OTDR

Optical Time Domain Reflectometer For T-BERD®/MTS-2000, -4000 V2, -5800, SmartOTDR, CellAdvisor 5G and OneAdvisor-800 Platforms

User Manual

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User Manual

Viavi Solutions
1-844-GO-VIAVI
www.viavisolutions.com

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For the VIAVI position statement on the use of Proposition 65 chemicals in VIAVI products, see the Hazardous Substance Control section of VIAVI's Standards and Policies web page.

EU WEEE and Battery Directives

This product, and the batteries used to power the product, should not be disposed of as unsorted municipal waste and should be collected separately and disposed of according to your national regulations.

VIAVI has established a take-back processes in compliance with the EU Waste Electrical and Electronic Equipment (WEEE) Directive, 2012/19/EU, and the EU Battery Directive, 2006/66/EC.

Instructions for returning waste equipment and batteries to JDSU can be found in the WEEE section of VIAVI's Standards and Policies web page.

If you have questions concerning disposal of your equipment or batteries, contact VIAVI's WEEE Program Management team at WEEE.EMEA@VIAVISolutions.com.

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Article 33 of EU REACH regulation (EC) No 1907/2006 requires article suppliers to provide information if a listed Substances of Very High Concern (SVHC) is present in an article above a certain threshold.

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EU CE Marking Directives (LV, EMC, RoHS, RE)

This product conforms with all applicable CE marking directives. Please see EU Declaration of Conformity for details.

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About This Guide

The VIAVI equipments provide handheld, modular platforms designed for the construction, validation and maintenance of fiber networks.

The topics discussed in this chapter are as follows:

- “Purpose and scope” on page xiv
- “Assumptions” on page xiv
- “Technical assistance” on page xiv
- “Recycling Information” on page xiv
- “Conventions” on page xiv

Purpose and scope

The purpose of this guide is to help you successfully use the equipment features and capabilities. This guide includes task-based instructions that describe how to configure, use, and troubleshoot the equipment with OTDR module.

Assumptions

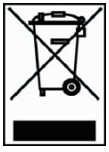
We are assuming that you have basic computer and mouse/track ball experience and are familiar with basic telecommunication and fiber optic concepts and terminology.

Technical assistance

If you require technical assistance, call 1-844-GO-VIAVI. For the latest TAC information, go to http://www.viavisolutions.com/en/services-and-support/support/technical-assistance.

Recycling Information

VIAVI recommends that customers dispose of their instruments and peripherals in an environmentally sound manner. Potential methods include reuse of parts or whole products and recycling of products components, and/or materials.



Waste Electrical and electronic Equipment (WEEE) Directive

In the European Union, this label indicates that this product should not be disposed of with household waste. Il should be deposited at an appropriate facility to enable recovery and recycling.

Conventions

This guide uses naming conventions and symbols, as described in the following tables.

Table 1 Typographical conventions

Description	Example
User interface actions appear in this **typeface**.	On the Status bar, click **Start**.
Buttons or switches that you press on a unit appear in this **TYPEFACE**.	Press the **ON** switch
Code and output messages appear in this `typeface`.	`All results okay`
Text you must type exactly as shown appears in this **`typeface`**.	Type: **`a:\set.exe`** in the dialog box
Variables appear in this ***typeface***.	Type the new ***hostname***.
Book references appear in this ***typeface***.	Refer to ***Newton's Telecom Dictionary***
A vertical bar | means "or": only one option can appear in a single command.	`platform [a|b|e]`
Square brackets [ ] indicate an optional argument.	`login [platform name]`
Slanted brackets < > group required arguments.	<`password`>

Table 2 Keyboard and menu conventions

Description	Example
A plus sign + indicates simultaneous keystrokes.	Press **Ctrl+s**
A comma indicates consecutive key strokes.	Press **Alt+f,s**
A slanted bracket indicates choosing a submenu from menu.	On the menu bar, click **Start > Program Files**.

Table 3 Symbol conventions

	**This symbol represents a general hazard.**
	**This symbol represents a risk of electrical shock.**
	**NOTE** This symbol represents a Note indicating related information or tip.
	**This symbol, located on the equipment or its packaging indicates that the equipment must not be disposed of in a land-fill site or as municipal waste, and should be disposed of according to your national regulations.**

Table 4 Safety definitions

	**WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	**CAUTION** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

1

Starting up

This chapter describes how to start using the equipment.

The topics discussed in this chapter are as follows:

- “Unpacking the device - Precautions” on page 2
- “Precautions relating to the OTDR Module use” on page 2
- “Connecting fiber optic cable” on page 2
- “Optical connectors and interchangeable adapters” on page 5

Unpacking the device - Precautions

We suggest that you keep the original packing material. It is designed for reuse (unless it is damaged during shipping). Using the original packing material ensures that the device is properly protected during shipping.

If another packaging is used (for returning the equipment for example), VIAVI cannot give warranty on good protection of the equipment.

If needed, you can obtain appropriate packing materials by contacting VIAVI Technical Assistance Center.

Precautions relating to the OTDR Module use

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be compromised.

Contact authorized, trained and qualified service personnel for all services.

Fans on OTDR Modules

Take care fans may be present on the side of the OTDR product. Under normal operation, no injury may occur to the user

Connecting fiber optic cable

Inspecting and cleaning connector end faces

Always inspect and clean the connector end face of the optical fiber cable and the test port before mating both together.

VIAVI is not responsible for damage and reduced performance caused by bad fiber handling and cleaning.

- Optical connector contamination is the #1 source of performance degradation and test equipment repair

- A single particle mated into the core of a fiber can cause significant back reflection, insertion loss and equipment damage. Visual inspection is the only way to determine if the fiber connectors are truly clean before mating them.

Follow this simple "INSPECT BEFORE YOU CONNECT" process to ensure fiber end faces are clean prior to mating connectors

Figure 1 "Inspect Before You Connect" process

Optical connector types

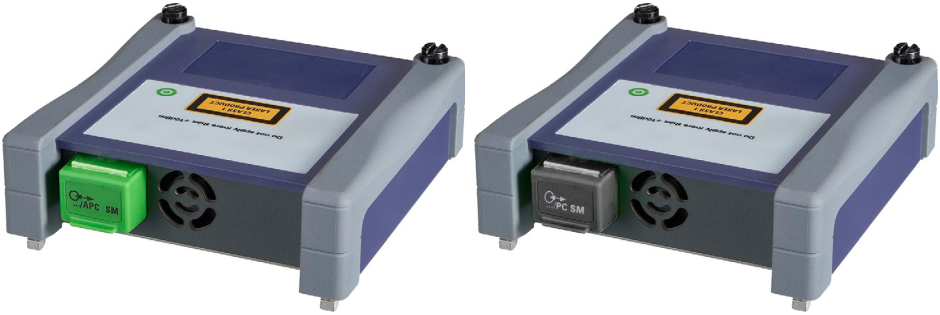
There are many optical connectors in the market place. Always ensure to use a high quality connector that meets the international standards.

Two main types of connectors are deployed in the telecommunication industry:

1. Straight polished connectors, so called PC or UPC
2. Angled polished connectors, so called APC

The PC or UPC-type test port is identified by a grey cap with the addition of a "PC" label. The APC-type test port is identified by a green cap with the addition of a "APC" label.

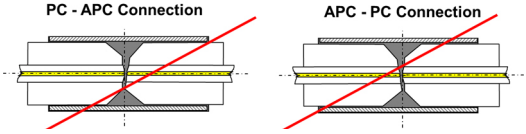
Figure 2 Modules with APC and PC connector



Caution

Never connect a PC connector into an APC test port or vice versa. This will result in damaging the connector end faces.

Figure 3 PC/APC bad connection



WARNING

VIAVI declines responsibilities of connector damages if a poor quality connector is used or APC to PC connections made. Test port connector repair will be charged

Connecting Fiber optic cable to test port

After ensuring proper cleaning of both end connectors, follow the below steps in order to correctly and safely connect the optical fiber into the test port:

1 Carefully align the connector and test port to prevent the fiber end from touching the outside of the port and scratching the end face.

NOTE

If your connector features a keying mechanism, ensure that it is correctly fitted into the test port's insert.

2 Push the connector to firmly place it inside ensuring physical end face contact.

NOTE

If your connector features a screw-on sleeve, tighten the connector to firmly maintain the fiber in place. Do not over tighten as this will damage the fiber and the test port.

WARNING

Never force the connector ferrule or insert it with an angle into the test port adapter. Mechanical stress may permanently damage the ceramic sleeve of the adapter or the end face of the connector. A new adapter purchase only will get the unit back to operation

Optical connectors and interchangeable adapters

Fiber Optic modules will come with a UPC or APC connector.

Interchangeable adapters

VIAVI offers interchangeable adapters, allowing the user to switch from one adapter to another according to which fiber type he intends to work with.
Adapter types supplied are: FC, SC, LC and ST.

In order to switch from an adapter to another, proceed as follow:

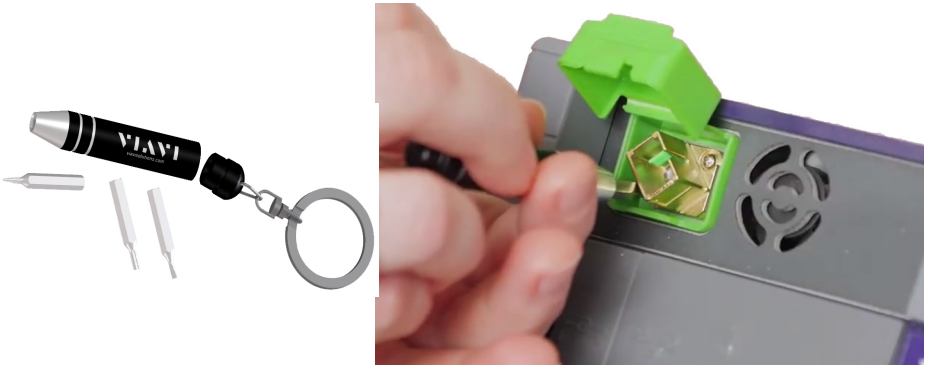
1 Unscrew the VIAVI screwdriver to find the 3 different tips for the adapters and set the correct one on the screwdriver.

2 Unscrew the current adapter using the VIAVI screwdriver with the correct tip.

3 Pull the adapter to remove it.

4 Set the new adapter and use the VIAVI screwdriver with the correct tip to screw it.

Figure 4 Removing and refitting an adapter



Cleaning universal connectors

Remove the adapter in order to access the ferrule and clean it using a cotton swab.

2

SMART TEST function

This chapter describes the entire Smart Test function, and all the processes available with this function.

The topics discussed in this chapter are as follows:

- "Principle of the Smart TEST" page 8
- "Selecting Smart TEST" page 8
- "Configuring the unit for Smart TEST" page 9
- "Performing acquisitions in Smart TEST mode" page 12
- "Results display" page 17
- "Saving results for Smart TEST acquisitions" page 29

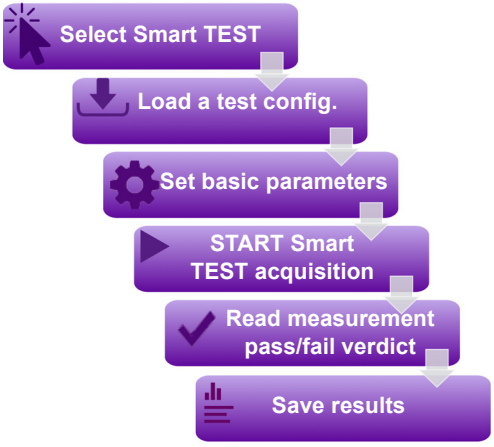
Principle of the Smart TEST

The Smart TEST is used to perform OTDR acquisitions using a pre-loaded configuration file (no setup required) and access to essential analysis features.

Smart TEST standard process

1. Select the configuration file, which contains all acquisition parameters and file storage setup, and which has been created in Expert mode (see “Saving OTDR configuration in a file” on page 36).
2. Configure / modify some parameters before starting the test.
3. Start the acquisition (standard or real time)
4. Save the results

Figure 5 Standard Smart TEST Process



Selecting Smart TEST

The Smart TEST function is available for any OTDR module installed on the equipment.

To select this function, after the equipment starts:

1. Press the **HOME** button
2. Select the Smart TEST icon.

The icon turns yellow 

.

The screen for configuration file selection is automatically displayed.

NOTE

The selection of Smart TEST icon automatically deselects the **Expert OTDR** icon and vice-versa.

NOTE

In case of Singlemode/Multimode module, there are distinct icons: one for multimode with a "MM" indicator and another one for singlemode with no specific indicator..

Configuring the unit for Smart TEST

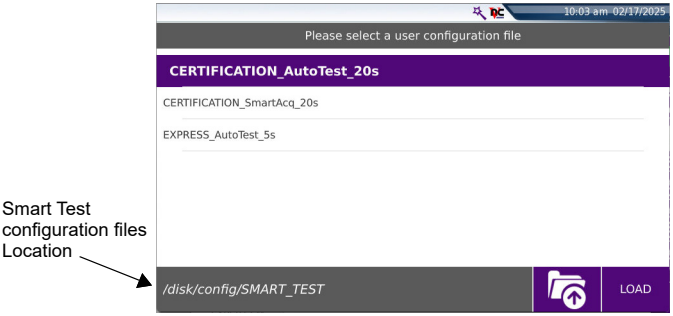
Selecting the configuration file

To load the configuration file to be used for Smart TEST:

1. If necessary, click on the button  to display a higher level of the directory `disk/config`.
2. In the selection file screen, select the configuration file to be used for the acquisition on Smart Test mode.

   The file is highlighted in purple.
3. Press **Load** to load the selected file and display the current parameters for this configuration.

Figure 6 Load file as Smart TEST Configuration

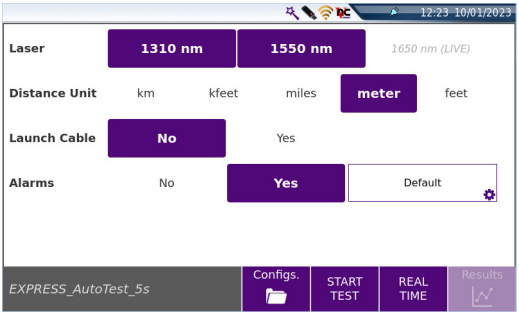


4 Once loaded, the configuration parameters that can be modified displays.

Modifying some parameters before the acquisition

In Smart TEST mode, the user has access to 4 parameters which can modified before launching the test.

Figure 7 Smart TEST Setup page

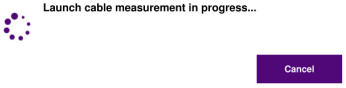


- **Laser** The acquisition will be carried out on the selected wavelength(s). The wavelengths depend on the module type (e.g. DWDM wavelengths available on 4100 DWDM OTDR Modules).
- **Distance unit** select the unit to be used for distance (**km** / **kfeet** / **miles** / **meter** / **feet** / **inch**).

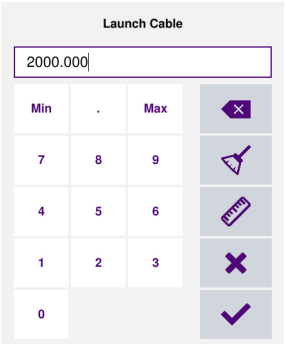
- **Launch cable** Define if the Launch Cable must be taken into account for the acquisition: **No** / **Yes**.
  If **Yes** is selected, set the length clicking on text box and:
  – enter the distance using the numeric keypad.

  or

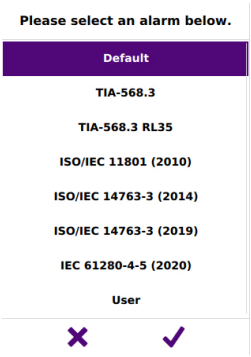
  – Click on  to perform a measurement of the launch cable: a dialog box informing to connect the launch cable displays. Press Confirm once it is connected to start the measurement.



  Once the measurement is completed, the distance is automatically entered in the numeric keypad and the keypad is closed.



- **Alarms** Define if alarms thresholds must be applied to the acquisition:
  Select **No** if no alarm thresholds.
  Select **Yes** to define alarms, and tap in the box to list the available alarms. Select the desired one.



See tables page 49 to get the values for each pre-defined alarm threhsholds.

The **User** thresholds can be modified only in Expert mode and saved in a new configuration file.

Once all configuration parameters are correctly defined, the acquisition can be launched.

Press **Config** key to return to the configuration selection screen (see Figure 7 on page 10).

Performing acquisitions in Smart TEST mode

The acquisition is carried out with the parameters saved in the Configuration file. It may be stopped at any time using the **Start** key.

At the end of test, the results page displays.

Performing acquisition in Real Time

To carry out an acquisition in real time:

1 In the **Setup** page of the Smart Test mode, press **Real Time** key REAL TIME (see Figure 7 on page 10).

or

If the results page is displayed, when an acquisition in Smart TEST has already been performed, press **Real Time** menu key .

The red **Testing** indicator will go on to show that real time acquisition is in progress. The trace acquired is displayed in real time.

