Cursor information is located below the trace. **Red** and **green** cursor information shows the distance to the cursor, and the **blue** information shows the distance and relative power (in dB) between the **red** and **green** cursors.

With cursors placed as shown at right, the **blue** length number is the approximate end-to-end length of the fiber link, and the **blue** dB number is the approximate dB loss of the link (not including the loss of the far end patch panel.)

In this example, the total link length is **24718 meters**, and the end-to-end link loss (not including the far end patch panel) is **7.43 dB**.



FIBER ATTENUATION MEASUREMENT

The fiber attenuation, or loss, for a certain section of an optical fiber link can be determined by placing the cursors at the beginning and end points of the segment of fiber under test.

CURSOR PLACEMENT

Proper cursor placement is necessary to determine the attenuation of a certain segment of fiber.

The **red** cursor should be placed at the beginning of the section of fiber under test.

The **green** cursor should be placed at the end of the section of fiber under test.

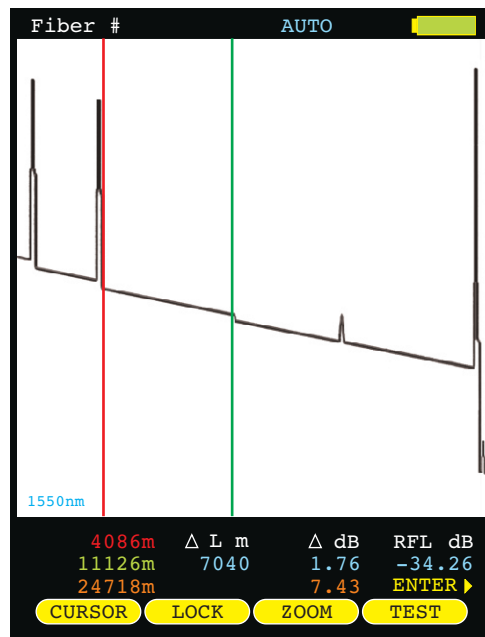
Cursor information is located below the trace. **Red** and **green** cursor information shows the distance to the cursor, and the **blue** information shows the distance and relative power (in dB) between the **red** and **green** cursors.

With cursors placed as shown at right, the **blue** length number is the length of fiber between the cursors, and the **blue** dB number is the dB loss of the fiber between the cursors.

In this example, the section of fiber being analyzed has **1.76 dB** of loss, and is **7040 meters**.

Using this information, attenuation of fiber (dB per kilometer) can also be calculated, which can then be compared to the fiber manufacturer attenuation specification. To determine dB/km:

$$1.76 \text{ dB} / 7.040 \text{ km} = 0.25 \text{ dB/km}$$



SECTION 3: TRACE ANALYSIS

REFLECTANCE MEASUREMENT

The reflectance of a specific event can be determined by placing the cursors on either side of an event. The OTDR will show the reflectance in dB of the highest reflective event between the cursors.

CURSOR PLACEMENT

Proper cursor placement is important when determining the reflectance of a reflective event.

The **red** cursor should be placed on the backscatter line directly before the event, on the sloping line before the spike.

The **green** cursor should be placed on the backscatter line at the point where the backscatter line returns to its normal slope.

Cursor information is located below the trace. **Red** and **green** cursor information shows the distance to the cursors, and the **blue** information shows the length, relative power, and reflectance between the **red** and **green** cursors.

With cursors placed as shown at right, the **blue** reflectance number is the point of highest reflectance (in dB) between the cursors.

NOTE: if multiple reflective events are included between the cursors, the reflectance number will display the most reflective of the events.

In this example, the reflective event being measured has a reflectance of **-34.26 dB**.



TRACE EVENTS MENU

Automatic event location can be performed from the trace screen by accessing the **EVENTS** function option. See Section 1: INTRODUCTION – DISPLAY for more information about function option menus.



IMPORTANT NOTE: automatic event location is only meant to be used as a guideline for the location of possible events. It is ultimately up to the user to verify and determine if an event actually exists at that location.

| | |
|----------|--|
| LOCATION | the distance to the start of the event |
| TYPE | type of event (reflective, loss, etc.) |
| REFL | reflectance of the event |
| LOSS | loss of the event |



moves the cursor up and down in the list of detected events



returns the user to the trace screen, zoomed in on the selected event



displays the next page of events, if there are more events than will fit on the screen



returns the user to the trace screen



view events for additional wavelength (if available)

| 1310nm TRACE EVENTS | | | |
|---------------------|------|--------|-------|
| Location | Type | Refl | Loss |
| 14m | REFL | -47.38 | 0.87 |
| ▶ 24011m | LOSS | -81.00 | 0.21 |
| 50539m | REFL | -17.54 | 11.63 |

VIEW PAGE DONE WAVE

NOTE: red text in the event table indicates that the event fails to meet user-set thresholds

Once an event has been selected from this menu, each individual event will be marked with a "tic" mark at the top of the trace area. The type of event is denoted by color: **black** for loss events and **light blue** for reflective events.

SECTION 3: TRACE ANALYSIS

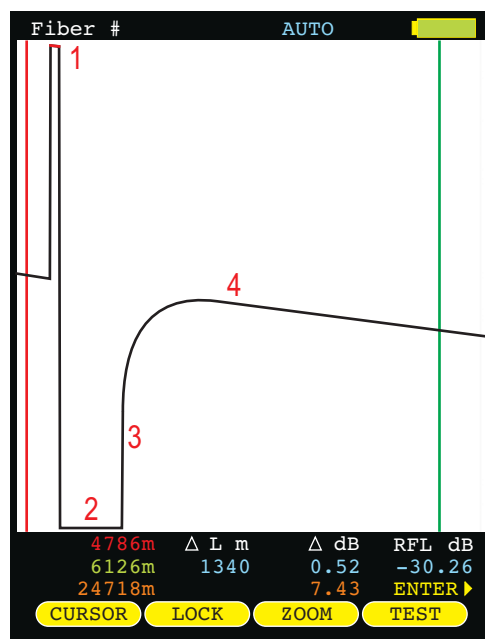
SATURATION INVERSION

Some highly reflective events are so reflective that they “over-drive” the OTDR circuitry, and cause the OTDR graph to appear as if the trace completely drops out.

This issue is called “saturation inversion”, and only appears when overly-reflective light causes the internal OTDR circuitry to become saturated.

Every OTDR suffers from saturation issues, and many high-end OTDRs include additional circuitry that tries to quench the saturation as it occurs.

However, irregardless of how well an OTDR can quench the saturation, the fact remains that the reflective event requires immediate attention.



TRACE ANALYSIS

The sample trace shown here shows what typical saturation inversion looks like. Four key points have been noted on the trace to explain what is occurring in the OTDR:

- 1) The red line at the top of the reflective peak shows that the OTDR has been saturated (please note that when the peak has a red line, the reflectance value is not being reported properly);
- 2) The flat line at the bottom of the trace shows that the OTDR has been “over-driven”, and has inverted the trace;
- 3) The OTDR has begun its recovery from saturation;
- 4) The OTDR has fully recovered from saturation, and has returned to its normal backscatter line.

In this example, the reflective event is caused by the interconnection that occurs between two connectors at a patch panel. The connectors on either side of the patch panel are PC (physical contact).

There are several ways to address highly reflective events like this:

- a) Thoroughly clean and inspect both connectors for debris or damage;
- b) If the connectors appear damaged after thorough cleaning, try re-polishing the connector endfaces;
- c) Re-terminate using connectors with better reflectance values (typical values shown here);

| | |
|-------------------------------|-------------------------|
| PC (physical contact) | -30 to -35 dB |
| UPC (ultra physical contact) | -45 to -50 dB |
| APC (angled physical contact) | -55 to -60 dB (or less) |
- d) Replace the mating sleeve in the patch panel.

Once the inverted event has been fixed, re-test the fiber to ensure the event is no longer overly reflective.

ANOTHER HELPFUL TIP


Another helpful tip for mitigating reflectance comes from the Fiber Optic Association (FOA) website:

http://www.jimhayes.com/OTDR/otdrs_d.htm

found under the section titled *This "Trick" Can Help*. This tip refers to the use of index-matching fluid between connectors to help eliminate the air gap causing the overly reflective event.

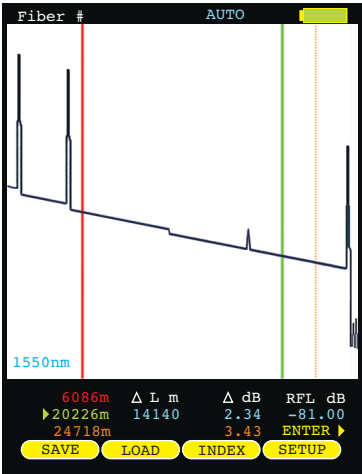
SECTION 4: TRACE STORAGE

STORED READINGS

 sets the Function Options Menu to allow access to Data Storage and Setup Menu options. The following soft-keys apply to data storage functions.

 SAVING A TRACE

 LOADING A PREVIOUSLY STORED TRACE



SAVING A TRACE

Traces may be stored in permanent memory for later viewing or download to hard disk for data file retrieval.

From the trace screen, press  to enter the fiber name and save the currently displayed trace to memory.


To enter a fiber name, use the arrow keys to highlight the appropriate character on the grid.

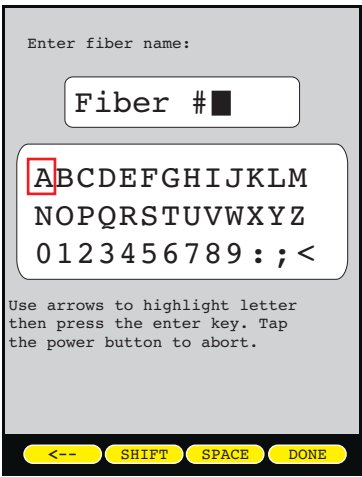
 BACKSPACE

 TOGGLE BETWEEN UPPER AND LOWER CASE ALPHABET

 FORWARD SPACE

 SELECT THE HIGHLIGHTED CHARACTER

 FINISHED ENTERING NAME



SECTION 4: TRACE STORAGE

LOADING A PREVIOUSLY STORED TRACE

Previously stored traces can be loaded from memory for later on-screen analysis.

The STORED TRACE menu may be accessed two ways:

- 1) from the Function Options menu on the trace screen, press **LOAD** ; or
- 2) select the STORED TRACES option from the SETUP MENU.



moves the cursor up and down in the list of stored traces



exits the STORED TRACES menu and returns to the trace screen



accesses context-sensitive help



loads the currently selected fiber trace into the trace screen



allows the user to overlay a previously stored trace on top of the currently loaded trace. Only one trace can be overlaid at a time, and the overlay trace is denoted by a dark arrow to the right of the trace information. Press this button again to clear the overlay status



gives the user the option: 1) to delete the currently selected fiber trace; 2) to not delete the selected trace; 3) to delete all traces; or 4) delete only traces that have been previously downloaded (see TRACE DOWNLOAD STATUS below)



displays the next page of fiber traces if there are more traces than will fit on the screen

| STORED TRACES | | |
|---------------|----------|-----------|
| Trace Name | Date | Time |
| SM-BB-F1-F2:1 | 10/05/09 | 04:16PM ✓ |
| SM-BB-F1-F2:2 | 10/05/09 | 04:17PM |
| SM-BB-F1-F2:3 | 10/05/09 | 04:19PM |
| SM-BB-F1-F2:4 | 10/05/09 | 04:21PM |
| SM-BB-F1-F2:5 | 10/05/09 | 04:24PM |
| SM-BB-F1-F2:6 | 10/05/09 | 04:27PM |

Overlay status column →
Download status column →

Trace Parameters
n=1.4681 L=33600 P= 10us S=1m

ABORT HELP
LOAD OVERLAY DELETE PAGE

TRACE PARAMETER INFORMATION. Information at the bottom of the STORED TRACES screen shows trace parameter settings used when the trace was taken:


| | |
|---|---------------------|
| n | index of refraction |
| L | fiber length |
| P | pulse width |
| S | step |



TRACE DOWNLOAD STATUS. If the trace has already been downloaded to the PC, this trace will be marked by a green checkmark which appears at the right of each trace.

