8100 V2 Modules Series

Portable, modular platform designed for the construction, validation and maintenance of optical fiber networks

User Manual

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VIAVI Solutions
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Manual

This guide is a product of VIAVI's Technical Information Development Department. This manual gives you the main information to install, start and use the 8100 Module Series.

WEEE Directive Compliance

VIAVI has established processes in compliance with the Waste Electrical and Electronic Equipment (WEEE) Directive, 2002/96/EC, and the Battery Directive, 2006/66/EC.

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. In the European Union, all equipment and batteries purchased from VIAVI after 2005-08-13 can be returned for disposal at the end of its useful life. VIAVI will ensure that all waste equipment and batteries returned are reused, recycled, or disposed of in an environmentally friendly manner, and in compliance with all applicable national and international waste legislation.

It is the responsibility of the equipment owner to return equipment and batteries to VIAVI for appropriate disposal. If the equipment or battery was imported by a reseller whose name or logo is marked on the equipment or battery, then the owner should return the equipment or battery directly to the reseller.

Instructions for returning waste equipment and batteries to VIAVI can be found in the Environmental section of VIAVI's web site at www.viavisolutions.com. If you have questions concerning disposal of your equipment or batteries, contact VIAVI's WEEE Program Management team.

Contents

About this guide

The MTS/TBERD series of VIAVI provides a portable, modular platform designed for the construction, validation and maintenance of optical fiber networks.

The modules described in this document are applicable for the following platforms:

- MTS 8000
- T-BERD 8000
- MTS 6000A V2
- T-BERD 6000A V2
- OneAdvisor ONA-800
- OneAdvisor ONA-1000

> **NOTE**
> All mainframes are supplied by extra low voltage < 60V DC supplies so that voltages which can create electrical shocks are excluded.

The topics discussed in this chapter are as follows:

Purpose and scope

The purpose of this guide is to help you successfully use the MTS / T-BERD features and capabilities. This guide includes task-based instructions that describe how to install, configure, use, and troubleshoot the equipment. Additionally, this guide provides a complete description of VIAVI’s warranty, services, and repair information, including terms and conditions of the licensing agreement.

Assumptions

This guide is intended for novice, intermediate, and experienced users who want to use the equipment effectively and efficiently. We are assuming that you are familiar with basic telecommunication concepts and terminology.

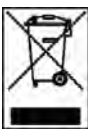
Technical assistance

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 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. 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

	**CAUTION** This symbol represents a general hazard.
	**DANGER** 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 a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

1

Principles of measurement

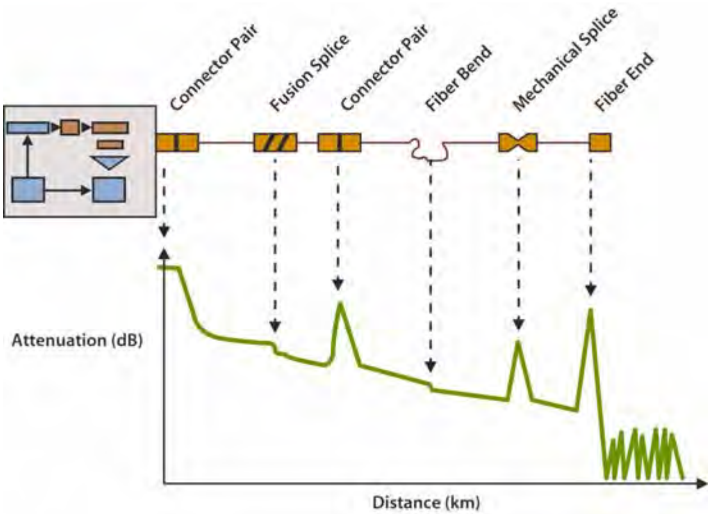
This chapter gives the principles of the measurements made by the reflectometer (OTDR) plug-ins, OSA spectrum analyzers (WDM technology) and PMD analyzers (Polarization mode dispersion).

The topics discussed in this chapter are as follows:

Principle of reflectometry measurements

Optical time domain reflectometry consists in injecting a light pulse into one end of the optical fiber to be analyzed and observing, at the same end, the optical intensity passing through the fiber in the opposite direction to the propagation of the pulse.
The signal detected is exponentially diminishing in form, typical of the phenomenon of backscattering, with superimposed peaks due to reflections from the ends of the fiber or other variations in the refractive index.

Figure 1 Trace showing typical backscattering



Information yielded by the measurement

From a backscatter trace it is possible, in particular, to determine the position of a section of fiber within a link. The measurement result must reveal:

- the attenuation
- the location of faults, by their distance from a point of origin,
- attenuation with respect to distance (dB/km)
- the reflectance of a reflective event or a link.

To locate faults, a reflectometer measures only time. Consequently, group velocity must be introduced in order to determine the distance of the location. This is done by introducing the refractive index of the fiber into the instrument.

Validity of Measurement

UTI-T, in recommendations G.650, G.651 and G.652, give backscatter measurement as an alternative method for measuring attenuation, the method of reference being the cut fiber.

The field of application of backscatter is not limited, but the conditions for application of this method are nevertheless stipulated:

- injection conditions: Fresnel reflections must be limited at fiber input.
- a high-power source (laser) should be used.
- receiver bandwidth should be chosen to achieve a compromise between pulse rise time and noise level.
- backscatter power should be represented on a logarithmic scale.

Reflectance

Reflectance is a value with which the coefficient of reflection of a reflecting optical element can be quantified. It is defined as the ratio of the power reflected by the element over the incident power.

These reflections are due to variations in refractive index all along the optical link in certain telecommunications applications. If they are not controlled, they may degrade the performance of the system by perturbing the operation of the emitting laser (especially DFB lasers) or may generate interference noise in the receiver by multiple reflections.

The reflectometer is particularly well suited to the measurement of discrete reflectances on an optical fiber link. To calculate the coefficient of reflection, it is necessary to measure the total amplitude of the Fresnel reflection generated and then to apply a conversion formula to obtain the reflectance value.

This formula takes into account:

- the total amplitude of the reflection measured by the reflectometer.
- the pulse width used to measure the amplitude of the reflection (in nanoseconds)
- the backscatter coefficient of the fiber used:

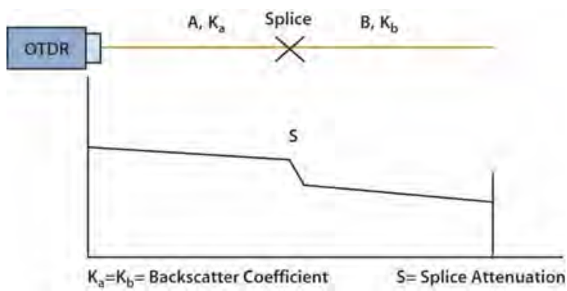
- typical values of the backscatter coefficient for a pulse of 1 ns and
  - for a single-mode fiber: -79 dB to 1310 nm
    -81 dB to 1550 nm and 1625 nm
  - for a multi-mode fiber: -70 dB to 850 nm
    -75 dB to 1300 nm

> **NOTE**
> To measure the widest range of reflection coefficient, it is necessary to insert a variable optical attenuator between the reflectometer and the link to be tested. This attenuator enables the level of the trace to be adjusted so as to avoid saturation of the reflectometer by the reflection to be evaluated.

Principle of bi-directional measurement

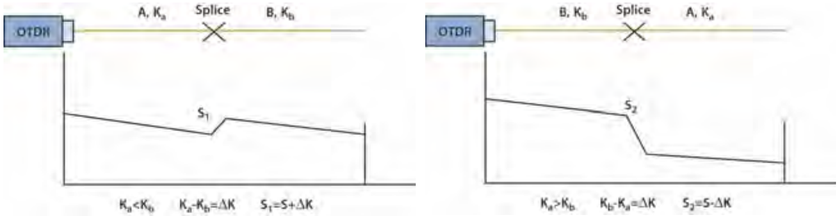
If fibers with different mode-field diameters (core size etc.) are joined, the resulting OTDR trace waveform can show a higher backscattering level. This is due to the increased level of backscattered signal reflected back to the OTDR in the downstream fiber.

Figure 2 Normal splice



This phenomenon can occur when jointing different types of fiber in multi-mode or 2 fibers with different backscattering coefficients.

Figure 3 Positive splice (A ->B) / Negative Splice (B -> A)



The sum gives the bi-directional or average splice loss value: $S = \frac{S1 + S2}{2}$

Bi-directionnal measurement consists in performing a measurement from the extremity of fiber A, then another measurement from the extremity of fiber B, finally get events of both traces and calculate the average for all slope, splice and reflectance measurements.

Principle of the optical power and attenuation measurements

Power measurement

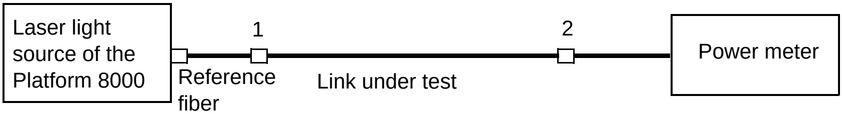
A power meter, is all that is needed to measure emitted or received power:

- to measure emitted power, connect the power meter directly to the output of the optical emitter;
- to measure the power at the input of an optical receiver, the power meter is connected to the end of the fiber, at the point where the optical receiver would be connected.

Attenuation measurements (optical link loss)

For measurement of the attenuation of power in a complete link or in elements such as sections of fiber, connections or optical components, a light source and a power meter are required.

This attenuation is usually deduced from the measurement of optical power at two points:



Attenuation $A_{(dB)} = P1_{(dBm)} - P2_{(dBm)}$

To perform accurate measurements, the following conditions are vital

- Use one of the light sources of the LTS or a light source which is stable both in time and as a function of temperature.
- Make sure that all connections and fibers and the receiving cell are perfectly clean.
- Use a reference link between the laser source and the test subject. If several measurements are to be made under identical light injection conditions, this reference fiber must not be disconnected during the period while measurements are taking place.

Insertion loss method

1 The power meter is first connected to the laser source via the reference fiber: P1 is measured.

2 Then the fiber to be tested is inserted between the reference fiber and the power meter: P2 is measured.

The difference between P2 and P1 gives the attenuation of the fiber under test.

It is preferable to use the same type of connector at both ends of the fiber being tested, to ensure the same connection conditions for measuring P1 and P2.

Accuracy of measurements

- A high degree of accuracy is often required. It is then necessary to perform a preliminary calibration without the fiber under test to eliminate the losses due to connections as far as this is possible. To do this, use the «Reference Value» function.

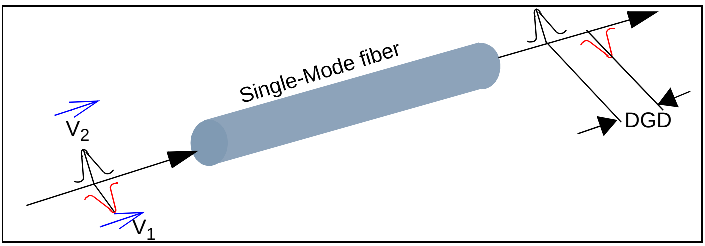
For measurements in the laboratory, where both ends of the fiber are on the same site, the repeatability of attenuation measurements is better than 0.1 dB. For measurements in the field, where the two ends are on different sites, variations from one measurement to another are of the order of ± 0.2 dB (using a relative measurement).

PMD principle

The transmission rate and range are two of the most important parameters of fiber optics paths and must therefore be optimized. And, since more and more paths (including those already installed) are being used for transmitting Wavelength Division Multiplex (WDM) signals or for bit rates of 10 Gbit/s, it is becoming all the more important to determine the Polarization Mode Dispersion (PMD).

PMD, which is the basic property of single-mode fibers, in particular affects the magnitude of the transmission rate. It results from the difference in propagation times of the energy of a given wavelength, which is split into two polarization layers that are at right angles to each other (as shown in the below diagram). The main causes of this birefringence are non-circularities of the fiber itself and external stress on the fiber (macro-bending, micro-bending, twist and temperature variations).

Figure 4 Example of a time delay between two polarization layers



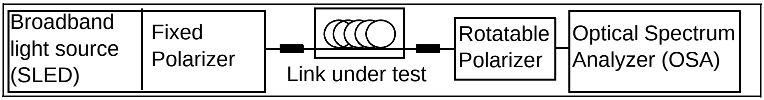
The PMD is also referred to as mean value of all Differential Group Delays (DGD) in picoseconds (ps) or as the DGD coefficient in ps/√km.

The mean DGD causes the transmission pulse to broaden when transmitted along the fiber, generating distortion, which in turns increases the bit-error-rate (BER) of the optical system. The consequence is that the PMD limits the transmission bit rate on a link. It is then important to know the PMD values to calculate what are the bit rate limits of the links.

Method used to measure the PMD

The method used to measure the PMD is based on the Fixed Analyzer Method[1] which requires a broadband polarized source at one extremity, and a polarized (variable) Optical Spectrum Analyzer (OSA) at the other extremity.

Figure 5 Fixed Analyzer Method used to measure the PMD



The method used to measure PMD is the Fast Fourier Transform Method (FFT).

From the spectrum, the mean period of the amplitude modulation is measured.

The Fast Fourier Transform Method into a time distribution will give a Gaussian curve and the mean DGD value is determined from this curve (for fiber links with strong mode coupling).

It is not necessary to modify the polarization angle of the analyzer when strong mode coupling is used. For weak mode coupling, an angle could be selected to get the maximum amplitude of the modulation.

The instrument should have a higher dynamic range than the link itself. A 35 dB dynamic range is usually enough for most of the applications, and 45 dB should be used for very long distance networks.

The measurement range of the PMD should be linked with the transmission rate. For WDM applications, it should be between 0.1 ps to 60 ps so that measurement can be carried out for bit rates between 2.5 and 40 Gbit/s. The table below indicates the maximum permitted PMD values for various bit rates.

Bit rate (Gbit/s)	**Maximum PMD (ps)**	**PMD coefficient (ps/√ km)** 400 km cable length
2.5	40	< 2
10	10	< 0.5
40	2.5	< 0.125
10Gbps Ethernet	5	-

- Tables at the end of chapter gives information about the appropriate standards and limits.

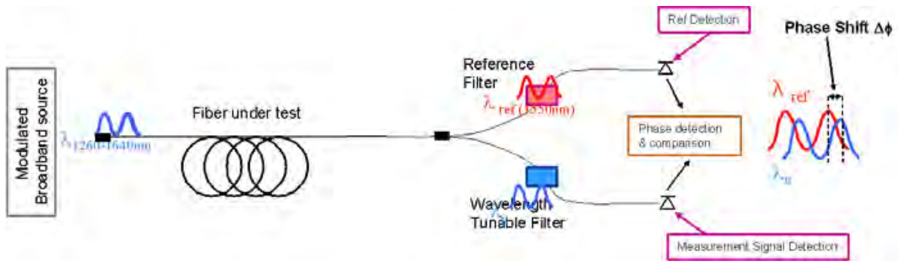
1.This is standardized by the ANSI/TIA/EIA FOTP-113 *Polarization Mode Dispersion Measurement for Single-Mode Optical Fibers by the Fixed Analyzer Method.*

Principle of measurement of Chromatic Dispersion (CD ODM) using phase shift method

The Phase shift method

A modulated broadband light is sent over the Fiber Under Test. The phase of the test signal is compared to the phase of the reference signal. The measured value is the group delay, corresponding to a wavelength interval between the reference phase and the test wavelength phase. It is measured in the frequency domain, by detecting, recording and processing the phase shift of The modulated signals. The fibre chromatic dispersion is derived from the measurement of the relative group delay using an approximation formula.

Figure 6 CD ODM measurement using phase shift method



Standards and λ0 for different types of fiber

Fiber	non-offset dispersion	offset dispersion	non-zero or homogeneous offset dispersion
Standard ITU/Y	ITU-T G.652	ITU-T G.653	ITU-T G.655
Standard IEC	IEC 60793-1-1 type B1	IEC 60793-1-1 type B2	IEC 60793-1-1 type B3
Standard TIA/EIA	Iva	IVb	IVb
Approximate λ_0 .	1310 nm	1550 nm	1500 nm or indefinite

Most suitable method of approximation according to trace zone

Single Mode Fiber Type	ITU-T	Wavelength Range	Approximation
Dispersion unshifted fiber (standard fiber)	G.652	around 1310 nm	3-term Sellmeier
		1550 nm region	Quadratic
		Full wavelength range (1260 - 1640 nm)	5-term Sellmeier
Dispersion shifted fiber	G.653	1550 nm region	Quadratic
		Full wavelength range (1260 - 1640 nm)	5-term Sellmeier
Non-dispersion shifted fiber	G.655	1550 nm region	Quadratic
		Full wavelength range (1260 - 1640 nm)	5-term Sellmeier
Wideband NZDSF	G.656	Full wavelength range (1260 - 1640 nm)	5-term Sellmeier
Mixed fibers	including DCF	1550 nm region	Quadratic
		Full wavelength range (1260 - 1640 nm)	5-term Sellmeier

2

Getting started

This chapter describes how to start using the T-BERD/MTS 8000 V2 or T-BERD/MTS 6000/6000A V2.

The topics discussed in this chapter are as follows:

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 Technical Assistance Center.

NOTE

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

Example: Commercial reference E4146QUAD is identified 4146QUAD on the product and refer to the same product

Laser Safety instructions

The provisions contained in two standards define the safety procedures to be observed both by users and by manufacturers when utilizing laser products:

- IEC 60825-1: 2014 - Safety of laser products – Part 1: Classification of products, requirements and user guidelines.
- FDA 21 CFR § 1040.10 - Performance standards for light-emitting products - Laser products.

Due to the range of possible wavelengths, power values and injection characteristics of a laser beam, the risks inherent in its usage vary. The laser classes form groups representing different safety thresholds.

Laser classes

Standards IEC 60825-1: 2014 and FDA21CFR§1040.10:

- VFL option: Class 2.

Warning labels for the laser classes

Due to the reduced dimensions of the optical modules, it is not possible to attach the required warning labels to them. In line with the provisions of Article 7.1 of the IEC 60825-1:2014 standard, the laser class identification labels are shown below:

The user must take the necessary precautions concerning the optical output of the instrument and follow the manufacturer's instructions.

Ref. standard	**IEC 60825-1:2014**	**FDA21CFR§1040.10**
Class 1	CLASS 1 LASER PRODUCT	
Class 1M	LASER RADIATION DO NOT EXPOSE USERS OF TELESCOPIC OPTICS CLASS 1M LASER PRODUCT	
Class 2	LASER RADIATION DO NOT STARE INTO BEAM CLASS 2 LASER PRODUCT	CAUTION LASER RADIATION - DO NOT STARE INTO BEAM CLASS II LASER PRODUCT

Measurements on optical fibers are difficult to execute and the precision of the results obtained depends largely on the precautions taken by the user.

AC/DC safety information

Do not use any mains adapter other than the one supplied with the instrument, or supplied by 3 as an option for this instrument.

If another adapter is used, it may damage the equipment itself.

Other basic safety precautions are as follows:

- Do not use AC/Adapter/Charger outdoors or in wet or damp locations
- Connect the AC/Adapter/Charger to the correct mains voltage, as indicated on the ratings label.
- Do not allow anything to rest on the power cord, and do not locate the product where people can walk on the power cord.
- Avoid using this product during an electrical storm. There may be a remote risk of electric chock from lightning.
- Do not use this product in the vicinity of a gas leak or in any explosive environment.
- Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous, high voltage points and other hazards. Contact qualified service personnel for all service.

Precautions relating to optical connections

- The normal operating life of an optical connector is usually of the order of a few hundred manipulations. It is then advisable to manipulate the optical connections as rarely as possible.
- The proper operation of the instrument and its accuracy of measurement are dependent on the cleanliness of the environment and the optical connectors as well as the care taken in its manipulation.
- The optical connectors must therefore be clean and dust-free. If the optical connection is not being used, protect the connections of the module using the protective caps.

Installing a module in a receptacle and removing it

With the T-BERD/MTS-8000 V2, a module may be inserted into either of the two slots provided for the purpose. With the T-BERD/MTS-6000/6000A, only one module may be installed into the Platform.

When a slot is vacant, it is closed by means of a cover-plate fitted with two captive screws like those on the plug-ins.

Figure 7 Rear view of the 8000 V2 Platform (example)

Captive screws securing the

Inserting a module

The Platform must be switched off, and if it has a mains power supply, the adapter cable must be unplugged

1 Slide the module into its slot.

2 When it is fully home, press against the screen-printed surface of the module while tightening the securing screws. The screen-printed surface of the plug-in must be flush with that of the receptacle.

3 Make sure that the two large captive screws of the plug-in are screwed fully home.

NOTE
UHD modules use very powerful lasers: they must be connected exclusively to optical connectors equipped with zirconium ferules. Using connectors equipped with metallic ferrules could damage the plug-in connector.

Removing a module

The Platform must be switched off, and if it has a mains power supply, the adapter cable must be unplugged

1. Completely unscrew (up to the stop) the two captive screws securing the module.
2. Carefully slide the module out of its slot.

Connecting fiber optic cable

Inspecting and cleaning connector end faces

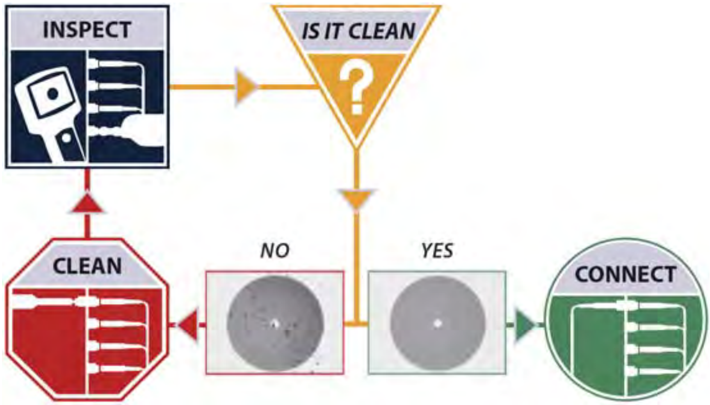
Always inspect and clean the connector end face of the optical fiber cable and the test port before mating both together.

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 8 "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.

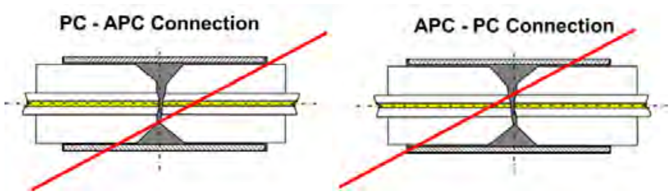
The APC-type test port is identified by a green cap with the addition of a "APC" label.

Figure 9 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 10 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

WARNING
All the universal connectors are available on the OTDR Modules, except on the LA Module.

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

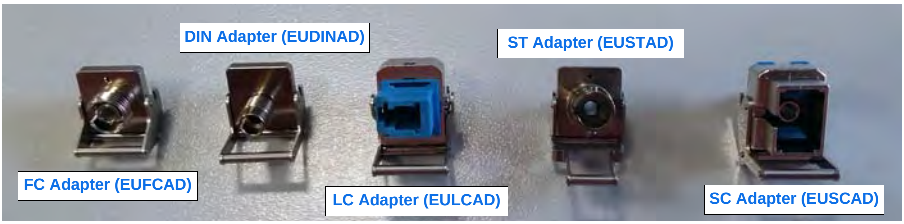
Fiber Optic modules may come equipped with a universal connector and adapter selected at time of order.

Adapter types

VIAVI offers 5 different adapters, all compatible with this connector, 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, DIN, ST and LC.

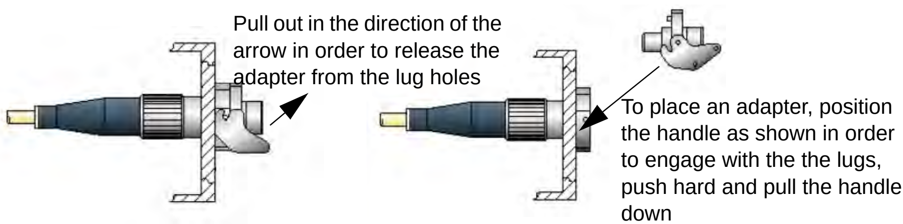
Figure 11 5 different types of adapters may be mounted on the universal connector



Switching adapter type

In order to switch from an adapter to another, proceed as shown.

Figure 12 Removing and refitting an adapter



Cleaning the universal connector

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

Display screen

The display screen is divided into a number of different zones. Starting from the top, these are:

1 a status bar in which various icons indicate the current functions:

2 a bar displaying a scaled-down representation of the trace, showing the zoom zone and the parameters of the measurement on display (signature of the measurement).

3 the main part of the screen, displaying a menu or the page of results.

4 tabs enabling the user to switch from one function to another (OTDR, PMD, power meter, etc.), as required.

5 At the right-hand side of the screen, softkeys give access to the various commands. Their action depends on the current function and configuration.

Figure 13 Example of display of results (OTDR)

Top status bar

The top status bar on the screen shows, on the right, current date and time, and in the form of icons:

- the type of power supply: mains or battery, and if the power supply is on battery the level of charge (see Battery management in chapter 2 from the Platform manual)
- if the Talkset option is present and the telephone is activated, the icon .
- if a remote screen is selected, the icon (or if two users or more are working on the same Platform).
- if transfer of data is in progress, the icon .
- if a printing process is in progress, the icon
- if a data saving is in progress, the icon
- if a USB key is connected onto the Platform, the icon

Mini-trace

The **File** menu and the **Results** page can include a scaled-down representation of the trace which may show the location of the zoom zone corresponding to the main display. The part of the trace shown in the main display is boxed on the mini-trace.

This mini-trace will only appear if the trace originated from an Platform . Other Bellcore files read on this instrument do not contain the information needed to display it.

In OTDR Mode, the symbol LFD can be displayed with the mini trace, indicating the Traffic Detection function has been used.

Signature of the measurement

A status bar repeats the parameters of the measurement, and in some cases:

- the position of the cursors:

  In OTDR results page, the cursors information are displayed only if Cursor key is active (see page 73).
- a comment
- the name of the file when the result is stored and recalled from a memory.

Main display zone

The central zone of the screen can display the configuration of the instrument or the measurement, the memory explorer of the Platform , the measurement results, etc. Refer to the chapter dealing with the measurement in progress.

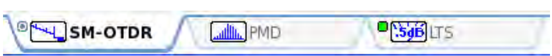
Tabs

When the instrument performs several different functions (OTDR, PMD, Power Meter, etc.), the various configuration or results pages are accessible from tabs. To change from one tab to another, the button selecting the page must be pressed. For example:

- on the Results page, to change from one tab to the other, press the **RESULTS** button
- on the measurement configuration page, to change from one tab to the other, press the **SETUP** button
- On the file configuration page, to change from one tab to the other, press the **FILE** button.

> **NOTE**
> There is a tab for each different type of measurement: OTDR SM, OTDR MM, OSA, Power Meter... The tab of a function is displayed if and only if a module corresponding to this type of measurement has been inserted in the instrument, or if a file of the type of this measurement is open. If two modules of the same measurement type are present, then only one module is "active", so only one tab will appear for this measurement. To change the active module, go to the **Home** screen and select it there.

A small icon may appear in the left corner of each tab, according to the status of the corresponding module.



The icon signification is the following:

- No icon: the function is used in a read-only mode (no module), or the module has not been selected.
- Dark green icon: the function has been selected but the corresponding module does not currently perform an acquisition.

- Green icon: the function has been selected and the corresponding module currently performs an acquisition.

Soft keys

The 7 softkeys at the side depend on the current configuration and the context.

Their use is symbolized by an icon.

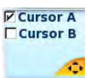
Icons

	shows that the action is immediate when the key is pressed.
	shows that the key gives access to a sub-menu.
	shows that the key will quit the sub-menu.
	shows that the function selected by the key will be controlled by the direction keys

Selection keys

The selection may be exclusive (only one choice possible) or non-exclusive (more than one option available at the same time):

This key offers two / three <u>exclusive options</u>. The change of function occurs immediately, the first time the key is pressed.



This key offers two / three <u>non-exclusive options</u>. Pressing the key repeatedly modifies the choice.

3

Reflectometry measurements

Pressing the **START/STOP** key is all that is needed to start or stop a measurement. However, it is necessary to configure the measurement and the type of results desired.

This chapter describes the different stages in a reflectometry measurement made using an OTDR module.

The topics discussed in this chapter are as follows:

Activating the OTDR function

Once the OTDR module is correctly set onto the equipment and the T-BERD/MTS is switched on, the desired OTDR function must be selected before any OTDR configuration, or measurement.

Selecting the Smart Test function

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.

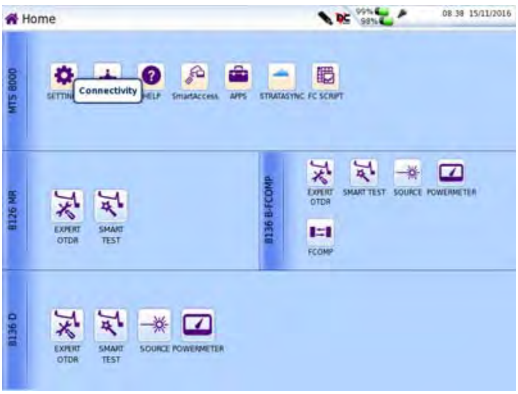
Selecting Smart Test

The Smart Test function is available whatever is the OTDR module set onto the T-BERD/MTS.

To select this function, after the equipment starts:

1 Press the **HOME** button.

Figure 14 Home page



2 Select the Smart Test icon 

The icon turns yellow 
.

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

> **NOTE**
> In the case a Singlemode/Multimode module, one line contains the Multimode icons and a second one the Singlemode icons.
> To distinguish both modes, multimode icons contain the MM mark.

Selecting the Expert OTDR function

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 Smart Test users.

Selecting Expert OTDR

The Expert OTDR function is available whatever is the OTDR module set onto the T-BERD/MTS.

To select this function, after the equipment start:

1. Press the **HOME** button
2. Select the Expert OTDR icon 

   The icon turns yellow 
.

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

NOTE

In the case a Singlemode/Multimode module, one line contains the Multi-mode icons and a second one the Singlemode icons.

To distinguish both modes, multimode icons contain the MM mark.

Configuring the reflectometry test[1]

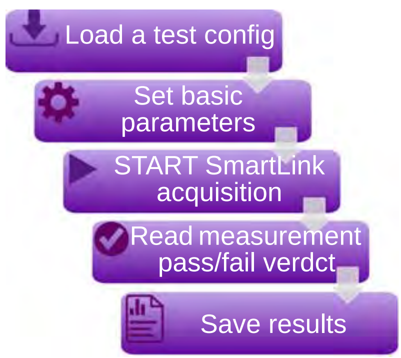
Configuring the unit for Smart Test

Once the Smart Test icon is validate, press **SETUP**.

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 53).
2. Configure / modify some parameters before starting the test.
3. Start the acquisition (standard or real time)
4. Save the results

Figure 15 Standard Smart Test Process



1.if an OTDR module is installed

Selecting the configuration file

To load the configuration file to be used for Smart Test test:

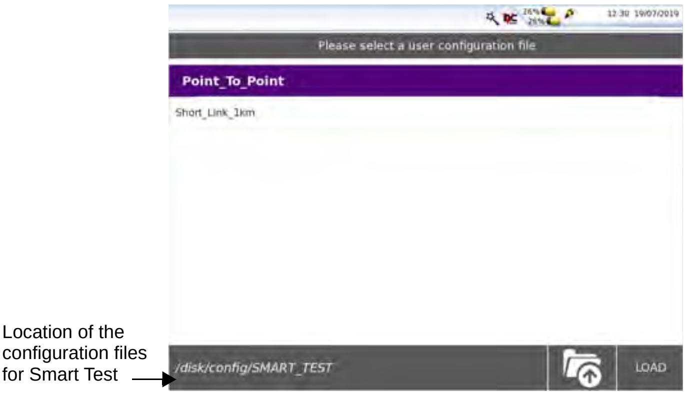
1 If necessary, click on the button  to display the superior level of the directory.

2 In the selection file screen, select the configuration file to be used for the acquisition on Smart Test mode.

The file is underlined in blue.

3 Press **Load** to load the selected file and display the current parameters for this configuration.

Figure 16 .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 have access to 4 parameters he can modified before launching the test.

Figure 17 Smart TestSetup page

- **Laser** The acquisition will be carried out on the wavelength(s) selected (for multiple-wavelength modules). In case of a multi-wavelength module, select **All** to perform a measurement for all the wavelengths available (this parameter visible exclusively on modules with one single OTDR port). The possible values depend on the module used.
- **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 **Set Length** and enter the distance using the numeric keypad. Click on  to validate (or on  to cancel)

- **Alarms** Define if alarms thresholds must be applied for the acquisition:
  Select **No** if no alarm thresholds must be applied.
  Select **Yes** to define alarms, and press **Alarm Level** to define the pre-defined thresholds for the acquisition.

See Table 1 and Table 2 to get the values for each pre-defined alarm thresholds.

The 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.

The **Config.** key allows to return to configuration file selection (see Figure 16 on page 29).

Configuring the test in Expert OTDR

Once the Expert OTDR icon is selected, the **Results** page automatically displays.

In Expert OTDR, the parameters for acquisition and for file storage can be configured.

1 To call up the test configuration window, press the **SETUP** button.
Dialog boxes / menu keys on the same screen enable selection of:

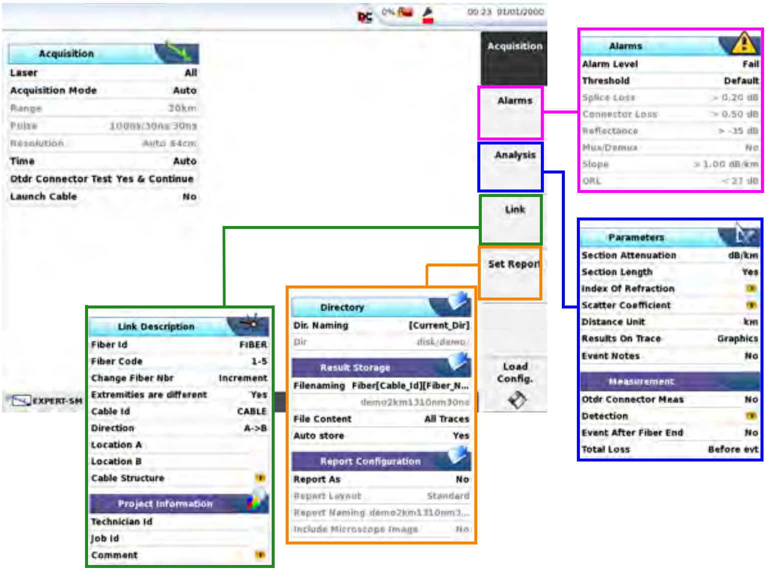
- Acquisition parameters
- Alarms parameters
- Analysis parameters

Used for the OTDR acquisition

- Link parameters
- File parameters

Used for the OTDR results saving

Figure 18 OTDR Setup screen



In these windows, the parameter selected is in video inverse.

Configuring the Acquisition parameters

You can choose the OTDR acquisition parameters.

1 Once the **Setup** page is displayed, press **Acquisition** menu key to configure the Acquisition parameters.

The Acquisition Setup page is divided into two parts: the **Acquisition** box and the **Launch cable** box.

If some acquisition parameters are not accessible (not visible or displayed in grey), check in the **Home** page that the Expert OTDR function is selected (see “Selecting the Expert OTDR function” on page 27).

Laser

The acquisition will be carried out on the wavelength(s) selected (for multiple-wavelength modules). In case of a multi-wavelength module, select **All** to perform a measurement for all the wavelengths available (this parameter visible exclusively on modules with one single OTDR port). The possible values depend on the module used.

Acquisition Mode

Select the kind of acquisition to be performed:

Manual The acquisition parameters **Pulse** / **Range** / **Resolution** can be set by user.

Auto The acquisition parameters **Pulse** / **Range** / **Resolution** are defined automatically and cannot be modified

The **Measurement time** will be set to **Auto**, but can be modified (see “Time” on page 34).

Smart Acq. (not available in Multimode)

This parameter allows to launch a short acquisition before the standard one.

The first acquisition is performed with the shortest pulse in order to detect more precisely the events at the beginning of the fiber.

Range

The possible range depends on the pulse length selected. This range is given for each pulse length in the paragraph “Distance Ranges” on page 591. This parameter is exclusively configurable if **Acquisition** parameter is set to **Manual**. It depends on the module used

Auto allows to detect automatically the range.

In **Auto** mode, the range is selected as a function of the end of the fiber.

Pulse

The available values depend of the module used. Parameter selectable only if **Acquisition** parameter is set to **Manual**.

In the case of a multi wavelength acquisition:

– you can define a pulse for each wavelength:

a select each wavelength in the Laser line and define a pulse

b Once all lasers are configured, go back to the pulse line and select **Multi**.

– you can define a pulse for all lasers:

c select **All** on the Laser line

d select a pulse, which will be common to all lasers

See “OTDR Specifications” on page 585.

> **NOTE**
> According to the value selected for **Pulse** parameter, the **Range** parameter can be automatically modified, and vice-versa.

Resolution

This parameter is exclusively 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	the highest dynamic is applied

Time

Real time	the equipment performs up to ten acquisitions per second (see “Performing OTDR acquisitions” on page 57).

> **NOTE**
> Whatever is the acquisition mode selected, an acquisition in real time mode can be launched maintaining the **START/STOP** button pushed for about 2 seconds.

> **NOTE**
> If the **Acquisition** parameter is defined to **Auto**, then the **Time** parameter is defined to **Auto**, but can be modified.

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 / 1 minute / 2 minutes / 3 minutes.

If the option **OptiPulse** is available, see "Configuring the OTDR acquisition with OptiPulses mode" on page 123 to configure the OTDR acquisition with this option.

Otdr Connector test

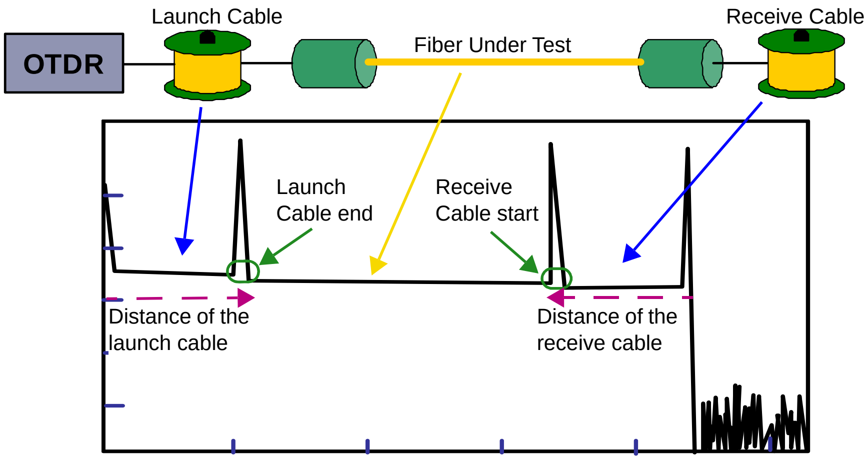
This parameter allows to choose if a test of the front connector must be performed when acquisition is launched.

No	the OTDR connection is tested with indication Bad/Good.
Yes & Continue	the OTDR connection is tested, and if the state is not good, 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.

Launch Cable End / Receive Cable Start

No	All the results are displayed and referenced on the basis of the board of the module.
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 selected.
Distance	Use the **Edit Number** key to enter a distance (Min= 0 / Max=50 km / 164.042 kfeet / 31.075 miles) or affect the active cursor value, using the **Set Cursor Distance** key. or click on **Measure Length** to launch the measurement of the launch cable connected and apply the results for the parameter.

Figure 19 Launch Cable / Receive Cable



Include Link Start Connector / Include Link End Connector

Defining the **Launch Cable End** parameter with an event number or a distance will automatically activate the corresponding parameter **Include Link Start Connector**. This parameters can be set to **Yes** if the budget must include the connectors loss of the launch cable at end

Defining the **Receive Cable Start** parameter with an event number or a distance, will automatically activate the corresponding parameter **Include Link End Connector**. This parameters can be set to **Yes** if the budget must include the connectors loss of the launch cable at start

If those parameters are set to **No**, the budget only displays the connector loss of the fiber.

Configuring the Alarms parameters

In the **Setup** page, press **Alarms** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Alarms**).

Once the **Alarms** page is displayed, configure the parameters for applying thresholds to results displayed.

Alarms > Threshold

None The alarm function is not active.

Fail This menu lists possible major alarm thresholds that the user could select. If results are above those thresholds, they will be highlighted in red in the table of results, and the icon will appear at the top right of the screen.

– 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: Splice / Connector / Reflectance / Slope / Fiber Length Min and Max / Total Loss Min and Max / ORL

TIA-568 3 / TIA-568 3.RL35 / **ISO/IEC 11801 2002 or 2010** / **ISO/IEC 14763-3 2006 or 2014** / **Default:** Select one of this parameter to configure the alarm thresholds with predefined values:

Table 1 Singlemode Modules

<table>
<tr><th></th><th>Splice Loss</th><th>Connector loss</th><th>Reflectance</th><th>Slope[1]</th><th>ORL</th><th>Mux/ Demux</th></tr>
<tr><td>Default</td><td>> 0.20 dB</td><td>> 0.50 dB</td><td>> - 35 dB</td><td>> 1.00 dB/km</td><td>< 27 dB</td><td>No</td></tr>
<tr><td>TIA-568.3</td><td rowspan="7">> 0.30 dB</td><td>> 0.75 dB</td><td>No</td><td>> 1.00 dB/km</td><td rowspan="4">No</td><td>-</td></tr>
<tr><td>TIA-568.3 RL35</td><td>> 0.75 dB</td><td>> - 35 dB</td><td>> 1.00 dB/km</td><td>-</td></tr>
<tr><td>ISO/IEC 11801 (2002)</td><td>> 0.75 dB</td><td>No</td><td>> 1.00 dB/km</td><td>-</td></tr>
<tr><td>ISO/IEC 11801 (2010)</td><td>> 0.50 dB</td><td>> - 35 dB</td><td>> 0.40 dB/km</td><td>-</td></tr>
<tr><td>ISO/IEC 14763-3 (2006)</td><td>> 0.50 dB</td><td>No</td><td>> 1.00 dB/km</td><td rowspan="2">No</td><td>-</td></tr>
<tr><td>ISO/IEC 14763-3 (2014)</td><td>> 0.75 dB</td><td>No</td><td>> 0.40 dB/km</td><td>-</td></tr>
</table>

1. This parameter is not available in OEO-OTDR configuration

Table 2 Multimode Modules

	Default	TIA-568C & ISO/IEC 11801
Splice Loss	> 0.20 dB	> 0.30 dB
Connector Loss	> 0.50 dB	> 0.75 dB
Slope 850 nm	> 3.50 dB/km	> 3.50 dB/km
Slope 1300 nm	> 1.50 dB/km	> 1.50 dB/km
Reflectance	> - 35 dB	-
ORL	< 27 dB	-

Warning This menu lists possible minor alarm thresholds that the user could select. If results are between those thresholds and the «fail» thresholds, they will be highlighted in yellow in the table of results, and the icon will appear at the top right of the screen.

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

If all the results lie within the thresholds (no result is in red or yellow), results are displayed in green in the table and the icon is .

Configuring the Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

The Analysis Setup page is divided into two parts: the **Parameters** box and the **Measurement** box.

Parameters

Section Attenuation

dB/km Displays the section slope in the table of results. When 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.

Section Length

Choose to display or not the section length in the table of results.

Index of refraction

Choice of group refraction index of the whole fiber.

User Define for each wavelength (1310 SM, 1360-1510 SM, 1550 SM, 1625 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).

NOTE

With the CWDM Module, the selection is as follows:

- For lasers 1271, 1291, 1311, 1331 and 1351, select the line 1310 SM.
- For lasers 1371 to 1511, select the line 1360 - 1510 SM
- For lasers 1531, 1551 and 1571, select the line 1550 SM
- For lasers 1591 and 1611, select the line 1625 SM.

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 à 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 20 Predefined index values (Single Mode)

Wavelength (nm)	1310 SM	1360 - 1510 SM	1550 SM	1625 - 1650 SM
Generic G652 G657	1.46750	1.46800	1.46800	1.46850
Generic G653 G655	1.46750	1.46800	1.46800	1.46850
ATT SM	1.46600	1.46700	1.46700	1.46700

Wavelength (nm)	1310 SM	1360 - 1510 SM	1550 SM	1625 - 1650 SM
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 21 Predefined index values (Multi Mode)

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

User Selects 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” on page 3.

Distance Unit

Define the unit of the distances displayed: km, kfeet, miles, meter, feet, inch.

Results on trace

None	the trace alone
All	the trace with results and markers.
Graphics	the trace with markers only.

If **All** or **Graphics** is selected, the reflectometry trace is displayed with a dotted vertical line set on the end of launch cable (if the Launch Cable is defined in the **SETUP** menu) and a dotted vertical line on the end of fiber .

Event Notes

See “Table notes” on page 88

No	no display of notes
Notes	display of notes entered by the user
Uncertainty	display of indicators of the level of confidence in the measurement result.

Measurement

Otdr Connector Measurement

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

No	In the results table, the first line corresponds to the first event detected.
Yes	In the results, the first result corresponds to the front connector measurement, at 0 meter (estimated value).

Detection

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

Press **Edit Number** soft key and select a value:

- Enter a min level of detection, from 0.01 to 1.99 dB
- **No**: no splice detection
- **Auto**: to automatically detect splice

Reflectance Select if level of detection for reflectance must be defined.

Press **Edit Number** soft key and select a value:

- Enter a min level of detection, from -98 to -11 dB
- **None**: no reflectance detection
- **All**: all reflectances are detected

Ghost 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)».

Fiber end Once parameter is selected, press Edit Number key to display the numeric keypad and select the wished value:

Auto (recommended) option in which the T-BERD/MTS automatically detects the end of a fiber.

> 3 to > 20 dB (steps of 1 dB): threshold of detection of end of fiber.

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, press **Edit Number** key to display the numeric keypad and select the wished value:

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

Mux/Demux Once parameter is selected, press **Edit Number** key to display the numeric keypad and select the wished value:

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

Event After Fiber End

If **Yes**, the events after the end of the link are detected.

Total Loss

Before evt for a given line on table, the total loss result does not include the splice/connector loss of the corresponding line

After evt on the table, for a given line, the total loss measurement on the table does include the splice/connector loss of the corresponding line.

Configuring the Link parameters

In the **Setup** page, press **Link** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Link**).

> **NOTE**
>
> The softkey **Copy File/Link To all** is displayed when one parameter is selected in the Link or File Setup page and when the Powermeter or Source function is active.
>
> It allows to apply the Link and File configuration parameters of the current applications to all the other active Fiber Optic applications (powermeter and source).

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

Fiber Id

Select the parameter **Fiber Id** and enter a name for the fiber, using the edition keypad.

Fiber Number / Fiber Code

The parameter **Fiber Number** becomes **Fiber Code** if, in the **Cable Structure** window, the **Cable Content** parameter is defined on another parameter than **Fiber** (**Ribbon/ Fiber**, **Tube/Fiber** or **Tube/Ribbon/Fiber**). See page 46.

The fiber code corresponds to the fiber number if, in the **Cable Structure**, the parameter **Color coding** is defined on **No**.

The fiber code corresponds to the fiber color if, in the **Cable Structure,** the parameter **Color coding** is defined on **Yes**.

Select the parameter **Fiber Number/Fiber Code** and modify the parameter using the left and right direction keys.

The fiber number can be automatically incremented/decremented at each new file save if it has been configured in the File Setup page (see “Configuring the File parameters” on page 48).

> **NOTE**
> The Fiber Code and the fiber number concatenated with **Fiber Name** are interdependent: they are incremented or decremented at the same time. However, the fiber number remains a number only, while the fiber code is alphanumerical. Whether it includes a color code or not (see “Cable structure” on page 45), it may be composed of one, two or three parts (see figure Table 22 on page 44).

Figure 22 Example of incrementation of fiber code

Fiber and cable parameters used in the example:

Fiber Name: ’Fiberx’
Cable Content: ’Tube/Fiber’
Max Tube: 12
Max Fiber: 24
Coding used for the fiber and the tube: TIA

	Fiber N		**Fiber N+1**	
Color Code	**Yes**	**No**	**Yes**	**No**
<Fiber Name>	Fiberx24	Fiberx24	Fiberx25	Fiberx25
<Fiber Code>	Bl/Aq-	1/24	Gold/Bl	2/1

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 Use **Edit Number** softkey 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.

Extremities are different

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

If this option is validated, it is possible, after selecting the extremity to be edited in the **Cable Structure** menu, to modify the values specific to the cable (cable name, color coding, content of the coding), for each of these extremities. See chapter "Cable structure" on page 45)

To display/modify the data specific to the fiber (name and code), it is necessary to change direction temporarily. In the "O->E" direction, the information on the origin can be edited, and in the "E->O" direction, that on the extremity.

Cable Id

This parameter allows to enter an identification of the cable, using the Edition menu.

Direction

The direction shows if the acquisition has been made from the origin to the extremity (A->B) or from the extremity to the origin (B->A). Changing direction makes it possible, when different extremities are handled, to see the parameters of the fiber for the other extremity.

Location A

The name of the Location A of the link may be entered here.

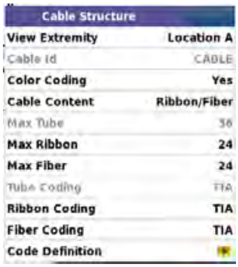
Location B

The name of the Location B of the link may be entered here.

Cable structure

This line opens a sub-menu, all the parameters of which can be different for each extremity.

Figure 23 Cable structure menu



> **NOTE**
> The **Cable Structure** window is specific to an extremity. Each structure keeps its own parameters by default. Modifications made to the one are not automatically applied to the other. Thus, after the values relating to the origin have been modified, it is normal not to find these same values entered for the extremity.

View extremity If extremities are declared as different (see “Extremities are different” on page 45), this parameter allows to navigate between the Extremity and Origin parameters.

Cable Id If the extremities are different, you can specify the cable identification for the origin and the extremity.

Color Coding Choice of whether or not to apply a color coding to the fiber. This choice is made at link level, as all the fibers of a given link, for a given extremity, will be coded the same way. This choice modifies the result of the <Fiber Code> line. See “Fiber Code / Fiber Num” on page 133.

Cable content Shows how the color code is to be used (see figure “Cable structure menu” on page 46):

- FiberOnly the color code of the fiber is proposed (example: «Gold»)
- Ribbon/Fiber The color code of the fiber is preceded by that of the ribbon, and separated by a ’/’ (example: ’Bl/Or’)
- Tube/Fiber The color code of the fiber is preceded by that of the tube, and separated by a ’/’ (example: ’Br/Or’)

– Tube/Ribbon/Fiber
The color code of the fiber is preceded by that of the tube, then by that of the ribbon; the three being separated by a '/' (example: 'Br/Bl/Or'). See "Fiber Code / Fiber Num" on page 133.

Max tube Shows the maximum number of tubes in the cable for the extremity selected. This information influences the automatic coding of the fiber. See "Fiber Code / Fiber Num" on page 133.

Max ribbon Shows the maximum number of ribbons in the cable for the extremity selected. This information influences the automatic coding of the fiber. See "Fiber Code / Fiber Num" on page 133.

Max fiber Shows the maximum number of fibers in the cable for the extremity selected. This information influences the automatic coding of the fiber. See "Fiber Code / Fiber Num" on page 133.

NOTE
Certain parameters are not valid in the configuration selected. Thus, if no tube is selected in **Cable Content**, all the lines relating to the tube concept will be deactivated (grayed out in the menu).

Tube Coding, Ribbon Coding, Fiber Coding
The lines Tube Coding, Ribbon Coding and Fiber Coding enable selection of the color coding of the tube, the ribbon and the fiber from 5 different codes described below: TIA, USER 1, USER 2, USER 3 and USER 4.

Code Definition The Code Definition line opens a sub-menu, with which the different color codes possible on the instrument can be displayed and modified (see figure "Color code definition" on page 48).

Five different codes can be managed by the T-BERD/MTS, including a standard code.

The standard code (TIA) may be displayed but it cannot be modified.

The other codes, called by default USER1, USER2, USER3 and USER4, can be entirely personalized.

– Edited code selects the code for display or modification.
– Code name to give a new name to the code selected, press the ▶ key, which calls up the edit menu.
– View codes displays the color codes 1 to 12, 13 to 24 or 25 to 36.
– Code 1...23 Use the arrow ▶ to modify the codes if necessary.

Figure 24 Color code definition

Project Information

Technician Id

Use the arrow ▶ to enter the name of the operator carrying out the measurement.

Job Id

Use the arrow ▶ to enter a description of the measurement to be performed.

Comment

In contrast to the other data in this menu, the comment is specific to a fiber. This line is thus used to enter a new comment and not to display it. The comment appears at the top of the screen, with the other parameters of the fiber.
This comment will remain available for the next acquisition, unless it is deleted. It is also saved when a trace is saved with a comment.

Configuring the File parameters

The File storage parameters must be also configured, in order to define how the results traces will be saved onto the T-BERD/MTS.

In the **Setup** page, press **Set Report** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Set Report**).

> **NOTE**
> The softkey **Copy File/Link To all** is displayed when one parameter is selected in the Link or File Setup page and when the Powermeter or Source function is active.
>
> It allows to apply the Link and File configuration parameters of the current applications to all the other active Fiber Optic applications (powermeter, and source).

Directory configuration

Dir. Naming

Click on **Current Directory** menu key to select the directory currently selected in the explorer for files saving

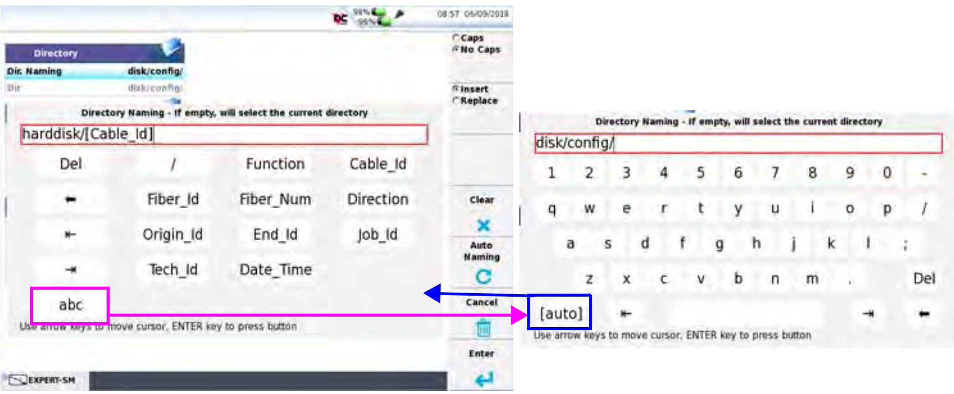
or

Use the arrow ▶ to enter the directory name and path:

In the edition keypad, 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/Test`

Figure 25 Directory - Edition keypad



or

Press **Default Filename** to apply the name by default to the file:

`(hard)disk/[Cable_Id]`

Press **Clear** and validate (**Enter** key) in order to define the `[Current directory]` selected as directory for saving measurements.

Dir

This parameter cannot be configured, and display the directory selected by default into which the file(s) will be saved.

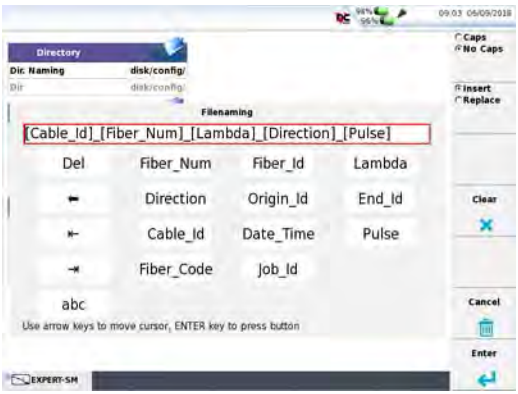
Result storage

Filenaming

Select **Filenaming** parameter and press the right arrow key to modify the name of the file for the result trace.

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

Figure 26 Filenaming - Edition keypad



or

Press **Default Filename** to apply the name by default to the file:

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

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

File Content

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

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

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

One and All Traces
this option combines the two previous ones: in case of traces in overlay, each trace is saved in a distinct file and all traces are saved in one single file.

NOTE
This parameter is not available with RDZ application (see "Reduced Dead Zone OTDR application" on page 167).

Auto Store

Select **Yes** to store automatically the trace or traces resulting from each acquisition according to the filenaming rules.

Report Configuration

A report can be generated from the OTDR results page at the same time as the trace saving (see "Saving the trace(s) and generating a report" on page 100).

The report configuration is performed form the File Setup page

Report As

Select the report format to be generated: **Txt** / **Pdf** or **All** (pdf + txt format).

Select **No** if no report must be generated.

Report Layout

This parameter allows to define the report page setting:

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

Consolidated in multi-traces display, one report page is generated for all traces

Report naming

Select **Report naming** parameter and press the right arrow key to modify the name of the report file for the result trace.

In the edition keypad, enter a name manually for the file and press Enter to validate.

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 not available if the report format selected is a Txt file.

Configuration in Test Auto mode

The **Test Auto** key imposes the parameters for acquisition, measurement and display of results defined as default settings in factory.

ACQUISITION	**Acquisition**	Laser	All
		Acquisition Mode	Auto
		Time	Auto
		OTDR Connector Test	Yes & Cont
		Launch Cable	No
	Additional Pulses Setup	Short Pulse	No
ALARMS	**Alarms**	Alarm Level	None
ANALYSIS	**Parameters**	Section Attenuation	dB/km
		Section Length	Yes
		Index of Refraction	G652 G657
		Scatter Coefficient	Auto
		Results on trace	Graphics
		Event Notes	No
	Measurement	OTDR Connector Meas	No
		Splice	Auto

ACQUISITION	**Acquisition**	Laser	All
		Reflectance	All
		Ghost	No
		Fiber End	Auto
		Bend	Auto
		Event After Fiber End	No
		Total Loss	Before evt.
LINK	**Link Description**	Change Fiber Nr	Increment
REPORT	**Dir. Naming**	[Current Dir.]	
	File configuration	Filenaming	Auto filenaming
	`Fiber[Cable_Id][Fiber_Num]_[Lambda]_[Direction]`		
		Auto Store	Yes

Saving OTDR configuration in a file

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

This configuration file can then be recalled in two cases:

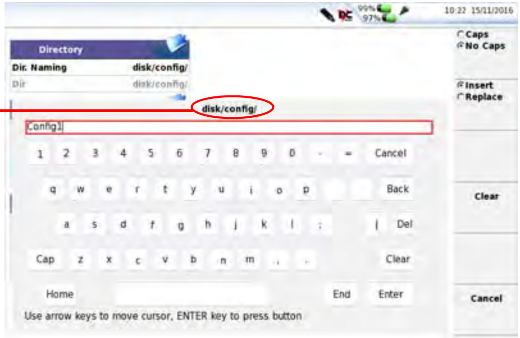
- in order to be applied when acquisition in Smart Test mode is performed.
- in order to be recalled for future acquisition in Expert OTDR

To save parameters in a configuration file:

1. If necessary, press **SETUP** to return to **Setup** page.
2. Select one parameter in one of the setup page (acquisition, link..)
3. Press **Save Config.** menu key 

4. Enter a name for the configuration file using the edition keypad (max 20 characters).

Figure 27 Save Configuration file - Edition keypad



NOTE
Configuration file is saved in the directory **config**, into the `disk`.

5 Press **Enter** 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 **Explorer** page.

This configuration file can be selected in Smart Test (see "Selecting the configuration file" on page 29) or loaded for Expert OTDR.

Loading an existing OTDR configuration file

To load a configuration file previously created or available in the T-BERD/MTS and apply parameters to new OTDR Expert tests:

From the File Explorer page

1 Press **FILE** hard key

2 Select the configuration file desired

3 Press **Load** > **Load Config.**

- Press **SETUP** hard key to display the OTDR acquisition parameters saved in the selected configuration file.

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 53).

From the Setup page

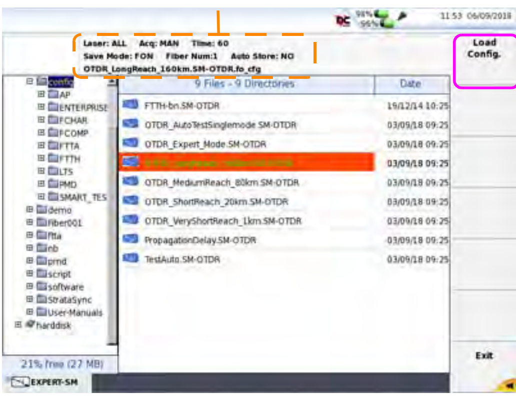
1. Select one header in either Setup page (Acquisition, Link, File...)
2. Press **Load Config.** menu key.
   The file Explorer page displays
3. Select the configuration file desired
4. Press **Load Config.** to load the configuration file for acquisition in OTDR Expert mode.
   A sound is emitted to confirm the loading.
   The **Setup** screen is displayed again.

> **NOTE**
> Some configuration files are available into the equipment, in `disk/config`.

Figure 28 Loading a configuration file

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

Configuration file will be used for Expert OTDR acquisition only



Traffic Detection and connection quality indicator

Traffic Detection

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

1. Press the **START/STOP** 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 cancelled (key **NO**), and the **START/STOP** pushed another time, the box asking if you wish to continue or not is displayed.

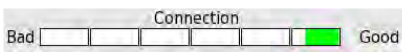
The functioning of Traffic Detection is then indicated in the scaled down representation of trace, on the upper left part of screen  .

Connection Quality indicator

An indicator of the state of the connection (Good / Bad) is given at the beginning of an acquisition, whatever is the acquisition mode selected.

The connection quality indicator gives the following information:

Table 3 Quality of connection



State	Connection
Good	The connection is OK

Table 3 Quality of connection

Bad	Possible causes of a bad result: - There are several connectors close to the external connector of the T-BERD/ MTS. - 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.

NOTE
If the connection is bad, check and clean the connector / jumpers (see “Cleaning the universal connector” on page 20).

Battery saver

When running on battery, if no acquisition has been performed for two minutes, the power supply of the module is cut off to save the battery.

Performing OTDR acquisitions

Once the configuration for acquisition and file storage has been defined, the instrument is ready to launch an OTDR measurement.

Acquisition in Real Time mode

Principle of Real Time mode

Acquisition in real time must not be used if a precise measurement is required because of the high noise level, but it is sufficient for rapid optimization of a connection and for observing a fiber in process of utilization.

Performing an acquisition in Real Time mode

To carry out an acquisition in real time, after selection of the requisite acquisition parameters (see “Configuring the Acquisition parameters” on page 32):

- Hold the **START** key down for about three seconds, to launch the acquisition in real time, either in Smart Test or Expert OTDR mode, whatever is the acquisition mode selected.

  or

  If the **Time** parameter is defined with **Real Time** in **Setup** page in Expert OTDR mode, press **START/STOP** hard key.

  or

  In the **Setup** page of the Smart Test mode, press **Real Time** key 

 (see Figure 16 on page 29).

  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.

> **NOTE**
> If the connection is bad, check and clean the connector / jumpers.

Once **START/STOP** key is pressed, the acquisition in real time is launched.

Figure 29 Example of acquisition in real time

During an acquisition in real time, several actions can be made on results in progress: see “Actions on trace during acquisition” on page 63.

> **NOTE**
> During acquisition, the traffic on fiber is automatically detected (see “Traffic Detection” on page 56)

Stopping the real time acquisition

To stop an acquisition in real time mode, press the **START/STOP** key at any time.

Performing a measurement with Smart Test

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

At the end of test, the results page displays.

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

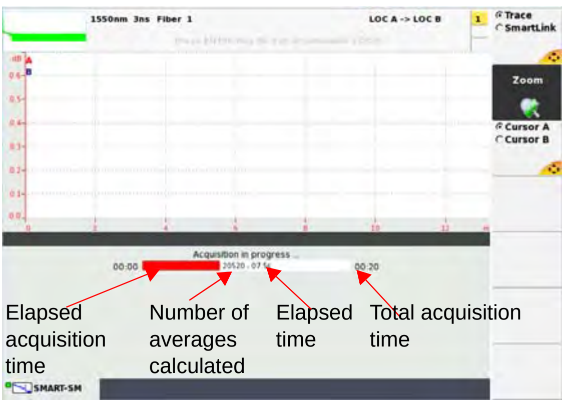
to launch measurement (see Figure 17 on page 30).

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 3 on page 56)

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

Figure 30 Acquisition in progress in Smart Test



At the end of the acquisition, a beep is emitted, and the measurements are displayed in SLM view,

> **NOTE**
> During acquisition, the traffic on fiber is automatically detected (see “Traffic Detection” on page 56)

Performing an acquisition with Expert OTDR

In this mode, the T-BERD/MTS 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 **Acquisition** menu. It may be stopped at any time using the **START/STOP** key.

1. Press the **START/STOP** key to start the acquisition.
   The red 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 3 on page 56)
   

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

Figure 31 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" on page 56).

NOTE

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

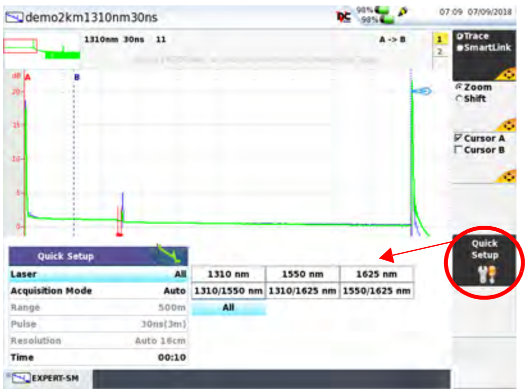
Performing an acquisition from Results page

Once the results page is displayed, you can perform a new acquisition modifying the main acquisition parameters.

> **CAUTION**
> Before launching a new OTDR acquisition, make sure the trace(s) displayed have been previously saved if necessary, as the new acquisition will automatically delete the displayed results.

On **Results** page,in Expert OTDR mode, press the softkey **Quick Setup**: the acquisition parameters to be modified are displayed under the results trace.

Figure 32 Results page and Quick Setup menu (Expert OTDR)



– Modify the acquisition parameters wished in the displayed menu: Laser / Acquisition / Range / Pulse / Time

See page 33 and page 34.

1 Once configured, launch the new OTDR test pressing the **START/STOP** hard key.

Press again **Quick Setup** menu key to hide the menu under the trace.

Multi-wavelength acquisition

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

1 In the **SETUP** menu, on the **Laser** line, choose several lasers or select **All**.

2 Start the acquisition by pressing the **START/STOP** button.

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

or

To stop manually the acquisition for current wavelength, click on **Stop Wavelength**. This will allow to automatically start the measurement for the following wavelength.

The different traces appear in the same window and can be managed as traces in overlay (see “Display of traces in overlay” on page 77).

Actions on trace during acquisition

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

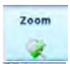
Positioning Cursors A and B

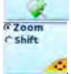
1 Select **Cursor A** or **Cursor B** and:

- 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

1 Select **Zoom** function:

- use the menu key 

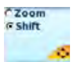
 in Smart Test
- use the menu key 

 in Expert OTDR

2 Use touchscreen or validation key to zoom in and zoom out on trace (see “Zoom function” on page 75)

Shifting the trace (Expert OTDR and Real Time only)

In Expert OTDR and Real time mode only, the trace can be shifted vertically or horizontally during the acquisition:

1 Select **Shift** function on menu key 

2 Use touchscreen or direction keys to shift horizontally or vertically the trace (see “Shift function (Expert OTDR only)” on page 77)

Displaying Trace or SmartLink page

1 Use the menu key **Trace/SmartLink** to display either:

- the acquisition trace in progress and the bar graph of time
- the SmartLink 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: once **Trace** is selected, press validation key to pass from Trace + results table on 1 line to Trace + results table on 4 lines, and vice-versa,
- the **SmartLink** function allows to display a graphical view of results.

Modifying acquisition parameters (in Real Time mode only)

You can modify the acquisition parameters without returning to the **SETUP** menu.

1 Press the **Acquisition Param** key

2 Use displayed keys to scroll through the possible values of the various acquisition parameters.

Figure 33 Example of acquisition in Real Time

Zooming on the fiber end (in Real Time mode only)

During a real time acquisition, you can reach the end of the fiber under test at any time:

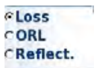
1 Press **Zoom to End** menu key.
The display automatically reaches the end of the fiber under test.
The menu key **Zoom to End** becomes **Zoom to Start**.

Press **Zoom to Start** to display the start of the fiber under test.

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 **Loss / ORL / Reflect.**:

1 Position A & B cursors on the trace

2 Click as many times as necessary on key 

to get the measurement between A & B cursors.

Figure 34 Example of loss measurement

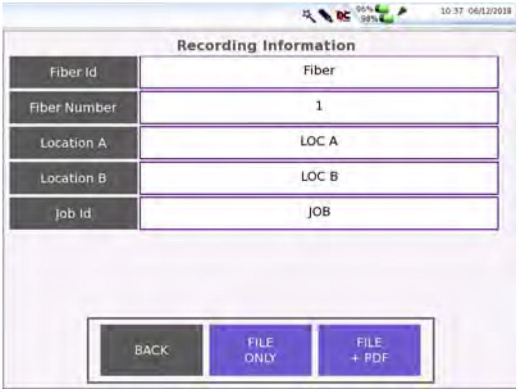
Saving results for Smart Test acquisitions

Once the acquisition is completed, the results trace displays, in Smart Link view

1 Press **Save** menu key to save the results in a file.

The Recording Information page displays

Figure 35 Save results in Smart Test mode



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

– **Fiber Id**: click on the fiber name currently defined to display the edition keypad and enter a new fiber name.

– **Fiber Number**; click on the fiber number currently defined to display the numeric keypad and enter a new fiber number.

– **Location A** / **Location B**: click on the location name currently defined to display the edition keypad and enter a new name.

– **Job Id**: click on the Job description currently defined to display the edition keypad and enter a new description.

NOTE

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

Example: if the **Job Id** is defined with *Test Fiber 1*, the otdr filename will be *Test Fiber 1*.sor.

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 **BACK** to return to results trace without saving the results.

Results display

The traces acquired or recalled from a memory are displayed on the Results page. According to the mode of acquisition (Expert OTDR or Smart Test), the results page offers similar functions, but also different functions.

At the end of the acquisition, the Smart Link view is displayed in Smart Test mode, whereas the Trace View is displayed in Expert OTDR mode.

Click on the softkey **Trace/SmartLink** to modify the diplay.

Trace Display

Figure 36 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 or in the Setup screen in Expert OTDR mode).

Table 4 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.
Warning	Results for minor alarm exceed the thresholds defined in Warning mode. Results are displayed in yellow in the table.
Valid	Indicates that all the results lie within the thresholds (no result is in red or yellow). Results are displayed in green in the table.

Common functions

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 test in Expert OTDR” on page 31). Attenuation and reflectance results for an event will be displayed if they can be calculated

The following table gives some examples of detection of events for different threshold values.

E.g.	Value of the thresholds		The T-BERD/MTS displays a value if the attenuation <u>or</u> the reflectance has one of the following values	
	Attenuat. (dB)	**Reflect. (dB)**	**Attenuation**	**Reflectance**
1	0.05	- 60	≥ 0.05 dB	> - 60 dB[1]
2	1	- 15	≥ 1 dB	≥- 15 dB[2]
3	6	---	≥ 6 dB	

1. Example: a value will be displayed at -43 dB.
2. Example: a value will be displayed at -14 dB but not at -20 dB.

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

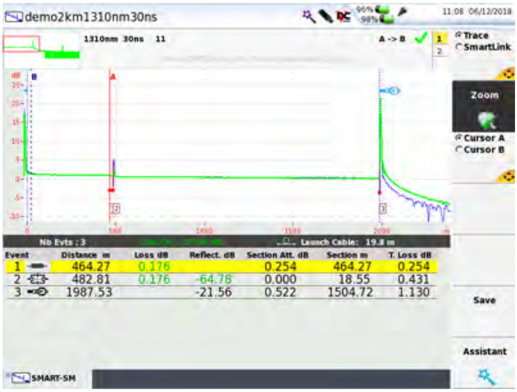
Under the trace is displayed the results table with all the events detected during acquisition.

Smart Test Mode

In Smart Test,mode, the results table is always displayed under the trace, in **Trace** dispay: see Figure 37 on page 70

Expert OTDR Mode

Figure 37 Trace + Table results in Smart Test



In Expert OTDR mode, once **Trace** is selected, press validation key to pass from Trace + results table on 1 line to Trace + results table on 8 lines, and vice-versa

The table with one line displayed under the trace gives the type and characteristics of the event nearest to the cursor.

The 8 lines table gives the type and the characteristics of all the events detected during the measurement: the 8 first lines displayed correspond to the 8 first events nearest to the cursor. The line corresponding to the event nearest to the cursor is highlighted. This highlighting moves if the cursor is moved.

Figure 38 Example of trace and results table in Expert OTDR

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, in Expert OTDR mode, reference trace icon (if trace is the reference trace - see “Reference Trace function” on page 99).

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.

Reflective event. (e.g. connector)

Ghost reflection.

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

End of fiber

OTDR connector

Event marker when a measurement cannot be carried out. If the event to be added is too close to an existing event, the icon appears on the trace and the table, but no measurement is carried out: to obtain the results for this event, a manual measurement is necessary.

Merged Connectors Loss

– Total group loss = loss on last connector
– Loss connector N-1 = 0 dB)

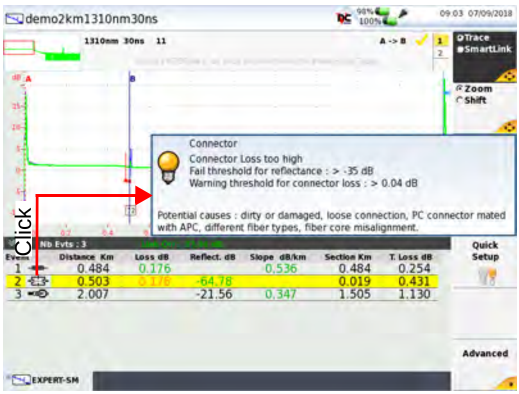
The event underlined in yellow is the one the nearest of the cursor set on trace. To visualize an event, click on this event on the table to set the cursor on it onto the trace.

Detailed description of an event

Click on one event icon in the results table to display the event type and the alarm threshold defined for this event (if Alarms have been defined in the Setup page).

If the value of the event selected exceeds the defined threshold, then the possible causes for this alarm are described in the window:

Figure 39 Event description



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

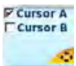
Distance	The distance of the event from the beginning of the fiber, in meters (or miles)
Loss	The attenuation due to the event, in dB
Reflect.	The reflectance of the event, in dB
Slope (Expert OTDR only)	The slope before the event, in dB/km (or dB/kft) if it can be measured
Section (Expert OTDR only)	The length of the section = the distance 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:

- in a solid line if the cursor is selected.
- in a dotted line if the cursor is not selected.

Positioning the cursor

1 Press the key 

to active the cursor.

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

You can also use the direction keys ◀ and ▶ to move the selected cursor along the trace

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

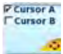
The cursors data are displayed exclusively if the Cursor menu key is active. If another key is active, the display shows help tooltips, different according to the selected function.

When a selected cursor touches the right or left-hand edge of the screen, the trace starts to scroll horizontally to maintain display of this cursor.

If an unselected cursor has been moved off-screen by a zoom, it can be brought back on to the screen by selecting it and then pressing one of the direction keys ◀ or ▶. It will then appear on whichever edge of the screen is closest to its position.

When the cursor function is selected, the keys ▲ and ▼ move the trace vertically.

Cursors information

The information related to cursors are displayed exclusively when the Cursor function is selected (menu key  selected).

Above the trace are shown the co-ordinates of the points of intersection of the cursors A and B with the trace, together with the distance between the two points.

Figure 40 Cursors information

The Cursor function is not selected

The Cursor function is selected

> **NOTE**
> The cursors information are displayed in the report when the Cursor function is selected (active key). If the cursors values must not be displayed in the report, select another softkey than the **Cursor** one before performing the report (softkey **Trace** or **Zoom** for example).

Cursor and Zoom

If the **Cursor** key is selected, press the validation button ( or **ENTER**) to perform an automatic zoom until the fiber end or until the end of the range (**Range** parameter defined in the configuration screen).

This will modify the cursors position, which will be positioned automatically at the beginning and at the end of the link (taking into account the possible launch cables).

If another key than the key **Cursor A / Cursor B** is activated when the validation key is pressed (**Trace** or **Zoom**), the cursors' position is unchanged.

Cursor function not selected

When Cursor menu key is not selected, the upper banner displays information, different according to the menu key selected:

- If the **Trace/Summary** key is selected, with **Trace** function valid, the upper banner indicates that to change the displayed trace, you can click on the banner or on the right arrow key
- If the **Zoom/Shift** key is selected, and the **Zoom** function valid, the upper banner indicates that to get an automatic or full zoom, you must press **ENTER** key.