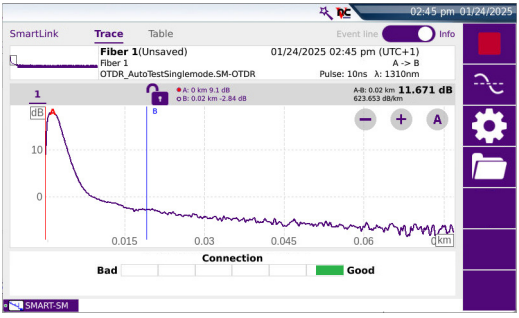
An indicator of the state of the connection (**Good/Bad**) is displayed below the trace:

Table 1 Connection indicator

State	Connection Connection Bad Good
Good	The connection is OK
Bad	• There are several connectors close to the external connector of the equipment • One of the connectors is dirty or badly connected. Replace the launch cable, make the connection again properly or clean the connector of the OTDR or of the jumper. • No fiber is connected.

If the state of the connection is bad, it is still possible to carry out a measurement, but the results will not be very reliable.

Figure 8 Example of acquisition in Real Time



Traffic detection

Traffic on the fiber under test is automatically detected and reported.

Press key  to begin the measurement. A message indicates there is traffic on the fiber and asks you if you wish to continue or not:

- If you click on **No**, the measurement is not launched.
- If you click on **Yes**, the measurement is performed, despite the traffic.

NOTE

If the measurement is validated despite the traffic (key **Yes**), the next measurement will be automatically performed, even if traffic is still detected on fiber.

If the measurement is canceled (key **No**), and the **Start** pushed another time, the box asking if you wish to continue or not is displayed.

The functioning of Traffic Detection is then indicated in the scaled down representation of trace, on the upper left part of screen: **LFD** is flashing.

During an acquisition in real time, several actions can be made on results in progress: see "Actions on trace during acquisition" page 15.

Stopping the real time acquisition

To stop or interrupt an acquisition in real time mode, press  at any time.

Performing an acquisition in Smart TEST mode

1 From the **Setup** page, press **Start Test** key 

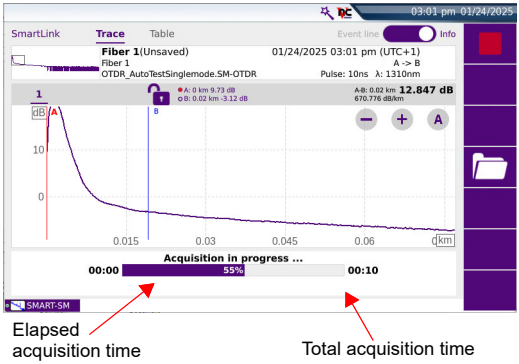
to launch measurement (see Figure 7 on page 10).

The red **Testing** indicator goes on to show that the T-BERD/MTS is in process of acquisition and the screen displays the trace in process of acquisition.

2 The quality of the connection is displayed for a few seconds (see Table 1 on page 13)

3 Then, a bar graph shows elapsed and remaining acquisition time.

Figure 9 Acquisition in progress in Smart TEST



At the end of the acquisition, a beep is emitted, and the measurements are displayed, in SmartLink view, with a dialog box indicating the pass or fail verdict.

NOTE

During acquisition, the traffic on fiber is automatically detected (see "Traffic detection" page 13)

Actions on trace during acquisition

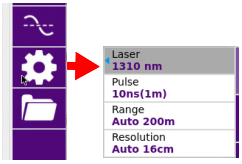
During an acquisition, several actions are available on results in progress.

Modifying acquisition parameters (Real Time mode only)

You can modify the acquisition parameters during the acquisition:

1 Press the key  .

2 Scroll through the possible values of the parameters.



Performing measurements during acquisition (Real Time mode only)

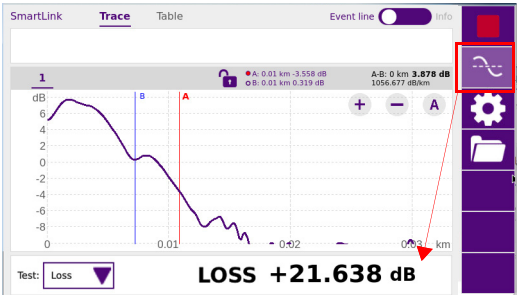
The real time mode allows to make Loss, ORL or Reflectance measurement using the A & B cursors and the key **Average**:

1 Position A & B cursors on the trace

2 Click on  .

3 Define the measurement wished (Loss, ORL or Reflectance) in the **Test** scrolling menu and get the result between A & B cursors.

Figure 10 Example of loss measurement



Actions on Display

- Positioning Cursors A and B

  Click on the Cursor line on the trace to select the cursor, and click on the trace:

  – Set both cursors A & B to control distance between two points.

  – Set one cursor A or B to get the distance from one point.

  – Set one cursor A or B to zoom on this cursor

- Zooming on trace

  Click on the key + or − to zoom in or out on the trace.

  Click on the key A to get an automatic zoom on trace during acquisition.

  See “” on page 25)

- Shifting the trace

  The trace can be shifted vertically or horizontally during the acquisition: click on the trace and move upward/downward or toward left or right (see “Shift function” on page 26)

- Displaying Trace or SmartLink page

  Click on **Trace** or **SmartLink** to display either:

  – the acquisition trace in progress and the bar graph of time

  – the Smart Link page with exclusively the bar graph of time.

  In the case of measurement on several wavelengths, once a measurement is completed for one wavelength:

  – the **Trace** function allows to display the trace and results table for this wavelength.

  – the **Smart Link** function allows to display a graphical view of results for this wavelength.

Results display

The traces acquired or recalled from a memory are displayed on the Results page.

From any results screen in SmartTest mode, press  to return to acquisition parameters.

SmartLink view

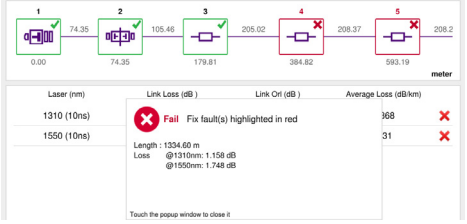
Once the results trace is displayed, click on **SmartLink** key to display the Smart Link view.

NOTE

The SmartLink view is displayed by default after an acquisition.

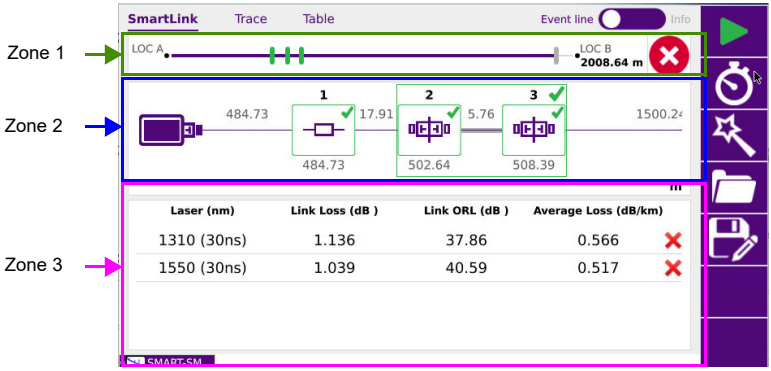
At the end of the acquisition,or when a file is opened from File explorer, a pop up window displays the overall test results.

Tap this window to close it.



Once the pup window is closed, a screen as the following one is displayed:

Figure 11 SmartLink function

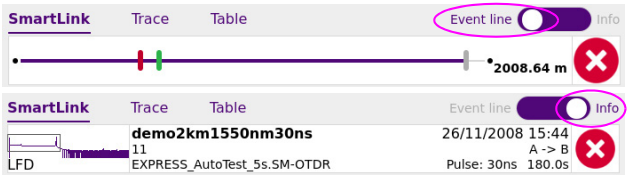


The screen is divided into three zones:

- **Zone1**: the **Event line**, which is a graphical representation of the fiber with the detected events position on this fiber and the alarm status icon, or the **Info** bar, with the acquisition parameters of the trace, together with a small-scale representation of the trace.

  Click on the button to switch from **Event line** to **Info** and vice-versa.

Figure 12 Event line or Info bar



NOTE

This zone is available whatever is the display: SmartLink, Trace or Table.

- **Zone 2**: Graphical representation of the link, with icons symbolizing the different events detected.
- **Zone 3**: Link Table, which gives a summary of results for each wavelength, with results within/without thresholds in green/red (according to Alarm thresholds defined in the setup screen).

Showing the detailed information of one event

The information concerning the event, its type and the alarm thresholds defined for this event, can be displayed from the SmartLink screen.

1 Select the event for which information must be displayed, on the graphic.

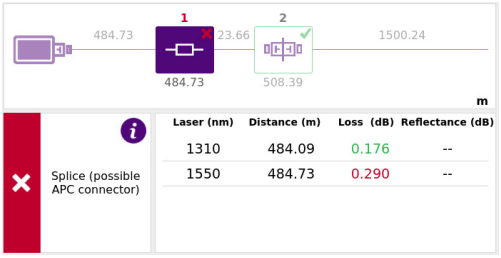
The event is highlighted in purple once selected. 

A frame displays, and describes:

– the event type

– the value above which it is on defect

Figure 13 Event Details



NOTE

The event is displayed with a red icon if it is above the alarm thresholds defined in the setup menu.
A green icon is displayed if it lies within the thresholds.

A yellow icon is displayed if the value is above a «Warning» threshold.
No icon is displayed if no alarm has been defined in the Setup menu

Grouped events

If two events are very close to each other, they are grouped with a square on the graphic. Either the group of events can be selected, or only one event of this group.

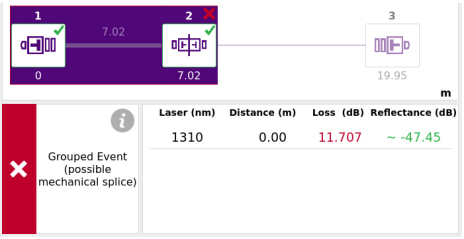
Group selection

To select a group of events, click on space between the events (not on the link section):

- The total loss of the group is displayed for each wavelength

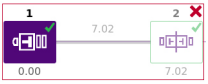
- The reflectance displays the worst reflectance of the group

Figure 14 Grouped events



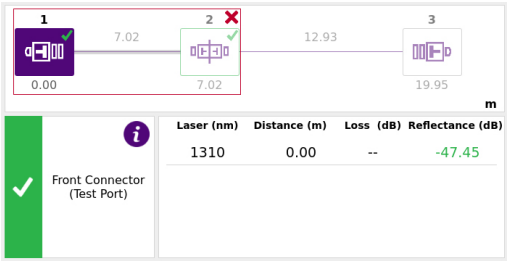
Sub Event selection

Click on one event icon to select this icon from the group.



- The loss of the selected event is not displayed in this case
- The reflectance displays the estimated reflectance value for the selected event

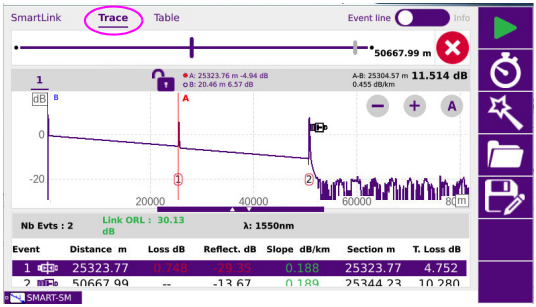
Figure 15 Grouped events - one event selected



Trace View

To display the trace and results table, click on **Trace**.

Figure 16 Example of results trace with Smart TEST

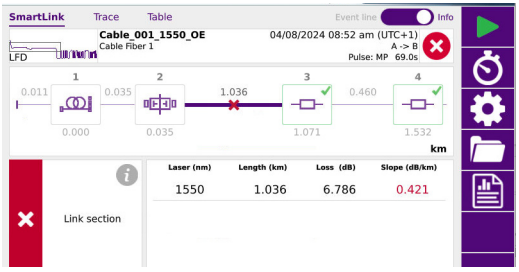


Click on  to return to Setup Information page.

Table 2 Alarms display

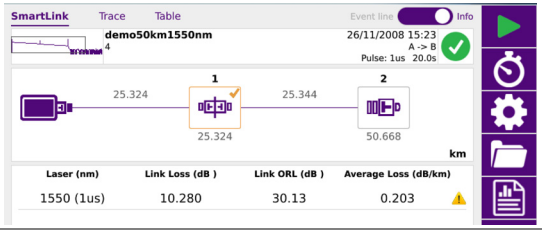
Fail

Indicates that at least one result (link, event or slope) exceeds the alarm thresholds defined in the configuration file used for acquisition Results are displayed in red.



Indicates that the global alarm lies within the thresholds defined in Alarms page. Some results can be in Warning status (orange), but the global alarms status is Pass.

Valid



Display of events on the trace

Each event detected is referenced under the trace by a serial number. The reflectometry trace is displayed with a dotted vertical line set on the start of launch cable  (if the **Launch Cable End** parameter is defined in the **SETUP** menu)

The trace can also be displayed with a dotted vertical line on the end of fiber  .

The icon  is displayed on trace if the **Receive Cable Start** parameter has been defined in the Setup menu.

The results of the measurements of attenuation, reflectance and slope can be marked on the trace.

The reflectance of a ghost event is displayed in brackets on the trace.

Criteria for display of an event

An event will be displayed if its attenuation or its reflectance exceeds the corresponding threshold selected in the **SETUP** menu (see "Configuring the unit for Smart TEST" page 9). Attenuation and reflectance results for an event will be displayed if they can be calculated

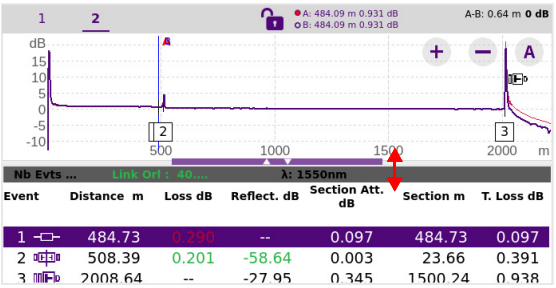
The reflectance of an event is always measured except when the event causes a saturated Fresnel peak or if it is drowned out by noise. In this case, the T-BERD/MTS displays **>** to show that the actual reflectance exceeds the value displayed.

Results table

Under the trace is displayed the results table with all the events detected during acquisition.

The line corresponding to the event nearest to the cursor is highlighted in purple. This highlighting moves if the cursor is moved.

To reduce or enlarge the size of the results table, click and maintain the bar between trace and table and move downward or upward  .



At the top of the table, a line shows the generic parameters of the fiber: numbers of events present, total ORL of the link and the wavelength of the active trace in case of multi wavelengths acquisitions.

Each event is referenced under the trace by a number which is repeated in the first column of the table. The table then shows:

- icon symbolizing the type of the event:

Receive cable Start

Launch cable End: the attenuation and distances are measured on the basis of the corresponding marker.

Non-reflective attenuation (e.g. splice).

Splitter

Mux/Demux

Reflective event. (e.g. connector)

Ghost reflection

Slope of the fiber (when no fault follows the slope).

End of fiber

OTDR connector

Bend

Bend on OTDR Connector

The event underlined in purple is the one the nearest of the cursor set on trace. To visualize an event, click on this event on the table to set the cursor on it onto the trace.

The following columns are then displayed next to each event icon:

Distance	The distance of the event from the beginning of the fiber, in meters (or miles)
Loss	The attenuation due to the event, in dB
Reflect.	The reflectance of the event, in dB
Slope	The slope before the event, in dB/km (or dB/kft) if it can be measured
Section Att.	The attenuation, in dB, between the marker of the event and the previous marker.
T. Loss	The total attenuation of the fiber (total loss), in dB

Cursors

The cursors A and B are represented by vertical lines of different colors:

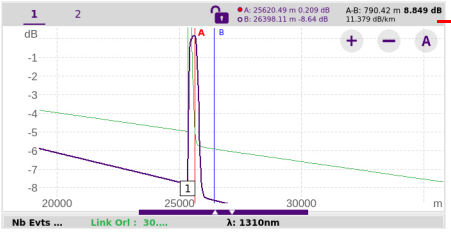
- The A cursor line is displayed in red
- The B cursor line is displayed in blue.

The Cursor position is displayed just above the trace: the active cursor is represented with a red/blue point in the cursor bar.

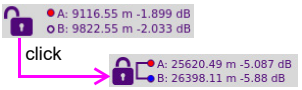
1 Touch the screen on the required location on trace where the active cursor must be set.

Above the trace is shown the 2-points loss measurement between the two cursors, together with the distance between the two cursors.

Figure 17 Cursors information



Click on the **Lock** icon in order to select both cursors and move it at the same time on the trace, keeping the current space between them:

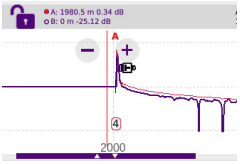


NOTE

The cursor information font size is increased if neither the **Info** bar nor the **Event line** is defined:

Precise positioning of the cursors

- To get a more accurate position of one cursor on trace, press Cursor Line and use − or +, at each side of the cursor line, to slightly move the cursor toward left or right.



Zoom function

The Zoom function is used to analyze part of the trace in greater detail.

The zoom is centered on the active cursor.

The position of the section of trace displayed with respect to the complete trace is represented by a rectangle on the mini-trace at the top left-hand corner of the screen, if the **Info** bar is selected.

Click as many times as necessary on the Zoom key + or − to zoom in or out on the trace.