SECTION 5: OTDR SETUP


MENU SYSTEM

To access the SETUP MENU, either press **MENU** or .

NAVIGATING THE MENU SYSTEM

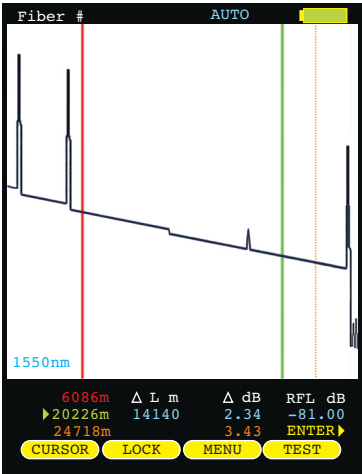
The arrow keys are used to navigate throughout the various menus and help screens in the OTDR. Green selection arrows highlight different menu options.

  moves the selection arrows to the next or previous menu option

 jumps to the highlighted menu option

 returns to the previous menu

 exits the menu system



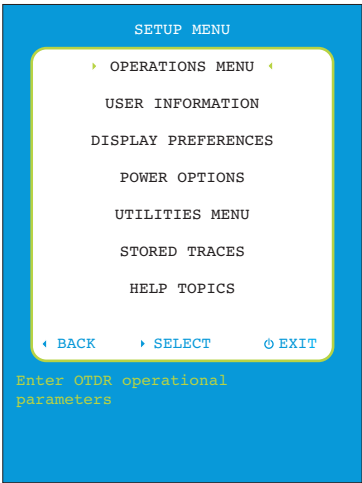
SETUP MENU

The SETUP MENU is the main entry point into the OTDR menu system. Shown below is a tree of menu options.

Each option will be explained in detail on the following pages.

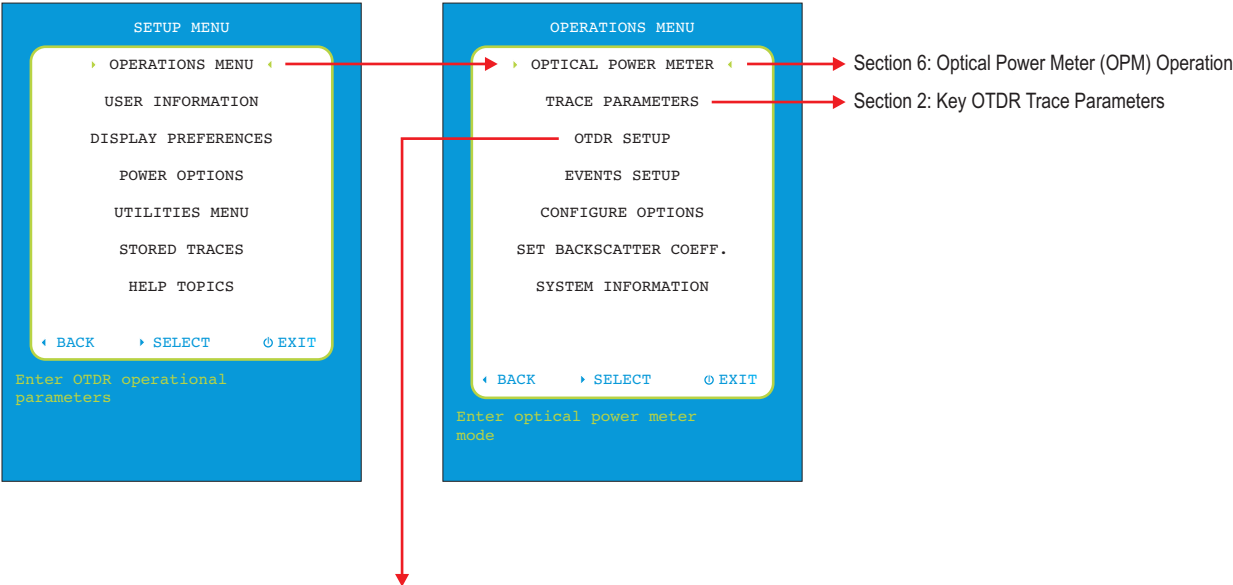
HELP TOPICS

The OWLTrek II includes a built-in help menu that can be accessed from the SETUP MENU. Context-sensitive help can also be accessed from various operational and menu screens throughout the OTDR by pressing the HELP button.



SECTION 5: OTDR SETUP

SETUP MENU ► OPERATIONS MENU



SETUP MENU ► OPERATIONS MENU ► OTDR SETUP

OTDR CONFIGURATION

| | |
|---------------------|---------|
| LENGTH UNITS | METERS |
| FIBER INDEX | 1.4681 |
| EOF EVENT THRESHOLD | 3.25 dB |
| EVENT PASS/FAIL | OFF |

SAVE QUIT HELP

OTDR CONFIGURATION

LENGTH UNITS – options: METERS, FEET
Changes the length units displayed on the OTDR trace results screen.

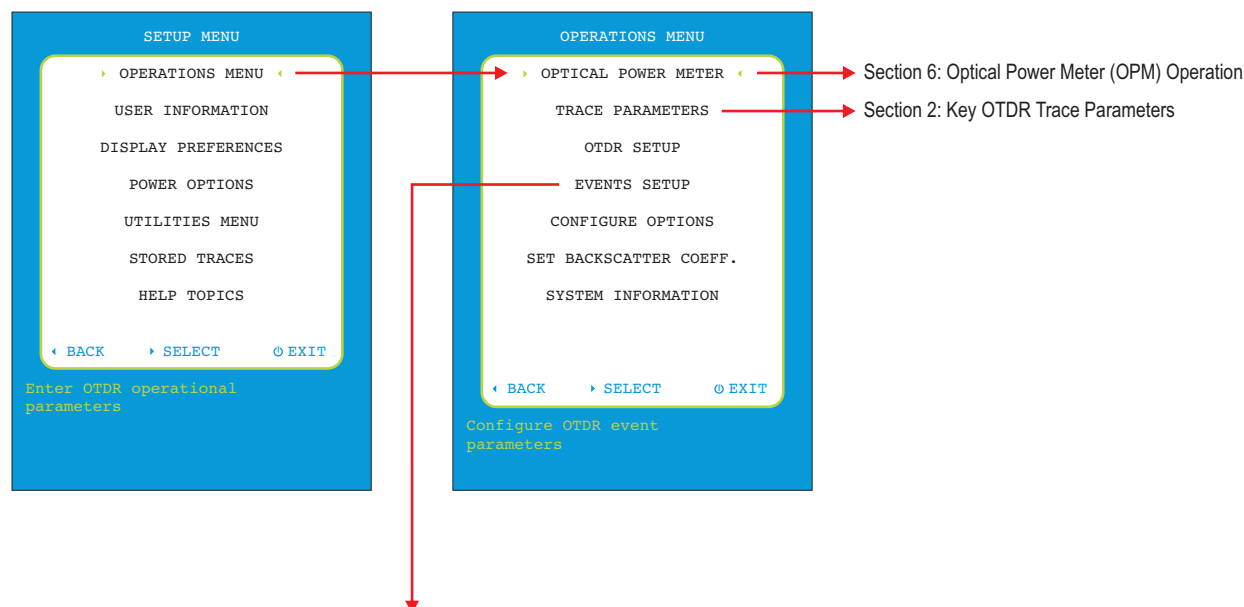
FIBER INDEX – range of values: 1.4000 to 1.6000
Sets the index of refraction (IoR) for the fiber under test. This value determines the speed of light in the fiber under test, and is used to calculate distances on the OTDR trace. If IoR is unknown, use the following suggested values:
Suggested index of refraction values:
SINGLEMODE: 1.4681
MULTIMODE: 1.4920

EOF EVENT THRESHOLD – range of values: 3.25 to 9.99 dB
End of Fiber backscatter threshold is the required backscatter level prior to an event for that event to be considered as part of the fiber and not an echo. The last event with the required backscatter level is considered the end of the fiber.

EVENT PASS/FAIL – options: ON/OFF
When ON, applies the event threshold settings from the EVENT CONFIGURATION setup screen. Events that do not meet event thresholds (i.e. FAIL) will be shown in red font on the EVENTS table.

SECTION 5: OTDR SETUP

SETUP MENU ► OPERATIONS MENU



SETUP MENU ► OPERATIONS MENU ► EVENTS SETUP

EVENT CONFIGURATION

| | | |
|-------------------------------|------------------------------------|----|
| REFLECTIVE EVENT THRESHOLD | <input type="text" value="-77"/> | dB |
| LOSS EVENT THRESHOLD | <input type="text" value="0.05"/> | dB |
| MAXIMUM REFLECTIVITY | <input type="text" value="-75.0"/> | dB |
| MAXIMUM LOSS | <input type="text" value="1.00"/> | dB |

SAVE QUIT HELP

EVENTS SETUP

REFLECTIVE EVENT THRESHOLD – range: -58 to -85 dB

Sets the minimum event threshold in dB for reflective events. Events must have this much reflectivity before they are marked in the event table. The smallest reflectivity value is limited by the fiber's currently set backscatter coefficient.

LOSS EVENT THRESHOLD – range: 0.05 to 0.50 dB

Sets the minimum event threshold in dB for loss events. Events must fall at least this amount below the backscatter power to be marked in the event table.

MAXIMUM REFLECTIVITY – range: -30.0 to -80.0 dB

The maximum reflectivity an event can have before failing.

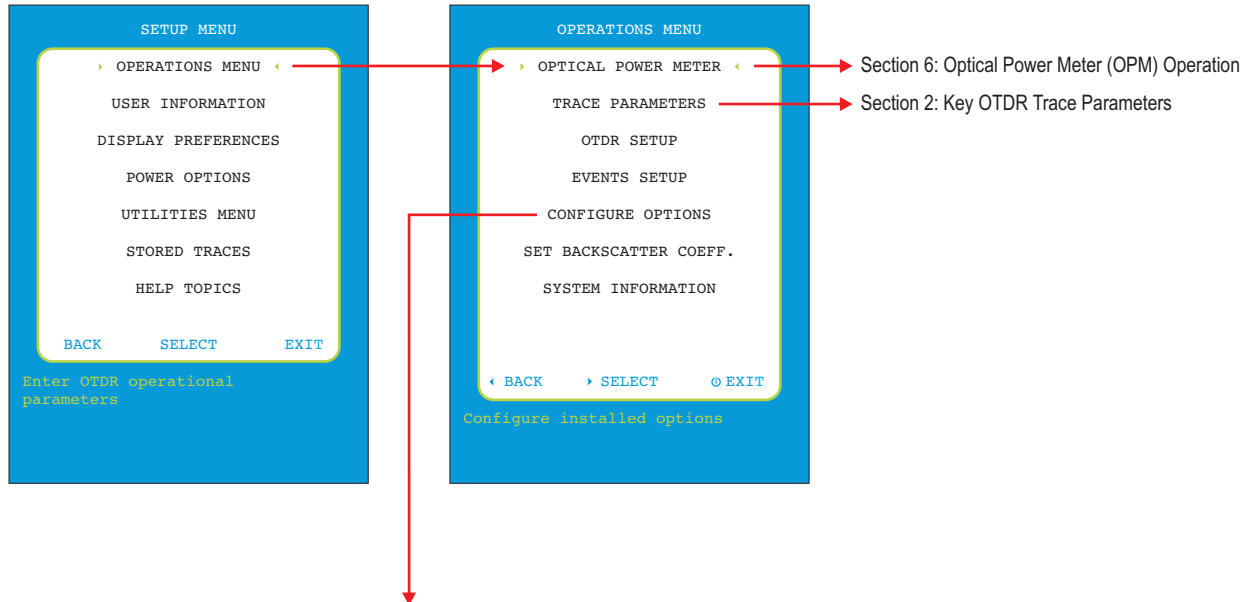
MAXIMUM LOSS – range: 0.10 to 20.00 dB

The maximum loss an event can have before failing.