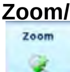
Zoom function

The Zoom function is used to analyze part of the trace in greater detail. The zoom is centred on the active cursor.

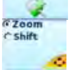
The position of the section of trace displayed with respect to the complete trace is represented by a red rectangle on the mini-trace at the top left-hand corner of the screen.

Defining a zoom on the trace using the touchscreen or screen deported on PC

1 Press **Zoom** or **Zoom/Shift** softkey to activate the zoom function

– menu key 

in Smart Test

– menu key 

in Expert OTDR

2 Press once in one location on the screen, which will represent the upper left corner of the zoomed area.
The icon  is displayed on the screen.

3 Press another time on the location which will represent the lower right corner of the zoom.

Figure 41 Zoom on trace using touchscreen

Defining a zoom level on the trace using direction keys

1. Select **Cursor A** or **B** and center it on the zone to be examined
2. Press **Zoom** softkey in Smart Test or select the **Zoom** function on key **Zoom/ Shift** on Expert OTDR.
3. Use the ▶ or ◀ key to increase or reduce the zoom factor, keeping the selected cursor centered on screen.

Swapping from an automatic zoom to full trace and vice-versa

The automatic zoom allows to get an optimized display of the trace.

To apply an automatic or entire zoom on the trace:

1. Press **Zoom** softkey in Smart Test or select the **Zoom** function on key **Zoom/ Shift** in Expert OTDR.
2. Press validation key to apply an auto zoom on trace.
   Press again validation key to display the trace in full screen.

Specific functions of the zoom with a touchscreen

With the touchscreen, once the **Zoom** function is selected, you can:

- 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

- once a zoom is performed, double click on the zoomed zone to undo the zoom

Zooming on the different events in succession

1 Zoom on one of the events detected as shown above.

2 On the **Trace/Summary** key, select the Trace function.

3 Use the ▼ and ▲ keys to move the zoom on to the successive events.

Shift function (Expert OTDR only)

The Shift function is used to displace the displayed section of the trace by pressing the direction keys or 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 Select the zoom factor as described above.

2 Choose cursor A and cursor B position.

3 On the **Zoom/Shift** key, select **Shift**.

4 Displace trace manually on touchscreen toward left/right or upward/backward.
or
Use the direction keys to shift the trace in the desired direction

Display of traces in overlay

Whether in Expert OTDR or Smart Test mode, up to 8 traces can be displayed in overlay. Those traces are either

- results from the acquisition
- loaded from the Explorer page
- open from the Overlay sub-menu, in Expert OTDR mode exclusively.

In overlay mode, the traces are shown in different colors (the active trace is green).

Figure 42 Traces in overlay

Selecting one trace from overlaid traces

To make actions on a trace in overlay (move on events, set a cursor...), it must first be swapped with the active trace. To do this:

1. Press the **Trace** key
2. Press the direction keys ◀ and ▶, as many times as necessary, until the active trace is displayed in green.

   or

   Click on the trace numbers in the upper right side of the result page until the trace desired is selected.

   or

   Click on the upper part of the screen, in Trace information zone to scroll the traces.

> **NOTE**
> Actions relative to traces (move cursors, events...) are exclusively done on the active trace (in green), not on the other ones.

Traces display in double acquisition mode

When a double acquisition has been performed, i.e. a short acquisition preceding a standard one (see page 33), two traces are displayed in the same window.

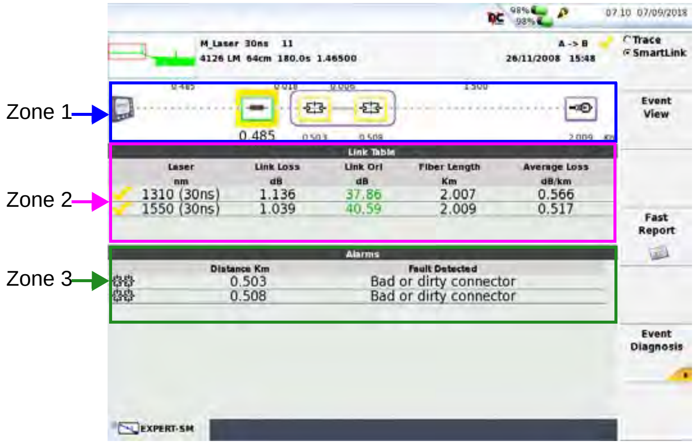
Figure 43 Traces display in double acquisition mode

The short trace is the one resulting from the short acquisition and stops while the standard one continues until the end of measurement.

SmartLink View

1 Click on this menu key **Trace/SmartLink** to select **SmartLink**.
A screen as the following one is displayed:

Figure 44 SmartLink function



The screen is divided into three zones:

- **Zone 1**: Graphical representation of the link, with icons symbolizing the different events detected.

Receive Cable

End Cable

Splice

Splitter

Mux / Demux

Connector

Ghost

ORL ORL

Bend

Slope

End connector

Front OTDR connector

Merged connectors

- **Zone 2**: 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).
- **Zone 3**: Alarms table (if any)

Show the detailed information of one event

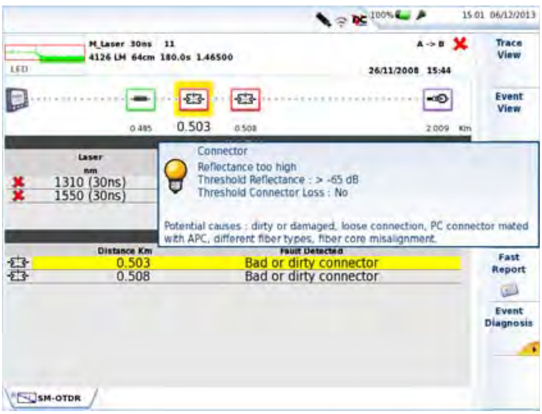
The information concerning the event, its type and the alarm thresholds defined for this event, can be displayed from the SmartLink screen.

1 Select the event for which information must be displayed, on the graphic using the touchscreen or direction keys.
The event is highlighted in yellow once selected.

2 Click on the **Event Diagnosis** menu key.
A small window displays. It describes:

- the event type
- the value above which it is on defect
- the possible causes of the alarm

Figure 45 Event Diagnosis



Event View

1 Click on **Event View** menu key to display a detailed description of one event detected on trace.

2 Select the event to be described on the graphic (underlined in yellow).
The corresponding event description is displayed on the Zone 3, with a recall of alarm threshold for this event:

Figure 46 SmartLink: Event View

3 Click on **View Trace** to display the selected event in the results table and zoomed on trace.

> **NOTE**
> The event is framed in red if it is above the alarm thresholds defined in the setup menu.
> It is framed in green if it lies within the thresholds.
> It is framed in purple if no alarm has been defined in the Setup menu

Changing the type of an event

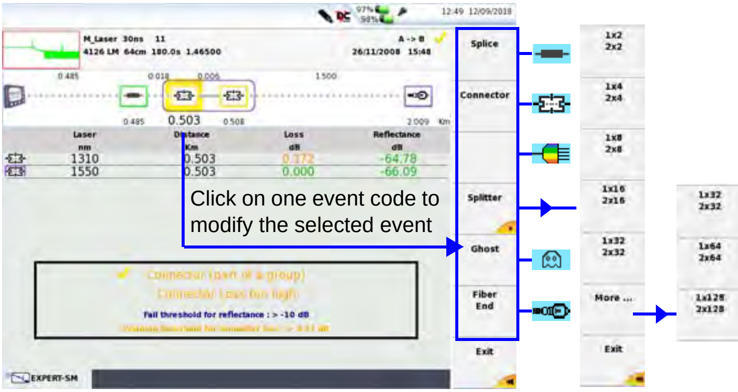
Once the Event View is displayed, the type of event can be modified:

1 Select the event to be modified (framed in yellow)

2 Press **Event Code** menu key

3 Click on the event type to be applied to the selected event:

Figure 47 Event Code



4 Click on **Exit** to return to **Event View**.

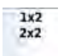
5 Click back on **Event View** menu key to return to Summary screen
or
Click on **Trace View** menu key to return to trace (+ table) screen.

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

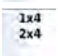
Splitter sub-menus

The Splitter icon is different according to the menu key pressed in the Splitter sub-menus.

Example:

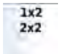
If the menu key 

is pressed, the icon  is displayed

If the menu key 

is pressed, the icon  is displayed.

Moreover, the icon and splitter configuration is different according to the number of «clicks» on one menu key.

Example with the menu key  :

- Click once: the icon is 
- Click twice: the icon is 
- Click three times: the icon is 
- Click four times: the icon is 

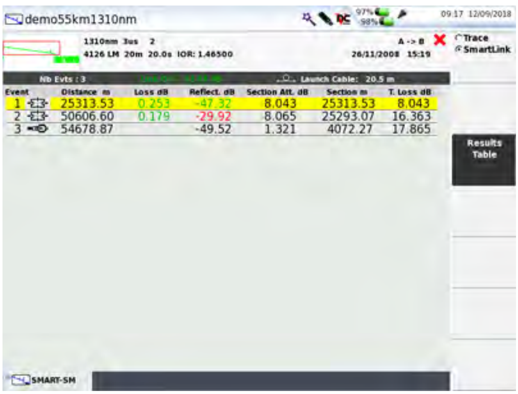
Click a fifth time to reset the event by default.

Results Table (Smart Test Mode)

In Smart Test mode, the Smart Link view allows to display exclusively the results table on screen.

1 Click on **Results Table** menu key.

Figure 48 Results Table in Smart Test mode



Press again the **Results Table** menu key to return to the Smart Link view.

Advanced functions in Expert OTDR mode

Several actions on trace displayed can be performed in Expert OTDR mode only.

Automatic measurement and detection

If the instrument does not detect all the expected events, additional manual measurements can be carried out.

To delete all the markers, press the **Advanced** key, then select **Modify Meas.** > **Delete**.

The following procedure is recommended:

1. By default, the instrument locates the events and proceeds to the measurements.
2. Addition of events (see “Addition of events” on page 85) 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 start an automatic measurement while a measurement is already in progress:

1. Press the **Advanced** key.
2. Press the **Modify Meas.** menu key
3. Select **Delete** and press validation key .
4. Select **Auto Meas.** and press validation key .

Addition of events

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

Representation of the events

The events are represented by the symbol : if they are set during a measurement.

The events are represented by the symbol if they are set manually in **Advanced** mode.

To add markers of events:

1. Select a cursor (A or B).
2. Use the direction keys or touchscreen to move the cursor to the place where you want to position a marker.
3. Press the keys: **Advanced** > **Set Event**.
4. An event marker is 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 events

- Do not add markers (with the **Set Event** key) 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 **Set Event** 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 **Set Event** 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.

Relative measurement

Relative measurements, using the 2 point method, can be carried out by means of the **Event** function in coordination with the two cursors. For example, you can analyze the total loss on a link with launch cable:

1. Place one of the cursors at the end of the launch cable.
2. Select the other cursor.
3. Use the **Set Event** function. The measurements displayed give the actual distance from the start of the link and the attenuation of the link plus the attenuation of the connection.

Modifying types of events

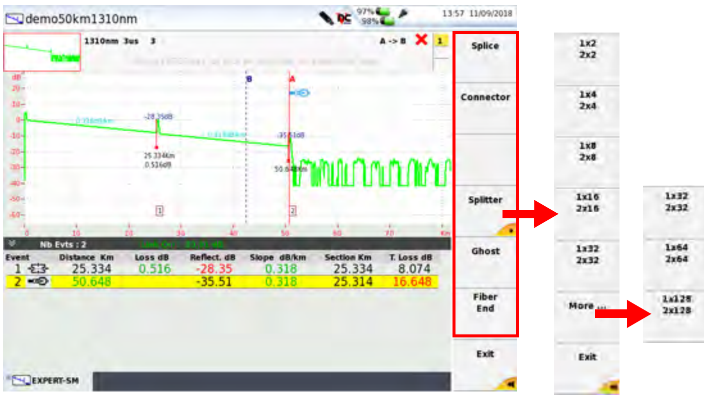
The types of events are detected automatically as a function of their optical signature. This can sometimes lead the system astray, if reflection from a connector is too strong (end of fiber?), if a splice has a very low insertion loss (slope?), etc. Similarly, some types of events cannot be recognized automatically from their signatures (for example, couplers, multiplexers, etc.). For this reason, it is advantageous in some cases to be able to change the type of events.

To do this:

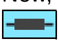
1 In the **Advanced** menu, press **Modify Meas.** key, then select **Manual Meas.**

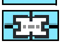
2 Select the **Event Code** button.

Figure 49 Buttons used to modify types of events



New, more specific event types are then proposed:

 Splice

 Connector

 Splitter/Coupler

 Ghost

 Fiber End

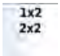
3 Position the cursor on the line for which modification of event type is desired.

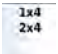
4 Click on the button corresponding to the required type of event.

Splitter sub-menus

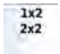
The Splitter icon is different according to the menu key pressed in the Splitter sub-menus.

Example:

If the menu key  is pressed, the icon  is displayed

If the menu key  is pressed, the icon  is displayed.

Moreover, the icon and splitter configuration is different according to the number of «clicks» on one menu key.

Example with the menu key  :

- Click once: the icon is 
- Click twice: the icon is 
- Click three times: the icon is 
- Click four times: the icon is 

Click a fifth time to reset the event by default.

Table notes

With each event, it is possible to associate:

- a note of no more than 40 characters, entered by the user
- an indicator of uncertainty qualifying the result displayed.

> **NOTE**
> This information appears in the table, under the line relating to the event, if it has been validated in the **SETUP** menu on the **Event Notes** line.

Notes

For each wavelength, a maximum of 16 notes is possible.

For each note, 40 characters can be entered.

NOTE

Each note is associated with an event. Consequently, if the event is deleted, the note will be deleted too.

To enter a note:

1. In the menu: **Setup** > **Analysis** > **Event Notes**, the Notes option must be selected
2. On the **Results** page, in the table, select the event
3. Press **Advanced**
4. Press **Notes**
5. Enter the text of the note in the edit menu that appears
6. Press **Enter** and then **Exit**.

The notes are displayed under the selected event, in the results table.

Uncertainty of results

In the table of results, the user can display indicators to evaluate the uncertainty of the result. This function must be validated in the **SETUP** menu, on the **Notes Evt.** line.

The following cases are possible:

Indicators concerning attenuation measurements	
2c manual	Result of a manual measurement between the reference and the cursor using the 2-cursors method.
5c manual	Result of a manual measurement using the 5-cursors method.
Global	The attenuation displayed is a global result for Fresnel reflections which are not sufficiently separated.
Close evts	As several events are too close together, only the attenuation of the last one is displayed.
Indicators concerning measurements of slope	
Few pts	Measurement of slope by the least square approximation method without using many points of acquisition.
2 points	Measurement of slope by the 2-point method.

> **NOTE**
> The **SETUP** menu > **Analysis** > **Event Notes** line enables display of notes, of uncertainties or of neither the one nor the other. Notes cannot be displayed at the same time as uncertainties.

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.

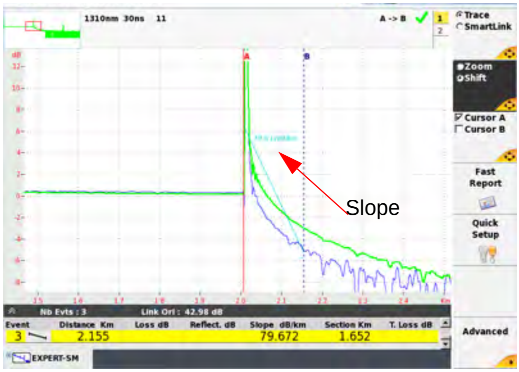
The manual measurements are accessible in the **Results** page, after pressing the keys: **Advanced**, then **Manual Mea.**.

Measurements of slope

To make a manual measurement of slope, 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 **Advanced** key, then the **Manual Meas.** key, then select **Slope**.
4. Press validation key (or **ENTER**) : the slope of the specified trace section is displayed.

Figure 50 Manual Measurement results



Result of slope measurement

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

The measurement results are also available in the table:

1 Press **Exit** to return to the initial results page.

2 Select **Trace** using **Trace/Summary** soft key

3 Press validation key to display results table under the trace.

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

– "Section" shows the distance between the previous event (which may also be the beginning of the link) and the end of the slope. Thus this section value is not equivalent to the distance between the two slope indicators [and].

– "Slope" shows the slope value in dB/km

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 Select **Slope** (after, if necessary, pressing **Advanced** > **Modify Meas.** > **Manual Meas.**).

3 Press validation 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 the **Advanced** > **Modify Meas.** > **Manual Meas.**, then select **ORL**.

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

Figure 51 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 the **Advanced** > **Modify Meas.** > **Manual Meas.**, then select **Reflec.**.

4 Press validation key .

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

Figure 52 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 the **Advanced** key, then **Modify Meas.** > **Manual Meas**.
3. Select the function **2 Pt Loss**.
4. Press validation 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 the **Advanced** key
4. Press **Modify Meas.** key, then **Manual Meas.**
5. Select **5 Pt Loss**.
6. Press validation 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

To memorize the position of events with a view to repeating the measurements at the same place during a future acquisition or on another trace, press the **Advanced** key, then select **Lock Evts**. The event memorization icon  will appear in the title bar.

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 **Lock** with the key  in the **Advanced** menu.

3 Add the manual measurements required (keys: **Advanced** > **Modify Meas.** > **Manual Meas.**).

CAUTION

<u>If an event is added</u> (with the **Set Event** key) <u>after manual measurements have been performed</u>, 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 memorization icon  is displayed, 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 **Free Events** 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 53 Example of overlaid traces

Overlaying several traces stored in memory

To display up to 8 traces from the memory, deleting the current trace(s) already loaded:

1 Press the **FILE** button.

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 green), the other traces being overlaid.

Display of traces in overlay

- The traces are shown in different colors (the active trace is green).
- Their serial numbers are repeated at the top of the screen.
- The OTDR markers are referenced on the active trace by the symbol , and on the other traces by vertical dashes.

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 “Reference Trace function” on page 99)

2 Press the **FILE** button, 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.

> **NOTE**
>
> If the number of files selected exceeds the display capacity, a message gives warning that loading will be incomplete: only the trace or traces selected first will be displayed, up to the permitted limit of 8 traces.

Swapping overlay traces

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 swapped with the active trace.

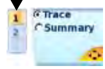
1 Press the **Trace** key,

2 Press the ◀ and ▶ direction keys, as many times as necessary, until the active trace is displayed in green.

or

Click on the trace numbers in the upper right side of the result page until the trace desired is selected.

traces



Changing the traces position

Once a trace is displayed in overlay, the traces can be adjusted according to the Y axis:

1 Press **Advanced** > **Overlay** menu keys.

2 Select the adjustment according to Y axis:

- **Y Reset**: all traces are on the the same level at the intersection with the active cursor.
- **Y Shift**: Each trace is shifted from 5 dB from the other.
- **Y Exact**: the traces displayed are on the same position according to their injection level.

Removing a trace

Removing the current trace in overlay

It is possible to remove a trace displayed. To do this, first select it (see previous paragraph), then successively press **Advanced** > **Overlay** > **Remove Current Trace**.

Removing all the traces in overlay

To remove all the traces except the current trace, then successively press **Advanced** > **Overlay** > **Remove Other Traces**.

Quitting the overlay menu

To quit the overlay menu, press the **Exit** key.

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).

Using 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

2 Go in the **Advanced** menu

3 Click on **Overlay**

4 Click on **Set curve As Reference** key.

The active trace becomes the reference trace;

- the icon  appears on the upper right hand part of the results table.

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

Removing the reference trace(s)

To change one reference trace into a «standard» trace, select it using the **Trace/ Summary** key or click on the trace number, and in the **Advanced > Overlay** menu, click on **Reset Reference**

To change all the reference traces displayed into «standard» traces, whatever is the active trace, go in the **Advanced > Overlay** menu and 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.

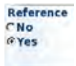
Using the reference trace function in the explorer

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**

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 trace(s) open(s) and the icon 

appears on the upper right hand part of the results table.

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

5 Go back to the explorer

6 Select the trace(s) to be opened in the same screen as the reference trace(s)

7 Click on **Load** and select **Reference = No** on the key 

8 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, **in Expert Mode only**, a report can be generated directly from the results screen.

In Expert mode, 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 Store" on page 51) with the appropriate **Save Mode** (file only or file + txt or + pdf).

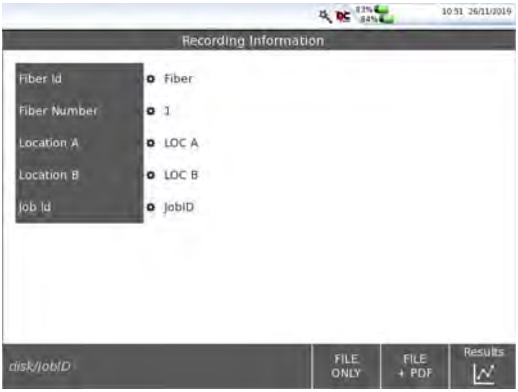
Saving results in Smart Test mode

Once the results page is displayed, cick on the menu key Save 

.

1 In the Recording Information screen, click on one parameter definition to modify it.

Figure 54 Saving results in Smart Test mode



> **NOTE**
> The file is saved automatically by default with the **Job Id** parameter.
> Example: if the **Job Id** is defined with *Test Fiber 1*, the otdr filename will be *Test Fiber 1*.sor.

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

- **Fiber Id**: click on the fiber name currently defined to display the edition keypad and enter a new fiber name.
- **Fiber Number**; click on the fiber number currently defined to display the numeric keypad and enter a new fiber number.
- **Location A** / **Location B**: click on the location name currently defined to display the edition keypad and enter a new name.
- **Job Id**: click on the Job description currently defined to display the edition keypad and enter a new description.

3 Once the recording information are correctly defined, click on **File Only** to save the results in a .sor file,

or

Click on **File + PDF** to save the results in a .sor file and in a pdf one.

A sound is emitted to confirm the results saving.

Saving results and creating a report in Expert OTDR mode

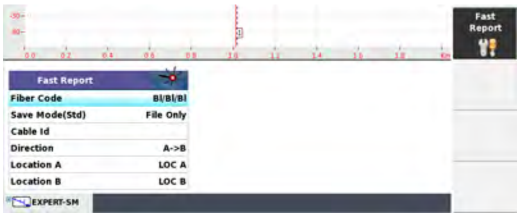
To save the trace and generate a report:

1 Press **Fast Report** key.

A menu displays under the trace.

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

Figure 55 Fast report configuration



a Modify the **Fiber Number** / **Fiber Code** using the key ▶.
The parameter is different according to the Cable Structure configuration (see “Cable structure” on page 45).

b In the **Save Mode** parameter, select:

txt file select **Yes** to save the results in a .sor file and to generate a txt file of the results.

pdf file select **Yes** to save the results in a .sor file and to generate a report in a pdf file.

json file select **Yes** to save the results in a .sor file and to generate a json file.

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

- **c** In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.
- **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** In the **Location A** and **Location B** parameters, enter/modify the name of Origin and Extremity.

3. Once saving is configured as wished, press **Save All** menu key
4. Enter a name for the file in the edition keypad.

   or

   Click on **Auto Filenaming** menu key to apply the file name defined in the Setup screen, in **Filenaming** parameter (see “Filenaming” on page 50)
5. Press **Enter** to validate.

> **NOTE**
> The sor file and the txt or pdf file will have the same name.

The icon  displays during saving process.
Once saving is completed, a sound is emitted onto the Platform.

> **NOTE**
> The file and the report are saved in the last storage media and directory selected.

> **NOTE**
> The file saving can also be performed from the **FILE** > **Explorer** page (see “Saving Files from the Explorer” on page 539).

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 (**SETUP** > **File**), the parameter **File Content** is defined with **One Trace**, one .sor file and 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 (**SETUP** > **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 **FILE** hardkey
2. In the **Explorer** page, in the directory selected, select the file/report.

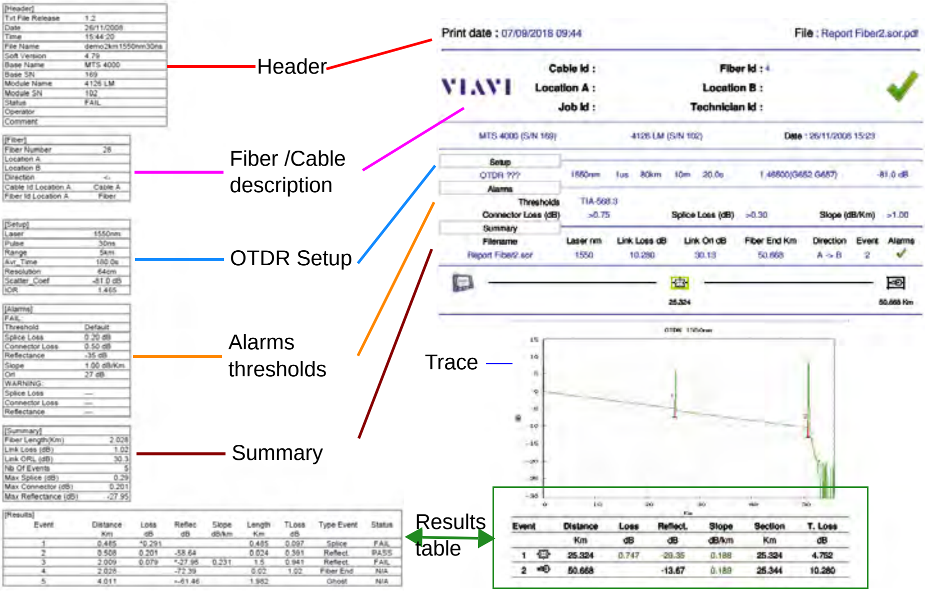
   The file name is:

   For the txt file: *trace file_sor.txt*

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

   The file opens on the T-BERD/MTS.

Figure 56 Example of TXT and PDF reports



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 onto the T-BERD/MTS (see "Generating pdf report(s)" on page 545).

Recalling OTDR files

Once a OTDR file has been stored, recall it using the Explorer:

1 Press **FILE** to open the Explorer.

2 Select the directory and then the file to open

3 Click on **Load**

4 Click on **View Tace(s)** or **Load Trace + Config.**
The selected file is opened

For further informations on file management, see Chapter 20 “File management”.

Enterprise-SLM Software option (T-BERD/MTS-6000A V2 only)

This chapter describes the use of the Enterprise-SLM option, when the software license has been purchased with an OTDR module.

Principle of Enterprise-SLM

The Enterprise-SLM is designed to simplify and automate the characterization (TIER-2) and troubleshooting of structured cabling in Enterprise & Data Centers.

Goals of this function are to:

- characterize/certify the entire link including passive elements such as connectors, cassettes, splices, couplers or splitters, at the installation
- be used as a troubleshooting tool to detect faults such as breaks, bends or excessive losses
- generate all-in-one PDF certification reports on site for each fiber link

Configuring the Enterprise-SLM

Loading a SmartConfig™

The SmartConfig™ is defined with pre-defined test settings to be used as a base configuration that can be customized.

Once the Enterprise-SLM license is installed:

1 From the Home page, select the **Otdr Entreprise** function 

.

2 Press **SETUP** hard key to display the OTDR configuration screen.

3 Press **Load Config.** to select a configuration file from the list:

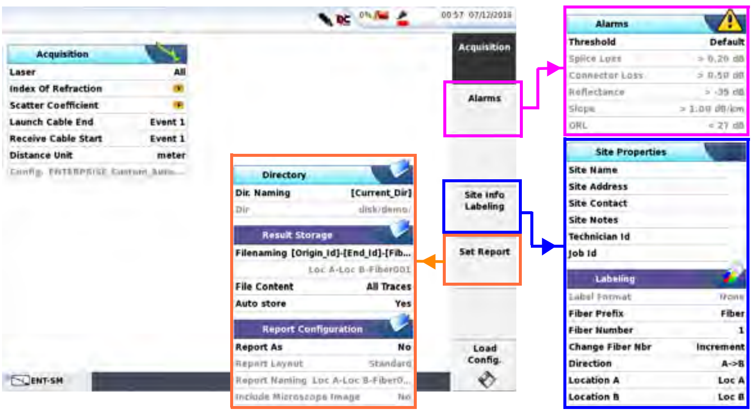
The configuration file includes pre-defined test parameters and label schemes (for automatic file labels generation)

- TIA-606A Class 2 Single Building Horizontal Link = ENTERPRISE_-Class2_Hlink
- TIA-606 Class 2 Single Building Backbone Cable = ENTERPRISE_-Class2_BBCable
- TIA-606 Class 3 Campus Backbone Cable = ENTERPRISE_Class3_BB-Cable
- TIA-606 Customized Hierarchical Cable Labeling Scheme = ENTER-PRISE_Custom
- TIA Colour Coding = ENTERPRISE_Color
- Simple Cable Label (Cable Id, Fiber Id, Fiber Num) = ENTERPRISE_-Simple

4 Once the file selected, press **Load as ENTREPRISE Config.**.

5 Once desired configuration file is loaded, **Acquisition**, **Alarms**, **Link Cable** and **File** setup menus can be configured.

Figure 57 OTDR - Enterprise SLM Configuration



Acquisition

In the first screen, configure the following parameters:

Laser

The acquisition will be carried out on the wavelength(s) selected (for multiple-wavelength modules). In case of a multi-wavelength module, select **All** to perform a measurement for all the wavelengths available (this parameter visible exclusively on modules with one single OTDR port). The possible values depend on the module used.

Index of refraction

Choice of group refraction index of the whole fiber.

User Define for each wavelength (1310 SM, 1360-1510 SM, 1550 SM, 1625 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 à 1.70000).

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. See OTDR chapter, "Index of refraction" on page 39.

Scatter coefficient

Define the scatter coefficient of the fiber. See OTDR chapter "Scatter coefficient" on page 40.

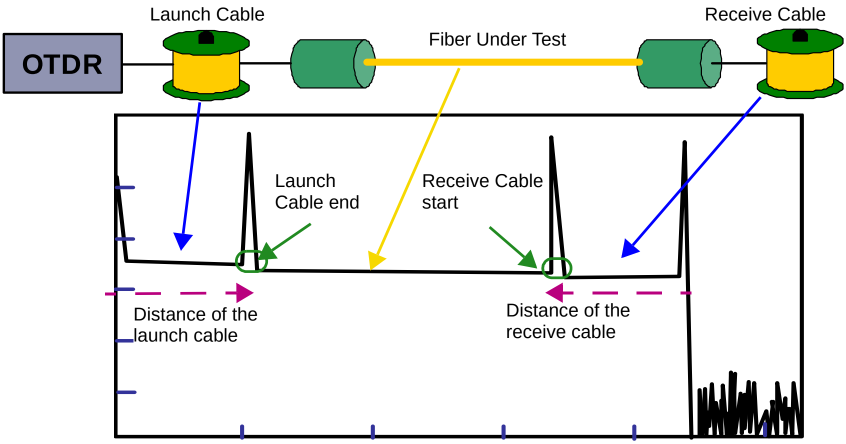
Launch Cable End / Receive Cable Start

No All the results are displayed and referenced on the basis of the board of the module.

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 selected.

Length Use the **Edit Number** key to enter a distance (Min= 0 / Max=50 km / 164.042 kfeet / 31.075 miles) or affect the active cursor value, using the **Set Cursor Distance** key.

Figure 58 Launch Cable / Receive Cable



Distance Unit

Define the unit of the distances displayed: km, kfeet, miles, meter, feet, inch.

Config.

This parameter displays the last configuration file loaded and cannot be modified unless a new configuration file is loaded.

Alarms

In the **Setup** page, press the **Alarm** menu key (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Alarms**).

Alarms > Threshold

- **None** The alarm function is not active.
- **User** Define your own thresholds values for one or several elements: Splice Loss / Connector Loss / Reflectance / Fiber Length Min / Link Loss Max / ORL
- **TIA-568 C / ISO/IEC 11801 / Default**
  Select one of this parameter to configure the alarm thresholds with predefined standards values:

	Splice Loss	Connector Loss	Slope	Reflectance	ORL	Distance	
						SM	MM
Default	> 0.20 dB	> 0.50 dB	**SM**: > 1.00 dB/km **MM**: 850 nm > 3.50 dB/km 1300 nm: > 1.50 dB/km	> -35 dB	< 27 dB	N/A	
TIA-568.3	> 0.30 dB	> 0.75 dB	**SM**: > 1.00 dB/km **MM**: 850 nm > 3.50 dB/km 1300 nm: > 1.50 dB/km	No	No	40 km	2 km
TIA-563.3 RL35				> -35 dB			
ISO/IEC 11801 (2002)	> 0.30 dB	> 0.75 dB	**SM**: > 1.00 dB/km **MM**: 850 nm > 3.50 dB/km 1300 nm: > 1.50 dB/km	No	No	5 km	2 km
ISO/IEC 11801 (2010)		> 0.50 dB	**SM**: > 0.40 dB/km **MM**: 850 nm > 3.50 dB/km 1300 nm: > 1.50 dB/km	> -35 dB			
ISO/IEC 14763-3 (2006)	> 0.30 dB	> 0.50 dB	**SM**: > 1.00 dB/km **MM**: 850 nm > 3.50 dB/km 1300 nm: > 1.50 dB/km	No	No	5 km	2 km
ISO/IEC 14763-3 (2014)		> 0.75 dB	**SM**: > 0.40 dB/km **MM**: 850 nm > 3.50 dB/km 1300 nm: > 1.50 dB/km				

If results are above the thresholds, they will be highlighted in red in the table of results, and the icon will appear at the top right of the screen.
If all the results lie within the thresholds (no result is in red), results are displayed in green in the table and the icon is .

Site Info Labels

In the **Setup** page, press **Site Info Labels** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Site Info Labels**).

The **Site Info Labels** screen allows configuring the Site Properties and the Labeling.

Site Properties

In the **Site Properties** box, click on the right arrow key for each parameter to define the **Site** Properties, the **Technician Id**entification and the **Job Id**entification.

Labeling

The Labeling box differs according to the configuration file loaded and currently used.

Label Format

This parameter displays the label format applied to the project according to the configuration file selected.

Fiber Count (mandatory for project creation)

This parameter is available once the configuration file `ENTERP RISE_Custom_List.SM-OTDR` is loaded.

Select the right **Fiber Count** for the cables being tested:

• Simplex (single fiber strand) 	• Duplex (dual fiber strand) 
• MPO 	 **MPO (8/12)**: 8 fibers used over 12  **MPO (12/12)**: 12 fibers used over 12  **MPO (20/24)**: 20 fibers used over 24  **MPO (24/24)**: 24 fibers used over 24

Fiber Prefix

Press the right arrow key to enter the prefix applied to the fiber, as an identification.

Fiber Number

Use the left and right arrow keys to increment or decrement the fiber number.

Fiber Code

Once selected, press the right arrow key to modify some fields of the fiber code. The structure must follow TIA-606 standards.

Change Fiber Number

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 Use **Edit Number** softkey 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 is not automatically modified at each new file-save.

Direction

The direction shows if the acquisition must be performed from the origin to the extremity (A->B) or from the extremity to the origin (B->A).

Location A

The name of the Location A of the link may be entered here.

Location B

The name of the Location B of the link may be entered here.

Label Structure

The Label Structure sub-menu is different according to the configuration file selected.

> **NOTE**
> See “Cable structure” on page 45 for a description of the Cable Structure sub-menu available with «Color» configuration.

- Fiber Code Displays the fiber code previously configured in the Labeling box (see “Fiber Code” on page 112. It cannot be modified from the Label Structure sub-menu.

- Floor — Press ▶ to open the sub-menu, different according to the selected configuration:
  - define the **Type of Label** (Alphabetical / Numerical / None) and enter the **Min** and **Max** values and the **Separator** type[1] (`No`; «`.`»; «`:`»; «`-`»: «`/`»; «_»).
    or
  - enter a floor number for **Floor 1** & **Floor 2**.
- Telecom Room — Press ▶ to open the sub-menu, different according to the selected configuration:
  - define the **Type of Label** (Alphabetical / Numerical / None) and enter the **Min** and **Max** values and the **Separator** type (`No`; «`.`»; «`:`»; «`-`»: «`/`»; «_»)<Exposant>1
    or
  - enter an identification for **Telecom Room 1** and **Telecom Room 2**.
- Rack-X / Rack-Y — Press ▶ to open the sub-menu, define the **Label Type** (Alphabetical / Numerical / None) and enter the **Min** and **Max** values and the **Separator** type (`No`; «`.`»; «`:`»; «`-`»: «`/`»; «_»).
- Panel Slice — Press ▶ to open the sub-menu, define the **Label Type** (Alphabetical / Numerical / None) and enter the **Min** and **Max** values and the **Separator** type (`No`; «`.`»; «`:`»; «`-`»: «`/`»; «_»).
- Panel — Press ▶ to open the sub-menu, define the **Label Type** (Alphabetical / Numerical / None)[2] and enter the **Min** and **Max** values and the **Separator** type (`No`; «`.`»; «`:`»; «`-`»: «`/`»; «_»)<Exposant>1.
- Port/Position — Press ▶ to open the sub-menu, define the **Label Type** (Alphabetical / Numerical / None)<Exposant>1 and enter the **Min** and **Max** values.
- Backbone Cable — Press ▶ to open the sub-menu and enter the **Min** and **Max** values according to the **Label Type** defined (not changeable).
- Cable — Press ▶ to open the sub-menu and enter the **Min** and **Max** values according to the **Label Type** defined (not changeable).
- Building — Enter an identification for **Building 1** and **Building 2**.

1. This parameter can be modified exclusively with «Custom» configuration
2. This parameter can be modified exclusively with «Custom» configuration

Label Format	**Simple**	**Custom**	**Color**	**TIA-606 Class 2 Single Building Horizontal Link**	**TIA-606 Class 2 Single Building Backbone Cable**	**TIA-606 Class 3 Campus Backbone Cable**	**List**
Fiber Count							x
Fiber Prefix	x	x	x	x	x	x	
Fiber Code	Fib. Num.	x	x	x	x	x	x
Change Fiber Number	x	x	x	x	x	x	
Direction	x		x				
Location A / B	x		x				
Label Structure			x[1]				
Fiber Code		x		x	x	x	
Floor		x		x	x	x	
Telecom Room		x		x	x	x	
Rack -X / -Y		x					
Panel Slice		x					
Panel		x		x			
Port/Position		x		x			
Backbone Cable					x	x	
Cable					x	x	
Building						x	

1. See “Cable structure” on page 45

File

In the **Setup** page, press **File** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **File**).

The file configuration is identical to the OTDR file configuration menu: see, in the OTDR chapter, “Configuring the File parameters” on page 48.

NOTE

The **Default Filename**, with the Enterprise SLM option, differs according to the configuration file selected.

Simple OTDR Testing (for single fiber)

The OTDR Enterprise Option can be use to test single fibers, with the optimum acquisition parameters automatically applied.

1 Select the **OTDR Enterprise** icon (MM or SM) and validate 

.
2 From the results page, press **SETUP** button.
3 In the **Setup** screen, press **Load configuration** to load an Enterprise SmartConfig™ file.
4 Select the file in the explorer and press **Load as ENTERPRISE Config.**
5 Modify / complete the parameters wished (see “Configuring the Enterprise-SLM” on page 106)
6 If necessary, press **Save Config.** to save the new configuration in a file , and reuse it for other tests.
7 Press **Start/Stop** button to launch the acquisition for the fiber.

See Results for description of the results page.

Managing projects for multi-fibers Testing

The Enterprise OTDR option allows to generate projects in order to easily control and document all test results.

Some existing projects are available on the Platform, and configured automatically. A configuration file exist for each Fiber count (= connector type): Simplex, Duplex and MPO cables.

A project may also be created by the user, with configuration previously defined.

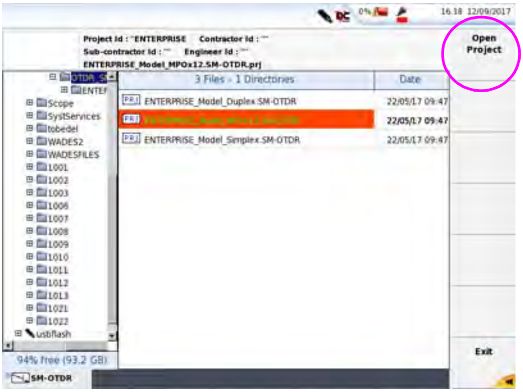
Opening an existing project

Once the **OTDR Enterprise** icon is validated:

1 Press **RESULTS** button to display a results page.
2 Press **Manage Project** menu key 

.
3 In the Explorer, select the project file to be used.

Figure 59 Select Project file



4 Press **Open Project** menu key.
The Project displays, with a list of labels to be tested.

5 Click on the label arrow to open the list of fibers to be tested for this label.

> **NOTE**
> In Simplex mode, only the label is available as it represents the single fiber.

Creating a project from the Setup page

Once the OTDR Enterprise icon is validated, the results page automatically opens:

1 Press **SETUP** button to open the **Setup** page.

2 Load the file `ENTERPRISE_Custom-list` SmartConfig™

3 Modify setup menus (**Acquisition**, **Alarms**, **Site Info Labels** and **File**) if needed.

4 In the **Site Info Labels** menu, make sure the **Fiber count** parameter is defined according to the network configuration:

– Simplex: generate a project for one single fiber test

– Duplex: generate the project for double fiber test

– MPO: generate a project for MPO cables

See “Fiber Count (mandatory for project creation)” on page 111.

5 Once all parameters are configured, press **Save Config.** to save the current configuration in a file.

6 Press **Import Label List** top right soft key.

7 Select the csv file that includes the list of labels / Cable Ids to be tested:

Simplex: 1 label = 1 fiber
Duplex: 1 label = 2 fibers
MPO: 1 label = up to 24 fibers

8 Press **Create Project** menu key to generate the project.

9 The project displays, with the list of labels defined in the csv file.

> **CAUTION**
> If the list of labels exceeds the maximum number of labels authorized by the software (1000 fibers / 500 for Duplex / 83 for MPO (12) / 41 for MPO (24)), a warning displays: `Label max numbers reached, next labels are ignored. Hit any key to continue`.

Warnings on CSV file

The csv file used for labeling must include the following instructions:

– 1 label per line, starting from row 1 of the spreadsheet.
– the number of characters per label cannot exceed 120.
– avoid the use of special characters, such as: `*`; `/`; `\`; %; &; #...

Project display

Once the project is loaded on the Platform, it is displayed as follows:

Figure 60 Example of Project

The icon  displays on the upper banner, indicating a project is opened.

Click on the label to open the sub-menu where the fiber numbers are displayed.

Note; This sub menu cannot be opened for Simplex mode as 1 label corresponds to 1 fiber.

Disable a test

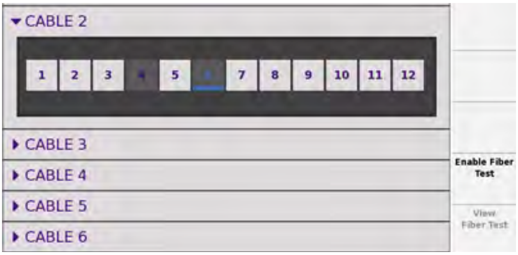
Before starting the test, some fibers can be disabled so that the acquisition will not be performed. on those

1 Select the fiber number which does not need to be tested (underlined).

2 Click on the soft key **Disable fiber test**.

3 Repeat the process for the fibers which do not have to be tested.

Figure 61 Fibers 4 and 6 deactivated



The disable fibers will be skipped while moving to the next fiber test.

> **If Disable Fiber Test is pressed while a tested fiber is selected, a dialog box displays: «`You're about to delete acquisition files. Are you sure?`».**
>
> Click on **Yes** to confirm the deactivation, and by consequence, to delete corresponding trace(s).
>
> Click on **No** to cancel the deactivation.

To activate the fiber, select it and press **Enable Fiber Test**.

Testing MPO

Once the project is opened, the OTDR acquisitions can be launched.

1 Connect the Switch to the Platform, via a USB cable.

2 Activate the USB Switch icon on the Platform 

3 On the Project page, select the label or fiber to be tested.

If a label is selected (highlighted in blue), all the active fibers of this label will be tested one after the other.

If one fiber number is selected (in blue), the test will be performed exclusively for this fiber.

4 Press **START/STOP** button to launch the test.

The fiber number being tested in displayed on the **Switch**.

5 Once a test is completed, a dialog box is displayed to test for next label/fiber.

6 Press **Yes** to launch a new acquisition or **No** to stop the acquisition and return to project screen.

Stopping the test

The test stops automatically once the label/fiber test is completed; or the user can press the Start/Stop button at any time to stop the test in progress.

In this case, the icon  is displayed on the label row to indicate that not all of the fibers have been tested.

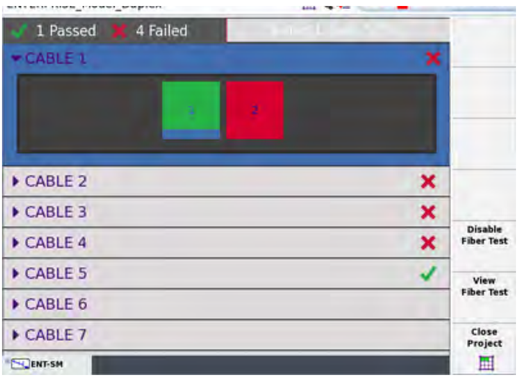
Trace saving

The traces are automatically stored into the project directory and according to defined filenaming convention.

Results of project

After each fiber/label tested, the project page is updated, on the fly.

Figure 62 Enterprise OTDR - Project



Description of the table

The status for each label is indicated on the right of the label row:

Pass

Fail

The number of fiber is highlighted in different color according to the alarm status:

1	Pass	1	No Alarm defined
2	Fail		No test performed on the fiber

View Trace

1 In the project page, click on the fiber number for which you want to display the corresponding OTDR trace (e.g. 1).

2 Click on **View Trace(s)** soft key.
The trace result page displays.

Figure 63 Trace from fiber selected in project

Once the traces are displayed, one can:

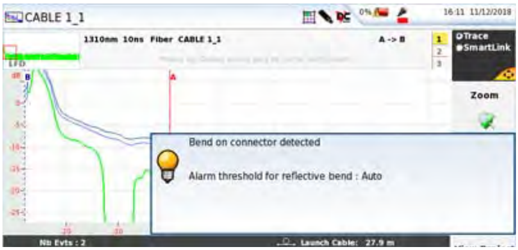
- Zoom on trace (see “Zoom function” on page 75).
- Set Cursor A and/or Cursor B (see “Cursors” on page 73).

- Save the traces and create a report (see “Saving the trace(s) and generating a report” on page 100).
- Analyze and visualize the different events (see “Results table” on page 69).

Detailed description of an event

When clicking on one event icon in the results table, a popup window describes the event type and provides a diagnosis to help troubleshoot faulty optical elements (indicated in red).

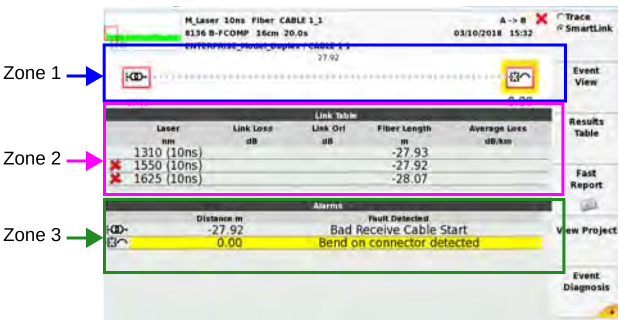
Figure 64 Event description



SmartLink view

1 Click on the menu key **Trace/SmartLink** to select **SmartLink**.
A screen as the following one is displayed:

Figure 65 SmartLink function



The screen is divided into three zones:

- **Zone 1**: Graphical representation of the link, with icons symbolizing the different events detected.
- **Zone 2**: 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).
- **Zone 3**: Alarms table (if any)

OptiPulses option

The OptiPulses option is automatically available with the FTTH-SLM option.

OptiPulses is a software license key for OTDR applications that uses multipulse acquisitions and advanced algorithms to deliver detailed information on every element of the link (available in the ExpertOTDR module).

This option is configurable in ExpertOTDR mode.

> **NOTE**
> Patented as described at www.viavisolutions.com/patents.

Configuring the OTDR acquisition with OptiPulses mode

Once the installation of the licence is completed (see Base-Unit manual) and the ExpertOTDR icon is sbelected in the **Home** page:

1 Press **SETUP** hard key to display the configuration parameters

2 In the **Acquisition** parameters, select **OptiPulses** and configure the acquisition:

- **No** — No OTDR short acquisition with the shorted pulsewidth is performed before the standard one
- **Auto** — this parameter allows to perform a short acquisition, before the standard one, with the **Short Pulse** and **Short Range** parameters defined automatically.
- **Manual** — this parameter allows to perform a short acquisition, before the standard one, with the **Short Pulse** and **Short Range** parameters defined by the user in the two following lines.

Figure 66 OptiPulses configuration

See page 33 for information on principle of the acquisition.

3 Configure the other parameters for the OTDR acquisition to be performed

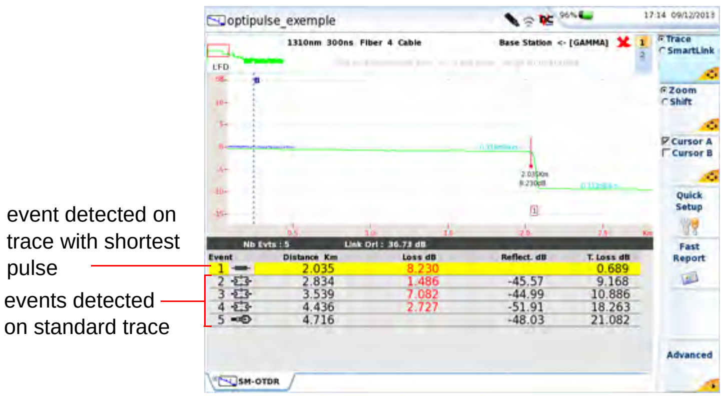
4 Launch the acquisition pressing **START/STOP** key

A beep is emitted at the end of the acquisition.

Results in OptiPulses mode

Once the acquisition is completed, a screen as the following one displays:

Figure 67 OTDR Traces with OptiPulses



With the OptiPulses option, the screen is as follows:

- Two traces for each wavelength measured: the trace with shortest pulse and the standard one,
- One single results table per wavelength with results from both traces merged.

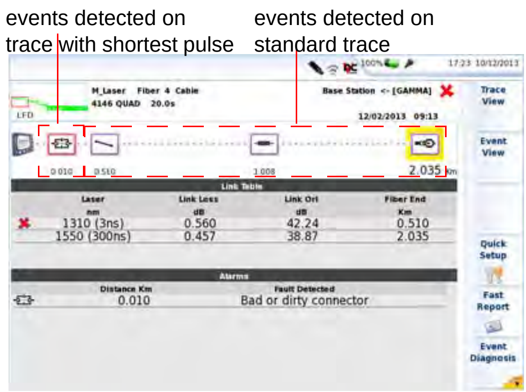
Example: if OTDR acquisition if performed on two wavelengths, the screen displays 4 traces and 2 results table.

Click on one event in the results table to automatically turns the trace on which it has been detected active

OptiPulses and SmartLink option

The SmartLink screen displays the graphical representation of the link with all the events detected, whether they are detected on the trace with shortest pulse or on standard trace.

Figure 68 OptiPulses results in SmartLink mode



FTTA-SLM option

Principle of FTTA-SLM

FTTA-SLM is an OTDR software application that is delivered as an option of the OTDR module (see references in the ordering information section), and is installed onto the mainframe as a license key (see the 2000/4000 base-unit user manual for the instructions on license files installation).

FTTA-SLM simplifies OTDR testing for cell-tower technicians and eliminates complexities of result interpretation.

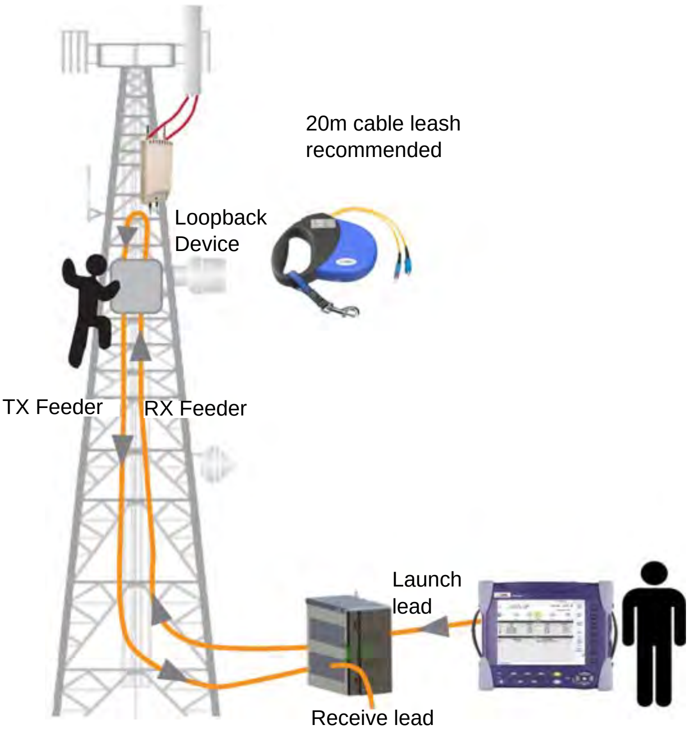
In a FTTA environment, the OTDR module, associated with the FTTA-SLM application, allows to:

- Characterize and measure the fiber link loss, measure the loss and reflectance of each passive element, and provide the position for each one: **Acceptance Testing**
- Locate and identify causes of failure on a fiber link: **Troubleshooting / Maintenance**.

Acceptance Testing

One way to judge installation quality is to use a loopback device (a retractible/expandable fiber leash cable or a patchcord) on duplex fiber to test at the junction box or RRU location and shoot with an OTDR from the BBU or fiber-patch panel location to qualify the entire fiber channel.

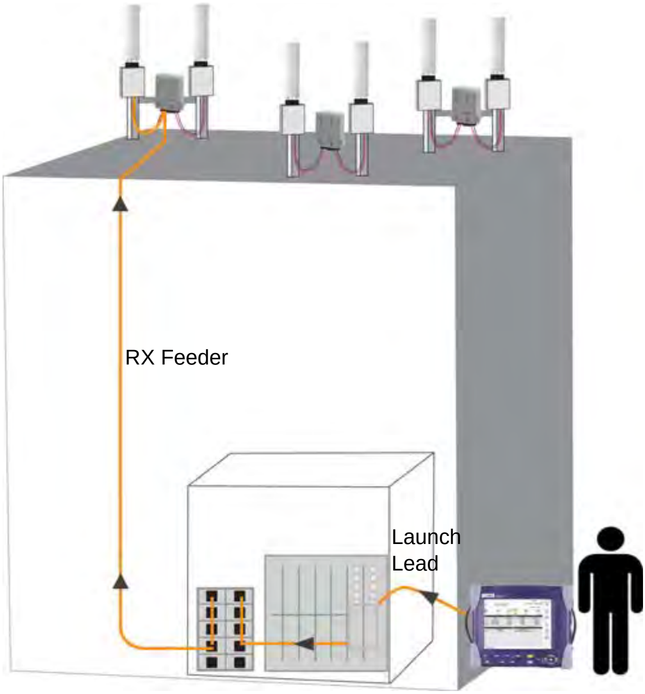
Figure 69 Acceptance Testing



Troubleshooting Testing

An OTDR from the BBU or fiber patch panel location will troubleshoot the fiber link up to the RRU/RRH. Before performing the OTDR measurement, make sure that the fiber being tested has no signal and the equipment is shut down.

Figure 70 Troubleshooting Testing



Configuring the Reflectometry test for FTTA network

Once the OTDR module is set into the T-BERD/MTS, and the FTTA-SLM license installed:

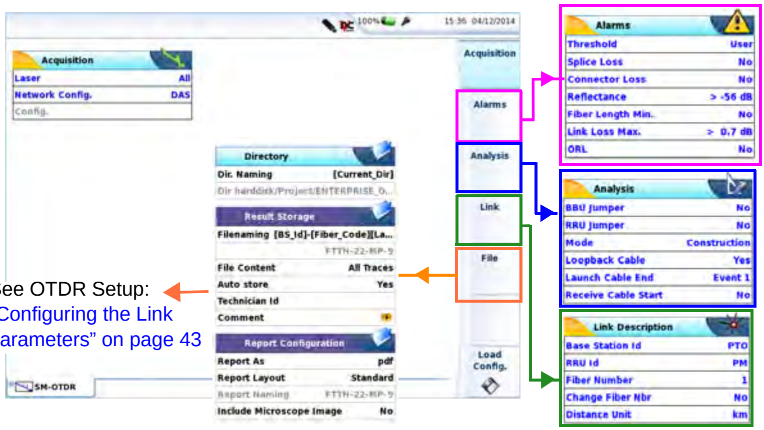
1 Select the FTTA-OTDR icon 

.

The results page automatically displays.

2 Press **SETUP** hard key to display the OTDR configuration screen for FTTA network.

Figure 71 FTTA OTDR Setup



See OTDR Setup: "Configuring the Link parameters" on page 43

FTTA setup

In the first screen, configure the following parameters:

Laser

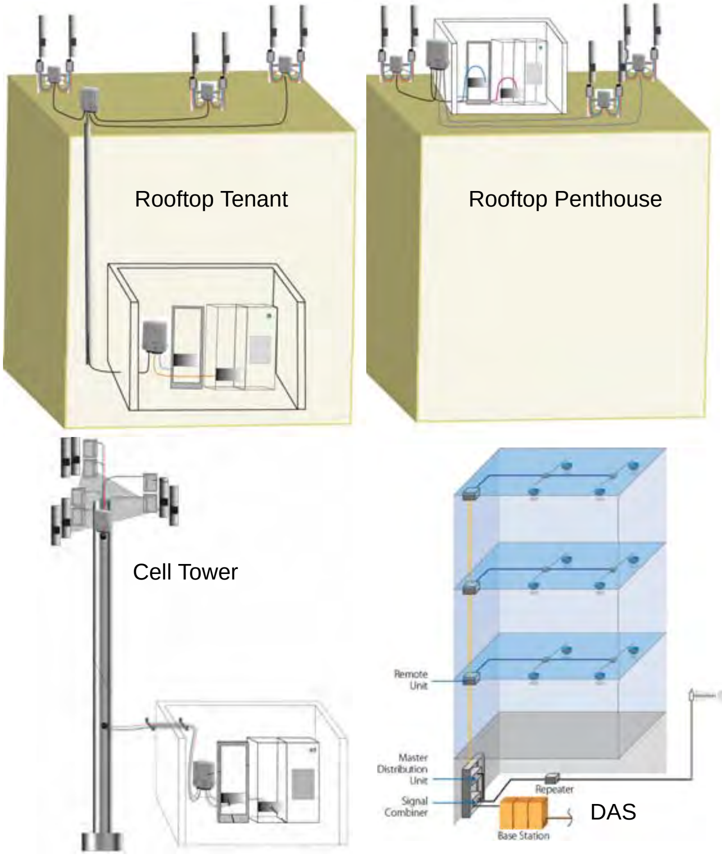
- The acquisition will be carried out on the wavelength(s) selected (for multiple-wavelength modules). In case of a multi-wavelength module, select **All** to perform a measurement for all the wavelengths available (this parameter visible exclusively on modules with one single OTDR port). The possible values depend on the module used.

Network Config. (see page 130)

This parameter is used to identify the network type.

Cell Tower	Typical macro cell tower topology
Rooftop Tenant	Rooftop topology
Rooftop Penthouse	Rooftop topology
Das	Distributed Antenna System

Figure 72 Network configurations



Config.

This parameter displays the last configuration file loaded and cannot be modified unless a new configuration file is loaded.

Alarms parameters

In the **Setup** page, press the **Alarm** menu key (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Alarms**).

Threshold

None The alarm function is not active.

User Define your own thresholds values for one or several elements: Splice Loss / Connector Loss / Reflectance / Fiber Length Min / Link Loss Max / ORL

TIA-568 C / ISO/IEC 11801 / Default
Select one of this parameter to configure the alarm thresholds with predefined values:

	Default	**TIA-568C & ISO/IEC 11801**
Splice Loss	> 0.20 dB	> 0.30 dB
Connector Loss	> 0.50 dB	> 0.75 dB
Slope[1]	> 1.00 dB/km	> 1.00 dB/km
Reflectance	> - 35 dB	-
ORL	< 27 dB	-

1. This parameter is not available in OEO-OTDR configuration

If results are above the thresholds, they will be highlighted in red in the table of results, and the icon will appear at the top right of the screen.

If all the results lie within the thresholds (no result is in red), results are displayed in green in the table and the icon is .

Analysis

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

This screen allows to configure the network:

BBU Jumper

Test from the patchcord that will be plugged into BBU.
(not applicable for DAS networks)

RRU Jumper

Test from the patchcord that will be plugged into RRU.
(not applicable for DAS networks)

Mode

Select the kind of acquisition to be performed:

Construction Select this mode to perform the OTDR acquisition in the case of an Acceptance Testing (see "Acceptance Testing" on page 126).

Maintenance Select this mode to perform the OTDR acquisition in the case of Troubleshooting (see "Troubleshooting Testing" on page 127).

Loopback Cable

Select if a loopback cable is used (parameter available exclusively in **Construction** mode).

Launch Cable End / Receive Cable Start (not available in Maintenance mode)

No All the results are displayed and referenced on the basis of the board of the module.

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 selected.

Distance Use the **Edit Number** key to enter a distance (Min= 0 / Max=50 km / 164.042 kfeet / 31.075 miles) or affect the active cursor value, using the **Set Cursor Distance** key.

Link description

In the **Setup** page, press **Link** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Link**).

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.

Base Station Id or Headend Id (in case of DAS)

If known, enter the name of the Base Station using the edition keypad, displayed pressing the right arrow key.

> **NOTE**
> The name of Location A entered in ExpertOTDR configuration is displayed by default in this parameter (see "Location A" on page 45).

RRU Id or Remote End Id (in case of DAS)

If known, enter the name of the RRU/RRH (Remote Radio Unit / Head) using the edition keypad, displayed pressing the right arrow key.

> **NOTE**
> The name of Location B entered in ExpertOTDR configuration is displayed by default in this parameter (see "Location B" on page 45).

Fiber Code / Fiber Num

To use the Fiber Code convention, with Rx/Tx labeling, choose between the following config files: *FTTA_Rx_Tx.SM-OTDR* or *FTTA_Rx_Tx.MM-OTDR*.

For a simple labeling of the fiber number (1 to 24), load one of the following config files: *FTTA_Simple.SM-OTDR* or *FTTA_Simple.MM-OTDR*

Example of fiber code in:

- Construction mode (with loopback): from **1-Rx_1-Tx** to **24-Rx_24-Tx**
- Maintenance mode: from **1-Rx** to **24-Rx**

Change Fiber Nbr

Select if the fiber number must be automatically **Incremented** or **Decremented** at each new file save.

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	Use **Edit Number** softkey 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

Distance unit

Select the unit to be used for distance (**km** / **kfeet** / **miles** / **meter** / **feet**).

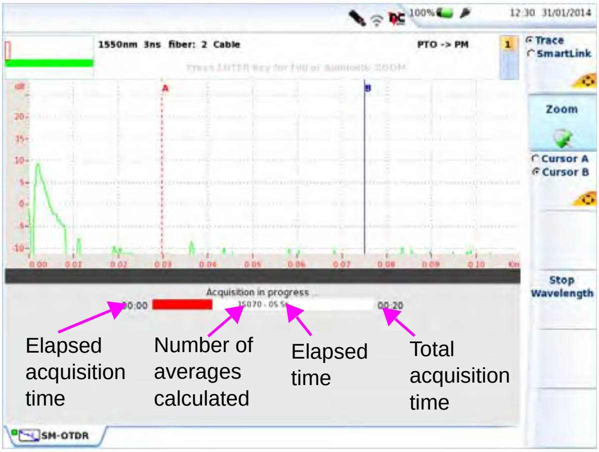
Launching the acquisition

CAUTION
Inspect & clean all fiber connections prior connecting fiber cables into the ports (BBU, distribution boxes, OVP and RRU/RRH and SFP ports).

1. Press **START/STOP** hard key to launch measurement.
   The red **Testing** indicator goes on to show that the T-BERD/MTS is working and the screen displays the trace in process of acquisition.
2. The quality of the connection is displayed for a few seconds (see Table 3 on page 56)

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

Figure 73 Acquisition in progress



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” on page 56).

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

1 In the **SETUP** menu, check in **Laser** line, that **several lasers are selected or select All**.

2 Start the acquisition by pressing the **START/STOP** button.

3 Once the acquisition for the first wavelength is finished, the acquisition for the following wavelength starts automatically.
or
To stop manually the acquisition for current wavelength, click on **Stop Wavelength**. This will allow to automatically start the measurement for the following wavelength.
A beep is emitted once the acquisitions on all lasers are completed.

The different traces appear in the same window and can be managed as traces in overlay (see “Overlay trace function” on page 96).

Results page

The trace(s) acquired or recalled from a memory is/are displayed on the Results page.

Trace View

The Trace view is displayed by default once OTDR acquisition is completed.

Figure 74 FTTA OTDR Trace

Once trace is displayed, you can:

- Zoom on trace (see “Zoom function” on page 75).
- Set Cursor A and/or Cursor B (see “Cursors” on page 73).
- Save trace(s) and launch a report of results (see “Saving the trace(s) and generating a report” on page 100)

Detailed description of an event

When clicking on one event icon in the results table, a popup window describes the event type and provides a diagnosis to help troubleshoot faulty optical elements (indicated in red).

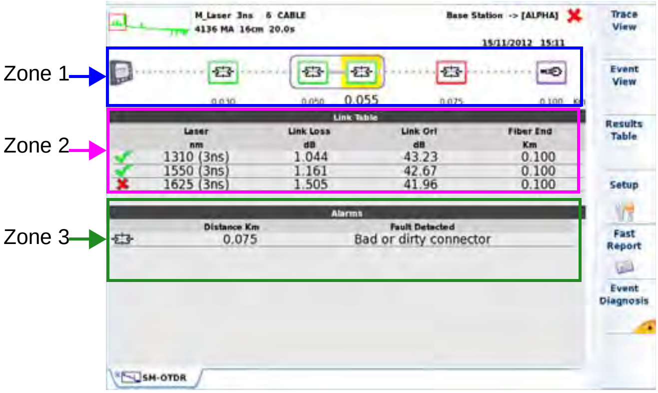
Figure 75 Event description

Press **SETUP** hard key or **Setup** soft key to go back to FTTA Setup screen and modify the parameters before launching a new acquisition.

SmartLink view

1 Click on the menu key **Trace/SmartLink** to select **SmartLink**.
A screen as the following one is displayed:

Figure 76 SmartLink function



The screen is divided into three zones:

- **Zone 1**: Graphical representation of the link, with icons symbolizing the different events detected.
- **Zone 2**: 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).
- **Zone 3**: Alarms table (if any).

CAUTION

If several traces are displayed in overlay, with the same wavelength, then only the Zone 2 is displayed, there is no graphical representation of the link (Zone 1).

Getting a diagnostic on potential causes of failure

When an event has reached an alarm, the diagnostic of potential causes is given in SmartLink view.

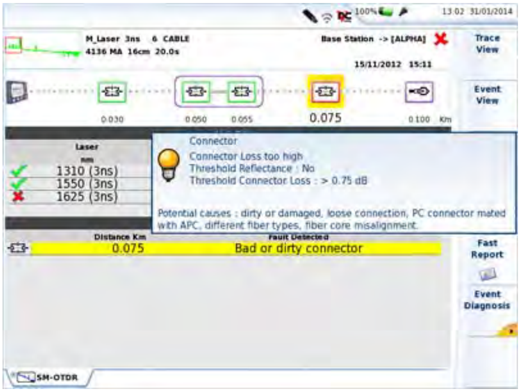
1 Select the event to be described (underlined in yellow).

2 Click on **Event Diagnostic** soft key

A new window, on the lower part of the screen, gives the details of the selected event:

– its type
– the thresholds applied for this event
– the possible causes of the alarm

Figure 77 Event Detail window



Results Table

To display exclusively the results table from the SmartLink page, press the **Results Table** softkey.

Figure 78 FTTA Smart Link: Results Table

Press again the **Results Table** menu key to return to SmartLink display.

Event View

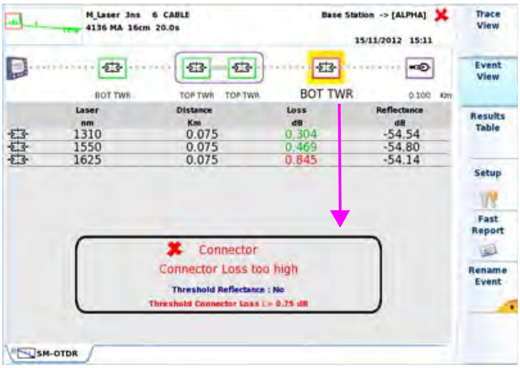
1 Click on **Event View** menu key to display a detailed description of one event detected on trace.

In this view, an algorithm automatically detects the elements of the FTTA link and label them.

2 Select the event to be described on the graphic (highlight in yellow).

The corresponding event description is displayed on the Zone 3, with a recall of alarm threshold for this event:

Figure 79 SmartLink: Event View



3 Click on **Trace View** to display the selected event in the results table and zoomed on trace.

> **NOTE**
> The event is framed in red if it is above the alarm thresholds defined in the setup menu.
> It is framed in green if it lies within the thresholds.
> It is framed in purple if no alarm has been defined for this type of event.

Merged connectors

When 2 or more connectors are very close to eahc others (in the attenuation dead zone), usually the reflectances can be measured but the loss of the individuals can't be - the loss of these connectors is "merged" .

The following formula is then applied (only in FTTA mode):

loss per connector = (total group loss) / (nb of connectors in the group)

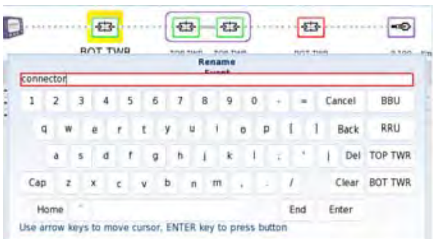
Changing the name of an event

Once the **SmartLink** screen is displayed, the name of an event can be modified:

1. Select the event to be modified (highlighted in yellow) 

.
2. Press **Rename Event** menu key
3. In the edition keypad, enter a new name for the event.

Figure 80 Rename Event



4. Click on **Enter** to return to **Event View**.
   The event name is displayed under the icon, and replaces the previous FTTA label 

.

Click on **Replay Label** to rename the event as it was previously (at last saving).

FTTH-SLM Software option

Principle of FTTH

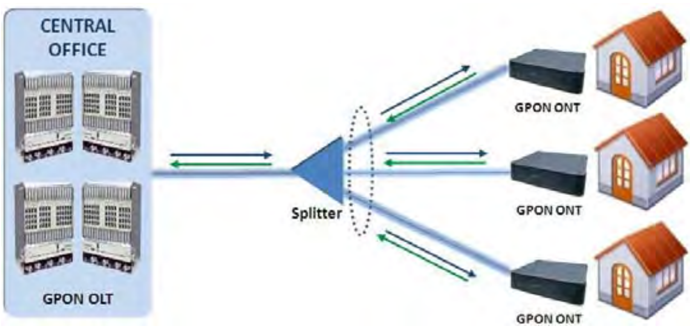
FTTH-SLM is an OTDR software application that is delivered as an option of the OTDR module (see references in the Chapter 22 on page 571), and is installed onto the mainframe as a license key (see the 8000 V2 or 6000A V2 base-unit user manual for the instructions on license files installation).

FTTH-SLM application brings an FTTH user interface and a specific algorithm for OTDR measurements, especially through PON splitters (Passive Optical Network).

In a FTTH environment, the OTDR module, associated with the FTTH-SLM application:

- Selects optimized test parameters to conduct reliable measurements, especially through optical splitters, and to detect close events near the start (Central Office splices/ connectors) (OptiPulses Automatic Algorithm).
- Automatically identifies all network elements such as PON splitter types/ratios (Discover Mode).
- Iconically displays a map of OTDR trace results (SmartLink View)
- Guarantees measurements with automatic PASS/FAIL analysis to ITU-T/IEEE PON standards or customer-defined specifications.

Figure 81 FTTH network



NOTE
Patented as described at www.viavisolutions.com/patents.

Configuring the Reflectometry test for FTTH network

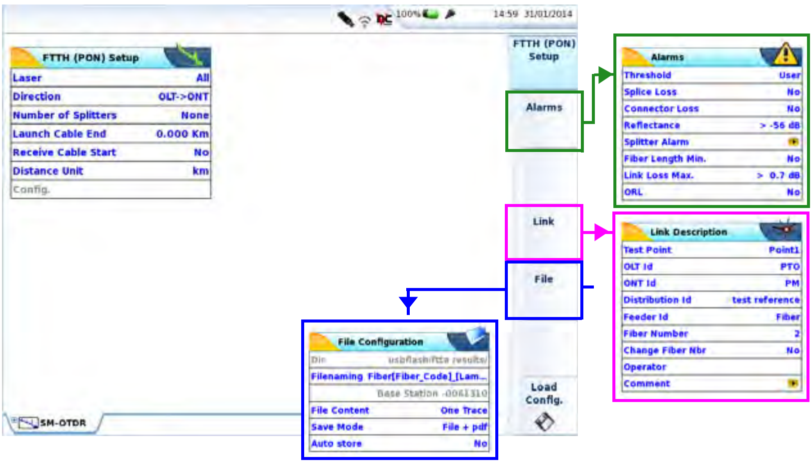
Once the OTDR module is set into the T-BERD/MTS, and the FTTH-SLM license installed:

1 Select the FTTH-OTDR icon 

.
The results page automatically displays.

2 Press **SETUP** hard key to display the OTDR configuration screen for FTTH network.

Figure 82 FTTH OTDR Setup



FTTH setup

In the first screen, configure the following parameters:

Laser

The acquisition will be carried out on the wavelength(s) selected (for multiple-wavelength modules). In case of a multi-wavelength module, select **All** to perform a measurement for all the wavelengths available (this parameter visible exclusively on modules with one single OTDR port). The possible values depend on the module used.

- OLT: Optical Line Terminal (switch at the Central Office)

- ONT: Optical Network Terminal (media converter and gateway in the Home)

Select the direction of the measurement:

– Downstream: from OLT to ONT (**OLT -> ONT**)
– Upstream: from ONT to OLT (**ONT -> OLT**)

Number of Splitters

If known, enter the number of splitters installed in the FTTH network.

CAUTION
It is preferred to know the number of splitters in order to get Pass/Fail status for the splitters' loss.

None: no splitter is installed

Discover: auto-detection and identification of PON splitter types.

NOTE
The **Discover** mode does not allow Pass/Fail analysis

1 / 2 / 3: select the number of splitters.

This selection opens a sub menu into which the splitters types must be defined for all splitters installed.

Splitters types

Splitter 1: define the splitter type among the list:

– 1x2 / 1x4 / 1x8 / 1x16 / 1x32 / 1x64
– 2x2 / 2x4 / 2x8 / 2x16 / 2x32 / 2x64

Splitter 2 and **Splitter 3**: define the splitter type among the list:

– **1x2** / **1x4** / **1x8** / **1x16** / **1x32** / **1x64**

Launch Cable End / Receive Cable Start

No All the results are displayed and referenced on the basis of the board of the module.

Length Use the **Edit Number** key to enter a distance (Min= 0 / Max=50 km / 164.042 kfeet / 31.075 miles) or affect the active cursor value, using the **Set Cursor Distance** key.

Distance Unit

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

Config.

This parameter displays the configuration file selected for acquisition, and cannot be modified from Setup page. To modify the configuration file to be used:

1. Click on the menu header **FTTH (PON) Setup**
2. Click on **Load Config.** menu key
3. Select the file in the Explorer.

Alarms parameters

In the **Setup** page, press **Alarms** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Alarms**).

None The alarm function is not active.

User Define your own thresholds values for one or several elements: Splice Loss / Connector Loss / Reflectance / Splitter Alarm / Fiber Length Min / Link Loss Max / ORL

Default / TIA-568 C / ISO/IEC 11801 / G.697/G.98x PON / G.697/IEEE PON

Select one of this parameter to configure the alarm thresholds with predefined values:

	Default	G.697/G.98x PON & G.697/ IEEE PON	TIA-568C & ISO/ IEC 11801
Splice Loss	> 0.20 dB	> 0.30 dB	> 0.30 dB
Connector Loss	> 0.50 dB	> 0.50 dB	> 0.75 dB
Slope	> 1.00 dB/km	-	> 1.00 dB/km
Reflectance	> - 35 dB	> - 35 dB	

	Default	G.697/G.98x PON & G.697/IEEE PON	TIA-568C & ISO/IEC 11801
ORL	< 27 dB	< 27 dB	
Splitter Alarm			
Splitter 1x2	> 5.0 dB	> 4.2 dB	
Splitter 1x4	> 8.0 dB	> 7.8 dB	
Splitter 1x8	> 11.0 dB	> 11.4 dB	
Splitter 1x16	> 14.0 dB	> 15.0 dB	
Splitter 1x32	> 17.0 dB	> 18.6 dB	
Splitter 1x64	> 21.0 dB	> 22.0 dB	
Link Loss Max		Select: **No**, **Manual** or: • for G.697/G.98x PON: **20 dB (A)** / **25 dB (B)** / **30 dB (C)** • for G.697/IEEE PON: **23 dB (PX-10)** / **26 dB (PX-20)**	

If results are above the thresholds, they will be highlighted in red in the table of results, and the icon ❌ will appear at the top right of the screen.

