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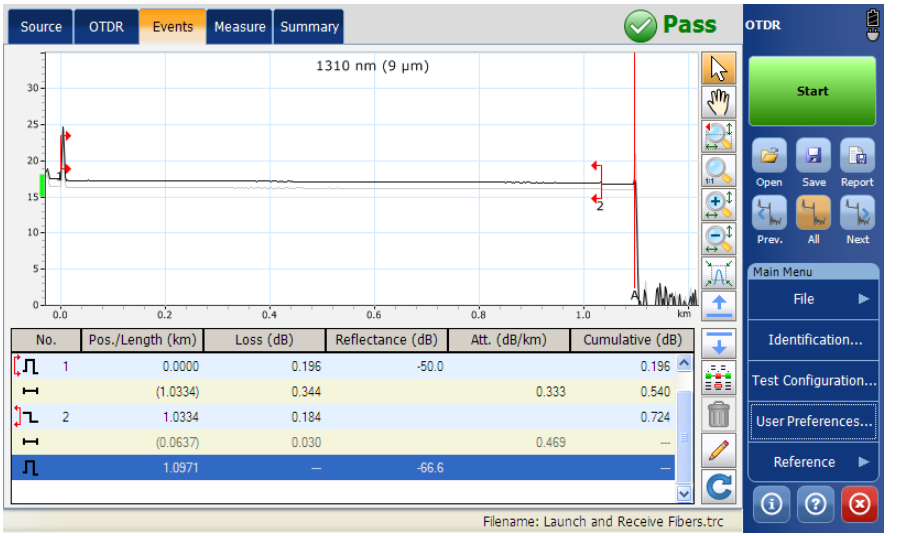
**IDEAL INDUSTRIES, INC.**

# USER MANUAL
# IDEAL OTDR



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Units of measurement in this publication conform to SI standards and practices.

### *Patents*

Feature(s) of this product is/are protected by one or more of US patents 6,612,750; and patent appl. US 2013/0088718 A1 and equivalents in other countries. The design patent is pending for this product.

Version number: 9.0.0.1

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# Certification Information

## North America Regulatory Statement

This unit was certified by an agency approved in both Canada and the United States of America. It has been evaluated according to applicable North American approved standards for product safety for use in Canada and the United States.

Electronic test and measurement equipment is exempt from FCC part 15, subpart B compliance in the United States of America and from ICES-003 compliance in Canada. However, IDEAL makes reasonable efforts to ensure compliance to the applicable standards.

The limits set by these standards are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

## European Community Declaration of Conformity

Warning: This is a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

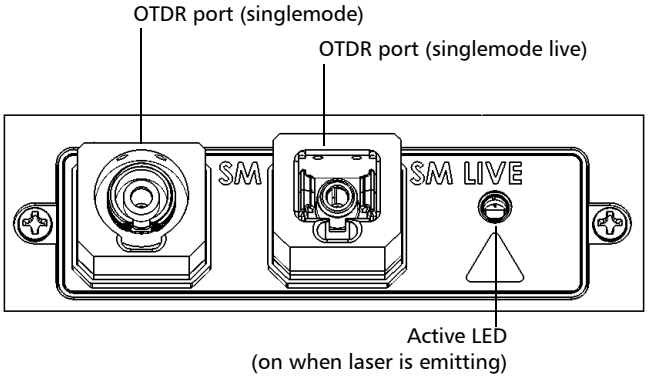
An electronic version of the declaration of conformity for your product is available on our website at *www.idealnetworks.net*. Refer to the product's page on the Web site for details.

# 1 Introducing the OTDR

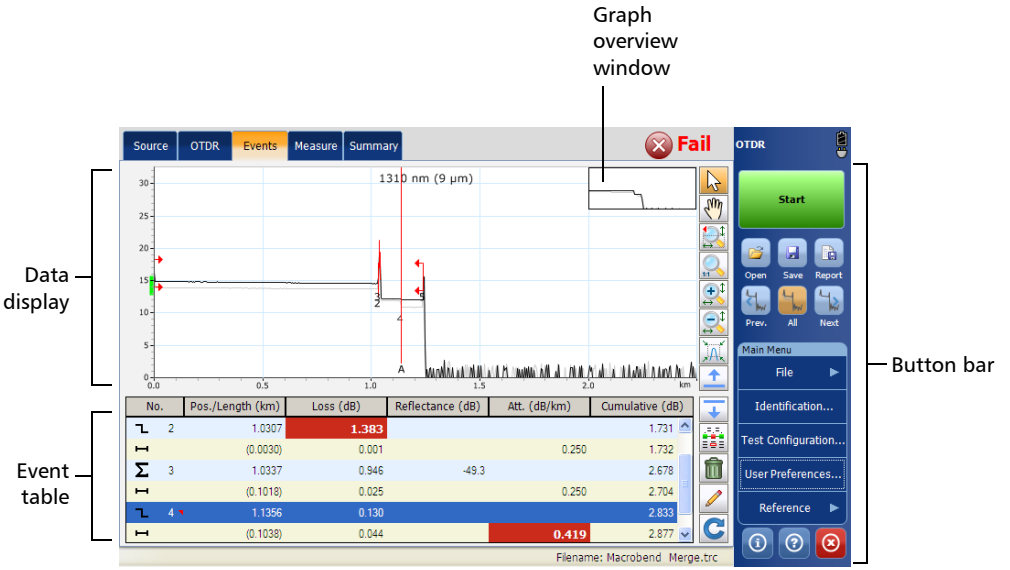
The OTDR allows you to characterize a fiber-optic span, usually optical fiber sections joined by splices and connectors. The optical time domain reflectometer (OTDR) provides an inside view of the fiber, and can calculate fiber length, attenuation, breaks, total return loss as well as splice, connector and total losses.

***Note:*** *In this documentation, the words "tap" and "double-tap" (related to the use of a touchscreen) replace the words "click" and "double-click".*

**MAX-700B Series**




## Main Window




***Note:*** *Due to screen resolution, the appearance of your OTDR application may vary slightly from the illustrations presented in this user guide.*

## Software Options

Software options may be offered with your unit.

- With the Source (SRC) software option, you can use your OTDR as a source.
- With the Real-Time (RT) software option, when working with the iOLM application, you can also have access to the OTDR by pressing the **Launch OTDR** button. In this case, the only button available to start an acquisition is the **Start Real Time** button. Most of the standard OTDR features, such as the **Events** tab, the **Summary** tab, the **Identification**, and the **Test Configuration** button, are disabled.

## Data Post-Processing

To view and analyze traces without the OTDR application, use a computer onto which FastReporter is already installed.

# OTDR Basic Principles

An OTDR sends short pulses of light into a fiber. Light scattering occurs in the fiber due to discontinuities such as connectors, splices, bends, and faults. The OTDR then detects and analyzes the backscattered signals. The signal strength is measured for specific intervals of time and is used to characterize events.

The OTDR calculates distances as follows:

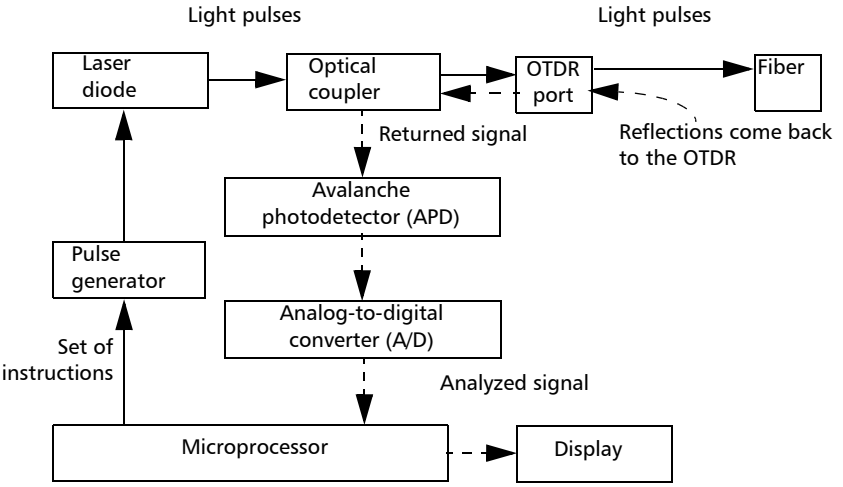
$$\text{Distance} = \frac{c}{n} \times \frac{t}{2}$$

where

- c = speed of light in a vacuum ($2.998 \times 10^8$ m/s)
- t = time delay from the launch of the pulse to the reception of the pulse
- n = index of refraction of the fiber under test (as specified by the manufacturer)

An OTDR uses the effects of Rayleigh scattering and Fresnel reflection to measure the fiber's condition, but the Fresnel reflection is tens of thousands of times greater in power level than the backscatter.

- Rayleigh scattering occurs when a pulse travels down the fiber and small variations in the material, such as variations and discontinuities in the index of refraction, cause light to be scattered in all directions. However, the phenomenon of small amounts of light being reflected directly back toward the transmitter is called backscattering.
- Fresnel reflections occur when the light traveling down the fiber encounters abrupt changes in material density that may occur at connections or breaks where an air gap exists. A very large quantity of light is reflected, as compared with the Rayleigh scattering. The strength of the reflection depends on the degree of change in the index of refraction.




When the full trace is displayed, each point represents an average of many sampling points. You will have to zoom to see each point.

## Technical Specifications

To obtain this product's technical specifications, visit the IDEAL Web site at *www.idealnetworks.net*.

## Conventions

Before using the product described in this guide, you should understand the following conventions:

### WARNING

**Indicates a potentially hazardous situation which, if not avoided, could result in *death or serious injury*. Do not proceed unless you understand and meet the required conditions.**

### CAUTION

**Indicates a potentially hazardous situation which, if not avoided, may result in *minor or moderate injury*. Do not proceed unless you understand and meet the required conditions.**

### CAUTION

**Indicates a potentially hazardous situation which, if not avoided, may result in *component damage*. Do not proceed unless you understand and meet the required conditions.**

### IMPORTANT

**Refers to information about this product you should not overlook.**

# 2 Safety Information

## General Safety Information

### WARNING

**Do not install or terminate fibers while a light source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times.**

### WARNING

**The use of controls, adjustments and procedures, namely for operation and maintenance, other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.**

### IMPORTANT

**When you see the following symbol on your unit** **, make sure that you refer to the instructions provided in your user documentation. Ensure that you understand and meet the required conditions before using your product.**

### IMPORTANT

**Other safety instructions relevant for your product are located throughout this documentation, depending on the action to perform. Make sure to read them carefully when they apply to your situation.**

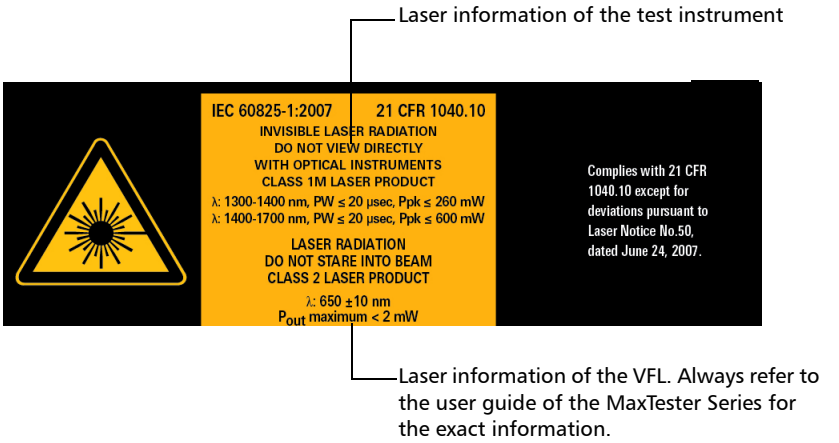
# Laser Safety Information for MAX-700B Series

Your instrument is a Class 1M laser product in compliance with standards IEC 60825-1: 2007 and 21 CFR 1040.10, except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007. Laser radiation may be encountered at the output port.

## WARNING

**Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard.**

The following label(s) indicate that the product contains a Class 1M source:




***Note:*** *The label is affixed to the back panel of the unit.*

# Electrical Safety Information

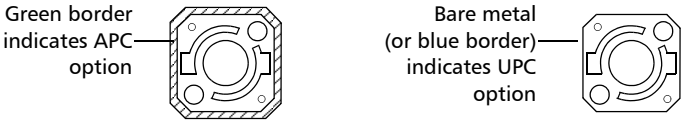
For more information on product safety and equipment ratings, refer to the user documentation of your platform.

All OTDR modules power consumption is below 10 W.

# 3 Preparing Your OTDR for a Test

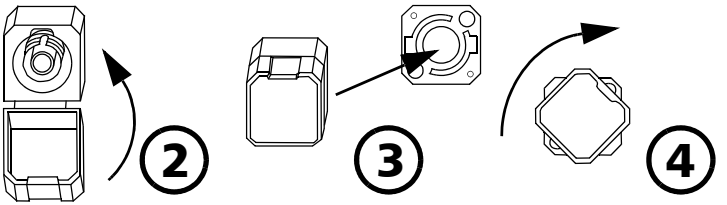
## Installing the IDEAL Universal Interface (UI)

The UI fixed baseplate is available for connectors with angled (APC) or non-angled (UPC) polishing.A green border around the baseplate indicates that it is for APC-type connectors




***To install a UI connector adapter onto the UI baseplate:***

***1.*** Hold the UI connector adapter so the dust cap opens downwards.




***2.*** Close the dust cap in order to hold the connector adapter more firmly.

***3.*** Align keys and insert the connector adapter into the baseplate.

***4.*** While pushing firmly, turn the connector adapter clockwise on the baseplate to lock it in place.

# Cleaning and Connecting Optical Fibers

## IMPORTANT

**To ensure maximum power and to avoid erroneous readings:**

- **Always inspect fiber ends and make sure that they are clean as explained below before inserting them into the port. IDEAL is not responsible for damage or errors caused by bad fiber cleaning or handling.**
- **Ensure that your patchcord has appropriate connectors. Joining mismatched connectors will damage the ferrules.**

***To connect the fiber-optic cable to the port:***

***1.*** Inspect the fiber using a fiber inspection microscope. If the fiber is clean, proceed to connecting it to the port. If the fiber is dirty, clean it as explained below.

***2.*** Clean the fiber ends as follows:

***2a.*** Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol.

***2b.*** Use compressed air to dry completely.

***2c.*** Visually inspect the fiber end to ensure its cleanliness.

***3.*** Carefully align the connector and port to prevent the fiber end from touching the outside of the port or rubbing against other surfaces.

If your connector features a key, ensure that it is fully fitted into the port's corresponding notch.

***4.*** Push the connector in so that the fiber-optic cable is firmly in place, thus ensuring adequate contact.

If your connector features a screwsleeve, tighten the connector enough to firmly maintain the fiber in place. Do not overtighten, as this will damage the fiber and the port.

***Note:*** *If your fiber-optic cable is not properly aligned and/or connected, you will notice heavy loss and reflection.*

IDEAL uses good quality connectors in compliance with EIA-455-21A standards.

To keep connectors clean and in good condition, IDEAL strongly recommends inspecting them with a fiber inspection probe before connecting them. Failure to do so will result in permanent damage to the connectors and degradation in measurements.

# Naming Trace Files Automatically

Each time you start an acquisition, the application suggests a file name based on autonaming settings. This file name appears at the bottom of the window.

The file name is made of one or more static parts (alphanumeric) and one or more variable parts (numeric) that will be incremented or decremented, according to your selection, as follows:

| If you choose incrementation... | If you choose decrementation... |
|---|---|
| Variable part increases until it reaches the *highest possible value* with the selected number of digits, then restarts at 1. | Variable part decreases until it reaches 1, then restarts at the *highest possible value* with the selected number of digits. |

***Note:*** *To decrement values, the start number must be higher than the stop number.*

After saving a result, the unit prepares the next file name by incrementing (or decrementing) the suffix.

You can select the number of digits displayed for the incremented or decremented values.

Select "#" if you want to keep the value exactly in the same format as defined in the start and stop values. If a value is to be incremented from 1 to 10, it becomes 1, 2, 3, ... 9, 10. One "#" is the default format.

Select two, three, or four "#" if you want all values to be expressed with the same number of digits. The application fills the empty spaces with zeros before the increment or decrement to ensure the appropriate format is displayed. For example, if you select two "#" and the value is to be incremented from 1 to 10, it becomes 01, 02, 03, ... 09, 10.

The file name can be incremented using one or more identifiers. Selecting a single identifier will follow the incrementation (or decrementation) value you have set.

When selecting more than one identifier, the latter appear sequentially in the order that you have set, and the incrementation will start with the last item in the list (the one with the farthest indentation). For example, if you have a file name with the Location, Cable and Fiber identifiers, in that order, the first item to be incremented is the Fiber identifier, then Cable, then Location:

Location 1, Cable 1, Fiber 1

Location 1, Cable 2, Fiber 1

Location 1, Cable 2, Fiber 2

and so forth.

***Note:*** *If you choose not to save a particular trace file, the suggested file name remains available for the next trace you acquire.*

This function is particularly useful when testing multiple-fiber cables.

If you deactivate the automatic file naming function, the application will use the default file name, which is *Unnamed.trc*.

By default, traces are saved in native (.trc) format, but you can configure your unit to save them in Bellcore (.sor) format (see *Selecting the Default File Format* on page 75).

***Note:*** *If you select the Bellcore (.sor) format, the unit creates one file per wavelength (for example, TRACE001_1310.sor and TRACE001_1550.sor, if you included both 1310 nm and 1550 nm in your test). The native (.trc) format contains all wavelengths in a single file.*

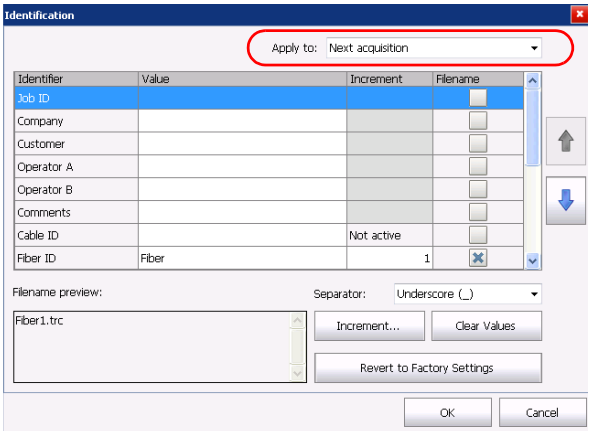
The autonaming parameters can be set only for files that have not been saved yet. You will only see the parameters for the current and next acquisition (when the test is done but not saved yet), or for the next acquisition only (test is not done yet). Otherwise, the parameters will not be displayed.

It is also possible to revert the settings to their default values.

***To configure the automatic file naming:***

***1.*** From the **Main Menu**, tap **Identification**.

***2.*** From the **Apply to** list, ensure that **Next Acquisition** or **Current and Next Acquisition** is selected.




***3.*** Enter all the information as follows:

***3a.*** Locate the row corresponding to the identifier that you want to modify.

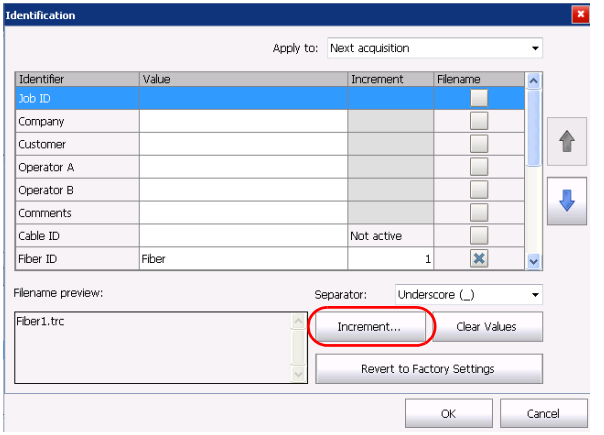
***3b.*** Tap the **Value** column corresponding to the desired identifier.

***3c.*** Enter the information.

***Note:*** *You cannot edit the information in the dark gray boxes.*

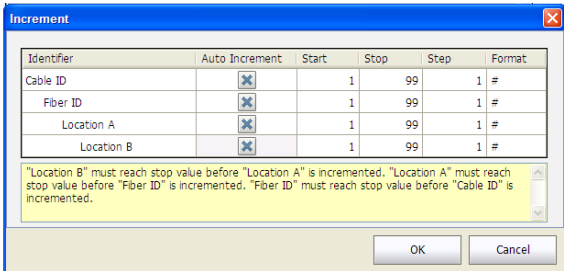
***4.*** If you want to increment automatically the cable ID, the fiber ID or the location (A and/or B), proceeds as follows:

***4a.*** Tap the **Increment** button.




***4b.*** In the **Increment** window, select the **Auto Increment** check box corresponding to the identifier you want to increment.

***4c.*** Enter the start, stop and increment values as desired.

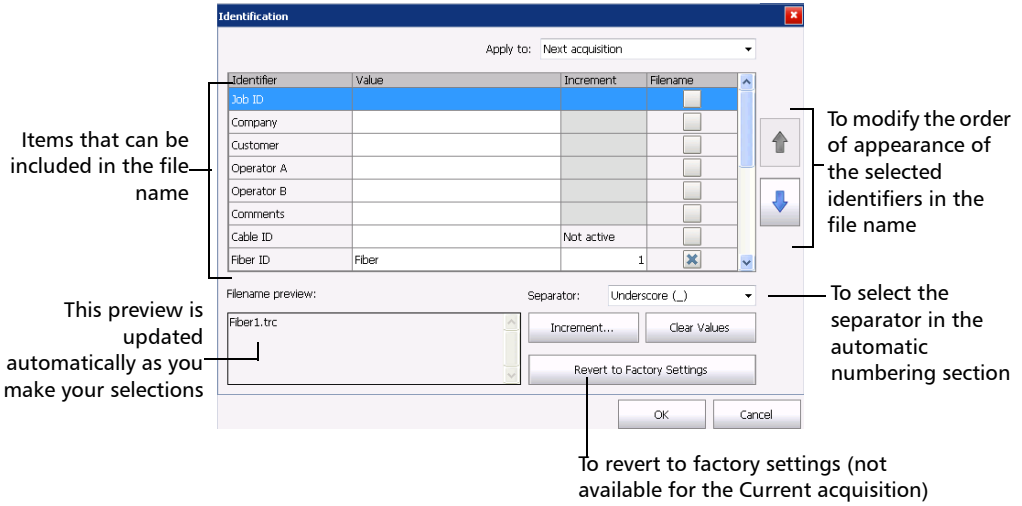



***Note:*** *To decrement values, the start number must be higher than the stop number.*

***4d.*** Choose the type of format in the list.

***4e.*** Tap **OK** to return to the **Identification** window.

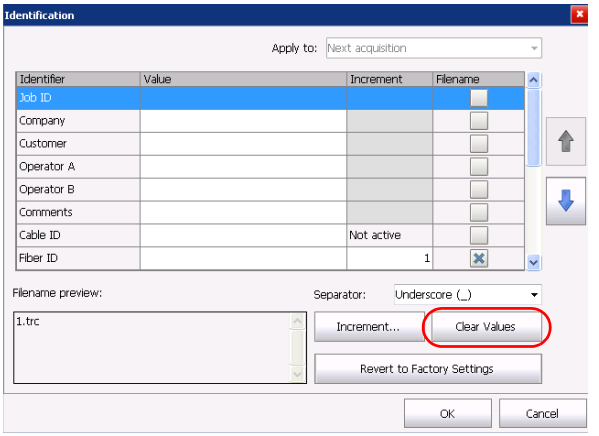
***5.*** Select the desired identifiers to include in the file name. You can change the order of appearance of the highlighted component with the up and down arrow buttons.




***6.*** Tap **OK** to confirm your new settings and to return to the main window.

***To clear the values:***

1. From the **Main Menu**, tap **Identification**.
2. In the **Apply to** list, select **Next acquisition**.
3. Tap the **Clear Values** button.




4. Tap **OK** to return to the main window.

   All values in the **Value** column are erased from the white boxes.

# Setting the IOR, RBS Coefficient, and Helix Factor

You should set the IOR (group index), backscatter coefficient and helix factor before performing tests in order to apply them to all newly acquired traces. However, you can also set them at a later time but in that case, you have to reanalyze the trace if you change the backscatter coefficient (see *Viewing and Modifying Current Measurement Settings* on page 115).

- The index of refraction (IOR) value (also known as group index) is used to convert time-of-flight to distance. Having the proper IOR is crucial for all OTDR measurements associated with distance (event position, attenuation, section length, total length, etc.). IOR is provided by the cable or fiber manufacturer.

  The test application determines a default value for each wavelength. You can set the IOR value for each available wavelength. You should verify this information before each test.

- The Rayleigh backscatter (RBS) coefficient represents the amount of backscatter in a particular fiber. The RBS coefficient is used in the calculation of event loss and reflectance, and it can usually be obtained from the cable manufacturer.

  The test application determines a default value for each wavelength. You can set the RBS coefficient for each available wavelength.

- The helix factor represents the ratio between the length of the cable and the length of the fiber inside the cable. Since fibers within a cable are spiraling around the cable core, the fiber length is different from the cable length.

  By setting the helix factor, the length of the OTDR distance axis is always equivalent to the physical length of the cable.

  The helix factor is expressed as a percentage. For example, a helix factor of 1 % implies that the fiber is 1 % longer than the cable. If you specify a helix factor of 1 %, the displayed length would be reduced by 1 % according to the cable length.

Thresholds values are saved with the measurement. It is possible to view these thresholds values even if you open the file on another unit.

You can revert the IOR, RBS Coefficient, and Helix factor to their default values.

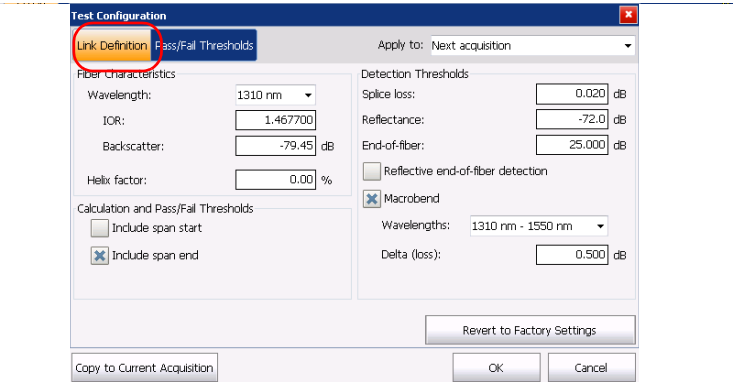
***To set the IOR, RBS, and helix factor parameters:***

1. From the **Main Menu**, tap **Test Configuration**.
2. From the **Apply to** list, select **Next acquisition.**

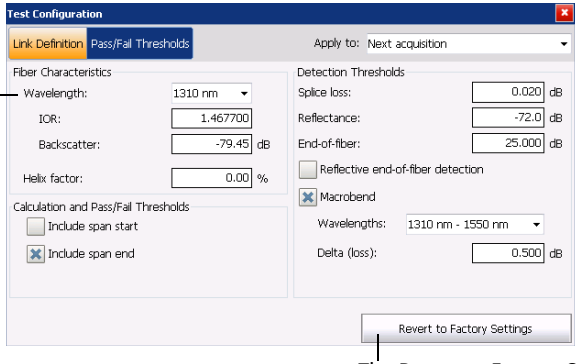
**IMPORTANT**

**In the Apply to list, Next acquisition and Current file will be displayed if an acquisition was made but was saved. The current trace settings, as well as the future acquisitions, will be modified.**

3. From the **Test Configuration** window, go to the **Link Definition** tab.



***4.*** From the **Wavelength list**, select the desired wavelength.




Wavelength for which RBS and IOR will be defined

The Revert to Factory Settings button resets all the values in the **Link Definition** tab

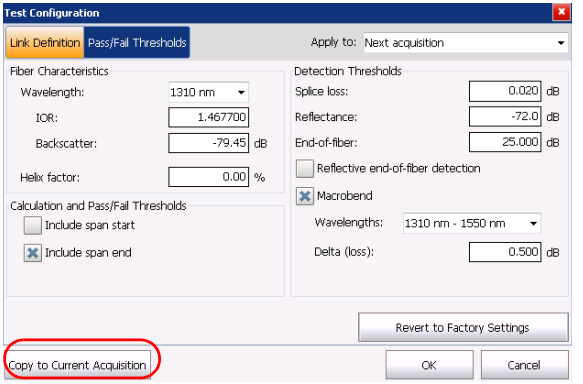
## IMPORTANT

**Change the default RBS coefficient *only* if you have values provided by the fiber manufacturer. If you set this parameter incorrectly, your reflectance measurements will be inaccurate.**

***Note:*** *The helix factor value takes into account the difference between the length of the cable and the length of the fiber inside the cable; it does not vary with wavelengths. For this reason, you cannot define a different helix factor for each wavelength.*

***5.*** If you want to apply the test configuration information to the current acquisition, proceed as follows:

***5a.*** Tap the **Copy to Current Acquisition** button.




***5b.*** When the application prompts you, select **Yes**.

***Note:*** *The information in the **Link Definition** and **Pass/Fail Thresholds** tabs will be copied to the current acquisition.*

***6.*** Tap **OK** to return to the main window.

# Excluding and Including Span Start and Span End

When applicable, the application includes the losses caused by the span start and span end events to the span loss value. The application also includes the ORL caused by the span start and span end events to the span ORL.