NOTE: in order for these settings to take effect, remember to turn ON the EVENT PASS/FAIL setting on the OTDR CONFIGURATION screen.

SECTION 5: OTDR SETUP

SETUP MENU ► OPERATIONS MENU



SETUP MENU ► OPERATIONS MENU ► CONFIGURE OPTIONS

CONFIGURE OPTIONS

FIBER ID TONE:

VISUAL FAULT LOCATOR:

Press ENTER when done
Press 0 for help

CONFIGURE OPTIONS

FIBER ID TONE – options: OFF, ON

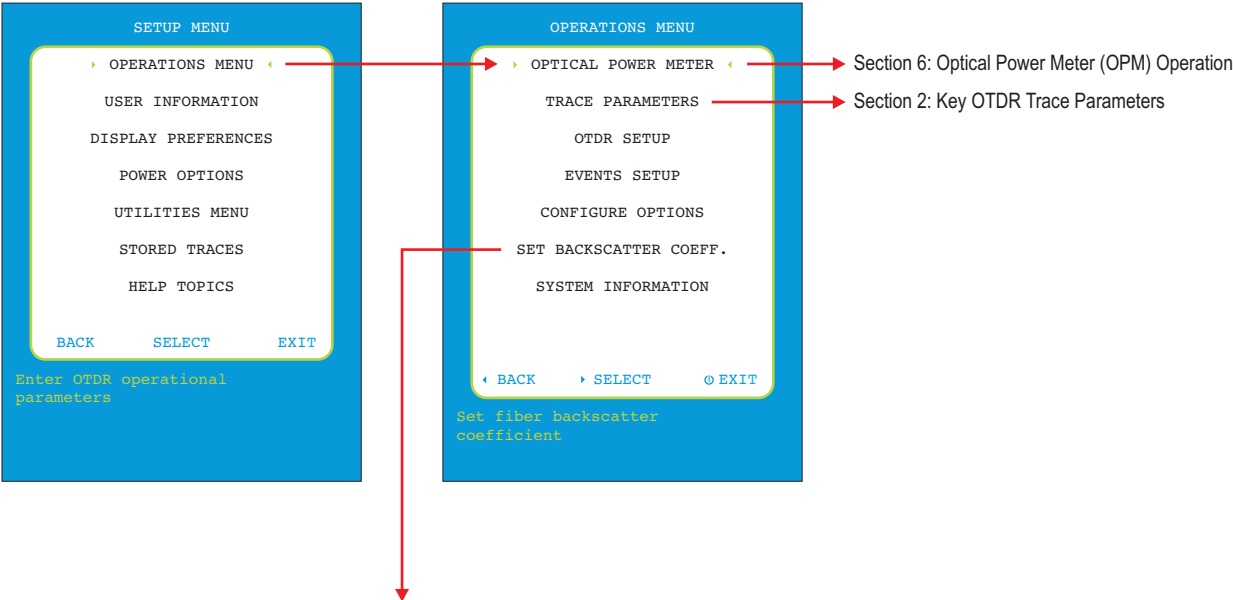
The OTDR can output a 2KHz tone into the fiber that can be used to identify the fiber at the far end using a clamp meter.

VISUAL FAULT LOCATOR – options: OFF, ON, BLINK

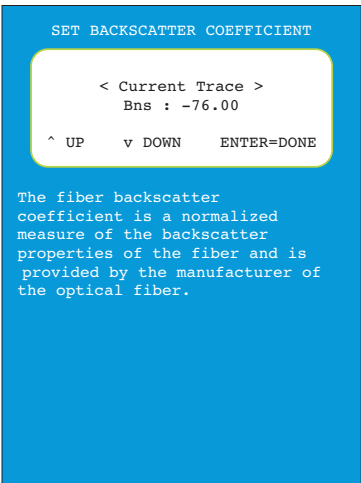
Red laser that can be used to identify short fiber runs from the far end, or can detect breaks in the near end of the fiber.

SECTION 5: OTDR SETUP

SETUP MENU ► OPERATIONS MENU



SETUP MENU ► OPERATIONS MENU ► SET BACKSCATTER COEFF.



SET BACKSCATTER COEFFICIENT

<backscatter option> – options: Current Trace, (Wave1), (Wave2)
Use left and right arrow keys to change value.

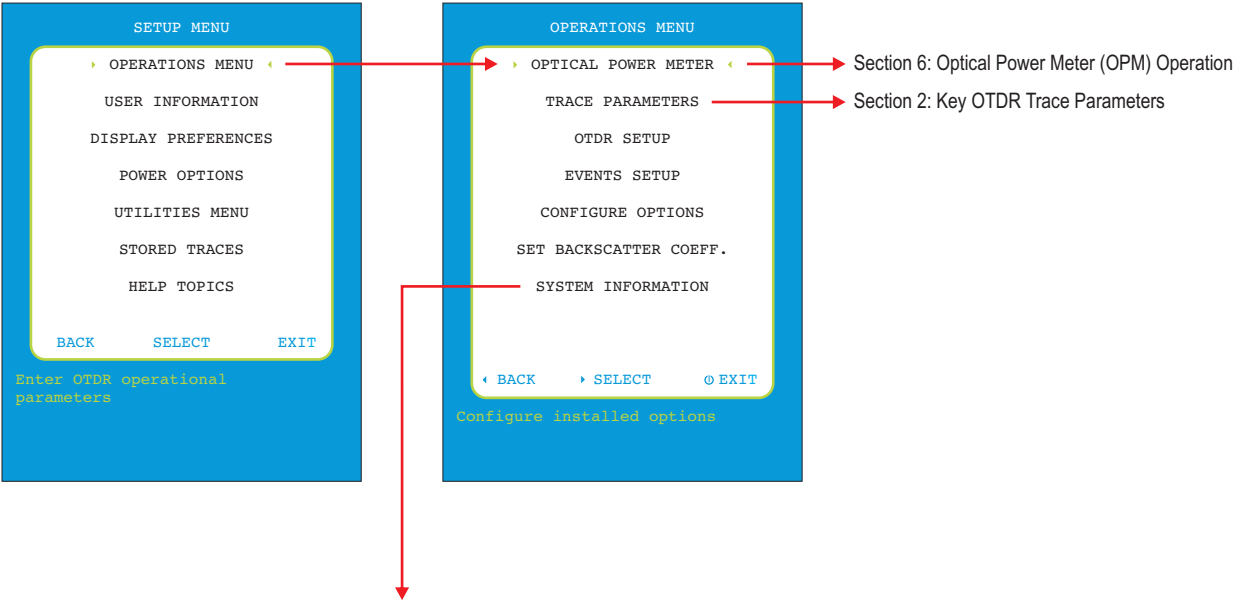
Bns – range: -60.00 to -85.00 dB
Use up and down arrow to increase/decrease backscatter value.

Backscatter coefficient is a measure of the backscatter properties of the fiber under test, and is provided by the fiber manufacturer.

Backscatter coefficient is important in accurately determining reflectance measurements in the OTDR.

SECTION 5: OTDR SETUP

SETUP MENU ► OPERATIONS MENU



SETUP MENU ► OPERATIONS MENU ► SYSTEM INFORMATION

```
SYSTEM INFORMATION

Serial Number: H30000
MFG Date: 09/21/15
Firmware Version: 2.01
BootLoader Version: 1.03
PCB Version: 2.0H
Installed RAM: 512KB
Display: ILI9341

Lasers: 1310nm
Options: VFL,TONE (060,060)
Trace Count: 5, APD:248
Date: 10/08/15
Time: 11:07:25
Temp C: 29
```

SYSTEM INFORMATION

Shows information about the OTDR.

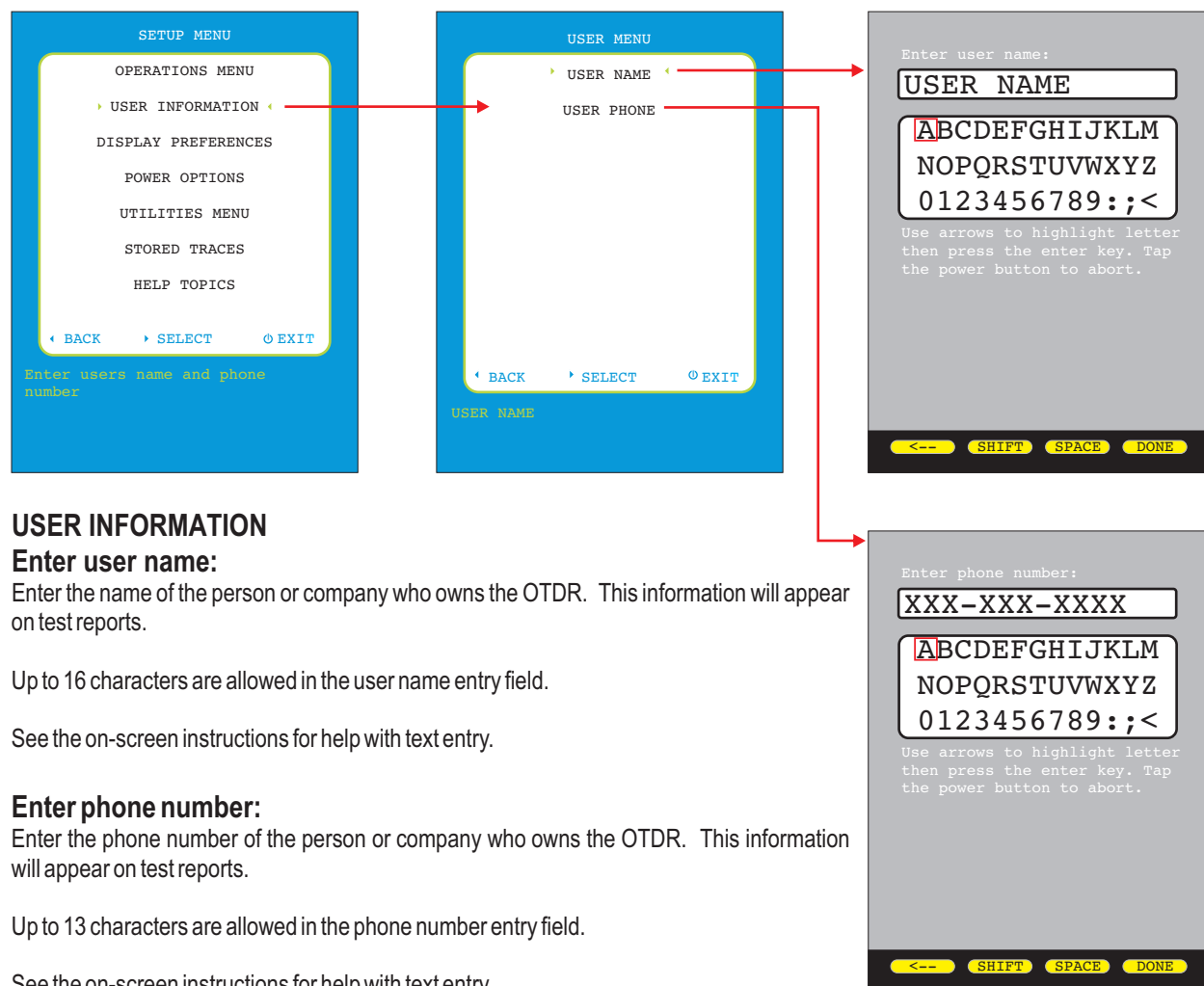
The top section contains hardware information about the OTDR.