If all the results lie within the thresholds (no result is in red), results are displayed in green in the table and the icon is ✔.

Link parameters

In the **Setup** page, press **Link** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Link**).

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.

Test Point / OLT Id / ONT Id / Distribution Id / Feeder Id

Those parameters allow to enter an identification for each element of the network (test point, OLT, ONT...) using the **Edition** menu.

Fiber Number

1 Select the parameter **Fiber Number** and modify the number of the fiber to be tested.

The fiber number can be automatically incremented/decremented at each new file save if it has been configured in the **Change Fiber Nbr** parameter (see "Change Fiber Nbr" on page 147).

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

No the Fiber number must not automatically modified.

User defined Use **Edit Number** softkey 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

Operator

Use the arrow ▶ to enter the name of the operator carrying out the measurement.

Comment

Use the arrow ▶ to enter a comment, which will be displayed in the file signature, on the upper part of the screen.

File parameters

Press the **File** menu key (or **Next** key when one parameter of the File page is selected) to configure the File saving parameters for the OTDR measurements.

Dir

The **Dir** parameter displays the directory (and sub-directory) into which file(s) will be saved and cannot be modified.

To modify the location of files saved, go to explorer page (pressing File hard key) and select another media storage/directory.

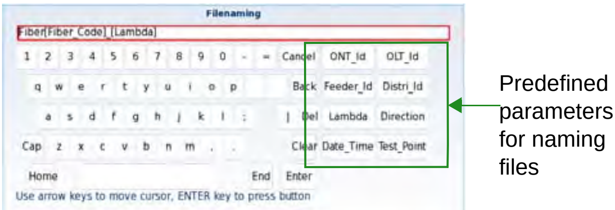
Filenaming

Select the parameter and modify the name of the file for the result trace.

a In the edition keypad, enter a name manually for the file and/or use the predefined parameters available (**ONT_Id**, **Feeder_Id**...).

b Press **Enter** to validate.

Figure 83 Filenaming - Edition keypad



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

Press the **Default Filename** menu key to apply the name by default for the file: `[Test_Point]_[Date_Time]`.

File Content

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

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

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

Save Mode

When a trace or more is displayed, in the parameter **Save Mode**, you can select three types of methods for storing traces:

File Only only the trace(s) is/are stored in one/several file(s), with its extension (.sor or .msor)

File + txt the trace(s) is/are stored in one/several file(s), with its extension and one txt file is also generated.

File + pdf the trace(s) is/are stored in one/several file(s), with its extension and one pdf file is also generated.

Auto store

Select **Yes** to store automatically the trace or traces resulting from each acquisition according to the filenaming rules.

Launching the acquisition

> **CAUTION**
> Inspect & clean all fiber connections prior connecting fiber cables into the ports.

1 Press **START/STOP** hard key to launch measurement.
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 3 on page 56)

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

Figure 84 Acquisition in progress

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" on page 56).

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

1. In the **Setup** menu, check in **Laser** line, that **several lasers are selected** or select **All**.
2. Start the acquisition by pressing the **START/STOP** button.
3. Once the acquisition for the first wavelength is finished, the acquisition for the following wavelength starts automatically.

   or

   To stop manually the acquisition for current wavelength, click on **Stop Wavelength**. This allows to automatically start the measurement for the following laser.

   A beep is emitted once the acquisitions on all lasers are completed.

The different traces appear in the same window and can be managed as traces in overlay (see "Overlay trace function" on page 96).

Results page

The trace(s) acquired or recalled from a memory is/are displayed on the Results page.

Trace View

The Trace view is displayed by default once OTDR acquisition is completed.

Figure 85 FTTH OTDR Trace

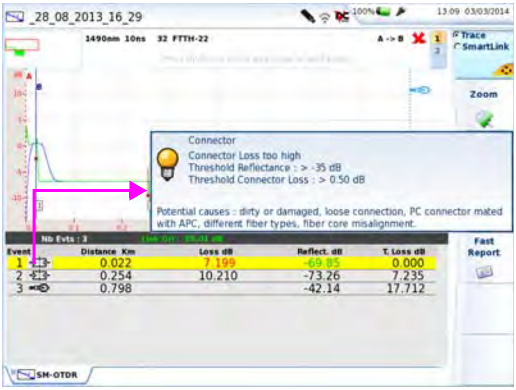
Once trace is displayed, you can:

- Zoom on trace (see “Zoom function” on page 75).
- Set Cursor A and/or Cursor B (see “Cursors” on page 73).
- Save trace(s) and launch a report of results (see “Saving the trace(s) and generating a report” on page 100)

Detailed description of an event

When clicking on one event icon in the results table, a popup window describes the event type and provides a diagnosis to help troubleshoot faulty optical elements (indicated in red).

Figure 86 Event description



Press **SETUP** hard key or **Setup** menu key on Results page to go back to FTTH Setup screen and modify the parameters before launching a new acquisition.

SmartLink view

1 Click on the menu key **Trace/SmartLink** to select **SmartLink**.

A screen as the following one is displayed:

Figure 87 SmartLink function

The screen is divided into three zones:

- **Zone 1**: Graphical representation of the link, with icons symbolizing the different events detected.
- **Zone 2**: 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).
- **Zone 3**: Alarms table (if any)

> If several traces are displayed in overlay, with the same wavelength, then the Zone 2 indicates the results for each wavelength. The graphical representation of the Zone 1 is a combination of multiple pulses and wavelengths acquisitions.

Getting a diagnostic of an event

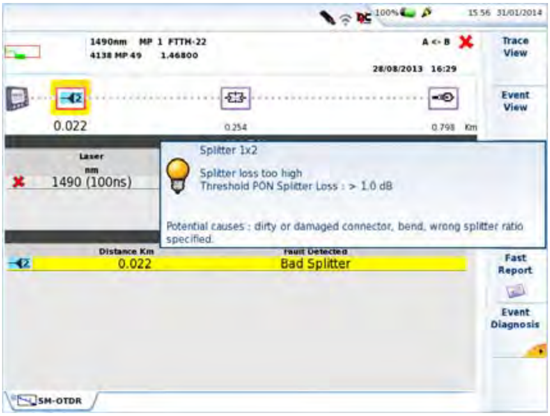
Diagnosis is used to provide further information about events and eventual problems, such as root cause possibilities of a failed optical element.

1. Select the event to be described on the graphic (underlined in yellow).
2. Click on **Event Diagnostic** soft key

A popup window, on the lower part of the screen, gives the information related to the selected event:

– its type
– thresholds applied for this event
– possible causes of the alarm

Figure 88 Diagnostic Event window



Results table

To display exclusively the results table from the SmartLink page, press the **Results Table** softkey.

Press again the **Results Table** menu key to return to SmartLink display.

Event View

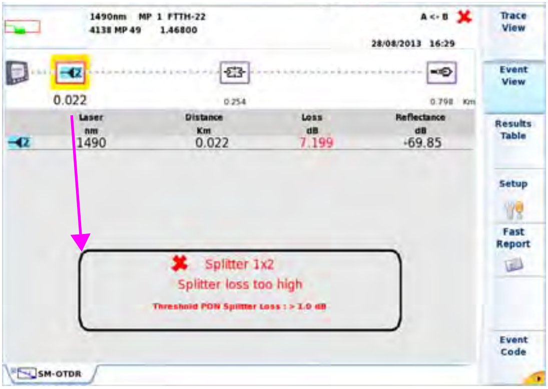
«Event View» provides the possible loss and reflectance of the selected event, per tested wavelengths.

1 Click on **Event View** menu key.
In this view, an algorithm automatically identifies the elements of the FTTH link and label them.

2 Select the event to be described on the graphic (highlight in yellow).

The corresponding event description is displayed on the Zone 3, with a recall of alarm threshold for this event:

Figure 89 SmartLink: Event View



3 Click on **Trace View** to display the selected event in the results table and zoomed on trace.

NOTE

The event is framed in red if it is above the alarm thresholds defined in the setup menu.
It is framed in green if it lies within the thresholds.
It is framed in purple if no alarm has been defined for this type of event.

Changing the type of an event

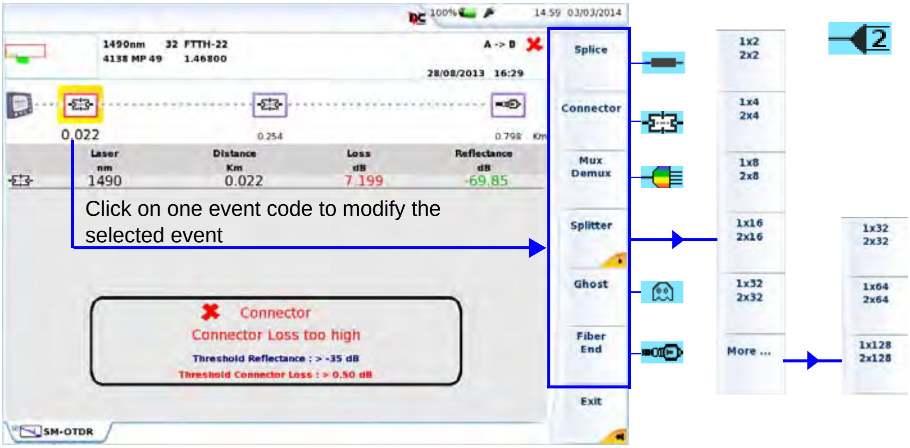
Once the **Event View** is displayed, the type of event can be modified:

1 Select the event to be modified (highlighted in yellow)

2 Press **Event Code** menu key

3 Click on the event type to be applied to the selected event:

Figure 90 Event Code



4 Click on **Exit** to return to **Event View**.

5 Click back on **Event View** menu key to return to Summary screen
or
Click on **Trace View** menu key to return to trace (and table) results screen.

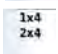
> **NOTE**
> The event modification is automatically applied on trace and in the results table.

Splitter sub-menus

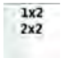
The Splitter icon is different according to the menu key pressed in the **Splitter** sub-menus.

Example:

If the menu key  is pressed, the icon  is displayed

If the menu key  is pressed, the icon  is displayed.

Moreover, the icon and splitter configuration is different according to the number of «clicks» on one menu key.

Example with the menu key 

:

- Click once: the icon is 
- Click twice: the icon is 
- Click three times: the icon is 
- Click four times: the icon is 

Click a fifth time to reset the event by default.

Smart Link Cable Option

This chapter describes the use of the Smart Link Cable option, when the software license has been purchased with an OTDR module.

Principle of Smart Link Cable

The Smart Link Cable option is a function used to manage a cable commissioning or a multi-fiber test project.

The aims of this option is to:

- improve workflow in cable commissioning (P2P links even with different distances, for example FTTH drops)
- ensure test consistency
- reduce manipulation errors / issue
- generate a report text file

Configuring the Smart Link Cable project

Configuring the project

Once the OTDR module is set into the T-BERD/MTS, and the Smart Link Cable license installed:

1 From the Home page, select the **Expert OTDR** function.

2 Press **SETUP** hard key to display the OTDR configuration screen and:

- Configure the OTDR **Acquisition** parameters (see page 32)
- Configure the OTDR **Alarms** parameters (see page 36)
- Configure the OTDR **File** parameters (see page 48)

3 Press **Link Cable** menu key 

.

4 Configure the **Link Description** parameters (see page 43)

5 In the new window **Project Information**, configure the project as required:

- Use the Edition keypad to enter a name for **Technician Id** / **Job Id** / **Contactor Id** / **Sub Contractor Id** / **Engineer Id**.
- Define the **Display mode** of the Project: **Numbering** or **Labelling**.

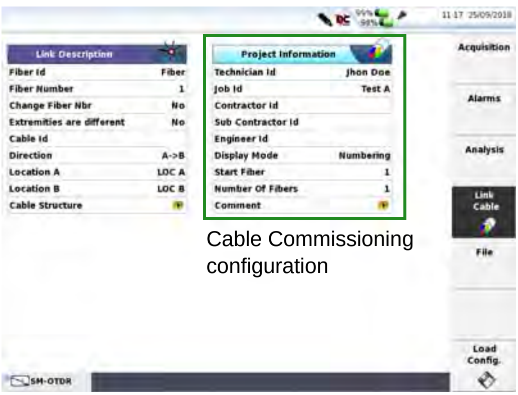
  If **Numbering** is defined:

  - On the parameter **Start Fiber**, press **Edit Number** soft key to enter the number of the first fiber of the cable to be tested (Min 1 / Max 100).
  - On the parameter **Number Of Fibers**, press **Edit Number** soft key to enter the total number of fibers of the cable (Min 1 / Max 100).

  If **Labelling** is defined:

  - On the parameter **Fiber Count**, select the type of connector: **Simplex** / **Duplex** / **MPO (8/12)** / **MPO (12/12)** / **MPO (20/24)** / **MPO (24/24)**
- Press the right direction key to enter a **Comment** if necessary, using the edition keypad.

Figure 91 Cable SLM Setup



Saving the project

Once all configuration parameters are defined, save the project:

1 Press **Save Project** soft key (displayed when one parameter of the Cable Project window is displayed).

2 In the Edition keypad opened, enter a name for the project and press **Enter** to validate.

Figure 92 Enter a name for the project

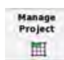
The project file (.prj) contains Acquisition / Alarms / Link / File parameters and is sa ved in root disk or Harddisk under `project` > `EXPERT_OTDR` > `OTDR_SM` or `OTDR_MM` directory.

A directory is automatically generated with the project name, and it is saved under `(hard)disk` > `Project` > `EXPERT_OTDR` > `OTDR_SM` or `OTDR_MM`. Measurements are stored into this directory, as well as a summary text file.

NOTE
Once a project is created, the parameters cannot be modified except the acquisition ones.

Loading an existing project

To open the project just created or to load an existing project

1 Press the **Manage Project** soft key on the Results screen 

.

2 Select the project file to be used (.prj) in `Project` > `EXPERT_OTDR` > `OTDR_SM` or `OTDR_MM` directory.

3 Press **Open Project** softkey..

Figure 93 Loading a project

Recall of the Cable Project parameters

A summary table of all fibers and measurements is displayed.

Starting project test process

Inspect & clean all fiber connections prior to connecting fiber under test to the OTDR port.

Once the project is loaded, the following screen is displayed.

Figure 94 Cable view

View «List» See page 158 View «Number»

1 Click on the first fiber to be tested.

2 The fiber number is underlined in purple (n°1 in Figure above)

3 Press **START/STOP** hard key to start the acquisition.

CAUTION

If a test is launched onto a fiber already tested, a dialog box displays: «`Test already done. Do you really want to repeat the test? Results files will be deleted.`».

Click on **Yes** to confirm the new test, and by consequence, to delete existing file(s).

Click on **No** to cancel the test.

4 Once all wavelengths have been measured, a window opens, asking:

– Click on **Yes** to test next fiber
– Click on **No** to return to project table.

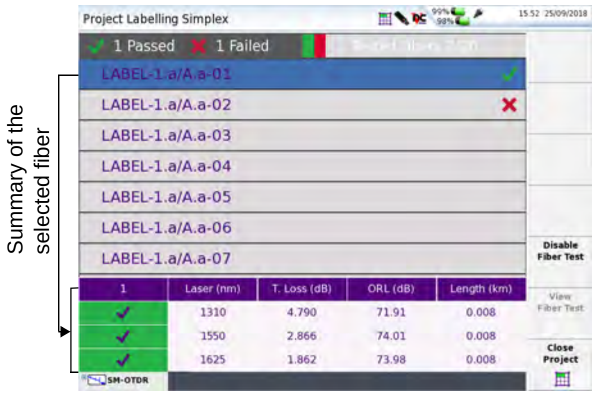
Trace saving

The traces are automatically stored into the project directory and according to defined filenaming convention.

Results of project cable

Once fibers have been tested, the project page updates on the fly:

Figure 95 Cable project



Description of the table

An icon is displayed to indicate if the alarm thresholds have been exceeded:

-  Pass
-  Fail
- No alarm or no test performed

Deactivate the fiber test

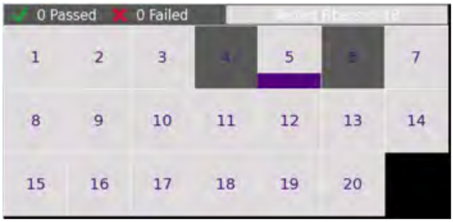
Before starting the test, some fibers can be deactivated so that the acquisition will not be performed.

1 Select the fiber number which does not need to be tested (framed in black).

2 Click on the soft key **Deactivate fiber test**.

3 Repeat the process for the fibers which do not have to be tested.

Figure 96 Fibers 4 and 6 deactivated



The deactivated fibers will be skipped while moving to next fiber to test.

CAUTION

If a test is deactivated on a fiber already tested, a dialog box displays: «`You're about to delete acquisition files. Are you sure?`».

Click on **Yes** to confirm the deactivation, and by consequence, to delete corresponding trace(s).

Click on **No** to cancel the deactivation.

View Trace

1 In the project page, click on the fiber number for which you want to display the corresponding trace.

2 Click on **View Fiber Test** soft key.
The trace result page displays.

Figure 97 Trace from fiber selected in project

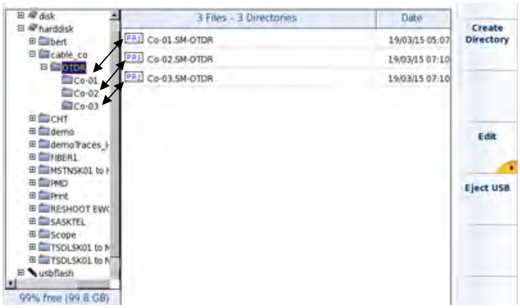
Files and Project storage

As soon as a project is saved from Setup page (see “Saving the project” on page 159), a folder is automatically generated with associated sub-directories.

The project and all corresponding test files are saved in the folder `cable_co`, automatic ally created.

The project file is saved in the directory `cable_co` > `OTDR`.

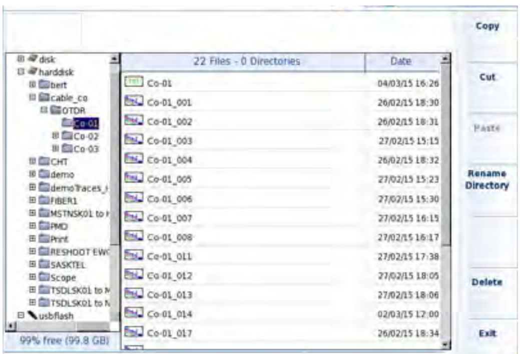
Figure 98 Project files



The project file is not visible in the explorer until the project is closed.

For each project, a subdirectory with the project Id is created, containing test OTDR files and summary results (in text format): `cable_co > OTDR > Project_Id`.

Figure 99 Project directory structure with file contents



Text file content

As soon as one acquisition is performed from the project, a summary text file (.txt) is associated to the OTDR test data.

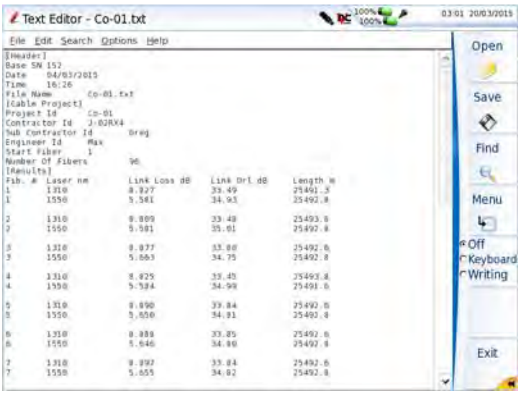
Each new test is inserted into the text file as project process evolves.

This file contains all the summary values of all tested fibers:

– Link loss
– Link distance
– Link ORL

This file uses tabulations to separate values. It is saved with the extension «.txt» and can be opened by the Platform.

Figure 100 Text file



4

Reduced Dead Zone OTDR application

This chapter describes the Reduced Dead Zone (RDZ) function, **available exclusively with a E8123AV OTDR Module.**

The topics discussed in this chapter are as follows:

Description of the RDZ function

The reduced dead zone (RDZ) multimode OTDR solution has been specifically designed to characterize and find faults on very short multimode fiber runs such as aircraft/spacecraft, submarine ships, as well as cable manufacturing.

Selecting and configuring the RDZ function

1 Press the **HOME** button.

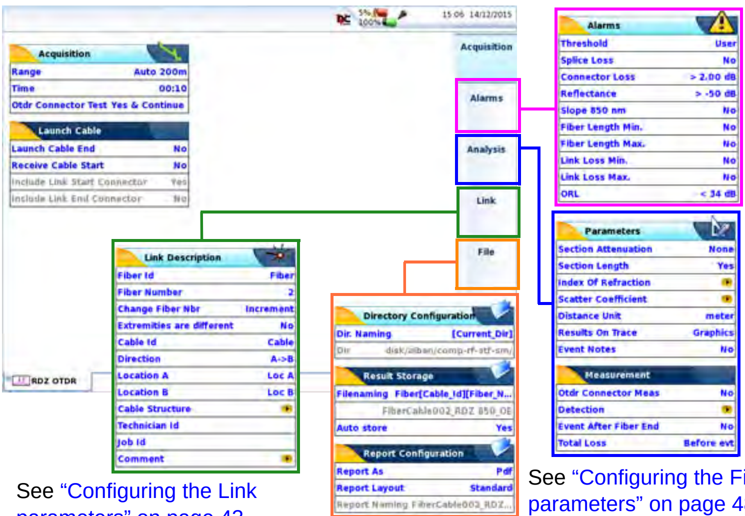
2 Once on the Home page, press the **RDZ OTDR** icon 

-> 

.

3 Press **SETUP** button to configure the OTDR measurement with RDZ function.

Figure 101 OTDR RDZ Setup



See “Configuring the Alarms parameters” on page 36

See “Configuring the Analysis parameters” on page 38

See “Configuring the Link parameters” on page 43

See “Configuring the File parameters” on page 48

NOTE
The selection of the RDZ function automatically de-selects the selection of the Multimode function on the same module ,and vice-versa.

Acquisition parameters

Acquisition

Range

Select the range of the measurement: from 50 m to 1km

or
Click on **Manual** to enter manually a range.
or
Click on **Auto** to detect automatically the range.
In **Auto** mode, the range is selected as a function of the end of the fiber.

Time

Select one of the acquisition times predefined: 10 seconds / 20 seconds / 30 seconds / 1 minute.

Otdr connector test

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 not good, 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.

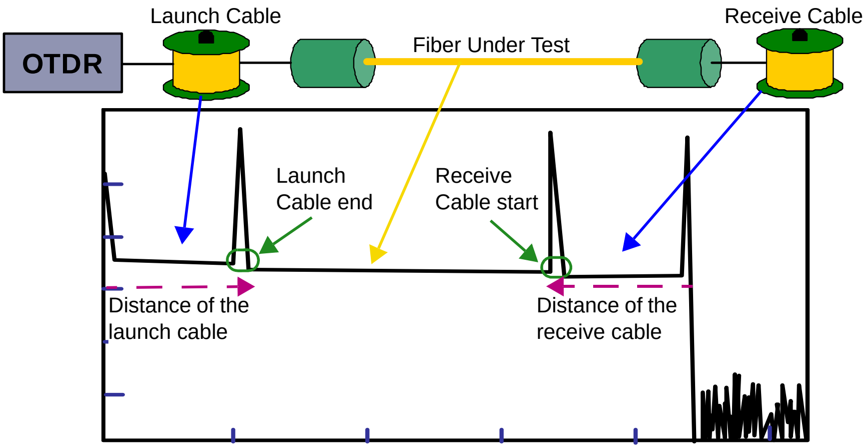
Launch cable

Launch Cable End / Receive Cable Start

No All the results are displayed and referenced on the basis of the board of the module.

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 selected.
Distance	Use the **Edit Number** key to enter a distance (Min= 0 / Max=50 km / 164.042 kfeet / 31.075 miles) or affect the active cursor value, using the **Set Cursor Distance** key.

Figure 102 Launch Cable / Receive Cable



Include Link Start Connector / Include Link End Connector

Defining the **Launch Cable End** parameter with an event number or a distance will automatically activate the corresponding parameter **Include Link Start Connector**. This parameters can be set to **Yes** if the budget must include the connectors loss of the launch cable at end

Defining the **Receive Cable Start** parameter with an event number or a distance, will automatically activate the corresponding parameter **Include Link End Connector**. This parameters can be set to **Yes** if the budget must include the connectors loss of the launch cable at start

If those parameters are set to **No**, the budget only displays the connector loss of the fiber.

Performing the measurement

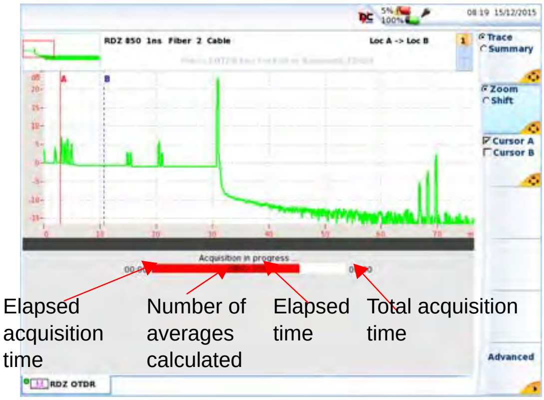
Once the measurement is correctly configured, the acquisition can be performed.

1. Press **START STOP** button on the T-BERD/MTS to launch the acquisition.
   The red **Testing** indicator goes on to show that the Platform 8000 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 3 on page 56)

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

Figure 103 Acquisition in progress in RDZ mode



At the end of the acquisition, a beep is emitted, and the measurements are displayed.

Performing an acquisition from Results page

Once the results page is displayed, you can perform a new acquisition modifying the main acquisition parameters.

CAUTION

Before launching a new OTDR acquisition, make sure the trace(s) displayed have been previously saved if necessary, as the new acquisition will automatically delete the displayed results.

1 On Results page, press the softkey **Quick Setup**: the acquisition parameters to be modified are displayed under the results trace:

Figure 104 Results page and Quick Setup menu

2 Modify the acquisition parameters wished in the displayed menu: see page 169.

3 Once configured, launch the new OTDR test pressing the **START/STOP** hard key.

Press again **(Quick) Setup** menu key to hide the menu under the trace.

Results display

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

Figure 105 Trace and table results

The 8 lines table gives the type and the characteristics of all the events detected during the measurement: the 8 first lines displayed correspond to the 8 first events nearest to the cursor. The line corresponding to the event nearest to the cursor is highlighted. This highlighting moves if the cursor is moved.

Once **Trace** is selected, press validation key  to pass from Trace + results table on 8 lines to Trace + results table on 1 line, and vice-versa

The table with one line displayed under the trace gives the type and characteristics of the event nearest to the cursor.

Figure 106 Trace results

At the top of the table, a line shows the generic parameters of the fiber: numbers of events present and the total ORL of the link.

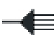
Each event is referenced under the trace by a number which is repeated in the first column of the table. The table then shows:

- 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.

 Reflective event. (e.g. connector)

 Ghost reflection.

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

 End of fiber

 OTDR connector

 Event marker when a measurement cannot be carried out. If the event to be added is too close to an existing event, the icon appears on the trace and the table, but no measurement is carried out: to obtain the results for this event, a manual measurement is necessary.

 Merged Connectors Loss

- Total group loss = loss on last connector
- Loss connector N-1 = 0 dB)

The event underlined in yellow 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.

See OTDR chapter “Detailed description of an event” on page 72.

The Trace view allows actions on trace, similar to standard OTDR traces:

- Setting Cursors on trace: see page 73
- Zoom on trace: see “Zoom function” on page 75
- Shifting a trace: see “Shift function (Expert OTDR only)” on page 77
- Modifying measurements: “Automatic measurement and detection” on page 85
- Adding an event: “Addition of events” on page 85
- Memorization of the events position: see “Memorization of the position of events” on page 95
- Overlaying trace: see “Overlay trace function” on page 96

SLM view

The SLM (Smart Link Mapper) function is automatically available with the RDZ application.

To display the SLM view of the results, press SLM on the Trace/SLM menu key.

Figure 107 SLM view

Refer to page 79 to page 123 for a complete description of the SLM screen.

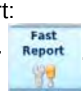
Saving the trace(s) and generating a report

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

Saving results and creating a report from results page

To save the trace and generate a report:

1 Press **Fast Report** key 

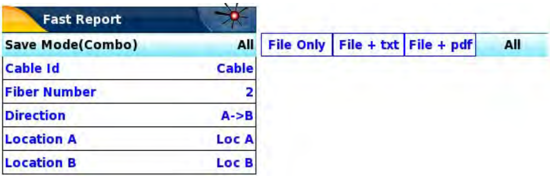
-> 

.

A menu displays under the trace.

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

Figure 108 Fast report configuration



a In the **Save Mode** parameter, select:

File Only to save exclusively the trace in a asor file.

File + txt to save the trace in a asor file and to generate a txt file of the results.

File + pdf to save the trace in a asor file and to generate a report in a pdf format.

All: to save the trace in a asor file and to generate one txt report and one pdf report.

> **NOTE**
> The Save mode is defined to Standard or Combo mode from the Setup > File page. See “Report Layout” on page 51

b In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.

c Modify the **Fiber Number** / **Fiber Code** using the key ▶.

The parameter is different according to the Cable Structure configuration (see “Cable structure” on page 45).

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

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

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

or

Click on **Auto Filenaming** menu key to apply the file name defined in the Setup screen, in **Filenaming** parameter (see “Filenaming” on page 50)

5 Press **Enter** to validate.

> **NOTE**
> The sor file and the txt or pdf file will have the same name.

The icon  displays during saving process.
Once saving is completed, a sound is emitted onto the Platform.

> **NOTE**
> The file and the report are saved in the last storage media and directory selected.

> **NOTE**
> The file saving can also be performed from the **File** page (see “Saving Files from the Explorer” on page 539).

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 (**SETUP** > **File**), the parameter **File Content** is defined with **One Trace**, one .sor file and 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 (**SETUP** > **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.

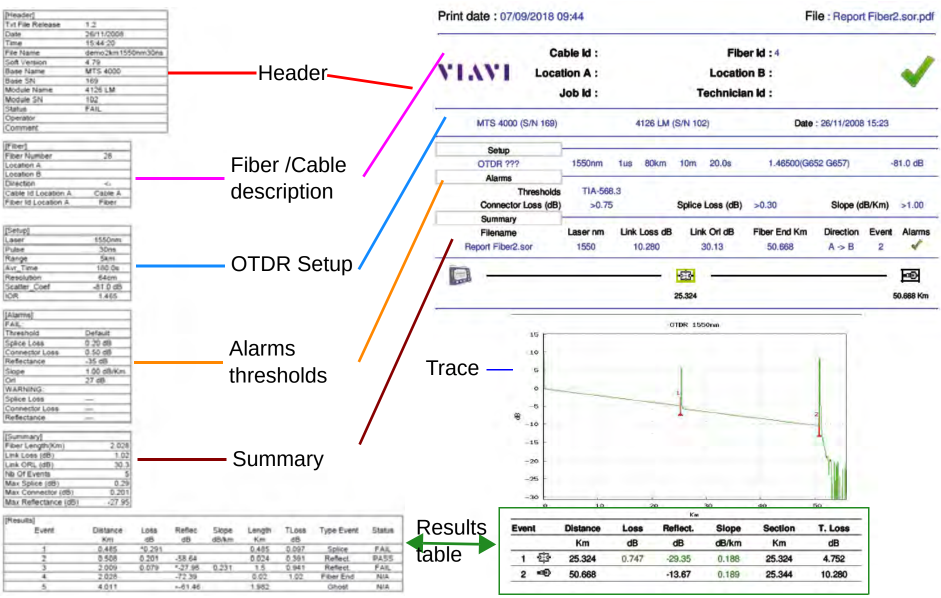
Opening a report

1 To open the report, press **FILE** hardkey

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*

3 Press **Load**.
The file opens on the Platform 8000.

Figure 109 Example of TXT and PDF reports



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 onto the T-BERD/MTS (see “Generating pdf report(s)” on page 545).

Recalling files

Once a file has been stored, recall it using the Explorer:

1 Select the directory and then the file to open

2 Click on **Load**

3 Click on **View Tace(s)** or **Load Trace + Config.**
The selected file is opened

For further informations on file management, see Chapter 20 “File management”.

5

Power meter and Source functions of the OTDR Modules

The source function is available:

- either as an option of the OTDR Module (E81OTDRLS)
- or on standard with the OTDR E81xxB and E81xxC module series

The power meter is available exclusively with the OTDR E81xxB and E81xxC module series.

The topics discussed in this chapter are as follows:

Connection to the power meter and the source

The type of optical connector used for the power meter and/or source is the same as the OTDR port.

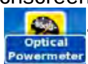
It is not possible to use simultaneously the Source function and the Powermeter function, when both options are set onto the OTDR module, as they use the same connector.

Configuring the Power meter

The power meter function is delivered on standard with the E81xxB and E81xxC OTDR Modules.

To activate the function:

1 Press the **HOME** button

2 Use the direction keys or touchscreen to select the power meter icon in the section of the OTDR Module 

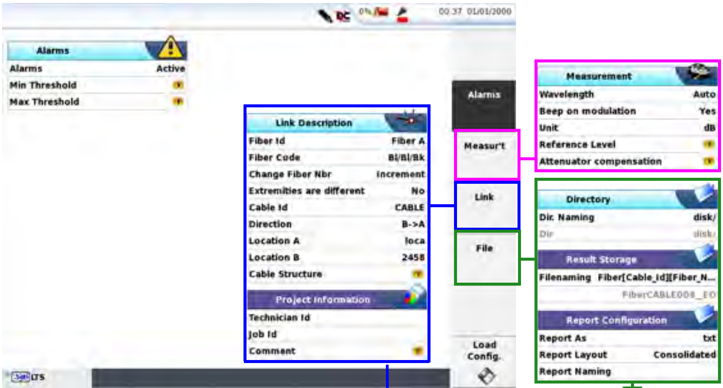
.

The effect of this action will to be to bring the power meter into use.

Configuring the measurement parameters of the power meter

The measurement parameters can be accessed with the **SETUP** key.

Figure 110 Configuration of power measurement



See OTDR Setup: “Configuring the Link parameters” on page 43

See OTDR Setup: “Configuring the File parameters” on page 48

Configuring the alarm parameters of the power meter

- **Alarm** Activation of the Alarm function: any result below the lower threshold or above the upper threshold will be displayed in red on the **Results** page.
- **Min and max thresholds**:
  Choice of lower and upper thresholds for each available wavelength, from -60 to +40 dBm (selected with the direction keys).

> **NOTE**
> To copy one value of the Lower or/and Upper threshold for all wavelengths, select the reference value and click on **Update for All Wavel.**.

> **NOTE**
> A continuous push on direction keys increments the value by 10 dBm.

Configuring the Measurement parameters

In the **Setup** page, press **Measur't** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Measur't**)

Wavelength Select wavelength:
Auto: the wavelength of the input signal will be automatically detected and selected to perform the measurement:
1310, 1490, 1550, 1625 or 1650 nm: measurement performed at specified wavelength.

Beep on modulation
Select if a sound must be heard when a modulation occurs (**Yes** / **No**)

Unit Unit of power displayed:
Watt, **dBm** for displaying absolute power
dB for displaying a result relative to a reference (link loss)

Reference level If dB units were chosen in the previous line, selection of the reference value for the wavelength selected. Using the direction keys, first choose the wavelength, then press the > key to access choice of the value (+XXX.XX), then confirm this value with the **ENTER** key. This reference is also automatically available, in the **Results** page, using the **Set as Reference** key.

Attenuator compensation
Choice of level to be applied to the wavelength chosen for measurement to compensate for the loss due to the external attenuator (+XX.XX dB). First use the direction keys to choose the wavelength, then press ▶ to access choice of value, then confirm this value pressing **ENTER.**

NOTE
To copy a Reference Level/Attenuator Compensator on all wavelengths, select the reference wavelength and click on **Update for All Wavel.**.

Activating the Source function

The Source function is an option chosen at the time of order and incorporated into the OTDR module in the factory.

To activate the function:

1. Press the **HOME** button
2. Use the direction keys or touchscreen to select the Source icon in the section of the OTDR Module.
3. With direction keys, press the **ENTER** key.
   The icon is selected 

.

Result page

The results page called up by the **RESULTS** button**,** gives the information relating to the measurement in progress, results previously saved and the commands available for measurement and saving.

Result page of the Power meter

The power measured by the power meter is displayed in large characters, in the units selected in the **SETUP** menu, together with:

- the mode of transmission of the signal measured: continuous (CW) or modulated to a frequency of 270Hz, 330Hz, 1KHz, or 2KHz.
- the wavelength of the signal measured.
- the reference level expressed in dB.
- the level of Attenuation Compensation.

Table of results

For one and the same fiber, the power meter displays a table of 9 results corresponding to the different possible wavelengths. The table shows the power measured in dBm, the relative power (in dB) and the reference level in dBm (if units = dB), together with the mode.

- A measurement result is displayed in the table when the **Keep Result** softkey is pressed.
- The **Clear Table** softkey orders deletion of all the results displayed in the table.
- If the Alarm function has been activated, any result that exceeds the selected thresholds appears in red in the table. Otherwise, results are shown in the table in green.
- When the instrument is switched off, results present in the table are saved.

Figure 111 Results and commands of the power meter

Commands of the power meter parameters

When the Powermeter function is selected, the following softkeys are available on the results page:

The different configuration buttons are displayed:

Wavelength Selection of the wavelength

Unit Choice of the unit

Zero Adjustment of the Zero value when the power meter's optical input is closed with a plug (a validation is required).

On the results page, the following actions are available:

Standard Reference
Selects the current result as reference value to measure the attenuation of a link. This reference is displayed under the measurement result until a new reference value is chosen.

Keep Result Saves the result on the corresponding line of the table.

Clear Table Deletes all the results recorded in the table.

If the Source function is selected (either on this Platform, on the base Unit or on an OTDR module, or on another Platform), the Power meter results page is different:

- The **Wavelength**, **Unit** and **Zero** menu keys are accessible via the menu key Power Config.

- The **Power Ref.** menu key allows to reach the **Standard Ref** menu key. It also allows to reach the **Jumper Ref** menu key if Power meter function is associated with Source function onto another unit (see “Carrying out the reference in loop-back mode” on page 191).

Result page of the Source

Once the source icon is selected, click on the **SETUP** or **RESULTS** button to display the result page and to configure the source.

Figure 112 Source result page

Laser On / Laser Off

Activation or shut-down of the laser (same function as the **START/ STOP** button)

When the laser is **on**, the icon  is displayed.

The parameters of the source can be accessed directly on the result screen:

Wavelength To change the wavelength when a multi-wavelength source is present (depending on option).

The wavelength value is displayed.

Mode To vary the mode of emission of the source. Possible modulation values are:

– 270 Hz / 330 Hz / 1 kHz / 2 kHz
– Auto (the sources emit on determined frequencies to enable the power meter to detect the wavelength used automatically)
– TwinTest (cyclical emission on all available wavelengths for a few seconds on each wavelength).
– CW (continuous emission)

The mode used is displayed, above the icon  .

Standard Reference

To perform a side by side reference measurement (see “Carrying out the side by side reference” on page 189).

If the power meter function is selected onto the equipment (either on Base-Unit or on OTDR module) the menu keys are different on screen:

Source Config

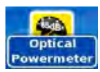
Allows to display the following keys:

– **Wavelength** and **Mode** menu keys
– The **Source Reference** menu key, which allows to open a sub-menu with the following keys:

Standard Ref:to perform a reference in side by side mode (see “Carrying out the side by side reference” on page 189).

Jumper Ref:to perform a reference measurement in loopback mode (see “Carrying out the reference in loopback mode” on page 191)).

Performing the power level measurement

The power meter is started up as soon as the function 

is activated in the **HOME** page.

It is not possible to use simultaneously the Source function and the Powermeter function, when both options are set onto the OTDR module, as they use the same connector.

Power measurement is automatically updated in consequence. The value «<-50 dBm» is displayed when the laser is switched off and if the source output is looped on to the power meter input.

1 Connect the light source to be tested to the rear connector (see "Connection to the power meter and the source" page -182).

2 In the **SETUP** menu, choose the units dBm, dB or Watts.

3 Press the **START/STOP** key to start the measurement**.**

The result will appear in the results page and can be memorized in the table (see "Table of results" page -185).

4 Press the **START/STOP** key to stop the measurement.

Performing the insertion loss measurement

Using light source and power meter, an insertion loss measurement can be performed, having previously carried out a reference measurement.

Setting the zero value of the power meter

1 Fix the plug over the optical input of the power meter so that no light can reach the photodiode of the power meter. If the zero adjustment is made without this plug, an error message may be displayed, as the photodiode will detect too much light.

2 In the **Results** page, press **Zero** soft key and validate.

> It is important to set the zero of the power meter before making any measurements where accuracy is required, as the noise from the germanium photodiode fluctuates over time and with variations in temperature.

Carrying out the reference

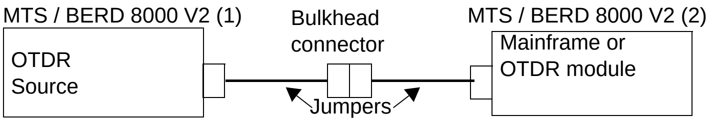
Using two T-BERD/MTS-8000 V2/6000(A), with an OTDR module including a laser source option and a Power meter option, an insertion loss measurement in continuous wave can be performed.

Two types of reference are available: referencing in side by side mode and referencing in loopback mode.

Carrying out the side by side reference

This reference can be carried out when both units are connected together meaning they have to be at the same location.

Figure 113 Side by side reference



1 Before connecting fiber/jumper, use appropriate cleaning tool to clean connector end-faces.

2 Connect the two jumpers together via a bulkhead connector.

3 Set, on MTS / T-BERD 8000 V2 (1), the OTDR light source as "**Standard Ref**"

a Press the **HOME** key

b Select the **Source** function from the OTDR Module on **Home** page 
.

c Press **RESULTS** key

d In the Results page, press **Standard Ref**

e Select the **Twintest** mode by skipping through the different modes via the **Mode** menu key.

f Press **Laser On** key to activate the source

4 Set, on MTS / T-BERD 8000 V2 (2), the power meter (from OTDR module or from the Base-unit) as "**Standard Ref**"

a Press the **HOME** key

b Use the arrow keys or touchscreen to select the Powermeter function of the Base-Unit, in **Home** page 
.

c Press **RESULTS** key

d In the **Results** page, press **Standard Ref.**

The actual power level is set as the new reference level for the selected wavelength. Then, the displayed value is around 00.00 dB.

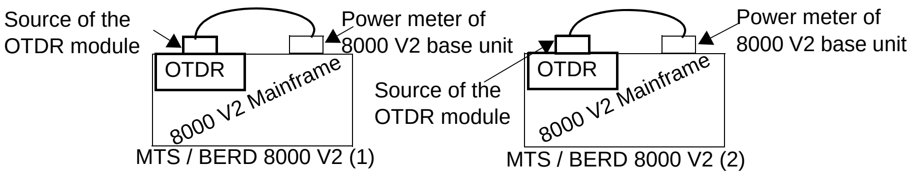
The reference levels are stored into the unit, and have been automatically filled into the setup.

Carrying out the reference in loopback mode

This reference can be carried out when the units are separated, at different locations. It is made using the OTDR source and the power meter built-in the platform.

> **NOTE**
> Each platform must be equipped with a power meter set onto the base-unit.

Figure 114 Reference in loopback mode

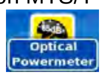


1 To reference the OTDR light source, on MTS/T-BERD 8000 V2 (1)

- **a** Select the **OTDR Source** icon in **Home** page , on the OTDR area.
- **b** Press **RESULTS** key
- **c** In the LTS result page, press **Source Config.** > **Source Reference** > **Jumper Ref.**.
  A popup message appears
- **d** Connect the jumper from the OTDR source to the mainframe power meter, and then press **OK**.
  The reference measurement is performed automatically.

A popup message appears when it's done: press any key to continue

2 To reference the mainframe power meter, on MTS/T-BERD 8000 V2 (2)

- **a** Select the **Optical Powermeter** icon  of the mainframe in **Home** page.
- **b** In the LTS result page, press **Pow. Reference** > **Jumper Ref.**.
  A popup message appears
- **c** Connect the jumper from the OTDR port to the mainframe power meter, and then press **OK**
  The reference is performed automatically.

A popup message appears once done. Press any key to continue

The reference levels are stored into the unit, and have been automatically filled into the setup.

Measurements on the fiber under test

Once the references have been performed on both units:

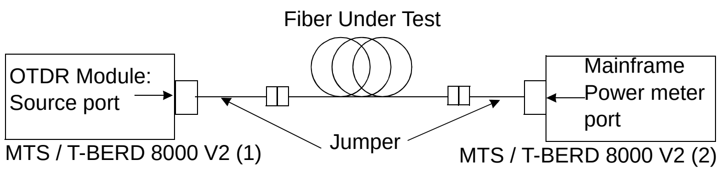
1 After a reference in loopback mode, disconnect the jumper from the powermeter port on the MTS / T-BERD 8000 V2 (1) and the jumper from the Source port on the MTS / T-BERD 8000 V2 (2).

After a reference in Side by side mode, disconnect the bulkhead connector and keep the jumpers connected to the Source and Powermeter ports.

2 Connect the jumpers to the fiber under test using the appropriate method (ex. keying mechanism for FC/PC types).

3 On MTS / T-BERD (1) select **Laser On** to activate the light source.

Figure 115 Measurement of the fiber under test



Storing and reloading results

File Setup

Click on the button **FILE** to access the **File** setup. See the chapter Chapter 20 “File management” for a complete description of all parameters, options and the explorer.

Storing results

In order to save the results of a measurement, click on **FILE** and select **Store trace**. Two files are being saved:

- The first file is to be used with the equipment and allows to retrieve all measurement results. It is saved with the extension .Lts.
- The second file is a ASCII file using tabulations to separate values. It is saved with the extension «.txt» and can be opened by the 8000 V2 Platform via the Web Browser. It has been designed to be used with a spreadsheet program on a PC where it allows to retrieve all measurement results and format them in a nice customized table.

Loading results

In order to load the results of a measurement

1. Select a file  with the extension «.Lts» in the file explorer (see Chapter 20),
2. Click on **Load** > **View trace**.
   The LTS tab is displayed with the loaded results in the table.

6

Bi-directional OTDR

This chapter describes the different steps to perform an automatic bi-directional measurement (also called OEO measurement = Origin-End-Origin).This measurement requires that two T-BERD/MTS-8000 V2 or 6000(A) are connected at each extremity of the fiber under test. Every MTS/T-BERD must be equipped with the software option called «OEO-OTDR» and with both optical talkset and OTDR module.

It is strongly recommended that the same type of OTDR is used (same reference) at each extremity of the fiber.

The topics discussed in this chapter are as follows:

Definition of terms used

Master / Slave unit

The master unit is the MTS/T-BERD that initiates the measurement at one extremity of the fiber.

The slave unit is the MTS/T-BERD connected on the other extremity of the fiber, and connected to the master unit via the data connection.

Local / remote unit

These terms are used in the Process Display page (see “Process page display (with two T-BERD 8000 V2)” on page 202). Each unit is considered as «Local» on its own screen.

> **NOTE**
> These terms are to be distinguished from the measurement direction and extremities of the fiber (see “Configuring the Link parameters” on page 43 and “Configuring the File parameters” on page 48)

Description of the measurement

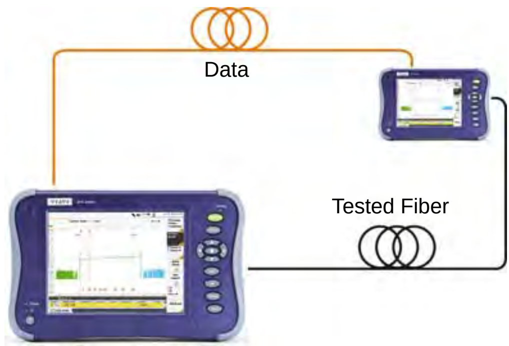
> **NOTE**
> The measurement principle and methods used are described in “Principle of bi-directional measurement” on page 4.

Thanks to the software option OEO-OTDR, bi-directional measurement can be fully automatic.

A minimum of two fibers is required. Two MTS/T-BERDs equipped with the talkset option and an OTDR plug-in are linked at every extremity of the fiber to test at the same time. A data connection is established between the two talkset ports of the units via another fiber, in order to exchange orders, configurations and measurement results.

NOTE
For automatic bidirectional OTDR testing, two units having the talkset option and the E80 bidirectional option are required.

Example with 6000 series



Fully automatic bi-directional acquisitions can not be performed without a data connection (see «Data transfer» in the user manual of the MTS/T-BERD, reference 8000EM02 for example).

Please check that the OTDR function has been selected (see “Activating the OTDR function” on page 26).

For best measurements and in order to qualify the fiber link and connectors, launch cables shall be inserted between the OTDR modules and the link.

Summary of the automatic operation procedure

- Test if both units are linked to the same fiber
- Consistency verification of the OTDR plug-in between the two units.
- Consistency verification of acquisition configuration, measurement and files, fiber and link definition. Then transfer of the master unit configuration to the slave unit if necessary.
- Acquisition start on the master unit

- Trace transfer to the slave unit
- Acquisition start on the slave unit
- Trace transfer to the master unit
- Bi-directional measurement on both units
- Results storage in a single «.OEO» file or in two «.SOR» files.

All this test procedure is fully automatic, and all results are immediately accessible on both units.

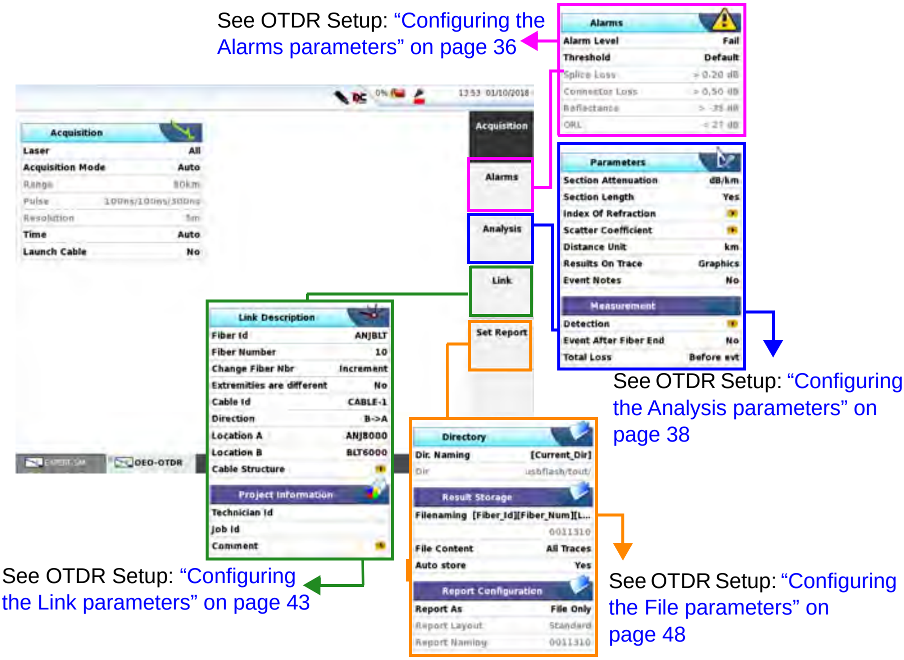
Configuration of bi-directional measurement

To access the OEO configuration menu, press the button **SETUP** from the MTS/T-BERD. OEO parameters are now displayed.

Please check that the OEO-OTDR tab has been selected.

Acquisition parameters are the same as for OTDR measurements (see "Configuring the reflectometry test" on page 28 for their description). Only different or extra parameters are presented in this chapter.

Figure 116 OEO test setup menu



Acquisition parameters

Laser Acquisition will be performed on all selected wavelengths, as long as they are available on the remote OTDR as well. If not, acquisition will be performed on all wavelengths selected and common to both OTDRs. Please see the recommendation on page 196 about using the same type of OTDR)

Acquisition Bi-directional measurement allows manual and Auto modes only. Operation is the same as for OTDR measurement.

Alarms parameters

The alarms apply to the measurements average, and not to the measurements for each side (as it is in the classical OTDR mode)

Configuration of files parameters

To access the files configuration menu of the OEO-OTDR tab, press the button **FILE**.

Related parameters are then displayed.

All parameters to describe the files, the fiber and the link are proposed in order to save all measurements. Please refer to “Configuring the File parameters” on page 48. Only differences are presented in this chapter.

File Content

This option allows to choose to save a bi-directional measurement under two different formats (see “Recalling OEO traces” on page 213):

One Trace	The bi-directional measurement is saved in two different «.SOR» files
All Traces	The bi-directional measurement is saved in a single file «.OEO».
One and All Traces	Both the .OEO and the two .sor files will be saved.

NOTE
For best use, it is recommended to use the auto file naming (with fiber code, origin, end, lambda, fiber name and auto-store). These parameters are applied on the master MTS/T-BERD.

Performing a bi-directional measurement

Process Display

The **Process** page displays the bi-directional measurement steps, the **Curve** page displays the traces and results and the **Summary** page displays a summary of the results in a table (and the alarms result if alarms have been configured in the **Setup** page).

In order to display the **Process** page, make sure you are currently under the OEO-OTDR tab, and press the key **RESULTS**.

The key **View Process/Curves/Summary** allows to change from the **Curve** page to the **Process** page and to the Summary page.

In order to select and follow the status of a measurement, go to the ***Process*** page.

> **NOTE**
> When a measurement has been started, the slave MTS/T-BERD automatically displays the **Process** page.

The **Process** screen is divided in three zones:

1 Information zone:

- Representation of the local MTS/T-BERD, with identification[1]
- Representation of the distant MTS/T-BERD, with identification[2]
- Status of the data connection: grayed when the link has been cut or the connection not yet established, yellow when the connection is operational
- Status of the fiber connection: this is the status of the last tested fiber. The fiber is represented cut and is grayed if the two units are not connected on the same fiber. If the two units are connected on the same fiber, the link does not appear cut. When a measurement is processed, the fiber is displayed in red
- When the fiber connection is established, information providing the module type and available wavelengths is displayed for both ***local*** and ***distant*** units

2 User guide zone:

A grey banner is displayed in the center of the screen where operation messages are displayed.

The icon for keeping all events in memory is displayed in this zone if the key **Lock Evt/Free Evts** is set on **Lock Evt.** In this case, the following measurement is performed using those markers (see “Memorization of the position of events” on page 95).

> **NOTE**
> This function keeps markers in memory for both local trace and distance trace.

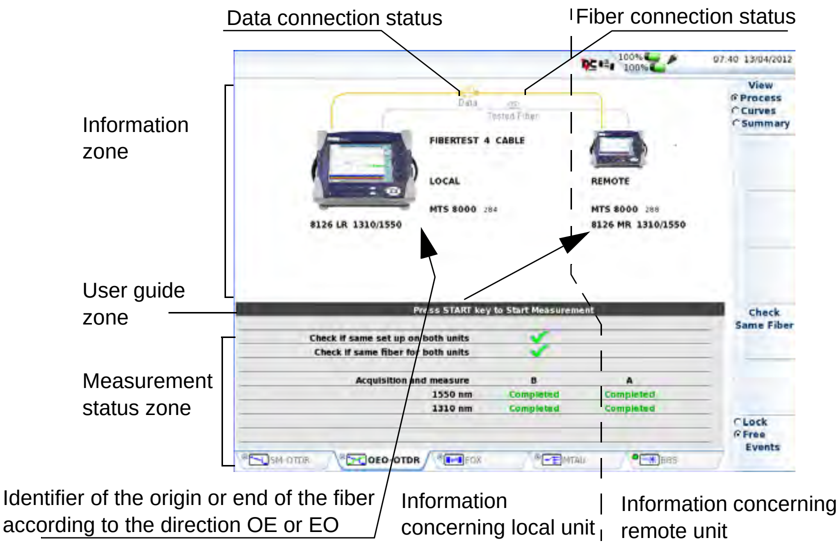
1.includes serial numbers of the mainframe and module as well as available wavelengths
2.requires active data connection

1 Measurement status zone:

When a bi-directional measurement has been launched, all the different steps in the measurement process are presented in this zone. Each one is detailed later in this chapter.

> **NOTE**
> The general information banner is displayed at the top of the screen as for all other tabs. When a OEO measurement is performed, Data icon is displayed as soon as a data connection is established.

Figure 117 Process page display (with two T-BERD 8000 V2)



Fiber link check

To ensure that the two units are connected to the same fiber under test, select **Check same fiber**. If the fiber is the same at both extremities, a symbol will be displayed on the measurement status zone.

Measurement process

Fiber measurement

Step 1

1 Choose to use the markers stored in memory or not by selecting **Lock Evt** or **Free Evts**.

> **NOTE**
> If the markers events are already defined for the link, you may select the **Lock Evt** key. This implies that the unit will now perform measurements with those markers. Otherwise select **Free Evts**.

2 Press **START** to begin the measurement.

The line Check if same set up on both units becomes In progress... .

> **NOTE**
> A warning may occur if the configurations of the two units are different (see “Warning/errors resulting from common configurations” on page 214).

The ***begin*** launch cable is transferred to the ***end*** launch cable, and the ***end*** launch cable is transferred to the ***begin*** launch cable. The master MTS/T-BERD must indeed know both extremities of the fiber and will send the information to the slave MTS/T-BERD. The direction of the link is defined by the master MTS/T-BERD, which transmits the opposite direction to the slave MTS/T-BERD.

In the **File** configuration, each MTS/T-BERD points to its own directory. Only the master MTS/T-BERD may save a measurement. **Auto storage** and **File Content** parameters only concern the master unit and are not compared or transferred to the slave MTS/T-BERD.

The list of lasers for which a measurement will be performed is set by the master MTS/T-BERD. If these lasters are not all available on the slave MTS/T-BERD, the list shall be restricted to the ones that are available.

When both menus **SETUP** and **FILE** are identical, the validation symbol  is displayed and the process goes to Step 2.

Step 2

The line <Check if same fiber for both units> becomes <In progress...>. If the master MTS/T-BERD successfully detects the other MTS/T-BERD at the extremity of the fiber under test, the validation symbol is displayed, and the process proceeds to Step 3. Otherwise, the red cross is displayed and the measurement is stopped.

Step 3

The master MTS/T-BERD performs the acquisition using the first wavelength in the list. The acquisition time selected on the Setup screen is displayed on each MTS/T-BERD, either in the ***«Local»*** column or the ***«Remote»*** column, depending on which MTS/T-BERD is considered. When the measurement is terminated, the message <Completed> is displayed. The trace is transferred to the other MTS/T-BERD.

Step 4

The slave MTS/T-BERD performs the acquisition using the same wavelength. The message acquisition time selected on the Setup screen is displayed on each MTS/T-BERD, either in the ***«Local»*** column or the ***«Remote»*** column, according to which MTS/T-BERD is considered. The message <Completed> is displayed when the measurement is terminated,. The trace is transferred to the master MTS/T-BERD.

Step 5

The bi-directional measurement is completed.

NOTE

The message <Impossible measurement> is displayed if the measurement has not been able to detect the end of the fiber on any of the two traces. The measurement must be performed once more with new acquisition parameters or by placing markers manually on the measurement.

Step 6

Step 3, Step 4 and Step 5 are performed for each wavelength to test.

IMPORTANT

It is possible to stop the measurement at any step of the process, by pressing the button **START/STOP** on the master MTS/T-BERD.

It is also possible to request from the slave MTS/T-BERD that the measurement is stopped, by pressing the button **START/STOP**. The master unit receives the request via a message on the screen: <Remote asks for stop, do you agree ?>. If ***Yes***, the measurement is stopped, if ***No***, the measurement resumes.

Trace display functions

Figure 118 Butterfly representation of the bi-directional measurement

By selecting the **Curves**, with the **View Process / Curves / Summary** key, the unit displays the traces and results like in classical OTDR mode, adding bi-directional measurement results.

The menu key View Process/Trace/Summary is not available if the OEO license is not installed onto the Platform.

In the **Trace** page, the multi-choice key 

[1]allows to visualize successively the local trace, the remote trace, or both superposed.

NOTE
The remote trace is reversed in order to superpose both traces in a «butterfly fashion» (see Figure 118 on page 205).

NOTE
You may only use this key to change page when the measurement is completed. When the measurement is completed, the **Curve** page corresponding to the local MTS/T-BERD is automatically displayed (***Origin*** if the direction of the link has been defined O->E, ***End*** if the direction of the link has been defined E->O).

Origin and End traces

Bi-directional measurement may be performed using up to 4 different wavelengths. We can therefore analyze successively up to 4 couples of Origin and End traces.

In order to go from one couple to another, activate the **Wavelength/Evt** key, select **Wavelength**, and move from one trace to another using arrows.

These traces are OTDR traces. All regular OTDR functions are proposed to modify the display (Zoom/Shift, Cursors, Evt, Curve/Table, Full scale,...).

Just like in OTDR mode, the user will be able to work on these traces in order to analyze the fiber: by moving events, consulting the selected trace associated ***result table***, asking for an ***auto-measurement***, adding ***markers,*** and doing ***manual measurements***.
See “Results table” on page 69, “Addition of events” on page 85 and “Manual measurements” on page 90.

When the user comes back to OEO trace, all modifications done on either the Origin curve or on the End curve are now taken in account. The OEO measurement is performed again.

1.In our example, St-Etienne corresponds to the extremity connected to the local unit, Lyon corresponds to the extremity connected to the remote unit.

OEO trace

Only one couple of OE and EO traces is displayed, corresponding to one wavelength.

If the measurement has been performed on different wavelengths, select **Wavelength** on the key **Wavelength/Evt** in order to go from one couple of traces to another, using direction keys.

Functions such as Zoom/Shift, Cursors, Evt, Curve/Table, Full scale... are all the same as for OTDR but the table result as well as the use of markers are specific to OEO measurements.

OEO Result table

Bi-directional measurement results use principles described in “Principle of bi-directional measurement” on page 4.

The total loss of the fiber (on the line specifying the total number of events) is resulting from the average between the total loss calculated in the direction O->E and the total loss calculated in the other direction.

Three tables are available in the **OEO curve** page, each showing attenuation, slope and reflectance.

In order to go from one table to another,

1 Click on the **Advanced** key

2 Click on **Loss/Slope/Reflect.** key and select one of the three possibilities.

Automatic measurement and addition of markers in OEO page

Key Delete/Auto Meas

When this key is activated in the OEO page, and **Delete**> is selected, OEO measurement is erased as well as OTDR measurement, for both origin and end traces.

When **Auto Meas** is selected, auto-measurement is performed once more for both origin and end traces, resulting in a new OEO measurement.

Addition of markers

In order to modify a marker on any of both origin and end traces, select cursor A or B, position your cursor when you want to modify or add a marker and press the key **Set Event**:

- If there was no marker at this position, a new one is added on both origin and end traces
- If there was two markers, one on each of both origin and end traces, both are deleted
- If there was only one marker, either on the origin trace or on the end trace, a second marker is added, on the trace when none was present.

Markers display

Markers are available on the trace taken from the origin.

Markers are available on the trace taken from the end.

> **NOTE**
> Acquisitions must be done with the same resolution. If not, the addition of markers cannot be performed perfectly.

Test of a cable

In order to test a full cable, it is first necessary to make an OEO reference trace, where all fiber events have been marked on both origin and end traces.

This trace may be obtained by requesting an auto-measurement after which markers may be added, or by performing a manual measurement.

The next step consists in memorizing all markers, by selecting **Lock Evts** in the **Process** page.

> **NOTE**
> If the auto mode was set for the referencing, it is recommended to change to manual mode for the next fibers. This will ensure that setup parameters used for all the fibers will be the same than those used for the reference trace.

Finally, a bi-directional automatic measurement is performed for each fiber. Results are stored in either one «.OEO» file or two «.SOR» files.

Saving the traces and generating a report

Once the results page is displayed, the traces can be saved and a report can be generated directly from the results screen.

Saving results and creating a report from results page

To save the trace (and generate a report):

1 Check in the results page that the OEO view is selected 

.

2 Press **Advanced** > **Fast Report** key 

A menu displays under the trace.

3 In the menu, configure the file saving (and the report).

Figure 119 Fast report configuration

a In the **Fiber Number** parameter, modify if necessary the number of the fiber

b In the **Save Mode** parameter, select:

File Only to save exclusively the traces in one oeo file or several .sor files

File + txt to save the trace in a oeo file or several .sor files and generate a txt file of the results

File + pdf to save the trace in a oeo file or several .sor files and generate a report of the trace and results in a pdf file.

NOTE

Traces are saved in oeo or sor format according to the configuration of the parameter **File Content** (**FILE** > **Setup**). See “Saving and report for traces in overlay” on page 211

c In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.

d Modify the **Fiber Number** / **Fiber Code** using the key ▶.

The parameter is different according to the Cable Structure configuration (see “Cable structure” on page 45).

e 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**)

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

4 Once saving is configured as wished, press **Save All** menu key

5 Enter a name for the file in the edition keypad

or

Click on **Auto Filenaming** menu key to apply the file name defined in the Setup screen, in **Filenaming** parameter (see “Filenaming” on page 50)

6 Press **Enter** to validate.

NOTE

The oeo/sor file(s) and the txt/pdf file will have the same name.

The icon displays during saving process.

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

NOTE

The file(s) and the report are saved in the last storage media and directory selected.

NOTE
The file saving can also be performed from the **FILE** > **Explorer** page (see "Saving Files from the Explorer" on page 539).

Saving and report for traces in overlay

As 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** > **Setup**), the parameter **File Content** is defined with **One Trace**, one **.sor** file and one pdf/txt report will be generated for each trace (one file for trace O -> E and one file for trace E-> O).
- If in the File Setup page (**FILE** > **Setup**), the parameter **File Content** is defined with **All Traces**, one single **.oeo** file and one single txt/pdf report will be generated, bringing together all traces: trace O -> E, trace E-> O and Bi-directional.

  Example: if 2 traces are displayed in overlay, one single **.oeo** file and one single txt/pdf file will be saved.

Opening a report

1. To open the report, press **FILE** hardkey
2. In the **Explorer** page, in the directory selected, select the pdf file of the report.

   The file name is:

   For the txt file: *trace file_oeo.txt*

   For the pdf file: *trace file.oeo.pdf*
3. Press **Load**.

   The pdf file opens on the platform.

Figure 120 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 onto the T-BERD/MTS 8000 V2 or 6000/6000A (see "Generating pdf report(s)" on page 545).

Recalling OEO traces

Recalling a «.OEO» file:

If the OEO software option is available, loading a «.OEO» file with the **Load** key followed by **View Trace** key will open automatically the OEO-OTDR tab in order to display the OEO trace.

Recalling two «.SOR» files:

Wether the OEO software option is available or not, if the two «.SOR» files corresponding to a bi-directional measurement are selected, the key **Load Bi-dir.** appears. The OEO trace is then displayed.

> **NOTE**
> If both traces are not compatible (not performed using the same wavelength and pulse width), a error message is displayed <Acquisition parameters for these two files are different ! >

For further information on File management, see Chapter 20 “File management”

Troubleshooting

Warning/errors after pressing the key Start

Error message	Possible problem	Possible solution
No data link. Activate connection before **START**	No data connection	Go back to **Home** page to establish a connection
No tab OEO-OTDR on remote Platform	No software option OEO-OTDR on remote Platform	Bi-directional measurement impossible if no software option on remote Platform
Remote Unit not ready	OTDR resource has not been selected	Go back to **Home** page on the remote Unit to select the OTDR function
No resource for remote Platform	OTDR resource is already being used	Stop measurement on remote Unit to free the resource

Error message	Possible problem	Possible solution
No response from remote Unit	Data link problem	Check the data connection

Warning/errors resulting from common configurations

Message	Action possible
No common laser: acquisition is impossible	Select a Platform equipped with the same type OTDR plug-in
Lasers are different. Do you want to continue?	**Yes** : measurement will occur using selected lasers common to both Platforms. **No**: measurement is stopped.
Acquisition configs are different. Transfer config to remote?	**Yes**: the **SETUP** configuration is transferred and applied on the remote Platform. **No**: no configuration transfer, the measurement is stopped.
File configs are different. Transfer config to remote?	**Yes** : the **FILE** configuration is transferred and applied to the remote Platform. **No**: no configuration transfer, the measurement is stopped.
Acquisition and files configs are different. Transfer config to remote?	**Yes**: The **SETUP** and **FILE** configurations are transferred and applied on the remote MTS/T-BERD. **No**: no configuration transfer, the measurement is stopped

7

FiberComplete Modules

This chapter describes the functions of the FiberComplete™ modules (Combined OTDR or Fault Finder and auto bidirectional IL/ORL and Distance) and their use.

The topics discussed in this chapter are as follows:

General introduction

Principle

FiberComplete is used to perform automatically and through a single connection port, the following tests:

- Bidirectional insertion loss (IL)
- Unidirectional / Bidirectional optical return loss (ORL) using the continuous wave method (OCWR)
- Distance/length measurements
- Unidirectional / Bidirectional OTDR or fault analysis

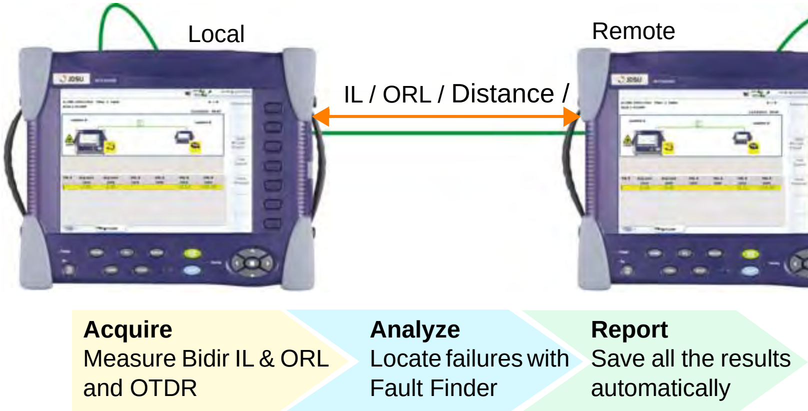
To carry out the measurements, 2x T-BERD/MTS-8000V2 or 6000/6000A are needed, both equipped with FiberComplete capable modules (see references in “OTDR Module B” on page 572 and “OTDR Module C” on page 572) and broadband power meters on the mainframes.

Using one unit at each end of the fiber under test and without any connection/disconnection, IL/ORL and distance measurements are performed and results exchanged via the fiber under test (FUT).

When the OTDR is selected, an OTDR measurement is launched automatically either in unidirectional mode from the primary unit (where the test has been initiated), or in bidirectional mode from both units.

A failed value of IL or ORL may trigger the Fault Finder function automatically in order to identify the faulty event.

Figure 121 Configuration for FiberComplete function



NOTE

The FiberComplete function can be performed with one T-BERD/MTS-8000 V2 and one T-BERD/MTS-6000/6000A.

Configurations

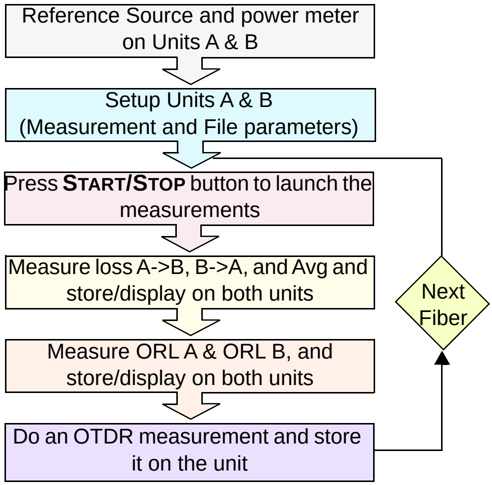
Two configurations are available, depending on the tests that have to be performed:

- Construction/Installation tests with loss, optical return loss, distance and OTDR.
- Acceptance Tests with loss, optical return loss and distance, and faults detection in case of problem.

Construction/Installation Test

In this configuration, bidirectional IL and ORL, length and/or unidirectional/bidirectional OTDR measurements are performed. The bidirectional IL/ORL and length results are stored on each unit, the OTDR traces are stored on the primary unit (where the test has been initiated*) in unidirectional mode, and on both units in bidirectional mode.

Figure 122 Construction/Installation Test



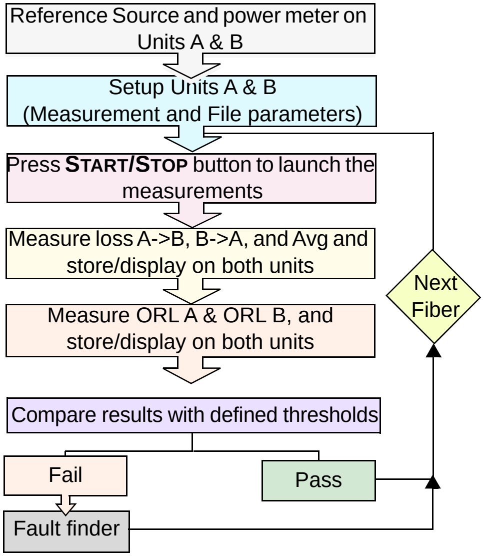
Acceptance Tests

In this configuration, the bidirectional IL, ORL and length measurements are performed and results are automatically stored on each unit.

If the **Fault Finder** function has been selected in the **Setup** menu, and if at least one result exceeds the defined thresholds, the predominant defects causing the failure are identified and located.

The FiberComplete screen displays an easy to interpret result table that prompts predominant issues for easy troubleshooting.

Figure 123 Acceptance Test



Activating the function

1. Press the **HOME** button.
2. Use direction key ▶ to reach the icon FCOMP.
3. Press **ENTER** key to activate the function.
   The icon turns yellow and Fiber Complete is displayed 

.

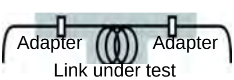
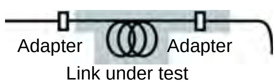
Establishing References

To get a meaningful measurement, the two leads or patch cords used for the measurement have to be referenced.

The references are valid for all fibers that will be tested during the day with the same patch cords, not disconnected from the source. If, at anytime, the patchcords are disconnected from the test instruments and/or have been contaminated by dirt or dust, they have to be re-inspected and referencing stage has to be redone.

Reference methods for insertion loss and ORL testing

Table 5 Reference methods for Insertion Loss and ORL Testing

	IL Loopback Reference Method	IL Side-by-side Reference method	Zero ORL reference method
Setup requirement	No specific requirement	Units shall be at the same location for references	No specific requirement
Description	Each unit is performing its own IL reference, with its source from the module port and powermeter from the base-unit, this with one dedicated jumper.	Each unit is performing its own IL reference, and units are connected using two jumpers and a bulkhead adapter.	Each unit is performing its own ORL reference, with its source / powermeter from the module, this with one dedicated jumper
Recommendations	Easiest process. Not recommended for short links. One the reference is performed, do not disconnect jumper from the source	Most accurate setup, but both units must be at the same location for references. Once the reference is performed, do not disconnect jumper from units ports.	Easy process. Once the reference is performed, do not disconnect jumper from the source. Use of non reflective terminator is mandatory for bend insensitive jumper.
Loss principle	Link ORL, including link connectors.  	Link IL including one link connector  	Link ORL measurement after jumper, for optimized testing. Requires mandrel wrap or non reflective termination at link end.

Reference stage process

The Power Meter option is mandatory onto the 8000 V2/6000(A) Mainframe.

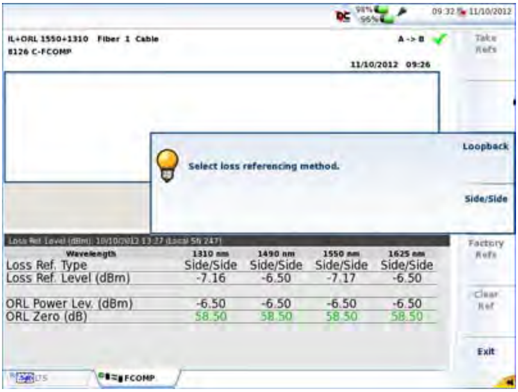
Each test equipment must set its own references and conform to the following process:

1 Press **RESULTS** button

2 Press **References** > **Take Refs** keys and follow the step by step instructions to perform references on each unit.

3 Choose between side by side or loopback for you loss referencing method.

Figure 124 Select the reference to be performed



Loopback Referencing method

The loopback referencing is used when the two units are at different location.