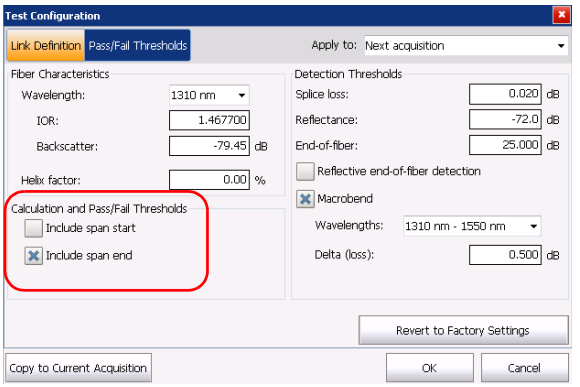
When the spans are included, the loss and reflectance values associated with the events are taken into account to determine the pass/fail thresholds.

***To exclude or include span starts and span ends:***

1. From the **Main Menu**, select the **Test Configuration** button.
2. Select the **Link Definition** tab.
3. Under **Calculation and Pass/Fail thresholds**, select the inclusion of the span start and span end you want to display in the table.

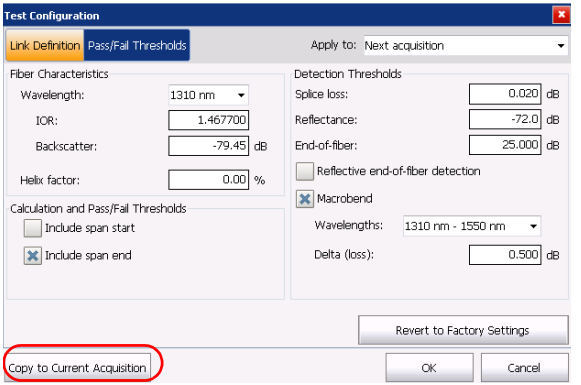
   OR

   To exclude the span start and span end, clear the boxes.



***4.*** If you want to apply the test configuration information to the current acquisition, proceed as follows:

***4a.*** Tap the **Copy to Current Acquisition** button.




***4b.*** When the application prompts you, select **Yes**.

***Note:*** *The information in the **Link Definition** and **Pass/Fail Thresholds** tabs will be copied to the current acquisition.*

***5.*** Tap **OK** to return to the main window.

# Setting the Analysis Detection Thresholds

To optimize event detection, you can set the following analysis detection thresholds:

- *Splice loss threshold*: To display or hide small non-reflective events.
- *Reflectance threshold*: To hide false reflective events generated by noise, transform non-harmful reflective events into loss events, or detect reflective events that could be harmful to network and other fiber-optic equipment.
- *End-of-fiber threshold*: To stop the analysis as soon as an important event loss occurs; for example, an event that could compromise signal transmission toward the end of a network.

  When the end of fiber detection threshold is modified for an existing measurement, the span end position at the new end of fiber position can be automatically reset by the application.

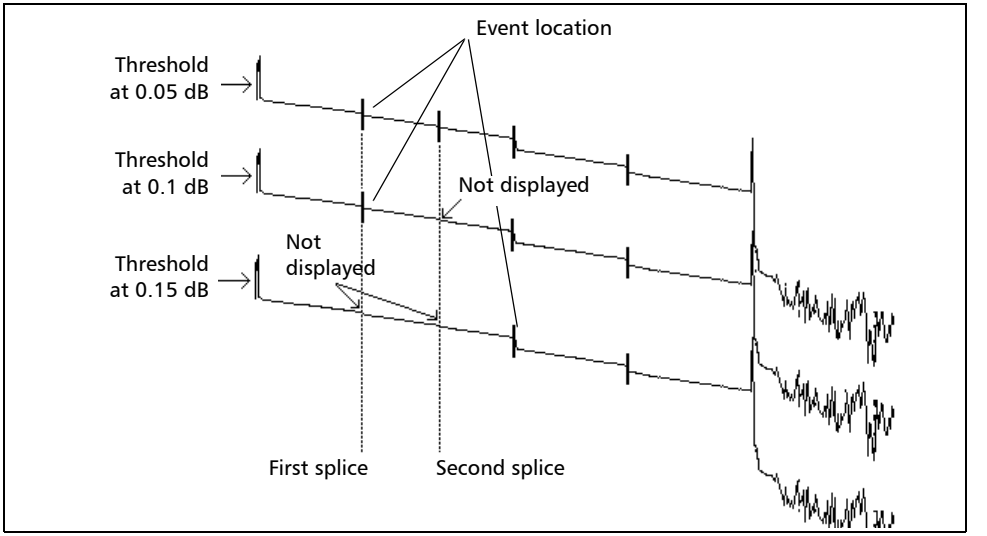
***Note:*** *Changing detection thresholds on the current trace leads to a reanalysis. All manual changes made will be lost.*

**IMPORTANT**

**The end-of-fiber (EoF) threshold that you define will be used if you let the application evaluate the acquisition settings.**
**If you set this threshold, an EoF event will be inserted at the first event for which the loss crosses the threshold. The application then uses this EoF event to determine the acquisition settings.**

Setting the thresholds allow you either to ignore events with known lower values, or to ensure that all events are detected—even the ones for which very small values are measured.

The following examples show how different splice-loss threshold levels can affect the number of displayed events, especially small non-reflective events such as those caused by two splices. Three traces are shown, corresponding to three threshold level settings.




➤ *Threshold at 0.05 dB*

With the threshold set to 0.05 dB, two events are displayed at distances corresponding to the location of the first and second splices.

➤ *Threshold at 0.1 dB*

Only the first splice is displayed, as the threshold is set to 0.1 dB and the second splice loss is lower than 0.1 dB.

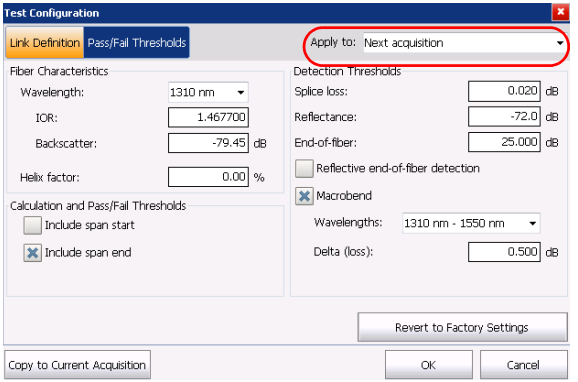
➤ *Threshold at 0.15 dB*

The first two splices are not displayed, as the threshold is set to 0.15 dB and the first and second splice losses are lower than 0.15 dB.

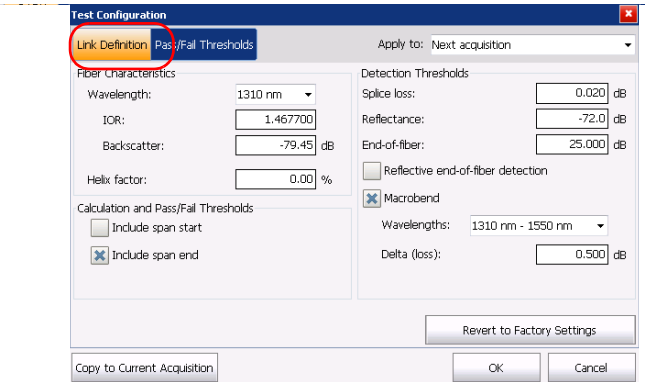
Thresholds values are saved with the measurement. It is possible to view these thresholds values even if you open the file on another unit.

### *To set the analysis detection thresholds:*

1. From the **Main Menu**, tap **Test Configuration**.
2. From the **Apply to** list, select **Next acquisition.**




3. From the **Test Configuration** window, go to the **Link Definition** tab.



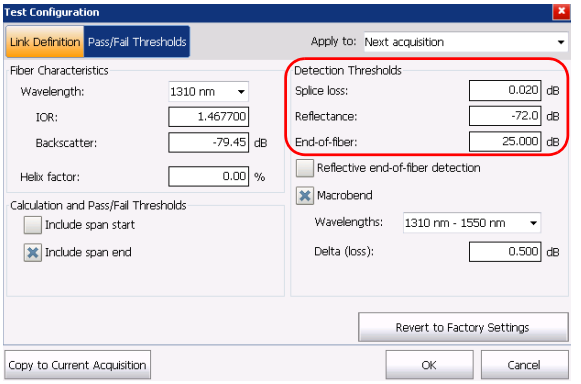
## IMPORTANT

**The Revert to Factory Settings button resets all the values in the Link Definition tab.**

***4.*** Under **Detection Thresholds**, enter the desired values in the appropriate boxes.

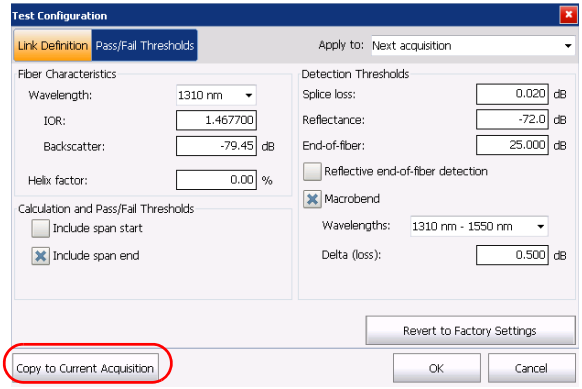
OR

If you want to revert all settings to their default values, tap the **Revert to Factory Settings** button.



***5.*** If you want to apply the test configuration information to the current acquisition, proceed as follows:

***5a.*** Tap the **Copy to Current Acquisition** button.




***5b.*** When the application prompts you, select **Yes**.

***Note:*** *The information in the **Link Definition** and **Pass/Fail Thresholds** tabs will be copied to the current acquisition.*

***6.*** Tap **OK** to return to the main window.

The analysis detection thresholds you have just set will be applied to future traces.

# Setting Macrobend Parameters

Your unit can locate macrobends by comparing the loss value of an event at a given wavelength (for example, 1310 nm) with the loss value at the same location with another wavelength (for example, 1550 nm).

The unit will identify a macrobend when comparing two loss values if:

- Of the two loss values, the greater loss occurred at the greater wavelength.

  AND

- The difference between the two loss values exceeds the defined delta loss value. The default delta loss value is 0.5 dB (which is suitable for most fibers), but you can modify it.

You can also disable macrobend detection.

***Note:*** *Macrobend detection is only possible with singlemode wavelengths. Filtered wavelengths or port with only one wavelength are not available for macrobend detection.*

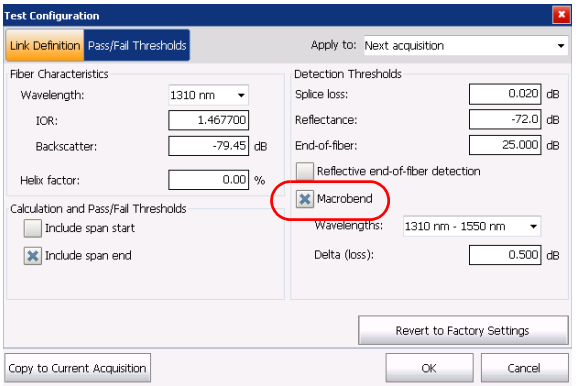
For information on how the information about macrobends is available after an acquisition, see *Summary Tab* on page 92.

***To set macrobend parameters:***

1. From the **Main Menu**, tap **Test Configuration.**
2. From the **Apply to** list, select **Next acquisition.**
3. Select the **Link Definition** tab.
4. To enable the macrobend detection, select the **Macrobend** check box.

   OR

   To disable it, clear the check box.

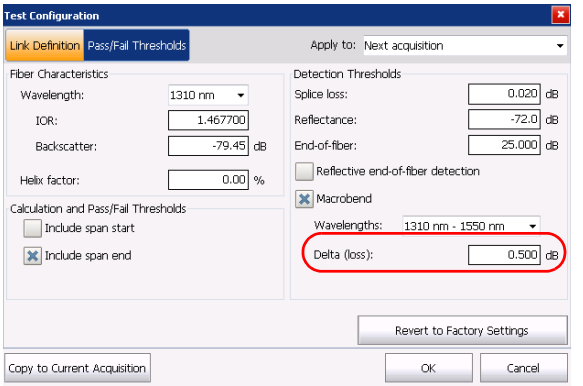


***5.*** If necessary, set the delta value as follows:

***5a.*** From the **Wavelengths** list, select the pair of wavelengths for which you want to define the delta value.

***Note:*** *Only the combinations of wavelengths your module can support will be available for a next acquisition. For a current acquisition, the available wavelength in the file will be used.*

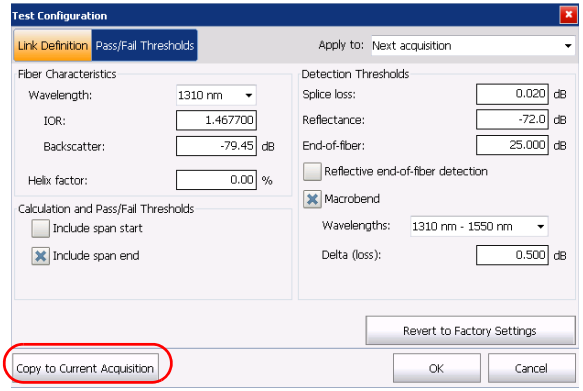
***5b.*** In the **Delta (loss)** box, enter the desired value.




***5c.*** Repeat steps 5a and 5b for all wavelength combinations.

***6.*** If you want to apply the test configuration information to the current acquisition, proceed as follows:

***6a.*** Tap the **Copy to Current Acquisition** button.




***6b.*** When the application prompts you, select **Yes**.

***7.*** Tap **OK** to return to the main window.

# Setting Pass/Fail Thresholds

You can activate and set Pass/Fail threshold parameters for your tests.

Thresholds values are saved with the measurement file. It is possible to view these thresholds values even if you open the file on another unit.

You can set thresholds for splice loss, connector loss, reflectance, fiber section attenuation, span loss, span length, and span ORL. You can apply the same pass/fail thresholds to all test wavelengths or set different thresholds for each available test wavelength.

These pass/fail thresholds will be applied to the analysis results of all newly acquired traces as well as current traces with the corresponding wavelength.

If you work with files containing other wavelengths, the application will automatically add these wavelengths to the list of available wavelengths. You will then be able to define thresholds for these new wavelengths. You can revert all thresholds to their default values.

The loss, reflectance and attenuation thresholds that you set are applied to all events where such values can be measured.

Once the thresholds are set, the application will be able to perform Pass/Fail tests to determine the status of the results (pass or fail).

Values that are greater than the predefined thresholds are displayed in white on a red background in the **Events** table. Span length, span loss and span ORL values are displayed in the **Summary** table.

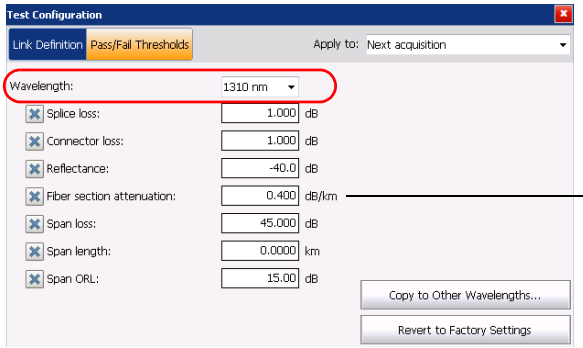
***To set pass/fail thresholds:***

1. From the **Main Menu**, select **Test Configuration**.
2. From the **Apply to** list, select **Next acquisition.**
3. Select the **Pass/Fail Thresholds** tab.

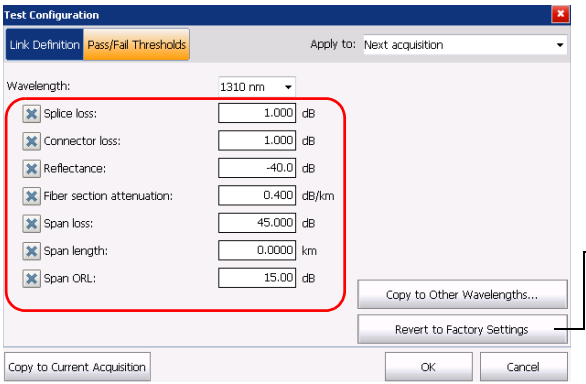
**IMPORTANT**

**In the Apply to list, Next acquisition and Current file will be displayed if an acquisition was made but was saved. The current trace settings, as well as the future acquisitions, will be modified.**

4. From the **Wavelength** list, select the wavelength for which you want to set thresholds.



***5.*** Select the boxes corresponding to the thresholds that you want to use, and enter the desired values in the appropriate fields.



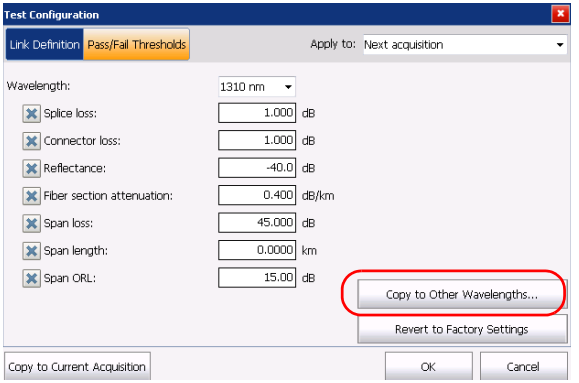

The Revert to Factory Settings button resets all the values in the **Pass/Fail Thresholds** tab

***Note:*** *If you no longer want the application to take into account a particular threshold, simply clear the corresponding check box.*

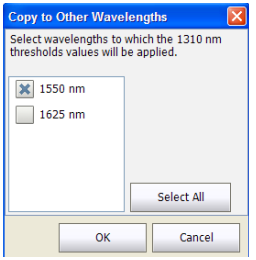
***Note:*** *Selecting or clearing a particular thresholds check box will affect all the available wavelengths, not only the selected one.*

***6.*** If you want to apply the thresholds you have just defined to one or several other wavelengths, proceed as follows:

***6a.*** Tap the **Copy to Other Wavelengths** button.




***6b.*** Select the boxes corresponding to the wavelengths for which you want to use the same thresholds.




***Note:*** *You can use the **Select All** button to quickly select all boxes at the same time.*

***6c.*** Tap **OK** to confirm you selection.

***7.*** If you want to apply the test configuration information to the current acquisition, proceed as follows:

***7a.*** Tap the **Copy to Current Acquisition** button.

***7b.*** When the application prompts you, select **Yes**.

***Note:*** *The information in the **Link Definition** and **Pass/Fail Thresholds** tabs will be copied to the current acquisition.*

***8.*** Tap **OK** to return to the main window.

# 4 Testing Fibers

Several tools are available to perform complete OTDR tests; you can also control all test parameters.

By default, all available test wavelengths are selected.

You can either set the acquisition parameters yourself or let the application determine the most appropriate values.

In the latter case, the application will automatically evaluate the best settings according to the fiber link currently connected to the unit.

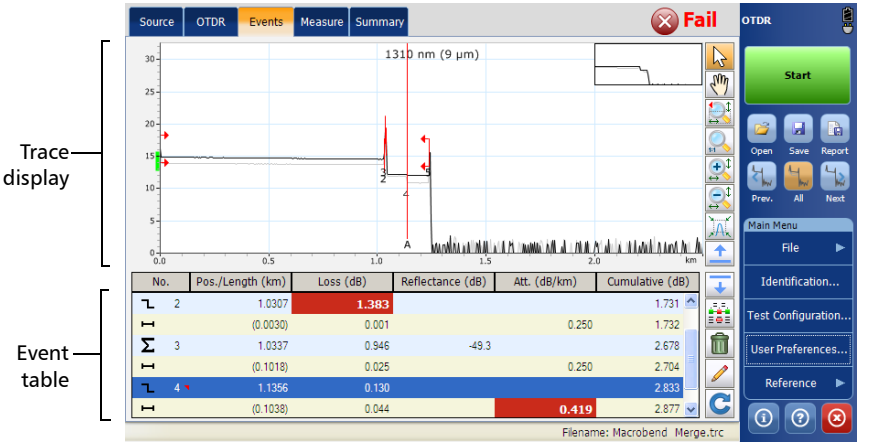
The pulse width will be determined using a factory-defined signal-to-noise ratio (SNR) requirement specified where the End-of-Fiber (EoF) event has been detected.

The EoF event detection algorithm uses the end-of-fiber threshold defined in the **Test Configuration** window (for more information, see *Setting the Analysis Detection Thresholds* on page 27). If you are not sure about which value to choose, revert to the factory default value for this parameter.

Although the application sets the acquisition parameters, you can modify these values as needed, even while the acquisition is in progress. The OTDR simply restarts the averaging each time a modification is made.

***Note:*** *You can interrupt the acquisition at any time. The application will display the information acquired to that point.*

After analysis, events appear in the events table. For more information, see *Analyzing Traces and Events* on page 89.




You can save the measurement after analysis. If former results have not been saved yet, the application prompts you to save them before starting a new acquisition.

***To acquire traces:***

1. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 12).
2. Connect a fiber to the OTDR port.

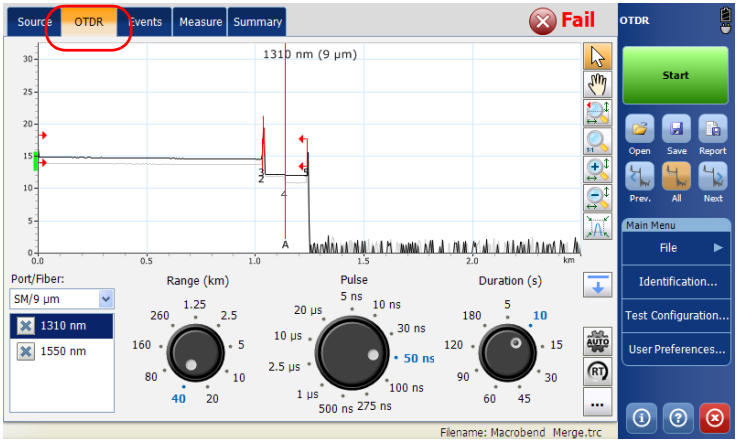
   If your unit is equipped with two OTDR ports, ensure that you connect the fiber to the appropriate port (singlemode, singlemode live, or multimode), depending on the wavelength you intend to use.

## CAUTION

**Never connect a live fiber to the OTDR port without a proper setup. Any incoming optical power ranging from –65 dBm to –40 dBm will affect the OTDR acquisition. The way the acquisition will be affected depends on the selected pulse width.**
**Any incoming signal greater than 10 dBm could damage your OTDR module permanently. For live-fiber testing, refer to the SM Live port specifications for the characteristics of the built-in filter.**

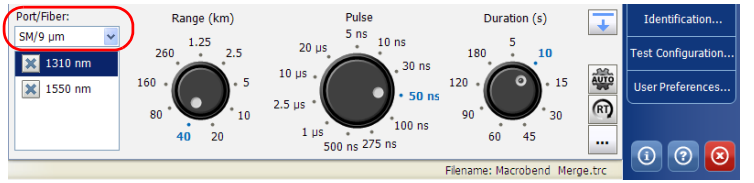
3. If you want to set your own IOR (group index), RBS coefficient or helix factor, see *Setting the IOR, RBS Coefficient, and Helix Factor* on page 21.
4. If you want to set the first connector check, see *Enabling or Disabling the First Connector Check* on page 53.

5. Go to the **OTDR** tab.



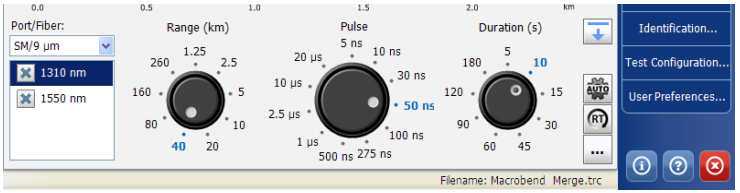

6. If you want to test in high resolution, simply select the feature (see *Enabling the High-Resolution Feature* on page 58)

7. If your OTDR supports singlemode, singlemode live, or multimode wavelengths, from the **Port** list, select the desired fiber type (for live-fiber testing, select SM Live; for C fiber, select 50 µm and for D fiber, select 62.5 µm).




8. Select the boxes corresponding to the desired test wavelengths.

***9.*** Select the desired distance range, pulse, and time values. For more information, see *Setting Distance Range, Pulse Width, and Acquisition Time* on page 56.




***Note:*** *To configure different parameters for each wavelength, see* Applying Acquisition Settings by Wavelength *on page 55.*

***10.*** Tap **Start**. If the first connector check feature is enabled, a message will appear if there is a problem with the injection level (see *Enabling or Disabling the First Connector Check* on page 53).

***Note:*** *The acquisition starts with the selected wavelength. The following wavelengths are tested in increasing order (smallest to largest).*

You can modify the acquisition parameters as needed while the acquisition is in progress. The OTDR simply restarts the averaging each time a modification is made. This applies only to the wavelength currently under test. Changing the time parameter does not restart the acquisition.

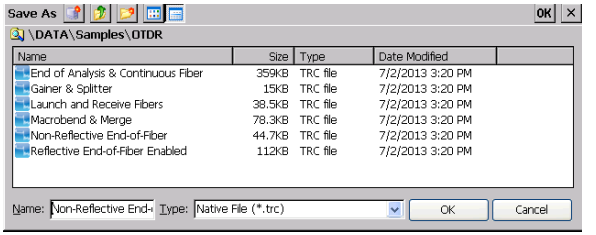
***11.*** Once the analysis is complete, save the trace by tapping **Save** in the button bar.

The application will use a file name based on the autonaming parameters you defined (see *Naming Trace Files Automatically* on page 14). This file name appears in the status bar.

The files that have to be saved are sent in the default file folder (see *Setting the Default Storage Folder* on page 74).

***Note:*** *The application will only display the **Save As** dialog box if you have activated the feature to always be prompted when you save a file. From this dialog box, you can change the location, the file name and the file format.*
*Even if you modify the name of the file, next time you save a trace, the unit will prepare the next file name by incrementing or decrementing the suffix.*

***11a.*** If necessary, change the folder to which the file will be saved by tapping the parent folder button until you reach the desired location.