- LASERS – shows the currently installed OTDR laser wavelengths
- OPTIONS – shows the currently installed optional hardware
- TRACE COUNT – shows how many traces have been taken with the OTDR
- DATE – current date (user configurable)
- TIME – current time (user configurable)
- TEMP C – current temperature in Celsius

Press the enter key to return to OPERATIONS MENU.

SECTION 5: OTDR SETUP

SETUP MENU ► USER INFORMATION



USER INFORMATION

Enter user name:

Enter the name of the person or company who owns the OTDR. This information will appear on test reports.

Up to 16 characters are allowed in the user name entry field.

See the on-screen instructions for help with text entry.

Enter phone number:

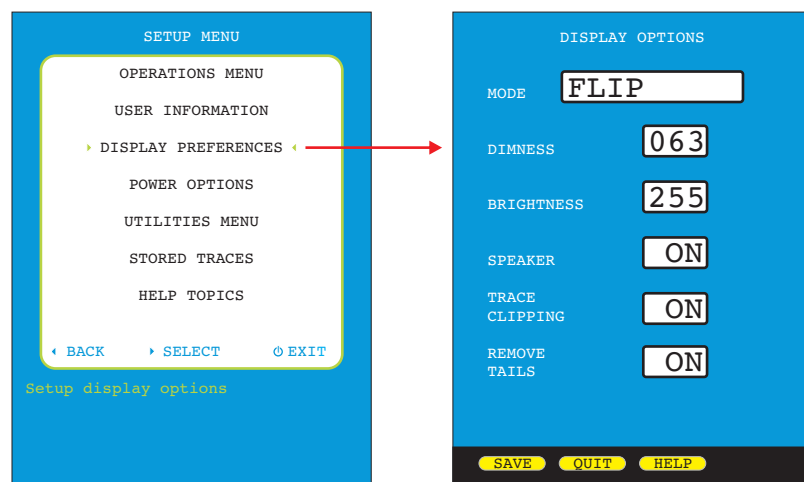
Enter the phone number of the person or company who owns the OTDR. This information will appear on test reports.

Up to 13 characters are allowed in the phone number entry field.

See the on-screen instructions for help with text entry.

SECTION 5: OTDR SETUP

SETUP MENU ► DISPLAY PREFERENCES



MODE – options: FLIP, PORTRAIT, LANDSCAPE

Sets the orientation of the LCD display.

FLIP LCD automatically alternates between portrait and landscape modes based upon the physical orientation of the OTDR

PORTRAIT display is always in portrait mode

LANDSCAPE display is always in landscape mode

DIMNESS – range: 25 to 125

Sets the level of the LCD backlight during power saving mode. Range of values are 25 (dimkest) to 125 (brightest).

NOTE: higher values require more battery power

BRIGHTNESS – range: 150 to 255

Sets the level of the LCD backlight during normal operation. Range of values are 150 (dimkest) to 255 (brightest).

NOTE: higher values require more battery power

SPEAKER – options: ON, OFF

Toggles the internal speaker either ON or OFF.

TRACE CLIPPING – options: ON, OFF

Toggles trace clipping mode either ON or OFF.

On a normal OTDR trace, as the sloping line of the trace approaches the noise floor of the OTDR, the trace starts becoming less smooth, making events harder to see near the end of the trace. Trace clipping is a method that “clips” the top of the most reflective peaks, in order to draw the sloping line away from the noise floor. This effectively smooths out the trace, allowing smaller events to be more easily detectable.

While trace clipping is ON, reflectance measurements of clipped events are not affected.

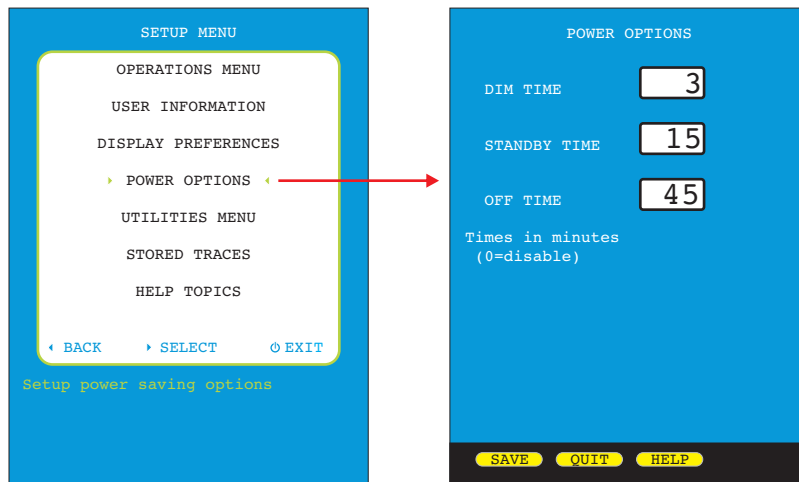
REMOVE TAILS – options: ON, OFF

Toggles detector tail removal either ON or OFF.

When ON, improves trace accuracy by running an additional trace at a lower APD bias voltage. Comparing the two traces reduces the APD saturation tails that follow highly reflective events, but at the expense of slightly reduced backscatter levels and increased trace acquisition time.

SECTION 5: OTDR SETUP

SETUP MENU ► POWER OPTIONS



Power options activate after certain periods of inactivity.

DIM TIME – range: 1 to 250

Sets the time (in minutes) before the display will enter DIM mode.

STANDBY TIME – range: 2 to 250

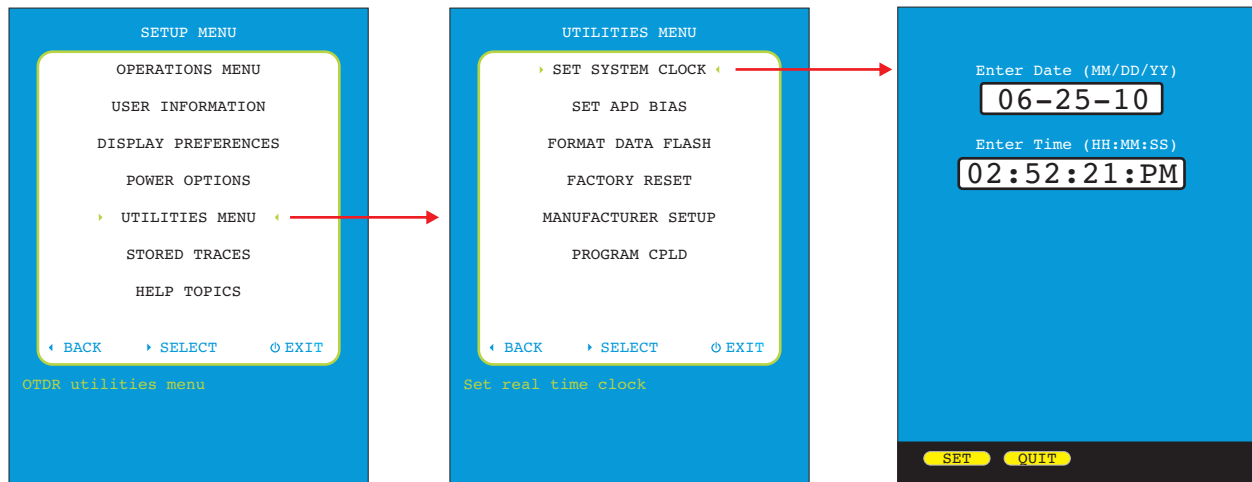
Sets the time (in minutes) before the OTDR will enter STANDBY mode.

OFF TIME – range: 3 to 250

Sets the time (in minutes) before the OTDR will power off.

SECTION 5: OTDR SETUP

SETUP MENU ► UTILITIES MENU ► SET SYSTEM CLOCK



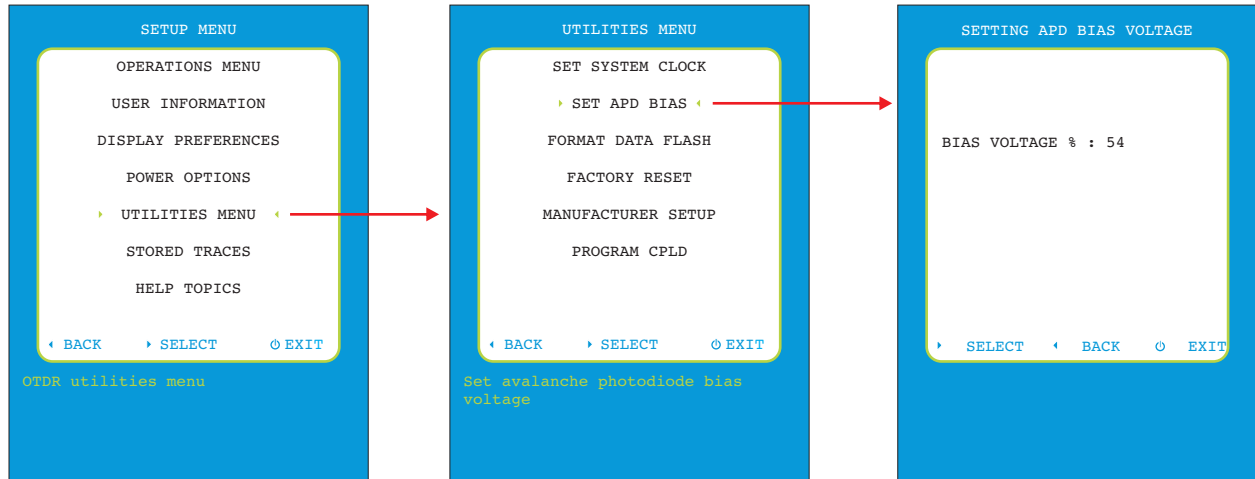
Set System Clock

Sets the current time and date in the OTDR.

Trace time and date are a part of the stored trace information and appear on test reports.

SECTION 5: OTDR SETUP

SETUP MENU ► UTILITIES MENU ► SET APD BIAS

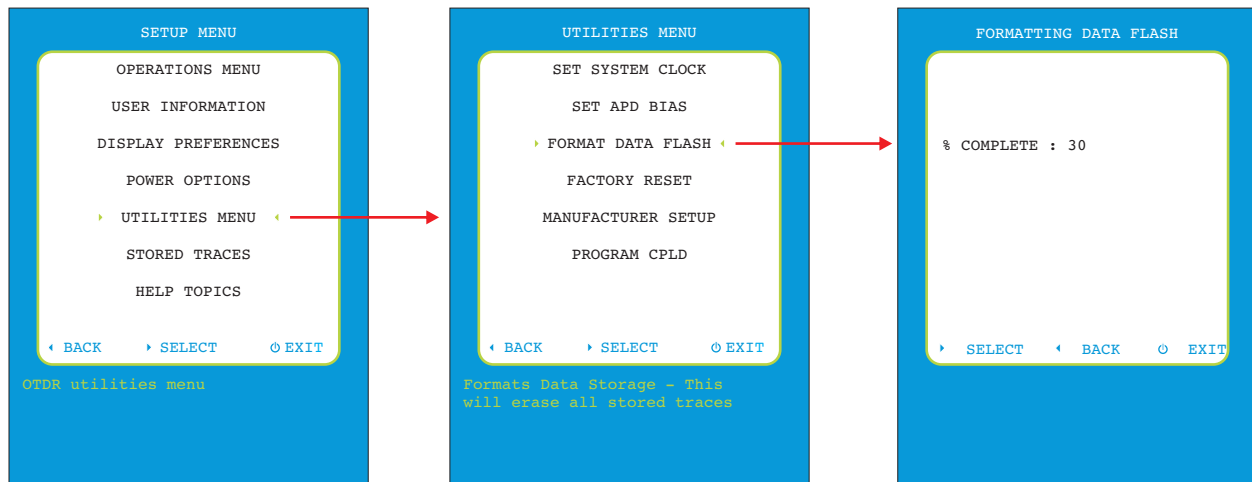


Set APD Bias

Sets the high voltage bias of the avalanche photodiode.