Click on the **Automatic Zoom** key A to swap from an automatic zoom to full trace and vice-versa

Specific functions of the zoom with a touchscreen

With the touchscreen:

- maintain your finger pressed on screen and shift the traces horizontally or vertically
- position your finger on a cursor and move it on trace maintaining your finger pressed and moving it toward left or right

Zooming on the different events in succession

1 Set the cursor on one event

2 Define a zoom on this event.

3 Click on another event in the results table.

The cursor is automatically positioned on this event, which is always centered on the screen, keeping the zoom level selected.

Shift function

The Shift function is used to displace the displayed section of the trace by directly clicking on the touchscreen.

The horizontal shift is performed maintaining the point of intersection between the trace and the selected cursor at the same level, scrolling the trace horizontally while following it vertically, so that it never goes off the screen.

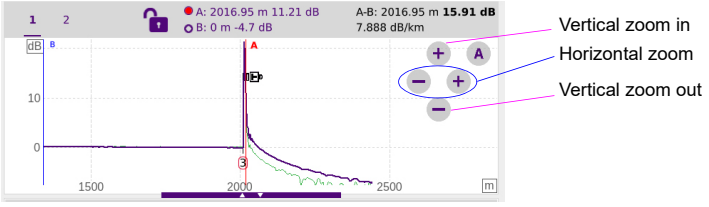
To use this function:

1 Click on the trace.and displace trace manually on touchscreen toward left/right or upward/backward.

Advanced Zoom function

Make a long press on A button to allow zooming vertically and horizontally independently.

Figure 18 Horizontal and Vertical Zoom



Make another long press on A button to return to initial zoom function.

Grouped events

If two events are very close to each other, they are grouped (see "Grouped events" page 19 to get a description of the SmartLink view with grouped events).

In Trace view:

1 In the table, the loss of the group will be displayed at 0.0dB.

2 The reflectance of the group will display the worst reflectance of the events in the group.

3 No loss is displayed on the event level in the group.

4 Estimated event reflectance will be displayed for every event in the group.

Figure 19 Trace results - Grouped events

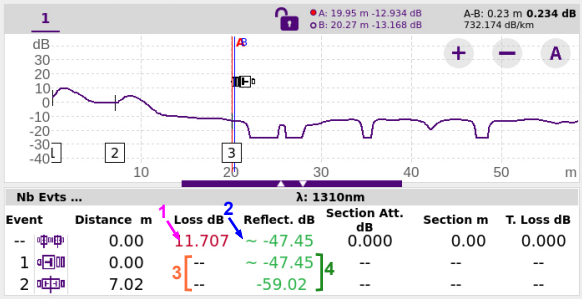
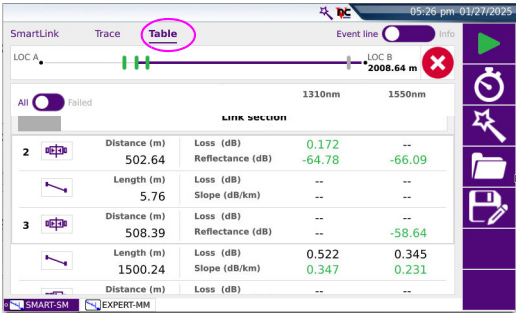


Table View

From the results screen, click on **Table** to display exclusively the measurement results in a table.

Figure 20 Table View

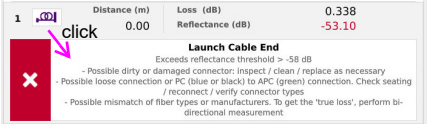


The list of all the events detected during acquisition or manually measured are displayed in a table:

- The events exceeding alarm thresholds are displayed in red, whereas those lying withing the thresholds are displayed in green.
  Select **Failed** on the button 

  to display exclusively the results exceeding the thresholds.
- Click on one event to display the event type under its values, and the alarm icon if alarm thresholds have been defined. If a fail alarm is detected; a description of the possible cause(s) for this alarm is displayed.

Figure 21 Results table - event details



Changing the type of an event

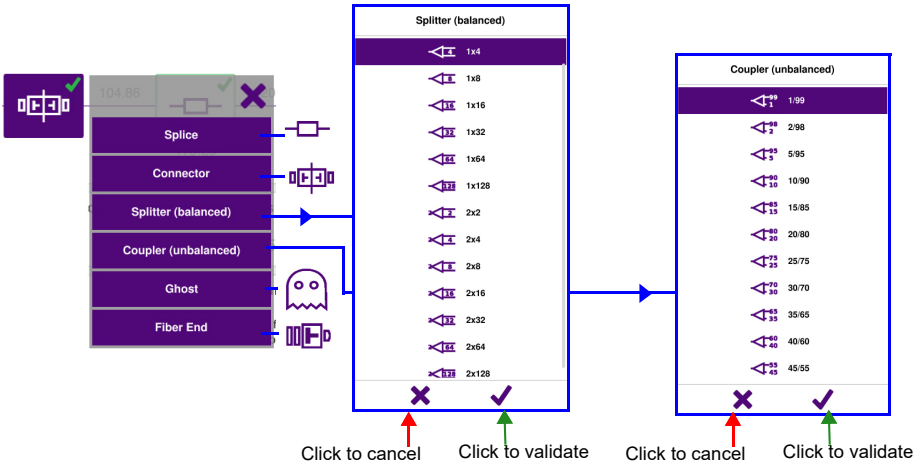
The type of event can be modified, either from **Trace**, **SmartLink** or **Table** view:

1 Maintain pressed the icon to be modified, in the results table.

2 In **SmartLink** or **Table** view, in the menu open, select the new type of event to be applied.

In Trace view; click first on **Event Codes**, and select the new type of event to be applied.

Figure 22 Event Code



Click on **the cross** to cancel the modification.

NOTE

The event modification is automatically applied on trace and in the results table.

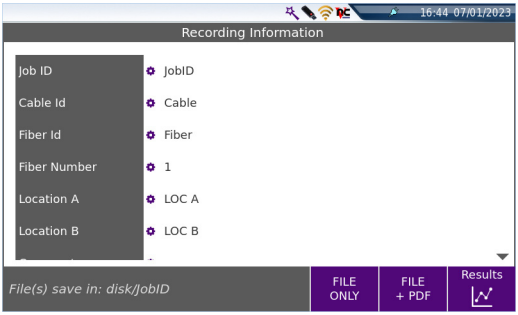
Saving results for Smart TEST acquisitions

Once the acquisition is completed, the results trace displays, in Smart Link view, with the **Save** key displayed.

1 Click on **Save** key  to save the results in a file.

The Recording Information page displays

Figure 23 Save results in Smart TEST mode



2 Click on one parameter configuration (white background) to modify it using the edition or numeric keyboard displayed:

- **Job Id**: click on the Job description currently defined to display the edition keyboard and enter a new description.
- **Cable Id**: click on the cable name currently defined to display the edition keyboard and enter a new cable name.
- **Fiber Id**: click on the fiber name currently defined to display the edition keyboard and enter a new fiber name.
- **Fiber Number**; click on the fiber number currently defined to display the numeric keyboard and enter a new fiber number.
- **Location A** / **Location B**: click on the location name currently defined to display the edition keyboard and enter a new name.
- **Comment**: click on the comment text box to enter a comment for the file.

NOTE

The file is saved automatically by default in a folder with the **Job Id** parameter.

Example: if the **Job Id** is defined with *Test Fiber 1*, the folder is named *Test Fiber 1*.

3 Once the recording information are defined as wished, select the saving mode wished:

– Click on **FILE ONLY** 

to save exclusively the results trace to the .sor format

– Click on **FILE + PDF** 

to save the results trace in a .sor file and to generate a pdf report of the results.

– Click on **Results** 

to return to Smart Test results view.

3

Expert OTDR function

This chapter describes the different stages in performing an acquisition in Expert OTDR mode, from configuration to results saving.

The topics discussed in this chapter are as follows:

- "Principle of the Expert OTDR" page 34
- "Selecting Expert OTDR" page 34
- "Configuring the unit for Expert OTDR" page 35
- "Performing acquisitions in Expert OTDR mode" page 59
- "Results display" page 64
- "Advanced functions" page 67
- "Saving the trace(s) and generating a report" page 78

Principle of the Expert OTDR

The Expert OTDR is used to

- perform OTDR acquisitions with full OTDR setup capabilities, and advanced analysis features.
- create configuration files that can be loaded by SmartTEST users.

Selecting Expert OTDR

The Expert OTDR function is available whatever is the OTDR module set onto the equipment.

To select this function, after the equipment start:

1 Press the **HOME** button

2 Select the Expert OTDR icon 

.

The icon turns yellow 

, then the result page displays.

NOTE

The selection of Expert OTDR icon automatically deselects the SmartTEST icon and vice-versa.

NOTE

In case of Singlemode/Multimode module, there are distinct icons: one for multimode with a "MM" indicator and another one for singlemode with no specific indicator.

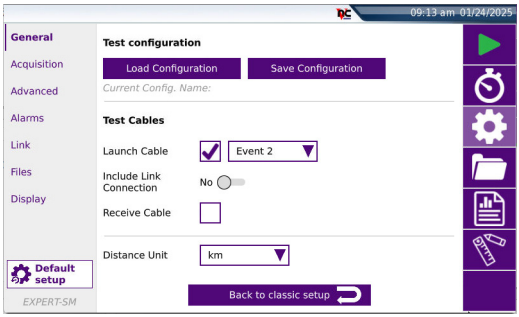
3 Press the menu key  on the Results page.

Configuring the unit for Expert OTDR

Configuring the General parameters

1 Once the **Setup** menu is opened, the **General** page is displayed and allows to configure the General parameters for OTDR acquisition.

Figure 24 ExpertOTDR Setup - General parameters



NOTE

Press **Back to classic setup** key to return to classic interface for OTDR setup.

Load Configuration

To load a configuration file previously created or available in the equipment and apply parameters to new OTDR Expert tests:

1 Press menu key Load Configuration.

2 Select the configuration file desired

3 Press **Load Config.**

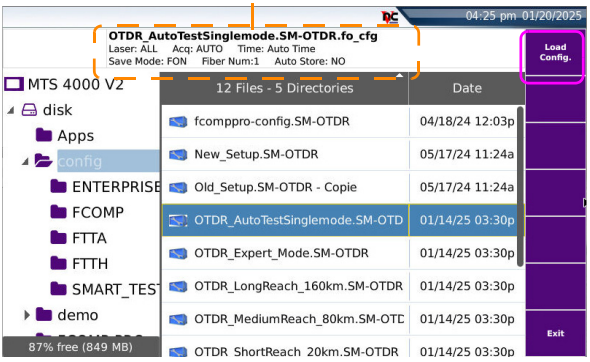
You can modify some acquisition or file storage parameters, and save them in a new configuration file (see “Saving OTDR configuration in a file” on page 36).

NOTE

Most of the configuration files are available into the equipment, in `disk/config`.

Figure 25 Loading a configuration file

The main parameters available in the selected configuration file are displayed in the File signature.



Saving OTDR configuration in a file

Once File and Measurement parameters have been configured, those parameters are kept in memory and can be saved in a configuration file.

This configuration file can then be recalled and reused in two cases:

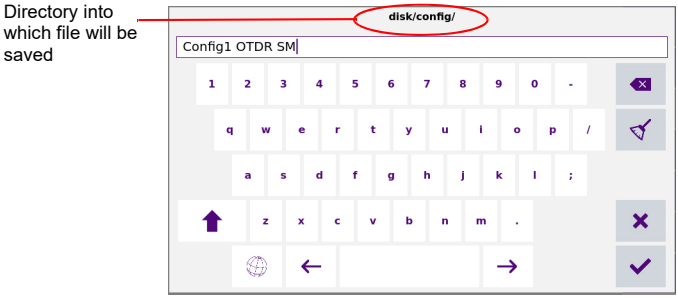
- in order to be applied when acquisition in SmartTEST mode is performed.
- in order to be recalled for future acquisition in Expert OTDR

To save parameters in a configuration file:

1. If necessary, press **Setup** to return to **Setup** menu.
2. Select one parameter in one of the setup page (acquisition, link..)
3. Press menu key Save Configuration.
   The onscreen keyboard displays
4. Enter a name for the configuration file (max. 20 characters).

NOTE
Configuration file is saved by default in the directory **`disk/config`**.

Figure 26 Save Configuration file - Onscreen keyboard



5 Press ✓ to validate
A sound is emitted to indicate the file is saved.
The configuration file is saved with the extension .fo_cfg (icon) and can be recalled at any time from the **File** page.

It can be selected in SmartTEST (see "Selecting the configuration file" on page 9) or loaded for Expert OTDR.

Distance Unit

Define the unit of the distances displayed: **km** / **kfeet** / **miles** / **meter** / **feet**.

Launch Cable / Receive Cable

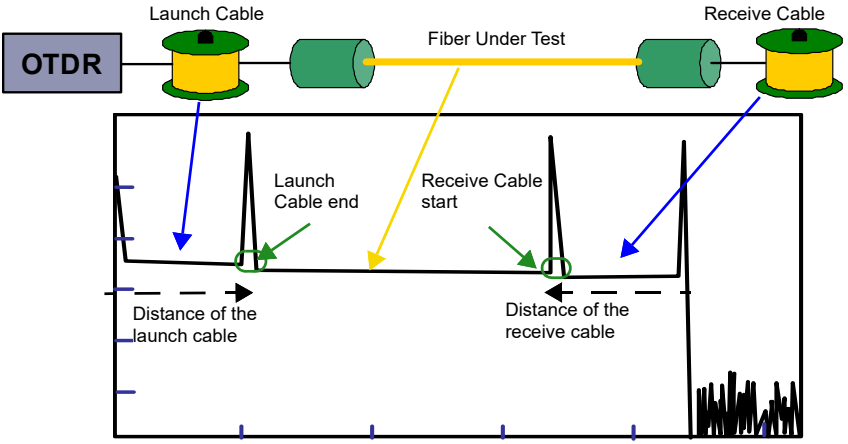
Not selected (=No) All the results are displayed and referenced relative to the connector on the module.

Selected If the parameter is elected, different settings can be defined:

Evt 1, 2, 3 The results relating to the launch cable are eliminated from the table. Attenuation and distances are then measured on the basis of the marker Evt 1, 2 or 3 as selected.

Length Press the **Length** selection a second time to display a keyboard. Enter the desired length value or measure the cable length using the key.

Figure 27 Launch Cable / Receive Cable



Include Link Connection

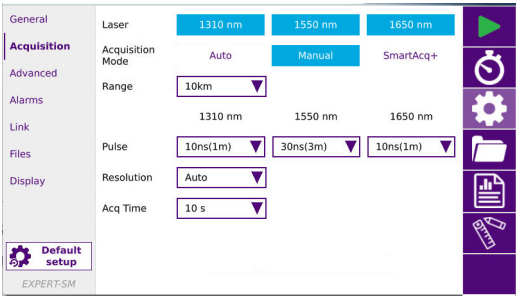
Defining the **Launch Cable** and/or **Receive Cable** parameter with an event number or a distance will automatically activate the corresponding parameter **Include Link Connection**. This parameter can be set to **Yes** if the budget/overall loss must include the launch/receive cable start/end connector loss.

If those parameters are set to **No**, the budget /overall link loss does not include these connectors in the calculation.

Configuring the Acquisition parameters

1 Once the **Setup** menu is opened, press **Acquisition** to configure the General parameters for OTDR acquisition

Figure 28 Acquisition parameters



Laser

The acquisition will be carried out on the wavelength(s) selected (for multiple-wavelength modules). The wavelengths available to select depend on the module type.

Acquisition Mode

Select the type of acquisition to be performed:

Auto — **Auto** mode selects the optimal acquisition parameters including a single, optimized pulse width for fast and efficient fiber link analysis.

Acq. Time is set to **Auto**, but can be adjusted (see "Acq. Time"page 38) "Acq. Time" page 40).

Manual — Manual mode allows users to configure each acquisition parameter (**Pulse** / **Range** / **Resolution** and **Acq. Time)**.

SmartAcq+ — (not available in Multimode) SmartAcq+ mode automatically sequences multiple pulse widths acquisitions to enhance the detection of all fiber link elements (splices, connectors…). It generates a consolidated results table and displays a single OTDR trace that seamlessly combines all utilized pulse widths. csor files (merged traces) are automatically saved at test completion. This mode is not recommended for bi-directional testing.

If the **Acquisition Mode** is defined with **Manual** parameter, then the following parameters can be defined/modified:

Range

The possible range depends on the pulse length selected. This range is given for each pulse length in the paragraph “Ranges” on page 101. This parameter is only configurable if **Acquisition** parameter is set to **Manual**.

Auto allows to detect automatically the range.The range is selected as a function of the detection of the end of the fiber.

Pulse

Parameter selectable only if **Acquisition** parameter is set to **Manual**. The range of selectable pulse widths varies by module type and will have values in the range 3ns to 20us.

In the case of a multi wavelength acquisition:

– you can define a pulse for each wavelength:

a select each wavelength in the **Laser** parameter and define a pulse

b Select one pule for each wavelength

See "Typical specifications" page 97.

Resolution

This parameter is only configurable if **Acquisition** parameter is set to **Manual**.

Auto resolution is selected automatically according to the last two parameters above.

High Resolution the highest resolution is applied

High Dynamic (not available in Multimode) the lowest resolution is applied to get the highest dynamic range.