***11b.*** If necessary, specify a file name.

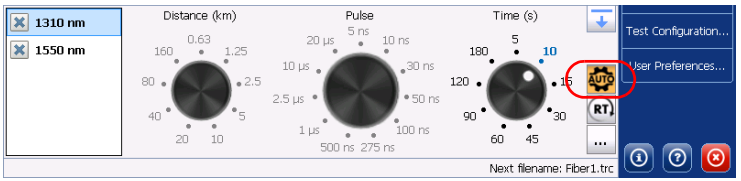
***12.*** Tap **OK** to confirm.

# Setting the Automatic Acquisition Parameters

When the auto-settings parameters are activated, the application calculates the distance and pulse for the first wavelength, then for the second wavelength, and so on. You can also enable a feature that will let you select the optimized range and pulse for the distance as determined by the application when the auto-settings parameters are used at least once.

***To set the automatic acquisition parameters:***

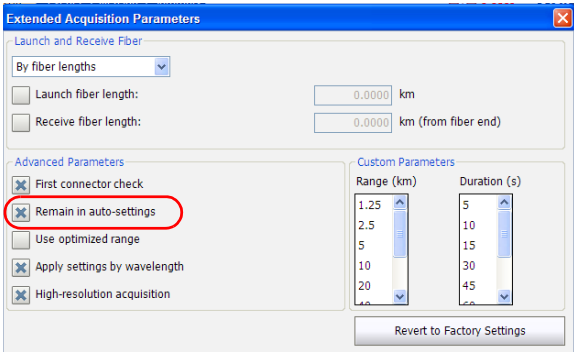
1. From the main window, go to the **OTDR** tab.
2. Go to the **Time (s)** dial and select the appropriate time for your test. The default value is 15 seconds.
3. Tap **AUTO**.



***4.*** If you want to keep the auto-settings activated once an acquisition is done, proceed as follows:

***4a.*** Tap the ... button.

***4b.*** Under **Advanced Parameters**, select the **Remain in Auto-Settings** box.

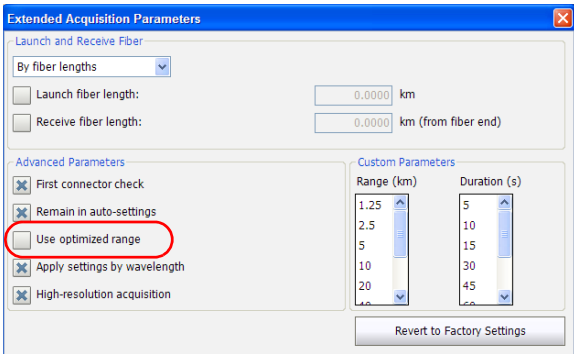



***4c.*** Tap **OK** to return to the main window.

***5.*** If you want to use the optimized range feature, proceed as follows:

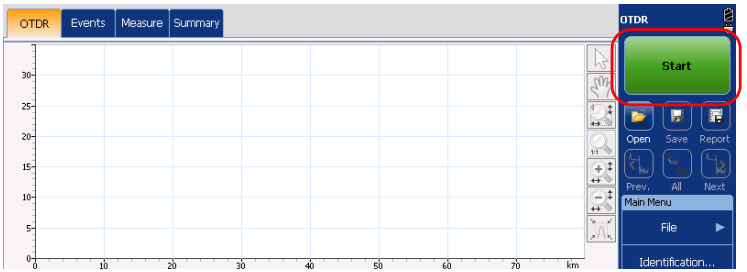
***5a.*** Tap the ... button.

***5b.*** Under **Advanced Parameters**, select the **Use optimized range** box.




***5c.*** Tap **OK** to return to the main window.

***6.*** Tap **Start** to launch the acquisition.



# Defining Launch and Receive Fiber Settings

To define the fiber span start, you can set the *launch fiber length*. If you do not know the fiber length, it is also possible to define the launch/receive fiber by event number.

When you perform tests with your unit, you connect a launch fiber between your unit and the fiber under test. If the launch and receive fiber are not defined, the fiber will appear as if it was part of the fiber under test.

When you define the length of the launch fiber, the application sets the fiber span start at the beginning of the fiber under test. It allows to characterize the first connector at the beginning of the fiber. Therefore, only events related to the defined fiber span will be taken into account. The application will include the loss caused by the span start event in the displayed values. The span start event will also be taken into account when determining the status (pass/fail) of connector loss and reflectance.

The span start becomes event 1 and its distance reference becomes 0. Events excluded from the fiber span are shaded in the event table, and do not appear in the trace display. The cumulative loss is calculated for the defined fiber span only.

When you perform tests with your unit, you can connect a receive fiber to the fiber under test. It allows to characterize the last connector at the end of the fiber. By default, the fiber span also includes the receive fiber. When the receive length is mentioned, the application finds the event which is characterized as the end of fiber and moves the span end according to a value corresponding to the specified receive fiber length (except for continuous or end of analysis events).

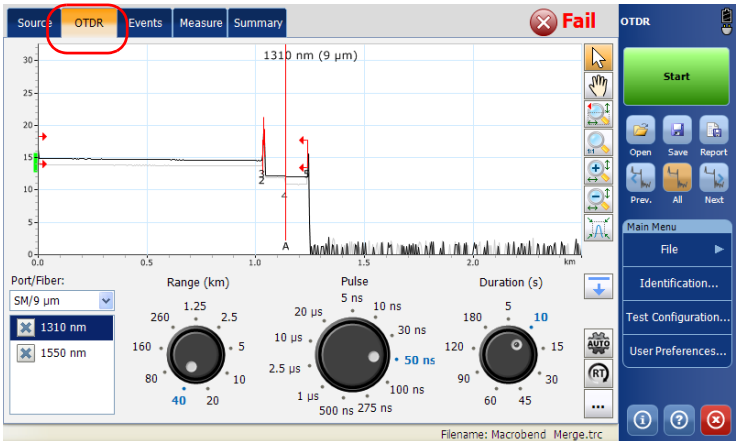
When the span end is positioned, an event should be near the new position of the span end. If no event is found, the application will automatically add an event where there should be one.

The application can also set the span end according to a number of events instead of using a distance.

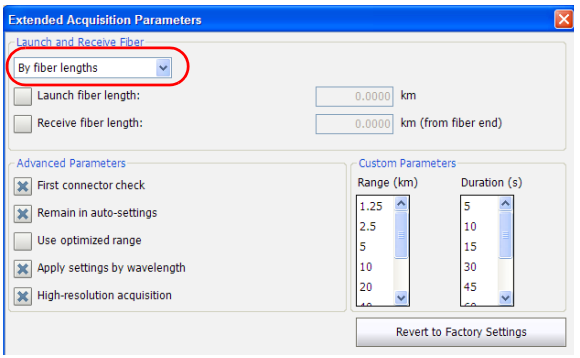
The application allows you to manually set the lengths or the events of both your launch and receive fibers.

***To set the launch and receive settings for the next acquisition:***

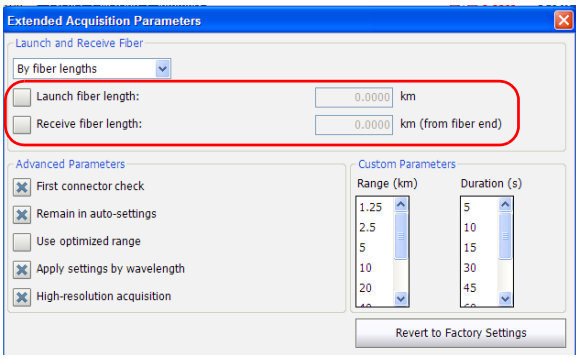
***1.*** From the main window, go to the **OTDR** tab, then tap the ... button.




***2.*** Under **Launch and Receive Fiber**, select if you want to apply settings By fiber lengths or By event.



***3.*** Select the check boxes corresponding to your needs and enter the appropriate information in the boxes.



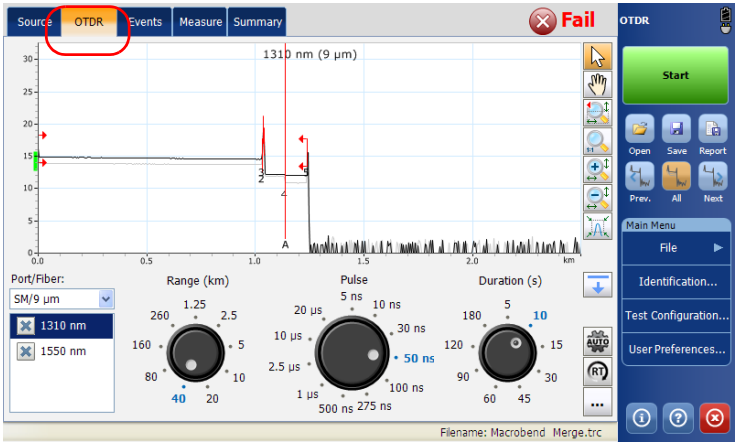

***4.*** Tap **OK** to return to the main window.

# Enabling or Disabling the First Connector Check

The first connector check feature is used to verify that the fibers are properly connected to the OTDR. It verifies the injection level and displays a message when an unusually high loss occurs at the first connection, which could indicate that no fiber is connected to the OTDR port. By default, this feature is disabled.

***To enable or disable the first connector check:***

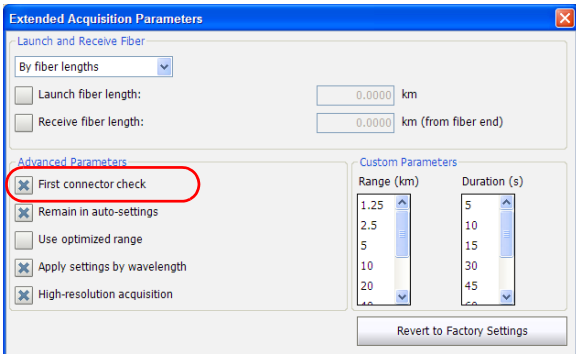
1. From the main window, tap the **OTDR** tab then tap the ... button.



2. Under **Advanced Parameters**, to enable the first connector check, select the **First connector check** box.

   OR

   To disable it, clear the box.



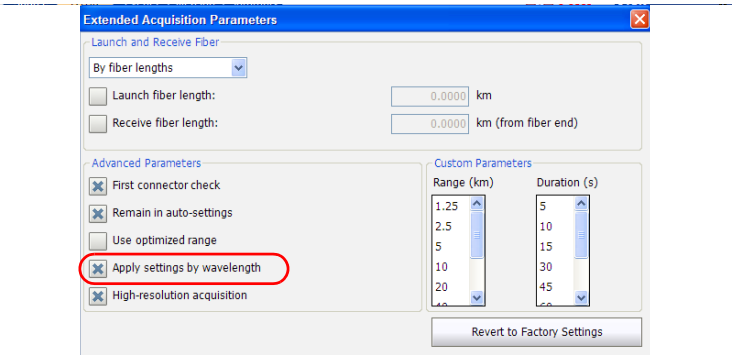

3. Tap **OK** to return to the main window.

# Applying Acquisition Settings by Wavelength

By default, the modifications made to the parameters (distance, pulse, and time) are applied to all wavelengths. However, it is possible to modify the acquisition parameters independently for each wavelength.

***To apply acquisition settings by wavelength:***

1. From the main window, select the **OTDR** tab then tap the **...** button.
2. Under **Advanced Parameters**, select the **Apply settings by wavelength** box.




3. Tap **OK** to return to the main window.

   You can now set the distance range, the pulse width, and the acquisition time independently for each wavelength.

# Setting Distance Range, Pulse Width, and Acquisition Time

The distance range, pulse width and acquisition time are set with the controls in the OTDR main window.

- **Distance**: corresponds to the distance range of the fiber under test according to the selected measurement units (see *Selecting the Distance Units* on page 65).

  Changing the distance range modifies the available settings of the pulse width and leaves only the settings available for the specified range.

- **Pulse**: corresponds to the pulse width for the test. A longer pulse allows you to probe further along the fiber, but results in less resolution. A shorter pulse width provides higher resolution, but less distance range. The available distance ranges and pulse widths depend on your OTDR model.

***Note:*** *Not all pulse widths are compatible with all distance ranges.*

- **Time**: corresponds to the acquisition duration (period during which results will be averaged). Generally, longer acquisition times generate cleaner traces (this is especially true with long-distance traces) because as the acquisition time increases, more of the noise is averaged out. This averaging increases the signal-to-noise ratio (SNR) and the OTDR's ability to detect small events.

  The time settings will also determine how the timer (displayed in the toolbar) counts time during testing.

You can use the same distance range, pulse width and acquisition time parameters for testing at all wavelengths on a multiwavelength OTDR. For more information, see *Applying Acquisition Settings by Wavelength* on page 55.

## IMPORTANT

**To test the high-resolution feature, you must set a minimum acquisition time of 15 seconds.**

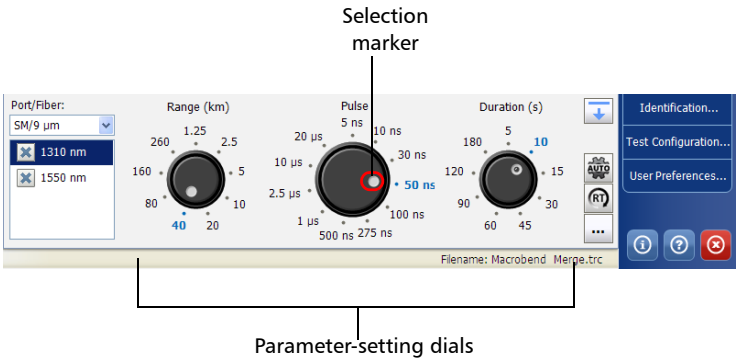
***To set the parameters:***

From the **OTDR** tab:

➤ Tap the dial corresponding to the parameter you wish to set (the selection marker will move clockwise).

OR

➤ Tap directly the value to select it. The selection marker will go to that value immediately.




***Note:*** *If your OTDR supports singlemode, singlemode live, or multimode wavelengths, settings would be applied to either singlemode, singlemode live, or multimode wavelengths, depending on the selected fiber type (same settings for 50 µm and 62.5 µm).*

# Enabling the High-Resolution Feature

You can select the high-resolution feature to obtain more data points per acquisition. This way, the data points will be closer to each other, which will result in a greater distance resolution for the trace.

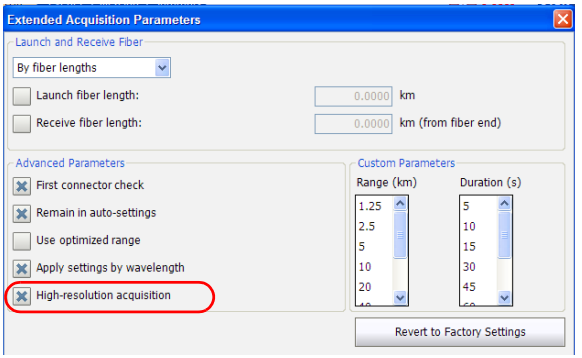
***Note:*** *When you test with the high-resolution feature, you should use a longer averaging time to maintain a signal-to-noise ratio (SNR) that will be equivalent to the one you would have had with the standard resolution.*

## IMPORTANT

**To test the high-resolution feature, you must set a minimum acquisition time of 15 seconds.**

### *To enable the high-resolution feature:*

1. From the main window, select the **OTDR** tab then tap the ... button.
2. Under **Advanced Parameters**, select the **High-resolution acquisition** box.




***Note:*** *If your OTDR supports singlemode, singlemode live, or multimode wavelengths, the high-resolution feature will be activated either for the singlemode, singlemode live, or multimode wavelengths, depending on the selected fiber type.*

3. Tap **OK** to return to the main window.

# Monitoring Fibers in Real-Time Mode

The application allows you to immediately view sudden changes in the fiber link. In this mode, the trace is refreshed instead of averaged until you switch to average mode or stop the acquisition.

***Note:*** *You cannot reanalyze a trace in real-time mode.*

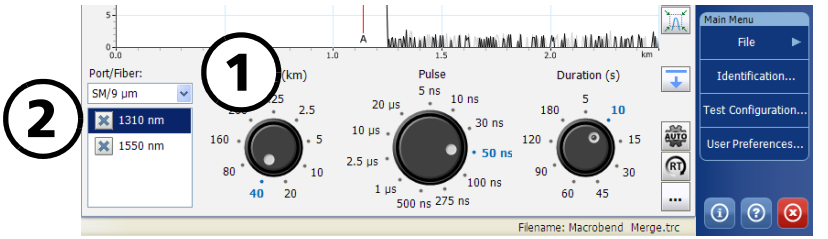
***Note:*** *In real-time mode, the trace is refreshed at a slower rate when the graph overview window is displayed.*

***Note:*** *You can only use one wavelength at a time to monitor your fiber.*

You can switch from real-time mode to the averaging time interval mode at any time. You can also switch between wavelengths during an acquisition (all wavelengths must be selected before starting the test).

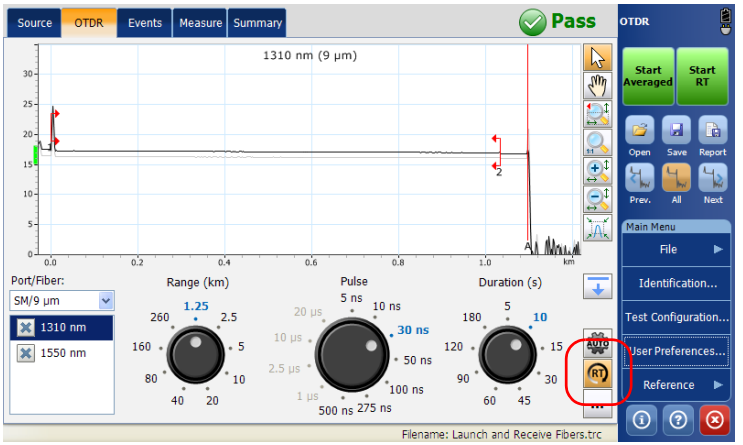
***To activate the real-time mode:***

1. If your module supports singlemode, singlemode live, or multimode wavelengths, specify the desired fiber type (for live-fiber testing, select SM Live; for C fiber, select 50 µm and for D fiber, select 62.5 µm).




2. From the wavelength list, ensure that all the desired wavelengths are selected.

3. If you have the full OTDR application, tap **RT**. The **RT** button turns orange to show that the real-time mode is activated.




4. If you have the full OTDR application, tap **Start RT**.

   OR

   If you only have access to the OTDR in Real Time mode, tap **Start Real Time**.

***Note:*** *The timer is not displayed during real-time acquisition.*

5. From the wavelength list, tap the wavelength value (not the checkbox) corresponding to the wavelength that you want to monitor.

***Note:*** *Ensure that the wavelength is highlighted.*

***To deactivate the real-time mode:***

➤ If you have the full OTDR application, when you want to stop monitoring, tap **Stop RT**.

OR

If you only have access to the OTDR in Real Time mode, tap **Stop Real Time**.

➤ If you have the full OTDR application, you can also stop the real-time acquisition by starting an averaged acquisition. All the wavelengths for which boxes are selected will be tested in averaging time interval mode (not only the highlighted one).

# 5 Customizing Your OTDR

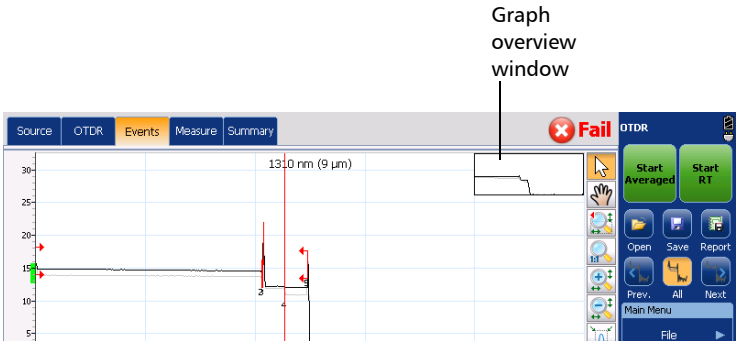
You can customize the appearance and behavior of your OTDR application.

## Setting Event Table and Graph Display Parameters

You can include or exclude items from the events table to better suit your needs. You can also change several trace display parameters:

***Note:*** *Hiding the fiber sections will not delete these items.*

- *Fiber sections*: You can display or hide fiber sections in the events table, depending on the types of values you want to display. When the fiber sections are hidden, the **Att.** column is also hidden.
- the gridlines: You can display or hide the grid appearing on the graph's background. By default, the grid is displayed.
- the graph background: You can display the graph with a black (invert color feature) or a white background. By default, the background is white.
- the graph overview: The graph overview window shows you which portion of the graph is being magnified.



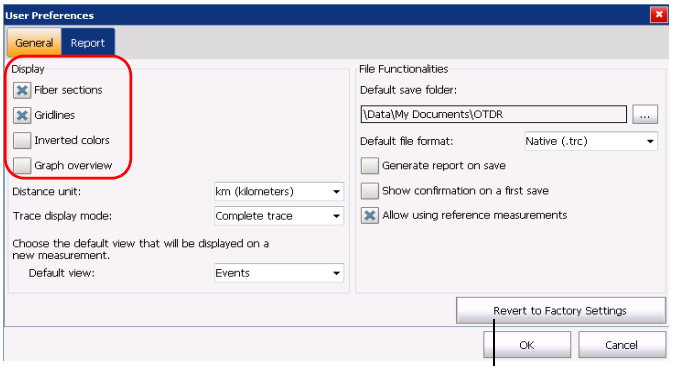

***Note:*** *The application always generates graphs with a white background in the reports.*

***To set the event table and graph display parameters:***

1. From the **Main Menu**, select the **User Preferences** button.
2. Select the **General** tab.
3. Under **Display**, select the boxes corresponding to the item you want to display or include in the table.

   OR

   To hide them, clear the boxes.

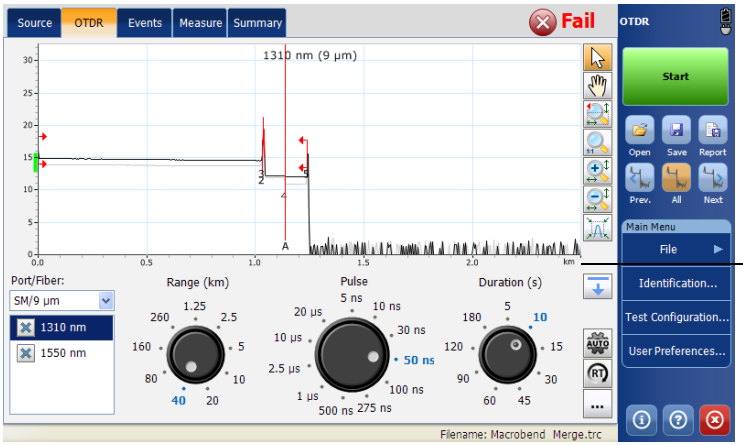



The Revert to Factory Settings button resets all the values in the **General** tab

4. Tap **OK** to return to the main window.

# Selecting the Distance Units

You can select the measurement units that will be used throughout the application.

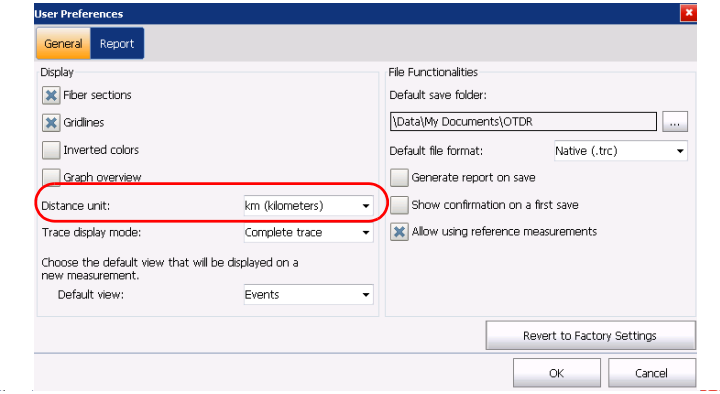



The default distance units are the kilometers.

***Note:*** *The attenuation of fiber sections is always presented in dBs per kilometer even if the distance units you selected are not the kilometers. This follows the standards of the fiber-optic industry that provides the attenuation values in dBs per kilometer.*

### *To select the distance units for your display:*

1. From the button bar, tap **User Preferences**.
2. From the **User Preferences** window, select the **General** tab.
3. From the **Distance unit** list, select the item corresponding to the desired distance units.

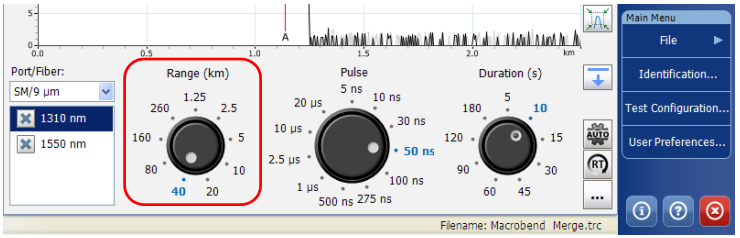



4. Tap **OK** to return to the main window.

   You return to the main window and the newly selected distance unit appears everywhere units are used.

# Customizing the Acquisition Distance Range Values

You can customize the values associated with the **Range** dial. Once the customization is complete, you are ready to set the distance range value for your test. For more information, see *Setting Distance Range, Pulse Width, and Acquisition Time* on page 56.



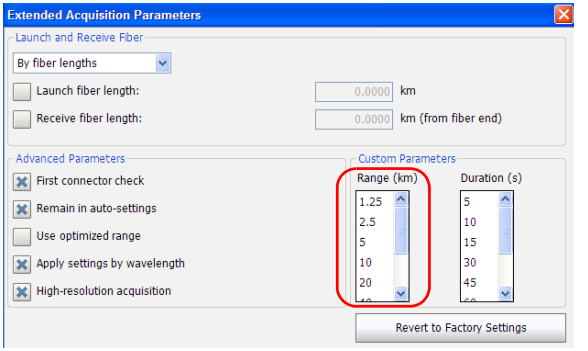

***Note:*** *The value found by an auto acquisition cannot be modified.*

***To customize the distance range values:***

1. From the main window, select the **OTDR** tab then tap the ... button.
2. Under **Custom Parameters**, if your OTDR supports singlemode or multimode, specify the desired fiber type.

***Note:*** *The fiber type list is not displayed if the module has only one fiber type.*

3. From the **Range** list, select the value you want to modify.
4. When the value becomes highlighted, enter the new value.

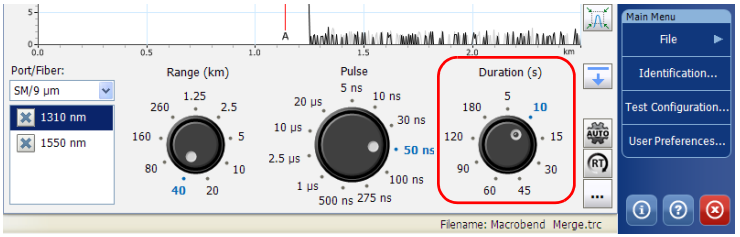



5. Tap **OK** to return to the main window.

***Note:*** *You can revert to factory values by pressing the* ***Revert to Factory Settings*** *button.*

# Customizing the Acquisition Time Values

You can customize the values associated with the **Duration (s)** dial. The acquisition time values represent the time during which the OTDR will average acquisitions.

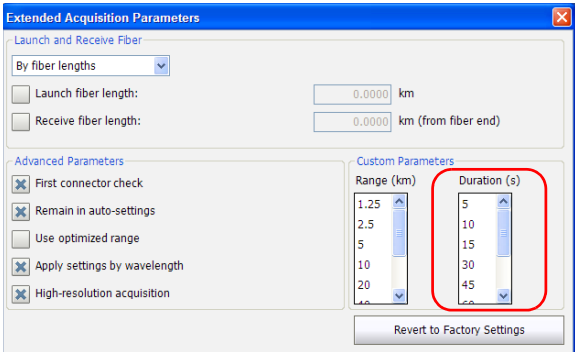



You can customize the acquisition time to improve the signal-to-noise ratio (SNR) of the trace and enhance the detection of low-level events. The SNR improves by a factor of two (or 3 dB) each time the acquisition time is increased by a factor of four.