SECTION 5: OTDR SETUP

SETUP MENU ► UTILITIES MENU ► FORMAT DATA FLASH

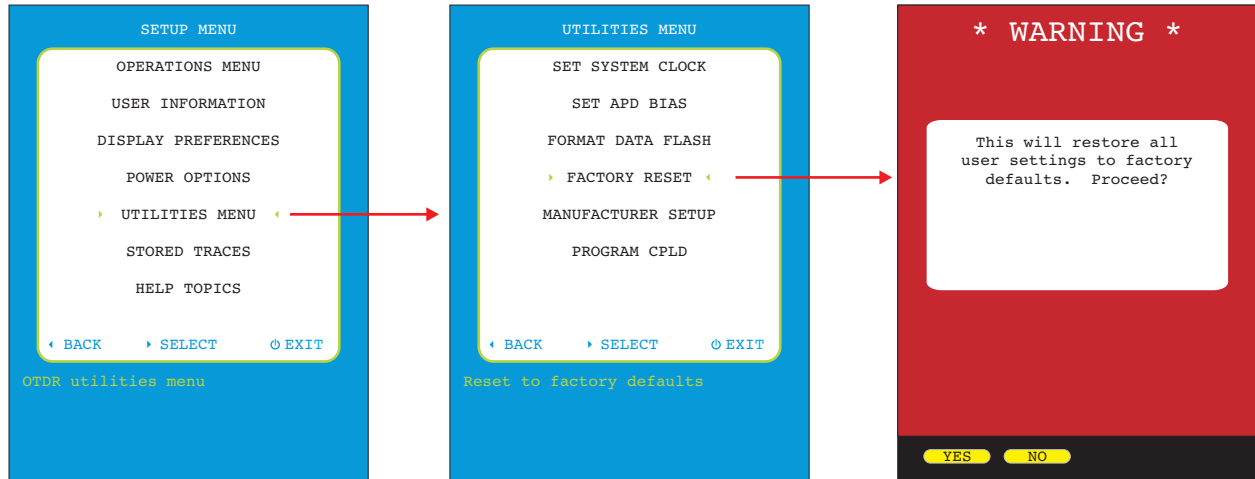


Format Data Flash

Initializes the internal trace storage memory. This option will erase all stored traces, and should only be used in cases where the file system has become corrupted.

SECTION 5: OTDR SETUP

SETUP MENU ► UTILITIES MENU ► FACTORY RESET



Factory Reset

Restores user settings to factory defaults.

SECTION 5: OTDR SETUP

SETUP MENU ► STORED TRACES

SETUP MENU

OPERATIONS MENU

USER INFORMATION

DISPLAY PREFERENCES

POWER OPTIONS

UTILITIES MENU

► STORED TRACES ◀

HELP TOPICS

◀ BACK ▶ SELECT ⓪ EXIT

View, load, and delete
stored traces

STORED TRACES

| Trace Name | Date | Time |
|-----------------|----------|-------------|
| ▶ SM-BB-F1-F2:1 | 10/05/09 | 04:16PM ◀ ✓ |
| SM-BB-F1-F2:2 | 10/05/09 | 04:17PM |
| SM-BB-F1-F2:3 | 10/05/09 | 04:19PM |
| SM-BB-F1-F2:4 | 10/05/09 | 04:21PM |
| SM-BB-F1-F2:5 | 10/05/09 | 04:24PM |
| SM-BB-F1-F2:6 | 10/05/09 | 04:27PM |

n=1.4681 L=33600 P= 10us S=1m

◀ ABORT ⓪ HELP

LOAD OVERLAY DELETE PAGE

STORED TRACES

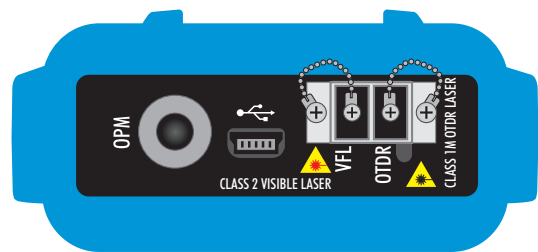
See Section 4: TRACE STORAGE for more information on working with currently stored OTDR traces.

SECTION 6: OPERATION/MAINTENANCE

OPTICAL POWER METER (OPM) OPERATION

Some models of OWLTrek II OTDRs contain an optical power meter port, allowing users to measure optical power and optical loss (when used with an external light source).

These models include a duplex LC connector for the OTDR and VFL, and a universal port for the OPM.



OPERATING THE OPM



Press the Enter key () until the MENU function option appears. Press the MENU soft key to enter the SETUP MENU.

Highlight OPERATIONS MENU, then press to continue.

Highlight OPTICAL POWER METER, then press to continue.

The optical power meter display shows current optical power readings in dBm and dB, and the currently selected wavelength.

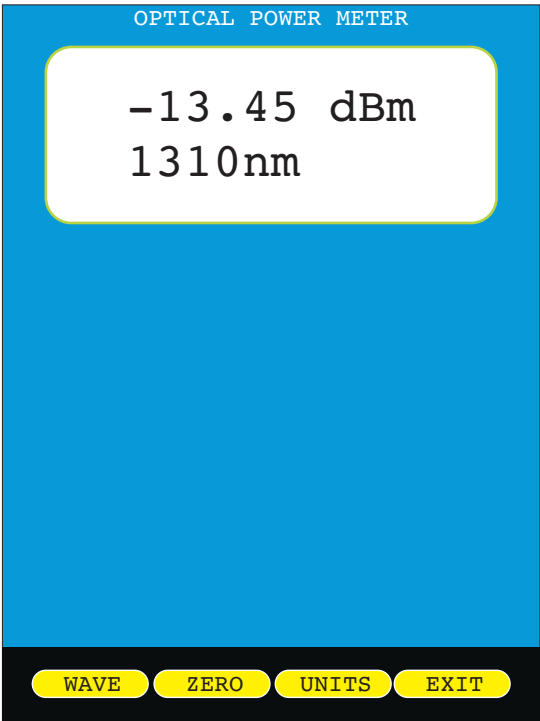
UNDER incoming optical power is too low to be measured
OVER incoming optical power is too bright to be measured

WAVE changes the currently selected wavelength. Calibrated wavelengths include:
850, 980, 1300, 1310, 1490, 1550, and 1625nm.

ZERO when an external test light source is connected, sets a reference point for the currently selected wavelength.

UNITS toggles the measurement units between dBm and dB.

EXIT returns to the OPERATIONS MENU.



SECTION 6: OPERATION/MAINTENANCE

VISUAL FAULT LOCATOR (VFL) OPERATION

The OWLTrek II OTDR contains a visual fault locator port used for quick troubleshooting of optical faults close to the near-end of the optical fiber under test.

The 2.5mm universal VFL port is located on the left-hand side on the top of the OTDR.

OPERATING THE VFL

Press the Enter key () until the VFL function option appears.




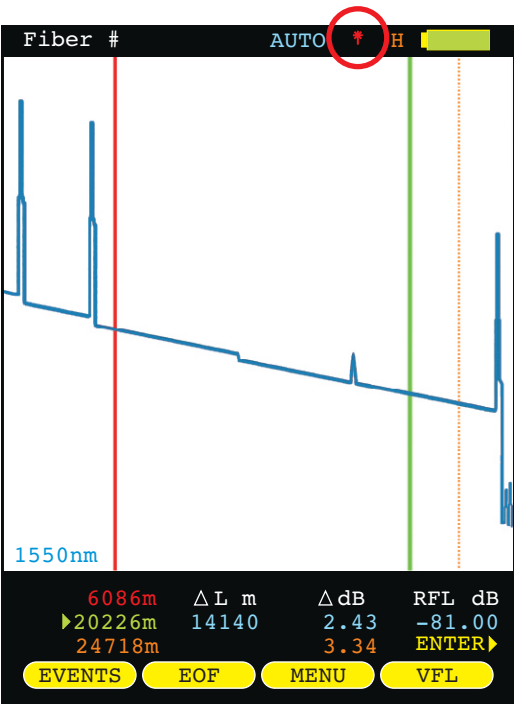
Press the VFL soft key to toggle through the different VFL modes.

The VFL status icon will appear on the trace screen above the trace area as shown at right:


(no icon) OFF


 ON

 BLINK



EYE SAFETY PRECAUTIONS

 **NEVER** look directly at the output of the VFL, and even limited exposure over time to reflected VFL light can be dangerous to the eye.


 For best results if using the VFL for end-to-end fiber identification, use a piece of paper to diffuse the light exiting the far-end connector.

SECTION 6: OPERATION/MAINTENANCE

FIBER ID TONE OPERATION

The laser output of the OTDR port can be used to produce a 2kHz tone for use with fiber identifiers.

SETTING THE FIBER ID TONE

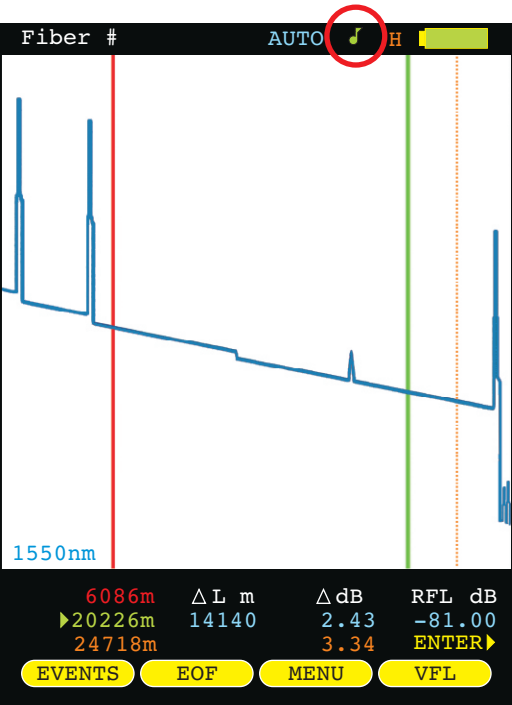
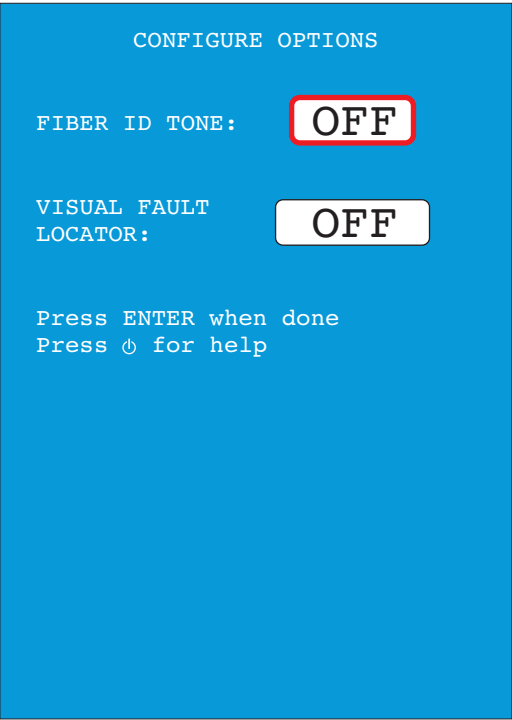
Press the Enter key () until the MENU function option appears.
From the SETUP MENU, follow the menu path below:

SETUP MENU >> OPERATIONS MENU >> CONFIGURE OPTIONS



From the CONFIGURE OPTIONS menu, highlight the FIBER ID TONE option. FIBER ID TONE has two settings: OFF and ON.

The FIBER ID TONE status icon () will appear on the trace screen above the trace area as shown at right.



SECTION 6: OPERATION/MAINTENANCE

LIVE MODE OPERATION

LIVE MODE is an advanced feature that periodically updates the OTDR screen while the OTDR is taking a trace, in order to view events as they happen in real-time.