After clicking on **Loopback**, the wizard will guide you through two steps:

1 The self reference is used for loss and ORL testing. Connect the jumper from the module port to the mainframe powermeter and press **Ok** to start referencing.

Figure 125 Self reference

The reference values are stored and displayed at the end of referencing.

2 The zero ORL reference is necessary for ORL testing. Once the self reference measurement has been carried out, the Zero ORL adjustment can be performed

Connect the jumper from the module port to the non-reflective termination via a mating sleeve. If you don't have a non-reflective termination, a mandrel can be used. Press **Ok** to start referencing.

Figure 126 Zero ORL reference

> **NOTE**
> Non-reflective terminations are mandatory when bend insensitive jumpers are used.

Side-by-Side referencing method

The side-by-side referencing is used when the two units are at the same location and is the preferred method for better loss measurement accuracy.
After clicking on **Side/Side**, the wizard will guide you through three steps:

1 The self reference is used for ORL testing. Connect the jumper from the module port to the mainframe powermeter and press **Ok** to start referencing.

See Figure 125 on page 222

2 The zero ORL reference is necessary for ORL testing. Once the self reference measurement has been carried out, the Zero ORL adjustment can be performed.

Connect the jumper from the module port to the non-reflective termination via a mating sleeve. If you don't have a non-reflective termination a mandrel can be used. Press **Ok** to start referencing.

See Figure 126 on page 223

3 For the loss reference, connect the jumper from the module port of the primary unit, toward the module port of the secondary one via a mating sleeve. Press **Ok** to start referencing.

> **NOTE**
> The side-by-side loss reference is bidirectional and performed automatically on both units.

Figure 127 Loss Reference

Factory References

In the **Take Refs** sub-menu, the softkey **Factory Refs** is available.

It allows to apply the reference values defined by default in factory.

The following figure show the values defined by default in factory:

Figure 128 Factory References

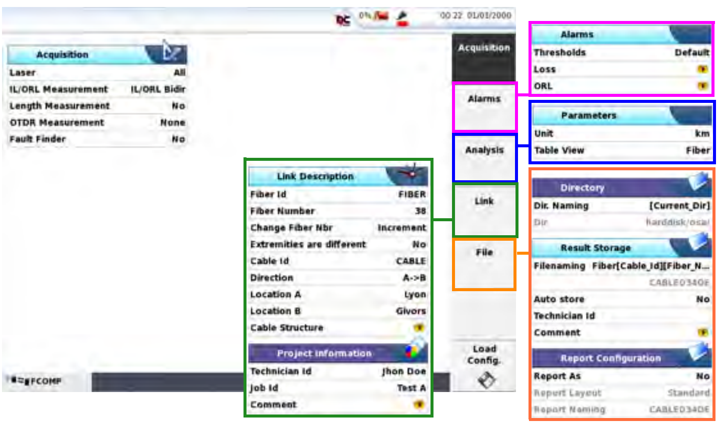
Configuring the units

Once references have been taken on both 8000 V2 Units, the acquisition parameters must be configured.

1 Press **SETUP** button to display the FiberComplete Setup menu.

> **CAUTION**
> The Laser selection and Results Screen parameters must be configured on both units. Other acquisition setups shall be set on the primary unit.

Figure 129 FiberComplete Setup



Acquisition parameters

Laser select the desired wavelength(s).
All: acquisition is performed for all wavelengths available in the instruments.

IL/ORL Measurement

ORL standalone: select this parameter to perform exclusively an ORL measurement in unidirectional mode.

IL/ORL Bidir: select this parameter to perform both an ORL and an Insertion Loss measurement, in bidirectional mode.

Length Measurement select if the fiber length must be measured during the test.

Yes: the fiber length will be measured.

No: the fiber length will not be measured during the test.

OTDR Measurement Select the measurement method for OTDR.

None.: OTDR measurement is not performed after FiberComplete test.

Unidir.: OTDR measurement is performed in one way: from the primary unit toward the secondary one.

Bidir.: OTDR measurement is performed with parameters defined in automatic mode (Quick Link Test) in the two ways: from primary to seconday unit, and from secondary to primary unit.

OTDR Acquisition If OTDR measurement is configured with **Unidir** or **Bidir** parameter, select the acquisition mode for OTDR.

Auto.: OTDR acquisition is performed with parameters defined in automatic mode (Quick Link Test).

Manual; OTDR measurement is performed with the parameters manually defined in the OTDR Setup menu (see “Configuring the reflectometry test” on page 28).

No: OTDR measurement is not performed.

Fault Finder select if Fault Finder function must be activated.

Yes: if a result for Loss and/or ORL exceeds one limit value defined in the **Thresholds** parameters (see “Alarms parameters” on page 227), the Fault Finder function is automatically triggered in order to identify the faulty events.

No: the Fault finder function is not activated (no fault finding occurs, even if one value exceeds the thresholds).

If «Fault Finder» parameter is set to Yes, the «OTDR» parameter is automatically set to No, and vice-versa.

The following parameters, defined on master unit, are automatically applied/transferred to the slave unit: Laser - IL/ORL Bidir. - OTDR Acquisition Auto (if **OTDR Acquisition** is defined on **Manual**, both units will performed a manual measurement, but according to their own configuration in the OTDR tab: the parameters can then be different).

Alarms parameters

In the **Setup** page, press **Alarms** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Alarms**).

- **Thresholds** Select the user defined thresholds to be used: **User 1**/ **User 2** / **User 3** / **User 4** and enter limits for:
  - Loss: enter a loss threshold for each wavelength (dB)
  - ORL: enter an ORL threshold for each wavelength (dB)

  Or select the **Default** parameter to define thresholds by default for Loss and ORL values:
  - Loss: > 40 dB for each wavelength
  - ORL: < 27 dB for each wavelength

  Select **None** if alarm thresholds must not be defined

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

Unit

Select the unit for the distance measurement: km / kfeet / miles.

Table View

Allows to choose the kind of table to be displayed at the end of acquisition.

- **Fiber** displays detailed results for one fiber: Loss B -> A and loss A -> B at each wavelength; the average loss at each wavelength and the ORL A and ORL B at each wavelength. See “Fiber View” on page 235.

> **NOTE**
> If **Fiber View** is selected, and if results are stored, then the filenaming convention is; *[fiber Id][fiber Num]*. Therefore, the unit will generate one IL / OLR / Distance file per fiber.

- **Cable** — displays cable result of multiple fibers: the average loss and the ORL A and ORL B at each wavelength. See "Cable view" on page 234.

> **NOTE**
> If **Cable View** is selected, and if results are stored, then the filenaming convention is; *[cable ID]*. Therefore, the unit will generate one IL / OLR / distance file per complete cable.

Link parameters

In the **Setup** page, press **Link** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Link**).

See "Configuring the Link parameters" on page 43.

File parameters

The File storage parameters must be also configured, in order to define how the results traces will be saved onto the equipment.

In the **Setup** page, press **File** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **File**).

> **The following parameters defined in the Setup > File page of the master unit are automatically applied/transferred to the slave unit: Filenaming - Save mode.**

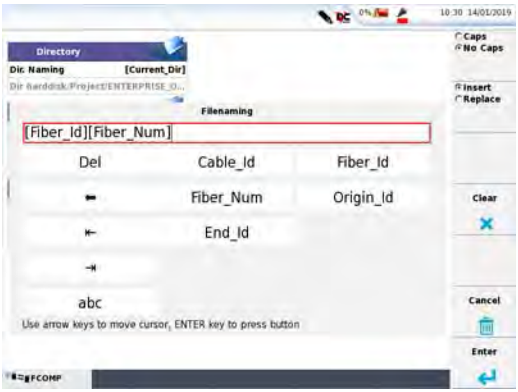
See "Configuring the File parameters" on page 48, except for **Filenaming** parameter.

Filenaming

Select **Filenaming** parameter and press the right arrow key to modify the name of the file for the result trace.

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

Figure 130 Filenaming - Edition keypad (pre-defined parameters)



or

Press **Default Filename** to apply the name by default to the file:

If the parameter **Table View** is defined on **Fiber**: `[Fiber_Id][Fiber_Num]`

If the parameter **Table View** is defined on **Cable**: `[Cable_Id]`

See “Table View” on page 227)

As soon as the Cable Id changes, the result table is cleared and the next tests are stored with the new Cable Id name.

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

Automatic configuration

Press the key **Auto Setup** to configure automatically the acquisition parameters as follows:

- Lasers: **All**

- IL/ORL Measurement: IL/ORL Bidir.
- Length Measurement: **Yes**
- OTDR Measurement: **None**
- Fault Finder: **No**
- Table View: **Fiber**
- Thresholds: **Default**

Saving parameters from configuration

Once the **File** and **Measurement** parameters are configured, it can be saved in a configuration file.

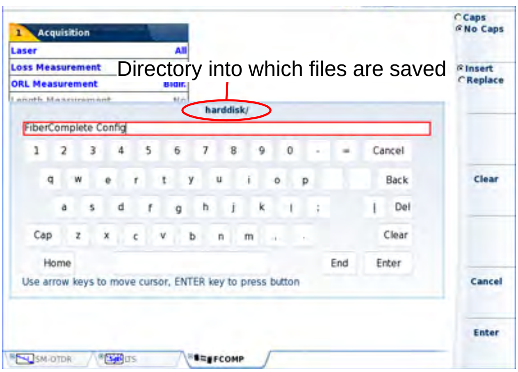
This configuration file can then be recalled for future acquisition in FiberComplete mode.

To save parameters in a configuration file:

1. If **File** page is displayed, press **SETUP** to return to **Setup** page.
2. Press **Save Config.** menu key 

.
   An edition keypad displays.
3. Enter a name for the configuration file.

Figure 131 Save Configuration file - Edition keypad



> **NOTE**
> Configuration file is saved in the current directory, the last one used.

4 Press **Enter** to validate
The configuration file is saved with the extension .fo_cfg (icon).

> **NOTE**
> The FiberComplete configuration file includes data storage and measurement settings of FCOMP and SM_OTDR. This configuration file can be shared and reused with other units.

Loading a configuration file FiberComplete

To load a configuration file previously created and apply parameters to new tests with FiberComplete function:

1 Press **File** hard key

2 Select the configuration file desired

3 Press **Load** > **Load Config.**

- Press **Setup** hard key to display the OTDR acquisition parameters saved in the configuration file.
- Select **Setup** page to display the file storage parameters saved in the configuration file.

You can modify some acquisition or file storage parameters, and save them in a new configuration file (see “Saving parameters from configuration” on page 230).

> **NOTE**
> Some Viavi pre-defined configuration files for FiberComplete are already available into the equipment, in **File disk** > **config** > **FCOMP**.

Performing the tests

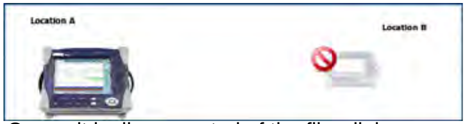
Once Setup is configured on both units, they can be linked to the fiber to be tested.

Press **Results** hard key to display the FiberComplete results page.

Automatic pairing / continuity check

As soon as the secondary (B) unit is connected to the fiber, the primary (A) unit detects it (and vice-versa).

Both unit are connected to the same fiber



One unit is disconnected of the fiber link, or there is a break

Sending a message to the distant Platform

Once both Platforms are paired via the fiber to be tested, each one can send a message to the other Platform.

This message can be sent to launch a test, to wait before launching the test, to clean the connectors...

To send a message to the distant equipment:

1 Go to the **Results** page.

2 Press **Send a message** softkey.
A new screen displays.

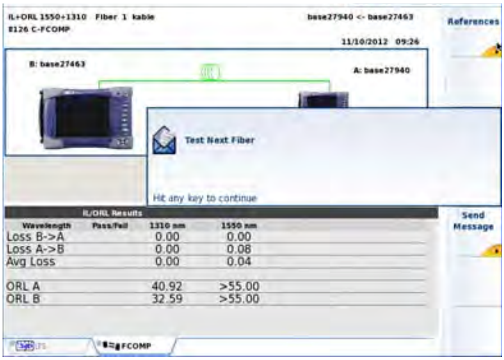
Figure 132 List of messages available

3 Select the message to send.

> **NOTE**
> If the message «Go to Fiber N°» is selected, use left and right direction keys to decrement/increment the fiber number.

4 Press the **Send Message** softkey.
The message displays automatically on distant Platform.

Figure 133 Receipt of the message on the distant Platform



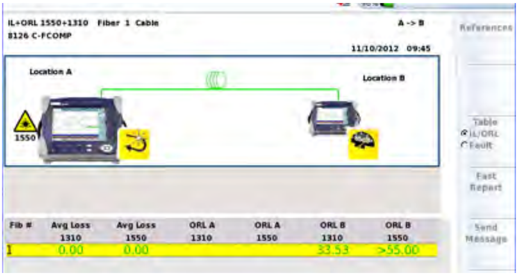
Starting the test

Below are described the steps when bidirectional IL/ORL and distance are selected in the **Setup** menu.

1 Press **START/STOP** button to launch the test

- **a** Unit A and B are performing IL test and mutually exchange their result values
- **b** Unit A and B are performing ORL test (using OCWR method) and mutually exchange their result values
- **c** Distance measurement is performed and recorded on both units.

Figure 134 Test in progress



d Once all tests are performed, results are displayed on both units

e If **OTDR** parameter is set to **Auto** or **Manual** in the **Setup** menu, the OTDR acquisition starts.

If **Fault Finder** parameter is set to **Yes** and an IL or ORL value reaches one of the user defined thresholds, the Fault Finder starts. See “Configuring the units” on page 225.

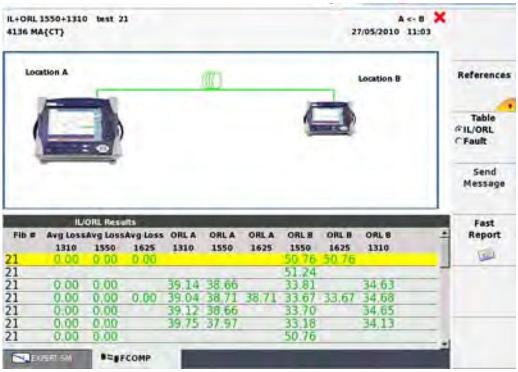
Results screen

Once the tests are completed, the results screen displays on both units.

Cable view

If, in the **Setup** page, the parameter **Table View** is set to **Cable**, the following result table is displayed:

Figure 135 Result Cable View



The **Cable View** allows to display results of multiple fibers:

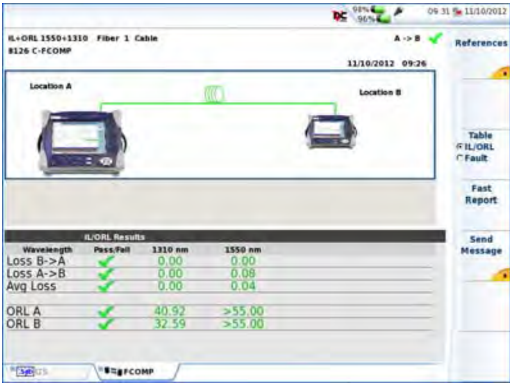
– the average loss at each wavelength
– the ORL A and ORL B at each wavelength
– the distance is displayed on top of the screen

NOTE
In order to erase the results table, the Cable ID must be modified in the **File Setup** menu (see “Filenaming” on page 229).

Fiber View

If, in the **Setup** page, the parameter **Table View** is set to **Fiber**, a screen as the following one displays:

Figure 136 Result Fiber View



The Fiber View allows to display results of one fiber:

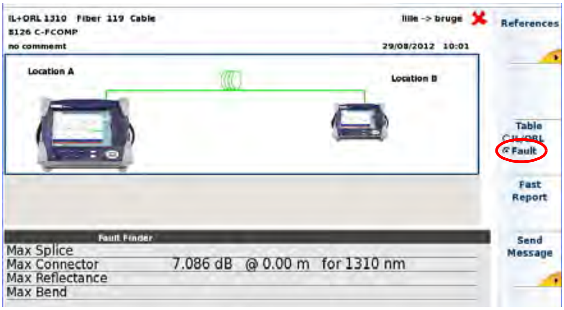
- Loss B -> A and loss A -> B at each wavelength
- the average loss at each wavelength
- the ORL A and ORL B at each wavelength
- the distance is displayed on top of the screen

Fault Finder

If, in the **Setup** page, the **Fault Finder** parameter is set to **Yes**, a Fault analysis is automatically launched, if one value exceeds the thresholds defined in the Setup menu. As soon as the Fault Finder finishes its analysis, an easy to interpret table is displayed. It indicates the attenuation values and/or reflectance of the predominant defects that may have caused the IL and/or ORL values to fail.

1 Select **Table IL/ORL - Fault** to switch between the IL/ORL and Fault Finder result.

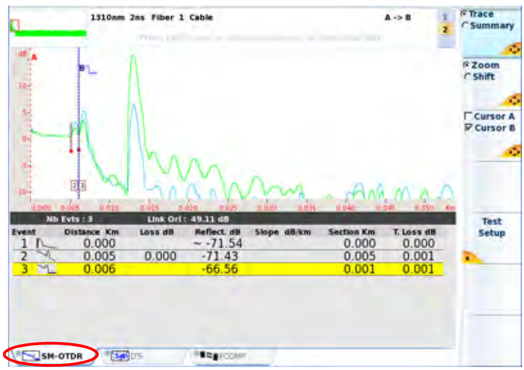
Figure 137 Fault finder result screen



OTDR

If the **OTDR Measurement** parameter has been set to **Unidir.** or **Bidir.**, the OTDR acquisition is launched and the trace can be seen by selecting the OTDR tab at the bottom of the screen.

Figure 138 OTDR trace



> **NOTE**
>
> In **Auto** mode, the wavelengths selected for IL/ORL are also used for OTDR testing.
>
> In **Manual** mode, all the OTDR parameters can be adjusted in the OTDR setup menu.

> **NOTE**
>
> To go from one tab to the other one, press the **RESULTS** button or, with touch-screen, directly select the tab wished.

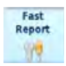
> **NOTE**
>
> In bidirectional mode:
>
> - The OTDR results trace for acquisition performed from Location A to Location B is stored on the primary unit (Location A)
>
> - The OTDR results trace for acquisition performed from Location B to Location A is stored on the secondary unit (Location B).

Saving results and generating a report

Once the results page is displayed, the results can be saved and a report can be generated directly from the results screen.

Saving results and creating a report from results page

To generate a report:

1 Press **Fast Report** soft key 

.
A menu displays under the trace.

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

Figure 139 Fast report configuration

a In the **Save Mode** parameter, select:

txt file select **Yes** to save the results in a blts file and to generate a txt file of the results.

pdf file select **Yes** to save the results in a blts file and to generate a report in a pdf file.

b In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.

c Modify the **Fiber Number** / **Fiber Code** using the key ▶.

The parameter is different according to the Cable Structure configuration (see "Cable structure" on page 45).

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

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

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

or

Press **Auto Filenaming** to apply the file name defined in the Setup screen, in **Filenaming** parameter (see "Filenaming" on page 229).

5 Press **Enter** to validate.

> **NOTE**
> The blts file and the txt or pdf file will have the same name.

The icon displays during saving process.

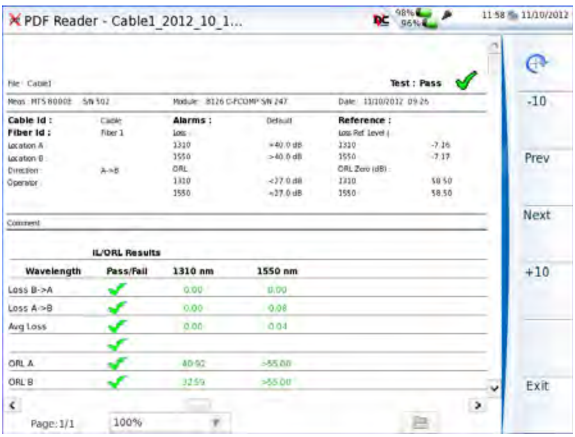
Once saving is completed, a sound is emitted onto the Platform.

> **NOTE**
> The file and the report are saved in the last storage media and directory selected.

Opening a report

1. To open the report, press **FILE** hardkey
2. In the **Explorer** page, in the directory selected, select the file of the report.
   For the txt file: *trace file_blts.txt*
   For the pdf file: *trace file.blts.pdf*.
3. Press **Load**.
   The file opens on the T-BERD/MTS-8000 V2 / or 6000/6000A.

Figure 140 Example of PDF report (Fiber view)



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 onto the T-BERD/MTS 8000 V2 or 6000/6000A (see "Generating pdf report(s)" on page 545).

Recalling OTDR files

Once a OTDR file has been stored, recall it using the Explorer:

1. Press **FILE** to open the Explorer.
2. Select the directory and then the file to open
3. Click on **Load**
4. Click on **View Tace(s)** or **Load Trace + Config.**
   The selected file is opened

For further informations on file management, see Chapter 20 "File management"

Filenaming convention

The filenaming convention is automatically generated by the unit.

Filenaming convention in Fiber View

In Fiber View, the filenaming convention is as follows:

`[Fiber_Id][Fiber_Num]`

One .blts file is created per each individual fiber tested. The Fiber Number is automatically incremented.

Filenaming convention in Cable View

In Cable View, the filenaming convention is as follows:

`[Cable_Id]`

The cable results, which includes all fibers, are stored in a .blts file.

As soon as the Cable Id changes, the result table is cleared and the next tests are stored with the new Cable Id name.

The table view can be modified in the Setup page (see Figure 129 on page 225).

Filenaming convention for Fault Finder results

If the fault finder is selected, the fault finder sor trace is using the following filenaming convention:

`[Cable_Id][Fiber_Id][Fiber_Num]`

Filenaming convention for OTDR results

If the OTDR is set to Auto, the sor traces have the following filenaming convention:

`[Cable_Id][Fiber_Id][Fiber_Num]`

A pre formatted .txt file can also be generated automatically at each measurement. It includes the Fault Finder table.

Please refer to Chapter 20 “File management” for more information on storage/recall functions.

8

Optical Spectrum Measurement

This chapter describes the different stages in carrying out a spectrum analysis of an optical signal, or analyzing effects from an optical components or network elements like EDFA, DFB-sources..., by a Platform equipped with an OSA of the OSA-50X series or the OSA-100 series.

The OSA-50X series are available on MTS / T-BERD 8000 V2 and ONA-1000 platforms.

The OSA-110 series are available on MTS / T-BERD 6000(A), 6000A V2, MTS / T-BERD 8000 V2, and ONA-800/1000 platforms.

Type	Resolution bandwidth (FWHM) typ	ORR 50GHz typ.	Total save Power	DROP	ROADM I-OSNR	OSNR	WDM	Drift	EDFA	DFB	LED	FPL
OSA-500	35pm	50dBc	23dBm			X	X	X	X	X	X	X
OSA-500M	38pm	47dBc	23dBm			X	X	X	X	X	X	X
OSA-501M	38pm	47dBc	23dBm	X		X	X	X	X	X	X	X
OSA-500R	38pm	47dBc	20dBm		X	X	X	X	X	X	X	X
OSA-500RS	38pm	47dBc	23dBm		X	X	X	X	X	X	X	X
OSA-110M	100pm	40dBc	23dBm			X	X	X		x		
OSA-110H	100pm	40dBc	30dBm			X	X	X		x		
OSA-110R	100pm	40dBc	23dBm		X	X	X	X		X		

NOTE

Looking for the OSA-type and series Nr, on the **Home** page, press **Settings** > **Help** page.

The topics discussed in this chapter are as follows:

1.Erbium Doped Fiber Amplifier

Laser safety

The OSA module contains a Class 1 Laser product according to DIN IEC 60825-1:2014. Please take notice of following instructions

When the system or device is switched on, never look directly into the in- and output or into a connected optical fiber.

The devices which are tested can be rated in a higher laser class with dangerous radiation. Observe their security instructions. Please heed the normal precautions for working with lasers and consider local regulations.

Possible carrier devices for OSA-110 and OSA-50x modules

Possible carrier devices for OSA-110 modules and its electrical specifications

Mainframe name	Power supply Voltage	Wattage
MTS-6000	24 VDC ± 5 %	160 Watts max
MTS-6000V2	24 VDC ± 5 %	160 Watts max
MTS-8000 with Adapter E8100E	24 VDC ± 5 %	220 Watts max
MTS-8000E with Adapter E8100E	24 VDC ± 5 %	220 Watts max
ONA-800 with adapter 81FMC1	19 VDC ± 5 %	160 Watts max
ONA-1000 with adapter	19 VDC ± 5 %	160 Watts max
	24 VDC ± 5 %	330 Watts max

Possible carrier devices for OSA-50x modules and its electrical specifications

Mainframe name	Power supply Voltage	Wattage
MTS-8000 with Adapter E8100E	24 VDC ± 5 %	220 Watts max
MTS-8000E with Adapter E8100E	24 VDC ± 5 %	220 Watts max
ONA-1000 with adapter	19 VDC ± 5 %	160 Watts max
	24 VDC ± 5 %	330 Watts max

Cleaning of Connectors

Cleaning of the patchcord connector is extremely important to avoid damage to the input of the OSA. A dirty connection can irreversibly damage both surfaces, especially when working with high powers.

We highly recommend inspection of the patchcord before connecting it to the OSA

Transportation

The OSA can be damaged by excessive acceleration during transportation with improper packaging.

Modules without a MTS / T-BERD should be shipped only in the original packaging.

For shipping of a MTS / T-BERD 6000(A) or MTS / T-BERD 6000A V2 containing an OSA, use either the original packaging with the black rubber foam, or the transportation case referenced E60HCASE-OSA.

For shipping of a MTS / T-BERD 8000 V2 containing an OSA, use either the original packaging with the black rubber foam, or the transportation case referenced E80HCASE-OSA.

Using the original packing material ensures that the device is properly protected during shipping. Otherwise, VIAVI cannot give warranty on modules good protection.

If you need a new packaging, please contact VIAVI Technical Assistance Center.

Configuration of the instrument

The instrument configuration menu will be displayed directly after power up or by pressing the **HOME**-button.

The actual module status will be shown (ON/OFF) on system window

1 For configuring the OSA press the OSA-icon (by touchscreen) , or select the function icon by arrow-keys and press **ENTER**.

2 Press **RESULT** button to see the OSA-result window.

If the MTS / T-BERD 8000/6000 is switched Off in this configuration, the next start up will directly start the to OSA-application, and display the result window.

For more details about the general MTS / T-BERD- configuration see the 6000(A),6000A V2 ou 8000 V2 Platforms user manuals.

For measurement, connect the fiber to be tested on the optical input of the selected module.

NOTE
Consider the maximum optical input power for OSA.

Kind of input connector:

- if the protection cap is green the optical input interface is a angled physical connector (APC-type)
- if it is a black protection cap, the interface type is physical connector (PC-type)

OSA optical spectrum analyzer Setup

To configure the Platform in preparation for an OSA test on a fiber, press the **SETUP** button.

The various measurement parameters are proposed:

NOTE
With OSA-500R/OSA-500RS/OSA-110R two auto modes are available: Test Auto WDM mode and Test Auto I-OSNR mode.

1 Setup in Test Auto mode

Parameter	**Test Auto WDM**	**Test Auto I-OSNR (only OSA-500R, OSA-500RS & OSA-110R)**
Acquisition settings		
Mode	WDM	I-OSNR
Sweep	single	
Sweep range	Full	ext. C Band
Averaging acquisition	No	Not available
I-OSNR Range (OSA-500R only)	Not available	Full
Resolution	0.04 nm (depends on module type)	

Analyze settings		
Channel detection	permanent	
Signal threshold	Auto	
Min channel spacing	Std 50GHz	
OSNR		
OSNR method	left & right	Not available
Noise Shape	Not available	Filtered
S<->N distance	Auto	Not available
Noise acq BW	std 0.1 nm	
SNR Meas. Type	S/N	
Splitter compensation	No	
Tilt & Slope Gain	No	
Results screen settings		
Grid	default = last value used	
Alarms	No	
Wavelength range	Auto	
Table Content	Standard	
Unit	nm	
Show I-OSNR trace	No	
Configuration of the file set-up (see Chapter 20)		
Filenaming	[Cable_id][Fiber_Num][Test_Poin][Direction]	
Auto Store	Yes	
Nb Fiber Increment	Yes	

2 or define your own configuration

The parameter to be modified must be selected by means of the direction keys . The possible options then appear on the screen: make your choice using the direction keys and , or using the touchscreen.

The **Setup** parameters are arranged in 5 sub-chapters:

1 Acquisition

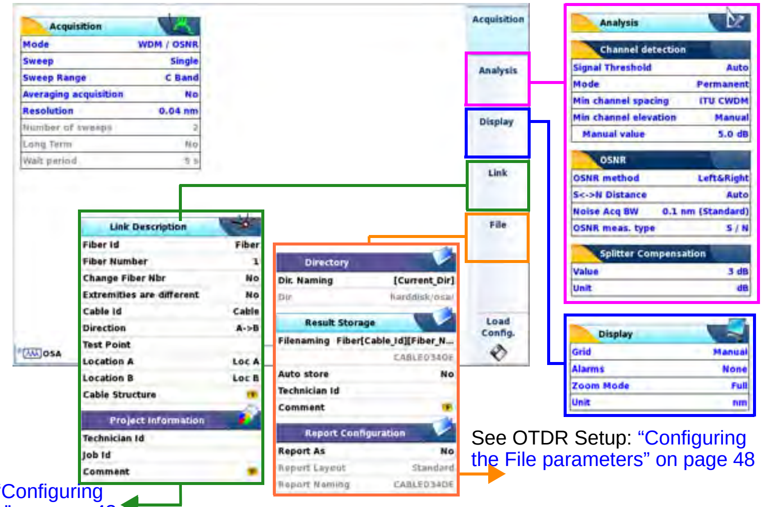
2 Analysis

3 Display

4 Link

5 File

Figure 141 OSA Setup



See OTDR Setup: "Configuring the File parameters" on page 48

See OTDR Setup: "Configuring the Link parameters" on page 43

On Setup page, you may select one of the sub-chapter by pressing one of the softkey **F1** to **F5**.

The various parameters proposed are defined below.

Loading a configuration file

To load the configuration file to be used for OSA test:

1 Press **SETUP** hard key.

2 On bottom right of setup page, press **Load Config.** menu key.

3 In the Explorer, select the desired file configuration

4 Press **Load Config.** menu keys.
A beep is emitted to validate the selection of the configuration file.

The software automatically brings you back to setup page.

> **NOTE**
> Most of the configuration files are available into the Platform in `disk/config/OSA`.

Acquisition Parameters

Mode (not available for OSA-110, fix WDM / OSNR)

WDM / I-OSNR	(only valid for OSA-500R, OSA-500RS and OSA-110R) Module is used for measuring the 'true' in-band OSNR by using the polarization nulling method. This mode is recommended for OSNR measurements in ROADM based networks. See “Testing ROADM networks” on page 285.
WDM / OSNR	Module is used to measure the optical spectrum of an optical signal. Standard WDM results are displayed in the results table. (See “Display of the WDM / OSA results” on page 262)
OO-OSNR	The On/Off-OSNR method is a two step method. Step one measures the optical spectrum and the channel power, while step two measures the noise power when the transmission channel is switched-off.
EDFA	Module is used to analyze results from an EDFA. EDFA results are displayed in the results table. (See “EDFA results analysis” on page 280)
DFB	Module is used to analyze results from a DFB. DFB results are displayed in the results table (See “DFB results analysis” on page 282).
FPL	Module is used to analyze results from a Fabriperot Laser. FPL results are displayed in the results table.
LED	Module is used to analyze results from a LED. LED results are displayed in the results table.

Sweep

Continuous	The OSA sweeps continuously and displays the results
Single	The OSA performs one single sweep and displays the result

Statistics	The OSA calculates a statistic of a number of sweeps. The number of sweeps must be entered (next parameter).
Filtering	Set the OSA filter to certain wavelength and switch the output of the filter to output connector. (OSA-501M only)
Drift	The OSA measures power, wavelength and signal to noise ratio over time. The number of sweeps and the wait time between the sweeps need to be set.

NOTE
For Drift measurements a Grid needs to be defined and the **Channel Detection** parameter is set to **Grid**.

Sweep Range

Select the wavelength numbers or **Full** parameter to use all wavelengths available.

I-OSNR Range (only valid for OSA-500R and OSA-110R)

This parameter defines the resolution of the polarization nulling routine for true in-band OSNR measurement.

Up to 15dB	low sensitivity mode for fast measurements, recommended for ROADM system testing at data rates of = 40Gbps and OSNR≤15dB or at data rates up to 12.5Gbps and OSNR values ≤ 25dB
Up to 20dB	recommended for data rates of = 40Gbps and OSNR ≤ 20 dB, or for data rates up to 12.5Gbps and OSNR ≥ 25dB.
Full	recommended for data rates of ≥ 40Gbps and OSNR ≥ 20 dB

Averaging acquisition

No (1 sweep), Low (4 sweeps), Medium (16 sweeps), High (32 sweeps)

This function can reduce the noise level of a value up to 5 dB. When the acquisition is averaged, a bar graph showing the state of advancement of the averaging is displayed at the bottom right of the screen.

Resolution (not available with OSA-110M)

The resolution bandwidth of the OSA (the minimum value depends on specification of OSA type. See page 243).

0.1/0.2/0.3/0.4/0.5, 1, 2 or 5 nm for modules OSA-50X.

Number of sweeps

In Statistics mode, this must be selected between 2 and 1000.

Long Term

> **NOTE**
> A long term measurement can be done only if the **Sweep** parameter is on Statistic mode.

Long term time diagram:

- number of sweeps 7
- wait period 5s

```
1    2    3    4     5    6    7
|----|------|-----|------|----|-----|
```

time distance between the next acquisition = wait period (time)

No

Manual The measurement is done manually, once the key **Stop Wait** is pressed

Period The measurement is automatically done, after the wait period selected (see hereunder).

Wait Period

The Wait Period parameter allows to enter a wait period before the measurement start (only active if **Long Term** is positioned on **Period**)

- Increments of 5 seconds up to 1 minute, then increments of 1 minute up to 10 minutes, then increments of 5 minutes up to 60 minutes; then increment of 1 hour up to 24 hours.

Monitoring Time (for Drift Measurement only)

For Drift Measurement a monitoring time may be selected between 1 minute and 20 days:

Interval (for Drift Measurement only)

The interval time between the measurements. The limits depend on the monitoring time.

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

Those parameters are only linked to the current active fiber.

Channel Detection[1]

Signal threshold [1]

Threshold of detection of channels (see “Channel detection threshold” on page 267).

Auto. the threshold is determined automatically.

Manual the threshold can be set from -79.9 to +30 dBm

Use direction keys or **Edit Number** to modify values.

NOTE

Modification of the parameters **Channel detection** and **Signal threshold** will only modify the results if the OSA module present is the one that was used for the acquisition.

Mode

Grid The grid serves as a detection reference: it must therefore be Regular, Manual, ITU DWDM, ITU CWDM, LR4/ER4-100G, LR4/ER4-40G or 10x10-100G. The choice of grid takes priority

1.Attention: all modification of these parameters has immediate repercussions on the trace and entails the loss of the measurement statistics.

over the choice Channel Selection. For example, it is not possible to choose Channel selection = Grid, if the option selected for the grid is «Without» or «Conventional».

Permanent Automatic detection of the channel on each acquisition. In this mode the channels are always detected without making a reference measurement.

NOTE

At the end of an acquisition in permanent mode, it is possible to create a grid on the basis of the channels detected. To do this, press the key **Adopt Grid** in the **SETUP** menu**.**

The new Grid can be shown as table by pressing **View Grid** in the Setup menu.

Min. Channel spacing

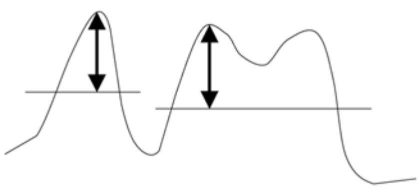
Defines the minimum spacing of two adjacent optical channels in the system.

This parameter is also used to set the range for integration to measure the accurate total signal power of an optical channel. The window for channel power integration will be ±1/2 the min. channel spacing setting left and right to the channel center frequency.

The measurement result will be displayed in the WDM table as 'Level' in dBm.

Min. Channel elevation

Defines the minimum elevation of two adjacent peaks from the valley between them which is required to recognize independent channels. Peaks which are not separated by a valley deeper than the min.channel elevation are considered as part of the same optical channel.



This example shows two signals, the left having only one peak larger than the selected Min.channel elevation, the right one with two peaks.

The two peaks of the right one are separated by a valley, but their elevation from that valley is smaller than the Min.channel elevation. Therefore they are not treated as independent sig-nals

Select **Auto** to define the value automatically or select **Manual** to enter a specific value for the parameter.

OSNR

To modify these parameters, go to the **OSNR** line. A sub-menu then appears proposing the following options:

OSNR method (only available in OSNR mode)[1]
Side of the peak where the point of reference for noise measurement is taken (left, right, average left and right, worst case of left and right).

S<->N Distance (only available in OSNR mode)
Distance between the peak of the channel and the point of reference for the noise.

Auto: distance determined according to spacing of channels.

Manual: an additional line **Manual value** opens. Go down and modify the value with < > or click on the value and enter a new one in the keypad that opens

Pre-defined: select 25 GHz (0.2 nm), 50 GHz (0.4 nm),100 GHz (0.8 nm) from the peak.

Noise Shape (only available for OSA-500R, OSA-500RS or OSA-110R in I-OSNR mode)

Filtered: evaluation for mixed filter shaped ROADM networks

Unfiltered: evaluation for networks without optical filters

Noise Acq. Bandwidth
Reference bandwidth used for the acquisition of noise:

Standard 0.1 nm

With the <> keys you can select other values between 0.05 nm and 1.0 nm.

OSNR meas.type: S / N or (S+N)/N

S/N: the integrated power in the channel minus the noise is considered as signal

1.Attention: all modification of these parameters has immediate repercussions on the trace and entails the loss of the measurement statistics.

(S+N)/N: the integrated power in the channel without correction is considered as signal.

Splitter compensation

When the measurement is made after a tap coupler (also known as a splitter), it is possible to compensate for the loss introduced by this element and to display the value measured before or after it.

The following options are available:

Value[1]	Yes: activation of compensation and choice of its value using the keys ◀ and ▶: or the numeric keypad : from 1 to 30 dB (by increments of 1) or 1 to 99% (by increments of 0.1%).
Unit	Choice of compensation in dB or as a percentage of the value measured.

For example, with a 10 dB splitter, the results will be augmented by 10 dB. The trace will be offset upwards by 10 dB. A channel measured at -30 dBm will be displayed -20 dBm.

Display Parameters

In the **Setup** page, press **Display** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Display**).

Those parameters are valid for all traces present on the screen.

Grid

Go to the **Grid** line to access the Grid sub-menu. Select the **Type** line to see the different choices and modify them if required.

Five possible types of grid are proposed with different corresponding values, some of which are fixed or non-applicable, others editable.

The type «Conventional» and the option «Without» do not give access to the parameters of the Grid sub-menu; the LR4/ER4-100G, LR4/ER4-40G, and the 10x10-100G are fix channels plan;.

- LR4/ER4-100G 229.0 THz, 229.8 THz, 230.6 THz, 231.4 THz

- LR4/ER4-40G: 1271 nm, 1291 nm, 1311 nm, 1331 nm
- 10x10-100G 1523 nm, 1531 nm, 1539 nm, 1547 nm, 1555 nm, 1563 nm, 1571 nm, 1579 nm, 1587 nm, 1595 nm

The others give access to certain options, as shown in the table below:

Table 6 Grid menu options for each type of grid

	ITU CWDM	ITU DWDM	Regular	Manual
Grid name	Editable	Editable	Editable	Editable
ITU standard	G.694.2	G.692	N/A	N/A
First ITU channel (with display in nm)	Editable, from 1270 to 1611 nm, by increments of 20 nm	Editable, from 1250.05 to 1649.93 nm, by increments corresponding to the channel spacing selected	Editable from 1250 to 1650 nm, by increments of 0.01 nm.	N/A
Channel spacing	20 nm	Editable, from 25 to 200 GHz	Editable from 20 to 1000 GHz by increments of 1 at each click, of 10 if key is held down	N/A
Number of channels	Editable, from 1 to 18 by incre-ments of 1	Editable, from 1 to 256 by increments of 1	Editable, from 1 to 256 by incre-ments of 1	Editable from 1 to 256
Channel settings	Sub-menu acces-sible to display the wavelengths of each channel, name the band, and name each channel	Sub-menu accessi-ble to display the wavelengths of each channel, name the band, and name each channel	Sub-menu accessible to dis-play the wave-lengths of each channel, name the band, and name each chan-nel	Sub-menu accessible to display the wavelengths of each channel, name the band, and name each channel

NOTE
The maximum real number of channels for ITU grids depends on the value selected for the first channel and the spacing between the channels.

> **NOTE**
> It is possible to display the grid with the **View Grid** key. A table then appears showing the channel number, the name of the channel, the reference wavelength and the alarm thresholds for delta F, min. P, max. P and min. SNR.

Alarms

When **Channel Detection** is positioned on **Grid**, it is possible to activate an alarm system. This system is based on a system of thresholds. Any measurement results that exceed these thresholds are displayed in red in the table, and the icon  appears at the top right of the screen. If all the results are within the thresholds (no result is in red), the icon becomes .

To activate the alarm system, go to the <Alarms> line and select "Active".

Thresholds can then be set (using the direction keys or numeric keypad), to global level or to the level of each channel:

1 Global alarms

Number of channels	Yes/No
Delta channel power[1]	No or threshold modifiable from 0.1 to 60 dB
Delta OSNR[2]	No or threshold modifiable from 0.1 to 60 dB
Composite power [3]	No or threshold modifiable from -59.9 dBm to +20 dBm

2 Channel alarms

Max channel offset[4]	No/Freq/Wavelen.
Min. channel power[5]	Yes/No
Max. channel power[6]	Yes/No
Min. OSNR [7]	Yes/No
Channel Number	From «001» to the max. number of channels.
Channel value	Display of the wavelength of the channel number selected

1.Max. acceptable variation between max. power and min. power on all channels
2.Max. acceptable variation between max. SNR and min. SNR on all channels
3.Maximum composite power
4.Wavelength drift. Selection of the alarm on the basis of the value of delta F
5.The values are then defined in Min. P
6.The values are then defined in Max. P
7.The values are then defined in Min. SNR

Delta F / Delta WL[1]	From 0 to 2 THz (2 THz is the default value) or from 0 to 8 nm. The unit depends on the value of the parameter Max channel offset
P Min. [2]	From -80 dBm to +9.9 dBm (below max. threshold)
P Max.[3]	From -79.9 dBm to +10 dBm (above min. threshold)
OSNR	From 0 to 50 dB

Zoom Mode (OSA-500)

The OSA module performs a measurement over the sweep range, but the display shows the part defined by the Zoom mode.

Auto	display automatically zooms into the wavelength range where optical channels are present
Full	display full sweep range or part chosen by the zoom function of the result page

For sweep range = FULL, it is possible to display the same wavelength range for every new sweep, independent of previous settings of the zoom function on the result page:

C+L Band	1530-1625nm
C Band	1530-1565nm
Start/ End	manually selectable start / end wavelengths
Center / Span	manually selectable center /span.
ext. C+L Band	1525-1625nm
ext. C Band	1525-1570nm

Zoom Mode (OSA-110)

The OSA module performs a measurement over the sweep range, but the display shows only the part defined by the Zoom mode..

This parameter sets the wavelength range to be displayed as a trace

Auto	display automatically zooms into the wavelength range where optical channels are present

1.Delta of frequency or wavelength
2.Minimum power
3.Maximum power

Manual display full sweep range or part chosen by the zoom function of the result page

Unit

Here the units of the x axis can be selected:

- Frequency in THz
- Wavelength in nm

Table Content

Standard The result table displays the columns Ch-Number, Ch-ID, Wavelength/Frequency, Spacing/Offset, Ch-Power, OSNR, Noise

Statistics The result table displays the columns Ch-Number, Ch-ID, Wavelength/Frequency, minimum Wavelength/Frequency, maximum Wavelength/Frequency, Ch-Power, minimum Ch-Power, maximum Ch-Power

Pass/Fail The result table displays the columns Ch-Number, Ch-ID, Wavelength/Frequency, Spacing/Offset, Ch-Power, OSNR, Pass/Fail result

CWDM The result table displays the columns Ch-Number, Ch-ID, Wavelength, Spacing/Offset, Ch-Power

See “WDM-Expert Software option” on page 290 to configure the **Table Content** with **Extended** or **User Defined** parameter.

Saving configuration in a file

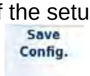
Once parameters have been configured, they can be kept in memory and saved in a configuration file.

This configuration file can then be recalled in order to be recalled for future OSA acquisitions.

To save parameters in a configuration file:

1 If necessary, press **SETUP** to return to **Setup** page.

2 Select one parameter in one of the setup page (acquisition, link..)

3 Press **Save Config.** menu key 

4 Enter a name for the configuration file using the edition keypad (max 20 characters).

> **NOTE**
> Configuration file is saved in the directory `disk/config/OSA`.

5 Press **Enter** 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 **Explorer** page.

Acquisition

To start a measurement press **START** key. The OSA-XXX will scan over the entire wavelength range and the measurement result will be displayed in graphical and tabular format.

> **NOTE**
> A warning message appears when the channel power or the composite power is larger than the absolute maximum rating for the OSA.
> In this case be extremely careful when disconnecting the patchcord - it might emit dangerously high optical power!

Trace display functions

The trace acquired or recalled from a memory is displayed on the Results page: see example Figure 142 on page 263.

A range of functions enable modifications to the display of the trace (Cursors, Zoom/Shift, Event/Trace, Trace/Table, Full scale, etc.).

Display of the WDM / OSA results

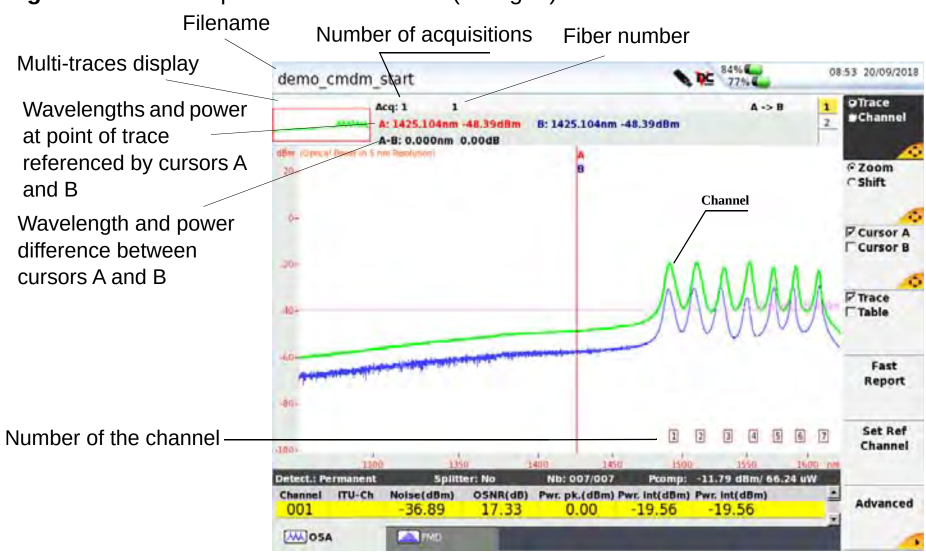
The results window, obtained by pressing the **RESULTS** button**,** shows different zones displaying, from top to bottom:

- the mini-trace in the upper part of the screen, accompanied by the principal characteristics of the acquisition and of the file if the result is stored in memory.
- the trace results associated with cursors A and B
- the trace proper (see “Trace display functions” on page 262).
- the table of results (see “Table of results” on page 272).

The trace represents power (in dBm) as a function of frequency (in THz) or wavelength (in nm). The channels detected are represented by peaks.

> **NOTE**
> If several acquisitions are performed, the trace displayed is the one corresponding to the last acquisition.

Figure 142 Example of OSA test result (with grid)



Display functions

Zoom function

The Zoom function is used to analyze part of the trace in greater detail. In association with Channel (WDM/OSA) it enables rapid checking of a succession of events or channels.
The zoom is centered on the cursor selected. If the two cursors A and B are selected, the zoom is centered midway between the two cursors.

The position of the section of trace displayed with respect to the complete trace is represented by a red rectangle on the mini-trace at the top left-hand corner of the screen.

To define a zoom on the trace:

1. Select **Cursor A** or **B** and center it on the zone to be examined
2. On the **Shift/Zoom** key, select the **Zoom** function.
3. Use the ▶ or ◀ key to increase or reduce the zoom factor.
   or
   Use touchscreen and click on trace to position the upper left and bottom right corners of the zoomed area.

Zooming on the different channels in succession

1. Zoom on one of the channels as shown above.
2. On the **Trace/Channel** key, select the **Channel** function.
3. Use the ◀ and ▶ keys to move the zoom on to the successive channels.

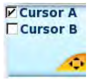
Cursors function

The vertical cursors A and B are used in the Zoom and Shift functions to position or delete markers.

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

- in a solid line if the cursor is selected.
- in a dotted line if the cursor is not selected.

Positioning the cursor

When a trace is displayed, the key 

can be used to select one or both cursors.

The direction keys ◀ and ▶ move the selected cursor(s) along the trace.

When a selected cursor touches the right or left-hand edge of the screen, the trace starts to scroll horizontally to maintain display of this cursor.

If an unselected cursor has been moved off-screen by a zoom, it can be brought back on to the screen by selecting it and then pressing one of the direction keys ◀ or ▶. It will then appear on whichever edge of the screen is closest to its position.

When the cursor function is selected, the keys ▲ and ▼ move the trace vertically.

Cursors information

The informations on Cursors are always display on the upper part of the screen. Above the trace are shown the co-ordinates of the points of intersection of the cursors A and B with the trace, together with the distance between the two points.

Cursor X and Y

Two types of cursors can be defined:

- **Cursor X**: only a vertical bar is present.
- **Cursor X** and **Cursor Y**: there is a vertical bar and a horizontal bar. The intersection between these two bars is placed on the trace.

To display the type of cursor selected:

1. Click on **Advanced**.
2. Select the key **CursorX/CursorY** to modify the current choice.
   Each click on this key will alternatively insert or delete the check mark against **Cursor Y**

Full scale

To display the entire trace, with no zoom or displacement:

1. Either press the **Full Scale** key
   or,
   With **Trace** selected on **Trace/Channel**, press validation key

Shift function

The Shift function is used to displace the displayed section of the trace by pressing the direction keys.
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. Select the zoom factor as described above.
2. Choose cursor and cursor position.
3. On the **Zoom/Shift** key, select **Shift**.
4. Use the direction keys or touch and hold screen to shift the trace in the desired direction.

Trace /Table key

This key offers a choice from the following displays:

Trace alone: main display of the trace with a single line of the table at the foot of the page (see Figure 142 on page 263).

Trace + Table: display of trace, reduced in size but followed by 5 to 8 lines of the table of results.

Figure 143 OSA Results - Trace and Table

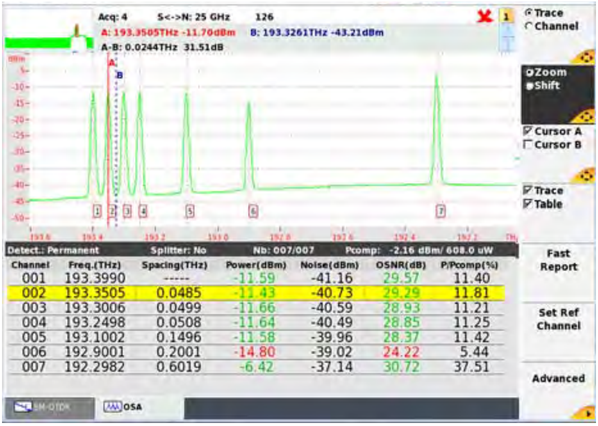


Table: display of the table alone

Figure 144 OSA Results - Table

Channel detection threshold

On the trace, some peaks corresponding to noise could be mistaken for channels. It is therefore necessary to fix a power threshold level: only peaks that exceed this threshold

will be considered as channels and included in the table of results.
To display or modify this threshold, press the **SETUP** key, then select **Signal threshold**. Modify the value to position it on **Auto**[1] or fix a threshold value.

Display of a grid

The display window of the trace can include a grid to facilitate verification of the position of the channels. Several grids are possible (see the chapter “Grid” on page 257)

Display of total power between cursors

To display on the trace the total power between the two cursors A and B:

1 Place the cursors at the desired positions.

2 Press the **Advanced** key, then **Total Power A<--->B**.

The space between the trace and the two cursors is greyed out and the power is displayed in the form "P=-4.95dBm".

Pressing the key **Total Power A<-->B** a second time removes the result of the total power measurement.

Display of gain Tilt (delta) and gain slope results

The Platform can display two additional results:

- The gain tilt, that is to say the difference between the max.and min. values of the peaks of the complete signal spectrum between the cursors.
- The gain slope measured by a method using a least squares algorithm on all detected channel using peak power levels or channel power levels.

To display these results above the channels:

1 Press the **Advanced** button

2 Press **Measure A<->B** button

3 Select the cursor and set it to the measurement range limits

4 Press **Tilt/Slope A<->B**

The Gain Tilt is displayed in dB.

1.The "Auto" value is obtained by continuing to reduce the value of the threshold below the minimum value of -79.9 dBm

The Gain Slope is traced and displayed as value dB/THz or dB/nm according to the units selected

Disable the Tilt and Slope by pressing the **Tilt/Slope** button again.

Figure 145 Display of total power, gain tilt and slope of the gain between the cursors

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.
- or to compare both curves get for each way of propagation in the origin/end mode.

For this purpose, the Platform possesses an overlay memory which can store:

- the current trace, for comparison with further traces to be acquired subsequently,
- or traces previously saved, for comparison with the current trace,

Overlaying several traces stored in memory

To display two traces from the memory, deleting the current trace or traces already loaded:

1. Press the **FILE** button**.**
2. On the **Menu/Explorer** key, select **Explorer**.
3. Select the files of the traces for display.
4. Press the **Load key**.
5. Press **View trace(s)** or **Load traces + config**.
6. When loading is complete, the **Results** screen appears: the first trace selected is the active trace, the other trace being overlaid.

Overlaying the current trace

To copy the current trace into the overlay memory, proceed as follows:

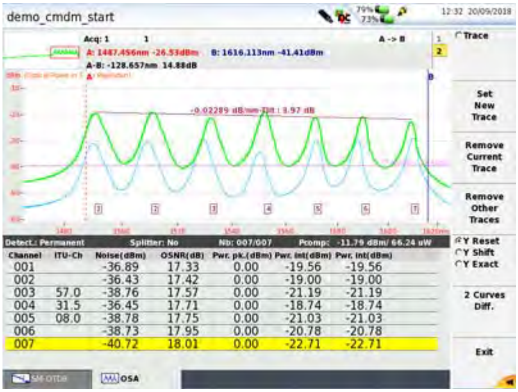
1. On the Results page, press the **Advanced** key, then **Overlay**.
2. Press **Set New Trace** soft key.
   The current trace is copied into the overlay memory: represented in a different color, it is automatically offset with respect to new trace.
   A new acquisition can then be started.

NOTE
In the case of Multi-trace display with multiple wavelength acquisition: when the **START** key is pressed, all the traces displayed are deleted to leave room for the new acquisitions.

Display of traces in overlay

- The traces are shown in different colors (the active trace is green).
- Their serial numbers are repeated at the top of the screen.

Figure 146 OSA - Overlaid traces



Swapping overlay traces

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 swapped with the active trace.

To do this:

1 Press the **Trace** key,

2 Press the ◀ and ▶ keys, as many times as necessary.
or
Click on the upper bar, with signature of the measurement and cursor information (next to Mini-trace).

Changing the traces position

Once a trace is displayed in overlay, the traces can be adjusted according to the Y axis:

1 Press **Advanced** > **Overlay** menu keys.

2 Select the adjustment according to Y axis:

- **Y Reset**: all traces are on the same level at the intersection with the active cursor.
- **Y Shift**: Each trace is shifted from 5 dB from the other.
- **Y Exact**: the traces displayed are on the same position according to their injection level.

Trace resulting from the difference between two traces

It is possible to obtain the trace corresponding to the point-by-point difference between the current trace and the trace in overlay (if only two traces are displayed simultaneously). To do this:

1. Press **Advanced** > **Overlay** menu keys
2. Press the **2 Curves Diff.** menu key.
   The screen displays the 2 traces in overlay and the trace resulting from "Difference".

Removing a trace in overlay

Removing the current trace

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

1. Select it (see previous paragraph),
2. In **Results** page, press **Advanced** > **Overlay** menu keys
3. Press **Remove Current Trace**.

Removing all the traces

To remove all the traces except the current trace, press the key **Remove Other Traces**.

Quitting the overlay menu

To quit the overlay menu, press the **Exit** key.

Table of results

Lines

According to the choice made in the **SETUP** menu, the table of results may include:

- either a line for each channel detected (if Channel Selection = Permanent)
- or a line for each graduation, (if Channel Selection = Grid and a grid is selected)

Type of display

The table may be displayed in a single line, on half of the screen or the whole screen as a function of the **Trace/Table** key (see “Trace /Table key” on page 266)

Contents of the table with statistics

When selecting the Statistics measurement mode and multiple acquisitions are performed, statistics are calculated on the results. To display these results in the table, select the parameter **Table Contents to Statistics**.

1. the number of the channel
2. the frequency or the channel wavelength
3. the min. frequency or the channel wavelength
4. the max.frequency or the channel wavelength
5. the level of the channel in dBm
6. the min. level of the channel in dBm
7. the max. level of the channel in dBm

If the option "**Osa Edit Table**" is released more further more statistics are available by using the User Defined Tables

Successive addressing of channels according to the sort type selected

On the trace and in the table, it is possible to move the cursor from one channel to the next in the selected sort order. To do this,:

1. Use the key **Cursor A/Cursor B** to choose the cursor A or B to be used on the trace.
2. Press the **Channel** key
3. Press ◀ and ▶ to move the cursor to the following or preceding channel:

Displaying relative results

By default, the table gives the results in absolute values. To obtain these results in relative values with respect to a reference channel:

1. Press the **Table Contents** key, then **Relative>/<Absolute** to select **Relative**.

2 Move the cursor on to the channel that is to serve as the reference.

3 Press the **Set Ref. Channel** key.

The results are recalculated with respect to this channel of reference.

On/Off-OSNR Method

Challenge

This is a precise out-of-service method used for measuring the in-band OSNR of standard and also of polarization-division multiplexed (PDM) systems.

Principle of "On/Off-OSNR Measurement"

The On/Off-OSNR method is based on measuring the noise power when the transmission channel is switched-off.

This is a 2 step method:

1 Switch-on all channels and perform a standard WDM measurement

All parameters like power (P_{on}) and wavelength are measured and stored in the instrument

2 Switch-off the channel carrying PDM signals and perform a second measurement

The channel power measured at the deactivated channel wavelength will indicate the in-band noise P_{off} = noise power

In-band OSNR is calculated based on P_{on} and P_{off}

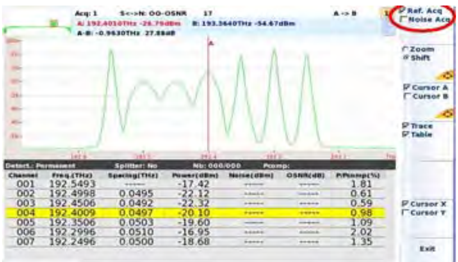
Setup

Select 'Measurements Mode' = **OO-OSNR**'

Figure 147 OSA Setup: OO-OSNR configuration

Step 1: Reference measurement

1 In the Results page, select '**Ref. Acquisition**' and perform (**Start**) an OSA measurement (all channels ON).



All channels will be detected and the total channel power (=integrated ch-power) of each channel will be shown and stored in the table = P_ch (Power [dBm]).

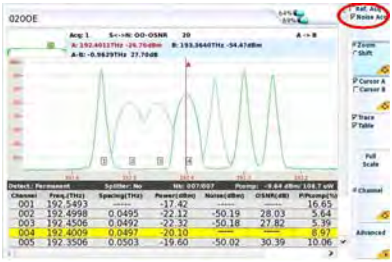
OSNR and Noise will not yet be displayed.

Step 2: Noise / OSNR measurement

1 Select '**Noise Acquisition'**

2 Switch off the channel you want to measure the OSNR (one or multiple channels).

3 Select Noise Acquisition measurement (Noise Acq) and start the measurement.



The OSA will perform a scan and automatically detect the channels switched-off.

Noise power is measured at the center frequency of the switched-off channels.

Noise power is normalized to Noise Acq BW (i.g. 0.1nm) according to the setup parameter.

OSNR will be calculated and displayed in the table based on stored P_ch (step 1).

Limitations

The On/Off-OSNR method requires an intervention into the optical system as the optical channel to be measured needs to be switched-off.

This is only applicable for an out-of-service measurement.

Some ROADM networks contain so called 'self-blocking' ROADMs.

These kind of ROADMs will block all light including the noise, when there is no signal present (switched-off).

This can be identified when the noise power < -60dBm or an unrealistic high OSNR value of >35dB is measured.

The self blocking function can be switched off in many ROADMs by the system management SW for service activation and trouble shooting purposes.

=> make sure that the self-blocking function is switched of for On/Off-OSNR measurements.

The On/Off-OSNR application will report OSNR = #### if the measured noise floor <-60dBm or the OSNR >35dB, as this is normally not present in an optical network when there are no self-blocking ROADMs implemented.

Channel filtering

Field of application

This option is only available for OSA-501M modules.

It is used to filter out one particular channel and extract it via a port called the "drop port".

Configuration

To obtain filtering of a given canal to the drop port, go into the**SETUP** menu of the OSA module. Choose **Acquisition**, then **Sweeps** and select **Filtering**.

The options of the acquisition menu then change and offer:

Choice of channel

In the Choice of Channel option, either a value may be entered manually or the current value from the table can be taken.

- Manual: A new line appears above choice of channel, in which the required value can be entered.
- Table: The value of the current selection in the results table is used automatically. To vary this selection, go to the result screen and use **Table contents**.

Channel value

Here the manual value of the filtering to be performed can be entered using the direction keys ◀ and ▶. or the numeric keypad

Tracking

Activating the tracking function will make the internal tunable filter follow slow wavelength changes of optical sources and transmitters providing stable output power.

The information «Locked» appears as long as the channel remains within the tolerance limits of the instrument. If the channel strays outside the tolerance band, the information «Unlocked» appears.

Using channel filtering

After setting sweep mode (in the acquisition menu of the **SETUP** screen) on **Filtering**, press the **START/STOP** button to start or stop filtering of the signal.

Drift measurement

The OSA-xxx modules provide a Drift measurement application to perform multiple measurements and display the recorded results in a graphical format (trace) over the time.

This can be used to monitor the drift of power, wavelength and SNR of optical systems or components. This is important to measure the drift of non temperature stabilized transmitter in CWDM networks.

NOTE
A Drift measurement can only be done at predefined wavelengths or frequencies, for this reason a reference Grid needs to be defined and the **Channel Detection** parameter is set to **Grid**.

The following parameters need to be set for Drift measurements:

Number of Sweeps	Defines the number of sweeps (1 to 10.000)
Interval	Defines the time between the measurements. Similar to Wait Period of Long Term application (see “Wait Period” on page 253).

NOTE
Interval specifies the time between start of one measurement and start of the next measurement and includes the instrument measurement time

All channels defined by the channel Grid can be monitored simultaneously with the drift application. To show the monitored measurement parameter use the **Trace/Channel/Drift** button in the result screen.

This button has a toggle function with the following selections:

- **Trace**: in Trace mode the up/down cursor change the active trace in a multiple trace display

- **Channel**: in Channel mode the up/down cursor changes the channel to be displayed over time.
- **Drift**: activates the drift display showing the selected parameter over time

Activating the Drift display will show the following screen:

Figure 148 Example of drift measurement, wavelength over time

In the Drift display the measurement result is shown in a graphical format (trace over time / scans) and a tabular format. The table shows the following parameters:

Channel number	number of the displayed channel
Wavelength or Frequency of the displayed channel	
Ref	reference value of wavelength, power or SNR
AVG	average value of wavelength, power or SNR
Min	Minimum of wavelength, power or SNR
Max	Maximum of wavelength, power or SNR
Sdev or **Delta**	standard deviation or delta (Min/ max) of wavelength, power or SNR

All Zoom and Shift functions are available in Drift mode.

By using the cursor A it is possible to get access to each measured data point. The Start value as well as the actual cursor position including the time information is shown in the grey field of the table.

NOTE
If the channel power drifts to a power level below the channel detection threshold the measurement will indicate "No Signal"

EDFA results analysis

This feature applies only to instruments OSA-50X series.

The results analysis of an EDFA consists in performing two spectrum analysis: one before the signal is amplified and another one after the signal is amplified. Both traces are further compared, providing the resulting power gain and noise figure.

EDFA test configuration

To configure the Platform in preparation for an EDFA test, press the **SETUP** button.

In the Measurements section, set **Type** on «EDFA».

Other **SETUP** parameters are the same for EDFA as for WDM measurements. Refer to “OSA optical spectrum analyzer Setup” on page 248 for a complete description.

NOTE
If your Platform is equipped with an OSA-303, you may use the two ports to test before and after the EDFA. In this case, make sure you select «Port A+B» for **Input Port**.

EDFA measurements

Measurement procedure, using one port :

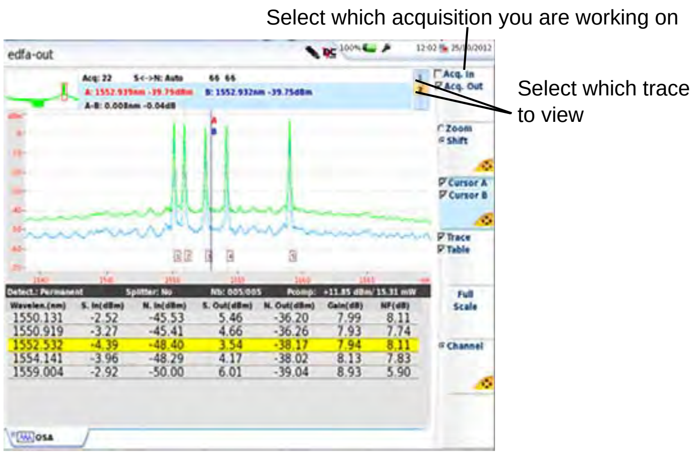
If only one port is selected, the Platform is ready to perform the «**Acq. in**» (signal before being amplified by EDFA).

1. Connect your Platform to your fiber before the EDFA.
2. Click **START/STOP** to perform the first acquisition.
3. Switch to **Acq. Out**.

4 Connect your Platform to your fiber after the EDFA.

5 Click **START/STOP** to perform the second acquisition.
Results appear automatically in the table.

Figure 149 EDFA measurements



Measurement procedure, using two ports:

If two ports are selected, the Platform will perform both «Acq. ***In»*** and «Acq. ***Out»*** in one step.

1 Connect your Platform to your fiber before the EDFA on port A and your fiber after the EDFA on port B.

2 Click **START/STOP** to perform both acquisitions.
Results appear automatically in the table.

EDFA results

A table is displayed (see “EDFA measurements” on page 281) showing for each channel:

S. In	Signal power before EDFA (expressed in dBm)
N. In	Noise level before EDFA (expressed in dBm)

S. Out	Signal power after EDFA (expressed in dBm)
N. Out	Noise level after EDFA (expressed in dBm)
Gain	Power gain from EDFA (expressed in dB)
NF	Noise figure from EDFA (expressed in dB)

<***Channel***> allows moving the cursor from one channel to another, both in the trace and in the table of results.

Saving EDFA results

Results are not saved in a file. Nevertheless, both traces may be stored as regular WDM traces.
To save your files:

1. Select **Acq. In** to save the first file
2. Click on **FILE**, select name and **Store Trace**
3. Click on **RESULTS** to come back to the previous screen
4. Proceed the same way for **Acq. Out**.

Loading EDFA results

Results are not saved in a file. Nevertheless, both traces may be reloaded as regular WDM traces. Results will be automatically recalculated.

1. Select **Acq. In** before loading your first file
2. Click on **FILE** and **Explorer** to select your file
3. **Load** and **view** your trace
   The first trace is now loaded for <Acq. In>.
4. Select **Acq. Out** before loading the second file and proceed the same way to load the second file.
   Results appear automatically in the table.

DFB results analysis

This feature only applies to instruments OSA-50X.

DFB results analysis allows to characterize DFB lasers, by giving the corresponding SMSR, Offset and bandwidth values.

DFB test configuration

To configure the Platform in preparation for a DFB test, press the **SETUP** button.

In the Measurements section, set **Type** on **DFB**.

A new DFB sub-menu is offered while other Setup parameters are the same for DFB as for WDM measurements. Refer to "OSA optical spectrum analyzer Setup" on page 248 for a complete description.

DFB (sub-menu)

Bandwidth level	Level (expressed in dB) where the main component bandwidth should be calculated
Min SMSR	Minimum offset value to consider to find the Side Mode
Max SMSR	Maximum offset value to consider to find the Side Mode

DFB measurements

Measurement procedure:

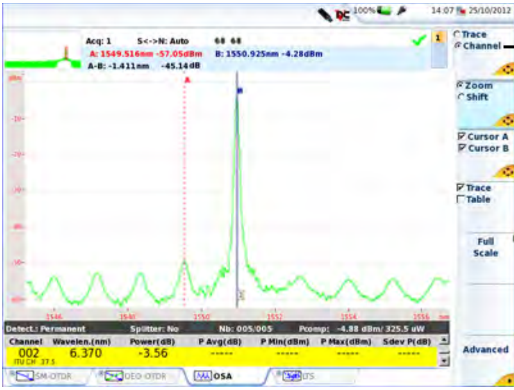
1 Use a patchcord to connect your DFB laser source to an input port of the OSA-XXX module on the Platform.

2 Power on the DFB laser source.

3 Click **START/STOP** to perform the acquisition.

The trace and corresponding results appear automatically after a few seconds.

Figure 150 DFB measurements



Select which DFB you are working on

Cursors A and B are automatically positioned on the first DFB laser, respectively on the max SMSR and the pick of the main component.

DFB results

A table is displayed (see “DFB measurements” on page 284) showing for each DFB:

Channel	Number of DFB laser detected
Wavelength	Wavelength (in nm) of the DFB main component
Level	integrated power (expressed in dBm)
SMSR	Side Mode Suppression Ratio (expressed in dBc)
Mode off	Mode Offset (expressed in nm)
BW @ level	Calculated bandwidth (expressed in nm) according to the bandwidth level (expressed in dBc) defined in the setup menu.

When the <***Channel***> key is selected, use the arrow keys ◀ and ▶ to move the cursor from one DFB pick to another[1], both in the trace and in the table of results.

1.In case several DFB lasers are characterized at the same time

Saving DFB results

DFB Results are not saved in a file. Nevertheless, the trace may be stored as a regular WDM trace.

To save your files:

1 Click on **FILE**, select name and **Store Trace**

2 Click on **RESULTS** to come back to the previous screen

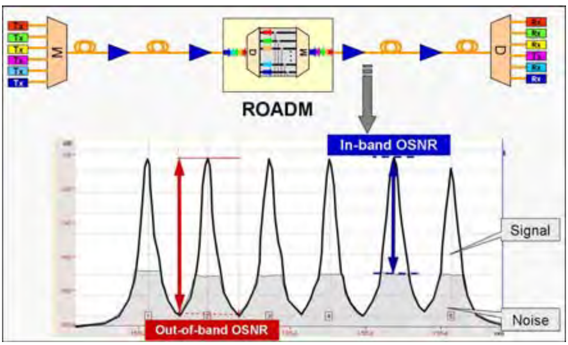
Loading DFB results

Results are not saved in a file. Nevertheless, the trace may be reloaded as a regular WDM trace. Make sure **Type** parameter is set on **DFB** in the **Setup** menu to recalculate DFB results.
Results appear automatically in the table.

Testing ROADM networks

In ROADM networks, each channel may traverse different routes, optical amplifiers, and add-drop filters, resulting in different OSNR for each channel. Conventional OSA measurements are unreliable, as they indicate OSNR values that are too high: up to 10dB above the true OSNR. Using the in-band OSNR method (I-OSNR) of OSA-500R, OSA-500RS or OSA-110R will provide the true OSNR value in ROADM based networks.

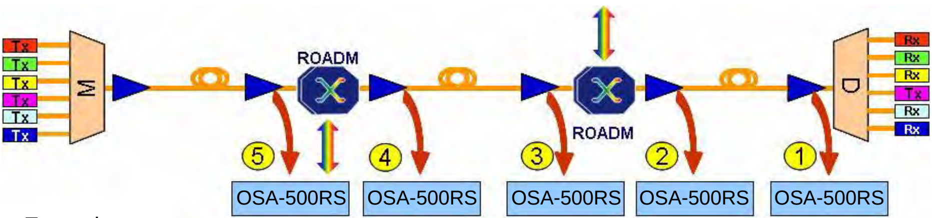
Figure 151 ROADM network test



With OSA-500R, OSA-500RS or OSA-110R, it is possible to measure the "true" in-band OSNR using the polarization nulling technique.

Here is a test setup for in-band OSNR testing.

Figure 152 Test setup for In-band OSNR testing



Example:

- OSNR measured with in-band OSA-500R or OSA-500RS at terminal site (1) provides value of 14dB
- Service failed as the OSNR is < 20 dB

How to locate the failure?

Perform the following tests at EDFA monitor access points (2-5):

- Check per channel input and output power of EDFA
  => Input power must be in the system specified range
- Check power uniformity
  => Equal power levels for all channels at EDFA output
- Compare OSNR from EDFA to EDFA
  => OSNR may decrease because of the amplifier noise figure NF (type 3-4 dB) per EDFA
- Locate and exchange optical amplifier

Measurement of I-OSNR

Pre-setting the OSA for an in-band OSNR measurement in I-OSNR mode

As the out-of-band OSNR measurements might not provide the 'TRUE' OSNR value for the above listed systems configurations, the in-band OSNR measurement method based on VIAVI's polarization nulling technique must be selected.

1. Press **SETUP** until OSA test setup appears.
2. Press **Test Auto I-OSNR** button.
   The instrument will be set for in-band OSNR measurements.

All Parameter settings will be done automatically:

The following parameters will be pre-set:

Sweep mode	single
Sweep range	ext. C-band= 1525-1570nm, covering all EDFA applications
I-OSNR sensitivity	(for OSA-500R only) needs to be set manually, see below
Resolution	full, i.e. highest resolution
Channel detection	permanent auto detection of channels & ch-spacing
Min channel spacing	std 50GHz, needs to be adjusted manually, see below
OSNR method	needs to be adjusted manually, see below
noise Acq. BW	standard 0.1nm
OSNR meas Type	S/N = indicates real signal to noise measurement

3. Select **Show I-OSNR trace**: **Yes**

In the I-OSNR mode the polarization nulling trace can be displayed on the screen by activating the **Show I-OSNR trace** to **Yes**.

A blue trace will then show the progress of the suppression of the polarized signal by the polarization nulling method.

Manual Settings:I-OSNR sensitivity (for OSA-500R and OSA-110R only)

I-OSNR sensitivity will set the number of measurements performed for polarization nulling

- **Low (fast) mode** (<2 min measurement time)

  Fast measurement with small number of polarization nulling measurements

  => can be used for a first check when expected OSNR <20dB for 10G systems at channel spacing of 50GHz and higher; and for systems running at 40GBps at channel spacing of 100GHz or higher
- **Medium mode** (<5min measurement time)

  Polarization nulling will be performed at about 3 times more measurement points than fast mode

  => to be used when expected OSNR is in the range of 20-25dB for 10G systems at channel spacing of 50GHz and higher; and for systems running at 40GBps at channel spacing of 100GHz or higher.
- **High mode** (<11min measurement time)

  Polarization nulling will be performed at about 3 times more points than in medium mode

  => to be used when expected OSNR is >25dB and for all systems running at 40/100GBps at channel spacing of 50GHz

Manual Settings: Min Channel Spacing

Min channel spacing needs to be set according to the minimum present channel spacing in a system.

NOTE

The preset min channel spacing is 50GHz, which works for most of the systems. For other systems, the operator needs to enter the effective minimum system channel spacing of the WDM system. This is important for a correct approximation of the noise distribution inside the transmission band of the WDM channels.

Example 1: only every second channel is loaded, system looks like 100GHz channel spacing

It might be that the system has a visible channel spacing of 100GHz but the min channel spacing is 50GHz as only every second channel is loaded. This could also be the case when 50GHz optical interleavers are used to multiplex two 100GHz spaced WDM signals (even and odd channels) together into a 50GHz spaced system

=> min-ch-spacing needs to be set to 50GHz

Example 2: submarine links

Submarine links often pack 3 channels into the ITU-T 100GHz grid

=> min-channel spacing needs to be set to 33GHz

Manual Settings: OSNR method

The OSNR method can be set according to the application.