The other values available depend on the module installed.

Acq. Time

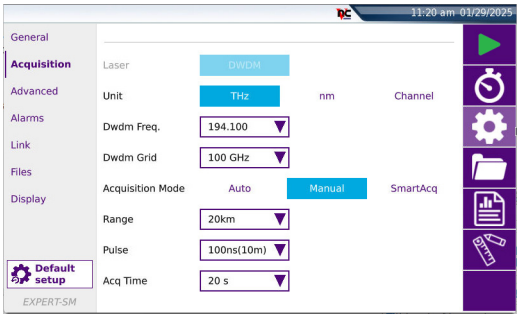
Manual Enter the acquisition time desired (from 5 s. to 5 minutes max).

Predefined Select one of the acquisition times predefined: 10 seconds / 20 seconds / 30 seconds / 45 seconds / 60 seconds / 90 seconds / 2 minutes / 3 minutes.

Specific Acquisition parameters with DWDM Modules

If a DWDM Module is installed onto the Platform, the **Setup** > **Acquisition** screen allows the configuration of specific parameters for acquisition on DWDM networks:

Figure 29 Acquisition parameters with DWDM module

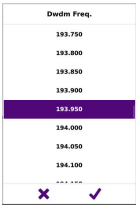


Unit

Define the wavelength unit to be used for acquisition: **THz**, **nm** or **Channel**.

Dwdm Freq. / Wavelength / Channel

The parameter is defined according to the **Unit** defined.



The acquisition will be carried out on the frequency/wavelength/channel selected from the list.

Click on ✓ to validate.

Dwdm Grid

Select one of the pre-defined grid to be used for acquisition: **25 GHz** / **50 GHz** / **75 GHz** / **100 GHz** / **200 Even** / **200 Odd**.

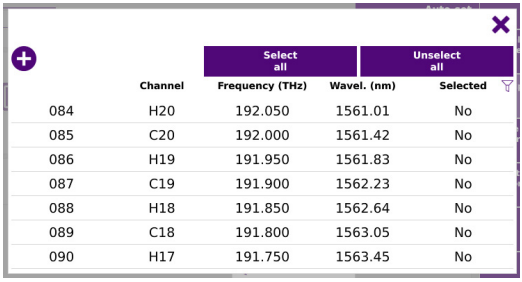
Or

Select **User** and press the **Edit Dwdm Grid** menu key to define a grid.

Defining a grid

1 Once the menu key **Edit User Dwdm Grid** is pressed, a table displays.

Figure 30 User-defined grid



2 To configure your own grid, click on one channel (highlighted) to switch from **Yes** to **No** and vice-versa.

or

Click on **Select all** or **Unselect all** to select all channels of the table, or to deselect the selected ones.

3 Once configuration of the grid is completed, press to return to Setup screen.
Changes to the table will be saved automatically.

Acquisition configuration

The last 3 parameters allows to configure the DWDM / CWDM acquisitions.

In the **Acquisition Mode** parameter, define the type of acquisition to be performed with DWDM/CWDM Module:

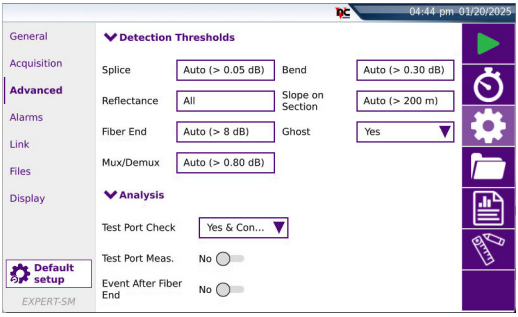
- **Auto**: The acquisition is performed with automatic configuration making the best compromise for Pulse/Range. When acquisition is complete, a measurement is made and the results are displayed.
- **Manual**: The acquisition parameters **Pulse** / **Range** and **Acq. Time** can be set by the user. See “Range”, “Resolution” and "Acq. Time" page 40.
- **SmartAcq**: This mode is a fully automated acquisition process which uses different pulse widths for a single wavelength to maximize the detection. The multiple acquisitions are combined to form a single graph and table of events per wavelength, combining the most relevant sections of each pulse.

Configuring the Advanced parameters

Click on **Advanced** to define:

- The **Detection Thresholds** for each different event
- The **Analysis** parameters
- The **Index of Refraction** to be defined
- The **Scatter Coefficient** to be used

Figure 31 Advanced - Detection Thresholds and Analysis parameters



Detection Thresholds

Splice

Select if a level of detection for splice must be defined.

Click on the text box and select a value:

– Enter a min level of detection, from 0.01 dB (**Min**) to 1.99 dB (**Max**).
– **No**: no splice detection
– **Auto**: to automatically detect splice

Reflectance

Select if level of detection for reflectance must be defined.

Click on the text box and select a value:

– Enter a min level of detection, from -98 dB (**Min**) to -11 dB (**Max**).
– **None**: no reflectance detection
– **All**: all reflectances are detected (click on  and validate to define **All**).

Fiber end

Once parameter is selected, click on the text box to display the numeric keypad and select the required value:

- **Auto** (recommended): option in which the equipment automatically detects the end of a fiber.
- **> 3** (**Min**) to **> 20 dB** (**Max**) (steps of 1 dB): threshold of detection of end of fiber.

Mux/Demux

Once parameter is selected, click on the text box to display the numeric keypad and select the required value:

- **Auto** (recommended): option in which the equipment automatically detects the mux/demux.
- **> 0.50** (**Min**) to **> 4.99 dB** (**Max**): threshold of detection of mux/demux.
- **None**: no mux/demux available.

Bend (not available in Multimode)

With any dual or triple-wavelength measurement module, the user will have access to the macro bend detection function in the test setup. Each event of the selected wavelengths will then be compared.

Once parameter is selected, click on the text box to display the numeric keypad and select the wished value:

- **None**: Bend will not be detected.
- **Auto**: Bend will be automatically detected (>0.30 dB).
- **Define by user:** Enter the bend value (in dB), with numeric keypad.

Slope on section

Define the section length for the slope detection.:

- Min: 0 / Max: 1000 m

Ghosts

Choice (**Yes** / **No** / **No Analysis**) of whether information relating to ghosts is to be displayed. If ghosts are displayed, the reflection icon in the table of results appears dotted and the reflection value is displayed in brackets on the trace, for example «(R:-50 dB)».

Analysis

Click on **Analysis** to open the sub-menu and define the detection level for each different event:

Test port Check

This parameter allows to choose if a test of the front connector must be performed when acquisition is launched.

- **No**: the OTDR connection is tested with indication Bad/Good.
- **Yes & Continue**: the OTDR connection is tested, and if the state is bad, the acquisition continues but a warning displays.
- **Yes & Abort**: the OTDR connection is tested, and if the state is bad, a warning displays and the acquisition stops.

Test port Meas.

This parameter allows to choose if a measurement of the front connector(s) must be performed.

- **No**: In the results table, the first line corresponds to the first event of the fiber under test or end of the launch cable.
- **Yes**: In the results, the first event corresponds to the front connector at 0 meter (loss and reflectance values are estimated).

Event After Fiber End

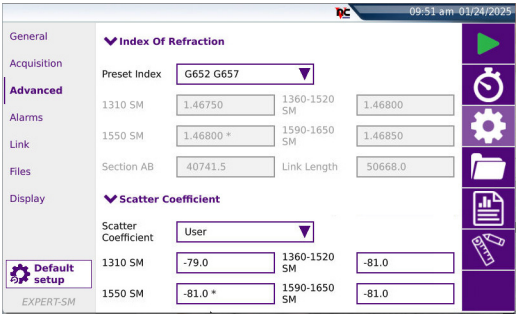
This parameter allows to choose if the event after fiber end must be detected.

- **No**: the event after fiber end are not detected during measurement.
- **Yes**: the event after fiber end is measured and displayed in trace and results table.

Index of Refraction

Click on **Index of Refraction** to open the sub-menu and define the group refraction index of the whole fiber.

Figure 32 Advanced - Index of Refraction and Scatter Coefficient



Preset Index

User Define for each wavelength (1310 SM, 1360-1520 SM, 1550 SM, 1590-1650 SM) a refraction index of 1.30000 to 1.69999. The selection of an index alters the value of the section AB (actual distance between cursors A and B).

or,

If the actual distance between the cursors A and B is known, enter its value under **Section AB** to establish the index of the fiber. Selection of this distance causes the display of the indices. The extreme distance values are given by the index values (1.30000 to 1.70000).

or

You can also enter the **Link Length**, if it is known, using the Numeric keypad.

Predefined It is possible to choose one of the predefined values given for certain cables. The corresponding indices given in the table below are repeated on the screen.

Figure 33 Predefined index values (Single Mode)

Wavelength (nm)	1310 SM	1360 - 1520 SM	1550 SM	1590 - 1650 SM
Generic G652 G657	1.46750	1.46800	1.46800	1.46850
Generic G653 G655	1.46750	1.46800	1.46800	1.46850
Generic G 654 E	1.46550	1.46550	1.46550	1.46550

Figure 33 Predefined index values (Single Mode)

Wavelength (nm)	1310 SM	1360 - 1520 SM	1550 SM	1590 - 1650 SM
ATT SM	1.46600	1.46700	1.46700	1.46700
Corning SMF-28	1.46750	1.46810	1.46810	1.46810
Corning SMF-DS	1.47180	1.47110	1.47110	1.47110
Corning SMF-LS	1.47100	1.47000	1.47000	1.47000
Corning-Leaf	1.46890	1.46840	1.46840	1.46900
Draka SMF	1.46750	1.46800	1.46800	1.46850
Draka Longline	1.46700	1.46700	1.46710	1.46750
Draka Teralight	1.46820	1.46820	1.46830	1.46850
Draka Benbright	1.46750	1.46750	1.46800	1.46850
Fitel Furukawa	1.47000	1.47000	1.47000	1.47000
OFS Lucent Allwave	1.46750	1.46750	1.46750	1.46850
Lucent Truewave	1.47100	1.47100	1.47000	1.47000
SpecTran SM	1.46750	1.46810	1.46810	1.46810
Sterlite	1.46700	1.46700	1.46750	1.46750
Sumitomo Litespec	1.46600	1.46600	1.46700	1.47000
Sumitomo Pure	1.46600	1.46600	1.46700	1.47000

Figure 34 Predefined index values (Multi Mode) - Not available in SmartOTDR

Wavelength (nm)	850 MM	1300 MM
Corning 62.5	1.50140	1.49660
Corning 50	1.48970	1.48560
SpecTran 62.5	1.49600	1.49100
Generic 50	1.49000	1.48600
Generic 62.5	1.49000	1.48700
Generic OM1-62/125	1.49600	1.49100
Generic OM2-3- 4 50/125	1.48200	1.47700

Scatter coefficient

Click on **Scatter coefficient** to open the sub-menu and define the value for the backscatter to be used in measurements (see Figure 32 on page 46). **Auto** is the recommended setting.

Scatter Coefficient

User Select, for each wavelength, the backscatter coefficient of -99 dB to -50 dB by increments of 0.1dB. Modification of the backscatter coefficient K changes the measurements of reflectance and ORL.

Auto Backscatter coefficients are selected automatically for each wavelength.

In Multimode, two predefined scatter coefficients are available:

Generic 50 850 MM - > -66.3 dB
1300 MM -> -73.7 dB

Generic 62.5 850 MM -> -66.1 dB
1300 MM -> -70.3 dB

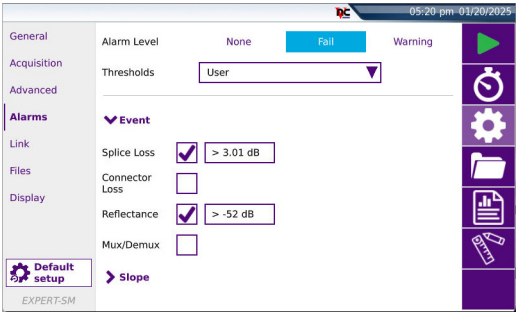
The default values are given in the paragraph "Reflectance" page 3.

Configuring the Alarms parameters

In the **Setup** menu, press **Alarms**.

Once the **Alarms** menu is displayed, configure the thresholds to be applied to the measurement. No need to redo an acquisition to apply them to the current measurement.

Figure 35 Alarms parameters



Alarm Level

None The alarm function is not active.

Warning This menu lists possible minor alarm thresholds which the user could select. If results are between those thresholds and the «fail» thresholds, they will be displayed in yellow in the table of results

Thresholds can be set for: Splice Loss / Connector Loss / Reflectance.

Fail This menu lists possible major alarm thresholds that the user could select. If results are above those thresholds. If Fail is selected, select in the Threshold parameter to defined values either manually or according to standards:

– **User**: define your own thresholds values for one or several elements:

Event: Splice Loss / Connector Loss / Reflectance / Mux/Demux

Slope: define the slope thresholds for each wavelength

Link: Loss Min. / Loss Max / ORL / Length Min. / Length Max..

– **TIA-568 3 / TIA-568 3.RL35** / **ISO/IEC 11801 (2010)** / **ISO/IEC 14763-3 (2014 / 2019)** / **IEC 61280-4-5 (2020)** / **Default:** Select one of this parameter to configure the alarm thresholds with predefined values:

Table 3 Singlemode Modules

	Splice Loss	Connector loss	Reflectance	Slope	ORL	Mux/ Demux
Default	> 0.30 dB	> 0.50 dB	> - 35 dB	> 1.00 dB/km	< 27 dB	No
TIA-568.3	> 0.30 dB	> 0.75 dB	No	> 1.00 dB/km	No	-
TIA-568.3 RL35		> 0.75 dB	> - 35 dB	> 1.00 dB/km		-
ISO/IEC 11801 (2010)		> 0.50 dB	> - 35 dB	> 0.40 dB/km		-
ISO/IEC 14763-3 (2014)		> 0.75 dB	No	> 0.40 dB/km		-
ISO/IEC 14763-3 (2019)		> 0.75 dB	> - 35 dB	> 0.40 dB/km		-
IEC 61280-4-5 (2020)		> 0.75 dB	> - 35 dB	> 0.40 dB/km		-

Table 4 Multimode Modules

	Splice Loss	Connector loss	Reflectance	Slope	ORL	Mux/ Demux
Default	> 0.30 dB	> 0.50 dB	> - 35 dB	> 1.50 dB/km	< 27 dB	No
TIA-568.3	> 0.30 dB	> 0.75 dB	No		No	-
TIA-568.3 RL35		> 0.75 dB	> - 35 dB			-
ISO/IEC 11801 (2010)		> 0.30 dB	> - 20 dB			-
ISO/IEC 14763-3 (2014)		> 0.50 dB	No			-
ISO/IEC 14763-3 (2019)		> 0.75 dB	> - 35 dB			-
IEC 61280-4-5 (2020)		> 0.75 dB	> - 35 dB			-

If results are above those thresholds:

- they are highlighted in red in the table of results
- the icon appears at the top right of the screen
- in SmartLink view, the event is framed in red with a red icon
- if at least one results is in red (event, slope or link), the fail icon is displayed on the top right of the screen- see page 21

If all the results lie within the thresholds

- they are displayed in green in the table
- the icon is displayed at the right top of the trace.
- in SmartLink view, the event is framed in green with a green icon
- the global alarm icon may be green but some results may be displayed in orange (warning) - see page 21.

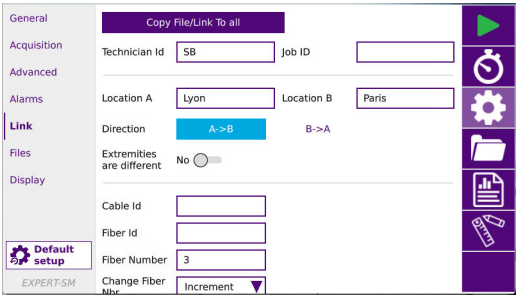
If results are very close to the fail thresholds, without exceeding the fail values:

- they will be displayed in yellow in the table of results
- in SmartLink view, the event is framed in yellow with a yellow icon

Configuring the Link parameters

In the **Setup** menu, press **Link**.

Figure 36 Link Description parameters



The information entered in the **Link Description** window concerns the editing and/or the modifications of the cable and fiber parameters. When a trace is recalled without recall of the configuration, the parameters of this trace will be present only in its signature. Link description parameters are recorded in the results files as they are of use for analytics including post processing.

Copy File/Link To all

The softkey **Copy File/Link To all** allows to apply the Link and File configuration parameters of the current applications to all the other active Fiber Optic applications (powermeter and source).

Technician Id

Click on the text box to enter the name of the operator carrying out the measurement.

Job Id

Click on the text box to enter a description of the measurement to be performed.

Direction

The direction shows if the acquisition has been made from the origin to extremity (A->B) or from the extremity to origin (B->A). Changing direction in the trace simplifies post-processing e.g. for manual bi-directional analysis.

Location A

The name of the Location A of the link may be entered here, using the onscreen keyboard.

Location B

The name of the Location B of the link may be entered here, using the onscreen keyboard.

Extremities are different

In some cases, it is interesting to save different information for the origin and the extremity of the cable.

Select **Yes** if the extremities are different.

In this case, the following parameters are different for each location.

Cable Id

This parameter allows to enter an identification of the cable, using the onscreen keyboard.

Fiber Id

Click on the text box to enter a name for the fiber, using the onscreen keyboard.