LIVE MODE OPERATION

Press  from the trace screen until the following menu options appear:




 opens the TRACE OPTIONS menu

  highlight CAPTURE MODE




  change the value to LIVE

Press SAVE to return to the trace screen. The function menu should show:



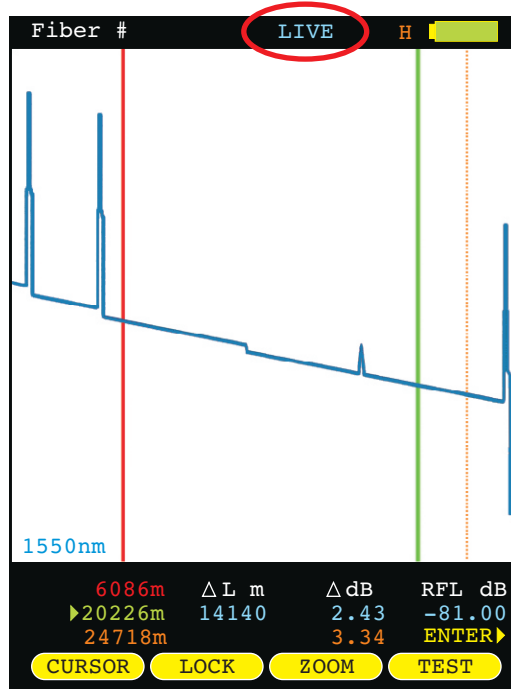
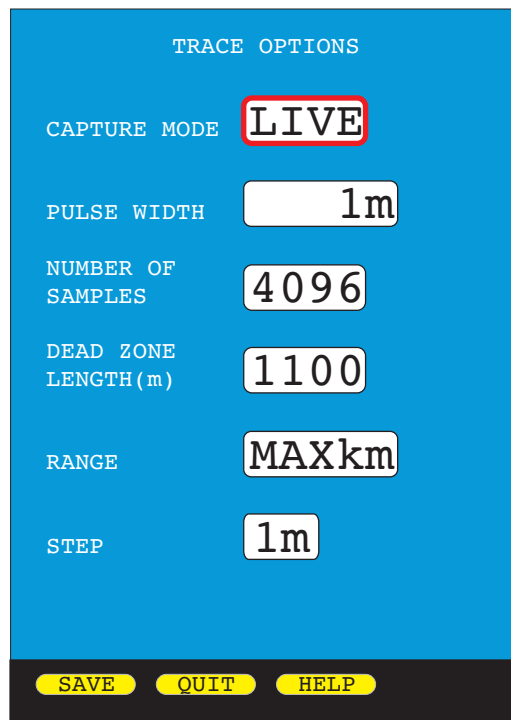
Press  to start LIVE mode. After a few seconds the OTDR screen will acquire its initial trace.

After acquiring its initial trace, the trace screen will begin to update every few seconds.

-  The frequency of screen updates will depend upon the selected TRACE OPTIONS. Lowering the number of samples and/or increasing the STEP value will increase the frequency of screen updates, but will also lower the trace resolution.
-  If the screen does not appear to be changing, the characteristics of the fiber are not changing.
-  When the OTDR is connected to a PC, OWLView software allows users to display LIVE mode on the software trace screen. This enables users to view real-time trace updates on the large PC monitor in order to better see events that may not be visible on the OTDR LCD display.

To enable LIVE mode in OWLView software:

- 1) Launch OWLView software;
- 2) Click "Start Live Mode"
- 3) If the OTDR is not already in LIVE mode, follow the instructions that appear on the software screen, wait for LIVE mode on the OTDR to begin, then click "Start Live Mode" again.



When LIVE testing is complete, press  again to exit LIVE mode.

SECTION 6: OPERATION/MAINTENANCE

MANUALLY SETTING END OF FIBER (EOF) MARKER

The OTDR marks the perceived end-of-fiber event with an **orange** dotted line.

However, in certain cases, the “end-of-fiber” event may be mis-marked due to factors such as echoes that occur in the noise area of the trace.

The EOF function gives technicians a way to manually set the EOF marker to the correct position.

SETTING EOF MARKER

Select either one (and only one) of the cursors to be the active cursor (in this example, the **green** cursor is the only active cursor).

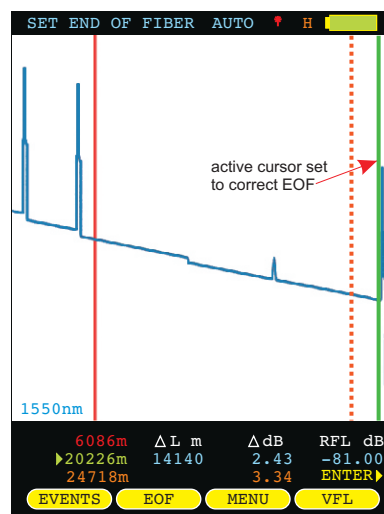
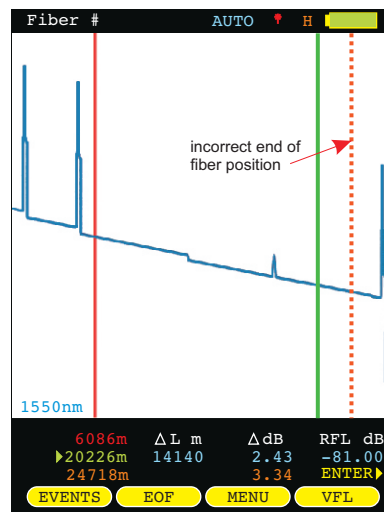
Move this active cursor to the actual EOF position. This cursor should be positioned on the backscatter immediately where the actual EOF event occurs.

Press the Enter key until the following menu appears at the bottom of the OTDR display:

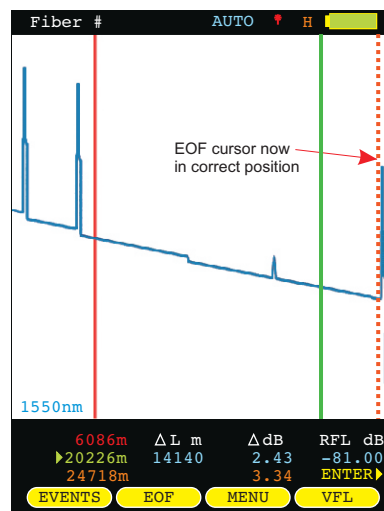


Press **EOF** key once. A “SET END OF FIBER” message will indicate that the OTDR is ready to re-position the EOF cursor.

(If the active cursor is not yet set in the correct EOF position, the technician can move the active cursor at this time.)



Once the active cursor is in the correct EOF position, press **EOF** key again to re-position the EOF cursor.



SECTION 6: OPERATION/MAINTENANCE

CLEANING THE OPTICAL PORTS

This cleaning procedure applies to the OTDR port on the OWLTrek II OTDR.

Required Accessories:

- › Isopropyl alcohol (91% or better)
- › In-adapter fiber optic cleaning accessories, such as 2.5mm cleaning swabs or 2.5mm HUXCleaner™
- › In-adapter fiber optic inspection scope (LCD-based, 200x magnification or greater recommended)
- › Compressed Air (optional)

Below are procedures for “wet” cleaning and “dry” cleaning. For best results, a combination of these cleaning methods is recommended.



IMPORTANT SAFETY NOTE: WHEN INSPECTING AN OPTICAL PORT, NEVER LOOK DIRECTLY OR INDIRECTLY INTO THE PORT WITHOUT SUFFICIENT EYE PROTECTION. THE OPTICAL PORT MAY BE ENERGIZED WITH POWERFUL INVISIBLE RADIATION THAT IS HARMFUL TO THE HUMAN EYE.

INVISIBLE LIGHT IS ESPECIALLY DANGEROUS SINCE THE EYE IS NOT AWARE OF EXPOSURE TO HARMFUL INVISIBLE ENERGY, AND BECOMES INCREASINGLY DANGEROUS WITH PROLONGED EXPOSURE.

TO AVOID ACCIDENTAL EXPOSURE TO OPTICAL ENERGY, IT IS HIGHLY RECOMMENDED TO POWER OFF EQUIPMENT BEFORE INSPECTING OPTICAL PORTS.

IT IS ALSO HIGHLY RECOMMENDED TO USE AN LCD-BASED FIBER INSPECTION SCOPE, WHICH CAN INSPECT OPTICAL PORTS AND FIBER ENDFACES WITHOUT EXPOSING THE EYE TO HARMFUL OPTICAL RADIATION.

“WET” CLEAN PROCEDURE

- 1 Wet the tip of a 2.5mm cleaning swab with isopropyl alcohol.
- 2 Carefully insert the wet tip of the swab into the optical port.
- 3 Clean out the optical port according to the directions provided with the swabs.
- 4 Blow dry the optical port with the compressed air. If compressed air is not available, allow 2 minutes for the alcohol to evaporate.
- 5 Inspect the optical port with the in-adapter fiber optic inspection scope to ensure the port is clear of obstructions.

“DRY” CLEAN PROCEDURE

- 1 Carefully insert a dry 2.5mm cleaning swab or a 2.5mm HUXCleaner™ into the optical port.
 - 2 Clean out the optical port according to the directions that came with the cleaning accessories.
 - 3 Inspect the optical port with the in-adapter fiber optic inspection scope to ensure the port is clear of obstructions.
- If the port is still dirty, another round of cleaning will be necessary. You may also want to use a combination of “wet” and “dry” cleaning to achieve best results.

If the port is still dirty, another round of cleaning will be necessary. You may also want to use a combination of “wet” and “dry” cleaning to achieve best results.

SECTION 7: OWLVIEW FOR OTDR SOFTWARE

OVERVIEW

OWLView for OTDR is a software program that is included free of charge with every OWLTrek II OTDR.

Primary functions of this software include:

- Downloading stored traces from OWLTrek II OTDRs and saving traces in native .OTD format
- View and analyze traces
- Export stored traces to SOR format (version 2)
- Import SOR files (that were previously exported with OWLView)
- Print stored traces
- View traces in real-time while OTDR is set into Live Mode
- Update firmware in OWLTrek II OTDRs
- View helpful PDF and video documentation

INSTALLING OWLVIEW FOR OTDR SOFTWARE

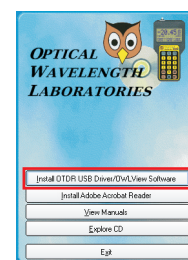
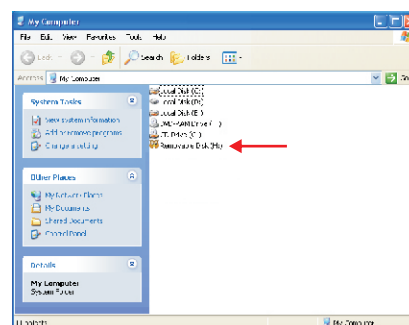
OWLView for OTDR can be installed onto a Windows™ PC or laptop from the supplied USB flash drive, or can be downloaded from OWL's website. This installation will also install the appropriate USB driver.

INSTALLING FROM USB FLASH DRIVE

- 1) Insert USB flash drive into a USB port on the PC or laptop (there may be a short delay while the computer installs the flash drive hardware and assigns a drive letter to the flash drive)

Depending upon computer configuration, the flash drive may or may not run the installation program automatically.
 - If the installation program runs automatically, skip to Step 5.
 - If the installation program does not run automatically, continue to Step 2.
- 2) Using My Computer, browse to the drive letter created when the flash drive was inserted (drive letter may vary for different PC configurations)
- 3) Double-click the drive letter to view the contents of the USB flash drive
- 4) Double-click the LaunchCD installation program
- 5) Click "Install OTDR USB Driver/OWLView Software button to begin the program installation.

Follow the on-screen instructions to complete the installation.