- **ROADM networks**: networks with optical filters in the link:

  Set OSNR method to 'filtered' (=pre-set)

  In-band noise approximation will be done automatically to match the in-band noise distribution of the measured filter shape, whatever shape it is: flat top or rounded

  => set OSNR method to 'filtered'
- **Overlapping spectra**: systems with Overlapping spectra, having no filter in the link (e.g. submarine links or 40/100G links at 50GHz channel spacing)

  => set OSNR method to 'unfiltered'

In-band noise will be approximated as a flat distribution.

Performing an in-band OSNR test in I-OSNR mode

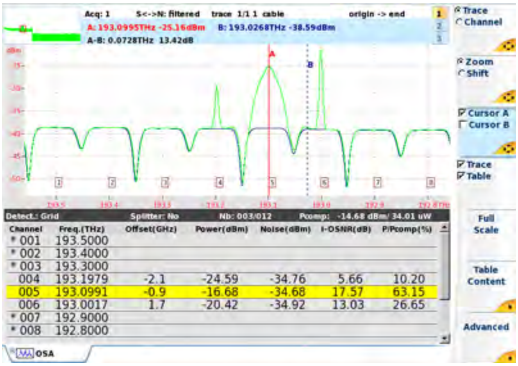
In the I-OSNR mode the instrument performs multiple scans for one measurement. During each scan the polarization controller will change its setting to adopt to the input signal for a maximum suppression of the signal to get access to the in-band noise.

1 Start the measurement by pushing the **START/STOP** button

A green on top of the WDM table will show the progress of the measurement.

When the measurement is finished the green bar disappears and the result is shown in the table.

Figure 153 Result trace of an I-OSNR measurement



The table will show the following results:

- Wavelen/Freq: will be displayed in nm or in THz
- Spacing: channel spacing in THz
- Level: total integrated channel power in dBm
- Noise: in-band noise power normalized to 0.1nm noise bandwidth
- I-OSNR: in-band OSNR measured Gaussian or no Filter approximation

WDM-Expert Software option

The WDM-Expert option is a software option, available on VIAVI OSA-110M//110R and OSA-500/500M/500RS.

This option allows to perform Real time analysis (no additional measurement time required) and can be used as a post analysis software on already measured links.

A new test parameter is available in WDM-table, **Data Rate**, allowing to get an

- Expert analysis of each optical channel to derive transmitted data rate
- Indication of per channel data rate and pol-mux modulation

Transmitted signals	Indication in WDM Table
100G signals higher using pol-mux modulation	≥100G PM
40G signals without pol-mux modulation	40G
10G signals without pol-mux modulation	10G
2.5G signals without pol-mux modulation	2.5G

Configuring the display with WDM-Expert option

Once the software option is installed, new parameters are available in the **Setup** page:

1 Press **SETUP**.

2 Select **Display** menu key.

3 In the **Display** parameters, press **Table Content** parameter.

In addition to pre-defined (**Standard** / **Statistics** / **Pass/Fail** / **CWDM** - see "Table Content" on page 261) a pre-defined **Extended** and four user definable WDM tables can be created

Extended to display the Data Rate in the trace results table

The result table displays the columns Ch-Number, Wavelength/ Frequency, Spacing/Offset, Ch-Power, OSNR, Noise and Data Rate.

User Def 1... 4 The user may compose any available result column to its own result table. The user may define up to four different user-defined result tables.

If the Table Content is set to one of the **User Defined** value, you can open the table editor page by pressing the softkey **Edit Table**.

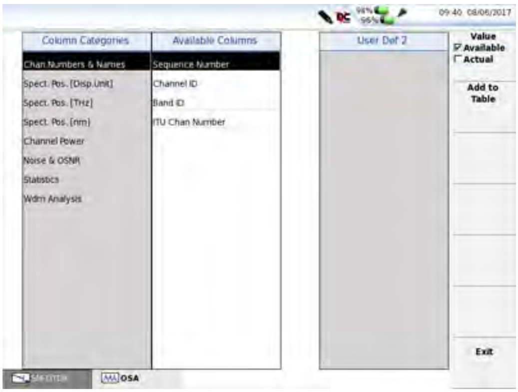
Customizing the WDM table (User Defined configuration)

The WDM-Expert option allows to define up to four user definable WDM tables, each one with up to 7 columns.

Once the parameter **User Def. 1**, **2**, **3** or **4** is selected in the **Setup** > **Display** page:

1 Press **Edit Table** menu key.

Figure 154 Customization of WDM table



2 In the right menu keys, check **Value** is defined to **Available**.

3 In **Column Categories**, select the category into which an item must be added to user-defined table.

4 In **Available Columns**, select the item to be added to the table (video reversed).

5 Click on **Add to Table** menu keys.

The selected item is displayed on the right part of the screen, in the **User Def. #** column.

6 Repeat from step 3 to step 5 to add all columns wished, up to seven.

7 Press **Exit** to return to **Setup** screen.

8 Press **RESULTS** to display the current trace open with the user defined table.

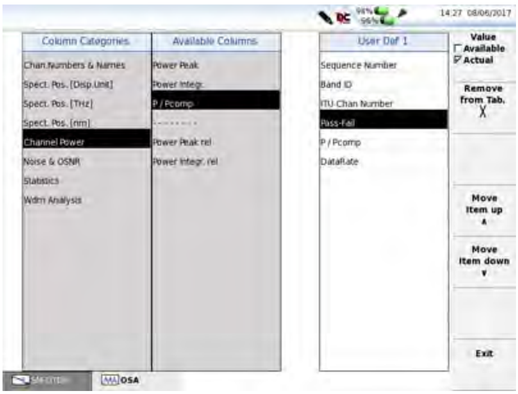
Modifying a user defined table

The left column of the table editor page shows the result table column categories; the column in the middle shows the corresponding result columns, and the right column shows the columns, that are currently part of the result table.

By selecting a column category and one of the available columns you may compose your own current result table by pressing the softkey **Add to Table**.

To rearrange the sequence of the columns in the result table select one of the result column in the Current Table column.

Figure 155 Modify / Remove items



Once a User defined table is available, it can be modified at any time from the Setup page:

- the position of a value in the table can be modified
- a value can be removed from the table.

1 In the **Display** parameters, press **Table Content** parameter.

2 Select the **User Def. 1**, **2**, **3** or **4** to be modified

3 Press **Edit Table**

4 In the column **User Def.** #, click on the parameter (= value) to be removed or moved.
The menu key **Value** is defined to **Actual**. and the menu keys are modified.

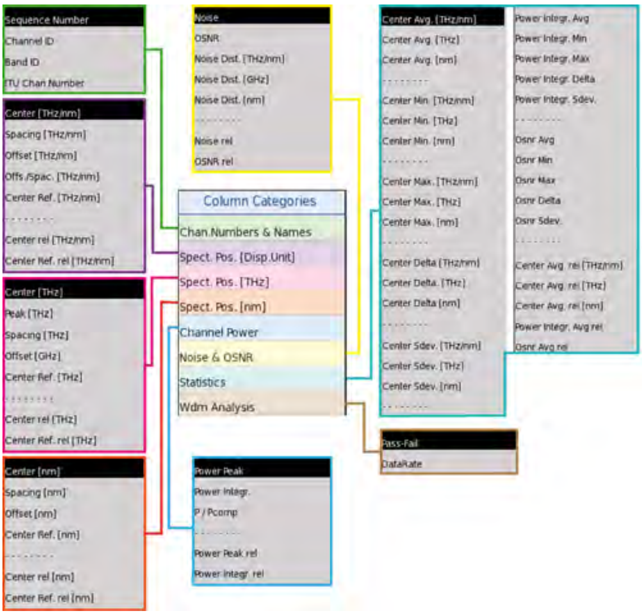
5 Click on **Move Item up ^** or **Move Item down v** to change the position of the item in the table.

or

Click on **Remove from Tab. X** to delete the item form the table.

Items available per category

Figure 156 Items for each category for user definable WDM table



Chan.Numbers & Names

Sequence Number	channels are consecutively numbered.
Channel ID	the channel identification, defined by the text in Display > Grid > Channel settings > Channel ID
Band ID	the channel identification, defined by the text in Display > Grid > Channel settings > Band ID

ITU Chan Number channel number derived from the channel's center frequency in the range of 190.100 THz to 197.950 THz (1 .. 79.5)

Spect.Pos. [Disp.Unit]

All spectral positions in this columns category are displayed in nm or THz. This depends on the value of the Setup/Display/Unit parameter

Center the center frequency / wavelength of the channel signal

Spacing the frequency / wavelength difference to the previous channel signal

Offset the frequency / wavelength difference to the corresponding grid line (only available if the parameter Analysis/Channel detection/ Mode is set to Grid)

Offs./Spac depends on the parameter Analysis > Channel detection > Mode: if this is set to Grid: Offset (see above) else Spacing

Center Ref depends on the parameter Analysis/Channel detection/Mode: if it is set to Grid: the grid frequency / wavelength else the center frequency / wavelength of the channel signal

Center rel the difference between the center frequency / wavelength of the channel signal and the reference channel (set by the softkey Set Ref Channel on the result page)

Center Ref.rel the difference between the **reference frequency / wavelength** of the channel and the reference channel

Spect. Pos [THz]

All spectral positions in this columns category are displayed in THz, independent of the value of the Setup/Display/Unit parameter. The available result table columns correspond to Spect. Pos [Disp.Unit]

Center the center frequency of the channel signal

Spacing the frequency difference to the previous channel signal

Offset the frequency difference to the corresponding grid line (only available if the parameter Analysis/Channel detection/Mode is set to Grid)

Center Ref depends on the parameter Analysis/Channel detection/Mode: if it is set to Grid: the grid frequency else the center frequency of the channel signal

Center rel	the difference between the center frequency of the channel signal and the reference channel (set by the softkey Set Ref Channel on the result page)
Center Ref.rel	the difference between the reference frequency of the channel and the reference channel

Spect. Pos [nm]

All spectral positions in this columns category are displayed in nm, independent of the value of the Setup/Display/Unit parameter. The available result table columns correspond to Spect. Pos [Disp.Unit]

Center	the center wavelength of the channel signal
Spacing	the wavelength difference to the previous channel signal
Offset	the wavelength difference to the corresponding grid line (only available if the parameter Analysis/Channel detection/Mode is set to Grid)
Center Ref	depends on the parameter Analysis/Channel detection/Mode: if it is set to Grid: the grid wavelength else the center wavelength of the channel signal
Center rel	the difference between the center wavelength of the channel signal and the reference channel (set by the softkey Set Ref Channel on the result page)
Center Ref.rel	the difference between the reference wavelength of the channel and the reference channel

Channel power

Power Peak	the peak power of the channel signal
Power Integr.	the entire power of the channel signal This parameter indicates the calculated total channel power level from the detected channels, achieved by mathematical power integration over ± ½ min channel spacing around the channel center frequency.(see "Min. Channel spacing" on page 178). This power level may differ from the peak power level indicated by cursor evaluation in the graphical trace.

> **NOTE**
> The power integration method is used to avoid wrong channel power measurement with modulated signals having a larger bandwidth than the optical filter resolution bandwidth of the OSA.

P / Pcomp — the percentage of the power of a channel signal to the sum of all powers of the channel signal

Power Peak rel — the difference between the peak power and the peak power of the reference channel

Power Integr. rel — the difference between the integrated power and the integrated power of the reference channel

Noise & OSNR

Noise — the noise level in dBm.

Indicates the noise level measured left and right of the peak of the optical channel (out-of-band noise measurement). The noise level is normalized to the selected noise acquisition bandwidth (see noise acq. Bandwidth setting).

> **NOTE**
> The noise level depends on the noise acquisition bandwidth so the noise level may be different to the result in the graphical trace.

> **NOTE**
> For OSA-500R, OSA-500RS and OSA-110R, in I-OSNR measure-ment mode, the noise level is calculated based on the polarization nulling method indicating the noise level at the channel transmission wavelength (in-band noise measurement).

OSNR — The optical signal to noise ratio for the channel in dB.

In WDM mode this parameter indicates the out of band SNR result based on the out-of-band noise measurement.

> **NOTE**
> For OSA-500R, OSA-500RS and OSA-110R, with I-OSNR setting, this parameter indicates the "true" I-OSNR (in-band OSNR) measured with the polarization nulling method.

Noise Dist [THz/nm] distance between the center of the channel and the point of reference for the noise (only valid for Acquisition Mode WDM / OSNR) given in THz or nm; depends on the value of the Setup/Display/Unit parameter

Noise Dist. [GHz] distance between the center of the channel and the point of reference for the noise (only valid for Acquisition Mode WDM / OSNR) given in GHz; independent of the value of the Setup/Display/Unit parameter

Noise Dist. [nm] distance between the center of the channel and the point of reference for the noise (only valid for Acquisition Mode WDM / OSNR) given in nm; independent of the value of the Setup/Display/Unit parameter

Noise rel the difference between the noise level and the noise level of the reference channel

OSNR rel the difference between the OSNR and the OSNR of the reference channel

Statistics

The statistics results are only available if the Acquisition Sweep parameter is set to Statistics!

All spectral positions in this columns category are displayed in nm or THz. This depends on the value of the Setup/Display/Unit parameter

Center Avg. the average of the center frequency or wavelength of a channel signal

Center Min. the minimum of the center frequency or wavelength of a channel signal

Center Max. the maximum of the center frequency or wavelength of a channel signal

Center Delta the difference between the maximum and the minimum of the center frequency or wavelength of a channel signal

Center Sdev.	the standard deviation of the center frequency or wavelength of a channel signal
Power Integr. Avg	the average of the integrated power of a channel signal
Power Integr. Min	the minimum of the integrated power of a channel signal
Power Integr. Max	the maximum of the integrated power of a channel signal
Power Integr. Delta	the difference between the maximum and the minimum of the integrated power of a channel signal
Power Integr. Sdef	the standard deviation of the integrated power of a channel signal
Osnr Avg.	the average of the optical signal to noise ratio of a channel signal
Osnr Min.	the minimum of the optical signal to noise ratio of a channel signal
Osnr Max.	the maximum of the optical signal to noise ratio of a channel signal
Osnr Delta	the difference between the maximum and the minimum of the optical signal to noise ratio of a channel signal
Osnr Sdev	the standard deviation of the optical signal to noise ratio of a channel signal
Center Avg.rel	the average of the difference between the center frequency or wavelength of a channel signal and the reference channel
Power Integr. Avg.rel	the average of the difference between the power of a channel signal and the reference channel
Osnr Avg.rel	the average of the difference between the OSNR of a channel signal and the reference channel

Wdm Analysis

Pass-Fail — If alarms are activated (see Channel settings Alarms) a pass/fail summary of the channel is displayed.

Data-Rate — The Data Rate column gives an estimation of the data rate the channel is modulated with. The resolution depends on the OSA module type:

OSA-500R & RS: can differentiate between =100G PolMux, 40G, 10G, and =2.5G

OSA-500 & OSA-500M: can differentiate between =40G, 10G, and =2.5G

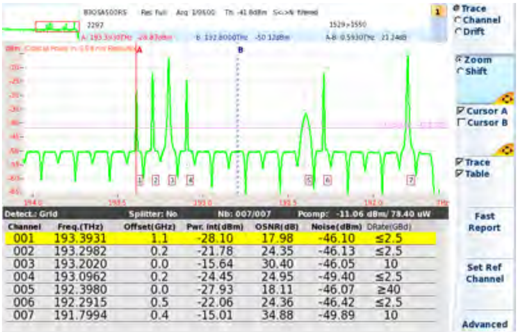
OSA-110R & RS: can differentiate between =100G PolMux, 40G, and =10G

OSA-110M: can differentiate between = 40G, and =10G.

Results tables with WDM-Expert software option

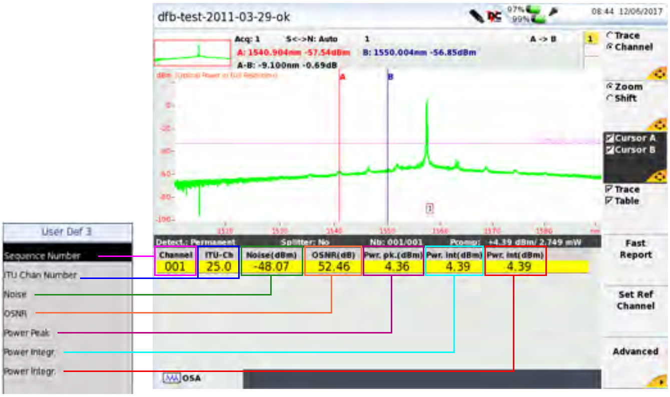
If the **Table Content** parameter is defined with **Extended**, a new column Data Rate is available in the results table:

Figure 157 Extended Table Content



If a user-defined table content has been configured, the table differs according to the items selected for the results table:

Figure 158 Example of user-defined results table

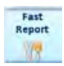


Saving the trace and generating a report

Once the results page is displayed, the trace can be saved and a report can be generated directly from the results screen.

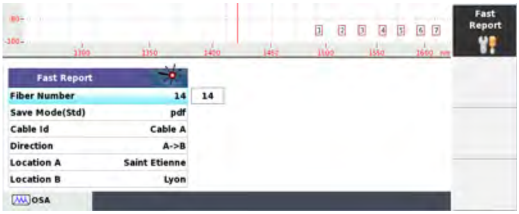
Saving results and creating a report from results page

To generate a report:

1 Press **Fast Report** menu key  .
A menu displays under the trace.

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

Figure 159 Fast report configuration



a In **Fiber Number** parameter, press ▶ to modify if necessary the number of the current fiber.

b In the **Save Mode** parameter, select:

txt file select **Yes** to save the results in a blts file and to generate a txt file of the results.

pdf file select **Yes** to save the results in a blts file and to generate a report in a pdf file

c In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.

d Modify the **Fiber Number**/**Fiber Code** using the key ▶.

The parameter is different according to the Cable Structure configuration (see “Cable structure” on page 45)

e 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**)

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

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

4 Enter a name for the file in the edition keypad

or

Click on **Auto Filenaming** menu key to apply the file name defined in the Setup screen, in **Filenaming** parameter (see “Filenaming” on page 50).

5 Press **Enter** to validate.

NOTE
The osa file and the txt/pdf file will have the same name.

The icon  displays during saving process.
Once saving is completed, a sound is emitted onto the Platform.

NOTE
The trace and the report are saved in the last storage media and directory selected.

Opening the report

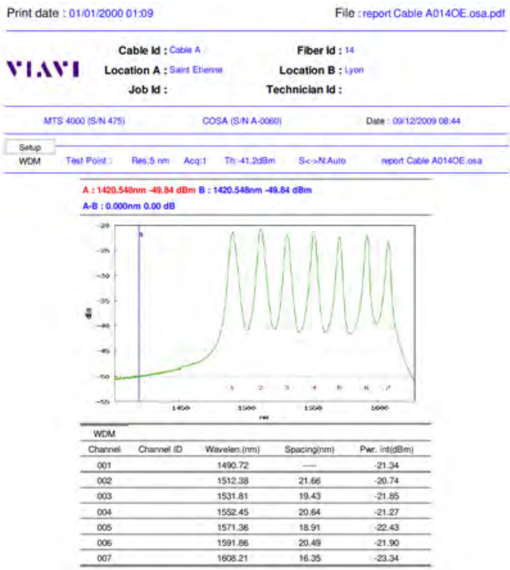
To open the report:

1 Press **FILE** hardkey

2 In the **Explorer** page, in the directory selected, select the file/report.
For the txt file: *trace file_pmd.txt*
For the pdf file: *trace file.pmd.pdf*.

3 Press **Load**.
The file opens onto the MTS/T-BERD.

Figure 160 Example of OSA Report in pdf



Print date : 01/01/2000 01:09 File : report Cable A014OE.osa.pdf

Cable Id : Cable A Fiber Id : 14
Location A : Saint Etienne Location B : Lyon
Job Id : Technician Id :

MTS 4000 (S/N 475) COSA (S/N A-0060) Date : 09/12/2009 08:44

Setup
WDM Test Point : Res:5 nm Acq:1 Th:-41.2dBm S<->N:Auto report Cable A014OE.osa

A : 1420.548nm -49.84 dBm B : 1420.548nm -49.84 dBm
A-B : 0.000nm 0.00 dB

WDM

Channel	Channel ID	Wavelen.(nm)	Spacing(nm)	Pwr. Int(dBm)
001		1490.72	----	-21.34
002		1512.38	21.66	-20.74
003		1531.81	19.43	-21.85
004		1552.45	20.64	-21.27
005		1571.36	18.91	-22.43
006		1591.86	20.49	-21.90
007		1608.21	16.35	-23.34

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 onto the T-BERD/MTS 8000V2 or 6000/6000A (see "Generating pdf report(s)" on page 545).

Recalling files

Once a file has been stored, recall it using the Explorer:

1. Press **FILE** to open the Explorer.
2. Select the directory and then the file to open
3. Click on **Load**
4. Click on **View Tace(s)** or **Load Trace + Config.**
   The selected file is opened

For further informations on file management, see Chapter 20 “File management”.

9

OSCA-710 Optical Spectrum Measurement

This chapter describes the different stages in carrying out a spectrum analysis of an optical signal, or analyzing effects from an optical components or network elements like ROADMs, DFB-sources..., by a Platform 8000V2 equipped with an OSCA -710.

The OSCA-710 series is only available on MTS / T-BERD 8000 V2 and ONA-1000 platforms.

Type	Resolution bandwidth (FWHM) typ	ORR 50GHz typ.	Total save Power	POL-MUX OSNR	ROADM I-OSNR	OSNR	WDM
OSCA-710	3pm	50dBc	23dBm	X	X	X	X

NOTE

Looking for the OSCA-type and series Nr, on MTS/T-BERD 8000V2 press **HOME** > **About**.

The topics discussed in this chapter are as follows:

Laser safety

The OSCA module contains a Class 1 Laser product according to DIN IEC 60825-1:2014. Please take notice of following instructions

When the system or device is switched on, never look directly into the in- and output or into a connected optical fiber.

The devices which are tested can be rated in a higher laser class with dangerous radiation. Observe their security instructions. Please heed the normal precautions for working with lasers and consider local regulations.

Guidelines for the prevention of hazards

In order doing measurements, the OSCA-710 might be plugged to fibers, which could operate at highly dangerous optical power-levels. Due to the fact that only a small part of the optical spectrum (C-Band) can be measured, one can not exclude that radiation beyond the detectable range is received however. Therefore the OSCA-710 must not be used to verify or monitor a certain class of hazard.

Possible carrier devices for OSCA-710 modules and its electrical specifications

Mainframe name	Power supply Voltage	Wattage
MTS-8000 with Adapter E8100E	24 VDC ± 5 %	220 Watts max
MTS-8000E with Adapter E8100E	24 VDC ± 5 %	220 Watts max
ONA-1000 with adapter	19 VDC ± 5 %	160 Watts max
	24 VDC ± 5 %	330 Watts max

Cleaning of Connectors

Cleaning of the patchcord connector is extremely important to avoid damage to the input of the OSCA. A dirty connection can irreversibly damage both surfaces, especially when working with high powers.

We highly recommend inspection of the patchcord before connecting it to the OSCA.

Transportation

The OSCA can be damaged by excessive acceleration during transportation with improper packaging.

Modules without a MTS / T-BERD should be shipped only in the original packaging.

For shipping of a MTS / T-BERD 8000 V2 containing an OSCA, use either the original packaging with the black rubber foam, or the transportation case referenced E80HCASE-OSA.

Using the original packing material ensures that the device is properly protected during shipping. Otherwise, VIAVI cannot give warranty on modules good protection.

If you need a new packaging, please contact VIAVI Technical Assistance Center.

Configuration of the instrument

The instrument configuration menu will be displayed directly after power up or by pressing the **Home**-button.

The actual module status will be shown (ON/OFF) on system window

1. For configuring the OSCA press the OSCA-icon (by touchscreen), or select the function icon by arrow-keys and press **Enter**.
2. Press **Result** button to see the OSCA-result window.

   If the MTS / T-BERD 8000 V2 is switched Off in this configuration, the next start up will directly start the to OSCA-application, and display the result window.

For more details about the general MTS / T-BERD- configuration see the 8000 V2 Platforms user manuals.

For measurement, connect the fiber to be tested on the optical input of the selected module.

> **NOTE**
> Consider the maximum optical input power for OSCA.

Kind of input connector:

- if the protection cap is green the optical input interface is a angled physical connector (APC-type)
- if it is a black protection cap, the interface type is physical connector (PC-type)

OSCA optical spectrum analyzer Setup

To configure the 8000 V2 Platform in preparation for an OSCA test on a fiber, press the **SETUP** button.

The various measurement parameters are proposed:

1 Setup in Test Auto mode

Acquisition settings		
Mode	WDM / OSNR	POL-MUX
Sweep	single, continuous	
Sweep range	Full, Start/End, Center, Span	
Averaging acquisition	No	
Resolution	0.3 pm	
Analyze settings		
Channel detection	Permanent, Grid	
Signal threshold	Auto	
Min channel spacing	Std 50GHz	
OSNR		
OSNR method	left & right	
S<->N distance	Auto	Not available
Noise acq BW	std 0.1 nm	
SNR Meas. Type	S/N	

Splitter compensation	No
Tilt & Slope Gain	No
Results screen settings	
Grid	default = last value used
Alarms	No
Wavelength range	Auto
Table Content	Standard
Unit	nm
Show I-OSNR trace	No
Configuration of the file set-up (see Chapter 20)	
Filenaming	[Cable_id][Fiber_Num][Test_Poin][Direction]
Auto Store	Yes
Nb Fiber Increment	Yes

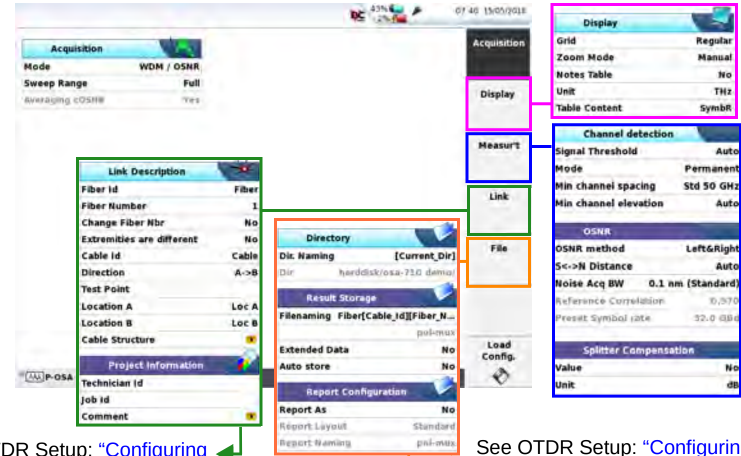
2 or define your own configuration

Click on one parameter on the screen to display the possible options: make your choice using the direction keys ◀ and ▶, or using the touchscreen.

The **Setup** parameters are arranged in 5 sub-chapters:

1 Acquisition
2 Display
3 Measurement
4 Link
5 File

Figure 161 OSCA Setup



See OTDR Setup: “Configuring the Link parameters” on page 43

See OTDR Setup: “Configuring the File parameters” on page 48

On Setup page, select one of the menu clicking on one of the menu key or press **Main Menu** to display the menu keys on the right of the screen.

The various parameters proposed are defined below.

Loading a configuration file

To load the configuration file to be used for OSCA test:

1. Press **Setup** hard key.
2. On bottom right of setup page, press **Load Config.** menu key.
3. In the Explorer, select the desired file configuration
4. Press **Load Config.** menu keys.
   A beep is emitted to validate the selection of the configuration file.
   The software automatically brings you back to setup page.

> **NOTE**
> Most of the configuration files are available into the Platform in `disk/config/OSA`.

Acquisition Parameters

Mode

WDM / OSNR	Module is used for measuring the OSNR by using the standardized analysis method. This mode is recommended for OSNR measurements on signals without optical filtering.
POL-MUX	This setup is used for polarization multiplexed carriers. The OSNR of the signal is calculated with a spectral correlation method on active links. See „“Measuring POL-MUX (polarization mulitplexed) channels” on page 330.

Sweep Range

Select the wavelength numbers or **Full** parameter to use all wavelengths available.

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

> Those parameters are only linked to the current active fiber.

Channel Detection[1]

Signal threshold [1]

Threshold of detection of channels (see “Channel detection threshold” on page 326).

Auto.	the threshold is determined automatically.
Manual	the threshold can be set from -79.9 to +30 dBm

Use direction keys or **Edit Number** to modify values.

1.Attention: all modification of these parameters has immediate repercussions on the trace and entails the loss of the measurement statistics.

NOTE

Modification of the parameters **Channel detection** and **Signal threshold** will only modify the results if the OSCA module present is the one that was used for the acquisition.

Mode

Grid	The grid serves as a detection reference: it must therefore be Regular, Manual, ITU DWDM, ITU CWDM, LR4/ER4-100G, LR4/ER4-40G or 10x10-100G. The choice of grid takes priority over the choice Channel Selection. For example, it is not possible to choose Channel selection = Grid, if the option selected for the grid is «Without» or «Conventional».
Permanent	Automatic detection of the channel on each acquisition. In this mode the channels are always detected without making a reference measurement.

NOTE

At the end of an acquisition in permanent mode, it is possible to create a grid on the basis of the channels detected. To do this, press the key **Adopt Grid** in the **SETUP** menu**.**

The new Grid can be shown as table by pressing **View Grid** in the Setup menu.

Min. Channel spacing

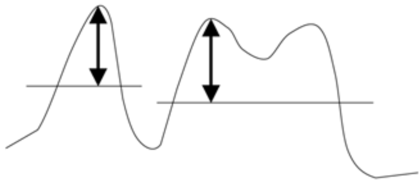
Defines the minimum spacing of two adjacent optical channels in the system.

This parameter is also used to set the range for integration to measure the accurate total signal power of an optical channel. The window for channel power integration will be ±1/2 the min. channel spacing setting left and right to the channel center frequency.

The measurement result will be displayed in the WDM table as 'Level' in dBm.

Min. Channel elevation

Defines the minimum elevation of two adjacent peaks from the valley between them which is required to recognize independent channels. Peaks which are not separated by a valley deeper than the min.channel elevation are considered as part of the same optical channel.



This example shows two signals, the left having only one peak larger than the selected Min.channel elevation, the right one with two peaks.

The two peaks of the right one are separated by a valley, but their elevation from that valley is smaller than the Min.channel elevation. Therefore they are not treated as independent signals

Select **Auto** to define the value automatically or select **Manual** to enter a specific value for the parameter.

OSNR

To modify these parameters, go to the **OSNR** line. A sub-menu then appears proposing the following options:

OSNR method (only available in OSNR mode)[1]
Side of the peak where the point of reference for noise measurement is taken (left, right, average left and right, worst case of left and right).

S<->N Distance (only available in OSNR mode)
Distance between the peak of the channel and the point of reference for the noise.

Auto: distance determined according to spacing of channels.

Manual: an additional line **Manual value** opens. Go down and modify the value with < > or click on the value and enter a new one in the keypad that opens

Pre-defined: select 25 GHz (0.2 nm), 50 GHz (0.4 nm),100 GHz (0.8 nm) from the peak.

Noise Acq. Bandwidth
Reference bandwidth used for the acquisition of noise:

Standard 0.1 nm

1.Attention: all modification of these parameters has immediate repercussions on the trace and entails the loss of the measurement statistics.

With the <> keys you can select other values between 0.05 nm and 1.0 nm.

OSNR meas.type: S / N

S/N: the integrated power in the channel minus the noise is considered as signal

Splitter compensation

When the measurement is made after a tap coupler (also known as a splitter), it is possible to compensate for the loss introduced by this element and to display the value measured before or after it.

The following options are available:

Value[1] — **Yes**: activation of compensation and choice of its value using the keys ◀ and ▶: or the numeric keypad: from 1 to 30 dB (by increments of 1) or 1 to 99% (by increments of 0.1%).

Unit — Choice of compensation in dB or as a percentage of the value measured.

For example, with a 10 dB splitter, the results will be augmented by 10 dB. The trace will be offset upwards by 10 dB. A channel measured at -30 dBm will be displayed -20 dBm.

Display Parameters

In the **Setup** page, press **Display** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Display**).

> ⚠ Those parameters are valid for all traces present on the screen.

Grid

Go to the **Grid** line to access the Grid sub-menu. Select the **Type** line to see the different choices and modify them if required.

Five possible types of grid are proposed with different corresponding values, some of which are fixed or non-applicable, others editable.

The type «Conventional» and the option «Without» do not give access to the parameters of the Grid sub-menu.

The others give access to certain options, as shown in the table below:

Table 7 Grid menu options for each type of grid

	ITU DWDM	Regular	Manual
Grid name	Editable	Editable	Editable
ITU standard	G.692	N/A	N/A
First ITU channel (with display in nm)	Editable, from 1530 to 1565 nm, by increments corresponding to the channel spacing selected	Editable from 1530 to 1565 nm, by increments of 0.01 nm.	N/A
Channel spacing	Editable, from 25 to 200 GHz	Editable from 0.1 to 100 GHz	N/A
Number of channels	Editable, from 1 to 256 by increments of 1	Editable, from 1 to 256 by increments of 1	Editable from 1 to 256
Channel settings	Sub-menu accessible to display the wavelengths of each channel, name the band, and name each channel		

NOTE
The maximum real number of channels for ITU grids depends on the value selected for the first channel and the spacing between the channels.

NOTE
It is possible to display the grid with the **View Grid** key. A table then appears showing the channel number, the name of the channel, the reference wavelength and the alarm thresholds for delta F, min. P, max. P and min. SNR.

Alarms

When **Channel Detection** is positioned on **Grid**, it is possible to activate an alarm system. This system is based on a system of thresholds. Any measurement results that exceed these thresholds are displayed in red in the table, and the icon appears at the top right of the screen. If all the results are within the thresholds (no result is in red), the icon becomes .

To activate the alarm system, go to the <Alarms> line and select "Active".

Thresholds can then be set (using the direction keys or numeric keypad), to global level or to the level of each channel:

1 Global alarms

Number of channels	Yes/No
Delta channel power[1]	No or threshold modifiable from 0.1 to 60 dB
Delta OSNR[2]	No or threshold modifiable from 0.1 to 60 dB
Composite power [3]	No or threshold modifiable from -59.9 dBm to +20 dBm

2 Channel alarms

Max channel offset[4]	No/Freq/Wavelen.
Min. channel power[5]	Yes/No
Max. channel power[6]	Yes/No
Min. OSNR [7]	Yes/No
Channel Number	From «001» to the max. number of channels.
Channel value	Display of the wavelength of the channel number selected
Delta F / Delta WL[8]	From 0 to 2 THz (2 THz is the default value) or from 0 to 8 nm. The unit depends on the value of the parameter Max channel offset
P Min. [9]	From -80 dBm to +9.9 dBm (below max. threshold)
P Max.[10]	From -79.9 dBm to +10 dBm (above min. threshold)
OSNR	From 0 to 50 dB

1.Max. acceptable variation between max. power and min. power on all channels
2.Max. acceptable variation between max. SNR and min. SNR on all channels
3.Maximum composite power
4.Wavelength drift. Selection of the alarm on the basis of the value of delta F
5.The values are then defined in Min. P
6.The values are then defined in Max. P
7.The values are then defined in Min. SNR
8.Delta of frequency or wavelength
9.Minimum power
10.Maximum power

Zoom Mode

The OSCA module performs a measurement over the sweep range, but the display shows the part defined by the Zoom mode.

Auto	display automatically zooms into the wavelength range where optical channels are present
Full	display full sweep range or part chosen by the zoom function of the result page

For sweep range = FULL, it is possible to display the same wavelength range for every new sweep, independent of previous settings of the zoom function on the result page:

C Band	1530-1565nm
Start/ End	manually selectable start / end wavelengths
Center / Span	manually selectable center /span.

Unit

Here the units of the x axis can be selected:

- Frequency in THz
- Wavelength in nm

Table Content

Standard	The result table displays the columns Ch-Number, Ch-ID, Wavelength/Frequency, Spacing/Offset, Ch-Power, OSNR, Noise

Acquisition

To start a measurement press **START** key. The OSCA-710 will scan over the entire wavelength range and the measurement result will be displayed in graphical and tabular format.

NOTE

A warning message appears when the channel power or the composite power is larger than the absolute maximum rating for the OSCA.

In this case be extremely careful when disconnecting the patchcord - it might emit dangerously high optical power!

Trace display functions

The trace acquired or recalled from a memory is displayed on the Results page: see example Figure 162 on page 322.

A range of functions enable modifications to the display of the trace (Cursors, Zoom/ Shift, Event/Trace, Trace/Table, Full scale, etc.).

Display of the WDM / OSCA results

The results window, obtained by pressing the **RESULTS** button**,** shows different zones displaying, from top to bottom:

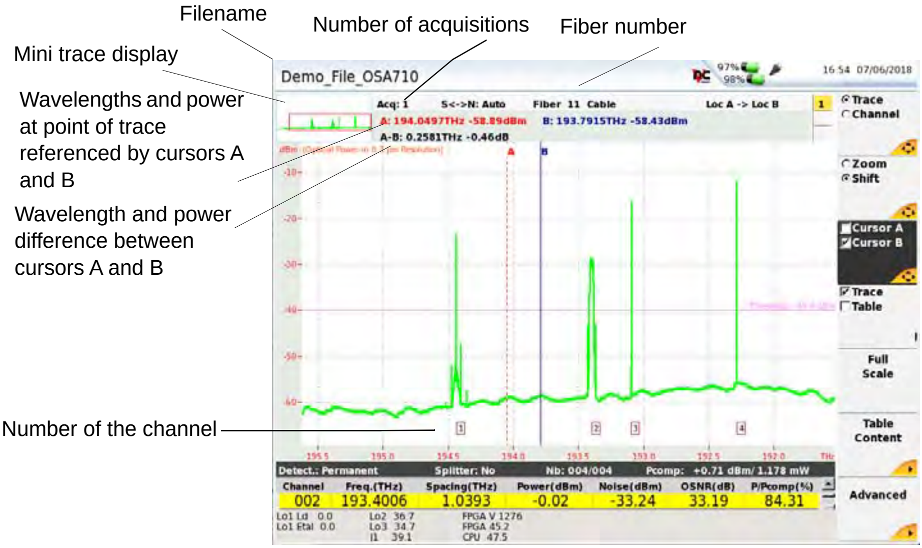
- the mini-trace in the upper part of the screen, accompanied by the principal characteristics of the acquisition and of the file if the result is stored in memory.
- the trace results associated with cursors A and B
- the trace proper (see “Trace display functions” on page 321).
- the table of results (see “Table of results” on page 327).

The trace represents power (in dBm) as a function of frequency (in THz) or wavelength (in nm). The channels detected are represented by peaks.

NOTE

If several acquisitions are performed, the trace displayed is the one corresponding to the last acquisition.

Figure 162 Example of OSCA test result (with grid)



Display functions

Zoom function

The Zoom function is used to analyze part of the trace in greater detail. In association with Channel (WDM/OSCA) it enables rapid checking of a succession of events or channels.
<u>The zoom is centered on the cursor selected</u>. If the two cursors A and B are selected, the zoom is centered midway between the two cursors.

The position of the section of trace displayed with respect to the complete trace is represented by a red rectangle on the mini-trace at the top left-hand corner of the screen.

To define a zoom on the trace:

1 Select **Cursor A** or **B** and center it on the zone to be examined

2 On the **Shift/Zoom** key, select the **Zoom** function.

3 Use the ▶ or ◀ key to increase or reduce the zoom factor.
or
Use touchscreen and click on trace to position the upper left and bottom right corners of the zoomed area.

Zooming on the different channels in succession

1 Zoom on one of the channels as shown above.

2 On the **Trace/Channel** key, select the **Channel** function.

3 Use the ◀ and ▶ keys to move the zoom on to the successive channels.

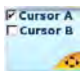
Cursors function

The vertical cursors A and B are used in the Zoom and Shift functions to position or delete markers.

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

- in a solid line if the cursor is selected.
- in a dotted line if the cursor is not selected.

Positioning the cursor

When a trace is displayed, the key 

can be used to select one or both cursors.

The direction keys ◀ and ▶ move the selected cursor(s) along the trace.

When a selected cursor touches the right or left-hand edge of the screen, the trace starts to scroll horizontally to maintain display of this cursor.

If an unselected cursor has been moved off-screen by a zoom, it can be brought back on to the screen by selecting it and then pressing one of the direction keys ◀ or ▶. It will then appear on whichever edge of the screen is closest to its position.

When the cursor function is selected, the keys ▲ and ▼ move the trace vertically.

Cursors information

The informations on Cursors are always displayed on the upper part of the screen. Above the trace are shown the co-ordinates of the points of intersection of the cursors A and B with the trace, together with the distance between the two points.

Cursor X and Y

Two types of cursors can be defined:

- **Cursor X**: only a vertical bar is present.
- **Cursor X** and **Cursor Y**: there is a vertical bar and a horizontal bar. The intersection between these two bars is placed on the trace.

To display the type of cursor selected:

1. Click on **Advanced**.
2. Select the key **Cursor X / Cursor Y** to modify the current choice.
   Each click on this key will alternatively insert or delete the check mark against **Cursor Y**

Full scale

To display the entire trace, with no zoom or displacement:

1. Either press the **Full Scale** key
   or,
   With **Trace** selected on **Trace/Channel**, press validation key

Shift function

The Shift function is used to displace the displayed section of the trace by pressing the direction keys.
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. Select the zoom factor as described above.
2. Choose cursor and cursor position.
3. On the **Zoom/Shift** key, select **Shift**.
4. Use the direction keys or touch and hold screen to shift the trace in the desired direction.

Trace /Table key

This key offers a choice from the following displays:

Trace alone: main display of the trace with a single line of the table at the foot of the page (see Figure 162 on page 322).

Trace + Table: display of trace, reduced in size but followed by 5 to 8 lines of the table of results.

Figure 163 OSCA Results - Trace and Table

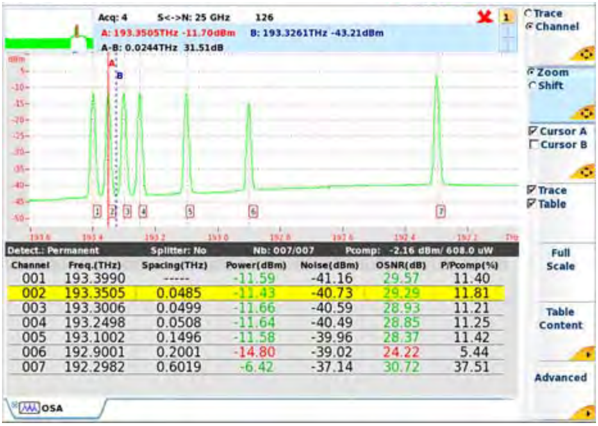
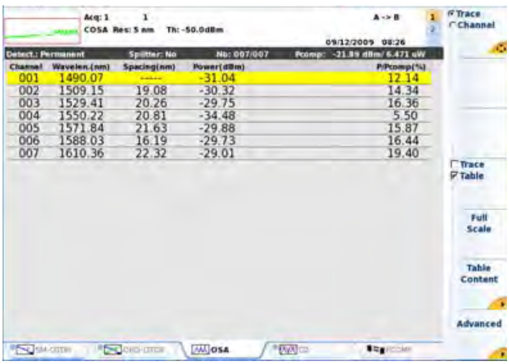


Table: display of the table alone

Figure 164 OSCA Results - Table



Channel detection threshold

On the trace, some peaks corresponding to noise could be mistaken for channels. It is therefore necessary to fix a power threshold level: only peaks that exceed this threshold will be considered as channels and included in the table of results.
To display or modify this threshold, press the **SETUP** key, then select **Signal threshold**. Modify the value to position it on **Auto**[1] or fix a threshold value.

Display of a grid

The display window of the trace can include a grid to facilitate verification of the position of the channels. Several grids are possible (see the chapter “Grid” on page 317)

Display of total power between cursors

To display on the trace the total power between the two cursors A and B:

1. Place the cursors at the desired positions.
2. Press the **Advanced** key, then **Total Power A<--->B**.

   The space between the trace and the two cursors is greyed out and the power is displayed in the form "P=-4.95dBm".

   Pressing the key **Total Power A<-->B** a second time removes the result of the total power measurement.

Display of gain Tilt (delta) and gain slope results

The 8000 V2 Platform can display two additional results:

- The gain tilt, that is to say the difference between the max.and min. values of the peaks of the complete signal spectrum between the cursors.
- The gain slope measured by a method using a least squares algorithm on all detected channel using peak power levels or channel power levels.

To display these results above the channels:

1. Press the **Advanced** button
2. Press **Measure A<->B** button
3. Select the cursor and set it to the measurement range limits

1.The "Auto" value is obtained by continuing to reduce the value of the threshold below the minimum value of -79.9 dBm

4 Press **Tilt/Slope A<->B**

The Gain Tilt is displayed in dB.

The Gain Slope is traced and displayed as value dB/THz or dB/nm according to the units selected

Disable the Tilt and Slope by pressing the **Tilt/Slope** button again.

Figure 165 Display of total power, gain tilt and slope of the gain between the cursors

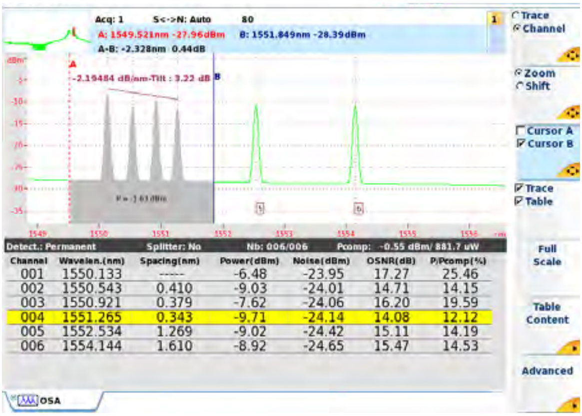


Table of results

Lines

According to the choice made in the **SETUP** menu, the table of results may include:

- either a line for each channel detected (if Channel Selection = Permanent)
- or a line for each graduation, (if Channel Selection = Grid and a grid is selected)

Type of display

The table may be displayed in a single line, on half of the screen or the whole screen as a function of the **Trace**/**Table** key (see “Trace /Table key” on page 324)

Contents of the table with statistics

When selecting the Statistics measurement mode and multiple acquisitions are performed, statistics are calculated on the results. To display these results in the table, select the parameter **Table Contents to Statistics**.

1 the number of the channel

2 the frequency or the channel wavelength

3 the min. frequency or the channel wavelength

4 the max.frequency or the channel wavelength

5 the level of the channel in dBm

6 the min. level of the channel in dBm

7 the max. level of the channel in dBm

If the option "**OSCA Edit Table**" is released more further more statistics are available by using the User Defined Tables

Successive addressing of channels according to the sort type selected

On the trace and in the table, it is possible to move the cursor from one channel to the next in the selected sort order. To do this:

1 Use the key **Cursor A/Cursor B** to choose the cursor A or B to be used on the trace.

2 Press the **Channel** key

3 Press ◀ and ▶ to move the cursor to the following or preceding channel:

Displaying relative results

By default, the table gives the results in absolute values. To obtain these results in relative values with respect to a reference channel:

1 Press the **Table Contents** key, then **Relative>/<Absolute** to select **Relative**.

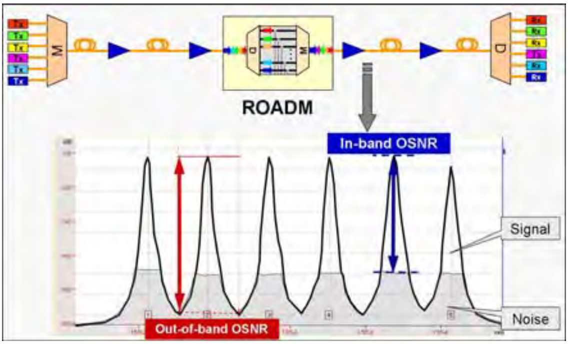
2 Move the cursor on to the channel that is to serve as the reference.

3 Press the **Set Ref. Channel** key.
The results are recalculated with respect to this channel of reference.

Testing ROADM networks

In ROADM networks, each channel may traverse different routes, optical amplifiers, and add-drop filters, resulting in different OSNR for each channel. Conventional OSA measurements are unreliable, as they indicate OSNR values that are too high: up to 10dB above the true OSNR. Using the POL-MUX OSNR method of OSCA-710 will provide the true OSNR value in ROADM based networks.

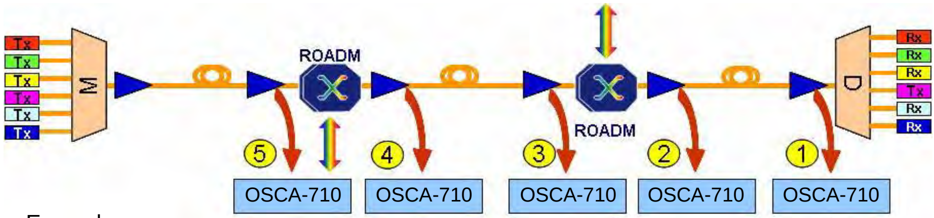
Figure 166 ROADM network test



With OSCA-710, it is possible to measure the "true" in-band OSNR using the Stokes analysis on the received polarized signals.

Here is a test setup for in-band OSNR testing.

Figure 167 Test setup for In-band OSNR testing



Example:

- OSNR measured with OSCA-710 at terminal site (1) provides value of 14dB
- Service failed as the OSNR is < 20 dB

How to locate the failure?

Perform the following tests at EDFA monitor access points (2-5):

- Check per channel input and output power of EDFA
  => Input power must be in the system specified range
- Check power uniformity
  => Equal power levels for all channels at EDFA output
- Compare OSNR from EDFA to EDFA
  => OSNR may decrease because of the amplifier noise figure NF (type 3-4 dB) per EDFA
- Locate and exchange optical amplifier

Measuring POL-MUX (polarization mulitplexed) channels

Pre-setting the OSCA for an in-service OSNR measurement in POL-MUX mode

As the out-of-band OSNR measurements might not provide the 'TRUE' OSNR value for the above listed systems configurations, the POL-MUX OSNR measurement method based on VIAVI's coherent spectral correlation technique must be selected.

1 Press **SETUP** until OSCA test setup appears.

2 Press **Test Auto PolMux-OSNR** button.
The instrument will be set for in-band OSNR measurements.

All Parameter settings will be done automatically:

The following parameters will be pre-set:

Sweep mode	single
Sweep range	C-band= 1527.6-1565.5nm 191.5T-196.25THz
Channel detection	permanent auto detection of channels & ch-spacing
Min channel spacing	std 50GHz, needs to be adjusted manually, see below
OSNR method	needs to be adjusted manually, see below
noise Acq. BW	standard 0.1nm
OSNR meas Type	S/N = indicates real signal to noise measurement
Reference Correlation	needs to be adjusted manually, see below
Symbol rate	needs to be adjusted manually, see below

Manual Settings: Min Channel Spacing

Min channel spacing needs to be set according to the minimum present channel spacing in a system.

NOTE

The preset min channel spacing is 50GHz, which works for most of the systems. For other systems, the operator needs to enter the effective minimum system channel spacing of the WDM system. This is important for a correct approximation of the noise distribution inside the transmission band of the WDM channels.

Channel detection	
Signal Threshold	Auto
Mode	Permanent
Min channel spacing	Std 50 GHz
Min channel elevation	Auto

Std 50 GHz	Manual	25 GHz
33 GHz	100 GHz	200 GHz

Example 1: every second channel is loaded, system looks like 100GHz channel spacing

It might be that the system has a visible channel spacing of 100GHz but the min channel spacing is 50GHz as only every second channel is loaded. This could also be the case when 50GHz optical interleavers are used to multiplex two 100GHz spaced WDM signals (even and odd channels) together into a 50GHz spaced system

=> min-ch-spacing needs to be set to 50GHz

Example 2: submarine links

Submarine links often pack 3 channels into the ITU-T 100GHz grid

=> min-channel spacing needs to be set to 33GHz

Manual Settings: OSNR method

The OSNR method can be set according to the application.

OSNR	
OSNR method	Left&Right
S<->N Distance	Auto
Noise Acq BW	0.1 nm (Standard)
Reference Correlation	0.970
Preset Symbol rate	32.0 GBd

Manual Settings: Reference Correlation

As each transmitter system is a sophisticated complex optical device, the unit is not perfect. Therefore the characteristics of the transmitting laser will vary over various types, manufacturers, configurations etc. The differences will have influences on the quality of the transmission system.

The OSNR is calculated from the difference between the correlation of the combination of signal and noise and the correlation of the pure signal without noise.

However, the correlation of the pure signal is smaller than 100% for all transmitters. Therefore, the correlation of the pure signal is called Reference Correlation and can be set manually for best accuracy. A typical reference correlation value is 98.5%.

Manual Settings: Symbol rate

The spectral correlation method depends on the knowledge of the Symbol rate the carrier uses, because the symbol rate defines the distance for the optimal correlation for two spectral components in the channel. Although the instrument will have a certain tolerance, when given wrong numbers for the Symbol rate (typ. 4-5%), it is advised to input the exact Symbol rate.

Manual Settings: PDL compensation

The accuracy of the measurement depends on spectral symmetry which could be degraded due to polarization effects (polarization depend loss and/or polarization mode dispersion). The analysis will gain accuracy if the effects are post-compensated by algorithms when PDL compensation is set to „Yes“. This is mandatory in distorted and optional in distortion-free systems.

Performing OSNR test in WDM/OSNR mode

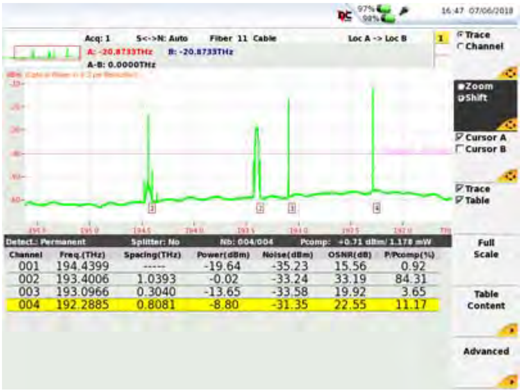
In the WDM/OSNR mode the instrument performs one measurement. The signal is evaluated with standard (out-of-band) ITU OSNR method.

Start the measurement by pushing the **START/STOP** button.

A green on top of the WDM table will show the progress of the measurement.

When the measurement is finished the green bar disappears and the result is shown in the table.

Figure 168 Result trace of an OSNR measurement



The table will show the following results:

- Wavelen/Freq: will be displayed in nm or in THz
- Spacing: channel spacing in THz
- Level: total integrated channel power in dBm
- Noise: in-band noise power normalized to 0.1nm noise bandwidth
- OSNR: measured OSNR

File Management

Storing OSCA measurements

If Auto store has been selected, then results will be saved automatically.
If not, or if you want to save the results under another name, directory etc.:

1. Click on **FILE** key
2. Click on **Save** > **Save**.
3. Enter a filename in the edition keypad.
4. Click on **Enter** to save the trace.
   The trace is saved with the extension ".DCR"

Recalling OSCA files

Once an OSCA file has been stored, recall it using the **Explorer**:

1 Press **FILE** to open the Explorer.

2 Select the directory and then the file to open.

3 Press the **Load** soft key.

4 Press **View Trace(s)** or **Load Trace + Config.**
The selected file is opened.

For further information on file management, see Chapter 20 “File management”.

10

Polarization Mode Dispersion Measurement

This chapter describes the different steps in carrying out a PMD measurement with a Platform 8000 equipped with a 81PMD / 81DISPAP / 81MRDISPAP Module.

The topics discussed in this chapter are as follows:

It is assumed that you are familiar with the operation of the Platform 8000, the OBS-5XX (Optical Broadband Source) or 81BBSxx (BroadBand Source).

Recommended equipment

To perform a PMD measurement, the following equipment is recommended:

- Platform 8000 with a module as mentioned above, and associated optical connectors.
- OBS-5XX Optical Broadband Source, or 81BBS1A and 81BBS2A Optical broad-band source modules.
- Fiber inspection scope with associated optical connector tips.
- Cleaning kit.
- Two fiber patchcords with required optical connectors.

> **NOTE**
> Method used to measure the Polarization Mode Dispersion (PMD) is described in the Reference Guide to Fiber Optic Testing - Vol2.

> **NOTE**
> The PMD value obtained by the fixe analyzer method is the mean DGD value, also designated as «PMD value».

PMD Activation and self calibration

1. Select the **PMD** function in the Instrument **HOME** page using touchscreen 

.

2. Press the button **RESULTS** to display the auto-calibration status. A bargraph «**tuning in progress»** informs of the progression status of the calibration at the bottom of the screen. Wait for the calibration to be fully completed before continuing.

3. Press the button **SETUP** to access to the configuration menu for PMD. Select a parameter to modify it.

Loading a configuration file

To load the configuration file to be used for PMD test:

1. Press **SETUP** hard key.
2. On bottom right of setup page, press **Load Config.** menu key.
3. In the Explorer, select the desired file configuration
4. Press **Load Config.** menu keys.
   A beep is emitted to validate the selection of the configuration file.
   The software automatically brings you back to setup page.

NOTE
Most of the configuration files are available into the Platform in `disk/config/PMD`.

Setup menu

To access the PMD test setup menu, press the **SETUP** button on the Platform 8000.

You can choose the default values by pressing the **Test Auto** key or define your own configuration.

The softkey is available when one header is selected.

In **Test Auto** configuration, the setups below are provided.

Acquisition

– Sweep[1]: Single
– Averaging acquisition: Auto
– Long term: No

Analysis

– Coupling: Strong
– Amplified Link: No
– Measurement Band; Auto

Link

– Fiber Nbr Increment: Yes

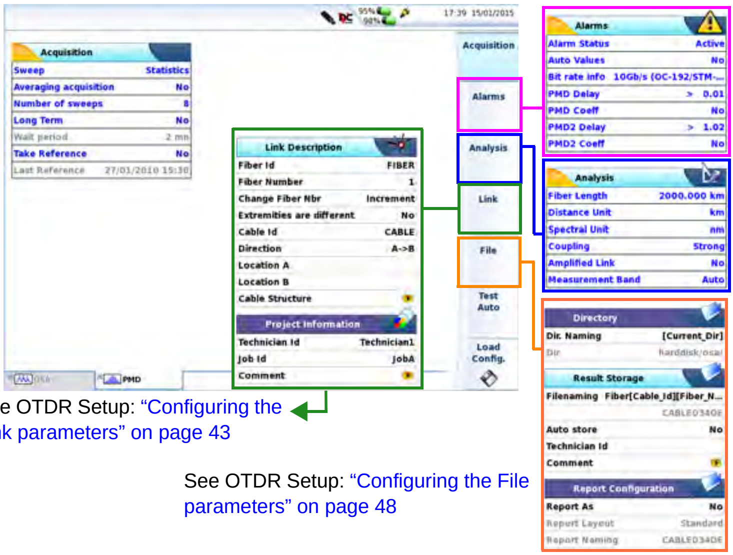
1.Does not apply with 81DISPAP/81MRDISPAP modules used with a PSM

File

– Filenaming: Auto : [Cable_Id][Fiber_Num][Direction]

– Auto store: Yes

Figure 169 PMD Test setup menu



See OTDR Setup: “Configuring the Link parameters” on page 43

See OTDR Setup: “Configuring the File parameters” on page 48

Acquisition parameters

> **NOTE**
> When the composite power of the input signal is higher than +20 dBm, a warning is displayed and the signal is cut off.

Acquisition band (only available with 81DISPAP modules)

OESCL Acquisition will be performed on the full band.

SCL Acquisition will only be performed on S, C and L bands.

Sweep (Not available when used with the Polarisation scrambler Module in High Resolution PMD mode)

Continue	Continuous measurement with a trace refresh and a real-time display of the results.
Single	Single measurement with associated results displayed.
Statistics	A set of measurements can be performed providing result statistics. This mode also gives access to the following parameters: **Long Term** and **Number of sweeps**.

Averaging acquisition

It enables to improve the dynamic range of the measurement by reducing the noise level. It is recommended to use the Auto mode and configure a manual averaging if needed only.

No	No averaging of the acquisition sample.
Low	Low averaging (4 samples).
Medium	Medium averaging (16 samples).
High	High averaging (32 samples).
Auto	Averaging automatically selected.

NOTE
An increase of the averaging can improve the dynamic range.

Power Level

No	No receive power level indication.
Yes	Receive power level is indicated in bar graph.

NOTE
When **Yes** selected, acquisition stops if not enough power is received.

Make zero (Only when used with the Polarization scrambler module in High Resolution PMD mode)

It enables to perform the reference of the 81BBS1A broadband source module before a measurement (see “Performing the reference” on page 347).

Last zero (Only when used with the Polarization scrambler module in High Resolution PMD mode)

This parameter displays the date and time of the last reference.

Number of sweeps (not available when used with the Polarization scrambler module in High Resolution PMD mode)

Number of acquisitions from 2 to 1000.

Long term (Only when used with the Polarization scrambler module in High Resolution PMD mode)

Enables to repeat the measurement defined by the number of sweeps, over a given period and to obtain statistical results:

None	Samples are displayed one after the other;
Manual	Requires the user to press the **Stop Wait** button to start the next sample.
Period	Defines time between 2 samples. To be configured with wait period parameter.

Wait Period

The Wait Period parameter allows to enter a time between 2 acquisition samples (only active if **Long Term** is positioned on **Period**)

- Increments of 5 seconds to 24 hours.

High Dynamic (only available with 81DISPAP modules)

Auto	The Dynamic range is automatically selected
No	High dynamic mode is not used for measurement
Yes	High dynamic mode is selected for measurement

Alarms parameters

In the **Setup** page, press **Alarms** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Alarms**).

Alarms Status

None No Pass/Fail thresholds selected.

Active Pass/Fail analysis will be made upon defined thresholds: auto values or delay.

Auto Values

No Threshold values entered manually.

Yes Threshold values automatically calculated according to the bit rate info selection.

Bit rate info.

This table provides the PMD thresholds according to the transmission bit rate. Use the direction keys ◀ and ▶ or touchscreen for selection.

Delay / Coeff

PMD Delay Maximum allowable delay.

PMD Coeff. Maximum allowable PMD coefficient.

PMD2 Delay Maximum allowable second order PMD delay (Only if **Coupling** is set to **Strong**)

PMD2 Coeff. Maximum allowable second order PMD coefficient (Only if **Coupling** is set to **Strong**)

Delay and coefficient values for PMD and PMD2 can be modified using the **Edit Number** key.

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

NOTE

The key **Copy Setup For AP/CD,** displayed if one parameter is selected, allows to apply the PMD configuration to the other selected function(s) of the 81DISPAP or 81MRDISPAP module.

Fiber length

Unknown	If you do not know the fiber length
Distance	Press **Edit Number** to enter fiber distance: Min=0.100 km / Max=20000 km

The fiber length must be set to calculate the PMD coefficient.

Distance Unit

When the fiber length is manually entered, choose the distance unit

Km	Distance unit defined in kilometers.
Kfeet	Distance unit defined in kilofeet.
Miles	Distance unit defined in miles.

Spectral Unit

Select Spectral unit: **THz** or **nm**.

If the softkey **PMD** is set to **Standard** mode, any measurement will be set to the strong mode Coupling and the wavelength range to Auto.

The **Expert** mode is to be used with measurement through EDFA. When selected, the **Expert** mode allows to define the coupling, to define if an amplified link is used and to set the wavelength range.

Coupling

Strong	For standard singlemode fibers
Weak	For polarization-maintained fibers and components.

Amplified link

Select Yes when measuring through optical amplifiers

Measurement Band

Auto / **C Band** / **L Band** / **C+ L Band** / **Manual**
When Manual is selected, the Measurement Start and End must be set (in nm or THz according to the unit defined in **Spectral Unit** parameter).

Saving configuration in a file

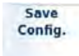
Once parameters have been configured, they can be kept in memory and saved in a configuration file.

This configuration file can then be recalled in order to be recalled for future PMD acquisitions.

To save parameters in a configuration file:

1 If necessary, press **SETUP** to return to **Setup** page.

2 Select one parameter in one of the setup page (acquisition, link..)

3 Press **Save Config.** menu key 

4 Enter a name for the configuration file using the edition keypad (max 20 characters).

> **NOTE**
> Configuration file is saved in the directory `disk/config/PMD`.

5 Press **Enter** 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 **Explorer** page.

Performing a PMD measurement with a PMD test module

The following modules apply:

- E81PMD
- E81DISPAP
- E81MRDISPAP

Handheld or module broadband sources can be used to perform PMD measurements:

- OBS-55
- OBS-500
- OBS-550

- 81BBS1A
- 81BBS2A

The following procedure considers the use of an OBS-5xx type source.

Remote operator

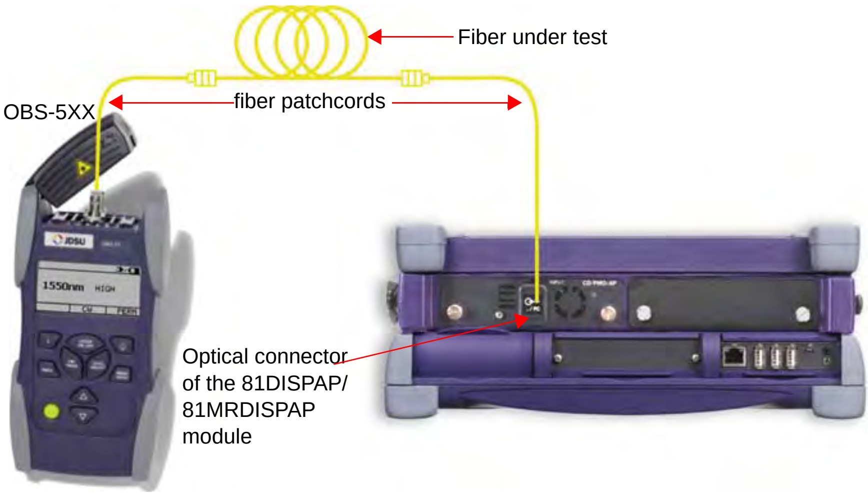
1. Inspect and clean connectors with appropriate methods as described in IEC 61300-3-35
2. Connect the fiber under test to the optical connector of the broadband source using required mating solution such as a fiber patchcord.
3. Press the **ON/OFF** button to switch on the OBS-5XX broadband source.
4. Press **Laser On/Off** of the OBS-55 or the "Active" button of the OBS-5x0 to activate the source transmission.

> **NOTE**
> Make sure the test mode is set to "PMD" when using the OBS-500 or OBS-550.

Local operator

1. Inspect and clean connectors with appropriate methods as described in IEC 61300-3-35
2. Connect the fiber under test to the optical connector of the test module using required mating solution such as a fiber patchcord, as shown in Figure 170.
3. Select the PMD function in the Instrument Setup menu and wait for the module self calibration (tuning).
4. Press the **SETUP** button to access the PMD Test Setup menu.
5. Select the appropriate PMD parameters according to your application as defined earlier in this chapter.
6. Press the **START/STOP** button and wait for the results to be displayed.

Figure 170 PMD measurement with an ODM plug-in



Performing a High Resolution PMD measurement

The HR PMD measurement requires a polarization scrambler module (PSM) to be connected to the PMD module, and the use of the 81BBS1A broadband source module at the other end of the fiber under test.

Selecting the HR-PMD function

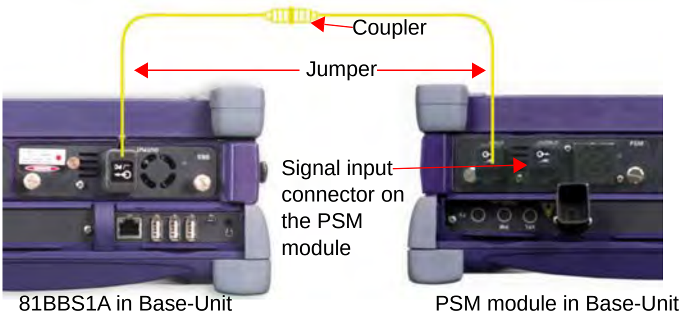
1. Press the **HOME** button
2. On the **Home** page, validate the **HR-PMD** icon of the PSM module.

Performing the reference

It is mandatory to perform a PMD reference prior to the first measurement.

1 To perform a reference, connect your Broadband source 81BBS1A to the PSM module as shown below:

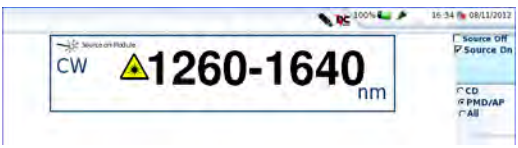
Figure 171 Interconnection of 81BBS1A and PSM modules



2 Press the **RESULTS** hardkey. A bar graph informs of the progression status of the module self-calibration. Wait for completion before continuing

3 On the BBS **Results** tab, select **Source On**, enter safety password 4877, and select **PMD/AP** function using the soft key.

Figure 172 BBS activation



4 Go to the PMD Setup page, and press the **Acq. Ref.** softkey.

> **NOTE**
> If the 81DISPAP or 81MRDISPAP module with the HR function is used for the first time, pressing the **SETUP** button directly open the Reference Setup page.

5 Set the parameter **Make Zero** to **Yes** in the configuration menu.

> **NOTE**
> When performing a PMD reference, acquisition parameters are not taken in account, except for averaging.

6 Press the button **Start/Stop** to start referencing of the broadband source.

> **NOTE**
> Performing a reference measurement can take several minutes (minimum 2 min 30).

Resulting reference will then be displayed and message "*ready to measure*" confirms the reference is valid.

If the reference measurement does not provide a correct result, check the following points:

Error message	Possible problem	Possible solution
Acquisition impossible Hit any key to continue	Auto-calibration is not completed	Wait for the calibration to be terminated
Signal level too low! Check source and connections Hit any key to continue	The 81BBS1A is not switched on	Press the **On/Off** button to switch on the 81BBS1A, check if **Make reference** is still set to **Yes**, then repeat step 6
	The 81BBS1A battery is too low	Check if the **LOW-BATT** red led is lighted. If yes, then recharge the battery.
	Defective connections	Check that the cables are properly connected, and the notches on the connectors are correctly aligned.

Performing the measurement

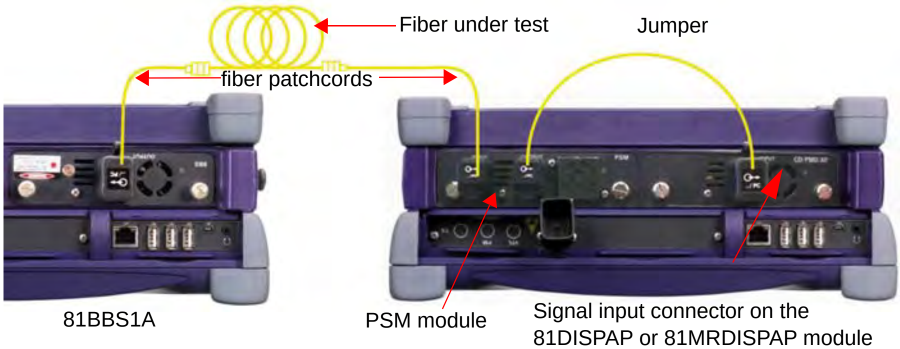
When the reference measurement of the broadband source has been completed, use the following procedure to start testing:

1 Press the **Setup** button to access the PMD configuration menu

2 Select the appropriate PMD test parameters according to your application as earlier defined in this chapter.

3 Press the **START/STOP** button to start measuring.

Figure 173 HR PMD measurement



Display of results

Spectrum/FFT menu key

The key **Spectrum / FFT** enables you to display:

- The spectrum representing the power (in dBm) according to the frequency (in THz) or wavelength (in nm).
- The FFT curve and PMD information (delay & coefficient) according to the Fast Fourier Transform Method. The FFT trace represents the PMD delay in ps.

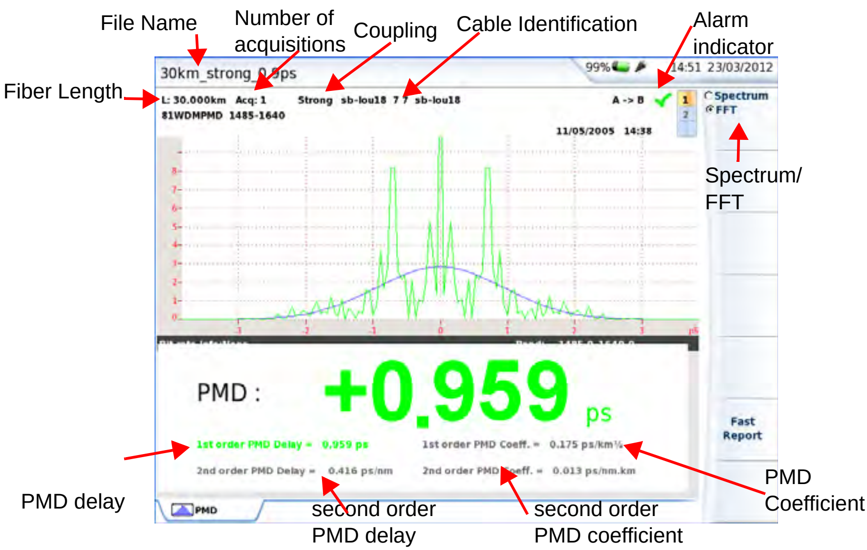
Display of PMD results

The PMD results screen is split in 3 main areas. from top to bottom::

- The information bar with:
  - module reference
  - number of acquisitions used for the statistics (Acq)
  - wavelength range (1525-1610 nm),
  - fiber number (N:)
  - fiber length in defined unit
  - date and time of acquisition.
  - file name (if result stored in memory)
  - Pass/fail indication
- The FFT curve and its gaussian shape (for strong mode coupling only).
- the table of results: PMD delay and coefficient, second order PMD (PMD2) delay and coefficient. This table is different if statistic measurement is selected (see “Statistics results” on page 353).

The results are displayed in black when no alarm is defined, in green if alarms are within the threshold defined in the **Setup** menu and in red if the alarms exceed the thresholds defined.

Figure 174 Example of PMD result (FFT view)



NOTE
When several acquisitions are performed, the trace resulting from the last acquisition is displayed.

Cursors, in spectrum display

To move the cursor(s) on the trace:

1 Press **Cursor A / Cursor B** menu key to select one or both cursor(s).

2 Use the direction arrow keys ▲ and ▼ or ◀ and ▶ .
or
With touchscreen, directly press on trace to position the cursor(s)
The coordinates of each cursor intersection with the trace are indicated underneath the trace:

Zoom access, in spectrum display

In order to zoom in on the trace:

1 Press the **Zoom/Shift** menu key to display **Zoom**,

2 Use the direction arrow keys to zoom in either horizontally or vertically.
or
Use touchscreen to position upper left and bottom right location of the zoom area
The zoom is made around the selected cursor(s).

NOTE
To reset the zoom and see the full trace, press **Full scale**.

Trace shift access, in spectrum display

To shift the trace horizontally or vertically:

1 Press the **Zoom/Shift** soft key to select **Shift** function.

2 Use the direction arrow keys
or
With touchscreen, touch and hold the screen to make the required shift.

Statistics results

Statistics can be performed on a series of samples defined by the number of samples and the time between two consecutive samples (Wait period). Refer to "Acquisition parameters" on page 340 for parameter setup.

To display the statistic results press the **RESULTS** button.

In Spectrum display, the results page gives access to several functions:

- Cursors A/B: see "Cursors, in spectrum display" on page 352
- Zoom: see "Zoom access, in spectrum display" on page 352
- Shift: see "Trace shift access, in spectrum display" on page 352

Table of results

Current value, average value, min value, max. value and standard deviation (Sdev) are provided in the table for each of the 4 parameters: PMD delay, PMD coefficient, second order PMD delay and second order PMD coefficient. The statistic results are automatically updated with each acquisition.

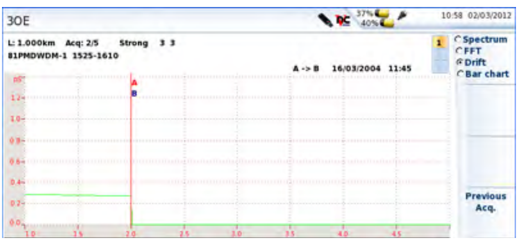
Graphics display

When Statistic mode is selected, the button **Spectrum/FFT** becomes **Spectrum/FFT/ Drift/Barchart**.

This button allows therefore to display alternatively:

- Delay drift during the acquisition time.

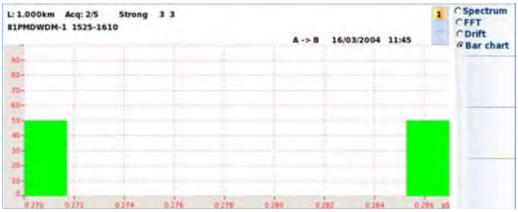
Figure 175 Example of drift



In Drift mode, the cursor can be moved on each measurement by clicking on the key **Previous Acq.** or **Next Acq.**

- The histogram providing the delay value for each acquisition.