***To customize the acquisition time values:***

1. From the main window, select the **OTDR** tab then tap the ... button.
2. Under **Custom Parameters**, from the **Duration (s)** list, select the value you want to modify.

***3.*** When the value becomes highlighted, enter the new value.




***4.*** Tap **OK** to return to the main window.

***Note:*** *You can revert to factory values by pressing the* ***Revert to Factory Settings*** *button.*

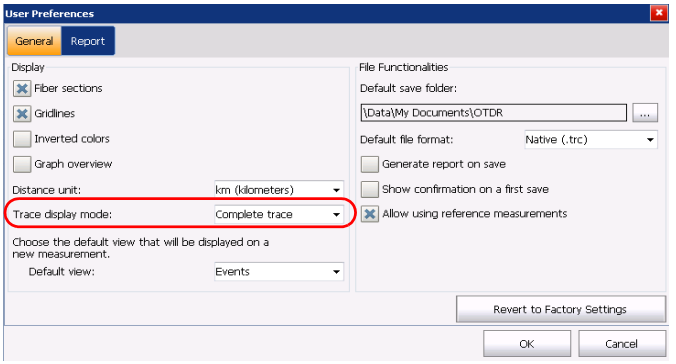
# Selecting a Trace Display Mode

You can choose the way the application will display traces on-screen and in reports. The available choices are:

- **Complete trace**: to display the whole trace and full acquisition distance.
- **Span**: to display the trace from the span start to the span end.

***To select a trace display mode:***

1. From the **Main Menu**, select the **User Preferences** button.
2. Select the **General** tab.
3. From the **Trace display mode** list, select a display mode.




4. Tap **OK** to return to the main window.

# Selecting the Default View

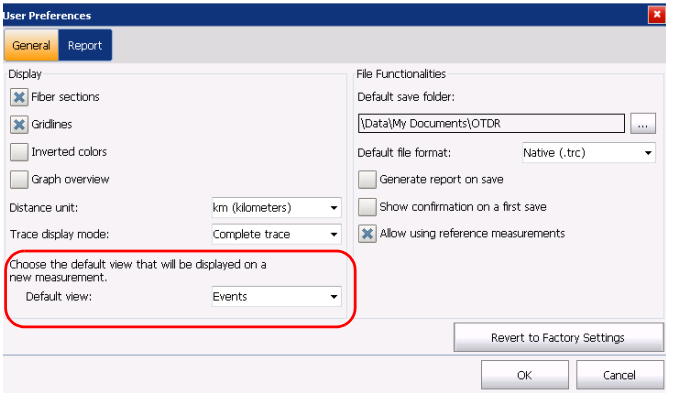
You can select which view will be displayed by default once all the acquisitions are performed (at all the selected wavelengths) and the analysis of the last wavelength is complete. The default view will also be used when opening a measurement file.

The table below indicates the views that can be displayed.

| View | Remarks |
|---|---|
| Keep current | The tab selected before the acquisition is started remains the same once the acquisition is complete. |
| OTDR | Displays the graph and the control dials (lists when graph is in full view) for the OTDR acquisitions.<br>For more information, see *Graph* on page 90. |
| Events | Default view.<br>Displays the results in the Events table after an acquisition. |
| Measure | Displays the results in the Measure table after an acquisition. This view allows you to take measurement with markers manually. |
| Summary table | This table gives, for each wavelength, information such as: the pass/fail status of the results, the span loss and span ORL values. Span length is also displayed.<br>For more information, see *Summary Tab* on page 92. |

***To select the default view:***

1. From the **Main Menu**, select **User Preferences**, then the **General** tab.
2. From the **Default view** list, select the desired view.




3. Tap **OK** to return to the main window.

   The application will automatically switch to the selected view when you perform the next acquisitions or open already existing files.

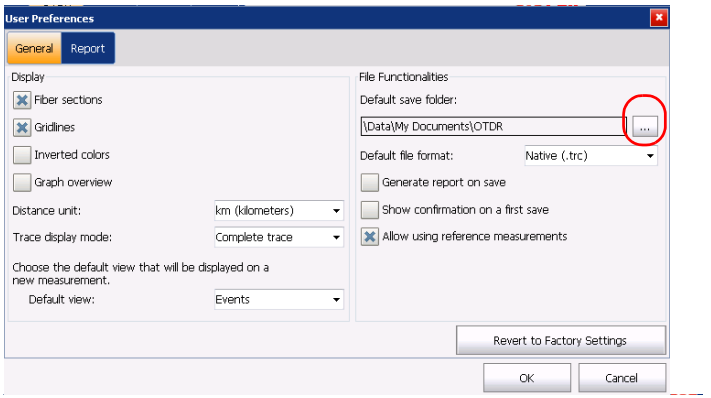
# Setting the Default Storage Folder

The default storage folder is Data\My Documents\OTDR but you can change the folder to better suit your needs. You can also work with a USB key. If the USB key is not connected to the device upon saving, the acquisitions are saved in the default storage folder.

***Note:*** *The **Save As** button allows you to save your files to a folder different than the default storage folder. If you change the storage folder from the **Save As** dialog box, it will be used the next time you use the Save As feature again. The default storage folder will not be modified.*

***To set the default storage folder:***

1. From the **Main Menu**, tap the **User Preferences** button, then select the **General** tab.
2. Under **File functionalities**, tap the **...** button next to **Default save folder**.



3. In the **Browse for Folder** window, select the location where you want to save the file.

***Note:*** *If you want to create a folder, you will have to do it manually via **File Manager** available from the Home screen.*

4. Tap **OK** to exit the **Browse for Folder** window.
5. Tap **OK** to return to the main window.

## Selecting the Default File Format

You can define the default file format the application will use when you save your traces.

By default, traces are saved in native (.trc) format, but you can configure your unit to save them in Bellcore (.sor) format.

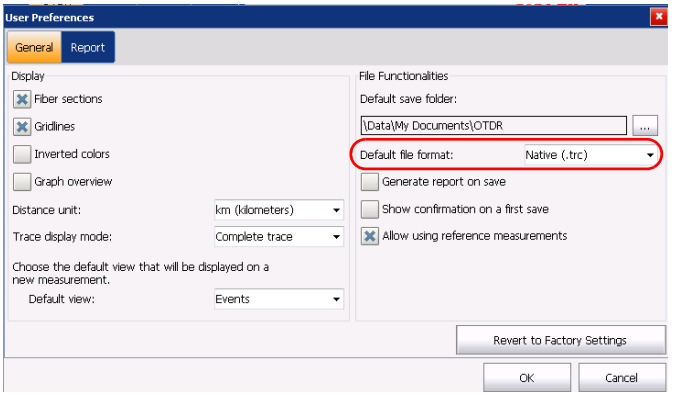
If you select the Bellcore (.sor) format, the unit will create one file per wavelength (for example, TRACE001_1310.sor and TRACE001_1550.sor, if you included both 1310 nm and 1550 nm in your test). The native format contains all wavelengths in a single file.

***Note:*** *If you selected the feature to be prompted each time you save a measurement, you can also modify the file format temporarily. Next time you save a measurement, the default file format will be used.*

***Note:*** *The **Save As** button allows you to save your files to a folder different from that of the default file format. If you change the file format from the **Save As** dialog box, it will be used the next time you use the Save As feature again. The default file format will not be modified.*

### *To select the default file format:*

1. From the **Main Menu**, tap the **User Preferences** button, then select the **General** tab.
2. From the **Default file format** list, select the type of file.




3. Tap **OK** to return to the main window.

   The next files will be saved in the new format.

# Enabling or Disabling Automated File Saving

By default, each time you save a file, the application saves it without asking for a file name or a folder.

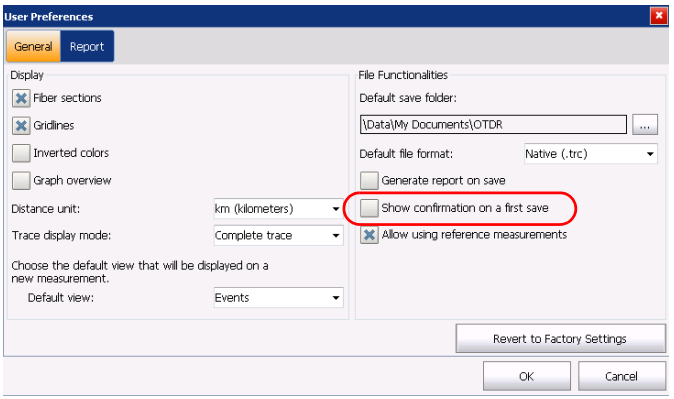
The application will use a file name based on autonaming settings (see *Naming Trace Files Automatically* on page 14).

***To enable or disable automated file saving:***

1. From the **Main Menu**, tap **User Preferences**, then select the **General** tab.
2. If you want to confirm the file name, folder, or file type each time you tap **Save**, select the **Show confirmation on a first save** check box.

   OR

   If you never want to be prompted, clear the check box.




3. Tap **OK** to return to the main window.

   The changes are applied automatically.

# 6 Analyzing the Results Manually

You can move markers and zoom in on or out of any event or trace segment to measure splice loss, fiber section attenuation, reflectance, and optical return loss. It is possible to do this once a trace has been acquired or opened, or even when an acquisition is in progress.

## Using Markers

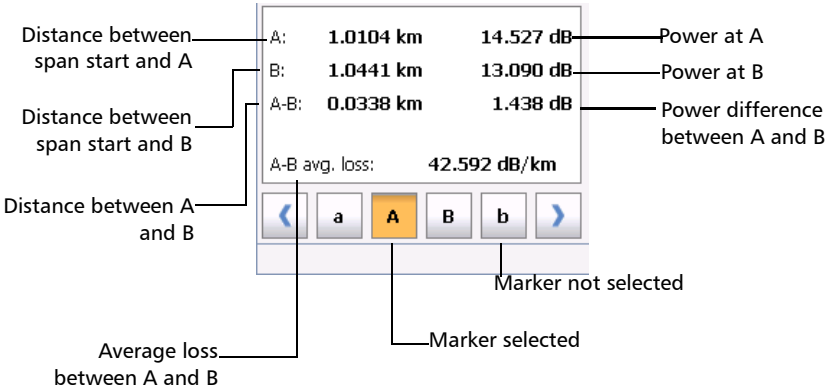
You can use markers to view the position and relative loss or reflectance of an event.

Markers are available from the **Events** tab (when you modify an event) or the **Measure** tab (when you add an event) in the main window.

You can lock or unlock the distance between the four markers and move them as a block. You can lock or unlock the distance between the A and a marker pair, as well as the B and b marker pair and move them. You can also lock a, A, b, B markers and move them as a group.

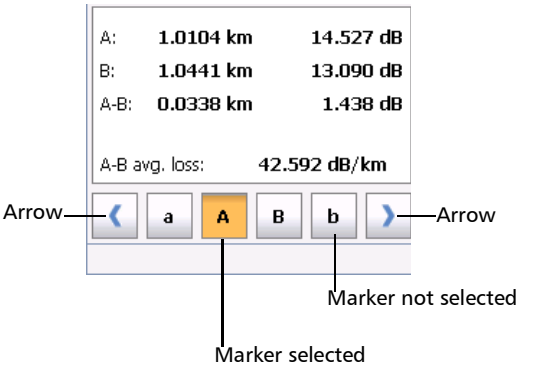
***To move a marker directly from the graph:***

1. Ensure that the button is selected in the zoom button bar.
2. Select the marker directly on the trace display and drag it to the desired position.



***To move a marker with the arrow buttons:***

1. From the **Measure** tab, tap the marker buttons to select the desired markers.




2. Once the appropriate markers are selected, use the right and left arrow buttons to move the markers along the trace.

***Note:*** *If you select more than one marker, they will move as a block.*

***To bring back a marker to the visible area:***

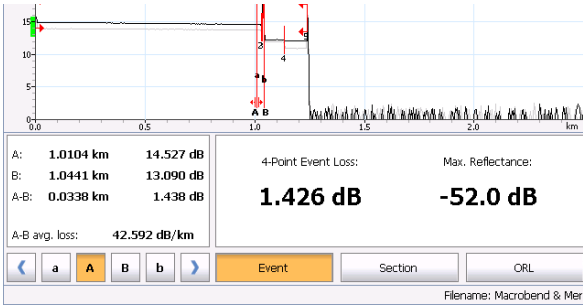
1. Ensure that only the marker that corresponds to the one that you want to retrieve is selected.
2. Use the left and right arrows to move the marker.

# Getting Event Distances and Relative Powers

The OTDR test application automatically calculates the position of an event and displays this distance in the events table.

You can retrieve the position of an event as well as the distance between events manually. You can also display various relative power readings.

Distances and relative powers correspond to the X-axis and Y-axis, respectively.

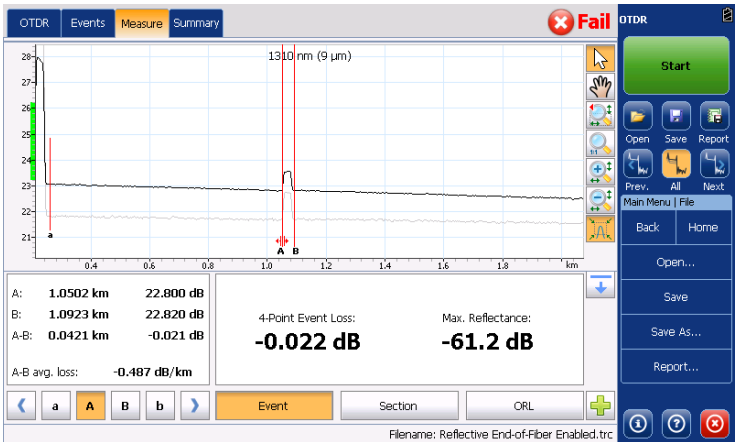



***To get the distance to an event and the associated relative power level automatically:***

1. From the main window, select the **Measure** tab.
2. Tap to display all markers. Markers are automatically positioned at the right location.

***To get the distance to an event and the associated relative power level manually:***

1. From the main window, select the **Measure** tab.
2. Move marker **A** to the beginning of the event. For more information about markers, see *Using Markers* on page 79.

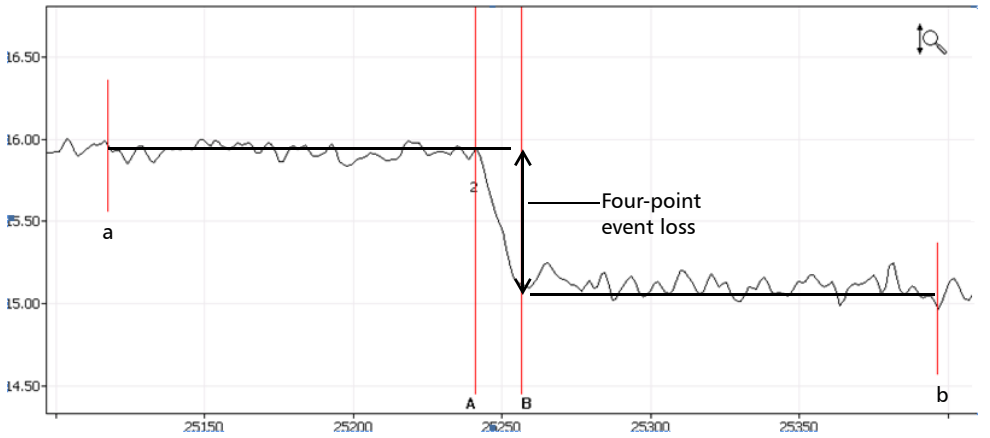


# Getting Event Loss and Maximum Reflectance

Event loss (expressed in dB) is calculated by measuring the signal level reduction in Rayleigh backscatter (RBS) caused by this event. Event loss can result from both reflective and non-reflective events.

The loss calculation provided is called the “four-point event loss”. The four-point event loss calculation uses the least-square approximation (LSA) method to determine the event loss. *The four-point event loss corresponds to the loss displayed in the events table.*

➤ *For the four-point event loss*: the LSA method is used to fit a straight line to the backscatter data within the two regions defined by markers a, A and b, B, that is over the regions to the left and to the right of the event bordered by markers A and B, respectively.




The two fitted lines are then extrapolated toward the center of the event and the loss event is directly read from the drop in power between the two lines.

➤ Reflectance is the ratio of reflected light to input light.

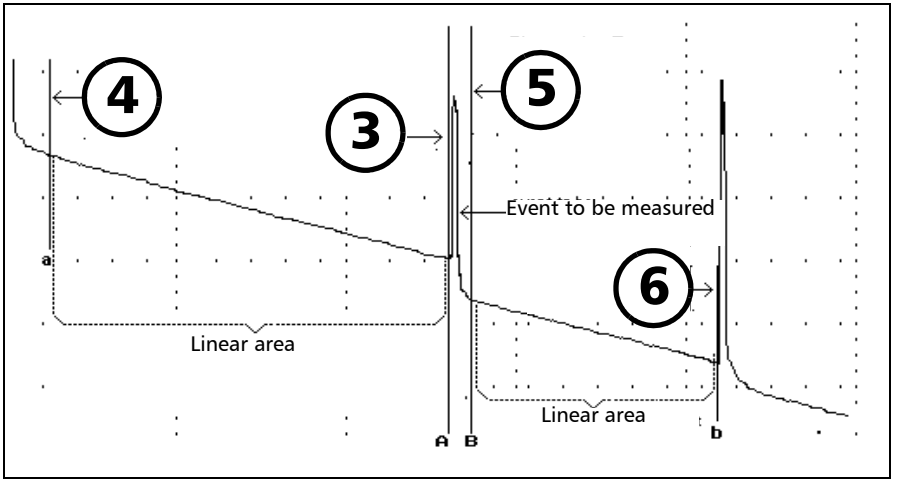
***Note:*** *If you are testing in Real time, the reflectance value you will get is not necessarily accurate.*

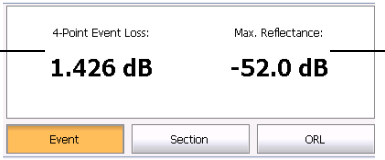
***To get event loss and maximum reflectance:***

1. From the main window, select the **Measure** tab.
2. At the bottom of the window, tap **Event**. Markers **a**, **A**, **B** and **b** appear on the graph.
3. Zoom in and position marker **A** at the *end* of the linear area *preceding* the event to be measured. For more information, see *Using Zoom Controls* on page 105 and *Using Markers* on page 79.
4. Position submarker **a** at the *beginning* of the linear area *preceding* the event to be measured (must not include any significant events).

***5.*** Position marker **B** at the *beginning* of the linear area *following* the event to be measured.

***6.*** Position submarker **b** at the *end* of the linear area *following* the event to be measured (must not include any significant events).




Four-point event loss from the areas delimited by markers a, A, B and b

Maximum reflectance

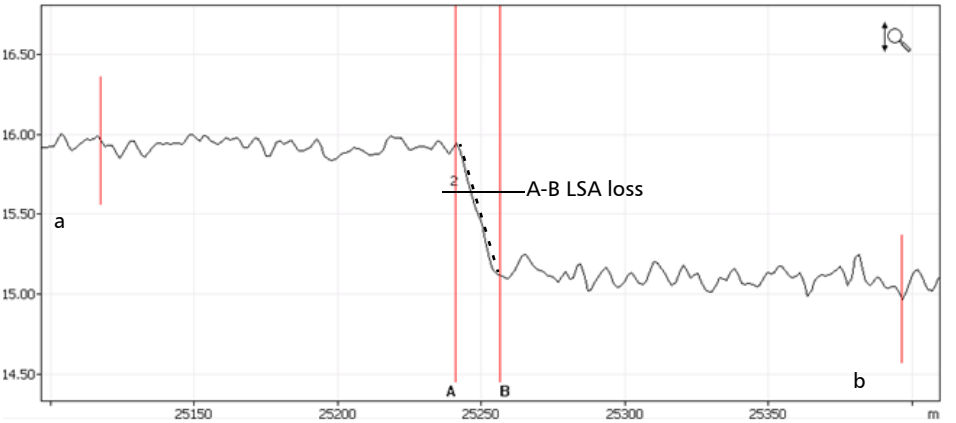
***Note:*** *For non-reflective events, ––– will be displayed.*

# Getting Section Loss and Attenuation

The least-square approximation (LSA) method measures the attenuation (loss over distance) between two points by fitting a straight line in the backscatter data between markers **A** and **B**. The LSA attenuation corresponds to the difference in power (Δ dB) over the distance between two points.

The LSA method, when compared to a two-point method, gives an average measurement and is more reliable when there is a high level of noise. However, it should not be used if an event such as an echo appears between the two markers.

*A-B LSA loss*: the loss of the event bordered by the markers A and B is obtained by fitting a straight line to the backscatter data between these two markers.




The event is then obtained by the reduction in power (dB) over the distance between the two markers, as calculated from the slope of the fitted line.

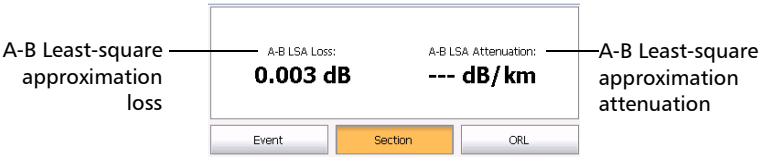
Although this method works fairly well for splice loss, it is clearly not appropriate for reflective events (definitely not a “straight-line” event). A-B LSA loss is mainly used to rapidly compute loss over a given length of a fiber section.

***Note:*** *A-B LSA event loss measurements should be used on fiber sections only. Measuring events will not yield meaningful results.*

***To get section loss and attenuation:***

1. From the main window, select the **Measure** tab.
2. Tap the **Section** button. Markers **A** and **B** appear on the graph.
3. Place markers **A** and **B** at any two points on the trace. For more information, see *Using Markers* on page 79.
4. Zoom in on the trace and fine-tune the marker positioning if necessary. For more information, see *Using Zoom Controls* on page 105.

***Note:*** *There should not be any event between markers A and B when performing a measurement.*



# Getting Optical Return Loss (ORL)

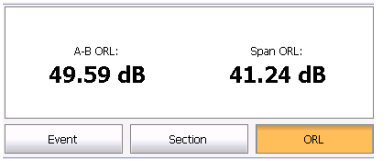
The ORL calculation will provide the following information:

- the ORL between markers **A** and **B**
- the total ORL is calculated either between the span start and the span end, or on the total fiber span, depending on the option you have selected. For more information, see *Excluding and Including Span Start and Span End* on page 25.

Optical return loss (ORL) refers to the total effect of multiple reflections and scattering events within a fiber-optic system.

***To get the ORL value:***

1. From the main window, select the **Measure** tab.
2. At the bottom of the window, tap **ORL**. Markers A and B appear on the graph.




3. Position markers A and B to delimit the area for which you want to know the ORL value.

# 7 Analyzing Traces and Events

Once the acquired trace is analyzed, it appears in the trace display and the events are displayed in the events table at the bottom of the screen. The trace display and events table are explained in the following sections. You can also reanalyze existing traces. For information on the various file formats you can open with the application, see *Opening Measurement Files* on page 138.

There are several ways to view the results:

- Graph view
- Summary table
- Events table
- Measure table
- Linear view

In addition, you can generate trace reports directly from your unit. For more information, see *Generating a Report* on page 145.

# Graph

The events, that are detailed in the events table (see *Events Tab* on page 95), are marked by numbers along the displayed trace.

Some items in the trace display are always visible, while others will appear only if you choose to display them.

The green rectangle on the Y axis (relative powers) indicates the proper injection level range for the defined test pulse.

***Note:*** *For multimode measurement, the location of the injection level depends on the type of fiber that you select.*

You can change trace display parameters (such as the grid). For more information, see *Setting Event Table and Graph Display Parameters* on page 63.

You can view all of the traces, in turn, in the trace display with the navigation buttons. For more information, see *Selecting the Displayed Wavelength* on page 111.

***Note:*** *You can tap* *to display the current trace only. When the current trace is displayed (main or reference trace), you can also switch from one wavelength to another. When the current trace is not displayed, all wavelengths appear.*

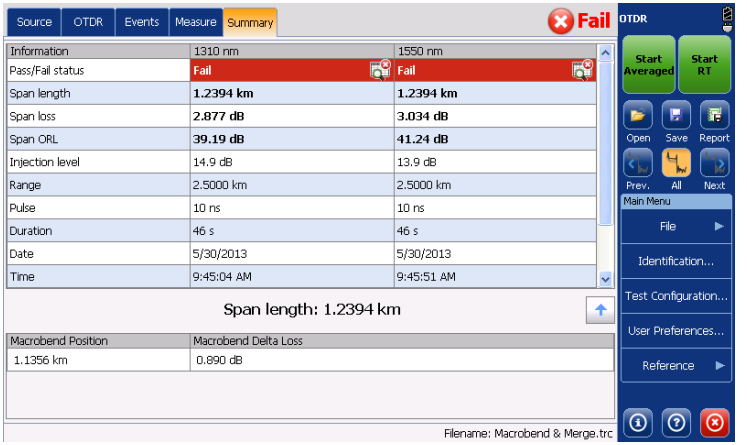
# Summary Tab

For each wavelength, the summary tab gives the span loss, the span ORL values, and the global status of the results:

- pass: no results exceed the thresholds
- fail: at least one result exceeds the thresholds
- unknown: no threshold is configured or a span value (length, loss, ORL) is not available

The span length (distance between span start and span end) is also displayed, except if a continuous fiber is detected for all wavelengths.

***Note:*** *In the summary tab, you can tap* *to display the current trace only. When the current trace is displayed (main or reference trace), you can also switch from one wavelength to another. When the current trace is not displayed, all wavelengths appear.*



- In the summary table, when you tap the pass/fail status row with a fail status, the application automatically switches to the events tab. The graph is displayed with “full trace” zoom. If the zoom on event feature is enabled, the application zooms in on the first event or fiber section for which the status is “fail”.
- Traces must have been analyzed before you can see them in the summary table. Real-time traces cannot be analyzed. The summary is always displayed but may be incomplete.
- If you configure the application to show the macrobends (**Test Configuration** > **Link Definition** tab), the information will appear at the bottom of the summary table.
- If no macrobends were detected, the application displays “No macrobend detected” instead of the information on the macrobends. “Invalid parameters” is displayed when the parameters are inappropriate.

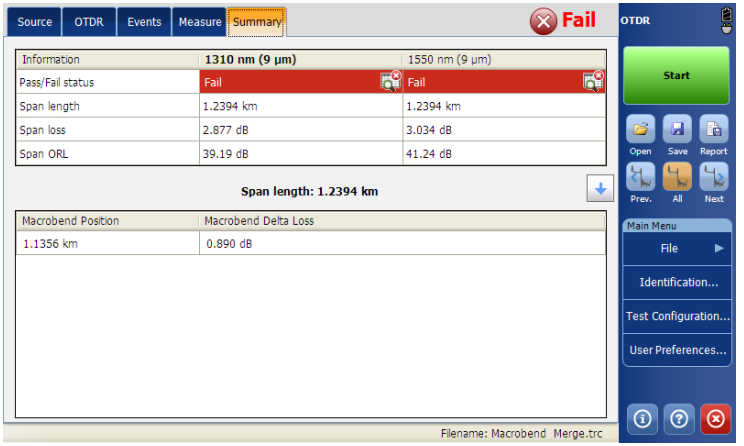
***To display the summary table:***

From the main window, tap the **Summary** tab.