INSTALLING FROM WEBSITE

- 1) Browse to OWL's website at the following location:

<http://owl-inc.com/literature/sub/html/otdr/owlview.htm>
- 2) Click the "OWLView for OTDR Software" link to download the software.
- 3) Once the software is downloaded, double-click on the installation program.

Follow the on-screen instructions to complete the installation.

SECTION 7: OWLVIEW FOR OTDR SOFTWARE

LAUNCHING THE SOFTWARE

For Windows™ operating systems up to Windows 7:

Start ▶ Programs ▶ OWL ▶ OWLView for OTDR ▶  OWLView for OTDR

For Windows 8:

Click Start icon. If there is no OWLView for OTDR panel, access the Apps menu.

QUICK-LAUNCH PANEL

When OWLView software is launched, a quick-launch panel appears (as shown at right).

This panel contains three main sections:

- 1) traditional menu-based functions;
- 2) frequently-used Common Actions; and
- 3) recently opened trace files.



OPERATING THE SOFTWARE

DOWNLOADING TRACES FROM OTDR

- 1) Connect the OTDR to the PC using the supplied USB download cable.
NOTE: if prompted to install new hardware, follow the on-screen directions to complete the USB driver installation.

- 2) Trace download can be initiated two ways:
 - **Common Actions:** “Download Trace(s) from OTDR”
 - **File menu:** Download Traces...

- 3) The dialog box (similar to the one at right) will appear with a listing of the OTDR traces that have not yet been downloaded to a PC.

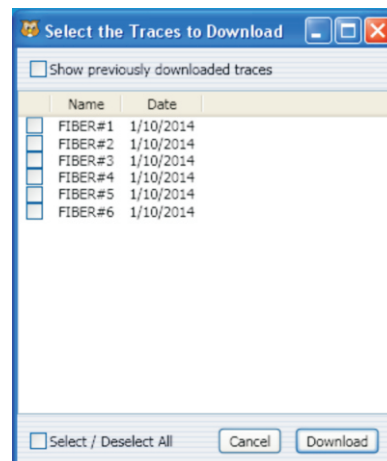
NOTE: to view all traces stored in the OTDR, check the box next to “Show previously downloaded traces”.

Select the traces to download by checking the box next to the traces.

To download all the displayed traces, check the “Select / Deselect All” box.

- 4) Once traces are selected, click **Download** to initiate the download process.

Stored traces will automatically be saved in “My Documents” in the “OTDR Traces” subfolder



SECTION 7: OWLVIEW FOR OTDR SOFTWARE

OPERATING THE SOFTWARE, CONT.

OPENING A STORED TRACE

- 1) From the trace screen, click **File, Open...**
The dialog box will open up to the default directory. If the traces are stored elsewhere on the PC, browse to that directory.
 - 2) Highlight the trace name to be viewed and click "**Open**", or double-click on the trace name.
The selected trace will appear in the software screen.
- NOTE:** only one trace may be viewed at a time.

SAVING TRACES

There are two menu options for saving traces. Traces can only be saved from the trace screen:

- 1) **File, Save...** saves the trace with the same file name in the same location.
NOTE: the File, Save... option will be disabled ("grayed out") unless information has been added to Miscellaneous Info
- 2) **File, Save As...** allows the user to save the trace with a different file name and/or in a different location.

PRINTING TRACES

To print the currently viewed trace:

- 1) Click **File, Print...**
- 2) Select the printer from the "Print" dialog box
- 3) Click **Print**

NOTE: the printout will print exactly what is shown in the trace area; i.e. if the trace was zoomed in on, only the part of the trace that is zoomed in on will print. Clicking File, Print Preview will show a preview of the trace printout.

Consult the Zoom In/Out section in this manual for more information about viewing the complete trace in the trace area.

PRINTING MULTIPLE TRACES

NOTE: printing multiple traces must be activated from the Common Actions screen. Close all traces before attempting to print multiple trace reports.

- 1) From the "Common Actions" screen, click the **Print Multiple Reports** hyperlink
- 2) Browse to the folder where the trace files to be printed are located

NOTE: all the traces to be printed simultaneously with this function must be located in the same location.

- 3) Select all of the traces to be printed

NOTE: hold the SHIFT key to select/deselect a range of traces; hold the CTRL key to select/deselect traces one by one; or press CTRL+A to select all traces in the folder. When using CTRL+A, de-select any additional folders that may have been highlighted.

- 4) Click **Open** to begin the print job

NOTE: when printing a large number of traces at once, a warning screen may appear. It is recommended to limit print jobs to less than 240 traces at a time.

SECTION 7: OWLVIEW FOR OTDR SOFTWARE

OPERATING THE SOFTWARE, CONT.

CLOSING TRACES

To close the currently viewed trace:

- 1) Click **File, Close**

WORKING WITH SOR FILES

OWLView software can export native .OTD files into an industry-standard file format called SOR version 2. Non-OWL trace viewing software may be able to open these SOR files for trace comparison.

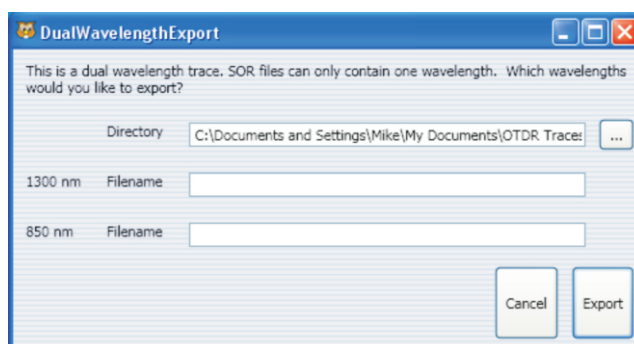
EXPORT SOR FILES

To export the currently viewed trace into SOR format:

- 1) Click **File, Export SOR file...**
- 2a) If the trace contains one wavelength, browse to the folder where the SOR file should be stored, rename the file if necessary, then click **Save**
- 2b) If the trace contains two wavelengths, a separate SOR file will be created for each wavelength.

A dialog box will appear allowing the user to choose a directory, as well as a different filename for the two different SOR files to be created.

Click **Export** to save the files.



BATCH EXPORT SOR FILES

OWLView contains a function that allows a large number of .OTD files to be exported simultaneously. However, this function is limited to traces with one wavelength only. Dual-wavelength traces must be exported one at a time.

- 1) From Common Actions, click the **Batch Convert to SOR** hyperlink
- 2) Browse to the folder where the SOR files will be stored
- 3) Click **Open**

IMPORT SOR FILES

NOTE: only SOR files exported with OWLView software can be imported with this function.

- 1) Click **File, Import SOR File...**
- 2) Browse to the folder that contains the SOR file to be imported
- 3) Click **Open**

SECTION 7: OWLVIEW FOR OTDR SOFTWARE

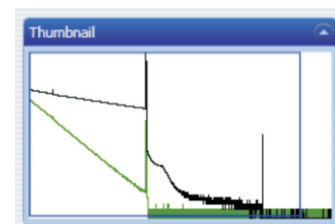
WORKING WITH TRACES

BUTTON CONTROLS

| | | | | | | | |
|---|--|--|---|--|--|-------------------------------|--|
| | | | | | | | |
| PAN | RECTANGLE ZOOM | ZOOM IN | ZOOM OUT | FIT TO SCREEN | SHOW/HIDE CURSORS | DOWNLOAD TRACES | LIVE MODE |
| Click and drag using the mouse will pan the trace screen up/down and left/right | Drag a rectangle on the trace screen to automatically zoom into the area viewed in the rectangle | Click to zoom in on the trace screen in small increments | Click to zoom out on the trace screen in small increments | Resets the trace screen to full zoom out | Shows or hides the cursors used for trace analysis | Download traces from the OTDR | View the OTDR trace in real-time as it changes on the OTDR itself (more on this function later in the manual) |

THUMBNAIL VIEW

Shows a small thumbnail of the overall OTDR trace



TRACE DETAILS

Contains information about the trace parameters used for the OTDR trace:

| | |
|---|--|
| Name | Name of trace entered when trace was stored |
| Wavelength ($\lambda 1$) | First test wavelength |
| Wavelength ($\lambda 2$) | Second test wavelength (if applicable) |
| Index of Refraction ($\lambda 1$) | Index of refraction for first wavelength |
| Index of Refraction ($\lambda 2$) | Index of refraction for second wavelength (if applicable) |
| Pulse Width | Shown in nanoseconds (pulse width in OTDR is shown in meters; conversion factor is 10ns per meter) |
| Number of Averages | Sampling rate |
| Fiber type | Type of fiber tested |
| Date of Test | Date that the fiber was tested |
| Trace Length | Shows the total trace length, including the noise area of the trace |

| Trace Details | |
|----------------------------|------------------------|
| Name | FIBER# |
| Wavelength | 1300 nm |
| Wavelength | 850 nm |
| Index of Refraction | 1.4681 (1300 nm) |
| Index of Refraction | 1.4681 (850 nm) |
| Pulse Width | 200 ns |
| Num Averages | 1024 |
| Fiber Type | Multi Mode |
| Date Tested | 10/31/2013 11:00:29 AM |
| Trace Length | 13723 m |

SECTION 7: OWLVIEW FOR OTDR SOFTWARE

WORKING WITH TRACES, CONT.

TRACE SCREEN

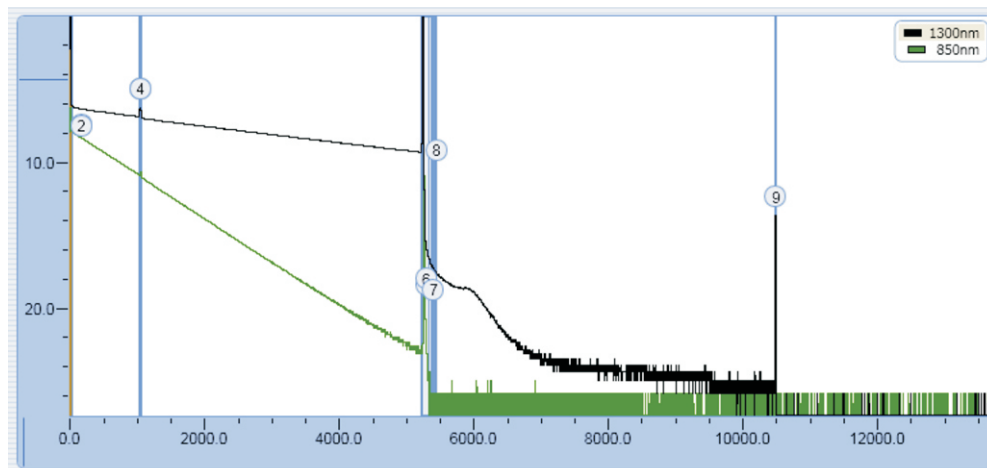
Shows the following information:

OTDR trace(s). Each wavelength is assigned a different color

Wavelength legend. Indicates the color of each wavelength trace.

Events. Corresponds to the event numbers in the event table.

Distance. Shown in either meters or feet on the X axis.



Power level. Shown in dB on the Y axis; 0 dB (a.k.a. origin) can be set to either top or bottom of Y axis.

Cursors. When cursors are activated, they will appear on the trace screen as red and green vertical lines.

EVENT TABLE

Shows the following information:

Event #. Shows the event number; corresponds to the event number shown on the trace screen.

| # | Event Type | Event Start | Event End | Reflectivity (1300 nm) | Loss (1300 nm) | Reflectivity (850 nm) | Loss (850 nm) |
|---|------------------|-------------|-----------|------------------------|----------------|-----------------------|---------------|
| 1 | Reflective Start | 0 m | 37 m | -50.46 dB | | | |
| 2 | Reflective | 0 m | 41 m | | | -57.58 dB | |
| 3 | Reflective | 1043 m | 1074 m | -57.80 dB | 0.08 dB | | |
| 4 | Reflective | 1049 m | 1079 m | | | -67.31 dB | 0.09 dB |
| 5 | Reflective | 5239 m | 5386 m | -34.41 dB | 7.70 dB | | |

Event Type. Shows the type of event: reflective, non-reflective, reflective start, reflective end, multiple reflective, etc.