Figure 176 Example of histogram



Information messages

Under the trace, at the right-hand corner a message indicates the current status of the trace or proposes to start next acquisition (by clicking on **Stop wait**).

Signal acquisition

This message indicates that an acquisition is in progress.

To stop an acquisition, whatever the mode is used, press the **START/STOP** button.

Next measurement

After each acquisition in the **Statistic** mode and when **Long term** has bee set on **Period** or **Manual**, this message requests that you select **Stop Wait**. The Platform 8000 then displays Signal Acquisition.

Ready to start test cycle

This message appears after a acquisition cycle is finished, when you are in statistic mode. Press **START/STOP** to start a new cycle.

Ready to start Measurement

The message is displayed after the completion of an acquisition sample or a Reference measurement.

Waiting bar graph

When **Statistic** mode is used and **Long term** is set to **Period**, a bargraph displays, the remaining time before the next acquisition.

Saving the trace and generating a report

Once the results page is displayed, the trace can be saved and a report can be generated directly from the results screen.

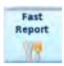
Saving results and creating a report from results page

This function is available exclusively in FTT view, in the results page. If Drift or Bar chart view is selected (in statistic mode), the report can be generated but will be generated for FTT view.

To generate a report:

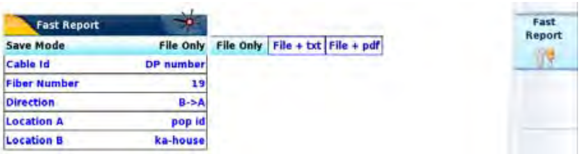
1. Select **FFT** view with the menu key 

(or menu key 

with statistics results).
2. Press **Fast Report** menu key 

.
A menu displays under the trace.
3. In the menu, configure the file saving (and the report).

Figure 177 Fast report configuration



a In the **Save Mode** parameter, select:

txt file select **Yes** to save the results in a blts file and to generate a txt file of the results.

pdf file select **Yes** to save the results in a blts file and to generate a report in a pdf file

b In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.

c Modify the **Fiber Number**/**Fiber Code** using the key ▶.

The parameter is different according to the Cable Structure configuration (see “Cable structure” on page 45)

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

4 Once saving is configured as wished, press **Save All** menu key

5 Enter a name for the file in the edition keypad

or

Click on **Auto Filenaming** menu key to apply the file name defined in the Setup screen, in **Filenaming** parameter (see “Filenaming” on page 50).

6 Press **Enter** to validate.

NOTE

The pmd file and the txt/pdf file will have the same name.

The icon displays during saving process.

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

> **NOTE**
> The trace and the report are saved in the last storage media and directory selected.

Opening the report

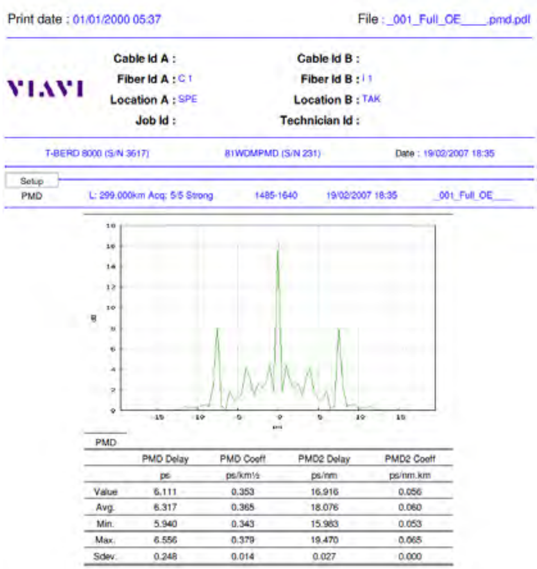
To open the report:

1 Press **FILE** hardkey

2 In the **Explorer** page, in the directory selected, select the file/report.
For the txt file: *trace file_pmd.txt*
For the pdf file: *trace file.pmd.pdf*.

3 Press **Load**.
The file opens onto the MTS/T-BERD..

Figure 178 Example of PMD Report in pdf



Print date : 01/01/2000 05:37 File : _001_Full_OE____.pmd.pdl

Cable Id A :
Fiber Id A : C 1
Location A : SPE
Job Id :

Cable Id B :
Fiber Id B : I 1
Location B : TAK
Technician Id :

T-BERD 8000 (S/N 3617) 81WDMPMD (S/N 231) Date : 19/02/2007 18:35

Setup

PMD L: 299.000km Acq: 5/5 Strong 1485-1640 19/02/2007 18:35 _001_Full_OE____

PMD

	PMD Delay	PMD Coeff	PMD2 Delay	PMD2 Coeff
	ps	ps/km½	ps/nm	ps/nm.km
Value	6.111	0.353	16.916	0.056
Avg.	6.317	0.365	18.076	0.060
Min.	5.940	0.343	15.983	0.053
Max.	6.556	0.379	19.470	0.065
Sdev.	0.248	0.014	0.027	0.000

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 onto the T-BERD/MTS 8000V2 or 6000/6000A (see "Generating pdf report(s)" on page 545).

Recalling PMD files

Once a PMD file has been stored, it can be recalled using the Explorer:

1 Press **FILE** to open the Explorer.

2 Select the directory and then the file to open

3 Press the **Load soft key.**

4 Press **View Trace(s)** or **Load Trace + Config.**
The selected file is opened

For further informations on file management, see Chapter 20 “File management”.

PMD standards and limits

Some organizations and standards are stating that 10% of the bit rate for the PMD delay can be tolerated for a system without disturbing the network performance by more than 1 dB loss, at 1550 nm, with NRZ coding:

Bit Rate Per Channel	SDH	SONET	Equivalent Time-slot	PMD Delay Limit
2.5 Gbit/s	STM-16	OC-48	401 ps	40 ps
10 Gbit/s	STM-64	OC-192	100 ps	10 ps
40 Gbit/s	STM-256	OC-768	25.12 ps	2.5 ps
10G Ethernet	Ethernet	-	-	5 ps

11

I-PMD Measurement

This chapter describes the different steps in carrying out an In-Service and In-Band PMD-OSNR with a T-BERD/MTS 8000 V2 equipped with 81IPMD and 81PSM Modules.

VIAVI's non-intrusive technique used in I-PMD enables to measure PMD in a link that is in-service by using the transmission DWDM channels.

VIAVI unique I-PMD test solution allows troubleshooting faulty channels of 10G / 40G transmission systems and qualifying fiber networks for future upgrade plans up to 100G without turning the entire network down.

> **This chapter refers exclusively to I-PMD measurement.**
> To get information on HR OSA measurement, refer to Chapter 12.

The topics discussed in this chapter are as follows:

It is assumed that you are familiar with the operation of the Platform 8000.

Recommended equipment

To perform an In-Band PMD measurement, the following equipment is recommended:

- T-BERD/MTS 8000V2 mainframe with a 81IPMD module, and associated optical connectors.
- one PSM Module and associated optical connectors.
- Fiber inspection scope with associated optical connector tips.
- Cleaning kit.

I-PMD Activation and Configuration

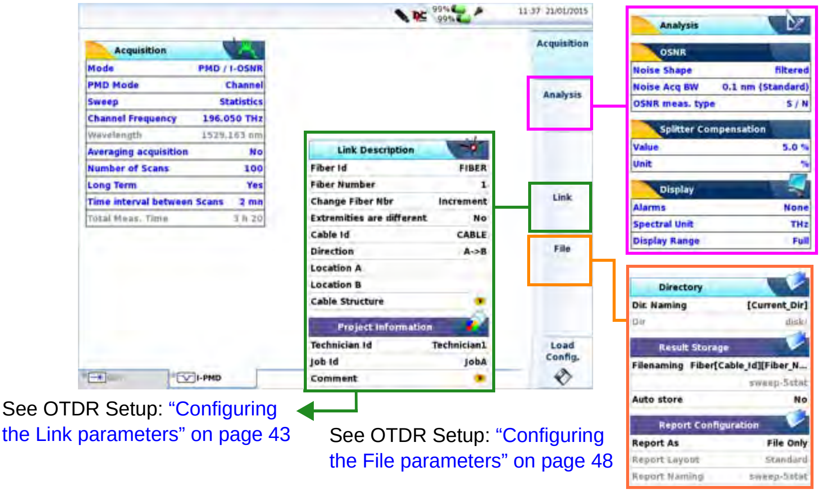
Activating the IPMD function

Once the Base-Unit is correctly configured for I-PMD Measurement:

1. Press **HOME** hard key
2. In the Home page, select I-PMD icon 

3. Press **SETUP** hard key to configure the acquisition.
   The following screen displays:

Figure 179 I-PMD Test Setup menu



Loading a configuration file

To load the configuration file to be used for IPMD test:

1 Press **SETUP** hard key.

2 On bottom right of setup page, press **Load Config.** menu key.

3 In the Explorer, select the desired file configuration

4 Press **Load Config.** menu keys.
A beep is emitted to validate the selection of the configuration file.
The software automatically brings you back to setup page.

> **NOTE**
> Most of the configuration files are available into the Platform in `disk/config/IPMD`.

Acquisition parameters

In the **Setup** screen,

1 First, select **PMD/I-OSNR** on the parameter **Mode**,

2 Then select the following parameters for acquisition:

PMD Mode

Select the acquisition mode in the parameter:

Channel	Acquisition will be performed on one G.694.1 Channel
Grid	Acquisition will be performed on multiple channels defined in a grid
BBS	Acquisition will be performed with BBS inserted, instead of Transmission signals (intrusive measurement, network should be down and replaced by a BBS module - see Chapter 15 “Broadband source BBS”).

Sweep

HR OSA Acquisition will be performed on a given frequency range (see sweep range menu to a complete description). In this mode, OSNR are measured «out band».

Channel Frequency

If **Channel** is selected in the **Mode** parameter, adjust the frequency of the channel to analyze (using the **Edit Number** menu key).

The **Wavelength** parameter is automatically configured according to channel frequency defined.

Sweep range

If **Sweep** mode is selected in the **Mode** parameter, select the frequency range in this sub-menu:

Full	Full frequency range is used for measurement
Start/End	Select manually the Start/End frequency
Center/Span	Select manually the Center/Span frequency

Number of Scans

Define the number of scans to perform (from 1 to 1000). This mode also gives access to the following parameters: **Long Term** and **Time Interval between scan** if more than 1 scan is selected.

It is also possible to perform continuous scans, by setting the parameter to **Continue** mode.

Averaging acquisition

Define the number of acquisitions to average for a scan: **from 1 to 64**.

Long Term

Enable to define a fix time between two scans:

No	no time between two scans;
Yes	fix time between two scans (value defined in the following parameter).

Time interval between scans

Define the time between two scans, from 30 seconds to 24 hours.

Total Meas. Time

This parameter cannot be modified but informs of the duration time of the measurement (according to parameters previously defined).

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

OSNR

This parameter is not available if PMD Mode is set to BBS.

To modify these parameters, go to the **OSNR** line.

Noise Shape

Filtered	evaluation for mixed filter shaped ROADM networks
Unfiltered	evaluation for networks without optical filters

Noise Acq. Bandwidth

Reference bandwidth used for the acquisition of noise

Standard 0.1 nm

Values lie between 0.05 nm and 1.0 nm.

OSNR meas.type

Selection of OSNR calculation: **S / N** or **(S+N)/N**

Splitter Compensation

When the measurement is made through a Test Access Port (also known as a TAP), it is possible to compensate for the loss induced by this element and to display the actual power level of the system.

Value

Yes: activation of compensation and selection of value: from 1 to 30 dB (by increments of 1) or 1 to 99% (by increments of 0.1%).

Unit

Choice of compensation in dB or percentage (%).

Define the Splitter Compensation using the numeric keypad (displayed via the **Edit Number** menu key) or left/right direction keys.

For example, with a 10 dB splitter, the results will be augmented by 10 dB. The trace will be offset upwards by 10 dB. A channel measured at -30 dBm will be displayed -20 dBm.

Display

Alarms

To define alarm thresholds for IPMD measurement , select **Alarm** parameter, and in the sub-menu displayed, configure the alarm values:

None — **No**, **Pass**/**Fail** thresholds selected.

Active — **Pass**/**Fail** analysis will be made upon defined thresholds: auto values or delay.

Auto Values

- **No** — Threshold delay values entered manually.
- **Yes** — Threshold delay values automatically calculated according to the bit rate info selection.

Bit rate info. — This table provides the PMD thresholds according to the transmission bit rate. Use the direction keys ◀ and ▶ for selection.

PMD Delay — Maximum allowable delay.

Delay values for PMD can be modified using the **Edit Number** key.

Spectral Unit

Select the spectral unit between **THz** and **nm**.

Display range (not available in BBS mode)

It enables to define the display width for a single channel:

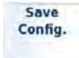
Full	full display width
+/- 40G	display from +/- 40GHz of the central frequency
+/- 20G	display from +/- 20GHz of the central frequency
+/- 10G	display from +/- 10GHz of the central frequency

Saving configuration in a file

Once parameters have been configured, they can be kept in memory and saved in a configuration file.

This configuration file can then be recalled in order to be recalled for future IPMD acquisitions.

To save parameters in a configuration file:

1. If necessary, press **SETUP** to return to **Setup** page.
2. Select one parameter in one of the setup page (acquisition, link..)
3. Press **Save Config.** menu key 

4. Enter a name for the configuration file using the edition keypad (max 20 characters).

> **NOTE**
> Configuration file is saved in the directory `disk/config/IPMD`.

5. Press **Enter** to validate
   A sound is emitted to indicate the file is saved.

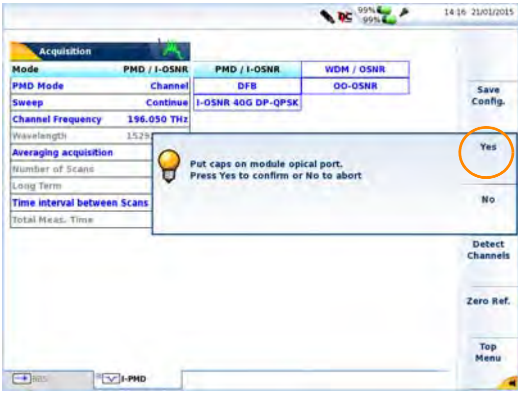
The configuration file is saved with the extension ".fo_cfg" (icon ) and can be recalled at any time from the **Explorer** page.

Performing a Zero Reference

For High OSNR accuracy, it is recommended to perform a Zero Referencing before first use of the product:

1. Press **SETUP** hard key to reach Setup screen
2. Put caps on the module optical port
3. Press **Zero Ref.** menu key
4. Confirm the reference process pressing **Yes**.

Figure 180 Zero reference screen



Performing an In-Band PMD-OSNR measurement with an I-PMD Module

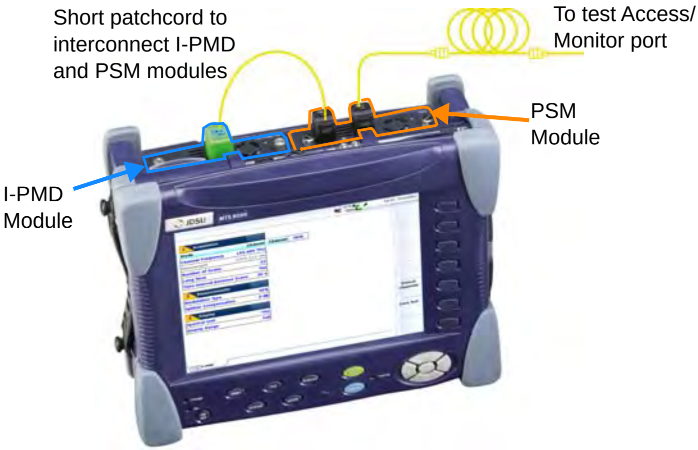
Installation

Once I-PMD setup has been correctly configured:

1 Connect a jumper between the I-PMD module and the PSM output port.

2 Connect the fiber to be tested to the PSM input port.

Figure 181 Modules interconnections



Detection of Channels

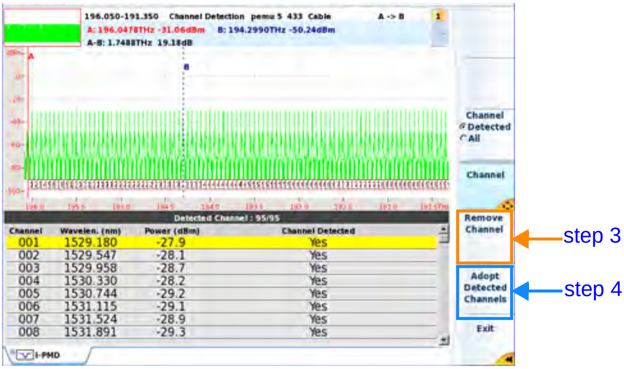
If the list of DWDM channels to be tested is unknown, it is possible to run a quick scan in order to detect all available frequencies:

1 Press **Detect Channels** menu key in order to start the detection of channels.

2 Wait for the end of detection

The optical spectrum with all detected channels is displayed, as shown below:

Figure 182 Channel detection



3 Check all channels have been detected.
If not, add or remove channels:

a Press **Table Contents** menu key

b Press **Add Channel** or **Remove Channel** menu key.

4 Press **Adopt Detected Channels** menu key to adopt detected channels to the acquisition grid.

In band PMD-OSNR measurement

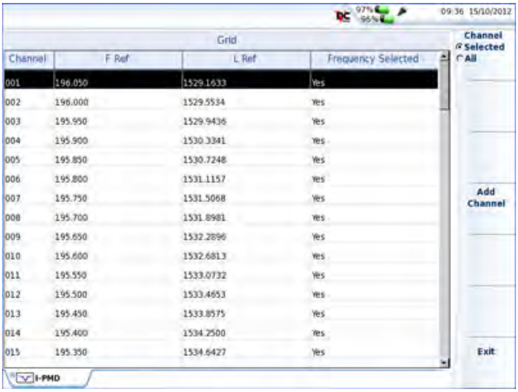
Once the Grid is entered (with detection channels)

1 Press **SETUP** hard key to return to I-PMD Setup screen.

2 In the **Mode** parameter, select **Grid**.

3 Press **View Setup Grid** menu key to visualize the adopted grid.

Figure 183 View Setup Grid



If necessary, channels can be added/removed from this screen.

4 Press **Exit** to return to the **Setup** menu

5 Enter the number of scans to be performed (see Figure 179 on page 363) using the parameter **Number of Scans**,.

This number depends on the number of channels that will be used.

6 Press **START** hard key to launch the scan, and wait for the end of measurement.

Display of results

The key **Osa / PMD** enables you to display either:

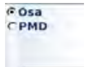
- The optical spectrum of the tested channels

  or

- The PMD results page, including the statistical measurements if more than one scan has been performed.

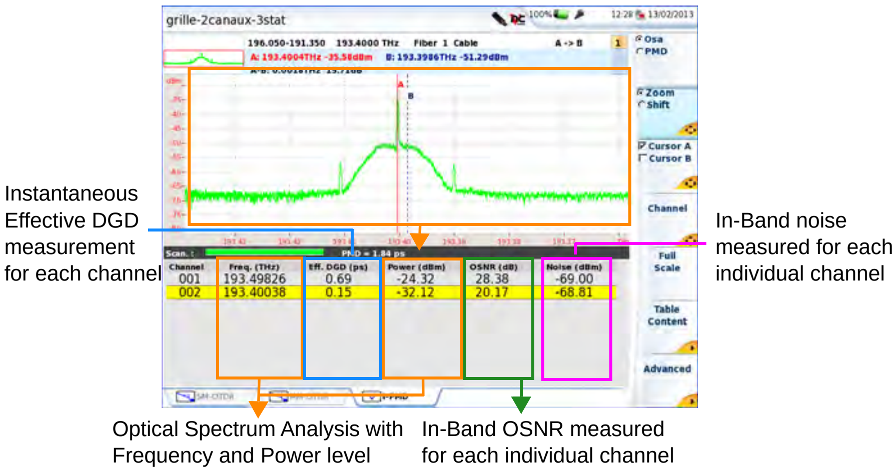
OSA Results

OSA menu key

1 Check **Osa** function is selected on the menu key  .

The spectrum results page is displayed as below:

Figure 184 Example of OSA Results



The OSA results screen is split in 3 main areas. from top to bottom:

The information bar with:

- module reference
- frequency range
- frequency of the selected channel
- fiber number (N:)
- date and time of acquisition.
- file name (if result stored in memory)

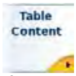
The table of results (without statistics):

If only one scan is performed, no statistics are available, and the results table contains the following results:

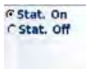
- the channel number
- the frequency or the wavelength of the channel, according to the unit selected in the Setup menu
- the effective DGD (in ps)
- the level of the channel in dBm
- the In-Band OSNR for the channel, in dB
- the In-Band noise for the channel, in dBm

The table of results (with statistics):

If more than one scan is performed, statistics are available and can be displayed:

1 Press the menu key 

.

2 Select **Stat. On** with the menu key 

.

The menu key 

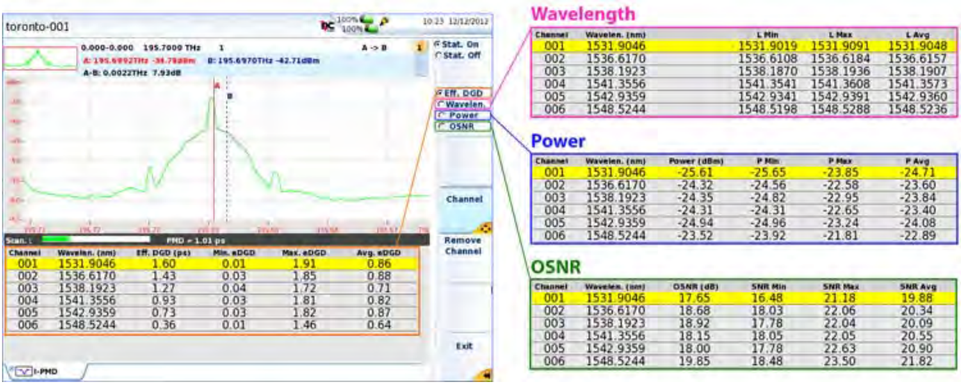
turns active.

3 Select the statistics to be displayed: **Eff. DGD** / **Wavelen.** / **Power** / **OSNR**.

- The table of results with statistics contains the following elements:

<table>
<tr><th></th><th>Column 1</th><th>Column 2</th><th>Column 3</th><th>Column 4</th><th>Column 5</th><th>Column 6</th></tr>
<tr><td>Eff. DGD</td><td rowspan="4">Channel number</td><td rowspan="4">Frequency / Wavelength</td><td>Effective DGD (ps)</td><td>Min eDGD</td><td>Max eDGD</td><td>Avg eDGD</td></tr>
<tr><td>Wavelen.</td><td></td><td>Frequency/ Length Min.</td><td>Frequency/ Length Max.</td><td>Frequency/ Length Avg.</td></tr>
<tr><td>Power</td><td>Power (dBm)</td><td>Power Min.</td><td>Power Max.</td><td>Power Avg.</td></tr>
<tr><td>OSNR</td><td>OSNR (dB)</td><td>SNR Min.</td><td>SNR Max.</td><td>SNR Avg.</td></tr>
</table>

Figure 185 Example of OSA Results with statistics



NOTE

When several scans are performed, only the trace resulting from the last scan is displayed.

Moving the cursors

To move the cursor(s) on the trace:

1. Press soft key **Cursor A / Cursor B** menu key,
2. Use the direction arrow keys ◀ / ▶
   or
   Touch the spectrum display at the location where the cursor must be positioned.
   The coordinates of each cursor intersection with the trace are indicated above the trace.

Zoom on trace

In order to zoom in on the trace:

1. Press the **Zoom/Shift** menu key to select **Zoom**.

2 Use the direction keys ▲ / ▼ or ◀ / ▶ to zoom in either horizontally or vertically.

or

Use the touchscreen to position upper left and bottom right location of the zoom area

The zoom is made around the selected cursor(s).

> **NOTE**
> To reset the zoom and see the full trace, press **Full scale**.

Trace shift

To shift the trace horizontally or vertically:

1 Press the **Zoom/Shift** soft key to select **Shift** function.

2 Use the direction arrow keys or touch and hold the screen to make the required shift.

Channel key

In order to move from channel to channel:

1 Press **Channel** menu key

2 Use direction keys ▲ and ▼ or ◀ and ▶ or touch the targeted channel.
This will change the active channel in the results table and in the spectrum display.

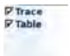
Advanced key

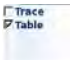
Trace/Table menu key: the table can be displayed either:

- in one single line 

.

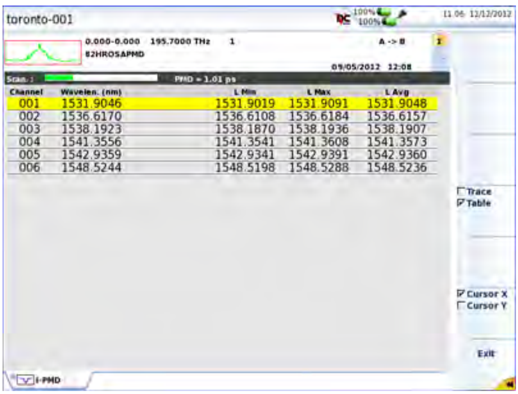
Figure 186 Results table - one single line

- on half of the screen 

 (see Figure 184 on page 373)
- on the whole screen 

 :

Figure 187 Results table in full screen



Cursor X / Cursor Y menu key: Two types of cursors can be defined:

– **Cursor on X**: only a vertical bar is present.

– **Cursor on X and Y**: there is a vertical bar and a horizontal bar. The intersection between these two bars is placed on the trace.

Each click on this key will alternatively insert or delete the check mark against **Cursor Y.**

Total Power A<->B menu key: allows to measure the total power between the A and B cursors:

a Place the cursors at the desired positions.

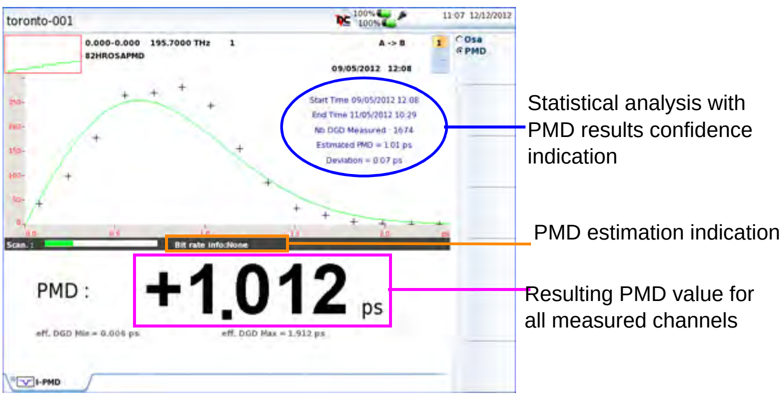
b Press the **Advanced** key, then **Total Power A<--->B**.

The space between the trace and the two cursors is greened out and the power is displayed in the form "P=xxxxdBm".

Pressing the key **Total Power A<-->B** a second time removes the result of the total power measurement.

PMD results

Figure 188 PMD Results page



Performing a PMD Measurement with BBS and IPMD Module

The following modules apply:

- E81PMD with E81PSM

Handheld or module broadband sources can be used to perform PMD measurements:

- OBS-55
- OBS-500
- OBS-550
- 81BBS2A (**the 81BBS1A cannot be used for this measurement**)

The following procedure considers the use of an OBS-5xx type source.

Remote operator

1. Inspect and clean connectors with appropriate methods as described in IEC 61300-3-35
2. Connect the fiber under test to the optical connector of the broadband source using required mating solution such as fiber patchcord.
3. Press the **ON/OFF** button to switch on the OBS-5XX broadband source.
4. Press **Laser On/Off** of the OBS-55 or the "Active" button of the OBS-5x0 to activate the source transmission.

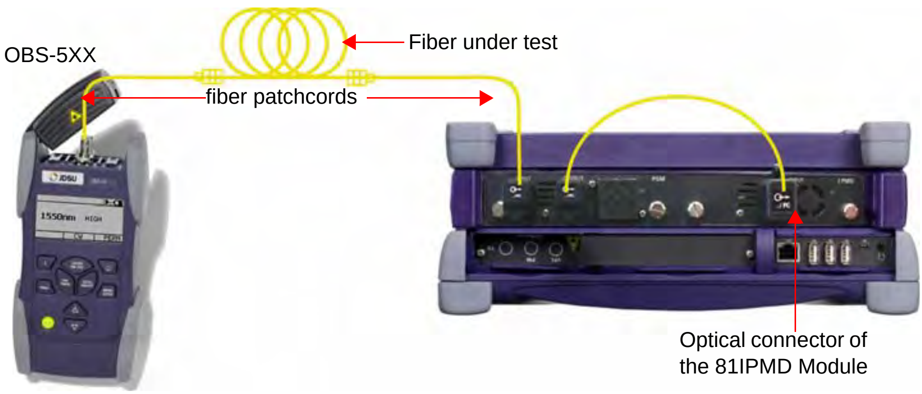
> **NOTE**
> Make sure the test mode is set to "PMD" when using the OBS-500 or OBS-550.

Local operator

1. Inspect and clean connectors with appropriate methods as described in IEC 61300-3-35
2. Connect the fiber under test to the optical connector of the test module using required mating solution such as a fiber patchcord, as shown in Figure 189 on page 380.

3. Select the I-PMD function in the **Home** page and wait for the module self calibration (tuning).
4. Press the **SETUP** button to access the IPMD Test Setup menu (see Figure 179 on page 363).
5. Select the BBS mode in the Setup menu in the **Mode** parameter.
6. Configure the other parameters as wished.
7. Press the **START/STOP** button and wait for the results to be displayed.

Figure 189 I-PMD measurement with a BBS module

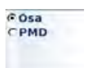


Display of results

The key **Osa / PMD** enables you to display either:

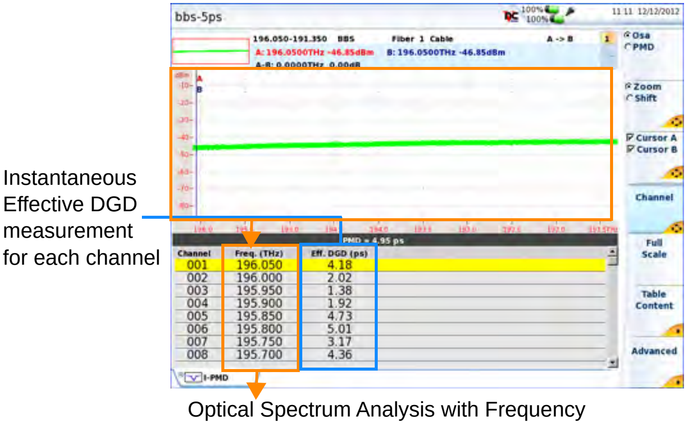
- The optical spectrum of the BBS
  or
- The PMD results page, including the statistical measurements (see description on Figure 188 on page 378).

OSA Results

1. Check **Osa** function is selected on the menu key 

.
   A results page as the following one is displayed:

Figure 190 Example of OSA BBS Results



The OSA results screen is split in 3 main areas. from top to bottom:

1 The information bar with:
- frequency range
- fiber number (N:)
- date and time of acquisition.
- file name (if result stored in memory)

2 The trace

3 The table of results contains the following results:
- the channel number
- the frequency or wavelength tested, according to the unit selected in the Setup menu
- the effective DGD (in ps)

If more than one scan is performed, statistics are available and can be displayed:

1 Press the menu key 

.

2 Select **Stat. On** with the menu key 

.

The menu key 

turns active.

The statistics for effective DGD display.

Figure 191 Example of OSA - BBS Results with statistics

Channel	Freq. (THz)	Eff. DGD (ps)	Min. eDGD	Max. eDGD	Avg. eDGD
064	192.900	36.55	36.55	36.55	36.55
065	192.850	3.36	3.36	3.36	3.36
066	192.800	47.52	47.52	47.52	47.52
067	192.750	36.25	36.25	36.25	36.25
068	192.700	36.71	36.71	36.71	36.71
069	192.650	38.98	38.98	38.98	38.98
070	192.600	43.09	43.09	43.09	43.09
071	192.550	40.64	40.64	40.64	40.64

NOTE
When several scans are performed, only the trace resulting from the last scan is displayed.

Functions on trace display

Several functions are available in results page, in OSA or PMD view, using the menu keys:

- **Cursors A/B**: see “Moving the cursors” on page 375
- **Zoom**: see “Zoom on trace” on page 375
- **Shift**: “Trace shift” on page 376
- **Channel**: see “Channel key” on page 376
- **Advanced** > **Trace/Table**: see “Advanced key” on page 376

File Management

Saving results

If **Auto store** is selected, results are saved automatically.
If not, or if you want to store the results under another name/directory etc.:

1. Click on the **FILE** key
2. Click on **Save** > **Save**.
3. Enter a filename in the edition keypad.
4. Click on **Enter** to save the trace.

The HR OSA and In-Band DGD-OSNR traces are stored with the extension ".PIB".

Recalling files

Once a file has been stored, it can be recalled using the Explorer:

1. Press **FILE** to open the Explorer.
2. Select the directory and then the file to open.
3. Press the **Load soft key.**
4. Press **View Trace(s)** or **Load Trace + Config.**
   The selected file is opened.

For further informations on file management, see Chapter 20 “File management”.

PMD standards and limits

Some organizations and standards are stating that 10% of the bit rate for the PMD delay can be tolerated for a system without disturbing the network performance by more than 1 dB loss, at 1550 nm, with NRZ coding:

Bit Rate Per Channel	SDH	SONET	Equivalent Time-slot	PMD Delay Limit
2.5 Gbit/s	STM-16	OC-48	401 ps	40 ps

Bit Rate Per Channel	SDH	SONET	Equivalent Time-slot	PMD Delay Limit
10 Gbit/s	STM-64	OC-192	100 ps	10 ps
40 Gbit/s	STM-256	OC-768	25.12 ps	2.5 ps
10G Ethernet	Ethernet	-	-	5 ps

12

High Resolution OSA Measurement

This chapter describes the different stages in carrying out a spectrum analysis of an optical signal, or analyzing effects from an optical components or network elements like DFB-sources by a Base Unit equipped with a High Resolution OSA.

> **NOTE**
> The HROSA-C and OSA610 series are available on T-BERD/MTS 8000 V2 and T-BERD/MTS 6000A V2platforms.

> **NOTE**
> Looking for the OSA-type and series Nr:
> - on T-BERD/MTS 8000V2 press **HOME** > **About**
> - on T-BERD/MTS 6000A V2 press **SYSTEM** > **Help** page.

The topics discussed in this chapter are as follows:

Cleaning of Connectors

Cleaning of the patchcord connector is extremely important to avoid damage to the input of the OSA. A dirty connection can irreversibly damage both surfaces, especially when working with high powers.

We highly recommend inspection of the patchcord before connecting it to the OSA.

Configuration of the instrument

The instrument configuration menu will be displayed directly after power up or by pressing the **HOME**-button.

The actual module status will be shown (**ON/OFF**) on system window

1 For configuring the OSA press the OSA-icon (by touchscreen), or select the function icon by arrow-keys and press **ENTER**.
2 Press **RESULT** button to see the OSA-result window.
   If the MTS / T-BERD 8000 V2/6000(A) is switched Off in this configuration, the next start up will directly start the to OSA-application, and display the result window.

For more details about the general MTS-configuration see the Base Unit manual.

For measurement, connect the fiber to be tested on the optical input of the selected module.

Kind of input connector:

- if the protection cap is green the optical input interface is a angled physical connector (APC-type)
- if it is a black protection cap, the interface type is physical connector (PC-type)

Loading a configuration file

To load the configuration file to be used for HR-OSA test:

1 Press **SETUP** hard key.
2 On bottom right of setup page, press **Load Config.** menu key.
3 In the Explorer, select the desired file configuration
4 Press **Load Config.** menu keys.

A beep is emitted to validate the selection of the configuration file.

The software automatically brings you back to setup page.

> **NOTE**
> Most of the configuration files are available into the Platform in `disk/config/IPMD`.

OSA optical spectrum analyzer Setup

To configure the Platform 8000 in preparation for an OSA test on a fiber,

1 Press the **SETUP** button.

The various measurement parameters are proposed

2 Select the parameter **Mode** and set it to **WDM/OSNR**

WDM / OSNR Module is used to measure the optical spectrum of an optical signal and the OSNR, using the interpolation method. Standard WDM results are displayed in the results table. (See "Display of the WDM / OSA results" on page 394)

WDM / OO-OSNR

Module is used for measuring the optical spectrum of an optical signal and the OSNR is measured by the two step On-Off method. Standard WDM results are displayed in the results table. (See chapter "On/Off-OSNR Method" on page 404)

DFB Module is used to analyze results from a DFB. DFB results are displayed in the results table (See "DFB results analysis" on page 406).

I-OSNR 40G DP-QPSK

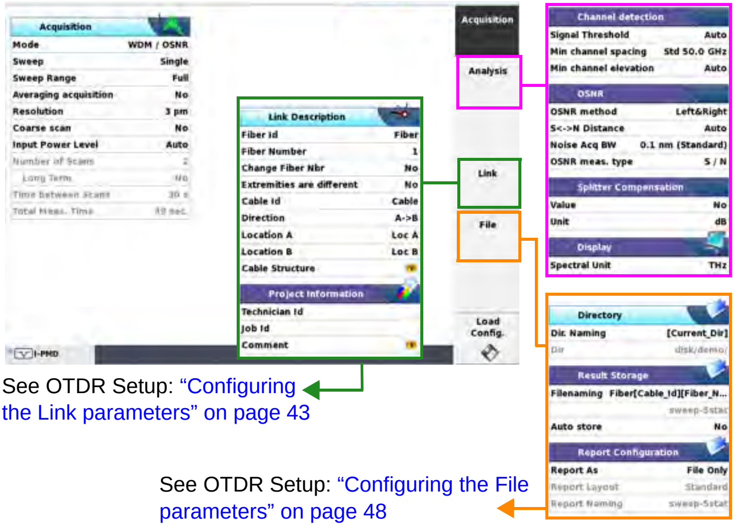
Module is used to acquire the optical spectrum of Dual polarization 40G signals (40G DP-QPSK) and to measure the In Band OSNR. Standard WDM results are displayed in the results table. (See "Display of the WDM / OSA results" on page 394).

3 Define your own configuration

The parameter to be modified must be selected by means of the direction keys or using the touchscreen. The possible options then appear on the screen: make your choice using the direction keys or touchscreen.

The various parameters proposed are defined below.

Figure 192 Setup for optical spectrum measurements



Acquisition Parameters

Sweep

Continue The OSA sweeps continuously and displays the results

Single The OSA performs one single sweep and displays the result

Statistics The OSA calculates a statistic of a number of scans. The number of scans must be entered (next parameter).

Sweep Range

Select the frequency range in this sub-menu:

Full Full wavelength range is used for measurement

Start/End Select manually the Start/End wavelength

Center/Span Select manually the Center/Span frequency

ITU Channel Select the Channel Frequency

Averaging acquisition

Select between "No" and 64 times averaging.

Resolution

Select the resolution bandwidth used for HR OSA acquisition (depends of the module used).

Coarse Scan

The coarse mode provides a faster scan over multiple channels at the cost of a degraded frequency accuracy. Select **Yes** to perform this scan.

Number of Scans

In Statistics mode, this must be selected between 2 and 1000.

Long Term

> **NOTE**
> A long term measurement can be done only if the **Sweep** parameter is on **Statistics** mode.

Long term time diagram:

- number of sweeps 7
- wait period 5s

```
1     2    3     4     5    6    7
 |-----|-----|-----|------|----|-----|
```

time distance between the next acquisition = wait period (time)

No	the measurement is not automatically launched
Yes	the measurement is automatically done, after the time interval selected (see hereunder).

Time Interval between Scans

This parameter allows to enter a wait period before the measurement start (only active if **Long Term** is positioned on **Yes**, in **Continue** or **Statistics** mode)

- Increments of 5 seconds up to 1 minute, then increments of 1 minute up to 10 minutes, then increments of 5 minutes up to 60 minutes; then increment of 1 hour up to 24 hours.

The modification of this parameter automatically modifies the next parameter, **Total Meas. Time**, which cannot be modified.

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

Channel Detection

Signal threshold [1]

Threshold of detection of channels (see “Channel detection threshold” on page 399).

Auto. the threshold is determined automatically.

Manual the threshold can be set from -79.9 to +30 dBm

Use direction keys or **Edit Number** to modify values.

Min. Channel spacing [1]

Defines the minimum spacing of two adjacent optical channels in the system.

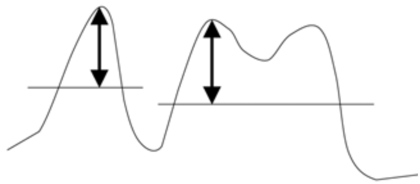
This parameter is also used to set the range for integration to measure the accurate total signal power of an optical channel. (see table contents page 403) The window for channel power integration will be ±1/2 the min. channel spacing setting left and right to the channel center frequency.

The measurement result will be displayed in the WDM table as 'Level' in dBm.

1.Attention: all modification of these parameters has immediate repercussions on the trace and entails the loss of the measurement statistics.

Min. Channel elevation [1]

Defines the minimum elevation of two adjacent peaks from the valley between them which is required to recognize independent channels. Peaks which are not separated by a valley deeper than the min.channel elevation are considered as part of the same optical channel.



This example shows two signals, the left having only one peak larger than the selected Min.channel elevation, the right one with two peaks.

The two peaks of the right one are separated by a valley, but their elevation from that valley is smaller than the Min.channel elevation. Therefore they are not treated as independent sig-nals

Select **Auto** to define the value automatically or select **Manual** to enter a specific value for the parameter.

OSNR

OSNR method[1]

Side of the peak where the point of reference for noise measurement is taken (left, right, average left and right, worst case of left and right).

S<->N Distance

Distance between the peak of the channel and the point of reference for the noise.

- **Auto**: distance determined according to spacing of channels.

- **Manual**: an additional line **Manual value** opens. Go down and modify the value with < > or click on the value and enter a new one in the keypad that opens

1.Attention: all modification of these parameters has immediate repercussions on the trace and entails the loss of the measurement statistics.

- **Pre-defined**: select 25 GHz (0.2 nm), 50 GHz (0.4 nm),100 GHz (0.8 nm) from the peak.

- **Left & Right**: manually define different left and right distances from the peak

Noise Acq. BW

Reference bandwidth used for the acquisition of noise:

- standard 0.1 nm

- with the <> keys you can select other values between 0.05 nm and 1.0 nm.

OSNR meas.type

S / N or (S+N)/N

- **S/N**: the integrated power in the channel minus the noise is considered as signal

- **(S+N)/N**: the integrated power in the channel without correction is considered as signal.

Splitter compensation

When the measurement is made after a tap coupler (also known as a splitter), it is possible to compensate for the loss introduced by this element and to display the value measured before or after it.

Go to the **Splitter compensation** line to display a sub-menu proposing the following options

Value[1] Activation of compensation and choice of its value using the keys ◀ and ▶: or the numeric keypad : from 1 to 30 dB (by increments of 1) or 1 to 99% (by increments of 0.1%). Select **None** on the numeric keypad to not activate the compensation.

Unit Choice of compensation in dB or as a percentage of the value measured.

For example, with a 10 dB splitter, the results will be augmented by 10 dB. The trace will be offset upwards by 10 dB. A channel measured at -30 dBm will be displayed -20 dBm.

Display

Spectral Unit

Here the units of the x axis can be selected:

- Frequency in THz

- Wavelength in nm

Those parameters are valid for all traces present on the screen.

Saving configuration in a file

Once parameters have been configured, they can be kept in memory and saved in a configuration file.

This configuration file can then be recalled in order to be recalled for future HR OSA acquisitions.

To save parameters in a configuration file:

1 If necessary, press **SETUP** to return to **Setup** page.

2 Select one parameter in one of the setup page (acquisition, link..)

3 Press **Save Config.** menu key Save Config.

4 Enter a name for the configuration file using the edition keypad (max 20 characters).

> **NOTE**
> Configuration file is saved in the directory `disk/config/IPMD`.

5 Press **Enter** 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 **Explorer** page.

Acquisition

To start a measurement press **START** key. The OSA-XXX will scan over the entire wavelength range and the measurement result will be displayed in graphical and tabular format.

Trace display functions

The trace acquired or recalled from a memory is displayed on the Results page: see example Figure 193 on page 395.

A range of functions enable modifications to the display of the trace (Cursors, Zoom/Shift, Event/Trace, Trace/Table, Full scale, etc.).

Display of the WDM / OSA results

The results window, obtained by pressing the **RESULTS** button, shows different zones displaying, from top to bottom:

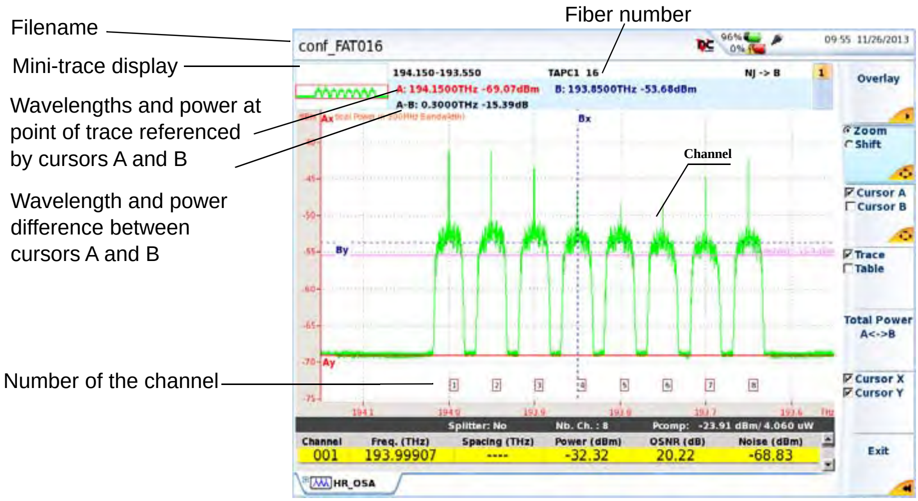
- the mini-trace in the upper part of the screen, accompanied by the principal characteristics of the acquisition and of the file if the result is stored in memory.
- the trace results associated with cursors A and B
- the trace proper (see "Trace display functions" on page 394).
- the table of results (see "Table of results" on page 403).

The trace represents power (in dBm) as a function of frequency (in THz) or wavelength (in nm). The channels detected are represented by peaks.

NOTE

If several acquisitions are performed, the trace displayed is the one corresponding to the last acquisition.

Figure 193 Example of OSA test result (with grid)



Display functions

Zoom function

The Zoom function is used to analyze part of the trace in greater detail. In association with Channel (WDM/OSA) it enables rapid checking of a succession of events or channels.
<u>The zoom is centered on the cursor selected</u>. If the two cursors A and B are selected, the zoom is centered midway between the two cursors.

The position of the section of trace displayed with respect to the complete trace is represented by a red rectangle on the mini-trace at the top left-hand corner of the screen.

To define a zoom on the trace:

1. Select **Cursor A** or **B** and center it on the zone to be examined
2. On the **Shift/Zoom** key, select the **Zoom** function.
3. Use the ▶ or ◀ key to increase or reduce the zoom factor.

or

Use touchscreen and click on trace to position the upper left and bottom right corners of the zoomed area.

Zooming on the different channels in succession

4 Zoom on one of the channels as shown above.

5 On the **Trace/Channel** key, select the **Channel** function.

6 Use the ◀ and ▶ keys to move the zoom on to the successive channels.

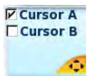
Cursors function

The vertical cursors A and B are used in the Zoom and Shift functions to position or delete markers.

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

- in a solid line if the cursor is selected.
- in a dotted line if the cursor is not selected.

Positioning the cursor

When a trace is displayed, the key 

can be used to select one or both cursors.

The direction keys ◀ and ▶ move the selected cursor(s) along the trace.

When a selected cursor touches the right or left-hand edge of the screen, the trace starts to scroll horizontally to maintain display of this cursor.

If an unselected cursor has been moved off-screen by a zoom, it can be brought back on to the screen by selecting it and then pressing one of the direction keys ◀ or ▶. It will then appear on whichever edge of the screen is closest to its position.

When the cursor function is selected, the keys ▲ and ▼ move the trace vertically.

Cursors information

The informations on Cursors are always display on the upper part of the screen. Above the trace are shown the co-ordinates of the points of intersection of the cursors A and B with the trace, together with the distance between the two points.

Cursor X and Y

Two types of cursors can be defined:

- **Cursor X**: only a vertical bar is present.
- **Cursor X** and **Cursor Y**: there is a vertical bar and a horizontal bar. The intersection between these two bars is placed on the trace.

To display the type of cursor selected:

1 Click on **Advanced**.

2 Select the key **CursorX/CursorY** to modify the current choice.
Each click on this key will alternatively insert or delete the check mark against **Cursor Y**

Full scale

To display the entire trace, with no zoom or displacement:

1 Either press the **Full Scale** key
or,
With **Trace** selected on **Trace/Channel**, press validation key 

Shift function

The Shift function is used to displace the displayed section of the trace by pressing the direction keys.
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 Select the zoom factor as described above.

2 Choose cursor and cursor position.

3 On the **Zoom/Shift** key, select **Shift**.

4 Use the direction keys or touch and hold screen to shift the trace in the desired direction.

Trace /Table key

This key offers a choice from the following displays:

Trace alone: main display of the trace with a single line of the table at the foot of the page (see“Example of OSA test result (with grid)” on page 395).

Trace + Table: display of trace, reduced in size but followed by 5 to 8 lines of the table of results.

Figure 194 OSA Results - Trace and Table

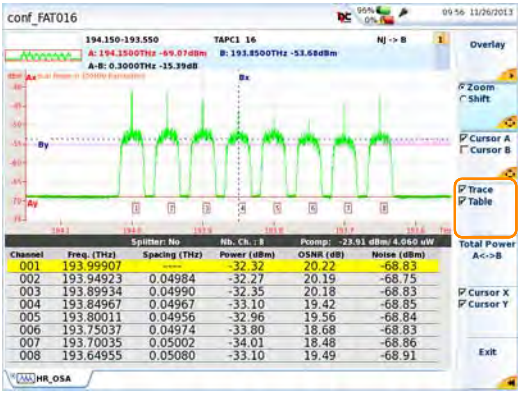
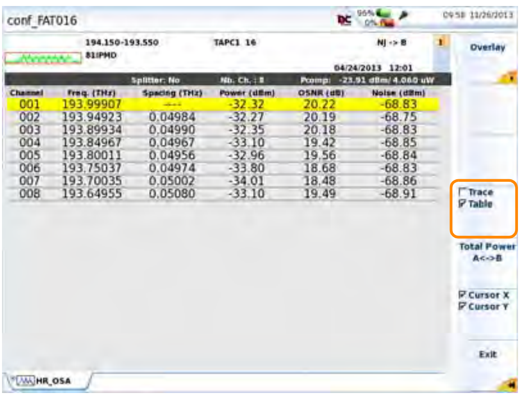


Table: display of the table alone

Figure 195 OSA Results - Table



Channel detection threshold

On the trace, some peaks corresponding to noise could be mistaken for channels. It is therefore necessary to fix a power threshold level: only peaks that exceed this threshold will be considered as channels and included in the table of results.
To modify this threshold, press the **SETUP** key, then select **Signal threshold**. Modify the value to position it on **Auto**[1] or fix a threshold value.

Display of total power between cursors

To display on the trace the total power between the two cursors A and B:

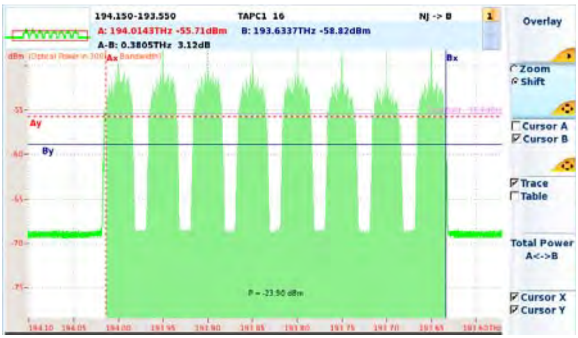
1 Place the cursors at the desired positions.

2 Press the **Advanced** key, then **Total Power A<--->B**.

The space between the trace and the two cursors is greyed out and the power is displayed in the form "P=-4.95dBm".

Pressing the key **Total Power A<-->B** a second time removes the result of the total power measurement.

Figure 196 Display of total power between the cursors



1.The "Auto" value is obtained by continuing to reduce the value of the threshold below the minimum value of -79.9 dBm

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.
- or to compare both curves get for each way of propagation in the origin/end mode.

For this purpose, the Platform 8000 possesses an overlay memory which can store:

- the current trace, for comparison with further traces to be acquired subsequently,
- or traces previously saved, for comparison with the current trace,

Overlaying several traces stored in memory

To display two traces from the memory, deleting the current trace or traces already loaded:

1. Press the **FILE** button**.**
2. On the **Menu/Explorer** key, select **Explorer**.
3. Select the files of the traces for display.
4. Press the **Load key**.
5. Press **View trace(s)** or **Load traces + config**.
6. When loading is complete, the **Results** screen appears: the first trace selected is the active trace, the other trace being overlaid.

Overlaying the current trace

To copy the current trace into the overlay memory, proceed as follows:

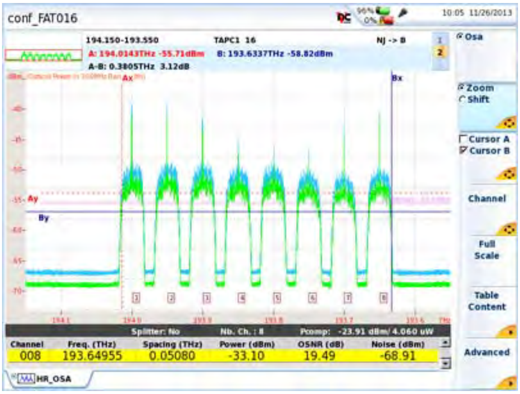
1. On the **Results** page, press the **Advanced** key, then **Overlay**.
2. Press **Set New Trace** soft key.
   The current trace is copied into the overlay memory: represented in a different color, it is automatically offset with respect to new trace.
   A new acquisition can then be started.

> **NOTE**
> In the case of Multi-trace display with multiple wavelength acquisition: when the **START** key is pressed, all the traces displayed are deleted to leave room for the new acquisitions.

Display of traces in overlay

- The traces are shown in different colors (the active trace is green).
- Their serial numbers are repeated at the top of the screen.

Figure 197 OSA - Overlaid traces



Swapping overlay traces

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 swapped with the active trace.

To do this:

1. Press the **Trace** key,
2. Press the ◀ and ▶ keys, as many times as necessary.
   or
   Click on the upper bar, with signature of the measurement and cursor information (next to Mini-trace).

Changing the traces position

Once a trace is displayed in overlay, the traces can be adjusted according to the Y axis:

1 Press **Advanced** > **Overlay** menu keys.

2 Select the adjustment according to Y axis:

Y Reset: all traces are on the the same level at the intersection with the active cursor.

Y Shift: Each trace is shifted from 5 dB from the other.

Y Exact: the traces displayed are on the same position according to their injection level.

Trace resulting from the difference between two traces

It is possible to obtain the trace corresponding to the point-by-point difference between the current trace and the trace in overlay (if only two traces are displayed simultaneously).

To do this:

1 Press **Advanced** > **Overlay** menu keys

2 Press the **2 Curves Diff.** menu key.

The screen displays the two traces in overlay and the trace resulting from the "Difference".

Removing a trace in overlay

Removing the current trace

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

1 Select it (see previous paragraph),

2 In **Results** page, press **Advanced** > **Overlay** menu keys

3 Press **Remove Current Trace**.

Removing all the traces

To remove all the traces except the current trace, press the key **Remove Other Traces**.

Quitting the overlay menu

To quit the overlay menu, press the **Exit** key.

Table of results

Lines

According to the choice made in the **SETUP** menu, the table of results may include:

- either a line for each channel detected (if Channel Selection = Permanent)
- or a line for each graduation, (if Channel Selection = Grid and a grid is selected)

Type of display

The table may be displayed in a single line, on half of the screen or the whole screen as a function of the **Trace**/**Table** key (see “Trace /Table key” on page 397)

Contents of the table without statistics

In the absence of statistics (see “Analysis parameters” on page 390) the parameters given for each channel are:

1 the number of the channel

2 the frequency or the channel wavelength according to the unit selected

3 the spacing between the channels in THz or in nm

4 the level of the channel in dBm

This parameter indicates the calculated total channel power level from the detected channels, achieved by mathematical power integration over ± ½ min channel spacing around the channel center frequency.(see “Min. Channel spacing 1” on page 390). This power level may differ from the peak power level indicated by cursor evaluation in the graphical trace.

5 The noise level in dBm

Indicates the noise level measured left and right of the peak of the optical channel (out-of-band noise measurement), in the defined resolution.

6 The optical signal to noise ratio for the channel in dB.

In WDM mode this parameter indicates the out of band SNR result based on the out-of-band noise measurement.

Contents of the table with statistics

When selecting the Statistics measurement mode and multiple acquisitions are performed, statistics are calculated on the results. To display these results in the table, press the **Table Contents** key, then **Statistics**. Different Statistics keys are available to choose the content of the table display for each channel.

The following statistics can be selected: wavelength or frequency statistics, power statistics, and SNR statistics.

The display will give current value, average value, max. value, min. value and standard deviation, or delta between min and max (selectable).

In the mode **Statistics Mixed** the table will show a mixture of statistical results: current, min. and max of wavelength or frequency, and current, min. and max of the power levels.

On/Off-OSNR Method

Challenge

This is a precise out-of-service method used for measuring the in-band OSNR of standard and also of polarization-division multiplexed (PDM) systems.

Principle of "On/Off-OSNR Measurement"

The On/Off-OSNR method is based on measuring the noise power when the transmission channel is switched-off.

This is a 2 step method:

1 Switch-on all channels and perform a standard WDM measurement

All parameters like power (Pon) and wavelength are measured and stored in the instrument

2 Switch-off the channel carrying PDM signals and perform a second measurement

The channel power measured at the deactivated channel wavelength will indicate the in-band noise Poff = noise power

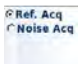
In-band OSNR is calculated based on Pon and Poff

Setup

In the **Acquisition** setup screen, set the parameter **Mode** to **OO-OSNR** and configure the measurement as wished (see "OSA optical spectrum analyzer Setup" on page 387).

Figure 198 OSA Setup: OO-OSNR configuration

Step 1: Reference measurement

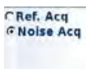
1 In the **Results** page, select '**Ref. Acquisition**' 

and perform (**Start**) an OSA measurement (all channels ON)

All channels will be detected and the total channel power (=integrated ch-power) of each channel will be shown and stored in the table = P_ch (Power [dBm]).

OSNR and Noise will not yet be displayed.

Step 2: Noise / OSNR measurement

1 In the **Results** page, select '**Noise Acquisition'** 

2 Switch off the channel you want to measure the OSNR (one or multiple channels).

3 Select Noise Acquisition measurement (**Noise Acq**) and start the measurement.

The OSA will perform a scan and automatically detect the channels switched-off.

Noise power is measured at the center frequency of the switched-off channels.

Noise power is normalized to Noise Acq BW (i.g. 0.1nm) according to the setup parameter.

OSNR will be calculated and displayed in the table based on stored P_ch (step 1).

Limitations

The On/Off-OSNR method requires an intervention into the optical system as the optical channel to be measured needs to be switched-off.

This is only applicable for an out-of-service measurement.

Some ROADM networks contain so called 'self-blocking' RAODMs.

These kind of ROADMs will block all light including the noise, when there is no signal present (switched-off).

This can be identified when the noise power < -60dBm or an unrealistic high OSNR value of >35dB is measured.

The self blocking function can be switched off in many ROADMs by the system management SW for service activation and trouble shooting purposes.

=> make sure that the self-blocking function is switched of for On/Off-OSNR measurements.

The On/Off-OSNR application will report OSNR = #### if the measured noise floor <-60dBm or the OSNR >35dB, as this is normally not present in an optical network when there are no self-blocking ROADMs implemented.

DFB results analysis

This feature only applies to instruments OSA-50X.

DFB results analysis allows to characterize DFB lasers, by giving the corresponding SMSR, Offset and bandwidth values.

DFB test configuration

To configure the Platform 8000 in preparation for a DFB test, press the **SETUP** button.

In the Acquisition setup screen, set **Mode** on **DFB**.

A new DFB sub-menu is offered while other Setup parameters are the same for DFB as for WDM measurements. Refer to “OSA optical spectrum analyzer Setup” on page 387 for a complete description.

DFB (sub-menu) in Analysis screen

Bandwidth level

Level (expressed in dB) where the main component bandwidth should be calculated

Min SMSR Minimum offset value to consider to find the Side Mode

Max SMSR Maximum offset value to consider to find the Side Mode

DFB measurements

Measurement procedure:

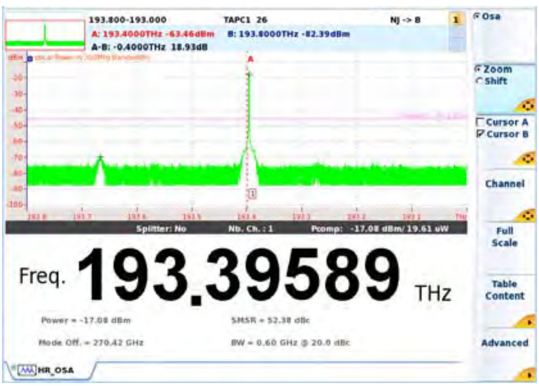
1 Use a patchcord to connect your DFB laser source to an input port of the OSA-XXX module on the Platform 8000.

2 Power on the DFB laser source.

3 Click **START/STOP** to perform the acquisition.

The trace and corresponding results appear automatically after a few seconds.

Figure 199 DFB measurements



Cursors A and B are automatically positioned on the first DFB laser, respectively on the max SMSR and the pick of the main component.

DFB results

A table is displayed (see “DFB measurements” on page 407) showing for each DFB:

Channel	Number of DFB laser detected
Wavelength	Wavelength (in nm) of the DFB main component
Level	integrated power (expressed in dBm)
SMSR	Side Mode Suppression Ratio (expressed in dBc)
Mode off	Mode Offset (expressed in nm)
BW @ level	Calculated bandwidth (expressed in nm) according to the bandwidth level (expressed in dBc) defined in the setup menu.

When the <***Channel***> key is selected, use the arrow keys ◀ and ▶ to move the cursor from one DFB pick to another[1], both in the trace and in the table of results.

Saving DFB results

DFB Results are not saved in a file. Nevertheless, the trace may be stored as a regular WDM trace.

To save your files:

1 Click on **FILE**, select name and **Store Trace**

2 Click on **RESULTS** to come back to the previous screen

Loading DFB results

Results are not saved in a file. Nevertheless, the trace may be reloaded as a regular WDM trace. Make sure **Type** parameter is set on **DFB** in the **Setup** menu to recalculate DFB results.
Results appear automatically in the table.

1.In case several DFB lasers are characterized at the same time

File Management

Storing HR-OSA measurements

If **Auto store** has been selected, then results will be saved automatically.
If not, or if you want to save the results under another name, directory etc.:

1. Click on **FILE** key
2. Click on **Save** > **Save**
3. Enter a filename in the edition keypad.
4. Click on **Enter** to save the trace.
   The trace is saved with the extension ".PIB"

Recalling HR-OSA files

Once an HR OSA file has been stored, recall it using the **Explorer**:

1. Press **FILE** to open the Explorer.
2. Select the directory and then the file to open.
3. Click on **Load**
4. Click on **View Trace(s)** or **Load Trace + Config.**
   The selected file is opened

For further information on file management, see Chapter 20 “File management”.

13

Attenuation profile

This chapter describes the different steps in carrying out a Attenuation Profile (AP) measurement with a Platform 8000 V2 equipped with a 81DISPAP or 81 MRDISPAP Module.

The topics discussed in this chapter are as follows:

It is assumed that you are familiar with the operation of the Platform 8000 V2 and the Optical Broadband Source you are using.

Recommended equipment

To perform a AP measurement, the following equipment is recommended:

- Platform 8000 V2 with a module as referenced above, and required optical connector.
- OBS-5XX,the BBS1A or BBS2A with required optical connectors.
- Fiber inspection scope with associated optical connector tips.
- Cleaning kit.
- Two fiber patchcords with required optical connectors.
- One mating adapter.

AP Activation and self calibration

1. Validate the **AP** function in the Instrument **Home** page.
2. Press **RESULTS** to display the auto-calibration status. A bar **tuning in progress** informs of the progression status of the calibration at the bottom of the screen. Wait for the calibration to be fully completed before continuing.
3. Press **SETUP** to access to the configuration menu for AP analysis.

Loading a configuration file

To load the configuration file to be used for AP test:

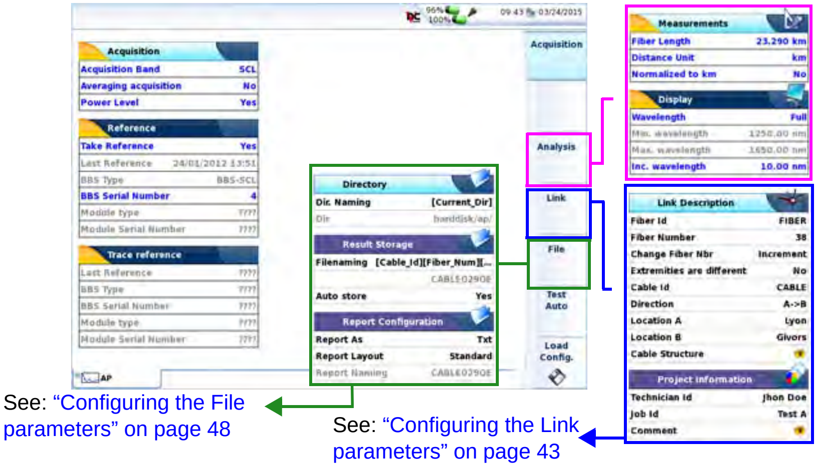
1. Press **SETUP** hard key.
2. On bottom right of setup page, press **Load Config.** menu key.
3. In the Explorer, select the desired file configuration
4. Press **Load Config.** menu keys.
   A beep is emitted to validate the selection of the configuration file.
   The software automatically brings you back to setup page.

NOTE
Most of the configuration files are available into the Platform in `disk/config/AP`.

Setup Menu

The different test and display parameters are described below:

Figure 200 Configuration menu for AP test



Test Auto configuration

The **Test Auto** soft key sets all parameters to auto or default values and let the unit to choose the appropriate setup, as listed below.

Setup Menu

Acquisition:

- Averaging acquisition: No

Results Screen:

- Wavelength range: full
- Normalized to km: No

File menu

- File naming: Auto
- Auto store: Yes
- Fiber Nb Increment: Yes

In **standard** mode, you can set the parameters below.

Acquisition parameters

Acquisition band (with 81DISPAP modules)

OESCL	measurement performed over the full wavelength range (OESCL bands).
SCL	measurement performed over a wavelength range limited to S,C and L bands

NOTE

In case of OBS5xx handheld sources, the measurement will be performed exclusively on SCL band.

Averaging acquisition

It enables to improve the dynamic range of the measurement by reducing the noise level. It is recommended to use the **Auto** mode and configure a manual averaging if needed only:

No	No average of the acquisition sample to be performed.
Low	Low averaging (4 samples).
Medium	Medium averaging (16 samples).
High	High averaging (32 samples).

Power Level

This parameter enables to get a power level indication at the start of an acquisition (only with 81DISPAP or 81MRDISPAP modules)

No	the received power is not indicated before starting the measurement acquisition.
Yes	the received power is indicated at the beginning of measurement.

NOTE

If **Yes** is selected, the acquisition stops if not enough power is received.

Last Reference / BBS Type / BBS Serial Number

These parameters provide the relevant information related to the Broadband source (BBS) referencing.

These parameters cannot be modified as they are automatically generated after a reference measurement (see “Performing the reference” on page 417)

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

Measurements

Known Length

A know fiber length enables to calculate and display the attenuation profile values in dB/ km, in the table. (see Figure 204 on page 422).

No	If you do not know the fiber length, select No
Yes	If you know the fiber length, select Yes.

Fiber length

If **Yes** has been selected on the previous line, click on **Edit number** to use the numeric keypad, or use the direction keys, to modify the fiber length (Min = 0.100 km / Max = 300 km).

Unit

Select the distance unit: km / kfeet / miles.

NOTE

The key **Copy Setup For PMD/CD** allows to apply the AP configuration to the other selected function(s) of the module.

Display

Wavelength

It enables to configure the range of wavelengths to be displayed on the graph and in the table of results.

Full	Displays results along the full available wavelength range
S+C+L Band	Displays results along S, C + L bands.
C+L Band	Displays results along C + L bands.
Manual	Displays results between 2 user defined wavelengths. The user must then select the <start> and <end> wavelengths.
ITUCWDM	Displays the ITU-T G.694.2 CWDM channels exclusively
ITUDWDM	Displays the ITU-T G.694.1 DWDM channels exclusively

Channel spacing can be fixed at: 25 GHz, 50 GHz, 100 GHz or 200 GHz.

Telecom	Displays 4 wavelengths: 1310 / 1480 / 1550 / 1625 nm

Inc.Wavelength

Defines the spacing between 2 consecutive measurement points displayed on the graph and in the table of results.

Normalized to km

No	The AP result is provided in dB only.
Yes	The AP result is also provided in dB/km (calculated according to fiber length).

Saving configuration in a file

Once parameters have been configured, they can be kept in memory and saved in a configuration file.

This configuration file can then be recalled in order to be recalled for future AP acquisitions.

To save parameters in a configuration file:

1 If necessary, press **SETUP** to return to **Setup** page.

2 Select one parameter in one of the setup page (acquisition, link..)

3 Press **Save Config.** menu key

4 Enter a name for the configuration file using the edition keypad (max 20 characters).

NOTE
Configuration file is saved in the directory `disk/config/AP`.

5 Press **Enter** 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 **Explorer** page.

AP Reference Measurement

On the measurement examples below, only the OBS-5XX is described. However, it can be replaced by E81BBSXX.

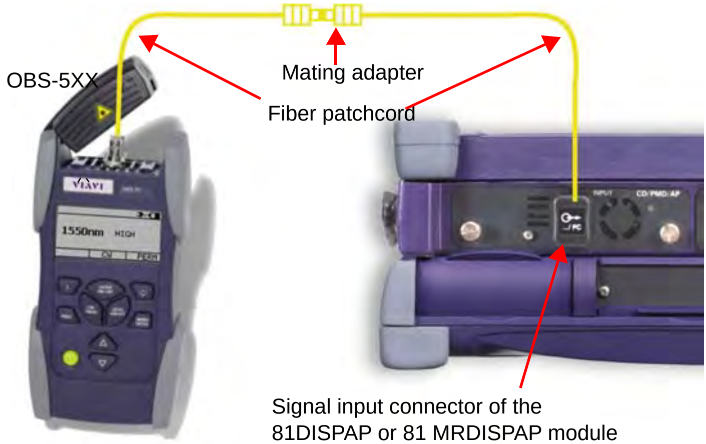
Performing the reference

It is recommended to perform a broadband source referencing once a day or each time the fiber patchcord has to be changed.

NOTE
When a reference is performed, acquisition parameters are not taken in account.

To make a reference, connect your OBS-5XX or BBS to the test module just like shown on figure below.

Figure 201 Reference measurement setup



1. Activate the source on the distant Unit, and select **AP** function.
2. In the AP Setup page, press the **Acq. Ref**. sofkey.

Figure 202 AP Reference Setup

3. In **Make Reference**, select **Yes**
   The line **BBS Serial Number** turns active.
4. Enter a serial number for the broadband source used.
5. Press the button **START/STOP** to start the reference of the broadband source.

6 Press **Yes** in the dialog box to start reference and wait for the end of reference measurement.

Once the reference is correct, the message "ready to start Measurement" appears in the blue bar.

Figure 203 Example of a reference for a broadband source

A bargraph indicates the source power level

Low High

If the reference measurement does not provide a correct result, check the following potential causes:

Error message	Possible problem	Possible solution
Acquisition impossible Hit any key to continue	Auto-calibration is not completed	Wait for the calibration to be terminated
Signal level too low! Check source and connections. Hit any key to continue.	The OBS-5XX (or other source) is not switched on	Press the **ON/OFF** button to switch on the source, verify if <Make reference> is still set to <Yes>, then repeat step step 5
	The OBS-5XX (or other source) battery is too low	Check if the **LOW-BATT** red led is lighted. If yes, then recharge the battery.
	Defective connections	Check that the cables are properly connected, and the notches on the connectors are correctly aligned.

Saving a reference measurement

When the reference measurement of the broadband source has been completed, you can save the result on the hard disk or disk of the Base Unit (8000V2 or 6000/6000A Platform).
Proceed as follow:

1. Click on the **FILE** button
2. Select **Setup**
3. Enter a filename for this reference, or click on **Default Filename**.

   The file has the extension ".AP", but differs from the AP measurement result files as it only contains the reference points (the information on the upper part of the screen are different). See “Saving the trace and generating a report” on page 426).

Loading existing reference

The last reference performed with the Base Unit may be different than the reference used by the current curve.

In this case, the **Acquisition Ref.** menu will be different than the **Curve** Menu, in the Reference setup page.

You can replace one reference by the other, using specific softkeys:

- **Load Ref From Trace**: the reference which has been used for the curve actually open will be used for the next acquisitions.
- **Update Trace With Ref.**: apply the acquisition reference parameters to the loaded curve.

Performing a AP measurement

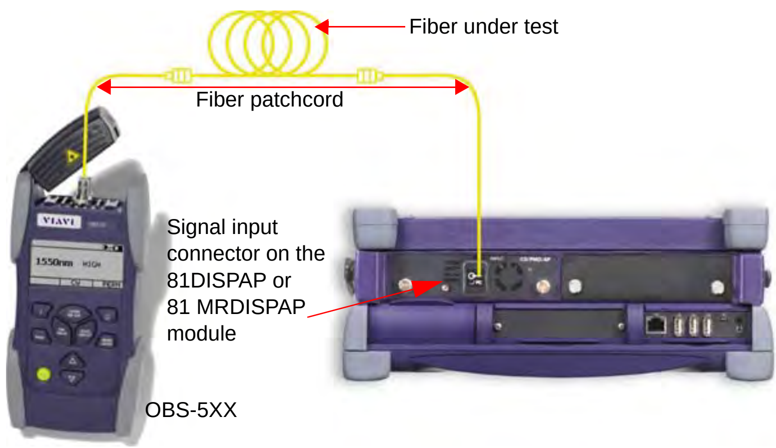
When the reference measurement of the broadband source has been completed, use the following procedure to make a measurement:

1. Disconnect the mating adapter and connect each fiber patchcord to the end of the fiber under test.
2. Press the **SETUP** button to access the configuration menu.
3. Select the appropriate AP test setup according to your application as earlier defined in “AP Activation and self calibration” on page 412.

4 Press the **START/STOP** button to see the results within a few seconds.

5 Repeat step 1 to 4 for every fiber to be tested.

> **NOTE**
> When the composite power of the input signal is higher than +20 dBm, a warning is displayed and the signal is cut off.



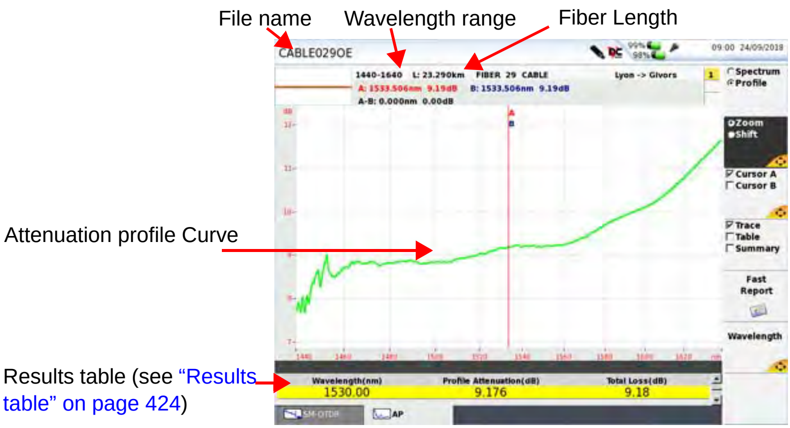
> **NOTE**
> You can modify the fiber length without performing a measurement again. The AP results (dB/km) will be recalculated automatically.

Display of AP results

The AP results screen presents different zones (see: “Example of a AP result” on page 422).

Trace display

Figure 204 Example of a AP result



Spectrum/Profile

For a reference measurement, only the spectrum is available.

For a AP measurement, two different graphs may be displayed.