Fiber Number

1 Click on the text box to modify the parameter using the numeric keypad.

The fiber number can be automatically incremented/decremented at each new file save if it has been configured in the File Setup page (see “Configuration in Test Auto mode” on page 58).

Change Fiber Nbr

Increment the fiber number is automatically incremented at each new file-save.

Decrement the fiber number is automatically decremented at each new file-save

User defined Click on the text box to enter the increment/decrement value for fiber number.

– Note: to decrement the number, enter the sign «-» before the number. Example: -1.

Min: -999 / Max: 999 / Auto: 0

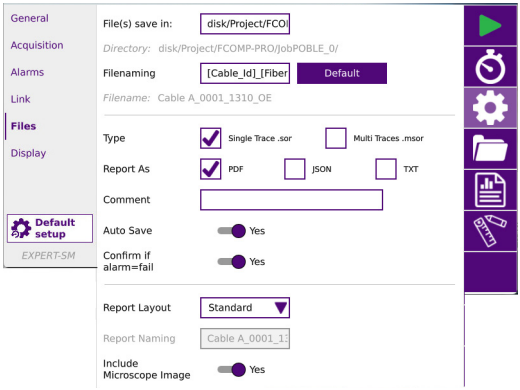
No the Fiber number must not automatically modified.

Configuring the Files parameters

The **Files** storage parameters must be also configured, in order to define how and where the results will be saved in the file system of the equipment.

1 In the **Setup** menu, press **Files**.

Figure 37 Files parameters



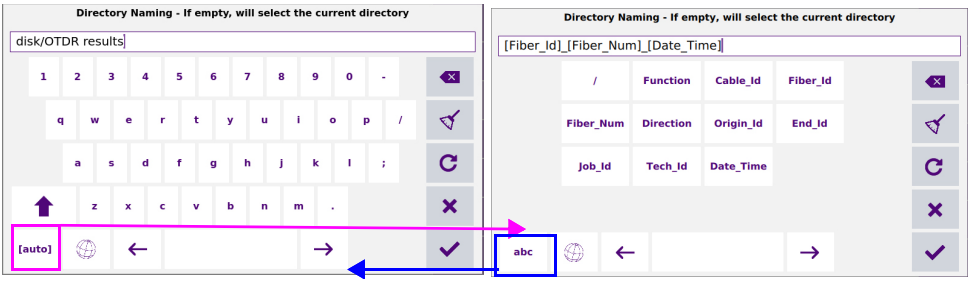
File(s) save in

Click on the text box to display the keyboard and define the directory for files saving

In the onscreen keyboard, select the pre-defined parameters available or, press **abc** key to enter a name manually for the directory. Then, press **Enter** to validate.

Example: `disk/OTDR results`

Figure 38 Directory - Onscreen keyboard



or

Click on  or leave the box empty to select the Current Directory for file saving.

Press  to validate.

Press  to modify the keyboard language: English / French / German.

Directory

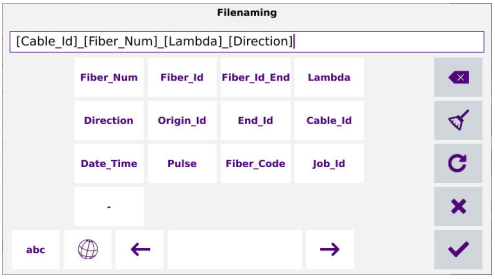
This field displays the directory selected/created into which the file(s) will be saved.

Filenaming

Click on the text box to modify the name of the file for the result trace.

Use the onscreen keyboard to view and select the pre-defined parameters available or, press **abc** key to enter a name manually for the file.

Figure 39 Filenaming - Keyboard (auto)



or

Click on or on the **Default** button to apply the name by default to the file:

`[Cable_Id]_[Fiber_Num]_[Lambda]_[Direction]`

Press to validate.

Press to modify the keyboard language: English / French / German.

The name of the file is displayed in grey under **Filenaming** parameter

Type

In this parameter, select the file content for traces saving:

Single Trace .sor in case of traces in overlay, each trace is saved in a distinct file (.sor extension).

Multi Traces in case of traces in overlay, all traces are saved in one single file (.msor extension).

Report

Select the report format to be generated:

PDF select to generate a report in a pdf file.

JSON select to generate json file(s) compatible with VIAVI test process automation (job manager and StrataSync cloud data management system).

TXT select to generate a txt file of the results.

If all parameters are defined with **No**, only the .sor (or .msor/.csor) file will be saved.

Comment

Click on **Comment** text box to enter a specific comment to the project.

Auto Save

Select **Yes** to store automatically the trace or traces resulting from each acquisition according to the filenaming rules. If the filename already exists, the user will be prompted to overwrite the "old" result or discard the current result and keep the "old" file

Confirm if alarm = fail

Select **Confirm if alarm = fail** to display a confirmation dialog box if a value exceeds alarm thresholds, and to be able to choose to save or not the trace.
If no alarm is detected on trace, it is automatically stored.

Report Layout

This parameter allows to define the report page setting and is available exclusively if a **pdf** and/or **txt file** has been defined in the **Report As** parameter.:

Standard	in multi-traces display, one pdf report page is generated for each trace.
Consolidated	in multi-traces display, one pdf report page is generated for all traces

Report naming

If **Consolidated** is defined for **Report Layout**, click on the Report Naming text box to modify the name of the report file for the result trace.

Using the onscreen keyboard, enter a name manually for the file and press  to validate.

If no name is entered, the report name by defaut applies: `Report_SM/MM-OTDR`.

Include Microscope Image

In the report page, an image of the scope test result can be displayed on the upper part of the report. Select **Yes** to include the scope test result image into the report.

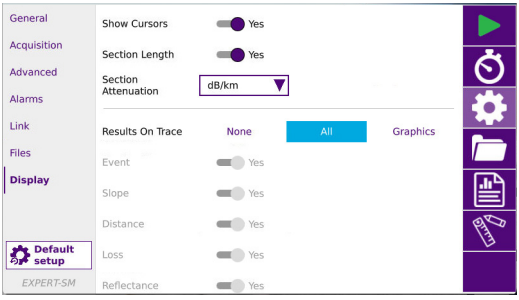
NOTE

This parameter is available only if the **PDF** report format is selected.

Configuring the Display parameters

In the **Setup** menu, press **Display**.

Figure 40 Display parameters



Show Cursors

No the Cursors A and B are hided on Trace view

Yes the Cursors A and B are displayed on Trace view.

Section Length

Define if the distance between the marker of the event and the previous marker must be indicated in the results table: select **Yes** or **No**.

Section Attenuation

dB/km Displays the section slope in the table of results. If the fiber is too short to measure the slope accurately, no value is displayed (empty field).

dB Displays the section loss in the table of results. With short fiber where the slope cannot be measured with a good accuracy, the loss in dB is approximate and displayed.

None The section attenuation and Loss values are not displayed in the table of results.

Results on trace

According to the selection, the trace will show:

None the trace alone

All	the trace with results value (loss, position, reflectance...) and markers.
Graphics	the trace with event markers only.

Configuration in Test Auto mode

The **Default setup** key 

imposes the parameters for acquisition, measurement and display of results defined as default settings in factory.

Press key **Default setup** and confirm the changes to Default in the dialog box.

ADVANCED	DETECTION	Splice	**Auto**
		Reflectance	**All**
		Fiber End	**Auto**
		Mux/Demux	**Auto**
		Bend	**Auto**
		Slope on section	**Auto**
		Ghost	**No**
	ANALYSIS	Test Port Check.	**Yes & Continue**
		Test Port Meas.	**Yes**
		Event After Fiber End	**No**
	INDEX OF REFRACTION		**G652 G657**
	SCATTER COEFFICIENT		**Auto**
	ACQUISITION	Laser	**All**
		Acquisition Mode	**SmartAcq+**
	ALARMS	Alarm Level	**None**
	LINK	Change Fiber Nr	**Increment**
	FILES	Filenaming	**Auto filenaming**
		`Cable_Id][Fiber_Num]_[Lambda]_[Direction]`	
		Auto Save	**Yes**
		Confirm if alarm=fail	**No**
	DISPLAY	Section Length	**Yes**
		Section Attenuation	**dB/km**
		Results on trace	**Graphics**

Performing acquisitions in Expert OTDR mode

Performing acquisition in Real Time

To carry out an acquisition in real time:

1 In OTDR Expert Setup or Results page, press  .

The red **Testing** indicator will go on to show that real time acquisition is in progress. The trace acquired is displayed in real time.

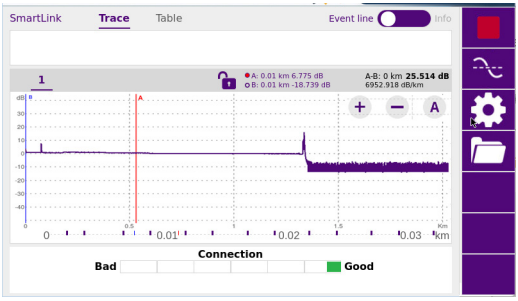
An indicator of the state of the connection (**Good/Bad**) is displayed below the trace:

Table 5 Connection indicator

State	Connection 
Good	The connection is OK
Bad	• There are several connectors close to the external connector of the equipment • One of the connectors is dirty or badly connected. Replace the launch cable, make the connection again properly or clean the connector of the OTDR or of the jumper. • No fiber is connected.

If the state of the connection is bad, it is still possible to carry out a measurement, but the results will not be very reliable.

Figure 41 Example of acquisition in Real Time



Traffic detection

Traffic on the fiber under test is automatically detected and reported.

Press the **START** key to begin the measurement. A message indicates there is traffic on the fiber and asks you if you wish to continue or not:

- If you click on **NO**, the measurement is not launched.
- If you click on **YES**, the measurement is performed, despite the traffic.

NOTE

If the measurement is validated despite the traffic (key **Yes**), the next measurement is automatically performed, even if traffic is still detected on fiber.

If the measurement is canceled (key **No**), and the **Start** pushed another time, the box asking if you wish to continue or not is displayed.

The functioning of Traffic Detection is then indicated in the scaled down representation of trace, on the upper left part of screen: **LFD** is flashing.

During an acquisition in real time, several actions can be made on results in progress: see "Actions on trace during acquisition" page 62.

Stopping the real time acquisition

To stop or interrupt an acquisition in real time mode, press  at any time.

Performing an acquisition with Expert OTDR

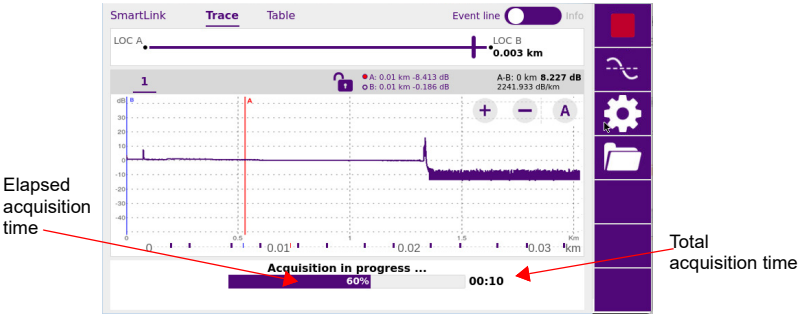
In this mode, the equipment carries out a number of averagings defined as a function of the maximum acquisition time specified in the Acquisition menu, and then terminates the acquisition.
The acquisition is carried out with the parameters previously selected in the **Setup** > **Acquisition** menu. It may be stopped at any time using the **Stop** key.

1 Press  to start the acquisition.
The red indicator goes on to show that the product is in process of acquisition and the screen displays the trace in process of acquisition.

2 The quality of the connection is displayed for a few seconds (see Table 5 on page 59)

3 Then, a bar graph shows elapsed and remaining acquisition time.

Figure 42 Acquisition in progress with Expert OTDR



At the end of the acquisition, a beep is emitted, the trace is displayed and an automatic measurement is started.

NOTE

During acquisition, the traffic on fiber is automatically detected (see "Traffic detection" page 60)

NOTE

To stop the acquisition, the **Stop** key may be pressed at any time. Then an automatic measurement is carried out, but some events can not be detected (a manual measurement must then be made).

Multi-wavelength acquisition

If the module possesses several lasers, to perform successive acquisitions on all the wavelengths:

1 In the **SETUP** menu, select **Acquisition** > **Laser** and ensure that several lasers are selected.

2 Start the acquisition by pressing  .

3 Once the acquisition for the first wavelength is finished, the acquisition for the following wavelength starts automatically.

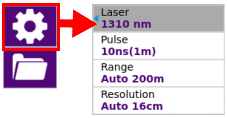
The different traces appear in the same window and can be handled similarly to overlaid traces (see "Overlay trace function" page 74).

Actions on trace during acquisition

During an acquisition, several actions are available on results in progress.

Modifying acquisition parameters (Real Time mode only)

You can modify the acquisition parameters during the acquisition:



1 Press  .

2 Scroll through the possible values of the parameters.

Performing measurements during acquisition (Real Time mode only)

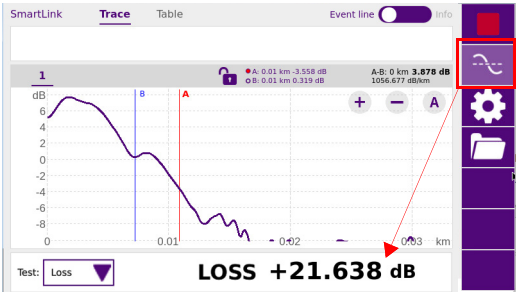
The real time mode allows to make Loss, ORL or Reflectance measurement using the A & B cursors and the key **Average**:

1 Position A & B cursors on the trace

2 Click on  .

3 Define the measurement wished (Loss, ORL or Reflectance) in the **Test** scrolling menu and get the result between A & B cursors.

Figure 43 Example of loss measurement



Actions on Display

- Positioning Cursors A and B

  Click on the Cursor line on the trace to select the cursor, and click on the trace:
  - Set both cursors A & B to control distance between two points.
  - Set one cursor A or B to get the distance from one point.
  - Set one cursor A or B to zoom on this cursor
- Zooming on trace

  Click on the key + or − to zoom in or out on the trace.

  Click on the key A to get an automatic zoom on trace during acquisition.

  See “Zoom function” on page 25
- Shifting the trace

  The trace can be shifted vertically or horizontally during the acquisition: Click on the trace and move upward/downward or toward left or right (see “Shift function” on page 26)
- Displaying **Trace** or **SmartLink** page

  Click on **Trace** or **SmartLink** to display either:
  - the acquisition trace in progress and the bar graph of time
  - the **Smart Link** page with exclusively the bar graph of time.

  In the case of measurement on several wavelengths, once a measurement is completed for one wavelength:
  - the **Trace** function allows to display the trace and results table for this wavelength.
  - the **Smart Link** function allows to display a graphical view of results for this wavelength.

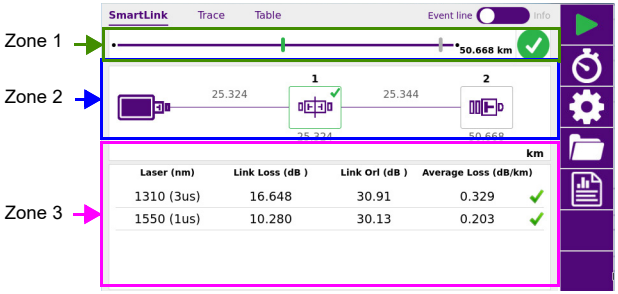
Results display

The traces acquired or recalled from a memory are displayed on the Results page.

SmartLink view

Once the results trace is displayed, click on **SmartLink** key to display the Smart Link view. At the end of the acquisition, a screen as the following one is displayed:

Figure 44 SmartLink function

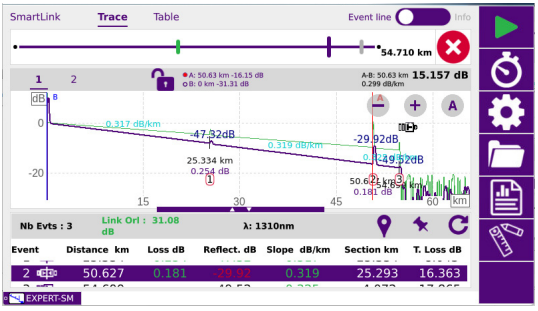


See “SmartLink view” on page 17 to get a full description of the view.

Trace View

To display the trace and results table, click on **Trace**.

Figure 45 Example of results trace with Expert OTDR



- On the upper right side, the alarm icon is displayed (if some alarm thresholds are defined in the pre-loaded configuration file).

Table 6 Alarms display

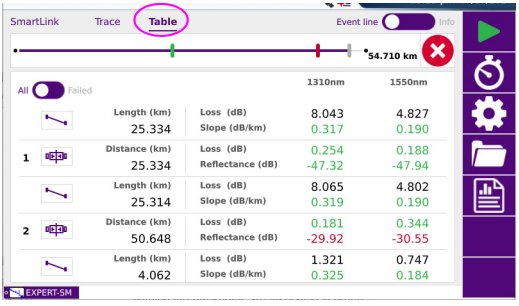
Fail	Indicates that at least one result exceeds the alarm thresholds defined in the configuration file used for acquisition Results are displayed in red in table. If at least one results is in red (event, slope or link), the fail icon is displayed on the top right of the screen- see page 21
Valid	Indicates that all the results lie within the thresholds (no result in red/yellow) Results are displayed in green in the table. The global alarm icon may be green but some results may be displayed in orange (warning) - see page 21

See “Trace View” on page 20 to get a full description of the view.