***Note:*** *To display the summary table as the default view after the acquisitions are all performed (at all the selected wavelengths) and the analysis of the last wavelength is complete, see Selecting the Default View* on page 72.

***To choose a display mode:***

1. From the main window, go to the **Summary** tab.
2. To display the condensed summary screen, tap .



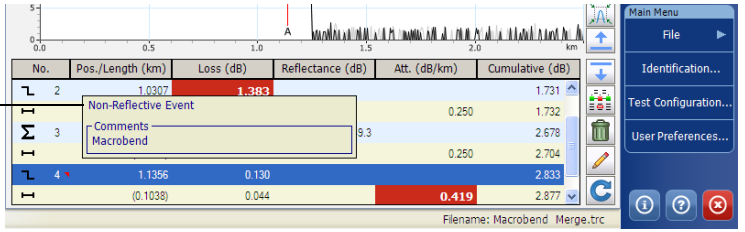

3. To return to the extended summary screen, tap .

# Events Tab

You can view information about all detected events on a trace and fiber sections by scrolling through the events table. When the graph is visible, when you select an event in the events table, marker **A** appears on the trace over the selected event. When the selected event is a fiber section, this fiber section is delimited by two markers (**A** and **B**). For more information on markers, see *Using Markers* on page 79.

These markers pinpoint an event or a fiber section, depending on what is selected in the events table. You can move markers directly by selecting an element in the events table or on the graph.

The events table lists all the events detected on the fiber. An event can be defined as the point at which change in the transmission properties of light can be measured. Events can consist of losses due to transmission, splices, connectors or breaks. If the event is not within the established thresholds, its status will be set to “fail”.




A red triangle appears next to the event number to indicate that a comment has been inserted manually for a specific event.

If you tap and hold the row corresponding to a specific event or fiber section for a few seconds, the application will display a tooltip identifying the item (for example, Non-reflective fault). In the case of a merged event, you will also see details about the “sub-events”.

The tooltip displays any comment that you have inserted manually.

If an asterisk appears next to the event symbol, the tooltip will also show "(*:Modified)" to indicate that this event has been modified manually.
If the asterisk appears next to the event number, "(*:Added)" will appear to indicate that this event has been inserted manually.

For each item listed in the events table, information is displayed:

- **No.**: Event number (a sequential number assigned by the OTDR test application) or, in parentheses, the length of a fiber section (the distance between two events).
  Various symbols are also used to describe different event types. For a more detailed description of symbols, see *Description of Event Types* on page 173.
- **Pos./Length**: Distance between the OTDR and the measured event or between the event and the beginning of the fiber span.
- **Loss**: Loss in dB for each event or fiber section (calculated by the application).
- **Reflectance**: Reflectance measured at each reflective event along the fiber.
- **Att.**: Attenuation (loss/distance) measured for each fiber section. The **Att.**. column is only visible when the fiber sections are displayed. For more information, see *Setting Event Table and Graph Display Parameters* on page 63.

***Note:*** *The attenuation value is always presented in dB per kilometers, even if the distance units you selected are not the kilometers. This follows the standards of the fiber-optic industry that provides the attenuation values in dB per kilometers.*

➤ **Cumulative**: Cumulative loss from the trace span start to span end; the running total is provided at the end of each event and fiber section.

Cumulative loss is calculated for the events displayed in the events table, excluding those that are hidden.

If you want to modify events or fiber sections, see *Modifying Events* on page 120 and *Inserting Events* on page 124.

***To quickly locate an event in the events table:***

1. From the main window, go to the **Events** tab.
2. Tap to go to the event table.
3. Ensure that the button is selected in the zoom button bar.
4. Select the event on the trace.

   The list scrolls automatically to the event you selected.

# Measure Tab

The application shows two, three or four markers: **a**, **A**, **B**, and **b**, depending on the button you tapped under **Results**.

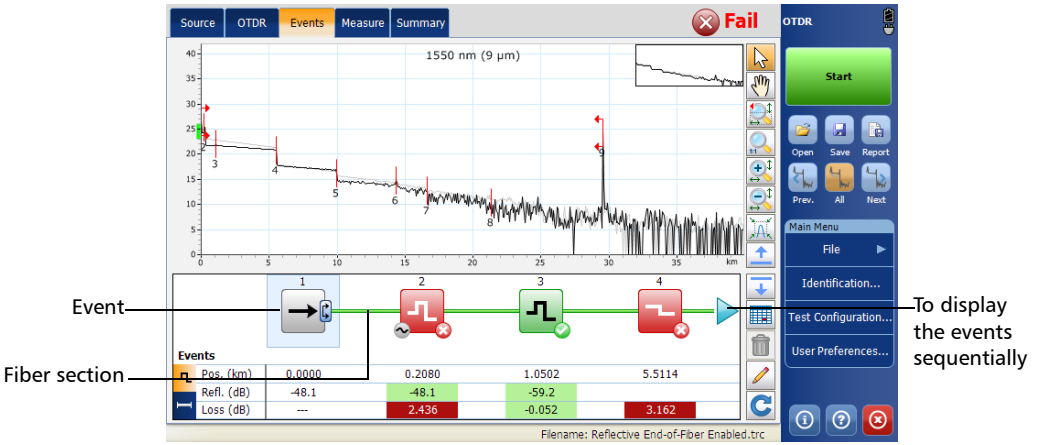
These markers can be repositioned along the trace to calculate loss, attenuation, reflectance, and optical return loss (ORL).

You can reposition all markers by using the controls in the **Markers** section. You can drag them directly from the trace display. You can also move the markers using the left/right arrows.

For more information on how to perform manual measurements, see *Analyzing the Results Manually* on page 79.

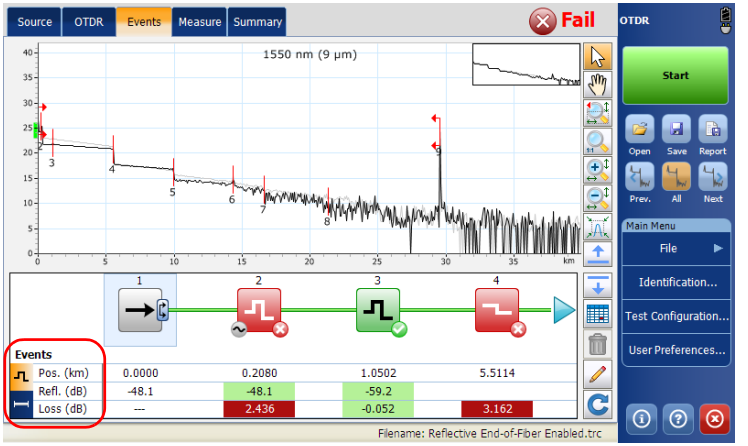
# Linear View

In the linear view, the events are displayed sequentially, from left to right. You can scroll the linear view with your finger.

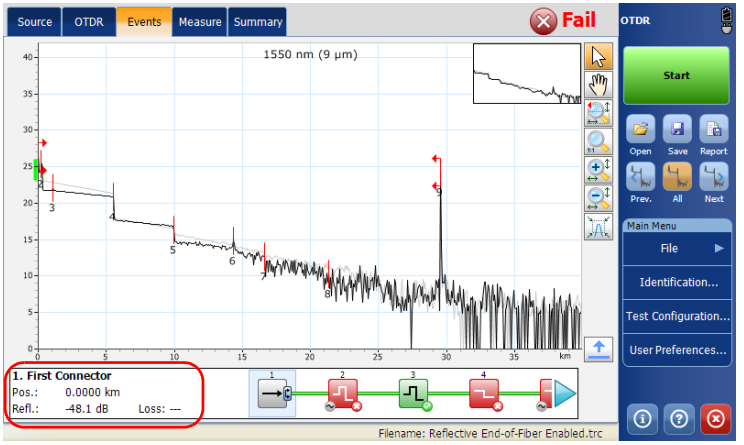



- Each rounded square represents an event.
- Each horizontal line that “links” two rounded squares represents a fiber section.
- Rounded squares and lines will be displayed in colors: green for pass, red for fail, gray for events and fiber sections appearing outside the current fiber span. Sections and events are also displayed in gray when they are not tested by the pass/fail thresholds.
- Spans ( and ) and macrobends ( ) icons are displayed on the rounded square. When macrobends are detected, icons will be displayed to identify them. Colors of the rounded squares correspond to the status of the events (green for pass, red for fail) and do not change if macrobends are detected.

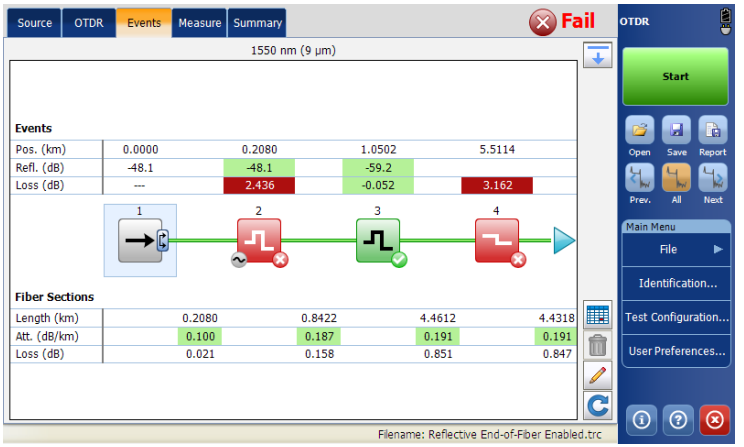
- When you select an event or a fiber section in the events table or in the graph, the linear view automatically scrolls to display the element.
- You can also select a rounded square or an horizontal line and the corresponding item will be selected in the events table or in the graph.
- The linear view always displays the current trace.
- A red triangle appears next to the event number to indicate that a comment has been inserted manually. For more information, see *Events Tab* on page 95.
- The linear view cannot be displayed when the events table is empty. Traces must have been analyzed before you can see them in the linear view.
- There are three display modes:
  - Split: You can switch between events information or fiber sections by clicking on the tab button.



➤ Condensed: The information of the selected element (event or fiber section) are displayed on the left of the linear view.




➤ Extended: The linear view fills the entire space and the graph is hidden.



***To choose a display mode:***

1. From the main window, go to the **Events** tab.
2. Tap to go to the linear view.
3. To display the desired mode between extended, split and condensed:
   - From the extended mode, tap to go to the split mode
   - From the split mode, tap to go to the extended mode
   - From the split mode, tap to go to the condensed mode
   - From the condensed mode, tap to go to the split mode

# Displaying the Graph in Full Screen

You can display the graph in full screen at any time, even when an acquisition is underway. The graph will keep the same display options as in normal view (grid, file name, inverted colors).

You can start acquisitions directly without having to go back to normal view first. During real-time mode acquisition, you can switch from one wavelength to another.

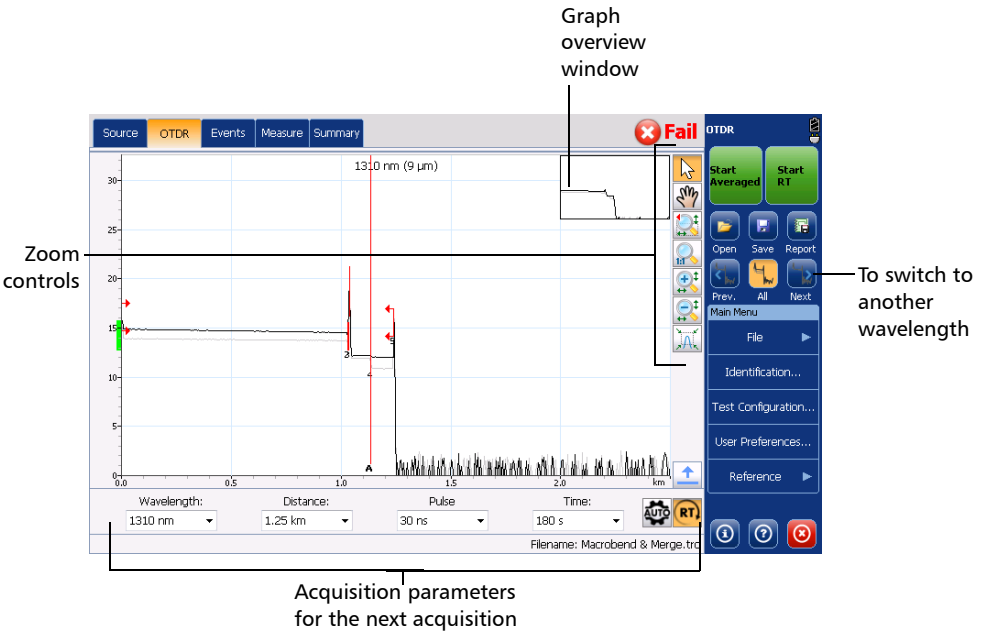
As soon as a trace is displayed (new acquisition or existing file), zoom controls are available (see *Using Zoom Controls* on page 105).

Once all acquisitions are complete, the application will automatically switch to the defined default view (see *Selecting the Default View* on page 72). If you prefer that the graph remains displayed after the acquisitions are complete, ensure that the default view is set to **Graph**. For more information, see *Selecting the Default View* on page 72.

***To display the graph in full screen:***

From the **OTDR** tab, tap the button.

The graph is now displayed in full-screen mode.



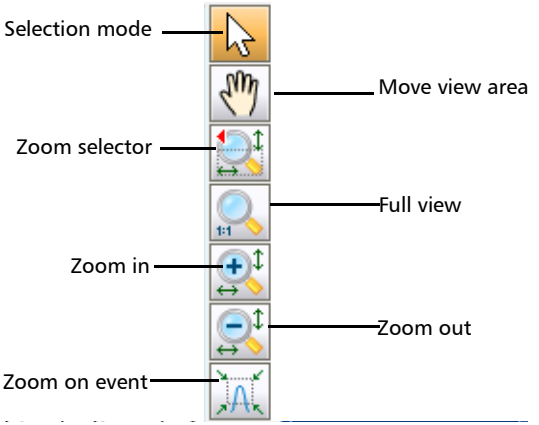
# Using Zoom Controls

Use the zoom controls to change the scale of the trace display.

You can zoom in on or out of the graph using the corresponding buttons or let the application automatically adjust the zoom on the currently selected event from the events table (table only available when the events window is displayed).

You can quickly zoom in on or out of the selected event.

You can also return to the original graph value.




***Note:*** *You cannot move the markers with the* *button.*

➤ When you manually zoom in or out on a trace, the application will apply the new zoom factor and marker positions to the other traces (wavelengths) of a same file. Both the zoom factor and marker positions will be saved along with the trace (same settings for all wavelengths).

➤ When you zoom in or out on the selected event, the application keeps the zoom on this event until you select another event or change zoom. You can select a different event for each wavelength (for example, event 2 at 1310 nm and event 5 at 1550 nm). The selected events will be saved along with the trace.

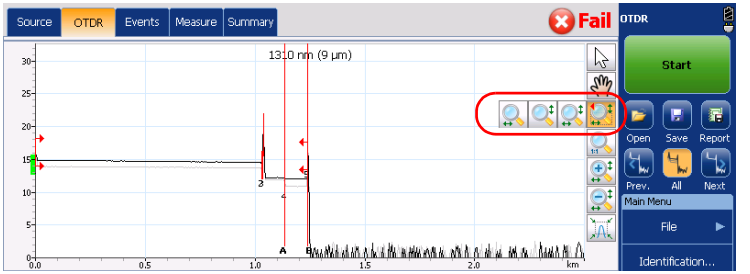
***To view specific portions of the graph:***

➤ You can define which portion of the graph will be visible by selecting the button and dragging the graph with the stylus or your finger.

This could be useful, for example, if you want to zoom in on events located outside the defined fiber span.

➤ The button is the zoom selector. It allows you to select whether the zooming will be performed according to the horizontal axis, the vertical axis, or both.

Tap and hold this button to select the zooming direction in the menu.




Then, define the zoom area with the stylus or your finger (a rectangle with dotted lines will appear to help you define the area). Once you release the stylus, the application automatically zooms in on the graph according to the zooming type you have selected. All of the other zoom buttons (except for the zoom on selected event button) will reflect your selection and behave accordingly.

➤ You can zoom in or out on the graph by first using, respectively,

the or the button, and then by tapping the location where you want to zoom on the graph with the stylus or your finger.
The application automatically adjusts the zoom by a factor 2 around the point that was tapped.

***To revert to the complete graph view:***

Tap the button or double-tap the graph overview window when it is displayed.

***To automatically zoom in on the selected event:***

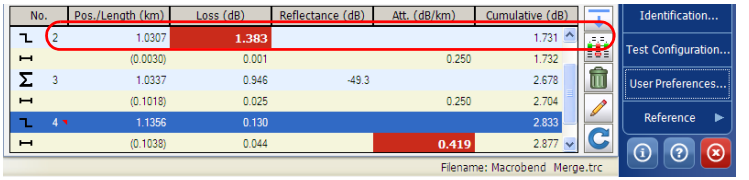
***1.*** Select the desired event:

- ➤ From the **OTDR** tab: place marker A on the event
- ➤ From the **Events** tab: select the item from the table
- ➤ From the **Measure** tab: go to the **Events** tab to select the item from the table, and then go back to the **Measure** tab.

***2.*** Tap the button to zoom in.

# Viewing Span Start and Span End in Events Table

When applicable, the application will include the losses caused by the span start and span end events to the span ORL and span loss values. For more information, see *Excluding and Including Span Start and Span End* on page 25.



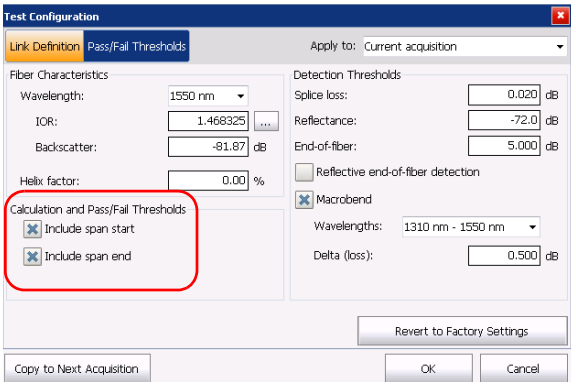

If you activated the pass/fail test (see *Setting Pass/Fail Thresholds* on page 36), span-start and span-end events will be taken into account when determining the status (pass/fail) of splice and connector loss and reflectance.

***To view span start and span end in events table:***

1. From the **Main Menu**, select the **Test Configuration** button.
2. Select the **Link Definition** tab.
3. Under **Calculation and Pass/Fail thresholds**, select the boxes corresponding to the item you want to display or include in the table.

   OR

   To hide them, clear the boxes.




4. Tap **OK** to return to the main window.

# Customizing the Events Table Appearance

The events tab allows you to view the information in three different modes:

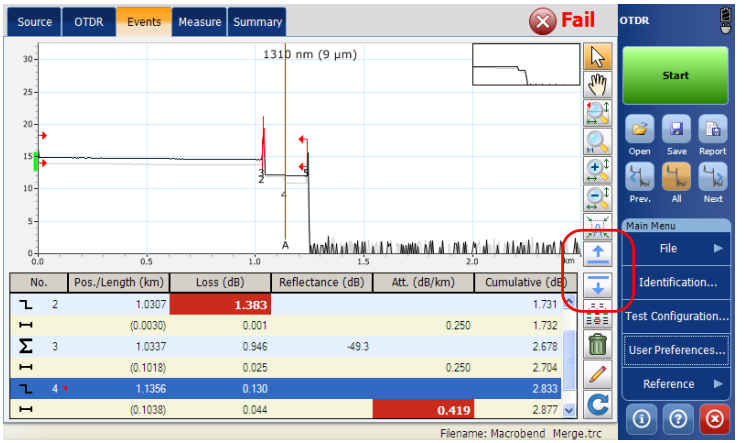
- a standard mode with the graph and the events table
- a condensed mode with the graph and only one row of the events table visible at a time (see *Displaying the Graph in Full Screen* on page 103)
- a full screen mode without the graph

***To choose a display mode from normal view:***

1. From the main window, go to the **Events** tab.
2. Tap the arrow corresponding to the desired display mode.
   - : condensed mode
   - : full screen mode without the graph

***To revert to normal view:***

Tap the arrow next to the table.



# Selecting the Displayed Wavelength

There are two ways of displaying a trace in the OTDR test application.

➤ You can switch from one wavelength to another. All wavelengths appear on the graph but the current trace is displayed in black. You can view all the trace files you have opened including main and reference traces.

The table below shows the possible colors.

| Main Trace | Reference Trace |
|---|---|
| Black when the trace is active. | Dark orange when the trace is active. |
| Dark grey when the trace is not active but matches the same wavelength as the active trace. | Orange when the trace is not active but matches the same wavelength as the active trace. |
| Light grey when the trace does not match the active wavelength. | Light orange when the trace does not match the active wavelength. |

➤ You can also hide traces and display the current trace only.

***To display traces in turn:***

Tap or to switch between the main and reference traces.

***To display only the current or all wavelengths:***

Tap .

***Note:*** *In the **Events** and **Summary** tabs, the information displayed will behave accordingly.*

***Note:*** *Hiding a trace has no impact on the pass/fail status or the result values.*

# Using a Reference Trace

Setting a measurement as a reference allows you to test fibers and compare them to a reference trace that was previously acquired and analyzed.

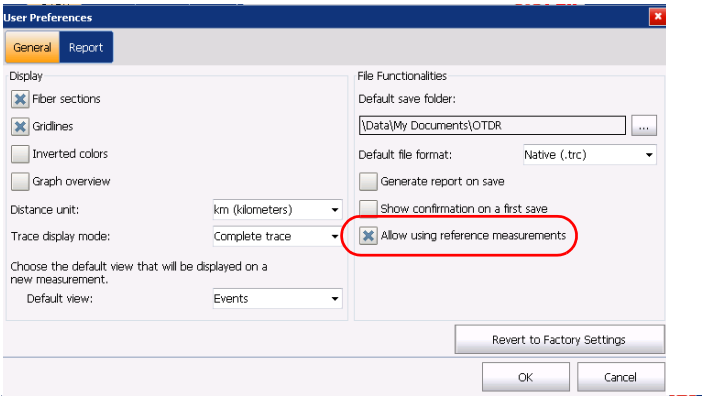
You must first open your reference trace (newly acquired and saved trace or open trace file).

The reference measurement in memory will be closed if the option is deactivated.

***Note:*** *You cannot edit a reference trace.*

***To set a measurement as a reference:***

1. From the **Main Menu**, select the **User Preferences** button.
2. Select the **General** tab.
3. Under **File Functionalities**, select the **Allow using reference measurements** box.

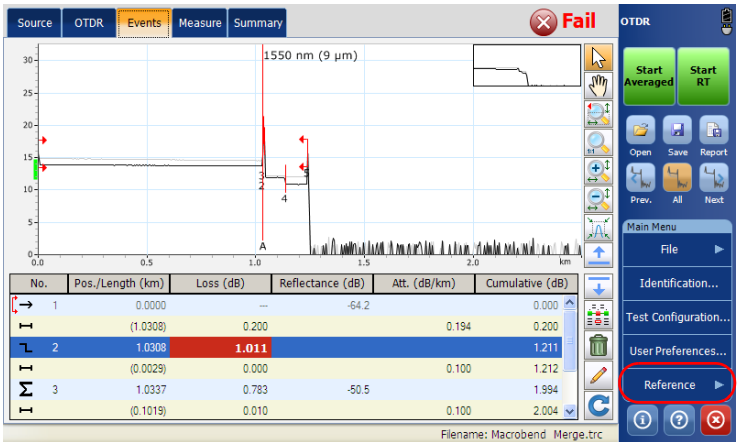



4. Tap **OK** to return to the main window.

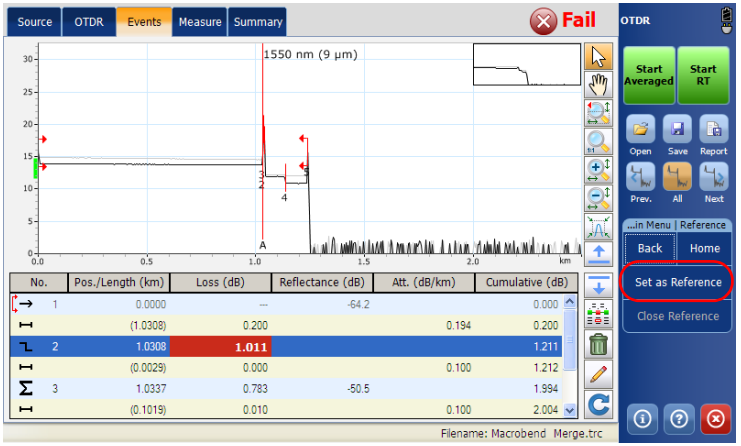
   You can now select the reference trace.

***To set the current trace as a reference:***

***1.*** From the **Main Menu**, select the **Reference** button.




***2.*** Tap the **Set as Reference** button.



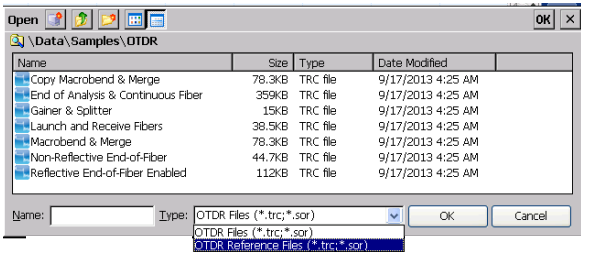
### *To open a measurement file as a reference:*

1. From the main window, tap .

   OR

   From the **Main Menu**, go to **File** > **Open**.

2. From the **Type** list, select the **OTDR Reference File**.




3. Select the file used as a reference trace.
4. Tap **OK** to confirm.

   You will automatically return to the main window.

### *To close a reference measurement in memory:*

1. From the **Main Menu**, select the **Reference** button.
2. Tap **Close Reference**.

# Viewing and Modifying Current Measurement Settings

You can view the trace settings and modify them at your convenience.

Two groups of settings can be changed:

- Fiber settings: index of refraction (IOR), also known as group index, Rayleigh backscatter (RBS) coefficient, and helix factor.
- Detection thresholds: for splice loss, reflectance, and end-of-fiber detection.

Modifications you make are only applied to the current trace (that is, to a particular wavelength), not to all traces.

The application will only prompt you to reanalyze the trace if you modify the RBS coefficient (no analysis necessary when you modify the IOR or helix factor). If you want to modify the settings that will be used for future acquisitions, see *Setting the IOR, RBS Coefficient, and Helix Factor* on page 21 and *Setting the Analysis Detection Thresholds* on page 27.

When viewing or modifying trace settings, these parameters are displayed:

- *Wavelength*: Test wavelength.
- *IOR*: Refraction index of the displayed trace, also known as group index. If you modify this parameter, the distance measurements for the trace will be adjusted. You can enter an IOR value directly, or let the application calculate it with the distance between span start and span end you provide. The IOR value is displayed with six digits after the decimal point.
- *Backscatter*: Rayleigh backscatter coefficient setting of the displayed trace. If you modify this parameter, the reflectance and ORL measurements for the trace will be adjusted.
- *Helix factor*: Helix for the displayed trace. If you modify this parameter, the trace distance measurements will be adjusted.

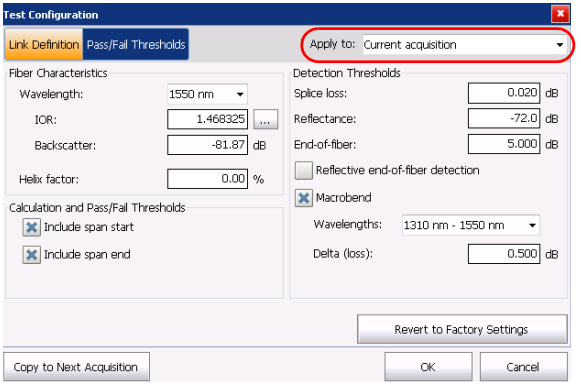
***Note:*** *You cannot define a different helix factor for each wavelength. This value takes into account the difference between the length of the cable and the length of the fiber inside the cable; it does not vary with wavelengths.*

- Detection thresholds:
  - *Splice loss*: Current setting for detecting small non-reflective events during trace analysis.
  - *Reflectance*: Current setting for detecting small reflective events during trace analysis.
  - *End-of-fiber*: Current setting for detecting important event loss that could compromise signal transmission during trace analysis.