You may switch from the «Profile» view to the final «Spectrum» view using the button **Spectrum/Profile.**

- **Spectrum**: It shows the final spectrum.

Figure 205 Example of a spectrum view after a measurement

- **Profile**: it provides the difference between the final spectrum and the reference spectrum of the broadband source- that’s the resulting attenuation profile (see figure “Example of a AP result” on page 422).

> **NOTE**
>
> For a reference measurement, only the spectrum is available.

> **NOTE**
>
> The **Trace - Table** and **Wavelength** functions are available exclusively with the Profile mode.

Zoom

In order to zoom in on the trace:

1. Press the **Zoom/Shift** menu key to select **Zoom**,
2. Use the arrow keys ▲ and ▼ or ◀ and ▶ to zoom horizontally or vertically. The zooming area is defined by the selected cursor(s).

With touchscreen, position upper left and bottom right location of the zoom area.

> **NOTE**
> To reset the zoom and see the full trace, press **Full scale**.

Trace shift

To shift the trace horizontally or vertically:

1. Press the **Zoom/Shift** menu key to select **Shift**
2. Use the arrow keys ▲ and ▼ or ◀ and ▶ to make the required shift.
   or
   With touchscreen, touch and hold the screen to make the required shift.

Cursor

To move the cursor(s) on the trace

1. Press the **Cursor A** / **Cursor B** menu key
2. Use the arrow keys ▲ and ▼ or ◀ and ▶ .
   or
   With touchscreen, directly click on position of the cursor(s) on trace
   The coordinates of each cursor intersection with the trace are indicated above the graph area.

Wavelength

To move the cursor from one wavelength to the next one,

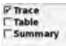
1. Press the **Wavelength** key
2. Use the arrow keys ▲ and ▼ or ◀ and ▶.
   The cursor will move both on the trace and in the table (if the trace and/or the results table is displayed).

Results table

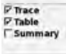
The **Trace/Table/Summary** key allows to display the trace and/or the results table.

> **NOTE**
> The Results Table is available exclusively in **Profile** view.

The menu key **Trace/Table/Summary** enables to display either:

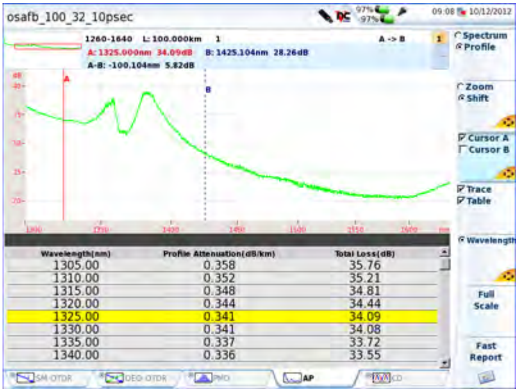


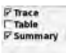
the trace and 1 line of the table (see Figure 204 on page 422).



the trace and 8 lines of the table

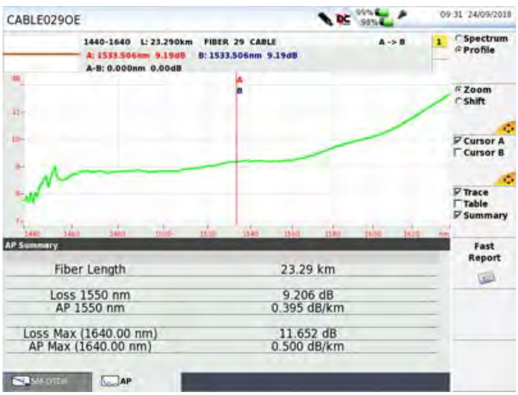
Figure 206 AP Profile - Trace and Results table

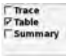




the trace and a summary of the results

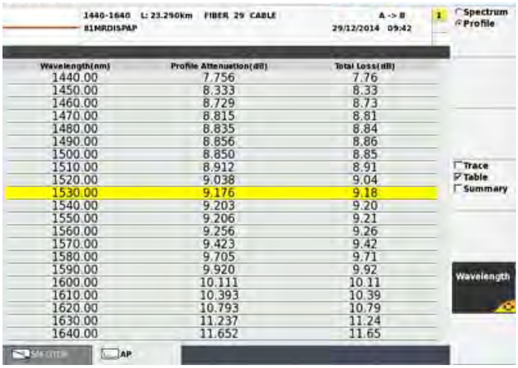
Figure 207 AP Profile - Trace and Summary





: the table only

Figure 208 AP Profile -Results table



Wavelength(nm)	Profile Attenuation(dB)	Total Loss(dB)
1440.00	7.756	7.76
1450.00	8.333	8.33
1460.00	8.729	8.73
1470.00	8.815	8.81
1480.00	8.835	8.84
1490.00	8.856	8.86
1500.00	8.850	8.85
1510.00	8.912	8.91
1520.00	9.038	9.04
1530.00	9.176	9.18
1540.00	9.203	9.20
1550.00	9.206	9.21
1560.00	9.256	9.26
1570.00	9.423	9.42
1580.00	9.705	9.71
1590.00	9.920	9.92
1600.00	10.111	10.11
1610.00	10.393	10.39
1620.00	10.793	10.79
1630.00	11.237	11.24
1640.00	11.652	11.65

The results table provides, for each wavelength (calculated using the wavelength range and the incrementation parameter as seen in “Wavelength” on page 416), the attenuation profile in dB/km and the total loss in dB.

Saving the trace and generating a report

Once the results page is displayed, the trace can be saved and a report can be generated directly from the results screen.

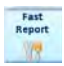
Saving results and creating a report from results page

This function is available exclusively in Profile view, in the results page.

To generate a report:

1 Select **Profile** view with the menu key **Spectrum/Profile**.

2 Check the results are not displayed in **Table** mode exclusively, otherwise the report cannot be generated (**Fast Report** menu key is not available).

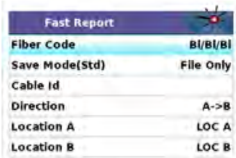
3 Press **Fast Report** menu key 

.

A menu displays under the trace.

4 In the menu, configure the file saving (and the report)

Figure 209 Fast report configuration



a In the **Save Mode** parameter, select:

File Only to save exclusively the trace in a ats file

File + txt to save the trace in a ats file and to generate a txt file of the results

File + pdf to save the trace in a ats file and to generate a report of the trace and results in a pdf file

b In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.

c Modify the **Fiber Number** using the key ▶.

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

5 Once saving is configured as wished, press **Save All** menu key

6 Enter a name for the file in the edition keypad

or

Click on **Auto Filenaming** menu key to apply the file name defined in the Setup screen, in **Filenaming** parameter (see “Filenaming” on page 50)

7 Press **Enter** to validate

NOTE

The ats file and the txt or pdf file will have the same name.

The icon displays during saving process.

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

> **NOTE**
> The file and the report are saved in the last storage media and directory selected.

Opening a report

1. To open the report, press **FILE** hardkey
2. In the **Explorer** page, in the directory selected, select the pdf file of the report.
   The file name is:
   For the txt file: *trace file_ats.txt*
   For the pdf file: *trace file.ats.pdf*.
3. Press **Load**.
   The file opens on the T-BERD/MTS.

Figure 210 Example of AP Report

Print date : 24/09/2018 12:08 File : report CABLE029OE.ats.pdf

VIAVI

Cable Id : CABLE Fiber Id : FIBER 29
Location A : Location B :
Job Id : Technician Id :

MTS 8000 (S/N 340) 81MRDISPAP (S/N 1035) Date : 29/12/2014 09:42

Setup
AP L: 23.290km 1440-1640 29/12/2014 09:42 report CABLE029OE

ATS

Wavelength	Profile Attenuation	Total Loss
nm	dB	dB
1440.00	7.756	7.76
1450.00	8.333	8.33
1460.00	8.729	8.73
1470.00	8.815	8.81
1480.00	8.835	8.84
1490.00	8.856	8.86
1500.00	8.850	8.85
1510.00	8.912	8.91
1520.00	9.038	9.04
1530.00	9.176	9.18
1540.00	9.203	9.20
1550.00	9.206	9.21
1560.00	9.258	9.26
1570.00	9.423	9.42
1580.00	9.705	9.71

Page: 1

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 onto the T-BERD/MTS (see “Generating pdf report(s)” on page 545).

Recalling AP files

Once an AP file is stored, use the Explorer to reload it:

1. Press **FILE** to open the Explorer.
2. Select the directory and then the file to open.
3. Click on **Load**
4. Click on **View Trace(s)** or **Load Trace + Config.**
   The selected file is opened

For further informations on file management, see Chapter 20 “File management”.

14

CD measurements using phase shift method

The Chromatic Dispersion analyzer function using phase shift method is available through the 81DISPAP, 81MRDISPAP and 81CD modules and is described in this chapter.

Topics discussed in this chapter are as follows:

CD activation and self calibration

1. Press the **Home** button
2. Select the **CD** function 

3. Press the button **Results** to display the auto-calibration status.

   A bargraph **tuning in progress** informs of the progression status of the calibration at the bottom of the screen. Wait for the calibration to be fully completed before continuing.
4. Press the button **Setup** to access to the configuration menu for Chromatic Dispersion analysis.

Configuring the CD test

To configure a chromatic dispersion test, press the **Setup** button. The different measurement parameters are displayed.

You can choose the default values by pressing the **Test Auto** key or define your own configuration.

> **NOTE**
> The key **Copy Setup For PMD/AP** allows to apply the CD configuration to the other selected function(s) of the 81XXX module.

Test Auto Configuration

In Test Auto configuration, the setups below are provided.

Setup menu

MEASUREMENT

Known Length	No
Approximation formula	
	Auto chooses the best formula depending on the acquisition band **Sellmeier 5T** if the 81XXX module is used with a BBS2A on the OESCL band **Quadratic** when the 81XXX modules are operating on the SCL bands.

Amplified Link:	No (refer to "Performing a CD measurement through amplifiers" on page 443)
RESULTS SCREEN	
Normalized to km	Yes
Show Measured points	No
Show Fit Formula	No

Storage parameters (see Chapter 20 "File management"):

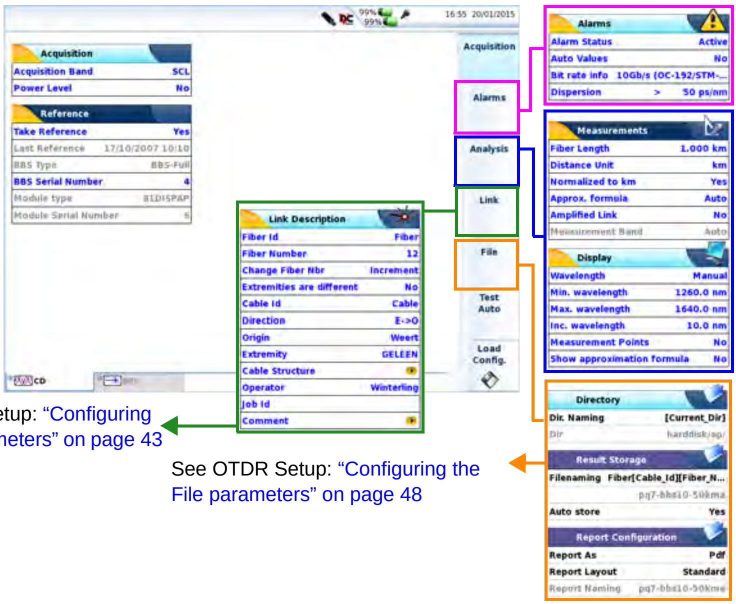
– Auto Store: Yes
– Increment Fiber Number: Yes

Manual Mode Configuration

In manual mode, you can set your own parameters.

To define your own configuration, select the parameter to be modified, then choose the option for this parameter.

Figure 211 Configuration of CD test (Expert mode)



See OTDR Setup: "Configuring the Link parameters" on page 43

See OTDR Setup: "Configuring the File parameters" on page 48

The configuration parameters of the CD test are described below.

Loading a configuration file

To load the configuration file to be used for CD test:

1 Press **SETUP** hard key.

2 On bottom right of setup page, press **Load Config.** menu key.

3 In the Explorer, select the desired file configuration

4 Press **Load Config.** menu keys.
A beep is emitted to validate the selection of the configuration file.
The software automatically brings you back to setup page.

> **NOTE**
> Most of the configuration files are available into the Platform in `disk/config/CD`.

Acquisition parameters

Acquisition

Acquisition band (with 81DISPAP modules)

OESCL measurement performed over the full wavelength range (OESCL bands).

SCL measurement performed over a wavelength range limited to S,C and L bands.

> **NOTE**
> In case of OBS5xx handheld sources, the measurement will be performed exclusively on SCL band.

Power Level

This parameter enables to get a power level indication at the start of an acquisition (only with 81DISPAP or 81MRDISPAP modules).

No the received power is not indicated before starting the measurement acquisition.

Yes the received power is indicated at the beginning of measurement.

> **NOTE**
> If **Yes** is selected, the acquisition stops if not enough power is received.

Reference

Last Reference / BBS Type / BBS Serial Number

These parameters provide the relevant information related to the Broadband source (BBS) referencing.

These parameters cannot be modified as they are automatically generated after a reference measurement (see “CD Reference measurement” on page 439).

Alarms parameters

In the **Setup** page, press **Alarms** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Alarms**).

Alarm Status

None No alarm management.

Active Enable the Pass/Fail evaluation according to the defined thresholds (see below).

Auto Values: **Yes**

The maximum dispersion tolerance is automatically set according to the bit rate information.

Bit rate info.

List all relevant data rates. Use the direction arrow keys ◀ and ▶ for selection.

Auto values: **No**

Dispersion

Threshold value is entered manually: select the maximum dispersion threshold (ps/nm) : from >1 to > 10000 ps/nm.

> **NOTE**
> Max. dispersion threshold is always considered for non normalized dispersion values.

The Pass/Fail indication is provided in the results table.

Analysis parameters

In the **Setup** page, press **Analysis** softkey (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click on **Analysis**).

Measurements

Fiber Length

Unknown	If you do not know the fiber length
Distance	Press **Edit Number** to enter fiber distance: Min=1km / Max=20000 kmDispersion coefficients (normalized values) will be calculated accordingly.

Distance Unit

When the fiber length is set manually, choose the distance unit: km / kfeet / miles.

Normalized to km

No	Only Dispersion results of the link are displayed, in ps/nm.
Yes	In addition to dispersion results, dispersion coefficient are calculated according to the fiber length and listed in the table.

Approx. formula

Select the approximation formula to be used for generation of the delay, dispersion and slope curves:

Please refer to ITU-T G.650.1 or IEC 60793 1-42 for further information.

Quadratic	$A+B\lambda+C\lambda^2$.
Sellmeier 3-term	$A+B\lambda^2+C\lambda^{-2}$.
Sellmeier 5-term	$A+B\lambda^2+C\lambda^{-2}+D\lambda^4+E\lambda^{-4}$.
Lambda Log	$A+B\lambda+C\lambda\ln(\lambda)$.

See “Most suitable method of approximation according to trace zone” on page 10.

You can also let the product to configure automatically the approximation formula to be used by selecting **Auto**.

It is recommended to select the quadratic formula when the 81XXX,Module is used with an OBS-5XX, a 81BBS1A or a 81BBS2A, in SCL mode.

Amplified link

Select **Yes** when measuring through optical amplifiers (see “Performing a CD measurement through amplifiers” on page 443).

Display

Wavelength

This parameter enables to set the displayed wavelength range.

Full	Displays results along the full available wavelength range
S+C+L Band	Displays results along S, C + L bands..
C+L Band	Displays results along C + L bands.
C Band	Displays results along C band
ITUCWDM	Displays the ITU-T G.694.2 CWDM channels exclusively
ITUDWDM	Displays the ITU-T G.694.1 DWDM channels exclusively

Channel spacing can be fixed at: 25 GHz, 50 GHz, 100 GHz or 200 GHz.

Manual Displays results between 2 user defined wavelengths. The user must then select the inf. wavelength to "start" with and the sup. wavelength to "end" with.

> **NOTE**
> This parameter cannot be configured if, in **Measurements** box, the parameter **Fiber Length** is defined to **Unknown**.

Inc.Wavelength

Defines the spacing between 2 consecutive measurement points displayed on the graph and in the table of results.

Measurement Points

Displays the acquisition points on the Delay curve (represented by black crosses).

Yes All the acquisition points are displayed.

No No acquisition points visible

Show approximation formula

Displays the resulting approximation equation and the correlation coefficient on the upper left side of the trace.

Yes Equation is displayed.

No Equation is not visible.

Saving configuration in a file

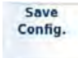
Once parameters have been configured, they can be kept in memory and saved in a configuration file.

This configuration file can then be recalled in order to be recalled for future CD acquisitions.

To save parameters in a configuration file:

1 If necessary, press **SETUP** to return to **Setup** page.

2 Select one parameter in one of the setup page (acquisition, link..)

3 Press **Save Config.** menu key 

4 Enter a name for the configuration file using the edition keypad (max 20 characters).

> **NOTE**
> Configuration file is saved in the directory `disk/config/CD`.

5 Press **Enter** 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 **Explorer** page.

CD Reference measurement

On the measurement examples below, only the OBS-5XX will be described. However, it can be replaced by E81BBSXX

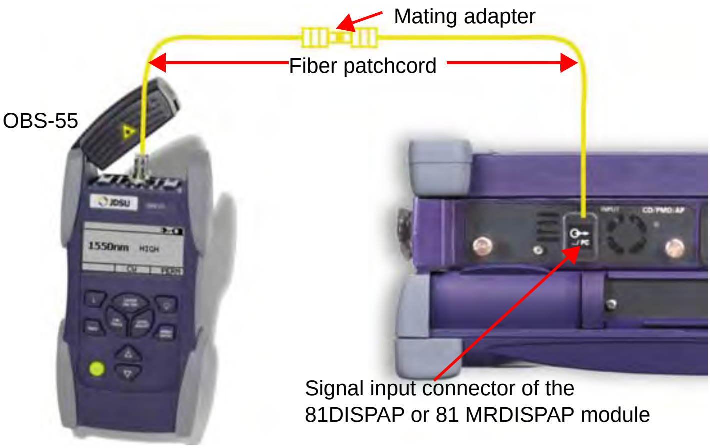
Performing the reference

It is recommended performing a CD referencing once a day or each time the fiber patchcord has to be changed.

> **NOTE**
> When a reference is performed, acquisition parameters are not taken in account.

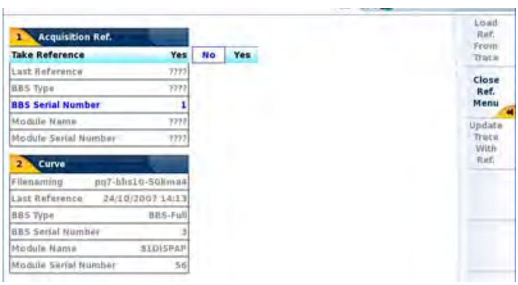
To perform a reference, connect your OBS-5XX or BBS to the test module as shown below.

Figure 212 Reference measurement setup



1. Activate the source on the distant Unit., and select **CD** function.
2. In the CD Setup page, press the **Acq. Ref**. sofkey.
   If 81XXX module with CD function is used for the first time, clicking on the **SETUP** button directly opens the Reference setup page.

Figure 213 Setup CD Reference Measurement



3. In **Make Reference**, select **Yes**
   The line **BBS Serial Number** turns active.

4 Enter a serial number for the broadband source used.

5 Press the button **START/STOP** to start the reference of the broadband source.

A bargraph as this one  is displayed until the end of the acquisition.

Once the reference is correct, the message `Valid Reference` is displayed in green, and related information are displayed in the upper blue part of the screen: date and time of reference acquisition / Source type / serial number.

If the reference measurement does not provide a correct result, check the following points:

Error message	Possible problem	Possible solution
Acquisition impossible Hit any key to continue	Auto-calibration is not completed	Wait for the calibration to be completed
Signal level too low! Check source and connections Hit any key to continue	The source is not switched on	Press the **Source ON/ Source OFF** button to switch on the source, verify if **Make reference** is still set to **Yes**, then repeat step 3
	The Source battery is too low	Check if the **LOW-BATT** red led is lighted. If yes, then recharge the battery.
	Defective connections The CD mode has not been selected on the source	Check that the cables are properly connected, and the notches on the connectors are correctly aligned.

Saving a reference measurement

When the reference measurement of the broadband source has been completed, you can save the result on the hardidsk or disk of the Base Unit used (8000 V2 or 6000/6000A Platform).

Proceed as follow:

1 Click on the **FILE** button

2 Select **Setup**

3 Enter a filename for this reference, or click on **Default Filename**.

The file has the extension ".OCD", but differs from the CD measurement result files as it only contains the reference points (the information on the upper part of the screen are different). See "Saving results and creating a report from results page" on page 449.

Loading existing reference

The last reference acquisition performed with the Base Unit may be different than the reference used by the curve one.

In this case, the **Acquisition Ref.** menu will be different than the **Curve** Menu, in the Reference setup page.

You can replace one reference by the other, using specific softkeys:

- **Load Ref From Trace**: the reference which has been used for the curve actually open will be used for the next acquisitions.

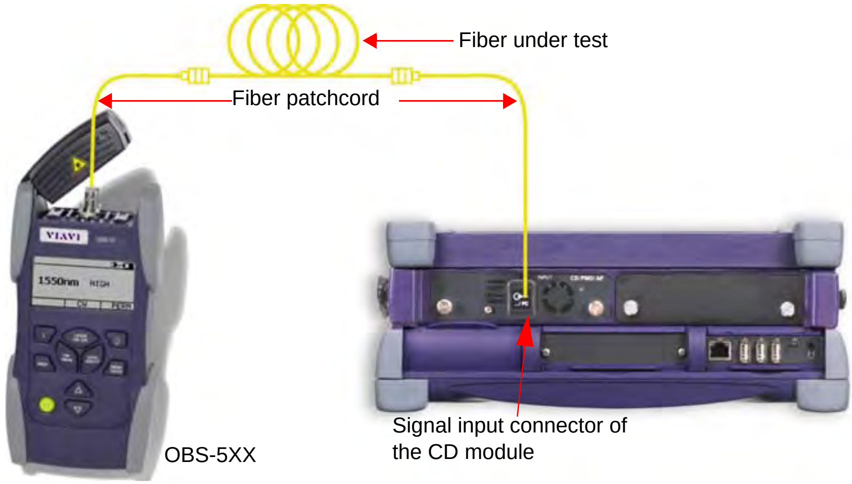
- **Update Trace With Ref.**: apply the reference parameters to the loaded curve.

Performing a CD Measurement

Once the reference measurement is correctly performed:

1. Disconnect the mating sadapter and connect each fiber patchcord to the end of the fiber under test
2. Press the **SETUP** button to access the CD configuration menu.
3. Select the appropriate CD test setup according to your application (see "CD activation and self calibration" on page 432).
4. Press the **START/STOP** button to see the results within a few seconds.
5. Repeat steps 1 to 4 for every fiber to be tested

Figure 214 Connections for the CD Measurement



> **NOTE**
> You can modify the fiber length without performing a measurement again. The CD results (dB/km) will be recalculated automatically.

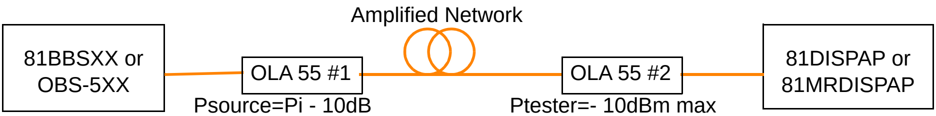
Performing a CD measurement through amplifiers

The CD reference step is not required for measuring through amplifiers:

1 Connect the source and the 81DISPAP/81MRDISPAP module at each end of the fiber under test. Optical attenuators (OLA55 1 and OLA55 2) have to be positioned before and after the amplified link.

VIAVI recommends to:

- setup the front attenuator (OLA55 #1) so that the power level received by the amplifier is 10 dB lower than the in-service power level (in normal operation).
- setup the far end attenuator (OLA55 #2) so that the maximum received power level by the CD tester is -10dBm max



2 Press the **SETUP** button to access the CD configuration menu.

3 Select the appropriate CD test setup according to your application as earlier defined in “Configuring the CD test” on page 432.

4 Select **Yes** for **Amplified link** (It will limit the acquisition band from 1530 nm to 1565 nm).

5 Press the **START/STOP** button to perform CD measurement.

> **NOTE**
> Depending on the amplifier specification, it may be required to adjust the acquisition band to a short wavelength range.

Display of CD results

General display

Once the acquisition is completed, the result curve is automatically displayed. The Delay curve is always displayed first.

Figure 215 Delay Curve

The information provided with the delay curve may be different depending on to the parameters settings. In the Figure 215, the following parameters have been configured:

- Normalized to km : **Yes**
- Show Measured Points: **Yes**
- Show Fit Formula: **Yes**

NOTE

If the parameter **Normalized to km** is set to **No**, the result table will not display the *Dispersion Coef (ps/nm.km)* values.

Functions available

Delay / Dispersion / Slope

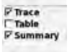
Once the delay curve is displayed, you can change to the Dispersion, then the Slope Curve, using the **Delay / Dispersion / Slope** key.

Figure 216 Example of the Slope display

Trace/Table

The menu key **Trace/Table/Summary** enables to display either:

: the trace and 7 lines of the table (see Figure 216 on page 446)

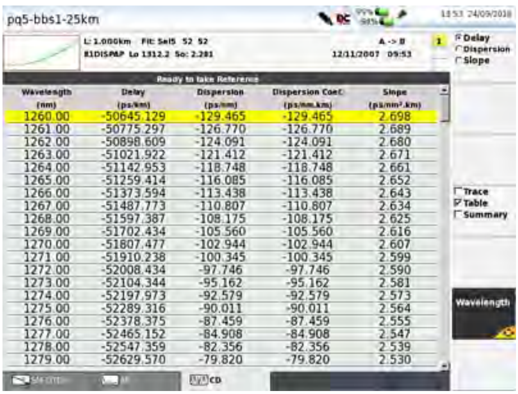


the trace and a summary of the results

Figure 217 CD Delay - Trace and Summary

: the table only

Figure 218 Results Table



Wavelength (nm)	Delay (ps/km)	Dispersion (ps/nm)	Dispersion Coef. (ps/nm.km)	Slope (ps/nm².km)
1260.00	-50645.129	-129.465	-129.465	2.698
1261.00	-50775.297	-126.770	-126.770	2.689
1262.00	-50898.609	-124.091	-124.091	2.680
1263.00	-51021.922	-121.412	-121.412	2.671
1264.00	-51142.953	-118.748	-118.748	2.661
1265.00	-51259.414	-116.085	-116.085	2.652
1266.00	-51373.594	-113.438	-113.438	2.643
1267.00	-51487.773	-110.807	-110.807	2.634
1268.00	-51597.387	-108.175	-108.175	2.625
1269.00	-51702.434	-105.560	-105.560	2.616
1270.00	-51807.477	-102.944	-102.944	2.607
1271.00	-51910.238	-100.345	-100.345	2.599
1272.00	-52008.434	-97.746	-97.746	2.590
1273.00	-52104.344	-95.162	-95.162	2.581
1274.00	-52197.973	-92.579	-92.579	2.573
1275.00	-52289.316	-90.011	-90.011	2.564
1276.00	-52378.375	-87.459	-87.459	2.555
1277.00	-52465.152	-84.908	-84.908	2.547
1278.00	-52547.359	-82.356	-82.356	2.539
1279.00	-52629.570	-79.820	-79.820	2.530

Move from 7 lines table to full table using menu key **Trace/Table**.

The results table displays the following values for each wavelength (depending on the range and increment defined in the Setup menu):

- Delay
- Total dispersion
- Dispersion Coefficient (if **Normalized to km** is set to **Yes** in the Setup menu. If not, this column is empty).
- Slope

The blue line at the top of the table displays the following information:

- The Bit Rate Info. used for the Pass/Fail indication
- L0: zero dispersion wavelength
- So: Slope at L0

Cursor, Zoom and Shift functions

Those functions are available exclusively in Expert mode (configurable in the CD ODM Setup screen).

Position the cursor

To move the cursor on the trace:

1 Press **Cursor A** menu key,

2 Use the direction arrow keys ▲ and ▼ or ◀ and ▶ .
or
With touchscreen, directly press on trace to position the cursor
The coordinates of cursor intersection with the trace are indicated above the trace.

Zooming on trace

In order to zoom in on the trace:

1 Press the **Zoom/Shift** menu key to display **Zoom**,

2 Use the direction arrow keys to zoom in either horizontally or vertically.
The zoom is made around the selected cursor(s).

With touchscreen, position upper left and bottom right location of the zoom area.

Shifting the trace

To shift the trace horizontally or vertically:

1 Press the **Zoom/Shift** soft key to select **Shift** function.

2 Use the direction arrow keys
or
With touchscreen, touch and hold the screen to make the required shift.

Wavelength

To move the cursor from one wavelength to the next one,

1 Press the **Wavelength** key

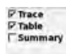
2 Use the arrow keys ▲ and ▼ or ◀ and ▶.
The cursor will move both on the trace and in the table (yellow highlight).

Saving the trace and generating a report

Once the results page is displayed, the trace can be saved and a report can be generated directly from the results screen.

Saving results and creating a report from results page

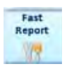
To save the trace (and generate a report):

1 Check the results are displayed in **Trace + Table** mode (menu key 

).

If the screen displays exclusively the Table, the report cannot be generated (the **Fast Report** key is not available).

> **NOTE**
> Whatever is the view selected in Results page (**Delay**, **Dispersion** or **Slope**), the report is always generated with the **Dispersion** trace.

2 Press **Fast Report** menu key 

.
A menu displays under the trace.

3 In the menu, configure the file saving (and the report)

Figure 219 Fast report configuration

- **a** In the **Save Mode** parameter, select:

  File Only to save exclusively the trace in a ocd file

  File + txt to save the trace in a ocd file and to generate a txt file of the results

  File + pdf to save the trace in a ocd file and to generate a report of the trace and results in a pdf file

- **b** In the **Cable Id** parameter, enter/modify the name of the Cable using the edition keypad.

- **c** Modify the **Fiber Number**/ **Fiber Code** using the key ▶.

  The parameter is different according to the Cable Structure configuration (see "Cable structure" on page 45).

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

4 Once saving is configured as wished, press **Save All** menu key

5 Enter a name for the file in the edition keypad

or

Click on **Auto Filenaming** menu key to apply the file name defined in the Setup screen, in **Filenaming** parameter (see "Filenaming" on page 50)

6 Press **Enter** to validate

> **NOTE**
>
> The trace file and the txt or pdf file will have the same name.

The icon displays during saving process.
Once saving is completed, a sound is emitted onto the Platform.

> **NOTE**
> The file and the report are saved in the last storage media and directory selected.

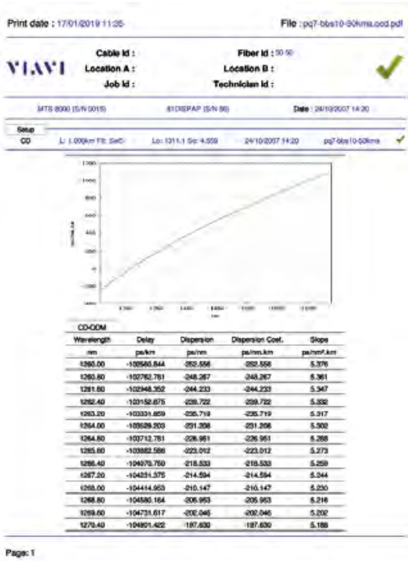
Opening a report

1 To open the report, press **FILE** hardkey

2 In the **Explorer** page, in the directory selected, select the pdf file of the report.
The file name is:
For the txt file: *trace file_ocd.txt*
For the pdf file: *trace file.ocd.pdf*

3 Press **Load**.
The file opens on the Platform.

Figure 220 Example of CD ODM Report


Print date : 17/01/2019 11:35 File : pq7-bbs10-50kms.ocd.pdf

VIAVI Cable Id : Fiber Id : 50 50
Location A : Location B :
Job Id : Technician Id :

MTS 8000 (S/N 0015) 81DISPAP (S/N 86) Date : 24/10/2007 14:20

Setup
CD L: 1.000km Fit: Sell- Lo: 1311.1 So: 4.559 24/10/2007 14:20 pq7-bbs10-50kms

CD-ODM

Wavelength	Delay	Dispersion	Dispersion Coef.	Slope
nm	ps/km	ps/nm	ps/nm.km	ps/nm².km
1260.00	-102580.844	-252.558	-252.558	5.376
1260.80	-102762.781	-248.267	-248.267	5.361
1261.60	-102948.352	-244.233	-244.233	5.347
1262.40	-103152.875	-239.722	-239.722	5.332
1263.20	-103331.659	-235.719	-235.719	5.317
1264.00	-103529.203	-231.208	-231.208	5.302
1264.80	-103712.781	-226.951	-226.951	5.288
1265.60	-103882.586	-223.012	-223.012	5.273
1266.40	-104070.750	-218.533	-218.533	5.259
1267.20	-104231.375	-214.594	-214.594	5.244
1268.00	-104414.953	-210.147	-210.147	5.230
1268.80	-104580.164	-205.953	-205.953	5.216
1269.60	-104731.617	-202.046	-202.046	5.202
1270.40	-104901.422	-197.630	-197.630	5.188

Page: 1

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 onto the T-BERD/MTS 8000V2 or 6000/6000A (see "Generating pdf report(s)" on page 545).

File Signature

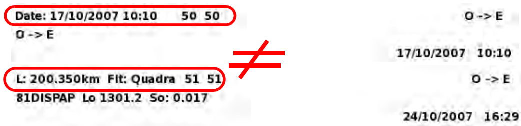
The Chromatic Dispersion results are stored with the extension ".ocd".

The Reference measurement and the CD measurement files have both the extension ".ocd" but can be differentiated by the information displayed in the File signature, on upper part of the screen:

Figure 221 File Signature for Reference and CD measurement

Reference File Signature

Measurement File Signature



Recalling reference or CD measurement files

Once a CD file is stored, it can be recalled using the Explorer:

1 Select **Explorer** with the key **Setup/Explorer**.

2 Select the directory and then the file to open

3 Press **Load**

4 Press **View Trace(s)** or **Load Trace + Config.**
Click on **Load Ref.** to open a reference file.

For further informations on file management, see Chapter 20 “File management”.

15

Broadband source BBS

This chapter describes the function of the BBS (Broadband Source) module and its use.

The topics discussed in this chapter are as follows:

- "Function of the BBS module" on page 456
- "Activation process" on page 456
- "Remote interlock connector" on page 457

NOTE
BBS modules comply with standard IEC 60825-1:2014, class 1M.

Function of the BBS module

The broadband source (BBS) module, covers two different wavelengths:

- from 1260 to 1640 nm with the 81BBS2A
- from 1460 to 1640 nm with the 81BBS1A.

They are used to measure the attenuation profile, chromatic dispersion and PMD of optical fibers.

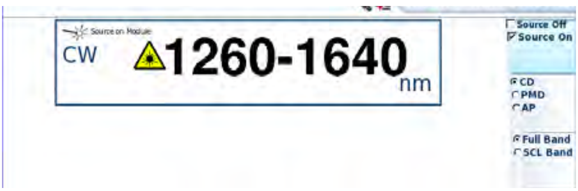
Activation process

To use the BBS function, go into the **HOME** page and select the BBS icon using the key or touchscreen.

1. Go into the **SETUP** or **RESULTS** menu (the same page is displayed for this plug-in) to access the BBS settings.
2. Press the **Source On** key.
3. Enter the password 4877, using the direction keys , or by pressing the numerical keyboard with the stylus.
4. Press the **Confirm** soft key to validate the password.
   The source is on and the icon is displayed.

Configuration with the 81BB2A module

Figure 222 Configuration of the BBS2A

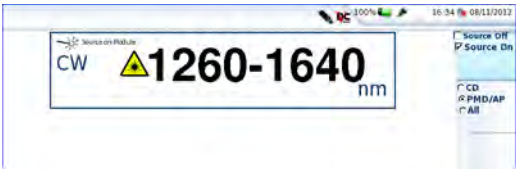


1. Select **CD**, **AP or PMD** transmission mode to perform the corresponding test using the 81DISPAP or 81MRDISPAP module.

2 If a CD mode is selected, the key **Full Band/SCL Band** is displayed and allow to select transmitted wavelength range.

Configuration with the 81BB1A module

Figure 223 Configuration of the BBS1A



1 Select **CD**, **AP/PMD** or **ALL** transmission mode to perform the corresponding test using the 81DISPAP or 81MRDISPAP module.

> **If the parameter All is selected, the dynamic range will be degraded by 3 dB.**

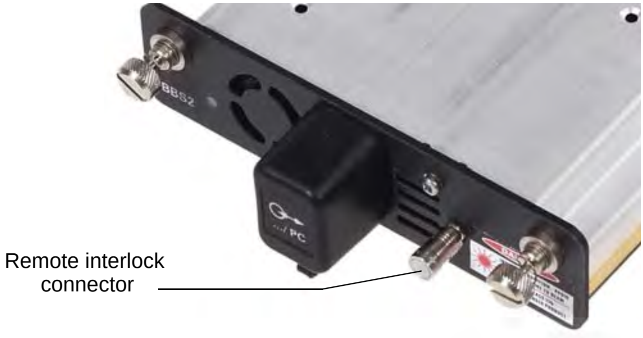
Remote interlock connector

The use of a Remote Interlock system is specified with class IIIb sources by 21 CFR 1040.10 (USA).

The BBS module is equipped with a remote interlock connector (SMB type) on the front panel. This is aimed to protect the user from injury when using class IIIb light sources.

If the short circuit at the SMB connector is opened, the broadband light source is switched off immediately and cannot be switched on until it is closed again.

Figure 224 Remote interlock connector



16

Multi Test Access Unit

This chapter describes the function of the MTAU (Multi Test Access Unit) module and its use.

The topics discussed in this chapter are as follows:

Function of the MTAU module

The MTAU is a passive module (switch) used to route the signals from the different measurement plug-ins to one and the same fiber.

The advantage is to be able, for example, to make all the characterization measurements (insertion loss, reflectometry, chromatic dispersion, spectrum and polarization measurements) with a single Platform 8000[1] without ever disconnecting the fiber.

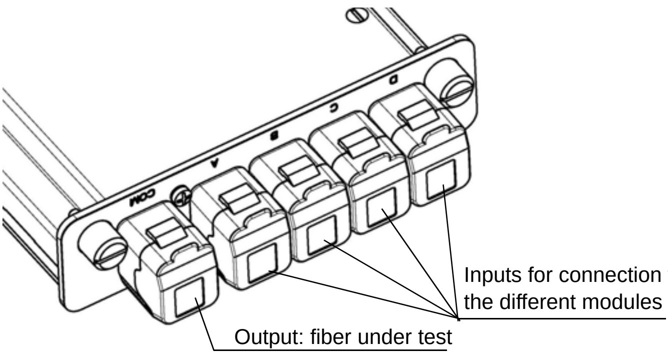
Connections

The MTAU plug-ins offer a common port with 4 ports A, B,C and D. The fiber to be tested must be connected to the common port. The other ports are connected to the measurement modules, e.g. OTDR, ODM, or an external instrument.

Two Platforms can be used at each end of the link under test for maximum efficiency and to carry out the largest number of tests in both directions.

NOTE
The MTAU is not directional. It is possible to use the common port either as an input or as an output.

Figure 225 MTAU plug-in with 1 common & 4 ports



1.Equipped with suitable plug-ins, for example an OTDR module and an ODM module

Configuration

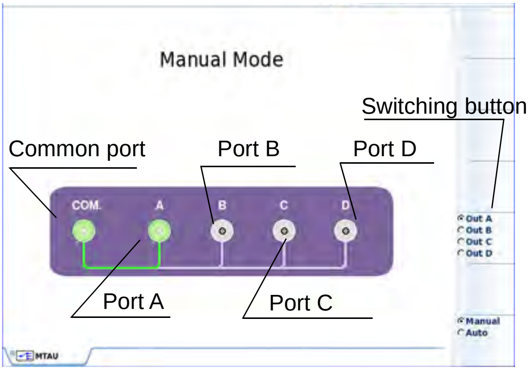
To use the MTAU function, go into the **HOME** page and select the icon 

.

Then go into the **SETUP** or **RESULTS** menu (the same page is displayed for this plug-in) to access the screen from which the the input channels can be switched.

The screen displays a diagram of the input and outputs to the switching device.

Figure 226 Manual mode for the MTAU plug-in



Manual mode

To switch each output, use the button **Port A/Port B/Port C/Port D**. Each click on this button switches the next output port.

The active port and the link to the common port are shown green, while the other ports remain grey.

> **NOTE**
> To optimize manipulation, always use the **RESULTS** key to change over from this screen to the screen corresponding to each measurement.

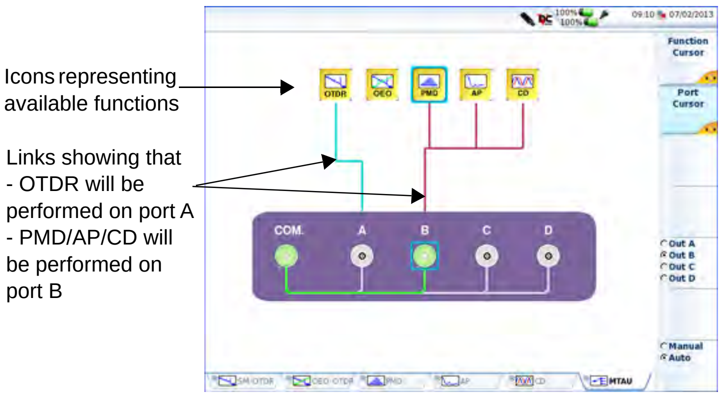
Auto mode

The auto mode offers the best way to test a full cable. The purpose is to set a sequence of operations, which will be performed for each fiber, one after the other with no need to modify the configuration or to go to each measurement tab. All operations can be handled from the MTAU tab.

> **NOTE**
> The switch between measurement (if necessary) is automatic. Nevertheless launching each measurement remains the user responsibility, as some extra equipment might be needed (ex broadband source for PMD).

Select **Auto** on the key **Manual/Auto** to switch to auto mode or vice et versa.

Figure 227 Auto mode for the MTAU plug-in



Different icons appear at the top of the screen, showing different available functions. According to your Platform 8000 configuration, you may have all the following functions available:

• OTDR	• CD
• OEO	• AP
• PMD	• OSA

17

Fiber Characterization

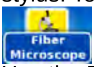
Used with the MTAU module, the Fiber characterization function allows to automate a test sequence with the different modules and associated test functions available in the T-BERD/MTS.

If a touchscreen is not available, to use the Fiber Characterization Script function, external keyboard and mouse or screen deported on PC are mandatory.

Topics discussed in this chapter are as follows:

Inspect and clean connectors

Before connecting a fiber into a test module, inspect and clean the module bulkhead and the fiber jumper connectors.

1. Connect the P5000i video inspection scope to both units USB port (any)
2. Press **HOME** hard key on the T-BERD/MTS 8000 V2.
   Press **SYSTEM** hard key on the T-BERD/MTS 6000A V2.
3. Activate the **Microscope** function on both units by touching with your finger or stylus. Touch the desired test f unction a second time to turn the icon yellow 

.
4. Use the P5000i video inspection scope to verify the connector quality.
5. Use appropriate cleaning material (e.g. IBC™ cleaner, cotton swab, dust air sprays, etc.) and re-inspect to confirm.

> **NOTE**
> See the user manual of the 8000 V2 or 6000A V2 Base-Unit for the P5000i scope use.

Connect the test modules to the MTAU

To perform a a test sequence with the fiber characterization script, you must connect the available plug-in modules to MTAU ports as follow:

- OTDR Module (Event characterization): PORT A
- ODM Module (Chromatic Dispersion / PMD / Attenuation profile): Port B

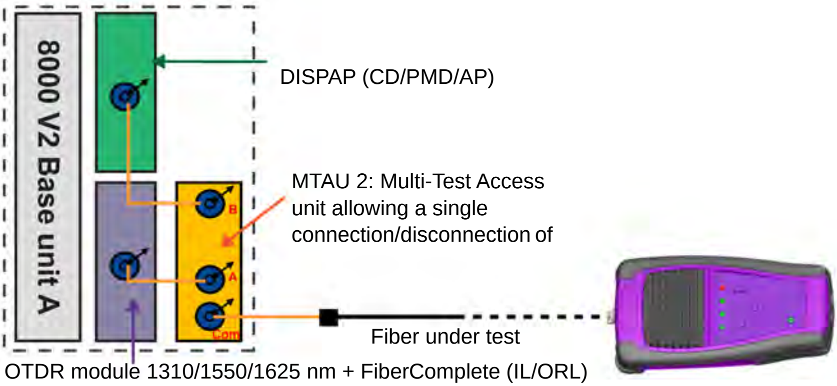
1. Connect the OTDR module to the MTAU port A with a short jumper.
2. Connect the ODM module to the MTAU port B with a short jumper

> **NOTE**
> Leave the port not connected if you don't have the associated test plug-in module.

The Fiber Characterization function can be used:

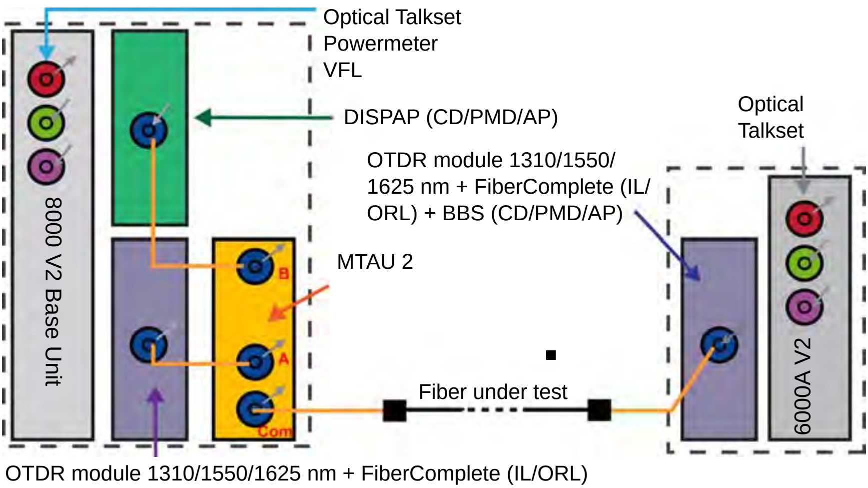
- in Unidirectional configuration

Figure 228 Interconnection - Unidirectional configuration



- in Bi-directional configuration, with one T-BERD/MTS 8000 V2 at one end, and one T-BERD/MTS 6000 at the other end.

Figure 229 Interconnection - Bi-directional configuration



The test modules (OTDR, DISPAP) have to be located in the slots closest to the mainframe. Keep the MTAU module at the back slots.

Referencing the test functions

The following test functions require REFERENCING before performing tests:

- FCOMP - Insertion Loss (IL) and Optical return Loss (ORL)
  The IL/ORL Referencing is done to ensure that the IL and ORL of the fiber jumpers are taken into account for an accurate qualification of the fiber to test.
- Chromatic Dispersion (CD), Attenuation Profile (AP)
  The AP /CD referencing is done to ensure that the far end broadband source is calibrated with the DISPAP module and the insertion loss of the fiber jumpers are taken into account for an accurate qualification of the fiber to test.

NOTE
This measurement is a two ended test. Both T-BERD/MTS 8000 V2 Platform and Broadband Source (OBS Handheld or T-BERD/MTS including the BBS capability) must be at the same location

Inspect and clean connectors

Before connecting a fiber into a test module, inspect and clean the module bulkhead and the fiber jumper connectors.

Caution

- Use the P5000i video inspection scope to verify the connector quality.
- Use appropriate cleaning material (e.g. IBC™ cleaner, cotton swab, dust air sprays, etc...) and re-inspect to confirm.

IL/ORL referencing

IL/ORL referencing with the integrated FiberComplete® solution

1 Connect a fiber jumper to the MTAU COM port of T-BERD/MTS 8000 V2 and one to the test port of the module of the T-BERD/MTS 6000A.

Refer to Figure 229 on page 465 for proper module interconnections.

2 Press **ON/OFF** to turn both units on and wait the completion of auto-test (45 sec.).

Activate the FCOMP function on both units

1 Press the **HOME** hard key and light the icon 

.

2 Press the hard key **RESULTS** and touch the MTAU tab of the 8000 V2 unit.

3 Press the soft key 

until **OUT A** is selected on the 8000 V2 unit.

ORL and side by side IL Referencing

1 Touch the **FCOMP** tab.

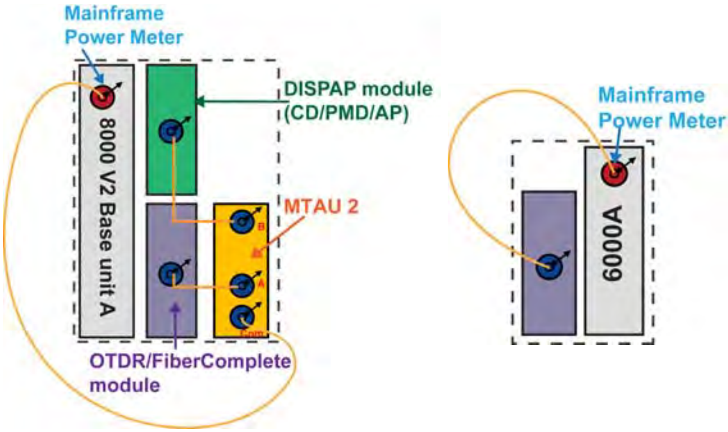
2 Press the soft key **References** to enter the reference menu.

3 Press the soft key **Take Refs** in order to enter the referencing wizard.

4 Press **Side/Side** key to start referencing process for ORL and side by side Insertion Loss.

5 When prompt, connect the test jumpers from the 8000V2 COM port to the mainframe power meter and from the 6000 test module to mainframe power meter, as shown below:

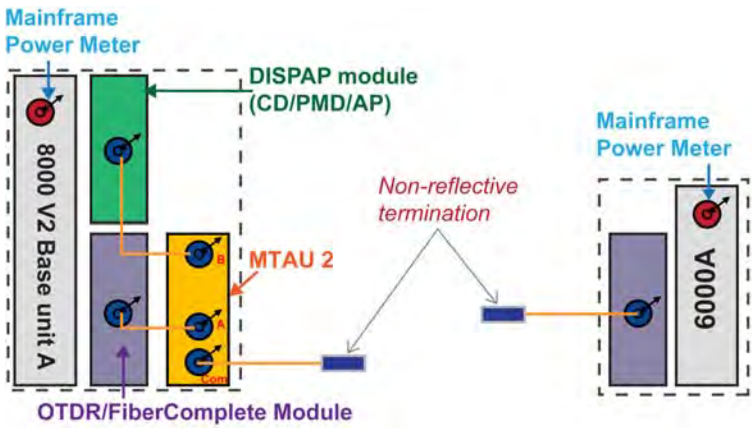
Figure 230 IL Side by side measurement



6 Press **OK** to measure emitted power level.

7 When prompt, disconnect the test jumpers from the mainframe power meters and connect the non-reflective terminator to the end of each test jumper, as shown below (terminators located in the black plastic box)

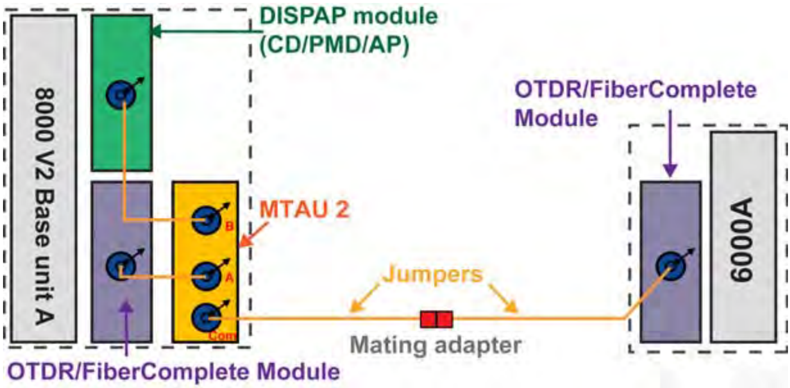
Figure 231 Zero ORL Referencing



8 Press **OK** to perform zero ORL referencing.

9 Connect both jumpers together using the appropriate mating adapter. See below the interconnection schematic.

Figure 232 IL Side by Side Referencing schematic



10 Press **Ok** to perform IL Referencing.

Perform ORL and Loopback IL Referencing

1 Touch the **FCOMP** tab.

2 Press the soft key **References** to enter the reference menu.

3 Press the soft key **Take Refs** in order to enter the referencing wizard.

4 Press **Loopback** to start referencing process for ORL and Insertion Loss

5 Repeat above steps 5 to 8 for loopback ORL/IL referencing.

AP and CD referencing with FC2 Test Kit

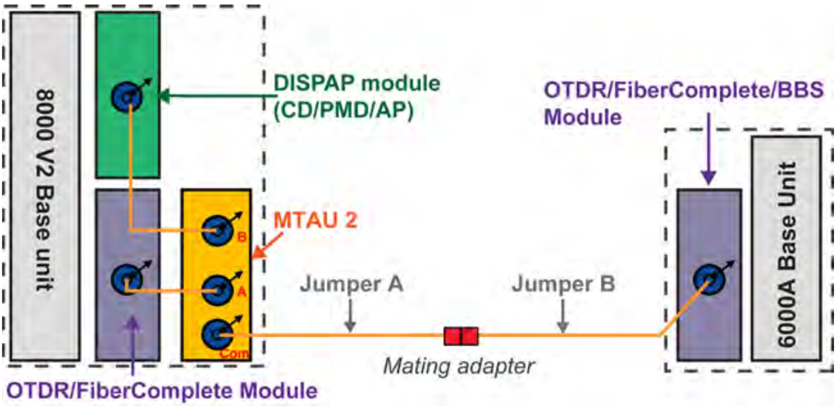
The referencing for AP and CD in bi-directional mode is performed with:

- one T-BERD/MTS 8000 V2 at one side
- one T-BERD/MTS-6000A V2, with the E81x6C-FCHAR module and integrated broadband source, at the other side.

1 Connect a fiber jumper to the MTAU COM port of T-BERD/MTS 8000 V2 and to the test module of the T-BERD/MTS 6000A V2.

2 Connect both jumpers together using the appropriate mating adapter.
See below the interconnection schematic.

Figure 233 Interconnection for CD/AP Referencing in Bidirectionnal mode



3 Press **ON/OFF** to turn both units on and wait the completion of auto-test (45 sec.)

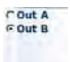
Activate the CD or AP function on T-BERD/MTS 8000 V2

Once the T-BERD/MTS 8000 V2 is switched on:

1 On the **Home** page, select **CD** icon  or **AP** icon  .

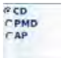
2 Wait for the self calibration process of the DISPAP module (~1min.).

3 Press the hard key **RESULTS** and touch the MTAU tab.

4 Press the soft key  until **OUT B** is selected

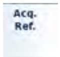
Activate the BBS Source on T-BERD/MTS 6000

Once the T-BERD/MTS 6000 is switched on:

1. On the **Home** page, select **BBS** icon 
.
2. Press **RESULTS** hard key.
3. Click on **BBS** tab.
4. Click on menu key 

to select **CD** or **AP**.
5. Press **START/STOP** hard key to activate the BBS.

Perform the CD/AP referencing on T-BERD/MTS 8000 V2

1. Click on **CD** or **AP** tab and press **SETUP**.
2. Click on **Ref Acq.** 

to enter in the reference menu.
3. Select **Make Reference** to **Yes**.
4. Press **Yes** to confirm making a new reference..
5. On the parameter **BBS Serial Number**, enter the BBS module serial number using the numerical keyboard and validate.

> **NOTE**
> The serial number is displayed in the **About** page of the Platform (**HOME** > **About**).

6. Press the soft key 

to exit the reference menu.
7. Press **START/STOP** hard key to reference

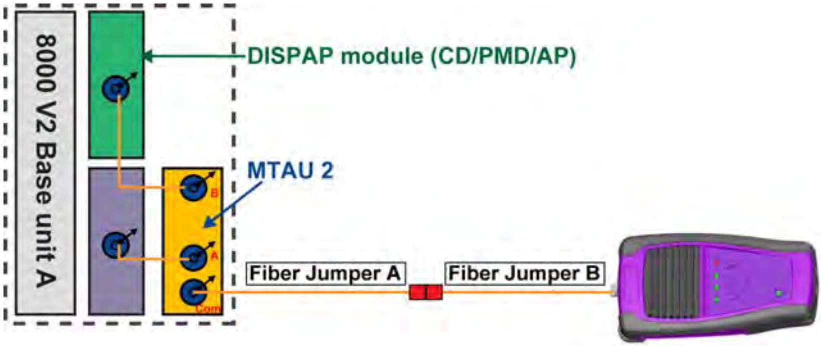
AP and CD referencing with FC1 Test Kit

The referencing for AP and CD in unidirectional mode is performed with:

- one T-BERD/MTS 8000 V2 at one side
- one OBS5x0 at the other side.

1. Connect a fiber jumper to the MTAU COM port of T-BERD/MTS 8000 V2 and to the OBS5x0.
2. Connect both jumpers together using the appropriate mating adapter.
See below the interconnection schematic.

Figure 234 Interconnection for Referencing in Unidirectionnal mode



3 Press the hard key **ON/OFF** on both the T-BERD/MTS 8000 V2 and the OBS5x0 unit

Activate the AP/CD function on the T-BERD/MTS 8000 V2

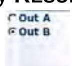
1 Press the hard key **HOME** and light the icon 

 / 

 with your finger or stylus.

Wait for the tuning process of the DISPAP module (~1min.)

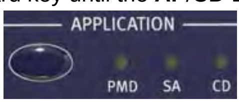
2 Press the hard key **RESULTS** and touch the MTAU tab

3 Press the soft key 

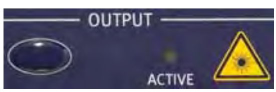
 until **OUT B** is selected

Activate the AP/CD mode of the OBS5x0

1 Press the **Application** hard key until the **AP/CD** LED is lighted.



2 Press **Output** hard key to activate the BBS .



Perform the AP / CD referencing on the T-BERD/MTS 8000 V2

1. Touch the **AP** / **CD** tab and press the hard key.
2. Press the soft key **Acq. Ref.** to enter the reference menu.
3. Select **Make Reference** to **Yes**.
4. Press **Yes** to confirm making a new reference.
5. Drop down using the navigation keys, or touch the **BBS Serial Number** parameter, and enter the OBS5x0 serial number using numerical keyboard and press **Enter**.

> **NOTE**
> The serial number can be found at the back of the OBS5x0 handheld.

6. Press the soft key **Close Ref. Menu** to exit the reference menu.
7. Press the **START/STOP** hard key to reference.

Fiber Characterization Test Sequence in Manual mode

There are two modes of performing a Fiber characterization in manual mode:

- In Unidirectional mode: one OTDR measurement is performed in one way (A -> B), using 1 x 8000 + OBS.
- In bi-directional mode: the OTDR measurement is performed in the two directions (A -> B and B -> A), with addition of bi-directional IL/ORL using 1 x 8000 + 1 x 6000.

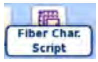
Fiber Characterization with FC1 Test Kit (Unidirectional)

Once the necessary referencing measurements have been done, a fiber characterization can be performed, in manual mode, using a T-BERD 8000 V2 at one end and an OBS 5x at the other end.

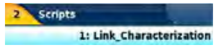
The Insertion Loss (IL), the Optical return Loss (ORL), the Chromatic Dispersion (CD) and the Attenuation Profile (AP) measurements have to be referenced before starting testing.

Please refer to chapter “AP and CD referencing with FC1 Test Kit” on page 471 for the associated procedures

Getting started with the "Link Characterization" Script

1 Press the **SCRIPT** hard key or press the icon 

.on the **Home** page.

2 Drop down using the navigation keys or touch 

to select the "Link characterization" script.

3 Press the soft key **Play** to launch the script process.

Define the Test Setup

The available test functions are listed in black in **Test Setup** window.

Check marked the square button for each test function to be added in the test sequence. (Button becoming red).

- **Connector Inspection**: Available if video inspection scope is connected to the mainframe. The script will open up the connector image viewer.
- **OTDR**: The script will use the wavelengths defined in the OTDR test Setup and measurements will be performed using Automatic configuration.
- **CD (PS)**: Chromatic Dispersion measurement. It requires the use of the OBS handheld or the selection of the BBS on the other T-BERD 8000 script configuration menu.
- **PMD**: PMD measurement. It requires the use of the OBS handheld or the selection of the BBS on the other T-BERD 800 script configuration menu.
- **AP**: Attenuation Profile measurement. It requires the use of the OBS handheld or the selection of the BBS on the other T-BERD 8000 script configuration menu.

Define the Job Type

The Job Type enables to define how the product is going to organize the results and what type of characterization test sequence is performed.

Check marked the square button for each type (button becoming red).

- **Cable commissioning**: is used for testing an entire cable. The script will save all the test results and the summary report into one directory, and for all the fibers. The directory will be created using the Cable ID as the name. This directory will be located under the current selected directory. Make sure the selected directory is the root hard disk or a well known one. Press the System hard key and the File hard key to get access to the Explorer in order to change the directory selection.
- **Fiber Span testing**: is used for few fiber testing. The script will save the test results of one fiber and the report summary into one directory. Each fiber will have its own directory. The directory will be created using the FiberID and the Fiber #, as the name. This directory will be located under the current selected directory.
- **Uni-directional Testing**: defines the script sequence when only one T-BERD 8000 is used in conjunction with a handheld OBS 5x0 at the far end.

Define the Link Description

The **Link Description** enables to document the information, related to the link being tested.

Fill-in all the information using the USB key board: **Local Cable Id** / **Local Fiber Id** / **Origin & End Location** / **Job Ticket**.

- **Rate**: select the expected bit rate in the drop down menu. This will pre-define the alarm thresholds for CD and PMD testing.
- Add a **Comment** which will be loaded into each test application and save with each test results.
- Define the **Local Fiber #** of your fiber under test.

  Set the **Direction** of the measurement between A->B and B->A (Origin and End).

  If the Origin fiber number or cable Id is different from the far end, check mark **Different extremities** in order to have access to the local and distant information using the **Settings: Local / Distant** soft key.

Configuring the “Results” Summary table

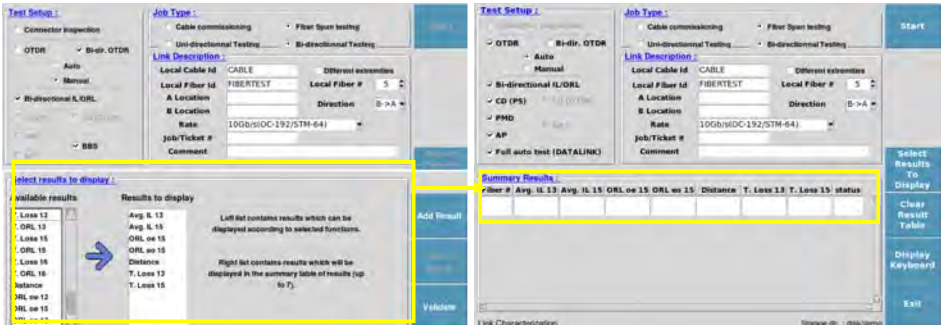
This summary table enables to review selected values at the end of the test sequence. A Pass/Fail status is associated to the table.

1. Press softkey **Select Results to Display** to access the list.
2. Highlight one parameter in the column **Available results**.
3. Press the soft key **Add Result** in order to select the parameter and see it in the column **Results to display**.

4 Repeat steps 1 to 3 until you have selected all the parameters. Maximum 7.

5 Press the soft key **Validate** in order to acknowledge the selection.

Figure 235 Summary table contents



6 Press **Exit** to return to Fiber Characterization screen.

Start the test sequence

When the script configuration is done, you can start the test sequence.

1 Press the **Start** soft key when ready.

2 Follow the step by step guidances to conduct the link characterization sequence.

- **a** Press **Yes** to Start a SM-OTDR test. (This will start a 1310/1550/1625 nm OTDR test).
- **b** When asked to "CHECK PMD SOURCE", contact far end of fiber under test and connect OBS-550/500 light source. Turn light source on, ensure BB mode of operation, PMD mode and press activate. Red light will come on indicating light source is active.
- **c** Press **Yes** to continue PMD test.
- **d** Upon completion of PMD test, instruct tech at far end to press AP mode of operation on light source.
- **e** Press **Yes** to continue AP test.
- **f** Upon completion of AP test, instruct tech at far end to press CD mode of operation on light source.

g Press **Yes** to continue CD test.

After completion of CD test, Result screen appears.

Figure 236 Results screen with FC1 Test Kit

If more fibers are to be tested press **Yes** and fiber number automatically increments.

If no more fiber is to be tested press **No** and a summary of the results is visible.

1 Press soft key **Exit** to exit the link characterization script.

> **NOTE**
>
> To see details of the tests, press **RESULTS** hard key and **Application** soft key at the bottom of the on-screen.

OBS-500/550 LightSource Operation for Fiber Characterization Testing

1 Press the **Power** button to turn on.

2 Using the MODE button to select BB(1).

3 When instructed by the technician performing the tests, using the **Application** button ensure PMD light is green.

4 Under **Output** press the button to activate the source.

When directed by the testing technician, using the **Application** button ensure AP light is green, then CD.

> **NOTE**
> OBS-550 has HD mode which is High dynamic mode. By selecting HD mode, the EDFA amplifier built into the light source is engaged and the output power increases substantially. In addition, the spectral range of the light source goes from 1460-1640 to 1530-1565 nm.

Fiber Characterization with FC2 Test Kit (Bi-dir.)

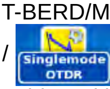
Once the necessary referencing measurements have been performed, a fiber characterization can be performed, in manual mode, using a T-BERD 8000 V2 at one end and a T-BERD/MTS 6000A V2 at the other end, or using two T-BERD/MTS 8000 V2.

Activating the test functions on T-BERD/MTS 8000 V2

1. Press the **HOME** hard key on the 8000 V2
2. Activate test functions: select the function to activate by touching with your finger or stylus.
   Touch the desired test function a second time to turn the icon yellow.
3. Activate 6 test functions: 

Activating the test functions on T-BERD/MTS 6000A V2

1. Press the hard key **SYSTEM** on the T-BERD/MTS 6000A V2
2. Activate 2 test functions 

/ 

:
   Select the function to activate by touching with your finger or stylus.
   Touch the desired test function a second time to turn the icon yellow.

Creating the storage directory

1. Press the **FILE** hard key.
2. Drop down using the navigation keys or use a pointer to highlight an existing folder. All files from all test functions will be saved to this folder going forward.

If a new folder is needed, go to step 3, else go to next section.

3 Highlight desired main folder. Press the soft key **Create Directory** to create a sub-directory.

A virtual keyboard will appear to allow you to input a new folder name. Alternatively, you can connect a USB keyboard to input the name.

> **NOTE**
> You must name the folder after your site name (ex: Jones, MSC, Valley View, etc).

4 Once the folder name is input, press **Enter** to validate and create.

5 All test files will be saved into this directory, unless a new one is created or the selection of the target directory changes.

> **NOTE**
> It is not mandatory to create a subdirectory as the script automatically creates one at the start of the test sequence.

Setting the test parameters

Setting the Fiber Complete (FCOMP) test parameters on both units

1 Go to the **FCOMP** tab

2 Press the **SETUP** key to get access to the setup menu

3 Configure the FCOMP Setup parameters as below:

Figure 237 FiberComplete setup

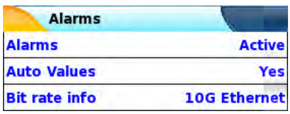
Setting the OTDR test parameters on both units

1. Go to the **SM-OTDR** tab.
2. Press the soft key **Alarms**.
3. Select **Alarm level** to **Fail**
4. Set the thresholds to **Default** or define your own criteria (see Figure 243 on page 488).

Setting the PMD test parameters on T-BERD/MTS 8000 V2

1. Go to the **PMD** tab
2. Press the soft key **Test Auto**.
3. Under the ‘**Display**’ section, tap “**Alarms**” field and define the **transmission bit rate**

Figure 238 PMD Alarm configuration



Setting the AP test parameters on T-BERD/MTS 8000 V2

1. Go to the **AP** tab
2. Press the soft key **Test Auto**

Setting the CD test parameters on T-BERD/MTS 8000 V2

1. Go to the **CD** tab
2. Press the soft key **Test Auto**
3. Under the **Display** section:
   – tap **Alarms** field and define the transmission bit rate:
   – tap **Wavelength Range** field and set as below:

Figure 239 Alarms and Wavelength range configuration

Defining the filenaming and fiber description

1 Go to the **FCOMP** tab

2 Press the **FILE** hard key

3 If needed, press soft key **Explorer/Setup** to toggle to **Setup**

4 Configure your File storage mechanism

For ‘Filenaming’, define your desired string, example: `[Origin_Id]_[End_Id]_[Fiber_Id]_[Fiber_Num]`

Press the soft key **Copy Setup To all** in order to update all the test functions (OTDR, CD, PMD, AP) with this filenaming information.

Starting a test sequence

1 Inspect and clean connectors of the fiber link to measure using the P5000i inspection scope

2 Connect the fiber under test to each patchcord (one connected to the TB8000 COM port of the MTAU module and one connected the 6000A module C)

On the T-BERD/MTS 8000 V2

1 Go to **MTAU** tab and select **Out A** 

.

2 Press the **RESULTS** hard key

3 Go to the **FCOMP** tab and press the **START/STOP** button to start the measurement sequence

NOTE
IL, ORL and bidirectional OTDR measurements are triggered under FCOMP.

4 Wait for the completion of FCOMPand OTDR testRed **Testing** light turns off.

5 Go to MTAU tab and select **Out B** 

.

On the T-BERD/MTS 6000A

1 Press the **SYSTEM** hard key to go to the Home page and activate the BBS function

2 Press the **RESULTS** hard key

3 Touch the **BBS** tab

4 Touch the soft key **Source Off/Source On** to turn the source on

5 Touch the softkey **CD/PMD/AP** to position the test mode as **CD**

On the T-BERD/MTS 8000 V2

1 Go to **CD** tab and press the **START/STOP** button to start the measurement sequence.

2 Test is complete when the red **Testing** light turns off.

On the T-BERD/MTS 6000A

1 Touch the softkey **CD/PMD/AP** to position the test mode as **PMD**

On the T-BERD/MTS 8000 V2

1 Go to **PMD** tab and press the **START/STOP** button to start the measurement sequence.

2 Test is complete when the red **Testing** light turns off.

On the T-BERD/MTS 6000A V2

1 Touch the softkey **CD/PMD/AP** to position the test mode as **AP.**

On the T-BERD/MTS 8000 V2

1 Go to **AP** tab and press the **START/STOP** button to start the measurement sequence

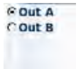
Test is complete when the red **Testing** light turns off.

All measurements are completed FOR THIS FIBER

Testing next fiber

Before testing next fiber, make sure the fiber description (fiber number, location…) has been correctly setup in the FiberComplete FILE setup page and copied to all.

On the T-BERD/MTS 8000 V2

1 Go to MTAU tab and select **Out A** 

On the T-BERD/MTS 6000A V2

1 Press the **SYSTEM** hard key on the 6000A

2 Activate 2 test functions: 

/ 

3 Repeat steps 1 to 20 above.

Fiber Characterization Automated Test Sequence using the Link Characterization Script

Fiber Characterization with FC1 Test Kit (Unidirectional)

Once the referencing measurements have been done, a fiber characterization test can be performed, using a T-BERD 8000 V2 at one end and a OBS5x0 at the other end.

Selecting data storage directory

1 Press the **FILE** hardkey.

2 Press **File/Explorer** softkey to select the "**Explorer**" page.

3 Using the navigation keys or touchscreen, on the left side of the screen, select the main or sub directory where you wish to store files, typically the "Hard Disk".

4 If necessary, create a new directory to store the results: see “Creating the storage directory” on page 478.

Launching the Link Characterization script

1 Press the **SCRIPT** hard key on the 8000 V2

2 Select the function **Scripts** > **Link Characterization** using touchscreen or stylus

3 Press the soft key **Launch** to enter the script configuration menu..

Configuring the Test Setup

The available test functions are listed in black in **Test Setup** window

1 Check the test functions to include in the characterization sequence as follow

Figure 240 Test sequence configuration on 8000 V2

Configuring the Job Type & Link Description

The **Job Type** window enables to define how the product is going to organize the results and what type of characterization test sequence is performed.

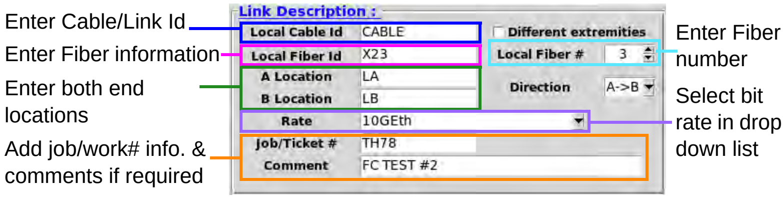
The **Link Description** window enables to document the information, related to the link being tested.

1 Check **Fiber Span testing** is defined in **Job Type** parameter.

2 Enter **Link Description** on both units

Make sure they are both identical for test documentation consistency.

Figure 241 Link Description parameters



NOTE

All test files will be saved into the directory automatically created as per [Local Fiber Id] [Local Fiber #].

Configuring the “Results” Summary table

This summary table enables to review selected values at the end of the test sequence. A Pass/Fail status is associated to the table.

1 Press softkey **Select Results to Display** to access the list.

2 Highlight one parameter in the column **Available results**.

3 Press the soft key **Add Result** in order to select the parameter and see it in the column **Results to display**.

4 Repeat steps 1 to 3 until you have selected all the parameters. Maximum 7.

5 Press the soft key **Validate** in order to acknowledge the selection.
See Figure 235 on page 476

6 Press **Exit** to return to Fiber Characterization screen.

Starting a test sequence

When the script configuration is done, you can start the test sequence.

1 Press the **Start** soft key when ready.

2 Follow the step by step guidances to conduct the link characterization sequence.

a Press **Yes** to Start a SM-OTDR test. (This will start a 1310/1550/1625 nm OTDR test).

b When asked to "CHECK PMD SOURCE", contact far end user to connect OBS-550/500 light source. Turn light source on, ensure BB mode of operation, and set for PMD mode and press **Activate**. Red light will turn on indicating source is active.

c Press **Yes** to continue PMD test.

Upon completion of PMD test, instruct user at far end to press AP mode of operation on light source.

d Press **Yes** to continue AP test.

Upon completion of AP test, instruct user at far end to press CD mode of operation on light source.

e Press **Yes** to continue CD test.

Upon completion of CD test, Result screen appears.

3 If more fibers are to be tested press **Yes** and fiber number automatically increments.

If no more fiber is to be tested press **No** and a summary of the results is visible.

4 Press soft key **Exit** to exit the link characterization script.

To see details of the tests, press **RESULTS** hard key and application soft key at the bottom of the on-screen.

Fiber Characterization with datalink

Once the referencing measurements have been done, a fiber characterization can be performed, in an automatic mode, using a T-BERD 8000 V2 at one end and a T-BERD/MTS 6000A V2 at the other end.

Connecting the Optical Talkset and Datalink

1 Connect the optical talkset port of each mainframe (labeled "TS") using a spare fiber.

2 When both units are connected, press **HOME** on the 8000 V2 unit

3 Select the function to activate by touching with your finger or stylus.

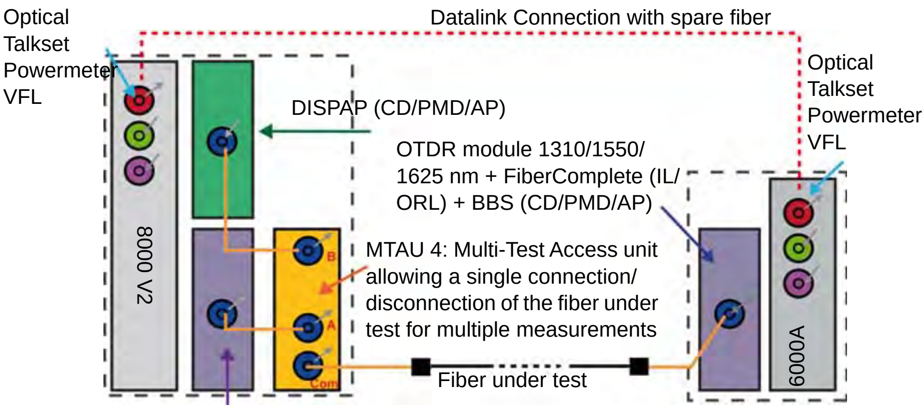
4 Touch a second time to turn the icon yellow 

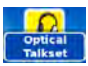
.

> **NOTE**
> The far end 6000A Datalink icon will turn yellow when connection is established. Both units will beep to confirm.

> **NOTE**
> You can use the optical talkset simultaneously to talk through the spare fiber.