Table View

From the results screen, click on **Table** to display exclusively the measurement results in a table.

Figure 46 Table View



The list of all the events detected during acquisition or manually measured are displayed in a table:

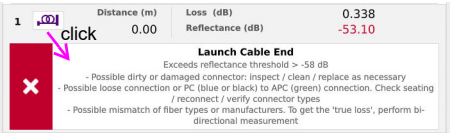
- The events exceeding alarm thresholds are displayed in red, whereas those lying withing the thresholds are displayed in green.

Select **Failed** on the button 

to display exclusively the results exceeding the thresholds.

- Click on one event to display the event type under its values, and the alarm icon if alarm thresholds have been defined. If a fail alarm is detected; a description of the possible cause(s) for this alarm is displayed.

Figure 47 Results table - event details



Changing the type of an event

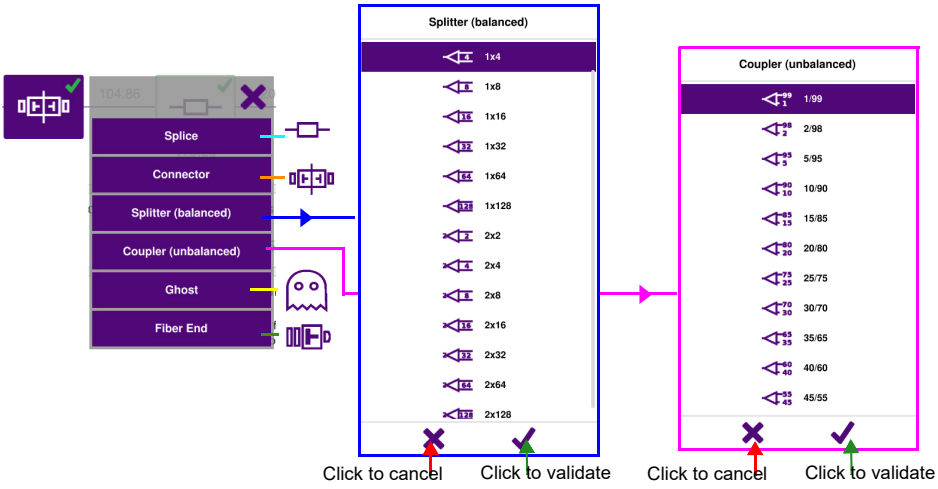
The type of event can be modified, either from **Trace**, **SmartLink** or **Table** view:

1 Maintain pressed the icon to be modified, in the results table.

2 In **SmartLink** or **Table** view, in the menu open, select the new type of event to be applied.

In **Trace** view; click first on **Event Code**, and select the new type of event to be applied.

Figure 48 Event Code



Click on **the cross** to cancel the modification.

NOTE
The event modification is automatically applied on trace and in the results table.

Advanced functions

Several actions on trace displayed can be performed in ExpertOTDR mode.

Automatic measurement and detection

Automatic mode enables rapid detection of all the faults in the trace. The faults detected are then measured and identified on the screen by markers. Only the results exceeding the detection threshold defined in the Setup menu are displayed

By means of this method of detection, you can quickly locate all the faults in the fiber under test.If an automatic measurement does not detect all the events, additional manual measurements can be carried out.

The following procedure is then recommended:

1. By default, the instrument locates the events and proceeds to the measurements.
2. Addition of events (see “Addition of events” on page 68) in the cases of splices showing low attenuation and of close events. The T-BERD/MTS then automatically measures the slope before and after the markers selected and measures the attenuation of the splice.
3. Addition of manual measurements if necessary (for deeper analysis). The T-BERD/MTS performs the measurements requested by the user.

To carry out an automatic measurement at any time, and get back to the events automatically detected at the end of the acquisition, click on the icon on the right of the results table.

This action will delete all the events manually added, if any.

Addition of events

You can also manually place markers in addition to those positioned automatically during automatic measurement.

Representation of the events

To add markers of events:

1. Select a cursor (A or B).
2. Move the cursor to the place where you want to position a marker.
3. Press the icon .
4. A marker and an event number are displayed at the position of the cursor and a measurement is carried out on the event.

   Measurement of slope before the marker starts just after the previous event (or at the end of the dead zone at the beginning of the fiber); measurement of slope after the marker stops just before the next marker or at the end of the fiber.

Hints on the positioning of markers

- Do not add markers after a manual measurement, as all the results will be recalculated automatically by the instrument.
- If two markers are too close together, they will appear on the trace and the table but no measurement will be carried out on the second marker: to obtain results for this marker, a manual measurement is necessary.
- If you press the key when the cursor is very close to a marker, the latter will be deleted.

Deleting events

To delete an event, move the cursor onto the event and press the key . The event selected will be deleted and a complete measurement, without this event, is carried out.

Deletion of events can cause incorrect measurement results.

Manual measurements

As soon as you have made an acquisition, with or without automatic measurement, you can make manual measurements on any event on the trace by means of the cursors A and B, in association with the functions of slope, detection of splice and calculation of ORL.

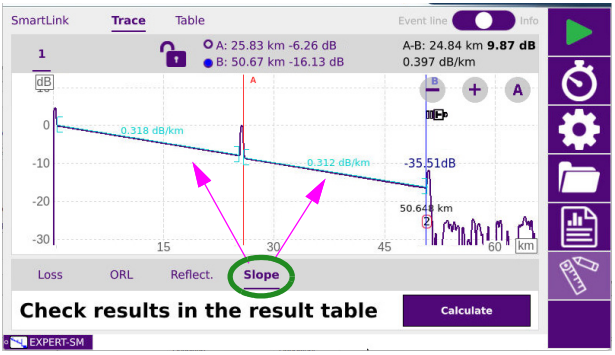
The manual measurements are accessible in the **Results** page, after pressing .

Measurements of slope

To make a manual measurement of slope, display the trace and press the **RESULTS** button to call up the trace and then:

1. Place the cursor A at the beginning of the section of the trace where the slope is to be measured.
2. Place the cursor B at the end of this section.
3. Press the key .
4. Press **Slope** in the manual measurements bar.
5. Press **Calculate** key.
   The slope of the specified trace section is displayed.

Figure 49 Manual Measurement results



The result is displayed on the screen between the two slope indicators [and].

The measurement results are also available in the table:

Click again on  to return to results table display.

"Distance" shows the distance between the beginning of the trace and the end of the slope;

If no result is displayed in the table, this means that the distance between the cursors A and B is too small.

Deleting a slope measurement

To delete a particular slope measurement result:

1. Superimpose the cursors A and B on the slope concerned.
2. Press  and click on **Slope** in the manual measurement bar.
3. Press **Calculate** key.
   The slope of the specified trace section is deleted.

Measurement of ORL

It is possible to carry out an ORL measurement on a part of the fiber.

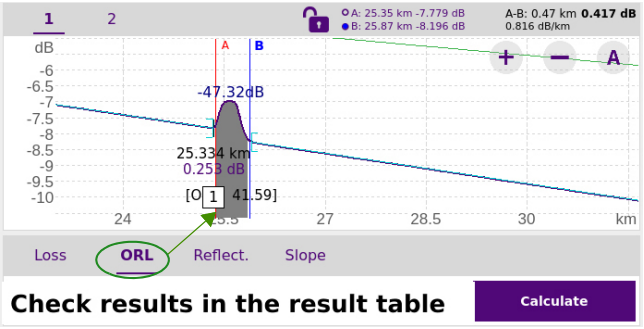
Follow the following procedure to measure a part of the fiber:

1 Position the cursors A and B to delimit the section that you wish to measure.

2 Press , then select **ORL** from the manual measurement bar.

3 Press **Calculate** key.
The ORL is measured for the section of trace defined.

Figure 50 Result of ORL measurement



ORL on a saturated trace

If saturation occurs during an ORL measurement, the result is given with the sign **<**. This means that the actual ORL value is less than the value displayed.

Measurement of Reflectance

It is possible to carry out a reflectance measurement of a Fresnel for a reflective event.

Follow the following procedure to measure the reflectance:

1 Position the cursor A at the base of the peak

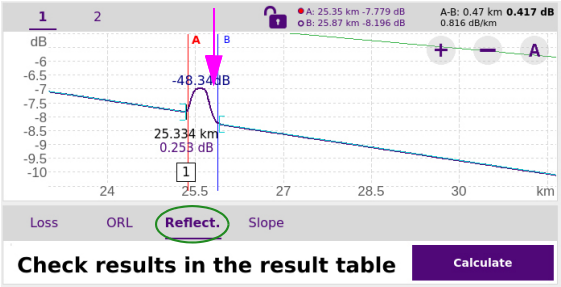
2 Position the cursor B at the top of the peak of the required Fresnel, or after the peak to calculate automatically the maximum reflectance.

3 Press , then click on **Reflect.**.

4 Press **Calculate** key.

The Reflectance value is defined in dB, and displayed in the trace in purple.

Figure 51 Reflectance measurement



Splice measurements

There are two methods of carrying out manual measurements of splices on the trace: the two-cursor method and the five-cursor method.

The five-cursor method is the more accurate, as it takes into account the difference of level between the slope before the splice and the slope after the splice. This method should be used whenever possible.

If very close events have created a dead zone preventing the measurement of slope by the five-cursor method, it is possible to use the two-cursor method. This considers the difference in level between the cursors.

Before performing one of these measurements, define in the **Setup** menu the splice detection threshold.

Two points method

To perform a splice measurement by the "two-points" method, display the **Results** page, then:

1. Place cursor A exactly on the fault, then place cursor B after the splice that you wish to define.
2. Press  , then click on **Loss**.
3. Select the function **2 Pt Loss**.
4. Press **Calculate** key.

The splice marker is placed at the point defined by the first (left-hand) cursor and the result is displayed on the screen. If the fault is reflective, the reflectance value is also measured and displayed. These results are added to the table of results.

NOTE

If you try to measure a splice on a slope, the measurement is not carried out and the following error message is displayed: "`Slope found between two cursors`".

Five points method

To carry out a splice measurement by the "five points" method:

1. Measure the slope preceding the fault to be measured, then the slope following it.
2. Place the cursor on the fault (between the two sections).
3. Press  , then click on **Loss**.
4. Select the function **5 Pt Loss**.
   Five cursors (A, a, B, b and C) are displayed on the trace.
5. Press **Calculate** key.
   The splice event marker is placed on the cursor and the result is displayed on the trace and in the table of results.

NOTE

If no result is displayed, it is possible that the display threshold of the attenuation measurement result is higher than the attenuation that you are trying to measure.

NOTE

If you try to measure a splice on a slope, the measurement is not carried out and the following error message is displayed: `Slope found between two cursors.`

Memorization of the position of events

Press the icon  to lock markers so all the events measured will be measured on all future traces that are taken.

The positions memorized will then be used in the subsequent measurements, either at the end of the manual acquisition, or when a stored trace is recalled.

NOTE
This function memorizes the markers placed on the current trace.

The following procedure is recommended to start a measurement with markers:

1 Carry out an automatic measurement.

2 Memorize the position of the events selecting the key .

3 Add the manual measurements required (key **Analysis**).

CAUTION

If an event is added (with the key) after manual measurements have been performed, then all the events on the trace will be converted into AUTO markers and an automatic measurement will be performed using these events. The previous manual measurements will be lost.

Provided the event lock, the automatic measurement following the acquisition is carried out using the events which were present before the acquisition.

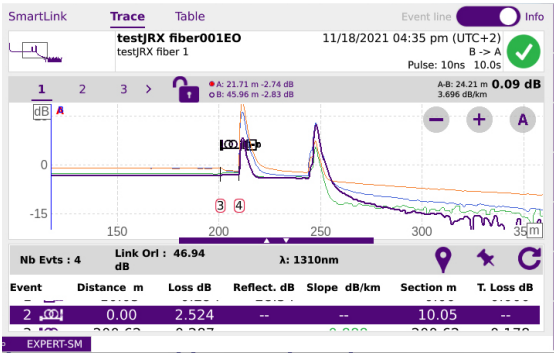
If you wish to make a measurement without events, deactivate memorization of events by pressing the key .

Overlay trace function

This very useful function enables up to eight traces to be displayed on the screen at once:

- either to compare traces acquired on a number of different fibers in the same cable,
- or to observe changes over time in traces taken of one and the same fiber.

Figure 52 Example of overlaid traces



Overlaying several traces stored in memory

To display up to 18 traces from the memory, deleting the current trace(s) already loaded:

1 Press  .

2 Select the files of the traces for display.

3 Press the **Load key**.

4 Press **View trace(s)**.

5 When loading is complete, the **Results** screen appears: the first trace selected is the active trace (in purple), the other traces being overlaid.

Display of traces in overlay

- The traces are shown in different colors (the active trace is purple).
- Their serial numbers are displayed above the trace view: click on one trace number to activate this trace.
- The OTDR markers are referenced on the active trace by the symbol | and the event number, and on the other traces the markers are hidden.
- Measurements can only be made on the active trace and not on overlaid traces. To make measurements on a trace in overlay, it must first be selected, clicking on its corresponding number.

Adding traces in overlay

With one or more traces already displayed, to add further traces to the display (the number of traces displayed cannot exceed 8):

1 Define at least one trace as reference (see page 77)

2 Press  , and in the Explorer, select the files of the traces to be added.

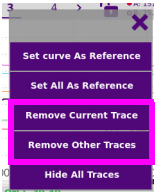
3 Press **Load** key.

4 Press the **View Trace(s) or Load Trace + Config.**
When loading is complete, the new traces are displayed in overlay with those that were defined as reference traces (see."Reference Trace function" on page 77).

Removing a trace

Removing the current trace in overlay

It is possible to remove a trace displayed. To do this:



1 Long click on its number.
A new menu displays.

2 Click on **Remove Current Trace**.

Removing all the traces in overlay

To remove all the traces except the current trace:

1 Long click on the number of the trace to keep
A new menu displays.

2 Click on **Remove Other Traces**.

Hiding the overlaid traces

To hide all the overlaaid traces, except the active trace:

1 Long click on one trace number.
A new menu displays.

2 Click on **Hide all traces**.
All the overlaid traces are hided, but are still opened.

3 Click on another trace number to display exclusively this trace, and hide all the others.

To show all the traces again, long click on one trace number and click on **Show All Traces**.

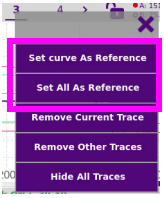
Reference Trace function

The reference trace function consists in defining trace(s) which will be «blocked» on screen and used as models before acquiring or loading other standard trace(s).

Use of the reference trace function in the Result page

Once one or several trace(s) is/are displayed, after an acquisition or loaded from the explorer:

1. If several traces are in overlay, check the correct current trace is selected: its number is displayed in purple and underlined.
2. Long click on this trace number.
   A new menu displays.
3. Click on **Set curve As Reference**.
   – The active trace becomes the reference trace: the trace number is displayed with square brackets and with a REF indicator [1]REF.



To define all the traces displayed as reference traces, click on **Set All As Reference** key (whatever is the active trace).

NOTE

If several traces are defined as reference traces, the color of the REF mark differs for each trace: [1]REF [2]REF [3]REF [4]REF.

Removing the reference trace(s)

To change one reference trace into a «standard» trace, select it using the trace number menu, and, after a long click to open the menu, click on **Reset Reference**.

To change all the reference traces displayed into «standard» traces, whatever is the active trace, long click on a trace number and, in the menu, click on **Reset All Reference**.

Performing an acquisition once one or several trace(s) is/are defined

Three situations can occur once an acquisition is performed:

- Only reference trace(s) is/are displayed: the trace acquired is added to the reference ones.
- Reference trace(s) and «standard» trace(s) are displayed: the reference trace(s) are «blocked», the standard ones are removed and the new trace acquired is displayed with the reference one(s).
- No reference trace(s) defined: all the «standard» traces are removed and only the new trace acquired is displayed.

Using the reference trace function in the explorer

A trace stored in memory can be set as reference trace before loading one or several «standard» trace(s).

To open one or several reference trace(s)

1. Go on the **File** Explorer clicking on  from the results page.
2. Select the trace(s) to be defined as reference
3. Click on **Load** and select **Reference = Yes** on the key 

.
4. Click on **View Trace(s)** or **Load Trace + Config.**
   The REF mark appears on the trace number.

To open «standard» traces to be added to the reference ones

1. Go back to the Explorer.
2. Select the trace(s) to be opened in the same screen as the reference traces
3. Click on **Load** and select **Reference = No** on the key 

4. Click on **View Trace(s)** or **Load Trace + Config.**

Saving the trace(s) and generating a report

Once the results page is displayed, the trace(s) can be saved and a report can be generated directly from the results screen, **in Expert Mode only**.

The traces saving and report generation can have already been performed automatically if the parameter **Auto Store** was defined on **Yes** in the Setup screen (see "Auto Save" on page 56) with the appropriate **Save Mode** (file only or file + txt, + pdf +json).