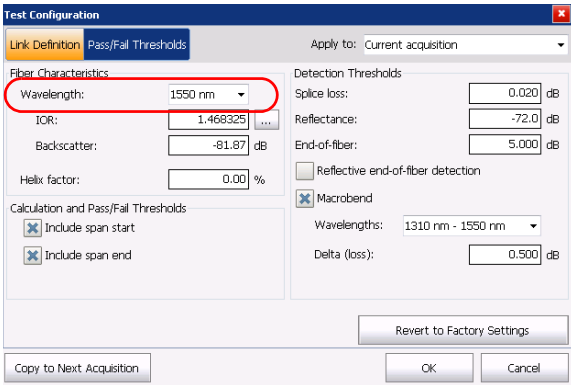
For more information, see *Setting the Analysis Detection Thresholds* on page 27.

***To view or modify measurement settings:***

1. From the **Main Menu**, tap **Test Configuration**.
2. From the **Apply to** list, select **Current acquisition.**



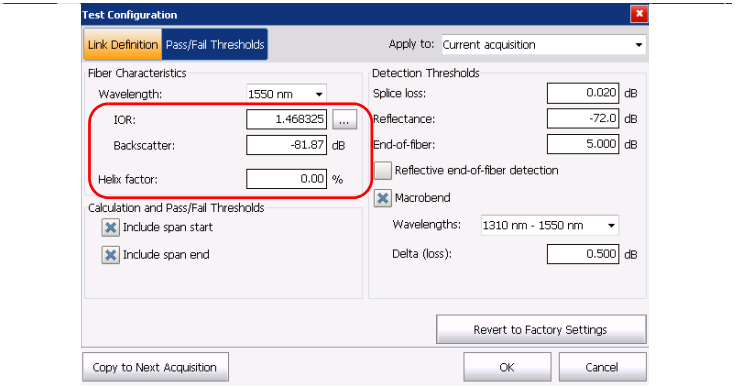

3. From the **Test Configuration** window, go to the **Link Definition** tab.
4. Under **Fiber Characteristics**, from the **Wavelength list**, select the desired wavelength.



***5.*** If you want to modify the parameters, enter the desired values for the current trace in the appropriate boxes.

OR

If you want to revert all settings to their default values, tap the **Revert to Factory Settings** button.




***Note:*** *The modifications you make will only be applied to the selected wavelength, except for the detection thresholds.*

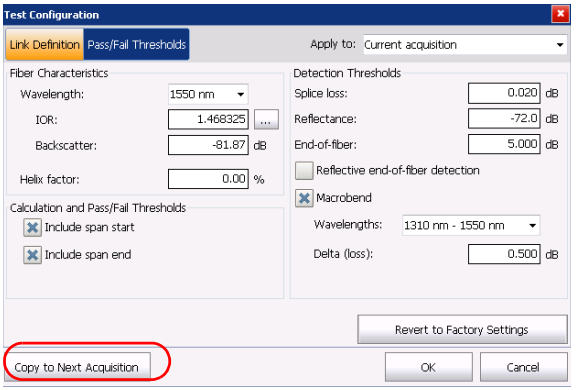
***Note:*** *You cannot define a different helix factor for each wavelength. This value takes into account the difference between the length of the cable and the length of the fiber inside the cable; it does not vary with wavelengths.*

➤ Unless you are absolutely sure of the different parameter values, revert to default values to avoid fiber setting mismatches.

➤ If you already know the IOR value, you can enter it in the corresponding box. However, if you prefer to let the application calculate the IOR value as a function of the known distance between span start and span end, tap **Set IOR by Distance**, then enter the distance value.

***6.*** If you want to save the modified IOR, RBS, and Helix Factor values for the next acquisitions performed at the current wavelength, proceed as follows:

***6a.*** Tap the **Copy to Next Acquisition** button.




***6b.*** When the application prompts you, select **Yes**.

***Note:*** *The information in the **Link Definition** and **Pass/Fail Thresholds** tabs will be copied to the current acquisition.*

***7.*** Tap **OK** to apply the changes.

You return to the main window.

# Modifying Events

You can change the loss and reflectance of almost any existing event except:

- continuous fiber
- end of analysis
- launch level
- merged events
- span start
- span end

**IMPORTANT**

**If you reanalyze a trace, all of the modified events will be lost and the events table will be re-created.**

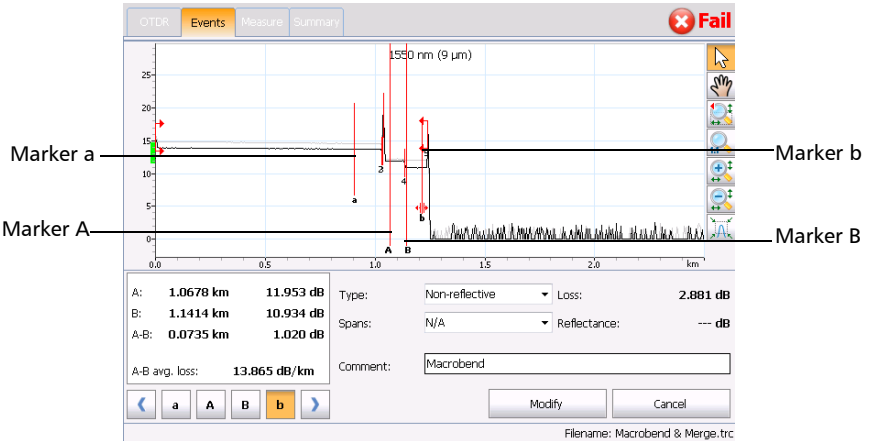
***To modify an event:***

1. Select the event you want to modify.
2. Tap .

   Markers **a**, **A**, **B**, and **b** appear on the graph. With these markers, you can define a new location for the selected event.

   You can reposition all markers directly by dragging them, or by tapping where you want to relocate them on the graph.

***Note:*** *The current marker locations are set, during the analysis, to calculate and display the original event loss and reflectance.*

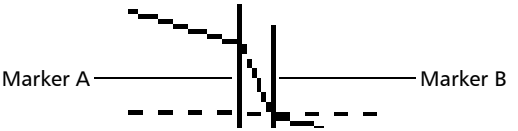


3. Position marker **A** on the event, and submarker **a** (to the left of marker **A**) as far as possible from marker **A**, without including the preceding event.

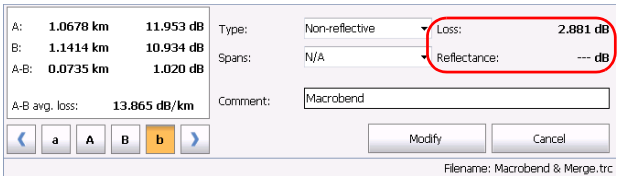
   The area between markers **A** and **a** must not include any significant variation. For more information on positioning markers, see *Using Markers* on page 79.

4. Position marker **B** after the end of the event, where the trace returns to a regular loss inside the fiber, and submarker **b** (to the right of marker **B**), as far as possible from marker **B**, without including the following event.

   The area between markers **B** and **b** must not include any significant variation. For more information on positioning markers, see *Using Markers* on page 79.

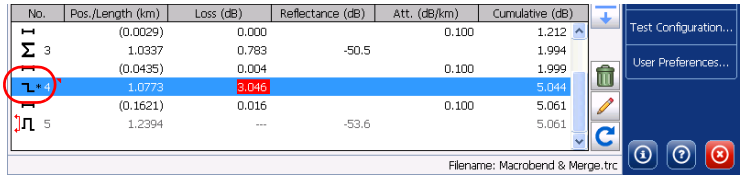



Event loss and reflectance are displayed, respectively, in the **Loss** and **Reflectance** boxes.



***5.*** Tap **Modify** to accept the modifications you have made or **Cancel** to return to the events table without saving the changes.

The modified events are identified with "*" (appearing beside the event symbol) in the events table as shown below.



# Inserting Events

You can insert events from the **Measure** tab manually.

This could be useful, for example, if you know that there is a splice at a given location, but the analysis does not detect it because it is hidden in the noise or because the splice loss is lower than the minimum detection threshold (see *Setting Pass/Fail Thresholds* on page 36).

You can add this event to the events table manually. This will add a number on the trace at the location of the insertion, but it will *not* modify the trace.

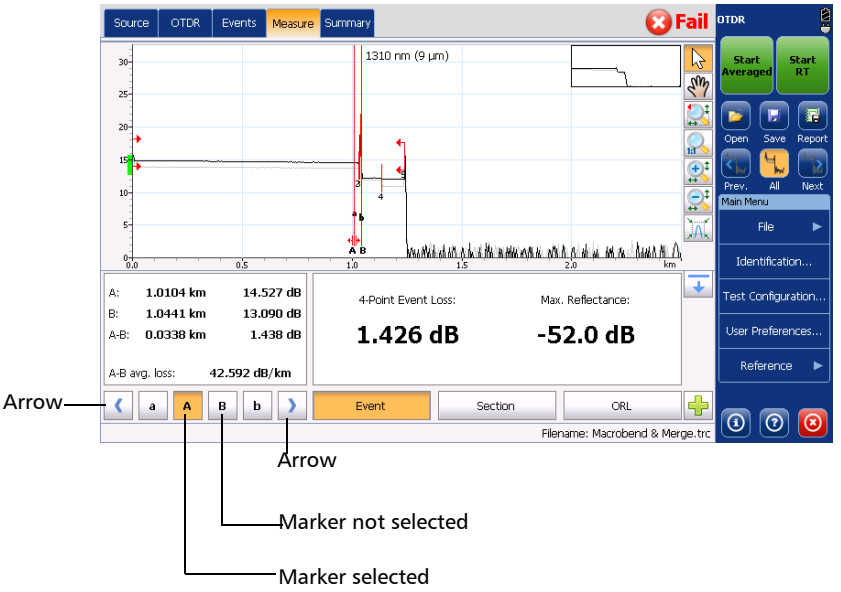
**IMPORTANT**

**Inserted events are removed when you reanalyze a trace.**

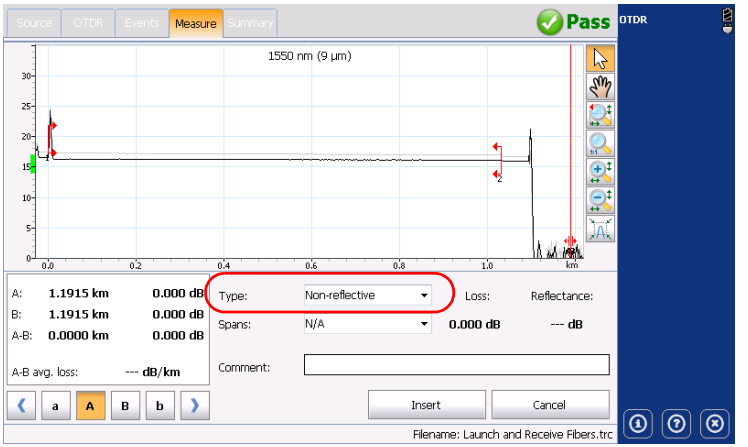
***To insert an event:***

1. From the **Measure** tab, tap .
2. Select the location where you want to insert an event.

   Four markers are available to measure the inserted event, but the new event will be inserted between Marker **A** and Marker **B**. Marker **A** identifies where the event will be inserted. Use the marker arrows to move markers **A** and **B** on the trace display.



***3.*** Once you have determined the location, from the **Type** list, select the desired event type.




***4.*** From the **Spans** list, select the desired span type.

***5.*** If necessary, enter a comment in the box.

***6.*** Tap **Insert** to insert the event or **Cancel** to return to the measure tab without making any changes.

Inserted events are marked with asterisks (appearing beside the event number).

# Deleting Events

Almost any event can be deleted from the events table, except:

- end of analysis
- fiber section
- launch level
- end of fiber
- span start
- span end

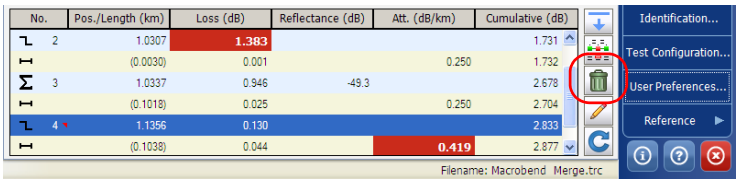
***Note:*** *The "End-of-fiber" event indicates the span end that was set for the first analysis of the trace, not the span end assigned to another event or distance from the span end in the* ***Analysis*** *tab.*

## IMPORTANT

**The only way to "recover" deleted items is to reanalyze the trace, as you would for a new trace. For more information, see *Analyzing or Reanalyzing a Trace* on page 130.**

***To delete an event:***

***1.*** Select the event you want to delete.




***2.*** Tap .

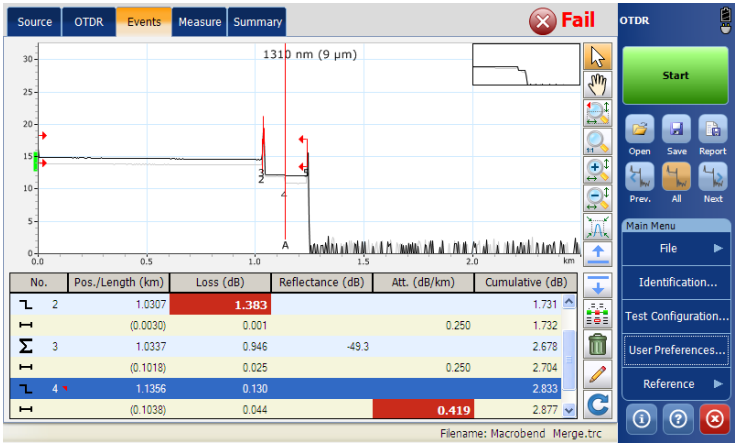
***3.*** When the application prompts you, tap **Yes** to confirm the deletion, or **No** to keep the event.

# Managing Comments

You can insert comments manually on a specific event. If comments are already present, you can modify or delete them. A red triangle on the event indicates that a comment has been added. This way, you can locate rapidly the events you have customized.

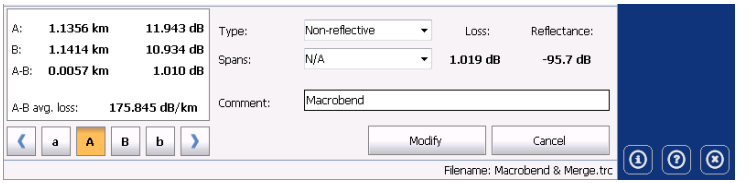
***To insert a comment:***

1. Select the event on which you want to insert a comment.




2. From the **Events** tab, tap .

3. Next to **Comment,** enter a comment in the box.



4. Tap **Modify**.

   A red triangle appears next to the event number to indicate that a comment has been inserted manually. The comments can be seen in the tooltip.

***To modify or delete a comment:***

1. Select the event on which you want to modify or delete a comment.
2. From the **Events** tab, tap .
3. Modify or delete the text in the **Comment** box.
4. Tap **Modify** to return to the main window.

# Analyzing or Reanalyzing a Trace

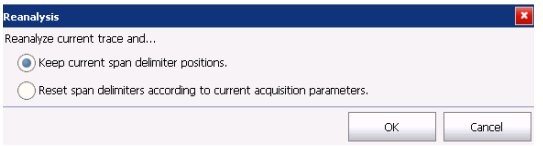
You can analyze a displayed trace at any time. Analyzing or reanalyzing a trace will:

- reanalyze a trace acquired with a previous version of the software.
- re-create the events table if it was modified.
- perform a Pass/Fail test, if enabled (for more information, see *Setting Pass/Fail Thresholds* on page 36).

If you prefer to focus your analysis on a specific fiber span, see *Analyzing the Fiber on a Specific Fiber Span* on page 132.

***To reanalyze a trace:***

1. From the main window, go to the **Events** tab.
2. Tap .
3. From the **Reanalysis** dialog box, select an item for setting the span start and end markers on the trace. On the first analysis after acquisition, this dialog box is not displayed and the default span start and end are applied according to acquisition parameters. For more information, see *Defining Launch and Receive Fiber Settings* on page 50.




   - ➤ **Keep current span delimiter positions** applies the current fiber span upon trace reanalysis.
   - ➤ **Reset span delimiters according to current acquisition parameters** applies the fiber span defined in the Extended Acquisition Parameters upon trace reanalysis.

4. Tap **OK** to confirm.

# Analyzing the Fiber on a Specific Fiber Span

If you want to focus your fiber analysis on a specific fiber span, you can define events (new or existing) as a span start and/or span end. You can even define a fiber span for short fibers by placing the span start and the span end on the same event.

***Note:*** *You can set a default span start and end, which will be applied during the first analysis or reanalysis performed upon trace acquisition.*

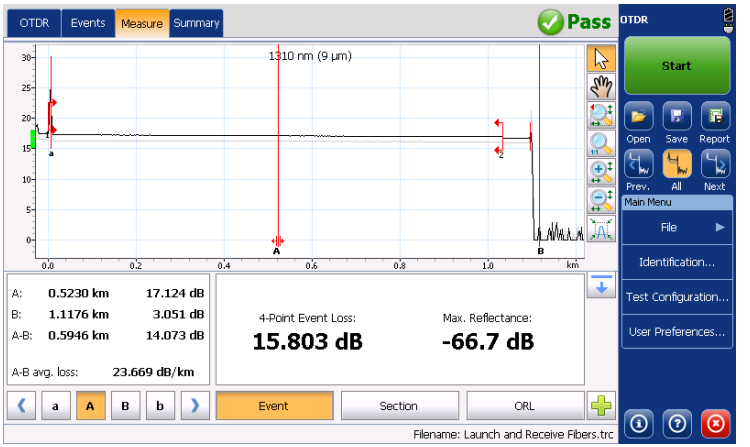
***To set a fiber span:***

1. From the main window, go to the **Events** tab (for existing events) and tap .

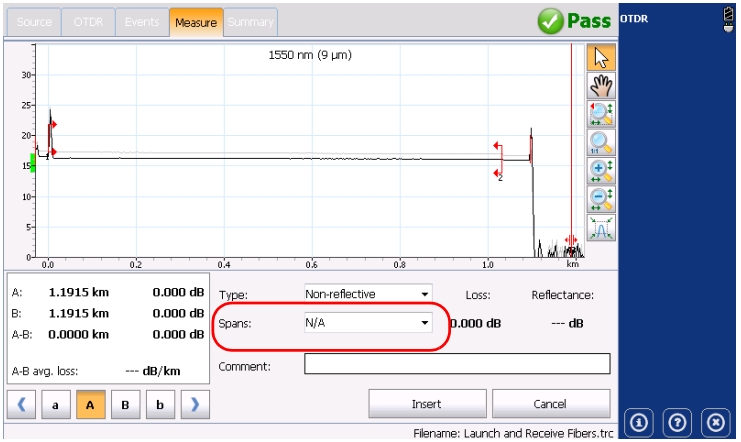
   OR

   From the main window, go to the **Measure** tab (for new events) and tap .

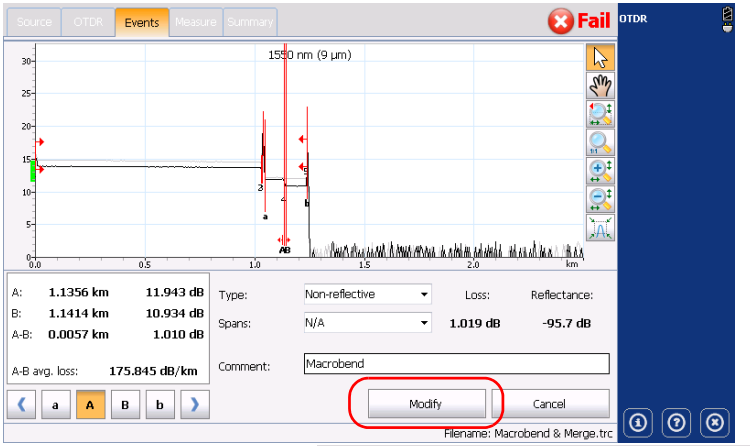
2. For new events, define the span event location by moving marker **A** along the trace using the left/right arrows. For more information see *Using Markers* on page 79.

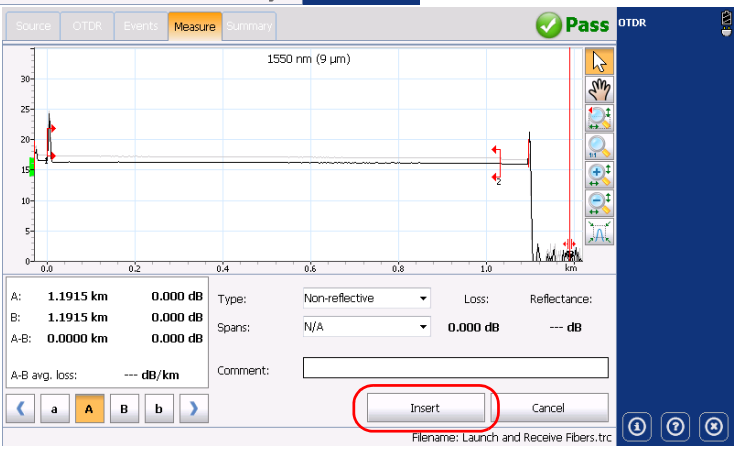


***3.*** From the **Spans** list, set the span start or span end marker on the appropriate event in the trace display.



4. Tap **Modify** (**Events** tab) or **Insert** (**Measure** tab) to return to the main window.




Changes to the span start and span end will modify the contents of the events table. The span start becomes event 1 and its distance reference becomes 0. The cumulative loss is calculated within the defined fiber span only.

# Enabling or Disabling the Detection of Reflective Ends of Fiber

By default, the application stops the analysis as soon as there is too much noise on a trace to ensure accurate measurements. However, you can configure the application to search the "noisy" portion of the trace to detect strong reflective events (such as those caused by UPC connectors) and set the span end at this point.

Once you have selected the option, the detection will be performed automatically on the next acquisitions.

If a trace was acquired without selecting the option first, you will be prompted to reanalyze the trace (for more information on trace reanalysis, see *Analyzing or Reanalyzing a Trace* on page 130). When you reanalyze a trace, to benefit from the option, you should select *Reset span delimiter positions*.

The application will take into account the option only if there is a significant reflective event located after the end of analysis.

The table below shows the differences you will notice in the event table depending on if you enable the detection of reflective ends of fiber or not.

| Case | Option not selected (conventional analysis) | | Option selected | |
|---|---|---|---|---|
| | Event on which span end is set | Loss or reflectance value | Event on which span end is set | Loss or reflectance value |
| Span end located on a physical event that crosses the end-of-fiber (EoF) threshold | Non-reflective fault or reflective fault | Value as calculated by the conventional analysis | Same as the conventional analysis | Same as the conventional analysis |
| Span end located on a physical event whose loss is below the EoF threshold | Non-reflective fault or reflective fault | Value as calculated by the conventional analysis | If applicable, reflective fault (located in the "noisy" area)[a] | If applicable, reflectance value as calculated by the conventional analysis.[b] |
| Span end not located on any physical event | End of analysis | N/A | If applicable, reflective fault (located in the "noisy" area)[c,d] | If applicable, reflectance value as calculated by the conventional analysis.[b] |

a. The cumulative loss value will remain the same for all elements appearing after the event on which the span end was set according to the conventional analysis. The span loss value will correspond to the loss calculated between span start and the event on which the span end was set according to the conventional analysis.
b. Value is underestimated because the event is located in the "noisy" area.
c. The end-of-analysis event is replaced by a non-reflective event with a loss value of 0 dB.
d. The cumulative loss value will remain the same for all elements appearing after the inserted event. The span loss value will correspond to the loss calculated between span start and the inserted event.

## IMPORTANT

**The analysis will stop as soon as the loss of an event crosses the end-of-fiber (EoF) threshold. The application will mark the event as an end-of-fiber event.**

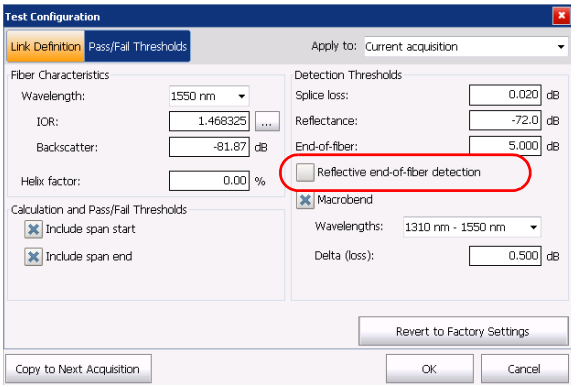
**In this case, even if you selected the option, the application *will not* search the "noisy" portion of the trace for reflective ends of fiber. If you want to do so, you will have to increase the EoF threshold (see *Setting the Analysis Detection Thresholds* on page 27).**

***To enable or disable the detection of reflective ends of fiber:***

1. From the **Main Menu**, tap **Test Configuration**.
2. From the **Apply to** list, select **Current acquisition.**
3. From the **Test Configuration** dialog box, go to the **Link Definition** tab.
4. If you want to enable the option, under **End-of-Fiber**, select the **Reflective end-of-fiber detection** box.

   OR

   If you prefer to disable the option, clear the box.




5. Tap **OK** to return to the main window.

# Opening Measurement Files

When you open trace files, the application always displays the first wavelength of the file.

When you open a file, the active wavelength will be the same as the one of the previous file. The default view is displayed when opening a file (see *Selecting the Default View* on page 72).

The table below presents the possible behavior of the zoom and markers when you open traces. If you open old OTDR traces, see the corresponding row for more information.

| File Type | Zoom | Markers | Selected Events |
|---|---|---|---|
| Measurement that has been saved with a manual zoom. | Application zooms in according to the zoom area and zoom factor that were saved with the file.<br>The same zoom will be applied to all wavelengths. | Markers are displayed in the same state they were when you saved the file.<br>Markers will remain in the same location even if you switch to another wavelength. | Selected events are displayed in the same state they were when you saved the file.<br>The selected events can be different for each wavelength. |
| Old trace file | Traces are displayed in full view mode. | Application defines default positions for markers. | The first event of the trace is selected. |

**IMPORTANT**

**If only the zoom, markers, or the selected event are modified, you will not be prompted to save the file when measurement is closed, you must save your file before opening another one.**

For information on how to navigate between traces, see *Selecting the Displayed Wavelength* on page 111.

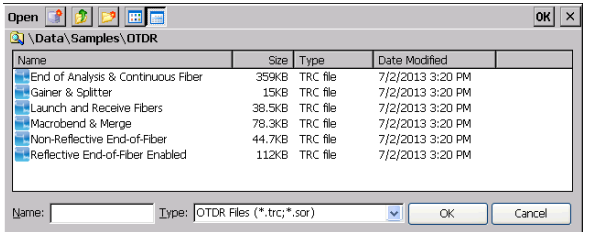
***To open a measurement file:***

1. From the **Main Menu**, tap **File**, then **Open**.

   OR

   From the **Main Menu**, tap .

2. If necessary, change the location to retrieve the file that was stored.




3. Scroll through the list of files and select a trace file to open.

4. Tap **OK**.

   You return to the main window.

   If you had already acquired (but not stored) a trace, the application prompts you to save the current trace. Tap **Save** to store the trace. You can now open another trace file.