Event Start. Shows the distance to the start of the event (in either meters or feet).

Event End. Shows the distance to the end of the event (in either meters or feet).

Reflectivity. Also called reflectance; indicates how much light reflects back towards the OTDR (applies to reflective events only).

Loss. Also called attenuation; indicates how much loss occurs through the event.

MISCELLANEOUS INFO

Allows users to enter custom information about the trace.

| Miscellaneous Info | |
|--------------------|----------------------|
| Cable ID | <input type="text"/> |
| Client Info | <input type="text"/> |
| Company | <input type="text"/> |
| Location | <input type="text"/> |
| Phone | <input type="text"/> |
| Tested By | <input type="text"/> |
| Company | <input type="text"/> |
| Email | <input type="text"/> |

STATUS BAR

Shows current distance and dB at the mouse cursor position.

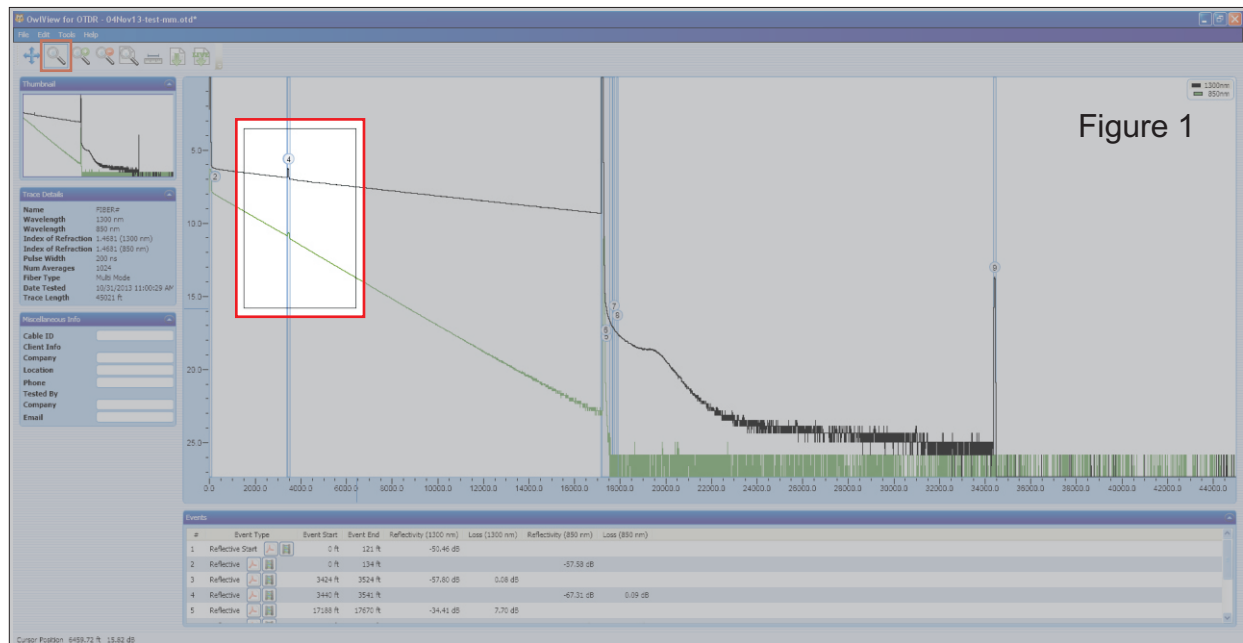
Cursor Position -2170.19 m 4.02 dB

SECTION 7: OWLVIEW FOR OTDR SOFTWARE

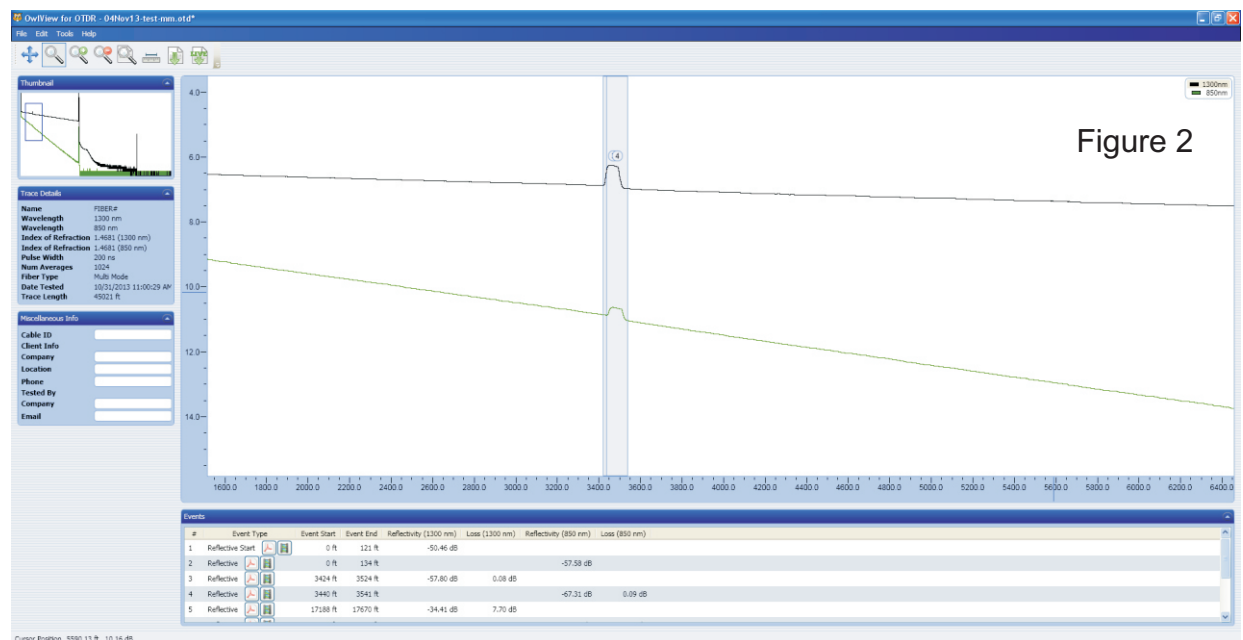
WORKING WITH TRACES, CONT.

RECTANGLE ZOOM

The rectangle zoom feature allows the user to drag a rectangle on the OTDR trace to quickly zoom in on the portion of the trace highlighted by the rectangle. Figure 1 below shows an example of rectangle zoom.



The highlighted rectangle in Figure 1 is a click-and-drag operation. Once the mouse button is released, the trace area changes to show the area of the trace produced by the rectangle (see Figure 2 below).



SECTION 7: OWLVIEW FOR OTDR SOFTWARE

WORKING WITH TRACES, CONT.

ZOOM IN/OUT

Clicking on the ZOOM IN and ZOOM OUT buttons zoom in and out on the trace at small increments.

SHOW/HIDE CURSORS

Clicking on the SHOW/HIDE CURSOR button either shows or hides the two cursors used for event analysis.

The cursors may be moved manually by click-and-drag.

EVENT ANALYSIS / PROPER CURSOR PLACEMENT

See Section 3: TRACE ANALYSIS for more information about event analysis and proper cursor placement.

TOOLS MENU

UPDATE FIRMWARE

The firmware of the OWLTrek II OTDR may be updated at the user's location by clicking **Tools, Update Firmware ►**.

NOTE: see SYSTEM INFORMATION in Section 5 in this manual for information about how to check your OTDR's current firmware version.

- 1) Click **Check for Updates...** (requires internet access) to download the firmware file from the OWLTrek II OTDR firmware update webpage onto the user's PC.
- 2) Connect the OWLTrek II OTDR to the PC via the USB download cable.
- 3) Click **From File...** then browse to the location where the firmware update file was saved to the user's PC.
- 4) Click **Open** to begin the firmware update

CHANGE LENGTH UNITS

Click **Tools, Meters** to view the length measurements in meters.

Click **Tools, Feet** to view the length measurements in footage.

The cursors may be moved manually by click-and-drag.

INVERT Y AXIS

HELP MENU

The Help menu contains links to helpful videos and PDF files, as well as information about OWLView for OTDR software.

SECTION 8: APPENDICES

SPECIFICATIONS

| Optical Specifications | | | | |
|--------------------------------------|--|---------|---|---------|
| | WTO2-M83 | | WTO2-S35 | |
| Fiber Type: | Multimode | | Singlemode | |
| Output Wavelength: | 850 nm | 1300 nm | 1310 nm | 1550 nm |
| Dynamic Range (SNR=1) ² : | 27 dB | 29 dB | 28 dB | 27 dB |
| Distance Range ⁵ : | 12 miles (20 kilometers) | | 80 miles (128 kilometers) | |
| Event Dead Zone ³ : | | | 2 meters (typical) | |
| Attenuation Dead Zone ⁴ : | | | 5 meters (typical) | |
| Maximum Data Points: | 64000 | | | |
| Data Point Spacing: | 1 meter | | Up to 64 km: 1 meter / Over 64 km: 2 meters | |
| Pulse Width: | 1, 2, 5, 10, 20, 50, 100 meters | | 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 meters | |
| Index of Refraction: | 1.4000 to 1.6000 | | | |
| Distance Accuracy: | Up to 64km: 1 + (distance in meters/10000) / Over 64km: 2 + (distance in meters/10000) | | | |
| Number of Stored Traces: | Maximum trace distance: up to 200 / Minimum trace distance: 3000+ | | | |

1: All price shown are in US Dollars (USD). List price is shown for US customers only. Prices outside the US may vary based on individual countries' import duties and taxes, currency conversion, and other value added charges.

2: Using maximum pulse width

3: Width measured 1.5dB down on each side of a reflective event using 1 meter pulse width

4: Distance from event beginning to within 0.5dB where backscatter resumes using 1 meter pulse width

5: Out to furthest reflective event

| General Specifications | |
|--|-----------------------------|
| Display Type: | High-resolution Color LCD |
| Display Size: | 2.8" diagonal |
| Battery Type: | Lithium Polymer |
| Battery Life: | up to 20 hours normal usage |
| Dimensions: | 2.87" x 4.42" x 1.25" |
| Weight: | 10 ounces (284 g) |
| Visual Fault Locator Specifications | |
| Output Wavelength: | 650nm |
| Output Power: | 1 mW |
| Operating Mode: | CW / Flash |

| Optical Power Meter Specifications | |
|---|---|
| Photodetector: | InGaAs |
| Connector: | 2.5mm/1.25mm universal |
| Fiber Type: | Multimode / Singlemode |
| Wavelengths: | 850, 980, 1300, 1310, 1490, 1550, 1625 |
| Accuracy: | ±0.15 dB |
| Resolution: | 0.01 dB |
| Measurement Units: | dBm / dB |
| Measurement Range: | +5 to -50 dBm (typical) (varies with wavelength) |

MAINTENANCE INFORMATION

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

Battery Replacement. The OWLTrek II contains an internal Lithium Polymer battery. If the battery requires service, the device must be sent in to OWL. Unauthorized attempts to service the battery will void the product warranty.

Cleaning. For accurate readings, the optical connector port on the OWLTrek II and the connector on the patch cable should be cleaned prior to attaching them to each other. Minimize dust and dirt buildup by replacing the dust caps after each use.

Warranty. The OWLTrek II comes standard with a two-year factory warranty, which covers manufacturer defect and workmanship.

CONTACT INFORMATION

Address:

Optical Wavelength Laboratories, Inc.
N9623 US Hwy 12
Whitewater, WI 53190
Phone:

262-473-0643

Internet:

OWL-INC.COM