Saving results and creating a report from results page

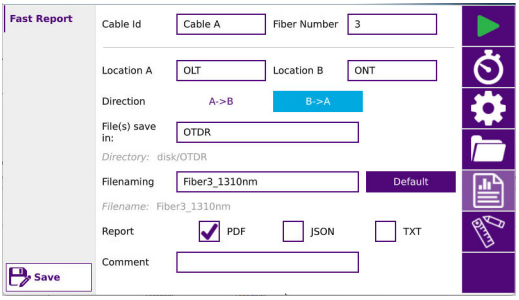
To save the trace and generate a report:

1 Press  .

A menu displays next to the fast report key.

2 In the menu, configure the file saving mode (and the report)

Figure 53 Fast report configuration



a If wished, define/modify the name for the Cable, clicking on **Cable Id** and on the text box to display the edition keyboard.

b Modify the **Fiber Number**.

c In the **Location A** and **Location B** parameters, enter/modify the name of Origin and Extremity.

d In the **Direction** parameter, select/modify the direction, to define if the measurement has been performed from Origin to Extremity (**A -> B**) or from Extremity to Origin (**B -> A**).

e Click on **File(s) save in** text box and enter the directory path (see "File(s) save in" page 53).

or

In the edition keypad, click on key to define the current directory as directory for file saving.

f Click on **Filenaming** text box and enter a name for the file in the edition keyboard (see Figure 39 on page 55).

or

In the edition keyboard, click on key to apply the auto filenaming (see "Filenaming" page 54)

g In the **Report** parameter, select:

PDF to save the results in a .sor file and to generate a report in a pdf file.

TXT to save the results in a .sor file and to generate a txt file of the results.

JSON to generate json file(s) compatible with VIAVI test process automation (job manager and StrataSync cloud data management system)

If all parameters are defined with **No**, only the .sor (or .msor) file will be saved.

h In the **Comment** parameter, if wished, enter a comment to the results.

3 Once saving is configured as wished, press **Save** key.

4 Enter a name for the file in the edition keyboard.

5 Press to validate.

NOTE

The msor / sor file and the txt, pdf and/or json files will have the same name.

NOTE

To modify the directory into which the report will be saved, click on the header of the **Saving** Edition keyboard to display the **Directory** keyboard and enter a new path for the directory.

Once saving is completed, a sound is emitted onto the Platform.

Saving and report for traces in overlay

If several traces are displayed in overlay in the results page, one or several file(s)/ report(s) is/are generated:

- If in the File Setup page (> **File**), the parameter **File Content** is defined with **One Trace**, one .sor file and, if the **Format** parameter for txt/pdf file has been defined, one pdf/txt report will be generated for each trace

  Example: if 3 traces are displayed in overlay, 3 **.sor** files (and 3 pdf/txt files) will be saved.
- If in the File Setup page (> **File**), the parameter **File Content** is defined with **All Traces**, one single .msor file and one single txt/pdf report will be generated, bringing together all traces.

  Example: if 3 traces are displayed in overlay, one single **.msor** file and one single txt/pdf file (with one trace per page; except if the results table is too long for one page) will be saved.

Opening a report

1. To open the report, press menu key.
2. In the Explorer page, in the directory selected, select the file/report.

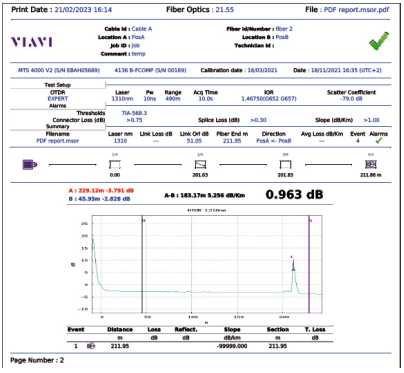
   The file name is:

   For the txt file: *trace file_sor.txt*

   For the pdf file: *trace file.sor.pdf/.json*
3. Press **Load**.

   The file opens on the equipment.

Figure 54 PDF report



CAUTION

To modify the VIAVI logo, set by default on the header of the pdf report, save your logo in a jpg file called `logo.jpg` and place it to the root of the disk: `disk > logo.jpg`.

NOTE

A PDF Report can also be generated from the File Explorer page (see “Generating pdf report(s)” on page 91).

4

File management

The topics discussed in this chapter are as follows:

- “Description of the explorer” on page 84
- “Saving and loading files” on page 86
- “Exporting files” on page 88

Description of the explorer

Opening the file explorer

To access the Explorer, press **File** menu key from the **Results** page.

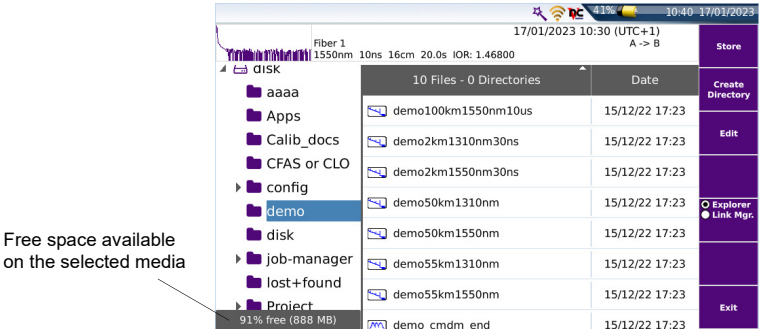
The explorer is used to:

- select the storage medium
- open a file
- create or rename directories and files:

The left-hand part presents the storage architecture. Click on the left of the screen to move around among all the media and their respective directories.

The right-hand part displays all the files present in the directory selected.

Figure 55 Example of explorer



At the top of the screen, the file signature selected is repeated (see Figure 56 on page 85).

Managing tabs

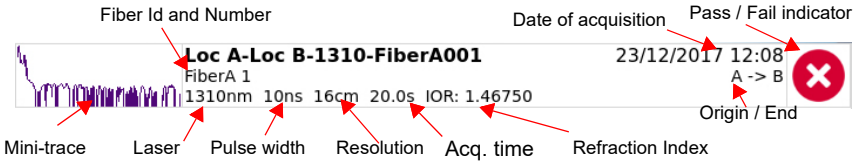
Tabs give access to the File menu of each application present in the modules of the instrument.

It is possible to open a file even if the corresponding module is not present in the instrument. A new tab then temporarily manages this application.

File signature

The acquisition parameters of the trace contained in the selected file are displayed at the top of the screen together with a small-scale representation of the trace (provided it was acquired on a MTS / T-BERD).

Figure 56 Example of signature of an OTDR file (in the File Menu)



Buttons on the right of the screen

Saving traces

Three buttons are used to save one or more traces. Click on **Store** menu key and then select:

- **Save**: allows to save the current trace opened.
- **Save All**: allows to store all the traces displayed in overlay (OTDR) in one single file.
- The softkey **Next Trace** is used to activate the menu of the following trace, when several OTDR traces are in overlay.

Storage media

For saving or recalling data, the equipment offers a wide choice of media, both built-in and external.

Free space on selected media is clearly displayed at the bottom of the left panel.

Directories and files editing function

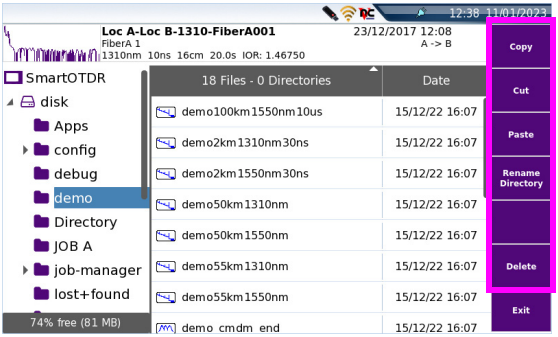
The directories or files can be copy/cut and paste, deleted or renamed from the Explorer:

1 Select the directory/file(s) to be pasted or deleted.

2 Click on **Edit** menu key.

3 Select the action to be performed.

Figure 57 Directory / File Editing functions



4 For directory or file paste, select a new directory and click Paste to paste the element.

For renaming directory or file, once the **Rename Directory**/**File** menu key is pressed, enter the new name in the Edition keyboard and click ✓ to validate.

For Directory/File deletion, once the **Delete** menu key is pressed, confirm the deletion clicking on **Yes** in the dialog box opened.

Saving and loading files

Saving files from the Explorer

When the explorer is displayed, the active trace for the selected tab is displayed in the File Signature.

You can then save the active trace:

1 Select a directory by clicking once on it.

2 Click on **Store** to save the active trace.

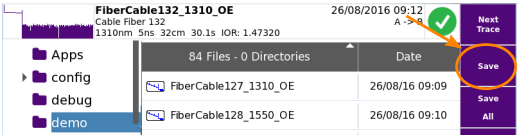
A new sub-menu displays.

3 Click on **Next Trace** to change the file signature on the top part of the screen and to save the next trace from traces in overlay.

4 Click on **Save All** or on **Save**.

The **Save All** menu key allows to save all the traces opened, whereas the **Save** menu key allows to save exclusively the trace described in the file signature.

Figure 58 Saving active trace from the explorer (with OTDR trace)



Displayed when two active overlaid traces are open.

The trace described in the file signature will be saved in the directory selected (in this example: demo)

This will open automatically the edition keyboard, in order to give a filename for the active trace.

The «Save» menu key is not available if the type of saving for OTDR files is defined to «Multi Traces» in the Files > Type parameter (see “Type” on page 55).

Loading files and displaying traces

To access the functions for loading one or more files, select the file(s) in the explorer and press **Load**.

Simple loading

The key **View Trace(s)** enables simple loading of traces, using the current parameters of the MTS/T-BERD or OneAdvisor-800. The current trace is then replaced with this new trace.

Load with configuration

The key **Load Trace + Config** will display the traces, recalling the configuration recorded in the file. Thus the zooms, cursors and parameters present at the time of acquisition will be used for the display.

This function also enables to recall and set the parameters defined in the screens corresponding respectively to the File and Setup keys.

It is then possible to perform an acquisition under the same conditions as those of the trace recalled.

- If the product was equipped with a different module from the current one when the trace was acquired, certain configuration parameters cannot be updated. A message warns the user of this.
- If several traces are selected, the configuration used will be that of the first trace.
- If the number of traces added and the number of traces present is greater than 8, then the last traces added will not all be taken into account.

The configuration cannot be recalled if the trace was not originally created by the equipment.

Loading several traces in overlay

Up to 18 traces in the same application (OTDR) can be displayed simultaneously in overlay.
To obtain a display of multiple traces, two methods are possible:

- Select all the files to be loaded at the same time and click on **Load > View Trace(s)**
- Define a reference trace in a first time, open it, then come back to the explorer to select the other traces to be added (see “Reference Trace function” on page 69).

Exporting files

Click on the **Export** menu key allows to display a sub-menu from which selected files can be:

- generated into one/several reports
- merged into one file (for txt/pdf files only)

Explorer/Link Manager

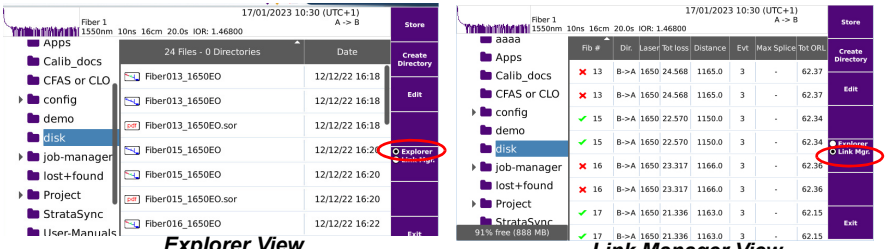
Before exporting file(s), the display can be modified, and the Link Manager can be selected instead of the Explorer using the **Explorer/Link Mgr** menu key.

The Link Manager function allows to display the explorer with all the link information exclusively for the active application (the function must be activated in **Test** page, or at

least one result trace must be opened to get the tab and display files in the Link Manager page).

For example, if the **Link Mgr.** function is selected in the tab OTDR, only the link information from the OTDR files will be displayed (whether in multimode or singlemode). Select **Link Mgr** with the menu key **Explorer/Link Mgr.** to display the corresponding files for the active tab.

Figure 59 Explorer and Link Manager display



According to the application selected, the fiber information available are different. The table below describes the fiber information displayed for each selected tab:

NOTE

The files in the Link Manager window can be sorted according each column available for a tab.

Table 7 Fiber Information displayed

Column.	OTDR & OEO
1st	Alarm status (icon) & Fiber number
2nd	Direction
3rd	Lambda
4th	Total Loss
5th	Distance
6th	Nb of Event
7th	Max Splice
8th	Total ORL

Editing function

The same editing functions as those from the Explorer are available with the Link Manager function, except the merging function (as this is used with txt files):

See “Directories and files editing function” on page 85.

Moreover, from the **Link Manager** page, a whole directory can be exported , with the files corresponding to the active tab, in a txt file.

Exporting a directory in a txt file

1. Select the **Link Manager** function
2. Select the directory to open
3. Select one file from the list
4. Click on **Export** > **Export** menu key.
   The txt file is automatically generated, in the same directory as the one selected for the export.
   The name by default for the txt file is: *fiber_info_otdr.txt*.

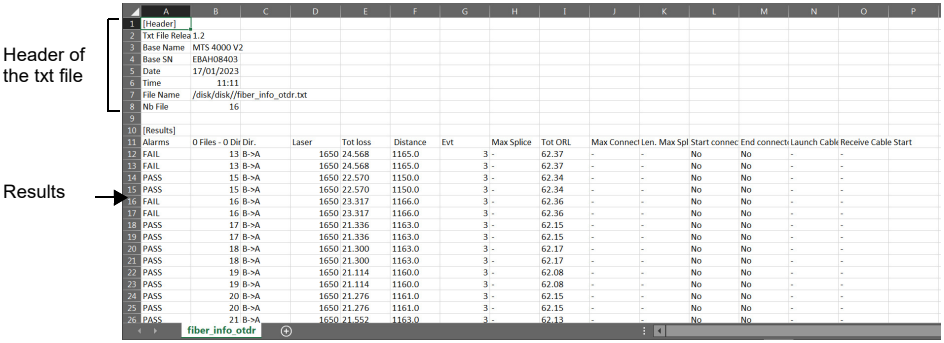
NOTE
The txt file can be renamed once it is saved.

This file is made of two parts:

- The Header, with general information: the equipment used and its serial number, the date and time of export, the location of the file, and the number of files exported.
- The table, containing all the fibers information coming from the files of the active tab.

Once generated, the txt file can be transferred onto a PC and opened via a spreadsheet program (e.g. Excel...).

Figure 60 Example of a directory exported in a txt file (open with Excel)



Generating pdf report(s)

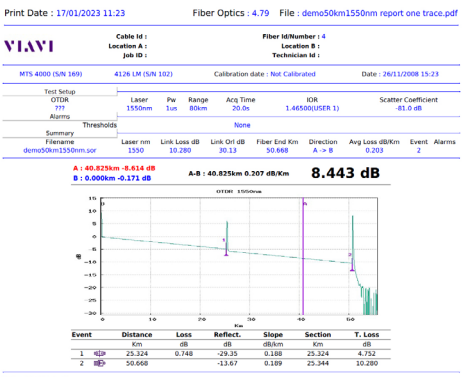
Several files of a same type (example: all OTDR files) can be generated in one/several pdf report(s).

1. Select the file(s) to be generated in a pdf report
2. Press **Export** > **Report** menu keys.
3. Using the menu key 

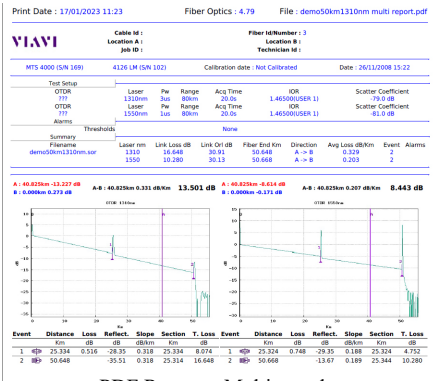
select:
   - **1 Trace** if the report must be generated with one trace per page
   - **Multi** if the report must be generated with up to three traces per page (for OTDR files only).
4. Click on **Build Report**.
5. In the edition menu displayed, enter the name for the report
6. Press  to validate and launch the report

   Once report is generated, a beep is emitted.

Figure 61 Report: 1 Trace and Multi (with OTDR files)



PDF Report: «1 Trace» mode



PDF Report: «Multi» mode

CAUTION

To modify the VIAVI logo, set by default on the header of the pdf report, save your logo in a jpg file called `logo.jpg` and place it to the root of the disk: `disk > logo.jpg`.

NOTE

The report is saved in the same directory as the selected files.

Using the Merge key, with the txt/pdf files

The txt or pdf files that have been saved/generated from a results page can be merged into one txt/pdf file from the Explorer.

The key **Merge** is used to merge several txt or pdf files into one file, putting together the results of all files.

1 In the explorer, select the txt/pdf files generated with the trace files you want.

The merging can be done exclusively from files of the same format. Pdf and txt files cannot be selected at the same time to generate a merged file.

2 Click on **Export** > **Merge** key

A beep is emitted once process is completed.

The file is saved with the filename: *merged_yyyy_mm_day__hr_mn_sec*.pdf/txt

It is automatically saved in the same directory as the one where the txt/pdf files have been selected.

NOTE

The file can be renamed once it is saved.

5

Technical specifications

This chapter shows the technical specifications of the OTDR modules and of the options available for the equipment.