# 8 Managing Trace Files from the OTDR Test Application

Once you have acquired traces, or when you want to work with them after an acquisition, you will need to save, open, rename, and delete trace files.

To rename, copy, move, and delete trace files, you must use the **File Manager** utility.

With the OTDR application, you can open trace files and save them in native (.trc) and Bellcore (.sor) formats. By default, the application saves the traces in native (.trc) format. For information on how to define the default file format, see *Selecting the Default File Format* on page 75).

***To save an OTDR trace file in another format:***

Use a computer onto which EXFO FastReporter is already installed.

# 9 Creating and Generating Reports

For future reference, you can add notes on the location of the tested fiber, type of job performed and general comments related to a trace in trace reports.

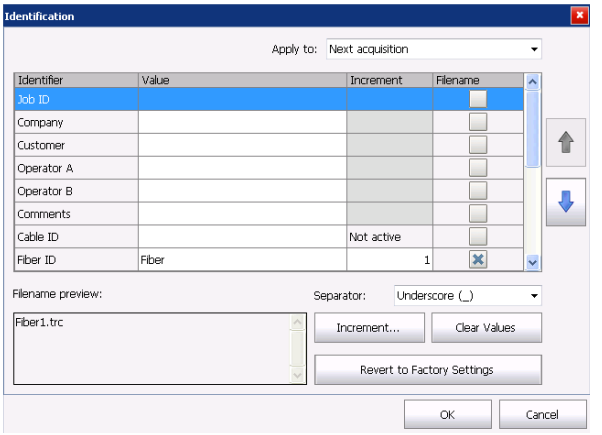
## Adding Information to the Test Results

Before or after acquiring a trace, you might want to include or update information about the tested fiber and job or add comments. The information you enter is saved for the currently open trace file or the next acquisition depending on your choice.

The information is common to all wavelengths (location A and B, cable ID and fiber ID, etc.). If you clear information from the **Identification** window, all information will be deleted.

***To add information to the test results:***

1. From the **Main Menu**, tap **Identification**.
2. Select either **Current Acquisition** or **Next Acquisition** from the **Apply to** list.
3. Enter the desired information. For more information, see *Naming Trace Files Automatically* on page 14.




***Note:*** *The information in the **Serial Number, Model Number,** and **Calibration Date** boxes is provided by the application and cannot be edited.The Wavelength(s), Pulse(s), and Duration(s) cannot be edited in the identification window but can be set before taking an acquisition in the OTDR tab.*

4. Tap **OK** to return to the trace display.

   The information entered is saved with the trace and can be viewed or changed at any time using the same process.

***To clear all the information from the Identification window:***

Tap the **Clear Values** button.

***Note:*** *The information appearing in the **Wavelength(s), Pulse(s), Duration(s), Serial Number, Model Number,** and **Calibration Date** boxes cannot be deleted.*

## Generating a Report

You can generate trace reports directly from your unit in PDF or XML format. By default, all traces are generated in a report, but you can also generate all the traces the current file contains.

The XML file does not contain the graphs, but contains all of the other information with the appropriate indicator so that the report generator displays it or not.

The following list shows the various items that can appear on a PDF report. By default, all these items are selected.

- Global Pass/Fail: this element shows if a result is Pass or Fail. It is displayed in the upper right part of the report.
- General Information: contains information such as filename, test date and time, cable ID, job ID, comments, customer, company, and fiber ID.
- Locations: displays information such as location A and B, operator A and operator B, the unit's model and serial number, and the calibration date.
- Results: displays information on the link measurement such as span length, span loss, average loss, average splice loss, maximum splice loss and span ORL.
- Graphic: Graphs will be generated exactly as they appear on screen. The same zoom factor will be applied to all traces (wavelengths) of a particular file. Markers will also be displayed on the graph.

- Markers: marker information: a, A, B, b as well as A to B LSA attenuation, LSA loss, and ORL. The attenuation, 4 point event loss, and maximum reflectance are also displayed.
- Event table: the failed results will appear in white on a red background. Otherwise, they will not be "highlighted".
- Macrobend table: contains the location and the delta loss of all the detected macrobends.

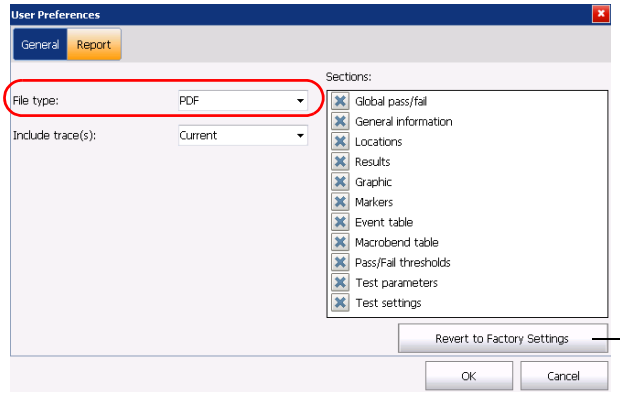
***Note:*** *This table is global to the fiber and will be generated if the application has detected macrobends (at any wavelength). For example, even if you choose to only include the current trace (for which no macrobends have been detected at this particular wavelength), the table could be generated if macrobends have been detected at other wavelengths.*

- Pass/Fail thresholds: splice loss, connector loss, reflectance, fiber section attenuation, span loss, span length and span ORL thresholds as they are defined in **Test Configuration**, under **Pass/Fail Thresholds**.
- Test Parameters: displays wavelength, range, pulse, and duration.
- Test Settings: displays IOR, backscatter, helix factor, splice loss threshold, reflectance threshold, end-of-fiber thresholds, macrobend wavelengths, and macrobend delta loss.

Once you generate a report, the application will keep in memory the items you have included in your reports for future use.

***To define report contents:***

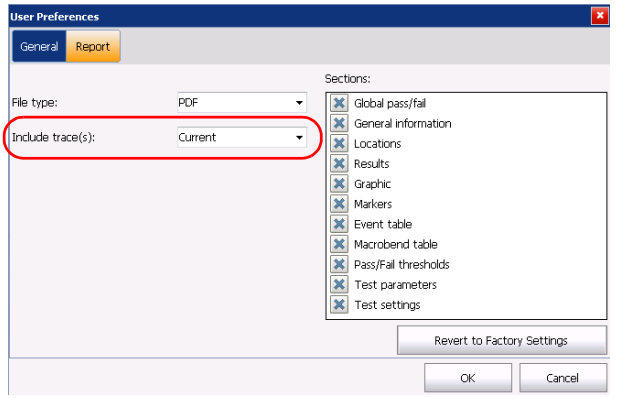
1. From the **Main Menu**, tap **User Preferences** then select the **Report** tab.
2. Select the desired file type.



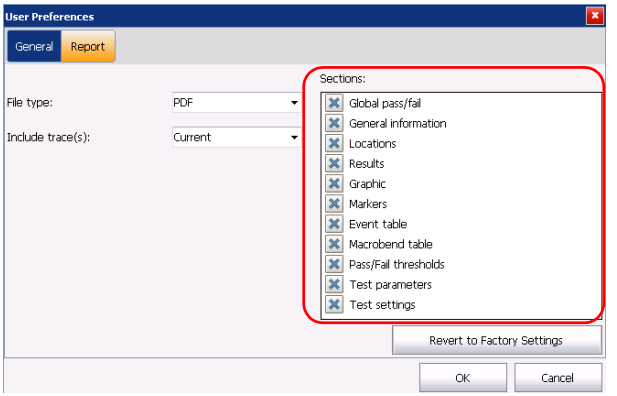

The Revert to Factory Settings button resets all the values in the **Report** tab.

***Note:*** *If you want to use the data or to customize your report later with your own tools, select* ***XML****.*

***3.*** From the **Include trace(s)** list, select **All** to generate a report for all traces (wavelengths) or **Current** to generate a report for the current trace.




***4.*** If the selected file type is PDF, from the **User Preferences** dialog box, under **Sections**, select the report characteristics, including whether you want to include the graphs or not.




***5.*** Tap **OK** to return to the main window.

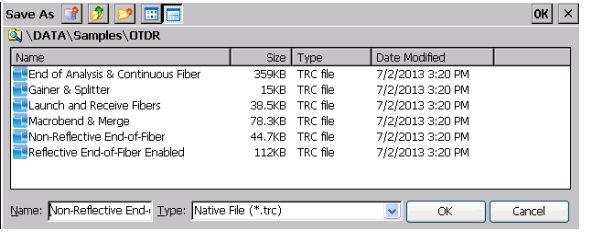
***To generate reports manually:***

***1.*** From the main window, tap .

OR

From the **Main Menu**, go to **File** > **Report**.

***2.*** From the **Save As** dialog box, select a folder or create one to save your file.



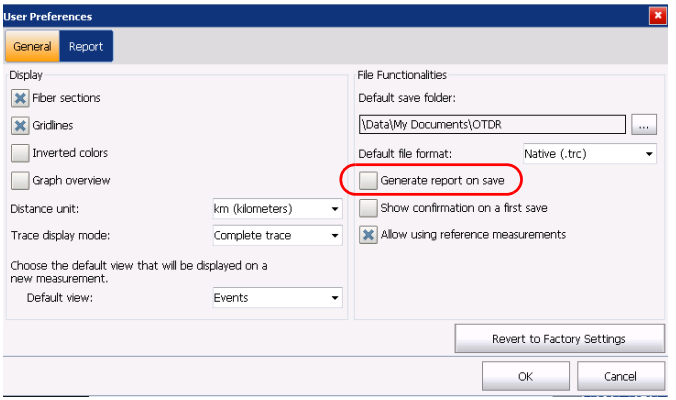

***3.*** If desired, modify the file name and the file type (.pdf or .xml).

***4.*** Tap **OK** to confirm.

You will automatically return to the main window and a report will be generated.

***To generate reports automatically:***

1. If you want to generate a report automatically on save, go to **User Preferences** > **General**.
2. Select the **Generate report on save** check box.




3. Tap **OK** to return to the main window.

***Note:*** *Each time a file is saved, reports are saved automatically at the same time as the OTDR file.*

# 10 Using the OTDR as a Light Source

***Note:*** *This function is available with the Source (SRC) optional software package only.*

If you want to perform measurements with a power meter and your OTDR as a source, the OTDR port can transmit a special tone. This port can be used only to transmit—not detect that tone.

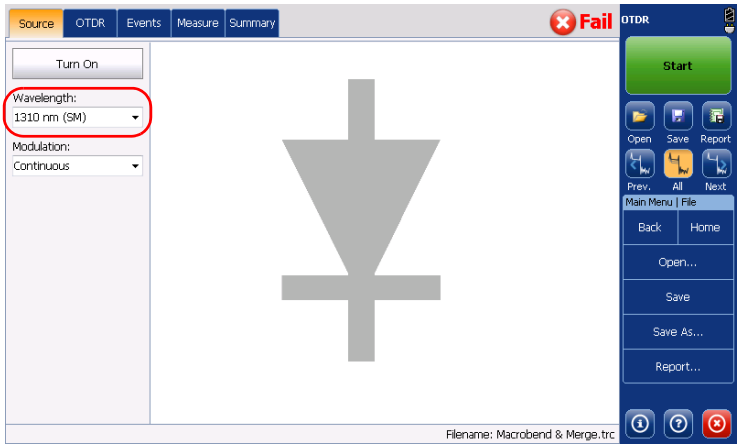
## CAUTION

**Never connect a live fiber to the OTDR port without a proper setup. Any incoming optical power ranging from –65 dBm to –40 dBm will affect the OTDR acquisition. The way the acquisition will be affected depends on the selected pulse width.**
**Any incoming signal greater than 10 dBm could damage your OTDR module permanently. For live-fiber testing, refer to the SM Live port specifications for the characteristics of the built-in filter.**

***To use your OTDR as a source:***

1. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 12).
2. Connect one end of the fiber under test to the OTDR port.

   If your unit is equipped with two OTDR ports, ensure that you connect the fiber to the appropriate port (singlemode, singlemode live, or multimode), depending on the wavelength you intend to use.
3. From the main window, tap the **Source** tab.
4. Select the wavelength you want to use.




***Note:*** *If only one wavelength is available, it is selected by default.*

***5.*** Select the desired modulation.

➤ For loss measurement, with a power meter at the other end, select **Continuous**.

**IMPORTANT**

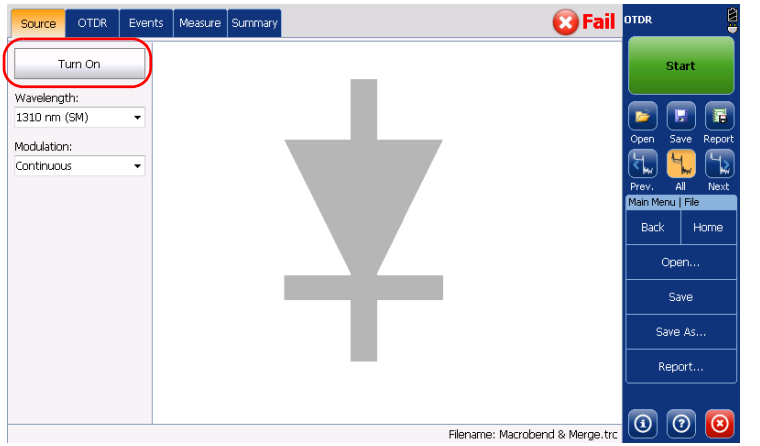
**OTDR can be used in continuous source mode (CW) to perform optical power measurements and it is compatible only with the following: high power Germanium (GeX) versions of the 300 and 600 Series, as well as any unit's built-in GeX power meters.**

**The EPM-50 power meter is not compatible for measurements using an OTDR in Continuous setting.**

➤ For fiber identification, select **1 kHz** or **2 kHz**. This will allow the person at the other end of the link to identify the fiber under test, which could be particularly useful when working with cables containing many fibers.

For easier fiber identification, the application also offers a flashing pattern. If you select this pattern, the modulated signal (1 KHz or 2 KHz) will be sent for 1 second, then will be off for the next second, then be sent again for 1 second, and so on. If you want the OTDR to emit light in a flashing pattern, select **1 kHz+Blink** or **2 kHz+Blink**.

6. Tap **Turn On**. You can stop light emission at any time by tapping **Turn Off**.




Using a power meter with tone-detection features, an operator at the other end will be able to quickly locate the correct fiber or perform loss measurements.

# 11 Maintenance

To help ensure long, trouble-free operation:

- Always inspect fiber-optic connectors before using them and clean them if necessary.
- Keep the unit free of dust.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store unit at room temperature in a clean and dry area. Keep the unit out of direct sunlight.
- Avoid high humidity or significant temperature fluctuations.
- Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, turn off the power immediately, disconnect from any external power source, remove the batteries and let the unit dry completely.

**WARNING**

**The use of controls, adjustments and procedures, namely for operation and maintenance, other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.**

## Cleaning UI Connectors

Regular cleaning of UI connectors will help maintain optimum performance. There is no need to disassemble the unit.

**IMPORTANT**

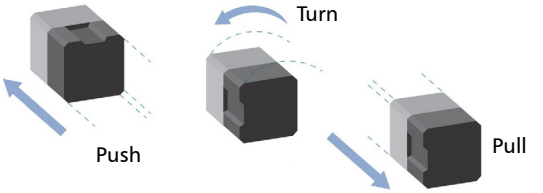
**If any damage occurs to internal connectors, the module casing will have to be opened and a new calibration will be required.**

## WARNING

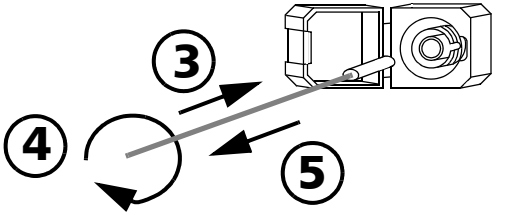
**Looking into the optical connector while the light source is active WILL result in permanent eye damage. IDEAL strongly recommends to TURN OFF the unit before proceeding with the cleaning procedure.**

***To clean UI connectors:***

1. Remove the UI from the instrument to expose the connector baseplate and ferrule.




2. Moisten a 2.5 mm cleaning tip with *one drop* of isopropyl alcohol (alcohol may leave traces if used abundantly).
3. Slowly insert the cleaning tip into the UI adapter until it comes out on the other side (a slow clockwise rotating movement may help).




4. Gently turn the cleaning tip one full turn, then continue to turn as you withdraw it.
5. Repeat steps 3 to 4 with a dry cleaning tip.

***Note:*** *Make sure you don't touch the soft end of the cleaning tip.*

***6.*** Clean the ferrule in the connector port as follows:

***6a.*** Deposit *one drop* of isopropyl alcohol on a lint-free wiping cloth.

## IMPORTANT

**Isopropyl alcohol may leave residues if used abundantly or left to evaporate (about 10 seconds).**

**Avoid contact between the tip of the bottle and the wiping cloth, and dry the surface quickly.**

***6b.*** Gently wipe the connector and ferrule.

***6c.*** With a dry lint-free wiping cloth, gently wipe the same surfaces to ensure that the connector and ferrule are perfectly dry.

***6d.*** Verify connector surface with a portable fiber-optic microscope or fiber inspection probe.

***7.*** Put the UI back onto the instrument (push and turn clockwise).

***8.*** Throw out cleaning tips and wiping cloths after one use.

# Recalibrating the Unit

IDEAL manufacturing and service center calibrations are based on the ISO/IEC 17025 standard (*General Requirements for the Competence of Testing and Calibration Laboratories*). This standard states that calibration documents must not contain a calibration interval and that the user is responsible for determining the re-calibration date according to the actual use of the instrument.

The validity of specifications depends on operating conditions. For example, the calibration validity period can be longer or shorter depending on the intensity of use, environmental conditions and unit maintenance, as well as the specific requirements for your application. All of these elements must be taken into consideration when determining the appropriate calibration interval of this particular IDEAL unit.

Under normal use, the recommended interval for your OTDR is: one year.

For newly delivered units, IDEAL has determined that the storage of this product for up to six months between calibration and shipment does not affect its performance (IDEAL Policy PL-03).

To help you with calibration follow-up, IDEAL provides a special calibration label that complies with the ISO/IEC 17025 standard and indicates the unit calibration date and provides space to indicate the due date. Unless you have already established a specific calibration interval based on your own empirical data and requirements, IDEAL would recommend that the next calibration date be established according to the following equation:

**Next calibration date = Date of first usage (if less than six months after the calibration date) + Recommended calibration period (one year)**

To ensure that your unit conforms to the published specifications, calibration may be carried out at an IDEAL service center or, depending on the product, at one of IDEAL's certified service centers. Calibrations at IDEAL are performed using standards traceable to national metrology institutes.

# Recycling and Disposal (Applies to European Union Only)

Recycle or dispose of your product (including electric and electronic accessories) properly, in accordance with local regulations. Do not dispose of it in ordinary garbage receptacles.

This equipment was sold after August 13, 2005 (as identified by the black rectangle).

- Unless otherwise noted in a separate agreement between IDEAL and a customer, distributor, or commercial partner, please return the equipment either to IDEAL or the business partner at which the equipment has been purchased.
- Except for reasons of safety or environmental benefit, equipment manufactured by IDEAL, under its brand name, is generally designed to facilitate dismantling and reclamation.

For complete recycling/disposal procedures and contact information, visit the IDEAL Web site at www.europe.idealindustries.de.

# 12 Troubleshooting

## Solving Common Problems

| Problem | Cause | Solution |
|---|---|---|
| The application displays a message indicating that a “Non-resolved fiber end” event has been found. | The fiber under test is too long. | Ensure that the fiber under test is shorter than the maximum length the OTDR can measure. |
| The application displays a message indicating that a “live fiber error” occurred and the fiber *was not* connected to the SM Live port. | Light has been detected on the OTDR port during the acquisition or while you were monitoring a fiber in real-time mode. | Disconnect the fiber from the OTDR port. Press OK to close the message.<br>Start another acquisition without any fiber connected to the OTDR. The message about live fiber error should not appear and the OTDR trace should look “normal”.<br>If you still see the message about live fiber error even if no fiber is connected to the OTDR, contact IDEAL.<br>Never connect a live fiber to the OTDR port without a proper setup. Any incoming optical power ranging from –65 dBm to –40 dBm will affect the OTDR acquisition. The way the acquisition will be affected depends on the selected pulse width.<br>Any incoming signal greater than – 20 dBm could damage your OTDR module permanently. For live-fiber testing, refer to the SM Live port specifications for the characteristics of the built-in filter. |

| Problem | Cause | Solution |
|---|---|---|
| The application displays a message indicating that a “live fiber error” occurred and the fiber *was* connected to the SM Live port. | The level of integrated power in the filter bandwidth of the SM Live port is too high. A transmission wavelength from the network could be too close to the SM Live wavelength. | Disconnect the fiber from the OTDR port. Press OK to close the message.<br>Start another acquisition without any fiber connected to the OTDR. The message about live fiber error should not appear and the OTDR trace should look “normal”.<br>If you still see the message about live fiber error even if no fiber is connected to the OTDR, contact IDEAL.<br>Singlemode live-fiber testing requires that the integrated power in the test channel (corresponding to the filter bandwidth of the SM Live port) be as low as possible. Any incoming optical power ranging from –65 dBm to – 40 dBm will affect the OTDR acquisition. The way the acquisition will be affected depends on the selected pulse width. Higher power levels will prevent acquisition from running. Verify network compatibility with the SM Live wavelength. Ensure that the network is not transmitting wavelengths greater than 1600 nm. |

# Customer Support and Technical Assistance

To obtain after-sales service or technical support for this product, contact IDEAL at one of the following numbers. All inquiries regarding service, calibration and technical assistance should be directed to the Customer Service department:

**IDEAL Industries, Inc.**
Corporate Headquarters
Becker Place
Sycamore, IL 60178, USA

Tel.: 800-947-3612
Fax: 815-895-4800
contactus@idealnetworks.net

**IDEAL Industries (Canada), Inc.**
33 Fuller Road
Ajax, Ontario L1S 2E1, Canada

Tel.: 800-824-3325
Fax: 800-263-3115
ideal_canada@idealindustries.com

**IDEAL Industries Product Solutions**
Stokenchurch House
Oxford Road High Wycombe
Stokenchurch Buckinghamshire
HP14 3SX, United Kingdom

Tel.: +44 (0) 1494 486400
Fax: +44 (0) 1494 486479
uksales@idealnwd.com

**IDEAL Industries GmbH**
Gutenbergstrasse 10
85737 Ismaning, Germany

Tel.: +49-89-99686-0
Fax: +49-89-99686-111
Tech. Hotline: +49-0-89-99-686-200
germanysales@idealnwd.com

**IDEAL Networks (France)**
ZA Burospace
Bâtiment 23
Route de Gisy
91570 Bièvres, France

Tel.: 01 69 35 54 70
Fax: 01 60 19 00 48
Tech. Hotline: +33 01 69 35 54 75
francesales@idealnwd.com

**IDEAL Industries Asia Limited (Beijing)**
Room 2507, Golden Tower
No.1 South Road of Xibahe
Chaoyang District
Beijing,100028 China
Tel.: 86-10-8518-3141
Ideal_China@idealindustries.com

**IDEAL Industries Asia Limited (Shanghai)**
No.61, Lane 1000, Zhangheng Road
Pudong District
Beijing, 201203 China
Tel.: 86-021-3126-3188

**IDEAL Industries India PVT Ltd**
229 - 230, Spazedge, Tower B,
Sector 47, Sohna Road,
Gurgaon, 122001, Haryana, India
Tel: +91 (0)956 0075 905
E-Mail:
Indiasales@ideal-industries.in

**IDEAL Industries Brasil**
Domo Business
Rua José Versolato, 111 - Bloco B - Sala 826
São Bernardo do Campo - SP
09750-730, Brasil
Tel.: +55-011-4314-9930
Ideal_Brazil@idealindustries.com

**IDEAL Industries Mexico**
Paseo de los Adobes 1079-10, Ferran 3
Guadalajara Technology Park
Zapopan, Jalisco, Mexico C.P. 45010
Tel.: 52-055-2488129
ideal_mexico@idealindustries.com

To accelerate the process, please have information such as the name and the serial number (see the product identification label), as well as a description of your problem, close at hand.

# Transportation

Maintain a temperature range within specifications when transporting the unit. Transportation damage can occur from improper handling. The following steps are recommended to minimize the possibility of damage:

- Pack the unit in its original packing material when shipping.
- Avoid high humidity or large temperature fluctuations.
- Keep the unit out of direct sunlight.
- Avoid unnecessary shocks and vibrations.

# 13 Warranty

## General Information

IDEAL warrants this equipment against defects in material and workmanship for a period of one year from the date of shipment. Any instrument found to be defective during the warranty period may be returned, transportation pre-paid, to the factory for repair without charge.

This warranty does not apply to instruments that have been repaired or altered by an unauthorized person, or which have been subjected to misuse, negligence, or accident, or to instruments on which the Calibration/Warranty seal is broken.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL IDEAL BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

## Liability

IDEAL shall not be liable for damages resulting from the use of the product, nor shall be responsible for any failure in the performance of other items to which the product is connected or the operation of any system of which the product may be a part.

IDEAL shall not be liable for damages resulting from improper usage or unauthorized modification of the product, its accompanying accessories and software.

## Exclusions

IDEAL reserves the right to make changes in the design or construction of any of its products at any time without incurring obligation to make any changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps, batteries and universal interfaces (UI) used with IDEAL products are not covered by this warranty.

This warranty excludes failure resulting from: improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the product or other factors beyond the control of IDEAL.

# Service and Repairs

IDEAL commits to providing product service and repair for five years following the date of purchase.

***To send any equipment for service or repair:***

1. Call one of IDEAL's authorized service centers (see *IDEAL Service Centers Worldwide* on page 170). Support personnel will determine if the equipment requires service, repair, or calibration.
2. If equipment must be returned to IDEAL or an authorized service center, support personnel will issue a repair authorization number and provide an address for return.
3. If possible, back up your data before sending the unit for repair.
4. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.
5. Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the repair authorization number on the shipping slip. *IDEAL will refuse and return any package that does not beara valid number.*

***Note:*** *A test setup fee will apply to any returned unit that, after test, is found to meet the applicable specifications.*

After repair, the equipment will be returned with a repair report. If the equipment is not under warranty, you will be invoiced for the cost appearing on this report. IDEAL will pay return-to-customer shipping costs for equipment under warranty. Shipping insurance is at your expense.

# IDEAL Service Centers Worldwide

If your product requires servicing, contact your nearest authorized service center.

**IDEAL Industries, Inc.**
Corporate Headquarters
Becker Place
Sycamore, IL 60178, USA

Tel.: 800-947-3612
Fax: 815-895-4800
contactus@idealnetworks.net

**IDEAL Industries (Canada), Inc.**
33 Fuller Road
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Tel.: 800-824-3325
Fax: 800-263-3115
ideal_canada@idealindustries.com

**IDEAL Industries Product Solutions**
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Room 2507, Golden Tower
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Beijing,100028 China
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Ideal_China@idealindustries.com

**IDEAL Industries Asia Limited (Shanghai)**
No.61, Lane 1000, Zhangheng Road
Pudong District
Beijing, 201203 China
Tel.: 86-021-3126-3188

**IDEAL Industries India PVT Ltd**
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Gurgaon, 122001, Haryana, India
Tel: +91 (0)956 0075 905
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**IDEAL Industries Brasil**
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São Bernardo do Campo - SP
09750-730, Brasil
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Ideal_Brazil@idealindustries.com

**IDEAL Industries Mexico**
Paseo de los Adobes 1079-10, Ferran 3
Guadalajara Technology Park
Zapopan, Jalisco, Mexico C.P. 45010
Tel.: 52-055-2488129
ideal_mexico@idealindustries.com

# A Description of Event Types

This section describes all types of events that may appear in the events table generated by the application. Here is a guide to the descriptions:

- Each type of event has its own symbol.
- Each type of event is represented by a graph of a fiber trace, which illustrates the power reflected back toward the source as a function of distance.
- An arrow points to the location of the event type in the trace.
- Most graphs show one complete trace; that is, an entire acquisition range.
- Some graphs show only a portion of the entire range to view events of interest more closely.