The topics discussed in this chapter are as follows:

- “OTDR modules technical specifications” on page 96
- “Environment” on page 104

NOTE

For more specifications regarding the environment, refer to the Base-Unit user manual.

NOTE

For SmartOTDR technical specifications, refer to the SmartOTDR Main-frame User Manual.

OTDR modules technical specifications

Characteristics of reflectometry measurements

Distance measurement

- Dual cursor
- Distance displayed takes into account the calibration of the refractive index of the fiber.
- Index adjustable from 1,30000 to 1,70000 in steps of 0,00001
- Resolution of display: 1 cm max.
- Resolution of cursor: 1 cm max.
- Spacing of measurement points: from 4 cm, with up to 256 000 acquisition points.
- Accuracy: ± 1m± sampling resolution $\pm 10^{-5}$ x distance for MM and QUAD (excluding errors of calibration of refractive index of the fiber).

  ± 0.5m± sampling resolution $\pm 10^{-5}$ x distance for , A, B and C Modules (excluding errors of calibration of refractive index of the fiber).
- Display span: 3.25 m up to 400 km, according to the Module

Attenuation measurement

- Dual cursor
- Resolution of display: 0,001 dB
- Resolution of cursor: 0,001 dB
- Linearity: ± 0.03 dB/dB with QUAD/MM, A, B and C Modules
- Display span: 1.25 dB to 55 dB

Reflectance Measurement

- Resolution of display: 0,01 dB
- Accuracy: ± 2 dB

Automatic measurement

- Automatic measurement of all the elements of the signal. Slope measurement by least squares or 2 points of measurement.
- Display threshold of faults:

  - 0 to 5.99 dB in steps of 0.01 dB for event thresholds

- -11 to -99 dB in steps of 1 dB for the reflectance
- 0.01 to 5.99 dB in steps of 0.01 dB for attenuation

- Display of slope and attenuation for a segment of fiber.
- Display of the position of a fault and of attenuation.
- Display of the reflectance of the fault.
- Display of ORL

Manual Measurement

- Measurement of slope between the cursors.
- Measurement of attenuation between two segments of fiber.
- Measurement of reflectance of a reflecting element.
- Measurement of ORL between the two cursors.
- Measurement of splice by 2 or 5 points method

Typical specifications

Typical values, measured at 25°C for all modules, unless specified.

Multimode Module

Multimode OTDR Module	**41XXMM**
Central Wavelength[1]	850 / 1300 nm ± 30 nm
Typical RMS Dynamic Range[2]	26 / 24 dB
Distance Range	Up to 80 km
Pulse width	3 ns to 1 µs
Event Dead Zone[3]	0.8 m
Attenuation Dead Zone[4]	4 m

1. Laser in CW mode, at 25° C
2. Typical value corresponding to the difference (in dB) between the level of back-diffusion extrapolated at the beginning of the fiber and the RMS noise level, after 3 minutes of averaging, with the largest pulse width.
3. EDZ measured at +/- 1.5 dB below the peak of a non-saturated reflecting event at shortest pulse width.
4. ADZ measured at +/- 0.5 dB on the basis of a linear regression, using a - 40 dB type reflectance, at shortest pulse width.

A, B and C Modules

Singlemode Modules	**41xxA**	**41xxB**	**41xxC**
Central Wavelength [1]	1310 ± 20 nm[2] 1550 ± 20 nm[2] 1625 ± 15 nm	1310 ± 20 nm[2] 1550 ± 20 nm[2] 1625 ± 10 nm 1650 + 10/-5 nm	1310 ± 20 nm 1550 ± 20 nm 1625 ± 10 nm 1650 ± 15 nm
RMS Dynamic Range [3]	37 dB 36 dB 36 dB	42 dB 40 dB 40 dB 40 dB	45 dB 44 dB 43 dB 42 dB
Distance Range	Up to 260 km		Up to 400 km
Pulse width	5 ns to 20 µs		
Event Dead Zone [4]	0.7 m	0.65 m	
Attenuation Dead Zone [5]	3 m		2.5 m
Typical Splitter Attenuation Dead Zone	-	45 m[6]	20 m[7]

1. Laser at 10 µs and 25° C
2. Laser in CW and 25° C
3. Typical value corresponding to the difference (in dB) between the level of back-diffusion extrapolated at the beginning of the fiber and the RMS noise level, after 3 minutes of averaging, with the largest pulse width.
4. EDZ measured at 1.5 dB below the peak of a non-saturated reflecting event at shortest pulse width.
5. ADZ measured at +/- 0.5 dB on the basis of a linear regression from a reflectance of type FC/UPC (-55 dB) at shortest pulse width.
6. Measured on a 16 dB loss (typical 1x32 split ratio) non-reflective splitter at 1310nm, using 200ns pulse-width.
7. Measured on a 16 dB loss (typical 1x32 split ratio) non-reflective splitter at 1310nm, using 100ns pulse-width

QUAD Module - E4146QUAD

	Multimode / Singlemode OTDR Module E4146QUAD	
Central Wavelength [1]	850 / 1300 nm ± 30 nm	1310 / 1550 nm± 20 nm
Typical RMS Dynamic Range [2]	26 / 24 dB	37 / 35 dB
Distance Range	Up to 80 km	Up to 260 km
Pulse width	3 ns to 1 µs	3 ns to 20 µs
Event Dead Zone [3]	0.8 m	0.9 m
Attenuation Dead Zone	4 m[4]	4 m[5]

1. Laser in CW mode, at 25° C
2. Typical value corresponding to the difference (in dB) between the level of back-diffusion extrapolated at the beginning of the fiber and the RMS noise level, after 3 minutes of averaging, with the largest pulse width
3. EDZ measured at +/- 1.5 dB below the peak of a non-saturated reflecting event at shortest pulse width
4. ADZ measured at +/- 0.5 dB on the basis of a linear regression using a -40 dB type reflectance, at shortest pulse width.
5. ADZ measured at +/- 0.5 dB on the basis of a linear regression from a reflectance of type FC/UPC (-55 dB) at shortest pulse width, at 1310 nm.

QUAD Module - E4146A-PC/-APC

	Multimode / Singlemode OTDR Module E4146A-PC/-APC	
Central Wavelength [1]	850 / 1300 nm ± 30 nm	1310 / 1550 nm± 20 nm
Typical RMS Dynamic Range [2]	26 / 24 dB	37 / 35 dB
Distance Range	Up to 10 km	Up to 260 km
Pulse width	5 ns to 1 µs	5 ns to 20 µs
Event Dead Zone [3]	0.55 m	0.65 m
Attenuation Dead Zone	3 m[4]	3 m[5]

1. Laser in CW mode, at 25° C
2. Typical value corresponding to the difference (in dB) between the level of back-diffusion extrapolated at the beginning of the fiber and the RMS noise level, after 3 minutes of averaging, at largest pulse width for singlemode, and at 500 ns for multimode
3. Measured at +/- 1.5 dB down from the peak of a non-saturated reflecting event at shortest pulse width
4. Measured at +/- 0.5 dB down from the linear regression using a -40 dB type reflectance, at shortest pulse width.
5. Measured at +/- 0.5 dB down from the linear regression from a reflectance of type FC/UPC (-55 dB) at shortest pulse width, at 1310 nm.

CWDM Modules

CWDM Modules	41CWDM8U	41CWDM10U	41CWDM10L
Central Wavelength[1]	1471 ±3 nm 1491 ±3 nm 1511 ±3 nm 1531 ±3 nm 1551 ±3 nm 1571 ±3 nm 1591 ±3 nm 1611 ±3 nm	1431 +/-3 nm 1451 +/-3 nm 1471 +/-3 nm 1491 +/-3 nm 1511 +/-3 nm 1531 +/-3 nm 1551 +/-3 nm 1571 +/-3 nm 1591 +/-3 nm 1611 +/-3 nm	1271 ± 3 nm 1291 ± 3 nm 1311 ± 3 nm 1331 ± 3 nm 1351 ± 3 nm 1371 ± 3 nm 1391 ± 3 nm 1411 ± 3 nm 1431 ± 3 nm 1451 ± 3 nm
RMS Dynamic Range[2]	35 dB		
Distance Range	Up to 260 km		
Puse Width	10 ns to 20 µs		
Event Dead Zone [3]	1.50 m		
Attenuation Dead Zone[4]	5 m		
Output power of the source in continuous mode	-3.5 dBm		
Modes[5]	CW, 270Hz, 330Hz, 1kHz, 2kHz		

1. Guaranteed, with laser at 25°C measured at 10 µs.
2. Value corresponding to the difference (in dB) between the backscattered level extrapolated at the origin of the fiber and the RMS noise level , after 3 minutes of averaging, with the largest pulsewidth.
3. EDZ measured at 1.5 dB below the peak of a non-saturated reflecting event at shortest pulsewidth.
4. ADZ measured at +/- 0.5 dB on the basis of a linear regression from a reflectance of type FC/PC (-55 dB) at shortest pulsewidth.
5. Remove 3 dB if used in modulation mode (270/330/1k/2kHz/Twintest/Auto)

DWDM Modules

DWDM Modules	41DWDMC	41FDWDMC
Wavelengths	C-Band tuning - C62 to C12 (1527.9 nm - 1567.95 nm)	
Channel Spacing	50/100/200 GHz	
Pulse Width	10 ns to 20 µs	
RMS Dynamic Range[1]	44 dB	42.5 dB
Distance Range	Up to 260 km	
Event Dead Zone [2]	1.50 m	
Attenuation Dead Zone[3]	4 m	
Output power of the source in continuous mode	0 dBm	
Modes[4]	CW, 270Hz, 330Hz, 1kHz, 2kHz	

1. Value corresponding to the difference (in dB) between the backscattered level extrapolated at the origin of the fiber and the RMS noise level , after 3 minutes of averaging, with the largest pulsewidth.
2. EDZ measured at 1.5 dB below the peak of a non-saturated reflecting event at shortest pulsewidth.
3. ADZ measured at +/- 0.5 dB on the basis of a linear regression from a reflectance of type FC/PC (-55 dB) at shortest pulsewidth.
4. Remove 3 dB if used in modulation mode (270/330/1k/2kHz/Auto)

Ranges

Ranges for A and B OTDR Modules

	5ns	10ns	30ns	100ns	200ns	500ns	1us	3us	10us	20us
100 m	x	x	x							
200 m	x	x	x							
500 m	x	x	x							
1 km	x	x	x	x						
2 km	x	x	x	x	x	x				
5 km	x	x	x	x	x	x	x			
10 km	x	x	x	x	x	x	x			
20 km	x	x	x	x	x	x	x	x		
40 km	x	x	x	x	x	x	x	x	x	x
80 km			x	x	x	x	x	x	x	x
160 km					x	x	x	x	x	x
260 km							x	x	x	x

Ranges for C OTDR Modules

	5ns	10ns	30ns	100ns	200ns	500ns	1us	3us	10us	20us
100 m	x	x	x							
500 m	x	x	x							
1 km	x	x	x	x						
2 km	x	x	x	x	x	x				
5 km	x	x	x	x	x	x	x			
10 km	x	x	x	x	x	x	x			
20 km	x	x	x	x	x	x	x	x		
40 km	x	x	x	x	x	x	x	x	x	x
80 km			x	x	x	x	x	x	x	x
160 km					x	x	x	x	x	x
260 km							x	x	x	x
400 km									x	x

Ranges for Multimode Modules

	3 ns	10 ns	30 ns	100 ns	300 ns	1 µs
0.5 km	x	x				
1 km	x	x	x			
2 km	x	x	x	x		
5 km	x	x	x	x	x	
10 km	x	x	x	x	x	x
20 km		x	x	x	x	x
40 km				x	x	x
80 km				x	x	x

Ranges for CWDM Modules

	10 ns	30 ns	100 ns	300 ns	1 µs	3 µs	10 µs	20 µs
0,5 km	x	x						
1 km	x	x						
2 km	x	x	x					
5 km	x	x	x	x				
10 km	x	x	x	x	x			
20 km	x	x	x	x	x	x		
40 km	x	x	x	x	x	x	x	x
80 km		x	x	x	x	x	x	x
160 km				x	x	x	x	x
260 km						x	x	x

Ranges for DWDM Modules

	10 ns	30 ns	100 ns	300 ns	1 µs	3 µs	10 µs	20 µs
0,5 km	x	x						
1 km	x	x	x					
2 km	x	x	x	x				
5 km	x	x	x	x	x			
10 km	x	x	x	x	x			
20 km	x	x	x	x	x	x		
40 km	x	x	x	x	x	x	x	x
80 km		x	x	x	x	x	x	x
160 km			x	x	x	x	x	x
260 km						x	x	x

Class of the lasers of the OTDR modules

Module Standard	IEC 60825-1:2014	FDA21CFR§1040.10
Singlemode A, B and C OTDR Modules	Class1	Class 1
Multimode OTDR Modules	Class 1M @ 850 nm Class 1 @ 1300 nm	Class 1

OTDR modules measurement

Weight: approx. 300 g (0,66 lbs) (400g for the QUAD OTDR Module / 510g for the DWDM Module)

Dimensions (in mm) - w x h x d: 128 x 134 x 41

OTDR Module supply

OTDR modules are powered by the mainframe which they are attached to.

- Rated range supply 8 -15 VDC
- Maximum power consumption is 8 W

Environment

Indoor/outdoor

- Backlight high visibility color screen
- High visibility capacitive touchscreen for indoor and outdoor use.
- Altitude up to 4000m.

CAUTION

It is strongly recommended to work on the Platform in its glove when the product is used outdoors, in rainy weather.

CAUTION

AC/DC power supply must be used indoors!

The Platform battery charging must be performed indoors only!

Temperature

• Platform operating temperature range	Refer to platform's specification sheet
• Storage	-20°C to +60°C (-4°F to +140°F)

IEC 61010-1 Temperature range from 0 to 40°C.

Humidity

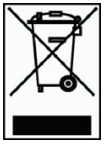
- 5 to 95% without condensation

Pollution degree

- Pollution degree: 2

VIAVI recommends that customers dispose of their instruments and peripherals in an environnmentally sound manner. Potential methods include reuse of parts or whole products and recycling of products components, and/or materials.

Waste Electrical and electronic Equipment (WEEE) Directive



In the European Union, this label indicates that this product should not be disposed of with household waste. It should be deposited at an appropriate facility to enable recovery and recycling.

6

Options and accessories

This chapter shows the references for the OTDR measurement modules, and for the options.

The topics discussed in this chapter are as follows:

- “Catalog order numbers for OTDR modules” on page 108

Catalog order numbers for OTDR modules

Product marking is based on the commercial reference excluding the first letter.

OTDR Modules[1]

Singlemode Module

A Modules	Commercial References
Module A OTDR 1310/1550 nm - PC/APC	E4126A-PC/-APC
Module A OTDR 1310/1625 nm - PC/APC	E4106A-PC/-APC
Module A OTDR 1310/1550/1625 nm - APC	E4136A-PC/-APC

B Modules	Commercial References
Module B OTDR 1310/1550 nm - PC/APC	E4126B-PC/-APC
Module B OTDR 1310/1550/1625 nm - PC/APC	E4136B-PC/-APC
Module B OTDR 1310/1550/Filtered 1650 nm - APC	E4138FB65-APC
Module B OTDR Filtered 1650 nm - APC	E4118FB65-APC

C Modules	Commercial References
Module C OTDR 1310/1550 nm - PC/APC	E4126C-PC/-APC
Module C OTDR 1310/1550/1625 nm - PC/APC	E4136C-PC/-APC
Module C OTDR 1310/1550/Filtered 1650 nm - APC	E4138FC65-APC

1. Specify optical connector of each OTDR ports

Multimode/Singlemode Modules	Commercial Reference
Multimode/Singlemode 850/1300/1310/1550 nm OTDR Module with Light Source - PC	E4146A-PC
Multimode/Singlemode 850/1300/1310/1550 nm OTDR Module with Light Source - APC	E4146A-APC

CWDM OTDR Modules

Modules	Commercial References
CWDM OTDR Module from 1471nm to 1611nm for T-BERD/ MTS2000 and 4000 V2	E41CWDM8U-APC/-PC
CWDM OTDR Module from 1431nm to 1611nm for T-BERD/ MTS2000 and 4000 V2	E41CWDM10U-APC/-PC
CWDM OTDR Module from 1271nm to 1451nm for T-BERD/ MTS2000 and 4000 V2	E41CWDM10L-APC/-PC

DWDM OTDR Modules

Modules	Commercial References
Tunable DWDM APC OTDR Module - C Band, with Tunable Light Source included	E41DWDMC-APC
Tunable DWDM PC OTDR Module - C Band, with Tunable Light Source included	E41DWDMC-PC
Filtered Tunable DWDM APC OTDR Module - C-Band	E41FDWDMC-APC
Filtered Tunable DWDM PC OTDR Module - C Band	E41FDWDMC-PC

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700MAN201
Rev. 008, 02-25
English

VIAVI Solutions

North America:	**1.844.GO VIAVI / 1.844.468.4284**
Latin America	**+52 55 5543 6644**
EMEA	**+49 7121 862273**
APAC	**+1 512 201 6534**
All Other Regions:	**viavisolutions.com/contacts**
email	**TAC@viavisolutions.com**
address	**6001 America Center Drive, San Jose, CA, 95002, USA**