## Span Start

The Span Start of a trace is the event that marks the beginning of the fiber span. By default, the Span Start is placed on the first event of a tested fiber (typically the first connector of the OTDR itself).

You can make another event the start of the span you want to focus your analysis on. This will set the beginning of the events table at a specific event along the trace.

## Span End

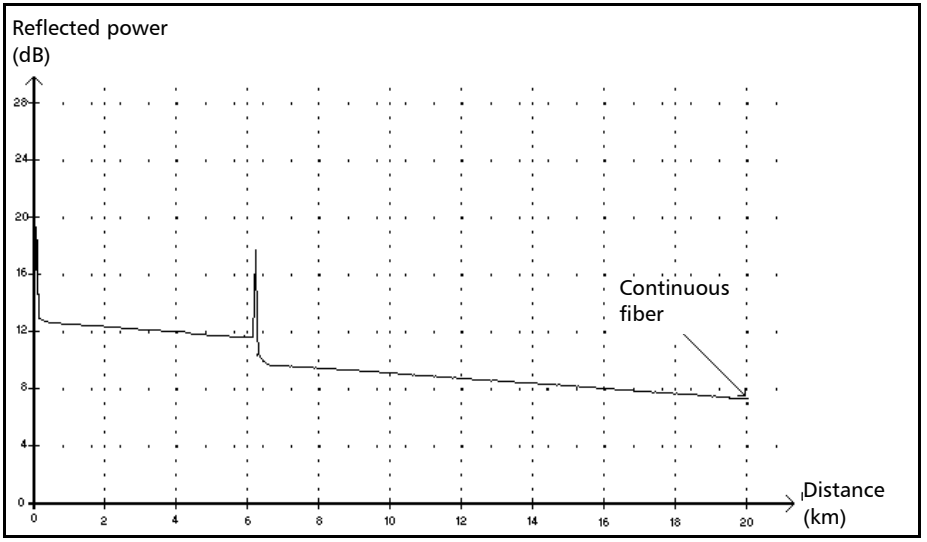
The Span End of a trace is the event that marks the end of the fiber span. By default, the Span End is placed on the last event of a tested fiber, and is called the end-of-fiber event.

You can also make another event the end of the span you want to focus your analysis on. This will set the end of the events table at a specific event along the trace.

## Short Fibers

You can test short fibers with the application. You can even define a fiber span for short fibers by placing the span start and the span end on the same event.

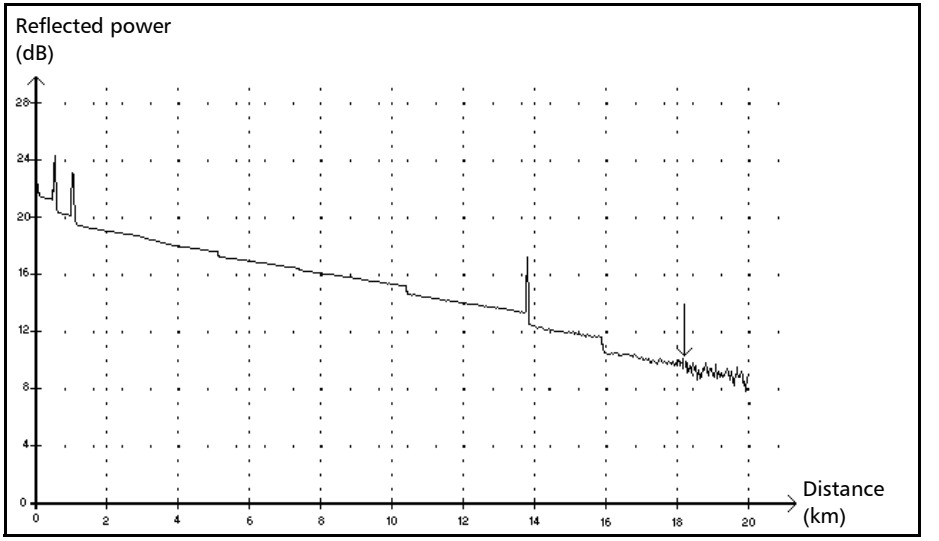
# Continuous Fiber




This event indicates that the selected acquisition range was shorter than the fiber length.

- The fiber end was not detected because the analysis process ended before reaching the end of the fiber.
- The acquisition distance range should therefore be increased to a value greater than the fiber length.
- There is no loss or reflectance specified for continuous fiber events.

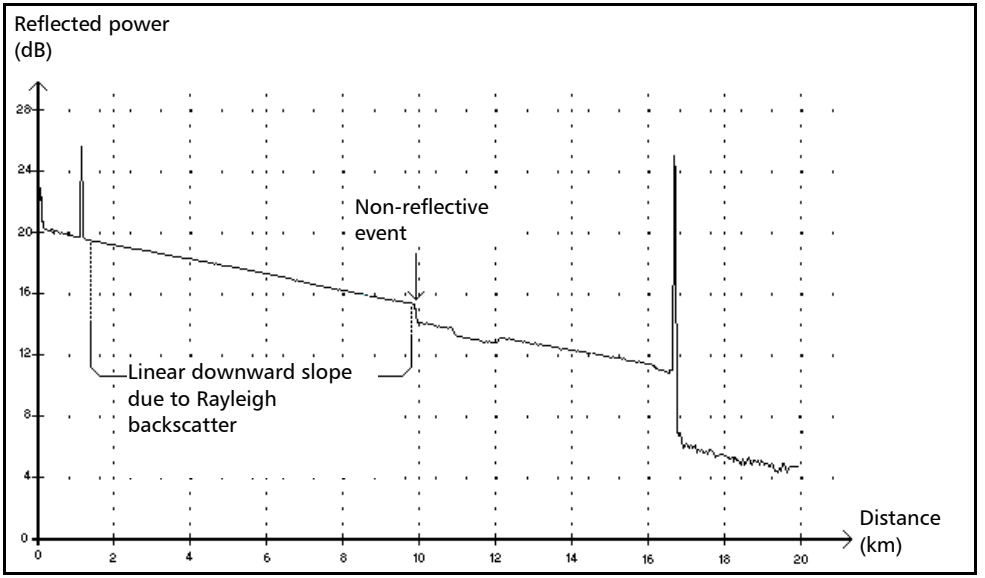
# End of Analysis




This event indicates that the pulse width used did not provide enough dynamic range to get to the end of the fiber.

- The analysis ended before reaching the end of the fiber because the signal-to-noise ratio was too low.
- The pulse width should therefore be increased so the signal reaches the end of the fiber with a sufficient signal-to-noise ratio.
- There is no loss or reflectance specified for end-of-analysis events.

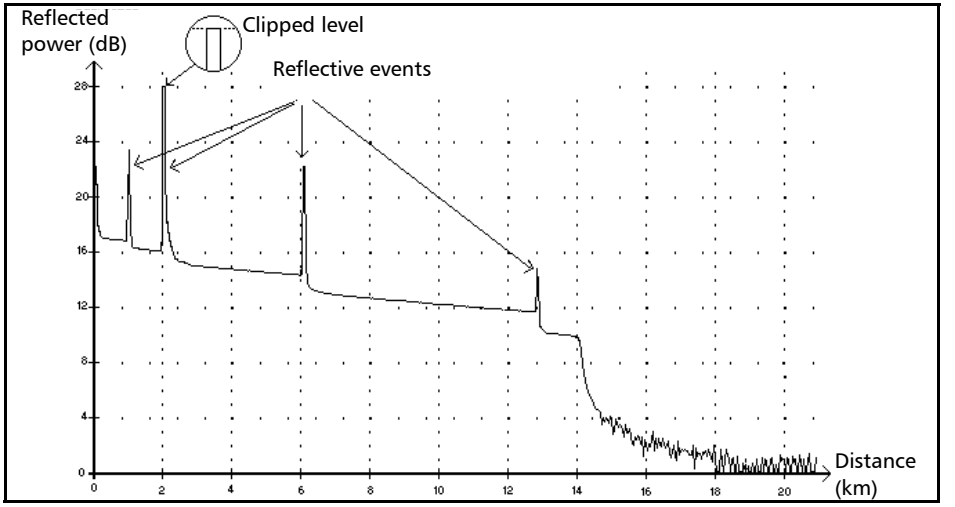
# Non-Reflective Event




This event is characterized by a sudden decrease in the Rayleigh backscatter signal level. It appears as a discontinuity in the downward slope of the trace signal.

- This event is often caused by splices, macrobends, or microbends in the fiber.
- A loss value is specified for non-reflective events. There is no reflectance specified for this type of event.
- If you set thresholds, the application indicates a non-reflective fault in the events table, whenever a value exceeds the loss threshold (see *Setting Pass/Fail Thresholds* on page 36).

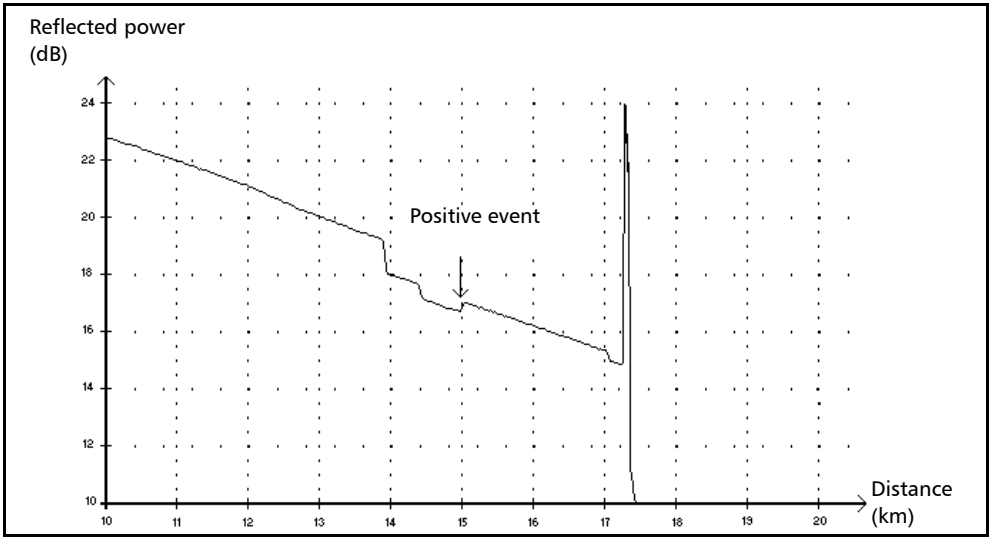
# Reflective Event




Reflective events appear as spikes in the fiber trace. They are caused by an abrupt discontinuity in the index of refraction.

- Reflective events cause a significant portion of the energy initially launched into the fiber to be reflected back toward the source.
- Reflective events may indicate the presence of connectors, mechanical splices, or even poor-quality fusion splices or cracks.
- Normally, loss and reflectance values are specified for reflective events.
- When the reflective spike reaches the maximum level, its top may be clipped due to the saturation of the detector. As a result, the dead zone (minimum distance for making a detection or attenuation measurement between this event and a second nearby) may be increased.
- If you set thresholds, the application indicates a reflective fault in the events table, whenever a value exceeds reflectance or connector loss thresholds (see *Setting Pass/Fail Thresholds* on page 36).

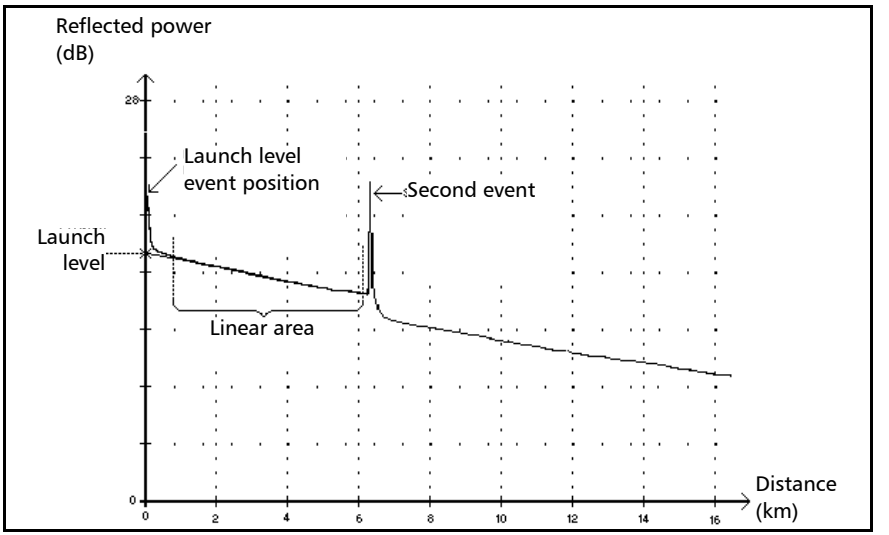
# Positive Event




This event indicates a splice with an apparent gain, due to the junction of two fiber sections having different fiber backscatter characteristics (backscatter and backscatter capture coefficients).

A loss value is specified for positive events. The loss specified does not indicate the true loss of the event.

# Launch Level →




This event indicates the level of the signal launched into the fiber.

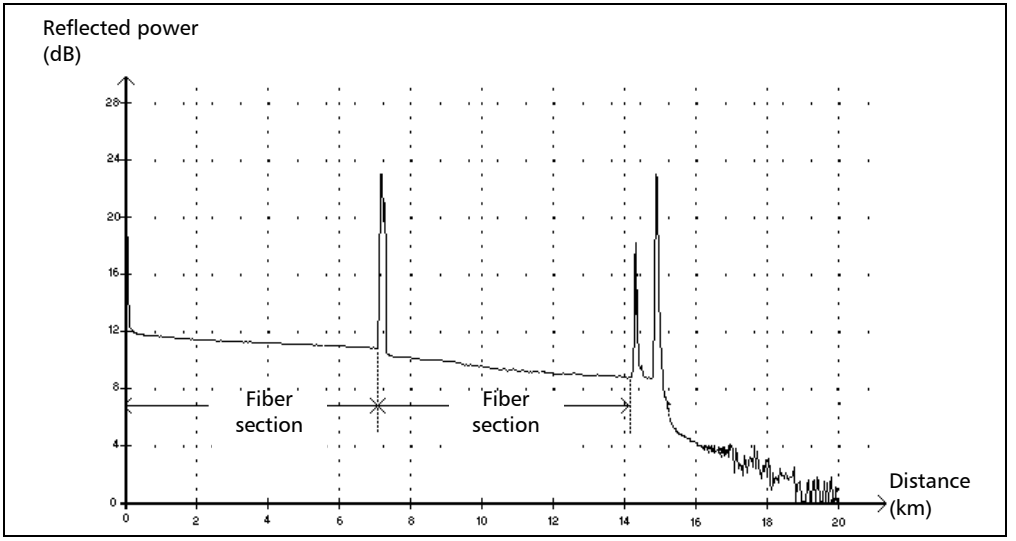
➤ The figure above shows how the launch level is measured. A straight line is plotted using least-square approximation to fit all trace points in the linear area between the first and second detected events.

The straight line is projected toward the Y-axis (dB) until it crosses the axis.

The crossing point indicates the launch level.

➤ <<<< in the events table indicates that the launch level is too low.

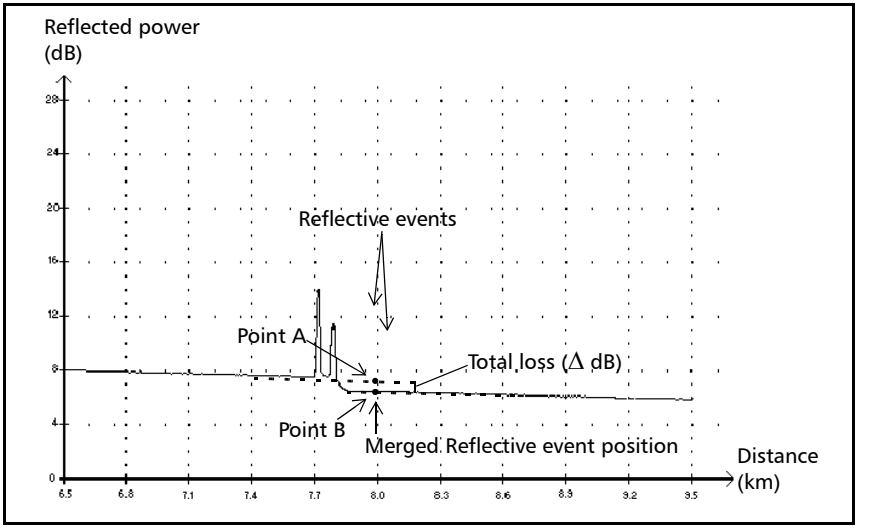
# Fiber Section ⊢




This symbol denotes a fiber section with no event.

- The sum of all fiber sections contained in an entire fiber trace equals the total fiber length. Detected events are distinct even if they cover more than one point on the trace.
- A loss value is specified for fiber section events. No reflectance is specified for this type of event.
- The attenuation (dB/distance in kilometers) is obtained by dividing the loss by the fiber section length.

# Merged Event Σ



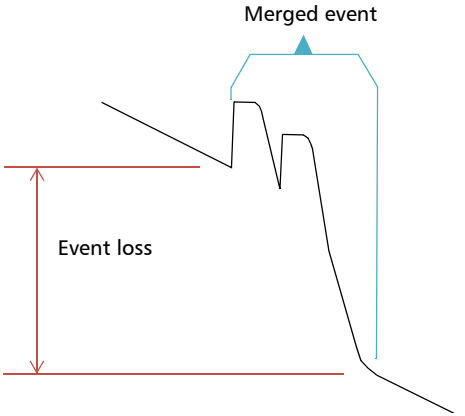

This symbol denotes an event combined with one or more other events. It also indicates the total loss produced by the merged events following it in the events table.

- A Merged Event is composed of subevents. Only the Merged Event is displayed in the events table, not the subevents composing it.
- *Reflective* events may indicate the presence of connectors, mechanical splices, or poor-quality fusion splices or cracks.
- *Non-reflective* events may indicate the presence of splices, splitters or bendings.
- A reflectance value is specified for all merged events and indicates the maximum reflectance for the merged event. A reflectance value is also displayed for each reflective subevent composing the Merged Event.

- The total loss (Δ dB) produced by the events is measured by plotting two straight lines.
  - The first line is plotted by fitting, through least-square approximation, trace points in the linear area preceding the first event.
  - The second line is plotted by fitting, through least-square approximation, trace points in the linear area following the second event. If there were more than two merged events, this line would be plotted in the linear area following the last merged event. This line is then projected toward the first merged event.
  - The total loss (Δ dB) equals the power difference between the point where the first event begins (point A) and the point on the projected straight line located just below the first event (point B).
  - No loss value can be specified for the subevents.

## Pass/Fail Tests

As an example about pass/fail tests, let us consider the situation below:




**Merged sub-events:**

2 reflective losses

1 non-reflective loss

**Thresholds:**

Reflective loss: 0.5 dB

Non-reflective Loss: 0.2 dB

For a merged event, it is possible to determine the global event loss, but not the contribution of each sub-event. This is why the pass/fail test may sometimes lead to “false positive” or “false negative” results.

When evaluating event status against thresholds, we are faced with two possible conditions:

- All event types are tested (reflective, non-reflective)
- Only some event types are selected (for example, you could decide not to test reflective loss)

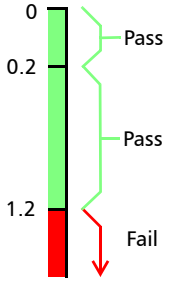
The third case would be to test none of the event types, which means the same as not wanting to know the status of the events.

## All Event Types Are Tested

In the first case, where all event types are tested, the pass/fail conditions are as follows:

- If the event loss is less than or equal to the smallest threshold value, then the event status is *Pass*.
- If the event loss is greater than the sum of the number of sub-events of a type, multiplied by the threshold value for this event type, then the event status is *Fail*.
- If the event loss is "in between", since it is not possible to know exactly the weight of a sub-event in the merged event, the global event is considered to have a status of *Pass*.

Pass/Fail Analysis



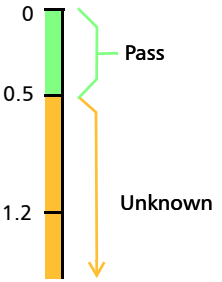

Fail Level
$=\Sigma(N_{sub} \times Th_{sub})$
$= (2 \times 0.5) + (1 \times 0.2)$
$= 1.2$

If the merged event loss is smaller than or equal to 1.2, then the status is *Pass*. Otherwise, it is *Fail*.

## Not All Event Types Are Tested

In this situation, the only thing that we can clearly know is when the loss has a *Pass* status. If the global event loss is less than or equal to the smallest threshold value (a value that is tested, of course), we are sure that the merged event status is *Pass*. Otherwise, we cannot know, so the status of the event is *Unknown*.

In our example, if we suppose that you chose not to test non-reflective losses, then the analysis would be done as shown below:

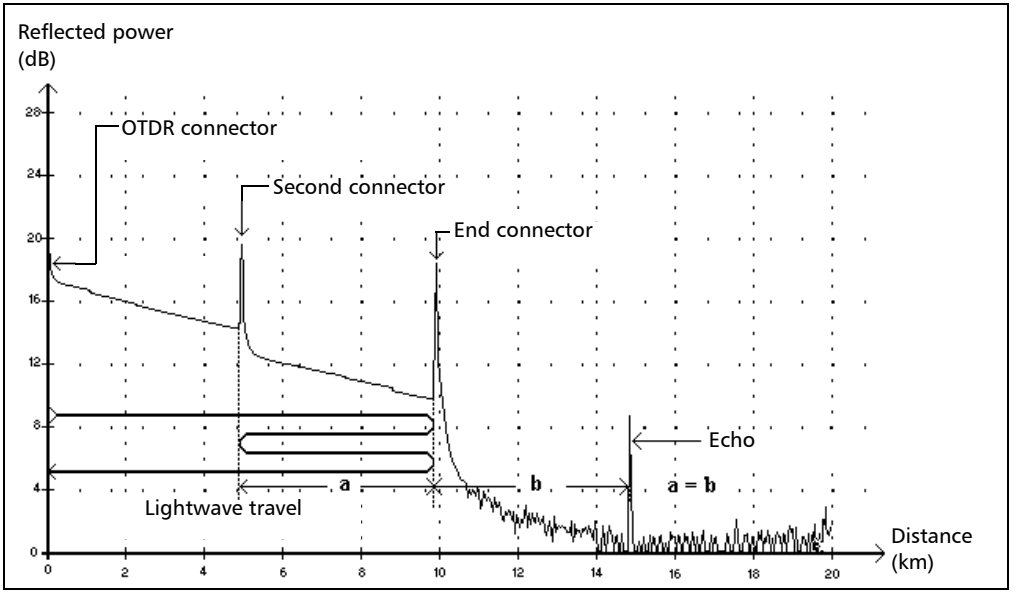


## Effect of Event Status in the Global Trace Status

- A trace status is, by default, set to *Unknown*.
- If a trace is set to *Fail* once, it remains with that status (it cannot be set back to *Pass* or *Unknown*).
- Whenever an event status is *Fail*, so is the trace status.
- If an event status is *Pass*, the trace status can change from *Unknown* to *Pass*.
- If an event status is *Unknown,* the trace status remains the same. In other words, the event, in this case, has no influence on the trace status.

To avoid *Unknown* statuses, do not unselect loss thresholds individually.

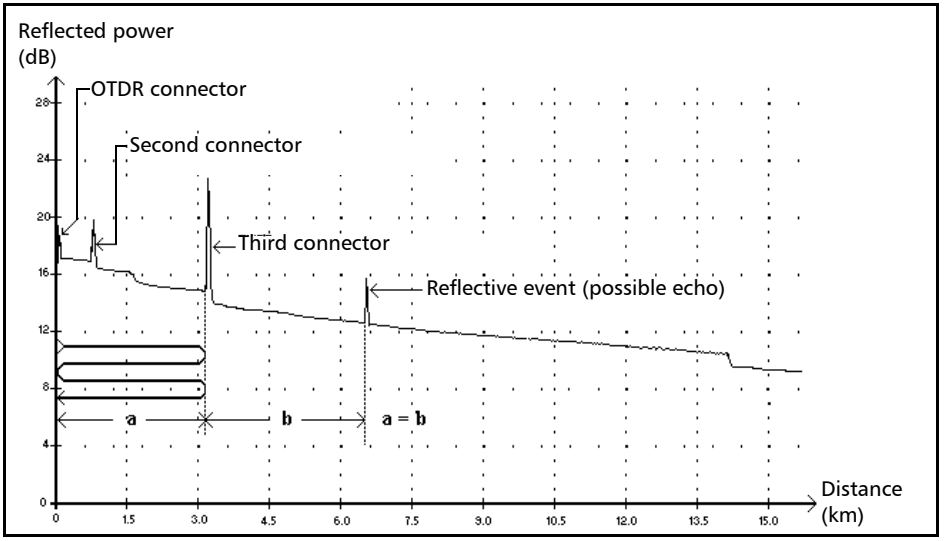
# Echo




This symbol indicates that a reflective event has been detected after the end of the fiber.

- In the example above, the launched pulse travels up to the end connector and is reflected back toward the OTDR. Then, it reaches the second connector and is reflected again toward the end connector. It is then reflected back to the OTDR.
- The application interprets this new reflection as an echo because of its characteristics (reflectance and particular position with respect to other reflections).
- The distance between the second connector reflection and the end connector reflection is equal to the distance between the end connector reflection and the echo.
- There is no loss specified for echo events.

# Reflective Event (Possible Echo)




This symbol indicates a reflective event that can be a real reflection or an echo produced by another stronger reflection located closer to the source.

- In the example above, the launched pulse hits the third connector, is reflected back to the OTDR and reflected again into the fiber. It then reaches the third connector a second time and is reflected once more to the OTDR.

  The application would therefore detect a reflective event located at twice the distance of the third connector. Since this event is almost null (no loss), and since its distance is a multiple of the third connector distance, the application would interpret it as a possible echo.

- A reflectance value is specified for reflective events (possible echo).

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# NOTICE
## 通告

CHINESE REGULATION ON RESTRICTION OF HAZARDOUS SUBSTANCES
中国关于危害物质限制的规定

NAMES AND CONTENTS OF THE TOXIC OR HAZARDOUS SUBSTANCES OR ELEMENTS CONTAINED IN THIS IDEAL PRODUCT
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| | |
|---|---|
| O | Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006<br>表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。 |
| X | Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006<br>表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。 |

| Part Name<br>部件名称 | Toxic or hazardous Substances and Elements<br>有毒有害物质和元素 | | | | | |
|---|---|---|---|---|---|---|
| | Lead<br>铅<br>(Pb) | Mercury<br>汞<br>(Hg) | Cadmium<br>隔<br>(Cd) | Hexavalent Chromium<br>六价铬<br>(Cr VI) | Polybrominated biphenyls<br>多溴联苯<br>(PBB) | Polybrominated diphenyl ethers<br>多溴二苯醚<br>(PBDE) |
| Enclosure<br>外壳 | O | O | O | O | O | O |
| Electronic and electrical sub-assembly<br>电子和电子组件 | X | O | X | O | X | X |
| Optical sub-assembly[a]<br>光学组件 [a] | X | O | O | O | O | O |
| Mechanical sub-assembly[a]<br>机械组件 [a] | O | O | O | O | O | O |

a. If applicable.
如果适用。

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| Battery[a]<br>电池 [a] | 5 | |

a. If applicable.
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