Figure 242 Talkset and Datalink connection



5 Activate the function 

Setting the OTDR/IL/ORL Pass/Fail criteria

If it has not already been done, the alarm parameters must be configured for OTDR and IL/ORL.

> **NOTE**
> You don't need to go through this step if the pass/fail criteria had previously been loaded.

1 Press the **SETUP** hard key on both units
2 Go to the **FCOMP** tab on both units
3 Configure the **FCOMP** Thresholds parameters as **Default** or enter your own criteria
4 Go to the **SM-OTDR** tab on both units
5 Press the soft key **Alarms**
6 Select Alarm level to “**Fail**”
7 Set the thresholds to **Default** or define your own criteria

Figure 243 OTDR Alarms - Default and User

Selecting data storage directory

1 Press the **FILE** hardkey.
2 Press **File/Explorer** softkey to select the "**Explorer**" page.
3 Using the navigation keys or touchscreen, on the left side of the screen, select the main or sub directory where you wish to store files, typically the "Hard Disk".
4 If necessary, create a new directory to store the results: see “Creating the storage directory” on page 478.

Launching the Link Characterization script

1 Press the **SCRIPT** hard key on the 8000 V2 and 6000A units
2 Select the function **Scripts** > **Link Characterization** using touchscreen or stylus

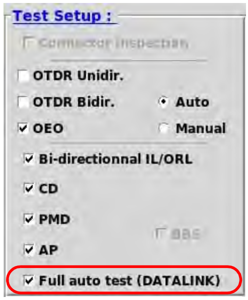
3 Press the soft key **Launch** to enter the script configuration menu.

Configuring the test sequence

Check the test functions to include in the characterization sequence as follow

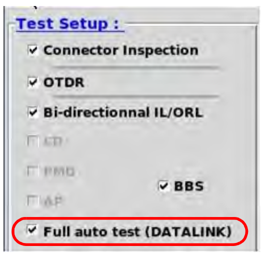
Configuring the test sequence on the T-BERD/MTS 8000 V2

Figure 244 Test sequence configuration on 8000 V2



Configuring the test sequence on the T-BERD/MTS 6000A V2

Figure 245 Test sequence configuration on 6000A

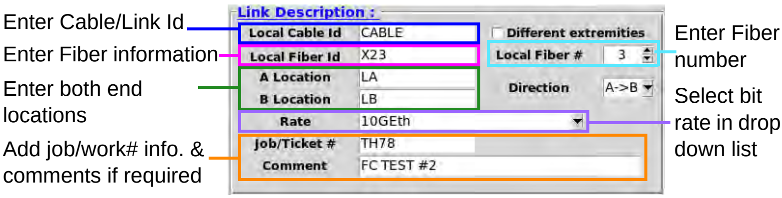


To perform the characterization with automatic method, check the parameter **Full auto test (Datalink)** is selected on both units.

Configuring the Job Type & Link Description

1. Check **Fiber Span testing** is defined in **Job Type** parameter.
2. Enter **Link Description** on both units

Figure 246 Link Description parameters



Make sure they are both identical for test documentation consistency.

All test files will be saved into the directory automatically created as per [Local Fiber Id] [Local Fiber #] if fiber span, and [Local Cable_Id] if cable commision.

Configuring the "Results" Summary table

This summary table enables to review selected values at the end of the test sequence. A Pass/Fail status is associated to the table.

1. Press softkey **Select Results to Display** to access the list.
2. Highlight one parameter in the column **Available results**.
3. Press the soft key **Add Result** in order to select the parameter and see it in the column **Results to display**.
4. Repeat steps 1 to 3 until you have selected all the parameters. Maximum 7.
5. Press the soft key **Validate** in order to acknowledge the selection.
   See Figure 235 on page 476.
6. Press **Exit** to return to Fiber Characterization screen.

Starting a test sequence

1 Press the soft key **Start** on both units

A message `Waiting for Datalink initialisation...` is displayed while both units are communicating to each others in order to synchronize the test sequence.

2 Inspect and clean connectors of the fiber to test using the P5000i inspection scope on both ends when the inspection page appears.

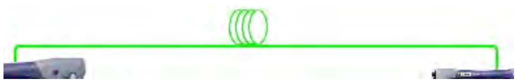
3 Connect the fiber under test to each patchcord (one connected to the TB8000 COM port of the MTAU module and one connected the 6000A module C).

4 Press the **SCRIPT** hard key on both units to continue with the test sequence.

On the T-BERD/MTS 8000 V2

1 The message 

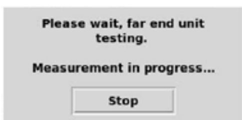
displays until the green link between both test sets is displayed.



> **NOTE**
> The test set will start the test sequence automatically. Do not press the **Yes / No** keys.

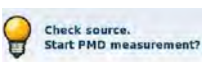
On the T-BERD/MTS 6000A V2

1 The following message appears while the 8000 V2 test is in progress:



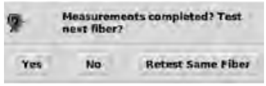
DO NOT click **Stop** until the 8000 V2 notifies test is completed.

On the T-BERD/MTS 8000 V2

1 The message 

to start PMD/CD/AP measurements display.

Measurement will start automatically,, when the far end BBS is on.

2 Press **No** when message prompt appears 

to stop testing.

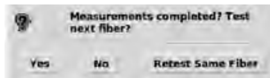
3 Notify the far end user to do the same.

Testing next fiber

> **Before testing next fiber, make sure the fiber description (fiber number, location…) has been correctly setup in the Link Characterization Script setup page.**

1 Repeat steps 1 to 9 to test the next fiber

Users can press **Yes** when the message prompts to sequence a new test with consecutive fiber number..



Fiber Characterization - No datalink

Once the referencing measurements have been done, a fiber characterization can be performed, in a semi automatic mode, using a T-BERD 8000 V2 at one end and a T-BERD/MTS 6000A V2 at the other end, or using two T-BERD/MTS 8000 V2.

Setting the OTDR/IL/ORL Pass/Fail criteria

If it has not already been done, the alarm parameters must be configured for OTDR and IL/ORL.

> **NOTE**
>
> You don't need to go through this step if the pass/fail criteria had previously been loaded.

1 Press the **SETUP** hard key on both units

2 Go to the **FiberComplete** tab on both units

3 Configure the **FCOMP** Thresholds parameters as **Default** or enter your own criteria

4 Go to the **SM-OTDR** tab on both units

5 Press the soft key **Alarms**

6 Select Alarm level to “**Fail**”

7 Set the thresholds to **Default** or define your own criteria

Figure 247 OTDR Alarms - Default and User

Selecting data storage directory

1 Press the **FILE** hardkey.

2 Press **File/Explorer** softkey to select the "**Explorer**" page.

3 Using the navigation keys or touchscreen, on the left side of the screen, select the main or sub directory where you wish to store files, typically the "Hard Disk".

4 If necessary, create a new directory to store the results: see “Creating the storage directory” on page 478.

Launching the Link Characterization script

1 Press the **SCRIPT** hard key on the 8000 V2 and 6000A units

2 Select the function **Script** > **Link Characterization** using touchscreen or stylus.

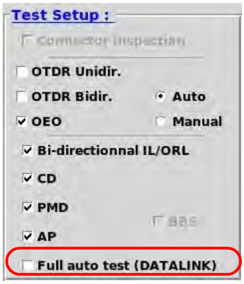
3 Press the soft key **Launch** to enter the script configuration menu.

Configuring the test sequence

Check the test functions to include in the characterization sequence as follow

Configuring the test sequence on the T-BERD/MTS 8000 V2

Figure 248 Test sequence configuration on 8000 V2



Configuring the test sequence on the T-BERD/MTS 6000A V2

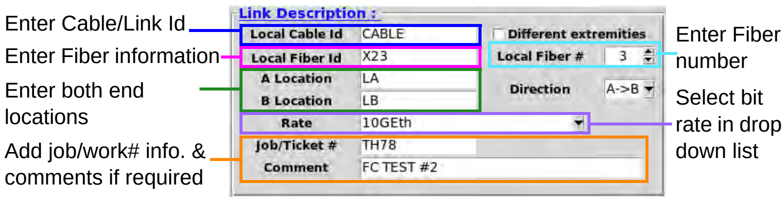
Figure 249 Test sequence configuration on 6000A

To perform the characterization with semi-automatic method, check the parameter **Full auto test (Datalink)** is not selected on both units.

Configuring the Job Type & Link Description

1. Check **Fiber Span testing** is defined in **Job Type** parameter.
2. Enter **Link Description** on both units

Figure 250 Link Description parameters



Make sure they are both identical for test documentation consistency.

All test files will be saved into the directory automatically created as per [Local Fiber Id] [Local Fiber #] if fiber span, and [Local Cable_Id] if cable commision.

Configuring the "Results" Summary table

This summary table enables to review selected values at the end of the test sequence. A Pass/Fail status is associated to the table.

1. Press the softkey **Select Results to Display** to access the selection list.
2. Highlight one parameter in the column .
3. Press the soft key **Add Result** in order to select the parameter and see it in the column .
4. Repeat steps 1 to 3 until you have selected all the parameters. Maximum 7.
5. Press the soft key **Validate** in order to acknowledge the selection.
   See Figure 235 on page 476.
6. Press **Exit** to return to Fiber Characterization screen.

Starting a test sequence

1 Press the soft key **Start** on both units

2 When message `Do you want to start measurement from your site?` appears, click **Yes** on the 8000 and **No** on the 6000A

3 Inspect and clean connectors of the fiber to test using the P5000i inspection scope on both ends when the inspection page appears

4 Connect the fiber under test to each patchcord (one connected to the TB8000 COM port of the MTAU module and one connected the 6000A module C)

5 Press the **SCRIPT** hard key on both units to continue with the test sequence

On the T-BERD/MTS 8000 V2

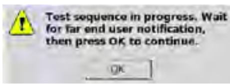
6 Press **Yes** to the message 

when the green link between both test sets is displayed.

IL, ORL and bidirectional OTDR measurements are performed under FCOMP

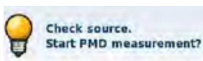
On the T-BERD/MTS 6000A V2

7 The following message appears while the 8000 V2 test is in progress:



DO NOT click until the 8000 V2 notifies test is completed.

On the T-BERD/MTS 8000 V2

1 Notify 6000A user when the prompt 

appears but DO NOT press **Yes** until far end user confirmed PMD source function is activated

On the T-BERD/MTS 6000A V2

2 When notified by the 8000 V2user, press **OK** button to continue

3 Touch the softkey 

to position the test mode as PMD

4 Notify the far end user

On the T-BERD/MTS 8000 V2

5 Press **Yes** to the message 

to start PMD measurement

6 Notify 6000A user when the prompt appears 

but DO NOT press **Yes** until far end user confirmed AP source function is activated

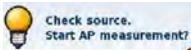
On the T-BERD/MTS 6000A V2

7 When notified by the 8000 V2 user, touch the softkey 

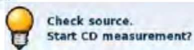
to position the test mode as AP

8 Notify the far end user

On the T-BERD/MTS 8000 V2

9 Press **Yes** to the message 

to start AP measurement

10 Notify 6000A user when the prompt appears 

but DO NOT press **Yes** until far end user confirmed CD source function is activated

On the T-BERD/MTS 6000A V2

11 When notified by the 8000 V2 user, touch the softkey 

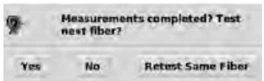
to position the test mode as CD

12 Notify the far end user

On the T-BERD/MTS 8000 V2

13 Press **Yes** to the message 

to start CD measurement

14 Press **No** when message prompt appears 

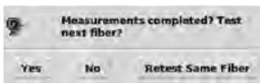
to stop testing

15 Notify the far end user

On the T-BERD/MTS 6000A V2

16 When notified by the 8000 user, press 

.

17 Press **No** when message prompt appears 

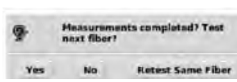
to stop testing

Testing next fiber

Before testing next fiber, make sure the fiber description (fiber number, location…) has been correctly setup in the Link Characterization Script setup page.

1 Repeat steps 1 to 24 to test the next fiber

Users can press **Yes** when the message prompts to sequence a new test with consecutive fiber number..



Results display and saving

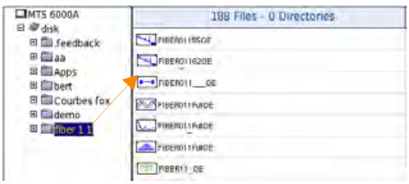
Once all the measurements are performed, the result table is displayed

Figure 251 Fiber Characterization Results Table

The results summary is filled in with the last 5 fiber measurements and the user can scroll up and down to view the other fibers tested.

The data are automatically saved in one directory.

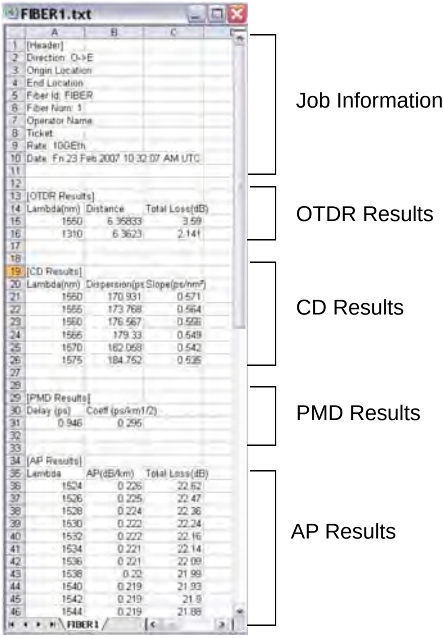
Figure 252 Directory automatically generated



All raw OTDR, CD, PMD and AP traces are saved (5 per fiber: 1310 OTDR, 1550 OTDR, PMD, CD and AP files).

The test set automatically creates a *.txt file which saves Loss, ORL, OTDR, CD, PMD and AP results in pre-formatted columns. This file can be opened on a PC with a spreadsheet program (e.g. Excel^{TM}...).

Figure 253 Example of txt file opened via Excel



	A	B	C
1	[Header]		
2	Direction: O->E		
3	Origin Location		
4	End Location		
5	Fiber Id: FIBER		
6	Fiber Num: 1		
7	Operator Name		
8	Ticket		
9	Rate: 10GEth		
10	Date: Fri 23 Feb 2007 10:32:07 AM UTC		
11			
12			
13	[OTDR Results]		
14	Lambda(nm)	Distance	Total Loss(dB)
15	1550	6.35833	3.59
16	1310	6.3623	2.141
17			
18			
19	[CD Results]		
20	Lambda(nm)	Dispersion(ps	Slope(ps/nm²)
21	1550	170.931	0.571
22	1555	173.768	0.564
23	1560	176.567	0.556
24	1565	179.33	0.549
25	1570	182.058	0.542
26	1575	184.752	0.535
27			
28			
29	[PMD Results]		
30	Delay (ps)	Coeff (ps/km1/2)	
31	0.946	0.296	
32			
33			
34	[AP Results]		
35	Lambda	AP(dB/km)	Total Loss(dB)
36	1524	0.226	22.62
37	1526	0.225	22.47
38	1528	0.224	22.36
39	1530	0.222	22.24
40	1532	0.222	22.16
41	1534	0.221	22.14
42	1536	0.221	22.09
43	1538	0.22	21.99
44	1540	0.219	21.93
45	1542	0.219	21.9
46	1544	0.219	21.88

18

OFI Module

This chapter describes the functions of the OFI module (Optical Fiber Installation) and its use.

The topics discussed in this chapter are as follows:

OFI module

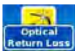
The OFI module is used to make insertion loss measurements, ORL measurements and distance measurements. The following functions are available with the OFI Module:

- Loss Test Set
- FOX (Fiber Optic eXpert)
- ORL (Optical Return Loss)

Selection of the OFI module

1. Push the **HOME** button.
2. Select the icon  and  to start the LTS function,

   Select the icon  to start the FOX function,

   Select the icon  to start the ORL function.

LTS function

Connections to the power meter and the source

The type of optical connector used for the power meter is UPP (Universal Push Pull), which is compatible with all diameter 2.5 mm connectors (FC, SC, ST, DIN, E2000, etc.).

Figure 254 Optical connectors

> **NOTE**
> The source connection is the same as the FOX port.

Configuring the LTS

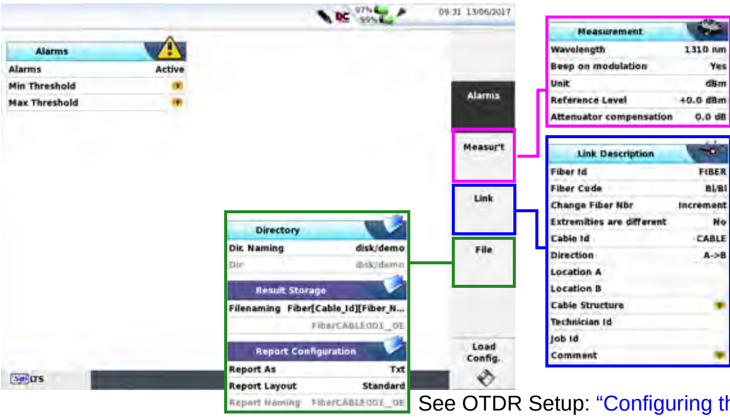
To activate the function:

1 Press the **SYSTEM** button.

2 Validate the **Powermeter** icon  and the **Source** icon .

The effect of this action will be to bring the power meter and source into use.

Figure 255 Configuration of power measurement



See OTDR Setup: "Configuring the Link parameters" on page 43

See OTDR Setup: "Configuring the File parameters" on page 48

Configuring the alarm parameters

Alarm Activation of the Alarm function : any result below the lower threshold or above the upper threshold will be displayed in red on the Results page.

Lower and upper thresholds

Choice of lower and upper thresholds for each available wavelength, from -60 to +40 dBm.

NOTE

To copy one value of the Lower or/and Upper threshold for all wavelengths, select the reference value and click **Update for All Wavel.**.

NOTE
A continuous push on the direction keys, increments the value by 10 dBm.

Configuring the Measurement parameters

In the **Setup** page, press **Measur't** soft key (if one parameter is selected in the current screen, press **Top Menu** soft key to display the right menu keys and click

Wavelength Selecting wavelength:
- Auto: the wavelength of the input signal will be automatically detected and selected to perform the measurement.
850, 980, 1300, 1310, 1420, 1450, 1480, 1490, 1510, 1550 or 1625 nm: measurement performed at specified wavelength.
- User: choice of wavelength on the next line in the menu.

User choice (if the User option was selected in the Lambda line) selection of the wavelength between 800 nm and 1650 nm, in 1 nm steps, by means of the direction keys ◀ and ▶.

Beep on modulation
Select whether a sound must be emitted or not when a modulation occurs (Yes / No).

Unit Unit of power displayed:
- Watt, dBm for displaying absolute power
- dB for displaying a result relative to a reference (link loss)

Reference level
If dB units were chosen in the previous line, selection of the reference value for the wavelength selected. Using the direction keys, first choose the wavelength, then press the > key to access choice of the value (+XXX.XX), then confirm this value with the validation key.

This reference is also automatically available, in the **Results** page, using the **Set as Reference** key.

Attenuator compensation
Choice of level to be applied to the wavelength chosen for measurement to compensate for the loss due to the external attenuator (+XX.XX dB). First use the direction keys to choose the wavelength, then press > to access choice of value, then confirm this value by pressing the validation key.

> **NOTE**
> To copy a Reference Level or a Attenuator Compensator on all wavelengths, select the reference wavelength and click on **Update for All Wavel.**.

Configuring and displaying the parameters of the source

Figure 256 Source configuration

When the laser is **on**, the icon  is displayed.

The parameters of the source can be accessed directly on the results screen of the LTS module, by pressing the **Source Configuration** soft key.

Wavelength To change the wavelength when a multi-wavelength source is present (depending on option).

The wavelength value is displayed.

Mode To vary the mode of emission of the source. Possible modulation values are:

270 Hz

330 Hz

1 kHz

2 kHz

Auto (the sources emit on determined frequencies to enable the power meter to detect the wavelength used automatically)

Twintest (cyclical emission on all available wavelengths for a few seconds on each wavelength), compatible with the VIAVI OLP 5/6/15/16/18.

CW (continuous emission)

The mode used is displayed, above the icon  .

PowerIn CW mode: You can choose the emitted power:

- either the nominal value: -3.5 dB

- or an attenuation of -3 or -6 dBm, with regard to this nominal value, to get a power of 6.5 dBm or of 9.5 dBm.

For all the **other modes** (270Hz / 330Hz / 1kHz / 2 kHz / Auto / Twintest), select one of the following emitted power: -12.5 , -9.5, -6.5 dBm.

Source Reference

Allows to access to the **Standard Ref.** menu key, to perform the standard reference of the source.

Display of results and command

The results page called up by the **RESULTS** button**,** gives the information relating to the measurement in progress, results previously saved and the commands available for measurement and saving.

Result of the measurement in progress

The power measured by the power meter is displayed in large characters, in the units selected in the **SETUP** menu, together with:

- the mode of transmission of the signal measured: continuous (CW) or modulated to a frequency of 270Hz, 330Hz, 1KHz, or 2KHz.
- the wavelength of the signal measured.
- the reference level expressed in dB.
- the level of Attenuation Compensation.

Table of results

For one and the same fiber, the power meter displays a table of 9 results corresponding to the different possible wavelengths. The table shows the power measured in dBm, the relative power (in dB) and the reference level in dBm (if units = dB), together with the mode.

A measurement result is displayed in the table when the **Keep Result** softkey is pressed.

The **Clear Table** softkey orders deletion of all the results displayed in the table.

If the Alarm function has been activated, any result that exceeds the selected thresholds appears in red in the table. Otherwise, results are shown in the table in green.

When the instrument is switched off, results present in the table are saved.

Figure 257 Results and commands of the LTS

Results
of the
power meter

Commands

When the LTS function is selected, the following softkeys are available on the results page:

Source Config. See “Configuring and displaying the parameters of the source” on page 505

Powermeter Config.

- Wavelength: Modify the signal wavelength
- Unit: Modify the unit selected
- Zero: Adjustment of the Zero value when the power meter’s optical input is closed with a plug..

Power Ref

– **Set as reference**
Selects the current result as reference value to measure the attenuation of a link. This reference is displayed under the measurement result until a new reference value is chosen.

Keep Result Saves the result on the corresponding line of the table.

Clear Table Deletes all the results recorded in the table.

Making a measurement

The power meter is started up as soon as the function 

is activated in the **Home** page.

> **NOTE**
> Power measurement is automatically updated in consequence. The value «<-60 dB» is displayed when the laser is switched off and if the source output is looped on to the power meter input.

If the OFI module's source is used, the **START/STOP** key must be used to start or stop emission of light.

Power measurement

1. Connect the light source to be tested to the rear connector (see "Connections to the power meter and the source" on page 502).
2. In the **SETUP** menu, choose the units dBm, dB or Watts.
3. Press the **START/STOP** key to start the laser.
   The result will appear in the results page and can be memorized in the table (see "Table of results" on page 506).
4. Press the **START/STOP** key to stop the laser.

Optical link loss

Setting the zero value of the power meter

> It is important to set the zero of the power meter before making any measurements where accuracy is required, as the noise from the photodiode fluctuates over time and with variations in temperature.

1 Fix the plug over the optical input of the power meter so that no light can reach the photodiode of the power meter. If the zero adjustment is made without this plug, an error message may be displayed, as the photodiode will detect too much light.

2 In the **Results** page, press the **Zero** soft key.

Carrying out the reference measurement

1 Fix the adapter corresponding to the jumper to the optical connector of the power meter.

2 Connect the jumper between the input of the power meter and the output of the source.

3 Configure the same wavelength on the source and the power meter.
The power measured is displayed in the results page of the LTS.

4 Press **Set as Reference** to save the result displayed as reference value.

Measurements on the fiber under test

After defining the reference value, proceed as follows to make the measurement:

1 Fix the jumpers and connectors needed to connect the fiber to be tested between the source output and the power meter input.

2 In the set-up menu, select dB units.

3 The power displayed in the Power Meter window corresponds to the optical loss of the link tested. It can be displayed in the table (see “Table of results” on page 506).

FOX[1] Function

The FOX function is used to make automatic, bidirectional optical power measurements and / or ORL measurements at one or several wavelengths. This function is also used to make a distance measurement of the link under test.

Two MTS 8000 are required, each one equipped with an OFI module at each end of the fiber.

The OFI module 81xx is also compatible with the OFI-2000.

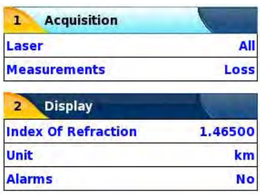
With the FOX function, the two MTS 8000s can communicate and send messages to each other.

Configuration of the FOX automatic measurement

Two types of parameters can be modified in the FOX configuration of the OFI.

- The Acquisition parameters
- The results screen parameters.

Figure 258 FOX parameters



Acquisition parameters

Laser	All / 1550 / 1310 / 1625 / 1550 + 1310 / 1550 + 1625 / 1310 + 1625
Measurements	Loss / Loss + ORL / Loss + Length / Loss + ORL + Length

> **NOTE**
> The acquisition and measurement parameters can change according to the OFI plug-in used.

1.Fiber Optic eXpert

Results screen parameters

Index Of Refraction

Preset Index	**1550 SM**
User	from 1.30000 to 1.70000
Corning SMF-28	1.46810
Lucent Truewave	1.47320
SpecTran SM	1.46810
Litespec	1.46700
ATT SM	1.46700
Fitel Furukawa	1.47000
Corning SMF-DS	1.47110
Corning SMF-LS	1.47000
Corning Leaf	1.46840
E-SMF	1.46450

Unit km / kfeet / miles

Alarms No

Active: used to set alarms.

– Loss: enter the loss threshold for each wavelength (in dB).
– ORL: enter an ORL threshold for each wavelength (in dB).
– Delay: enter a delay time (in µs).
– Length: indicative value, changes according to the delay time and the fiber index.

To change the alarms values, use the direction keys ◀ and ▶ or the numeric keypad.

File Storage parameters

Filenaming[Cable_Id][Fiber_Num][Fiber_Code]

Auto Store Yes (cannot be modified)

Fiber Nbr Increment Yes (cannot be modified)

In the FOX function:

- the measurement results are automatically saved

- the fiber number is automatically incremented.

To display the fiber to be tested, push the **START/STOP** button in the results page of the FOX function (see "Choosing the fiber to be tested" on page 517).

Establishing a reference

Before making a power, a ORL and / or distance measurement with the FOX function of the OFI module , you have to take references.

1 On the **RESULTS** page, push the **References** button.

Different references can be taken:

- For a loss measurement
  – Side by Side reference
  – Loopback reference
- For an ORL measurement
  – Power emitted reference
  – Zero ORL

> **NOTE**
> As the ORL is an option, establishing a reference for this measurement is not automatically available with the OFI module.

Establishing a reference for loss measurement

Before any measurement, you must establish references.

Two methods can be used to take references: taking a side by side reference and taking the reference in a loop-back mode.

Taking a side by side reference

> **NOTE**
> This reference can only be performed when the two MTS 8000 are at the same location.

1. On the **Results** page, push the **References** key.
2. Push the **Loss Side/Side** key.
3. Link the FOX connectors of the two MTS 8000s by using two jumpers.
4. Push on **Go** key.

Figure 259 Taking a side by side reference (8000 V2 series example)

Reference date. Type & serial number of the distant instrument

Once the references are taken, the reference screen is updated for the wavelengths available on the distant instrument. It indicates the type of reference used.

The date of the reference as well as the type and serial number of the distant instrument are indicated on the first line of the table.

If the reference is correct, disconnect the jumpers at the middle point, in order to insert the fiber to be tested.

If the reference taken is not correct, take a new reference.

> If the reference measurements are too weak, a warning is displayed.
> Clean all connections to improve the reference measurements.

> The reference is only valid if the jumpers are not disconnected from the MTS 8000.

Taking the reference in a loop-back mode

> **NOTE**
> This reference can be made wether the MTS 8000s are on the same site or not.

1 Connect the optical output of the source (FOX port) to the optical input of the power meter by means of a jumper.

2 Push the **References** key.

3 Push the **Loss Loopback** key.

4 Push the **Go** key.

Figure 260 Taking a reference in a loop-back mode

Once the reference is taken, the reference table is updated for the wavelengths available on the local instrument. It indicates the type of reference used.
The date of the reference as well as the type and serial number of the local instrument are indicated on the first line of the table.

If the reference is correct, disconnect the jumper in order to connect the fiber to be tested.

If the reference is not correct, take a new reference.

Establishing a reference for an ORL measurement

Two steps must be carried out to take a reference for a ORL measurement:

1. Power emitted reference
2. Zero ORL adjustment

Follow the order given above to take the reference. They are not two different processes but two steps necessary to establish a reference for an ORL measurement

NOTE
As ORL is an option, establishing a reference for this measurement is not automatically available with the OFI module.

ORL Emitted power

1. Link the FOX port to the power meter input port via a jumper.
2. Click on **ORL Power Emitted**
3. Click on the **Go** key. The power measurement from the laser signal emitted is completed.

   Once the reference has been taken, the reference screen is updated for the wavelengths available on the local instrument. It indicates the type of reference used.

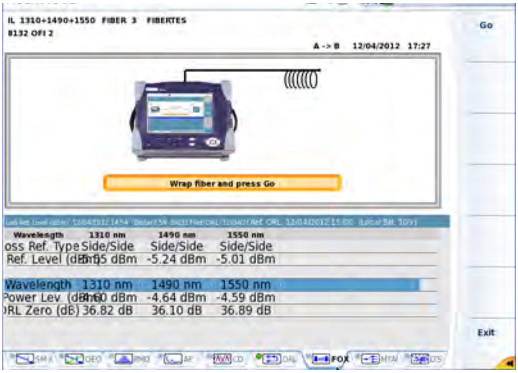
   As the Zero measurement as not yet been done, the first line of the table displays the message Ref ORL : Incomplete.

ORL Zero adjustment

Once the Power Emitted measurement has been carried out, the Zero adjustment can be performed:

1. Disconnect the jumper from the external power meter and wrap this jumper, still connected to the FOX port, around the mandrel (6 to 7 times).
2. Click on **ORL Zero**
3. Push the **Go** key

Figure 261 Adjustment of the ORL Zero



Once the reference has been taken, the reference screen is updated for the wavelengths available on the local instrument. It indicates the type of reference used.

> Once the two references are complete, the date as well as the type and serial number of the local instrument are displayed on the first line of the table.
>
> If not, the message Ref ORL : Incomplete is displayed.

Measurement acquisition

Before making an automatic FOX measurement, check that:

- both MTS 8000s (local and distant) as well as the OFI module on each instrument are powered on and the FOX function selected.
- the FOX function is correctly configured (**SETUP** menu).
- each end of the fiber is correctly connected to the module.
- the fiber and jumpers are in good condition.

To display the fiber measurement page, push the **RESULTS** key.

The page displays:

- Both instruments connected to the link (local and distant).

- The **Results** table with the last measurement made.
- The tested fiber parameters

Choosing the fiber to be tested

Once the results page is displayed, push the **START/STOP** button.

The details of the next fiber to be tested are displayed.

Figure 262 Details of the following fiber to be tested

To test a different fiber to the one displayed, select the new fiber according to its number or its color code.

Use the direction keys ◀ and ▶ to change the number or color code of the fiber to be tested.

Changing the fiber number involves a modification of the color code and vice versa.

Making the measurement

Before making the measurement, check that the reference measurements are correct (see “Establishing a reference” on page 512).

Push the **START/STOP** button once more to start the measurement of the selected fiber.

The results are displayed as the sequence progresses, on both MTS 8000s. During the measurement, the soft keys on the right of the screen are inactive.

Once the measurement has finished, the MTS 8000 beeps to signal the end of the sequence. The beep differs, depending on wether the measurement has completed correctly or according to the measurement/alarm status.

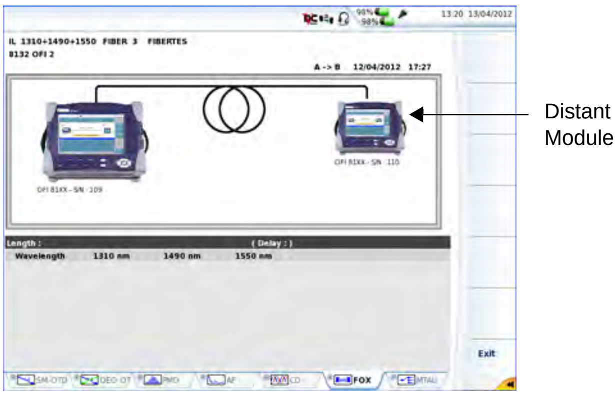
Identifying the distant module

Before making a measurement, you can check presence of the distant module.

Once the results page is displayed, click on **Identify distant**.

The distant module identification is made automatically.

Figure 263 Distant module Identification



Data from the distant instrument is displayed: The serial number and the operator name on this instrument.

Check this data before making a measurement or taking a reference.

Displaying results for a FOX automatic measurement

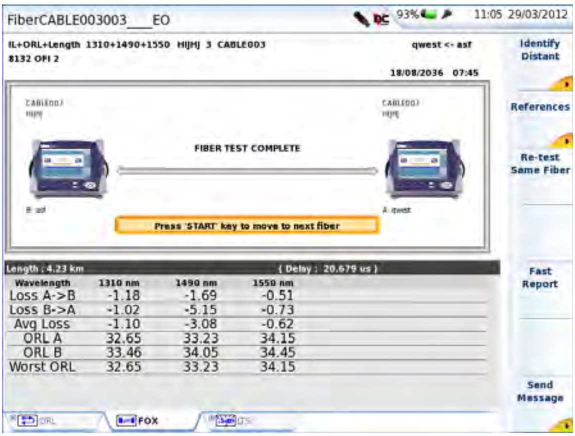
The measurement results are displayed as the sequence progresses, on both MTS 8000s.

During the measurement, the following icon is displayed and the keys on the right of the screen are inactive.

Once the measurement has finished:

- the icon turns grey
- keys are active.
- the MTS 8000 beeps to signal the end of the measurement.

Figure 264 Result of a FOX automatic measurement



The data displayed in the table can vary according to the acquisiton parameters (see “Configuration of the FOX automatic measurement” on page 510).

Sending a message

When two MTS 8000s are connected at each end of the fiber, via their FOX port, they can send messages to each other.

Two types of messages are available:

– predefined messages (10)
– User-definable messages(4)

The message sent by one MTS 8000 will be displayed on the screen of the other MTS 8000.

To send a message to the distant MTS 8000:

1 In the Results page, push the **Send Message** key.

Figure 265 Messages that can be sent to the distant MTS 8000

A menu with 10 predefined messages available is displayed.
Another menu with 4 messages the user can defined is also displayed.

2 Select the message to be sent.
To enter a user message:

– select one of the last 4 messages (called «User Msg. #n»)
– press the empty box to open the edition keypad
– enter the text you want
– push the **Enter** key.

3 Push the **Send Message soft** key.
On the distant MTS 8000, the message is displayed.
Press any key to delete the message.

NOTE
If the link is not established between the two MTS 8000, the following error message is displayed: «No acknowledge received for the SMS sent».

Manual ORL

The OFI module can be equipped with the ORL function (option), which allows to make an ORL manual measurement .

However, before making this measurement, the references have to be established once the ORL tab has been selected on the OFI module or on the MTS 8000, in the **SYSTEM** page 

.

The functions LTS, FOX and ORL can be selected at the same time on the OFI module.

However, the Powermeter and ORL functions from the MTS 8000 cannot be selected simultaneously.

Establishing a reference for an ORL manual measurement

Two steps must be carried out to take a reference for an ORL manual measurement:

1. Power emitted reference: see “ORL Emitted power” on page 515
2. Zero ORL adjustment: see “ORL Zero adjustment” on page 515

Follow the order given above to take the reference. They are not two different processes but two steps necessary to establish a reference for an ORL manual measurement.

Establishing references is only valid for a specific module or function. For example, the references for an ORL automatic measurement are only available for the FOX function (a new reference must be redone for an ORL manual measurement.).

Moreover, the Manual ORL references performed with the MTS 8000 are not valid with an OFI module.

NOTE
As ORL manual is an option, establishing a reference for this measurement is not automatically available with the OFI module.

Measurement acquisition

The page displays:

- The results screen with the wavelength and the ORL references established.
- The table where are saved the ORL measurements.

Making the measurement

Before making the measurement, check that the reference measurements are correct (see “Establishing a reference for an ORL manual measurement” on page 521).

Push the **START/STOP** key to start the measurement.

Display of results for an ORL manual measurement

To display the fiber measurement page, push the **RESULTS** key.

For each wavelength, push the key **Keep Result** to display the result in the table.

The **Clear Table** softkey orders deletion of all the results displayed in the table.

If the Alarm function has been activated, any result that exceeds the selected thresholds appears in red in the table.

Figure 266 Results for an ORL manual measurement

Once all the results are displayed, click on the **FILE** button to save the file in a directory.

Generating a pdf report

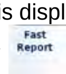
Once the FOX results page is displayed, a report can be generated directly from the results screen.

> **NOTE**
> The report cannot be generated from Manual ORL results page or from LTS results page.

Creating a report from results page

To generate a report:

1 Check the FOX results page is displayed

2 Press **Fast Report** menu key 

.

The key turns grey 

(inactive) and the icon  displays on the upper banner, until the end of the report.

Once report has been generated, the **Fast Report** key returns active and a beep is emitted, to indicate the work is completed.

> **NOTE**
> The pdf report is saved in the last storage media and directory selected.

Opening a report

To open the report

1. Press **FILE** hardkey
2. In the **Explorer** page, in the directory selected, select the pdf file of the report.
   The pdf file name by default is:
   trace file name_year_month_day__hour_min_sec.pdf.

> **NOTE**
> If the results table is too long for one single page, then several pdf files are created (1 file per page), with filename ending with «*_1.pdf*», «*_2.pdf*»...

3. Press **Load** > **Confirm Load**.
   The file opens in the PDF Reader of the T-BERD/MTS.

Figure 267 Example of FOX Report

File : Fiber_Bl_Gr-

Meas : MTS 8000 S/N 923 Module : 8132 OFI 1 S/N 6 Date : 18/07/2006 13:55

Cable Id :	CABLE001
Fiber Id :	FIBER 15
Color Code :	Bl/Gr-
Location A :	SAINT ETIE...
Cable Id :	CABLE001
Fiber Id :	FIBER 15
Color Code :	Bl/Gr-
Location B :	SAINT MAR...
Direction :	A->B
Operator :	OLIVIER

Comment :

Length : <0.21 km **(Delay : <1 us)**

Wavelength	1310 nm	1490 nm	1550 nm
Loss A->B	-0.01	0.02	0.03
Loss B->A	-0.01	0.02	-0.01
Avg Loss	-0.01	0.02	0.01
ORL A	57.21	50.83	55.09
ORL B	47.89	44.89	48.40
Worst ORL	47.89	44.89	48.40

Adding a logo to a pdf report

To display a logo (or any other image) on the upper left part of the pdf report:

1 Go to the **System Settings** screen (**HOME** > **System Settings**)

2 In the **Printer** menu, select **File (Formatted)**

3 In the **Logo** parameter, enter the full path of the image file (with file extension)
Example: `disk/Logo.jpg`

4 Click on **Exit** to return to **Home** page.

5 Press **FILE** and in the **Explorer**, open the file for which a pdf report must be generated.

6 Launch the report.
Once report is generated, the logo is displayed on the upper left part of the page.

File Management

Storing results

Although each measurement is automatically stored (for FOX results only), it is possible to save the results under a different file name, directory etc.
Once the results are displayed:

1. Push the **FILE** button
2. Select **Setup** with the key **Setup/Explorer**
3. Modify the parameter you want in the **FILE** configuration menu
4. Click on the **Store Trace** key

   The FOX files are saved with the extension «.FOX»; the LTS files are saved with the extension «.LTS»; the ORL files are saved with the extension «.ORL»

With the LTS and ORL results, two files are saved:

The first file is to be used with the Platform 8000 and allows all LTS measurements results to be retrieved. It is saved with the extension «.LTS» or «.ORL».

The second file is an ASCII file using tabulations to separate values. It is saved with the extension «.txt» and can be opened by the Platform 8000. It has been designed to be used with a spreadsheet program on a PC where it allows all LTS measurement results to be retrieved and formatted in a customized table.

For more details on file management, see Chapter 20 “File management”.

Recalling files

To recall a LTS, FOX or ORL file:

1. Go to the **Explorer**
2. Select the directory
3. Select the file to load
4. Click on **Load**
5. Click on **View Trace(s)** or **Load Trace + Config.**

   The selected file is opened.

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Macros

The macro function allows to store series of user actions, in order to play them back automatically.

The macro function is operational only while the Platform is used under the context of «fiber optic applications», meaning used with one of the following application selected: OTDR, OSA, CD, PMD, AP, LTS...

Actions in the HOME page will not be recorded

A file macro may also be operational with no active modules, as long as «Standalone results» for fiber optics is used, and concerned files are fiber optics files.

The topics discussed in this chapter are as follows:

Calling the Macro function

This function is accessible via the button **SCRIPT**, in the front of the 8000 V2 or clicking on the upper banner and pressing Script button on the 6000/6000A V2.

10 various macros may be created and used.

Once you click on the button **SCRIPT**, you see the list of all the 10 macro positions. Each number from 1 to 10, displays the name of the macro stored at that position, or displays «(Empty)» in case that particular spot is free.

Figure 268 List of Macros

Macro recording

The Platform offers two different types of macro: Standard and File.

For both types, it is required to select and activate all necessary modules before starting the macro recording

Never press the Home key during macro recording

Standard macro

This macro type shall be used to automate functions or operation mode.

To create a new standard macro:

1. Select a free position. A sub-menu automatically appears.
2. Change the Macro type if necessary to set it on Standard.
3. Click on the soft key **Learn**. You arrive directly to the **Results** page. You can now see the icon  at the top of the screen. You are now ready to record.
4. Perform all actions you wish to record in your macro.
5. Click on **SCRIPT** when you are done, and select **End Macro**. You macro has now been saved.
6. Enter the name of your new macro in the text editor and confirm.

> **NOTE**
> All events are recorded wether you use the Platform buttons, the soft keys, the touchscreen, a mouse, or an external keyboard.

> **NOTE**
> The speed of your actions is relevant if the macro is played in Real time. Otherwise, if it is played in «standard» mode, it is not taken into account during the macro recording. See “Macro playback” and “Playing a macro in Real Time”

File macro

This macro type shall be used to perform a template, which will be used to perform the same actions directly on a multiple selection of files.

To create a new file macro:

1. Select a free position. A sub-menu automatically appears.
2. Change the Macro type if necessary to set it on **File**.
3. Click on the soft key **Learn**.
   You arrive directly to the **FILE** page.
   The icon  is displayed at the top of the screen

4 Select the file you want to work with to perform all actions.

5 Load and view the corresponding trace.

You can now see the icon  at the top of the screen indicating the macro can be recording.

6 Perform all actions you wish to record in your macro.

7 Press **SCRIPT** button when you are done, and select **End Macro**. You macro has now been saved.

8 Enter the name of your new macro in the text editor and confirm.

Notes for standard macros also apply for file macros.

Adding interaction to your macro

You may insert in your macro, a special dialog box, a message or a pause. These features will be very useful to you. They will give you some time to switch to another fiber if necessary, let you play a macro to a partial state and stop, or simply just bring your attention after or before a specific action is performed.

To access all these features, press **SCRIPT** button during the learning process of a macro, just like if it was done. Several soft keys will become available.

Inserting a dialog box

Click on the soft key **Insert Dialog Box**. The dialog box editor is displayed. Enter the content of your dialog box and press confirm when you are done.

Inserting a message

Click on the soft key **Insert Message**. The Message text editor is displayed. Enter the content of your message and press confirm when you are done.

NOTE

Dialog boxes and messages serve different purposes when the macro is played back. A message will just appear to bring your attention to a specific point and wait until you are ready to continue. A dialog box will give you the choice between continuing to play the macro, or aborting it, letting you partially play a macro in some cases.

Inserting a pause

Click on the soft key **Insert Pause**. This action will automatically make the macro wait for a user action.

Renaming a macro

Whether you just created a new macro or you wish to modify the name of an existing macro, you may edit the name and change it as much as you want.

1 Select the macro and select **Name** on the sub-menu.

2 Click on ▶ to open the text editor, and type the new name.

3 Click on **Confirm** to accept the new name.

The «Overwrite Config.» setting

Both your actions and the actual configuration are saved when you create a new macro. So when you play a macro back, you have the choice between:

1 Playing all actions and keeping the actual configuration

Your actions are fairly independent of the configuration, and you don't wish to modify the current configuration: set **Unit Config. / File Config.** on **None**.

2 Playing all actions and restoring the original configuration

Your actions are very dependant of the configuration, for example in case you need to do some measurements where you wish to keep all the acquisition parameters the same: set **Unit Config. / File Config.** on **Yes.** This setting will also allow to make sure all necessary modules are selected in the **HOME** page before the macro is started.

> It is strongly recommended to use the second method where all configuration is restored before playing the macro. Only experienced users might decide to do otherwise for different reasons.

Replacing a macro

Select an existing macro and click on the soft key **Learn**.

A message will be displayed, asking you if you really wish to overwrite the macro. Click Yes if you wish to continue.

Removing a macro

Select an existing macro and click on the soft key **Remove**.

A message will be displayed, asking you if you really wish to delete the selected macro. Click **Yes** if you wish to continue.

Default macro

Using the default macro

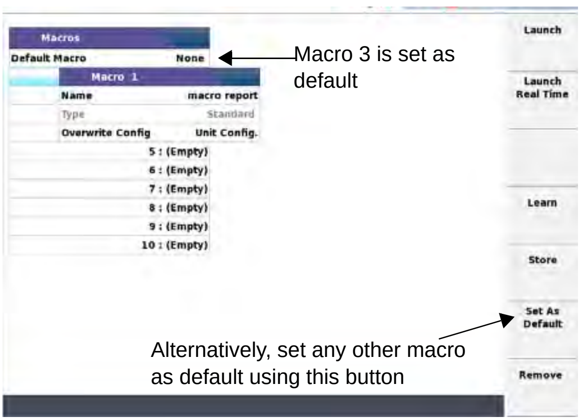
It is possible to set one macro as default. This is very useful if, for example, you wish to perform one macro several times in a row. Double clicking on the button **SCRIPT** will automatically play the default macro.

Setting a macro as default

Select **Default Macro**, and choose in the sub-menu, which macro you wish to set as default.

As an alternative, you may also select a macro and press the soft key **Set as default**.

Figure 269 Menu keys



Macro playback

1 To play the default macro, you may directly double click on **SCRIPT**.

To play another macro, go to the macro screen (press **SCRIPT** once), and select the macro you wish to play. Then press the soft key **Play**.

During all the play back of the macro, you can see the icon  at the top of the screen.

> **NOTE**
>
> This icon changes to  when the playback is suspended by a **pause** event, waiting for the user to restart the process (see “Inserting a pause” on page 531).

All actions recorded in your macro are now performed.

In «standard» playing, the speed of the playback is not the same as the speed of the recording. All actions except for acquisitions, will appear faster, but will remain slow enough to let you see what is currently performed. Acquisition times remain the same as during the recording.

If you play the macro in real time, the speed of your actions during recording is taken into account (see “Playing a macro in Real Time” on page 534)

> **NOTE**
>
> Don’t forget to add interactive events during your macro recording if you need a pause, a specific message or simply to be able to abort the macro at a certain stage if necessary.

> Touching a button on the Platform will automatically cause the macro play-back to abort, except for restarting the playback, interrupted by a **pause** event.

> **NOTE**
>
> For a File macro, you may select several files before you call the Macro function.

Playing a macro in Real Time

In the **Script** page, the soft key **Play Real Time** allows to play the macro selected, taking into account the speed of the actions during the macro recording.

Script (specific option)

According the configuration of the MTS/T-BERD 6000/8000V2, this one can be equipped with a Script function, available on the same page as the macro page.

To use the script, a MTAU module is mandatory. See Chapter 17.

Storing a macro

The Platform lets you save macros as files on the hard disk or other storage media.

To store a macro, select it and click on the soft key **Store**. It will automatically store it in the current directory.

> **NOTE**
> If you wish to store your macro at a specific place on your storage media, make sure you use the file explorer to set that place as your current directory.

To reload this macro later on, go to the file explorer and load the file. The macro will automatically take the first available place in the list of your 10 macros.

> The macro cannot be loaded if no macro position is available.

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File management

The topics discussed in this chapter are as follows:

In Home > App’s > File Explorer, the files can be loaded and traces can be displayed or saved even when no module is set into the Base Unit.

Description of the explorer

Opening the file explorer

To access the Explorer

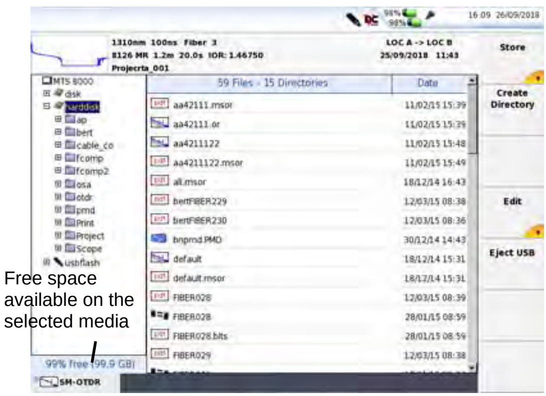
1 Press the **FILE** button

The explorer is used to select the storage medium, and to create or rename directories and files:

– The left-hand part presents the storage architecture. Use the keys ▲ and ▼ or touchscreen 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 270 Example of explorer



The direction keys can be used to move horizontally between the two parts and vertically within each zone.

At the top of the screen, the file signature is displayed if a function (OTDR, OSA...) is activated in the Home page (see “Example of signature of an OTDR file” on page 537).

Managing tabs

Tabs give access to the File menu of each application (OTDR, OSA, Power Meter, etc.) present in the instrument.

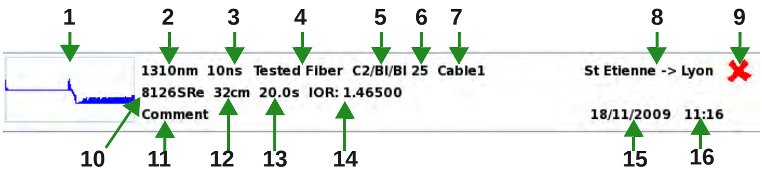
It is possible to open a file even if the corresponding module is not present in the instrument (e.g. OSA file without OSA module). A new tab then temporarily manages this application.

When several different applications (corresponding to modules or plug-ins for different measurements) are managed by the MTS / T-BERD, pressing the **FILE** key several times in succession changes from one tab to another to give access to the file configuration of the desired application (e.g. OTDR, OSA, etc.). See “Tabs” on page 23.

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) (see “Mini-trace” on page 22).

Figure 271 Example of signature of an OTDR file



1	Mini-trace	9	Alarm status
2	Laser	10	Plug-in used
3	Pulse width	11	Comment
4	Fiber Identification	12	Resolution
5	Color Code	13	Acquisition Time
6	Fiber Number	14	Refraction Index
7	Cable Identification	15	Date of signal acquisition
8	Direction of measurement	16	Time of signal acquisition

Figure 272 Example of signature of a FCOMP file

1	Measurement parameters	5	Origin / End
2	Fiber Identification	6	Module used
3	Fiber Number	7	Comment
4	Cable Identification	8	Acquisition Date & Time

Buttons on the right of the screen

Saving traces

These buttons are used to save one or more traces/

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

Storage media

For saving or recalling data, the Platform 8000 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.

NOTE

Remote T-BERD/MTS and data transfer

During a data transfer (with the option Data/Talkset), the distant MTS / T-BERD hard drive connected by the fiber is displayed as a storage media. File and directory edition features may all be used in the same manner with this storage media as with the other ones.

Directory and files editing function

The Files and directories editing functions are similar to those available in the Explorer page of the Platform.
Refer to 8000 V2 or 6000A V2 Platform User Manual if you want to work on directories and files (copy/paste, rename...).

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. For OTDR traces only 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** (OTDR files only).
   The **Save All** menu key in OTDR tab allows to save all the traces opened, whereas the **Save** menu key allows to save exclusively the trace described in the file signature.
5. If you wish, click on **FILE** button to display the Explorer page for another application and save, using the same method, the active trace from this application.

Figure 273 Saving active trace from the explorer

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

> **NOTE**
> The «**Store**» menu key is not available if the type of saving for OTDR files is defined to «**All Traces**» in the **File Content** parameter (see “File Content” on page 51).

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**. Several options are then available:

Simple loading

The key **View Trace(s)** enables simple loading of traces, using the current parameters of the Platform 8000. The current trace(s) is/are then replaced with this new trace(s).

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 MTS / T-BERD 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 a MTS / T-BERD.**

Loading several traces in overlay

Up to 8 traces in the OTDR application 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 (see 5800 Platform User manual for multiple selection of files) 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 99).

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)
- sent by e-mail

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.

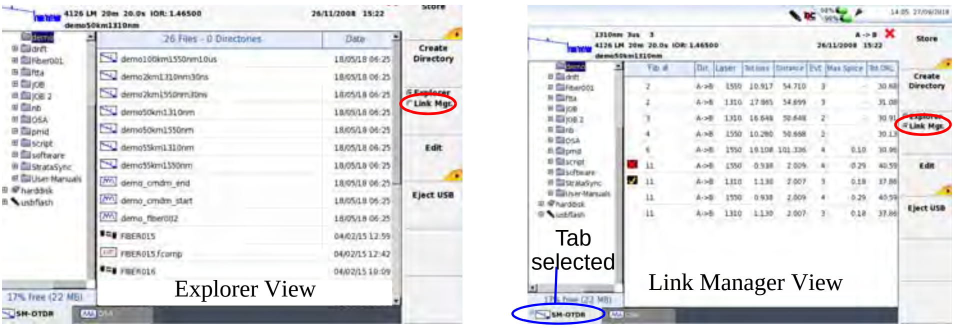
The Link Manager function allows to display the explorer with all the link information exclusively for the active application (the function must be activated in **Home** page, or at least one result trace must be opened to get the tab and display files in the Link Manager page).

For example, if the **Link Mgr.** function is selected in the tab OTDR, only the link information from the OTDR files will be displayed (wether in multimode or singlemode).

Select **Link Mgr** with the menu key **Explorer/Link Mgr.** to display the corresponding files for the active tab.

> **NOTE**
> The function is only available with the OTDR, CD, OSA, PMD & AP functions

Figure 274 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 8 Fiber Information displayed

Column.	OTDR & OEO	CD ODM	OSA	PMD	AP	LTS
1st	Alarm status (icon) & Fiber number					
2nd	Direction					Laser

Table 8 Fiber Information displayed

Column.	OTDR & OEO	CD ODM	OSA	PMD	AP	LTS
3rd	Lambda	Length	Nb Channel	Length	Length	Power (dBm)
4th	Total Loss	L0	Power Max.	Delay 1	AP @ 1310 nm	Loss (dB)
5th	Fiber Length	S0	Power Min.	Coeff. 1	AP @ 1650 nm	Ref (dBm)
6th	Nb of Event	Dispersion at 1550 nm	OSNR Max	Delay 2	AP @ 1625 nm	-
7th	Max Splice	Coeff at 1550 nm	OSNR Min.	Coeff 2	-	-
8th	Total ORL	-	-	-	-	-

Editing function

The same editing functions as those from the Explorer are available with the Link Manager function:

- Directory: Copy (or cut) / Paste; Rename, Delete,
  See “Directory and files editing function” on page 539).
- File(s): Copy / Cut, Rename, Delete

Moreover, the **Edit** menu from the **Link Manager** allows to export the whole directory, with the files corresponding to the active tab, in a txt file.

Exporting a directory in a txt file

1. Click on **Export** and select the **Link Manager** function
2. Select the tab corresponding to the files you want to use
3. Select the directory to open
4. Select one file from the list
5. Click on **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_”name of application selected”.txt`.
   For example, for the export of the Fiber Information from the OTDR application, the txt file will be called: *fiber_info_otdr.txt*

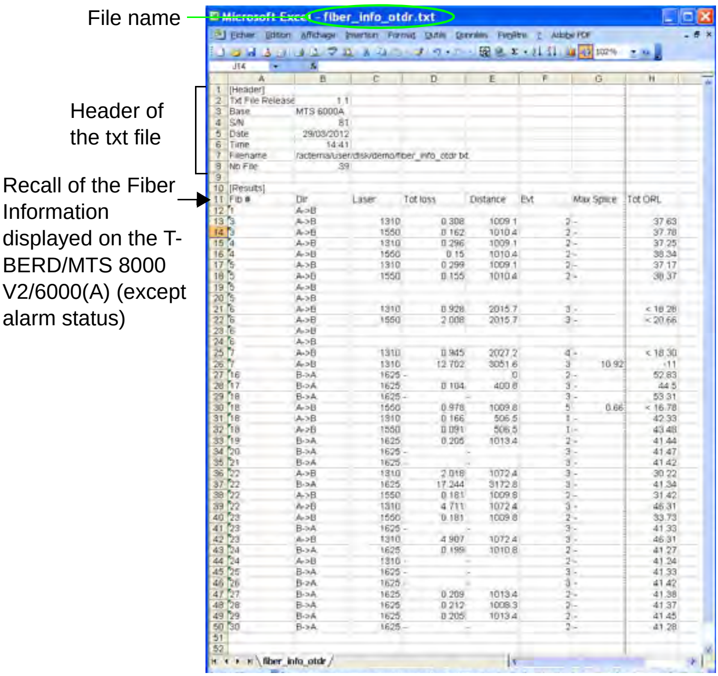
> **NOTE**
> The txt file can be renamed once it is saved.

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



	A	B	C	D	E	F	G	H
1	[Header]							
2	Txt File Release	1.1						
3	Base	MTS 6000A						
4	S/N	81						
5	Date	29/03/2012						
6	Time	14:41						
7	Filename	/acterna/user/disk/demo/fiber_info_otdr.txt						
8	Nb File	39						
9								
10	[Results]							
11	Fib #	Dir	Laser	Tot loss	Distance	Evt	Max Splice	Tot ORL
12	1	A->B						
13	3	A->B	1310	0.308	1009.1	2	-	37.63
14	3	A->B	1550	0.162	1010.4	2	-	37.78
15	4	A->B	1310	0.296	1009.1	2	-	37.25
16	4	A->B	1550	0.15	1010.4	2	-	38.34
17	5	A->B	1310	0.299	1009.1	2	-	37.17
18	5	A->B	1550	0.155	1010.4	2	-	38.37
19	5	A->B						
20	5	A->B						
21	6	A->B	1310	0.928	2015.7	3	-	< 18.28
22	6	A->B	1550	2.008	2015.7	3	-	< 20.66
23	6	A->B						
24	6	A->B						
25	7	A->B	1310	0.945	2027.2	4	-	< 18.30
26	7	A->B	1310	12.702	3051.6	3	10.92	-11
27	16	B->A	1625	-	0	2	-	52.83
28	17	B->A	1625	0.104	400.6	3	-	44.5
29	18	B->A	1625	-	-	3	-	53.31
30	18	A->B	1550	0.978	1009.8	5	0.66	< 16.78
31	18	A->B	1310	0.166	506.5	1	-	42.33
32	18	A->B	1550	0.091	506.5	1	-	43.48
33	19	B->A	1625	0.205	1013.4	2	-	41.44
34	20	B->A	1625	-	-	3	-	41.47
35	21	B->A	1625	-	-	3	-	41.42
36	22	A->B	1310	2.018	1072.4	3	-	30.22
37	22	B->A	1625	17.244	3172.8	3	-	41.34
38	22	A->B	1550	0.181	1009.8	2	-	31.42
39	22	A->B	1310	4.711	1072.4	3	-	46.31
40	23	A->B	1550	0.181	1009.8	2	-	33.73
41	23	B->A	1625	-	-	3	-	41.33
42	23	A->B	1310	4.907	1072.4	3	-	46.31
43	24	B->A	1625	0.199	1010.8	2	-	41.27
44	24	A->B	1310	-	-	2	-	41.24
45	25	B->A	1625	-	-	3	-	41.33
46	26	B->A	1625	-	-	3	-	41.42
47	27	B->A	1625	0.209	1013.4	2	-	41.38
48	28	B->A	1625	0.212	1008.3	2	-	41.37
49	29	B->A	1625	0.205	1013.4	2	-	41.45
50	30	B->A	1625	-	-	2	-	41.28
51								
52								

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).

– **ODM** if the report must be generated with one PMD result, one CD result and one AP result for example (for PMD, CD ODM and AP files only).

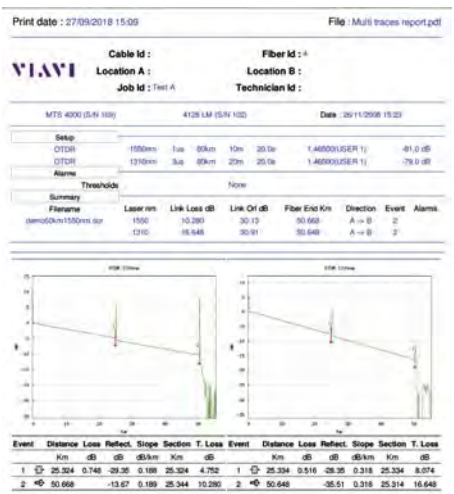
4 Click on **Build Report**

5 In the edition menu displayed, enter the name for the report

6 Press **Enter** to validate and launch the report
The icon  display during report generation.
Once report is generated, a beep is emitted.

Figure 276 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

The icon displays during merging process, and 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.

Sending files by e-mail

Several files can be sent by e-mail.

1 Check in the Setup page that the File Export parameters are correctly configured (see 8000 V2 or 6000(A V2) Platform User Manual).

2 In the Explorer, select the file(s) to be sent by e-mail

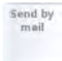
3 Press **Export** menu key.

4 Click on **Send by mail** menu key 

.

5 If necessary, in the edition menus displayed, modify the e-mail address and/or the subject of the e-mail.

6 Press **Enter** to validate and send the file

The menu key **Send by mail** 

turns inactive until the end of process

Once mail is sent, menu key is active again and the message `Mail Sent` is displayed.
Click on any key to follow.

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Technical specifications

This chapter shows the technical specifications of the modules, of the T-BERD/MTS, and options and accessories available.

The topics discussed in this chapter are as follows:

NOTE

Mains adapters and Environmental specifications provided in this chapter are for T-BERD/MTS 8000 V2 and vary by platform. Refer to platform’s specification sheet. For the modules refer to their own environmental specifications.

Mains adapters

	Standard Mains Adapter	High power Mains Adapter
Input	100-250 V, 50-60 Hz	100-250 V, 50-60 Hz
Output	24 V continuous, 6,25 A max	21V continuous, 10.5 A max
Compliance	IEC 62368-1:2018	IEC 62368-1:2018

Environment

Indoor/outdoor

- Backlight high visibility color screen
- High visibility capacitive touchscreen for indoor and outdoor use.
- Altitude up to 2000m.

CAUTION

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

CAUTION

AC/DC power supply must be used indoor!

The Platform battery charging must be performed indoor 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. Il should be deposited at an appropriate facility to enable recovery and recycling.

-

EMI/ESD

- CE class A Compliant, according to EN 61326-1:2013
- FCC 47-1 Part 15 Compliant

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

Drop test

In accordance with the Telcordia GR-196-CORE recommendations, the MTS/T-BERD resists the following test:

- 6 impacts dropped from a height of 76cm on a pinwood floor of 5 cm thickness (1 impact on each of its 6 sides, with power off).

Shocks

The MTS/T-BERD resists the following test:

- 3 shocks per axis along each of the 3 axes, with power off.
- Impacts of 15g, 1/2 sine, duration 11 ms, at 10 second intervals.

Bumps

The MTS/T-BERD resists the following test:

- 1,000 bumps per axis along each of the 3 axes, with power off.
- Jolts of 15g, 1/2 sine, duration 6 ms, at 1 second intervals.

Vibration

The MTS/T-BERD resists the following vibration tests:

- Complete test comprising 6 cycles along each of the x, y and z axes.
- One cycle of 5 to 200 Hz and back to 5 Hz with a sweep duration of one minute per octave.
- 3 mm amplitude displacement test, for the range 5 Hz to 9 Hz.
- 3g acceleration test for the range 10 Hz to 200 Hz.

Flammability

The MTS/T-BERD housing (in ABS, type V0) does not propagate fire.

IP Protection Index

Index of the IP protection for the Platform 8000: IP32

> **NOTE**
> For a higher classification, contact VIAVI.

Overvoltage

Overvoltage category I

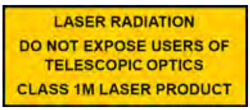
OTDR Modules

Typical values at 25°C, otherwise specified.

Warning labels for the laser classes

> **Dangerous voltage (> 70VDC) is present inside of the product.**
> **Do not attempt to remove cover when product is in use.**

Due to the reduced dimensions of the optical modules, it is not possible to attach the required warning labels to them. In line with the provisions of Article 7.1 of the IEC 60825-1:2014 standard, the laser class identification labels are shown below.
The user must take the necessary precautions concerning the optical output of the instrument and follow the manufacturer’s instructions.

Ref. standard	IEC 60825-1: 2014	FDA21CFR§1040.10
Class 1	CLASS 1 LASER PRODUCT	
Class 1M		
Class 2		

> **Measurements on optical fibers are difficult to execute and the precision of the results obtained depends largely on the precautions taken by the user.**

OTDR measurements characteristics

Distance measurement

- Distance displayed takes into account the calibration of the refractive index of the fiber.
- Refractive 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.
- Sampling resolution (distance between measurement points): from 2 cm, with up to 256 000 acquisition points.
- Absolute Accuracy:
  - **For OTDR Modules A**:
    MM part: ±0.33m ± sampling resolution + 1.10^{-5} x distance
    SM part: ±0.5m ± sampling resolution + 1.10^{-5} x distance
  - **For OTDR Modules B, C, D**: ± 0.75m ± sampling resolution ±10^{-5} x distance (excluding errors of calibration of refractive index of the fiber)
  - **For other modules**: ± 1m ± sampling resolution ±10^{-5} x distance (excluding errors of calibration of refractive index of the fiber).
- Relative Accuracy (Multimode):
  - **Expert Mode**
    ±0.07m ± sampling resolution + 1.10^{-5} x distance
  - **RDZ Mode**
    ±0.1m ± sampling resolution + 1.10^{-5} x distance

Attenuation measurement

- Dual cursor
- Mode Automatic, manual, 2-point, 5-point and LSA
- Display resolution: 0.001 dB
- Cursor resolution: 0.001 dB
- Linearity:
  - **Multimode**
    ± 0.05 dB/dB
  - **Singlemode**
    ± 0.03 dB/dB

Reflectance measurement

- Display resolution: 0,01 dB
- Accuracy: ± 2 dB

Automatic measurement

- Automatic measurement of all the elements of the signal: Event Distance / Event Loss / Event Reflectance / Section Loss and Attenuation / Optical Return Loss
- Slope measurement by least square averages or 2-point method.
- Thresholds of event detection:
  - **Splice**: 0.01 to 1.99 dB in steps of 0.01 dB (Auto ≥ 0.05 dB)
  - **Reflectance**: -11 to -99 dB in steps of 1 dB
  - **Bend**: 0.01 to 1.99 dB in steps of 0.01 dB (Auto ≥ 0.1 dB)
  - **Fiber end**: 3 to 20 dB in steps of 1 dB (Auto ≥ 6 dB)

Manual Measurement

- Attenuation between A & B cursors.
- Reflectance between A & B cursors.
- ORL between A & B cursors.
- Event loss using 2-point or 5-point method

OTDR size and weight

- Weight: approx. 500 g (1.1 lbs)
- Dimensions (in mm, without front panel) - w x h x d: 120 x 27 x 211

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

B, C & D Modules

Singlemode Modules

	8100B OTDR Series	8100C OTDR Series	8100D OTDR Series
Central Wavelength [1]	1310 ± 20 nm 1550 ± 20 nm 1625 ± 20 nm 1650 +15/- 5 nm	1310 ± 20 nm 1490 ± 20 nm 1550 ± 20 nm 1625 ± 10 nm 1650+15/- 5 nm	1310 ± 20 nm 1550 ± 20 nm 1625 ± 10 nm 1650 ± 1 nm
Laser Classes - IEC 60825-1: 2014	Class1	Class 1M @ 1310 nm Class1 for other wavelengths	
Laser Classes - EFDA21CFR§1040.10	Class 1		
RMS Dynamic Range [2]	41 dB 40 dB 40 dB 43 dB	46.4 dB 45.4 dB 46.4 dB 46.4 dB 46.4 dB	50 dB 50 dB 50 dB 48 dB
Distance Range	Up to 400 km		
Pulse width	5 ns to 20 µs	2 ns to 20 µs	
Event Dead Zone [3]	0.65 mm	0.6 m	0.55 m
Attenuation Dead Zone [4]	2 m		2.5 m
Splitter Attenuation Dead Zone (SADZ)	-	25 m[5]	15 m[5]
Power Meter			
Calibrated wavelengths	1310, 1490, 1550, 1625 nm	1310, 1490, 1550, 1625 nm[6]	1310, 1490, 1550, 1625 nm
Power range	-3 to -55 dBm	-3 to -55 dBm	-5 to -55 dBm
Uncertainty[7]	± 0.5 dB @ -30 dBm		
Linearity	± 0.5 dB from -50 to -5 dBm	± 0.2 dB from -50 to -5 dBm	
Continuous Wave Light Source			
Wavelengths	1310, 1550, 1625 nm	1310, 1490, 1550, 1625 nm	1310, 1550, 1625 nm

	8100B OTDR Series	8100C OTDR Series	8100D OTDR Series
Output Power Level	-3.5 dBm		0 dBm
Stability	< ± 0.1 dB @ 25°C over 1 hour		
Operating modes[8]	CW[9], 270Hz, 330Hz, 1kHz, 2kHz, Twintest, Auto		

1. Guaranteed, with laser at25°C measured at 10 µs. 1650 nm +/- 1nm for E81165C module
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. Measured on a 15 dB attenuation with -70 dB reflectance
6. Except for 8138C-65 as 1625 nm is not available
7. At calibrated wavelengths
8. Substract 3 dB when used in modulation mode (270/330/1k/2kHz/Twintest/Auto)
9. The CW mode is not available with OTDR D Modules

FiberComplete specifications

Values measured at 25°C unless specified and after a warm-up period of at least 20min. Note that to warm-up both unit, simply switch-on the FiberComplete application.

	8100B OTDR Series	8100C OTDR Series
Bi-directional Test Set		
Wavelength [1]	1310 ± 20 nm 1550 ± 20 nm 1625 ± 20 nm	1310 ± 20 nm 1490 ± 20 nm 1550 ± 20 nm 1625 ± 10 nm
Measurement Time[2]	32 seconds	
Insertion Loss		
Reference Methods	Loopback + Side by side	
Dynamic Range	42 dB	
Typical Uncertainty[3]	± 0.25 dB	
Repeatability[4]	< 0.1 dB	
Optical Return Loss (ORL) - including manual ORL		
Measurement range[5]	Up to 55 dB	
Typical Uncertainty[6]	± 0.9 dB	
Repeatability [4]	< 0.1 dB	

	8100B OTDR Series	8100C OTDR Series
Power Meter		
Calibrated wavelengths	1310, 1490, 1550, 1625 nm	
Power range	-3 to -55 dBm	
Uncertainty[7]	± 0.5 dB @ -30 dBm	
Optical Source		
Wavelengths	1310, 1550, 1625 nm	1310, 1490, 1550, 1625 nm
Output Power Level	-3.5 dBm	
Stability	< ± 0.1 dB @ 25°C over 1 hour	
Operating modes[8]	CW, 270Hz, 330Hz, 1kHz, 2kHz, Twintest, Auto	
OTDR (see "B, C & D Modules" on page 556)		

1. Guaranteed, with laser at 25°C
2. Typical measurement time for bidir 1310/1550 nm IL/ORL, after referencing is completed
3. Side by side referencing
4. 10 consecutive measurements without disconnection
5. With APC connector
6. From 10 to 45 dB @1310 or 1550 nm
7. At calibrated wavelengths
8. Substract 3 dB when used in modulation mode (270/330/1k/2kHz/Twintest/Auto)

A Modules

Multi-/Single-mode modules

	E8146A E8156 A	
	Multimode	**Singlemode**
Central Wavelength [1]	850 +10/-30 nm 1300 ± 20 nm	1310 ± 20 nm 1550 ± 20 nm 1625 ± 20 nm
Laser Classes - 21CFR IEC 60825-1:2014	Class 1	
RMS Dynamic Range [2]	24 dB	40 dB
Distance Range	from 50 m to 10 km	from 100 m to 260 km
Pulse width	1 ns to 50 ns	3 ns to 20 µs

	E8146A E8156 A	
Event Dead Zone [3]	0.20/0.25 m	0. 60 m
Attenuation Dead Zone [4]	1.5 / 2.1 m	2 m (@ 1310 nm)
Continuous Wave Light Source		
Output Power Level	0 dBm	
Stability[5]	< ± 0.2 dB @ 25° over 1 hour	< ± 0.1 dB @ 25° over 1 hour
Operating modes	270Hz, 1kHz, 2kHz, Auto, Twintest	

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 for Singlemode and -35dB for Multimode) at shortest pulsewidth.
5. After 20 minutes warm-up time

High Resolution Multimode module

	E8123AV	
	RDZ Mode	**Expert mode**
Central Wavelength [1]	850 +10/-30 nm	850 +10/-30 nm 1300 ± 20 nm
Laser Classes - 21CFR IEC 60825-1:2014	Class 1	
RMS Dynamic Range [2]	16 dB	24 dB
Distance Range	From 50 m to 1 km	From 50 m to 10 km
Pulse width	1 ns	1 ns to 50 ns
Event Dead Zone [3]	0.2 m	0.2/0.25 m
Attenuation Dead Zone [4]	0.4 m	1.5 / 2 m

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 30 seconds 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 pulsewidth.
4. ADZ measured at +/- 0.5 dB on the basis of a linear regression from a reflectance of type FC/PC (-35 dB) at shortest pulsewidth.

CWDM Modules

CWDM modules	8100 CWDM1E	8100 CWDM2E	8100 CWDM3E	8100 CWDM4E	8100 CWDM5E
Central Wave-length[1]	1551 ± 5 nm 1571 ± 5 nm 1591 ± 5 nm 1611 ± 5 nm	1471 ± 5 nm 1491 ± 5 nm 1511 ± 5 nm 1531 ± 5 nm	1431 ± 5 nm 1451 ± 5 nm	1351 ± 5 nm 1371 ± 5 nm 1391 ± 5 nm 1411 ± 5 nm	1271 ± 5 nm 1291 ± 5 nm 1311 ± 5 nm 1331 ± 5 nm
RMS Dynamic Range[2]	42dB 42dB 42dB 42dB	42dB 42dB 42dB 42dB	42dB 42dB 42dB 42dB	42dB 42dB 42dB 42dB	42dB 42dB 42dB 42dB
Pulse width	3ns to 20 µs				
Event Dead Zone[3]	0,8 m				
Attenuation Dead Zone[4]	4.5 m				
Continuous Wave Output Power	0 dBm				
Operating modes[5]	CW, 270Hz, 330Hz, 1kHz, 2kHz				

1. Guaranteed, with laser at 10 µs, over entire temperature range
2. Typical value corresponding to the difference (in dB) between the level of back-diffusion extrapolated at the beginning of fiber and the RMS noise level , after 3 min. of averaging, with 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 type FC/UPC (-55 dB) at shortest pulsewidth.
5. Substract 3dB when used in modulation mode (270/330/1k/2k Hz)

Distance Ranges

Ranges for OTDR Module A

Multimode Module

	1 ns	3 ns	10 ns	30 ns	50 ns
50 m	x	x			
100 m	x	x			

	1 ns	3 ns	10 ns	30 ns	50 ns
200 m	x	x	x		
500 m	x	x	x	x	
1 km	x	x	x	x	x
2 km	x	x	x	x	x
5 km	x	x	x	x	x
10 km			x	x	x

Singlemode Module

	3 ns	10 ns	30 ns	100 ns	300 ns	1 µs	3 µs	10 µs	20 µs
100 m	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				
5 km	x	x	x	x	x				
10 km	x	x	x	x	x	x			
20 km	x	x	x	x	x	x	x		
40 km	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 OTDR Module B

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

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

Ranges for OTDR Module C

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

Ranges for OTDR Module D

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

Ranges for CWDM modules

	3 ns	30 ns	100 ns	300 ns	1 µs	3 µs	10 µs	20 µs
5 km	x	x						
10 km	x	x	x					
20 km	x	x	x	x	x			
40 km	x	x	x	x	x	x	x	x
80 km	x	x	x	x	x	x	x	x
140 km		x	x	x	x	x	x	x
260 km				x	x	x	x	x
380 km							x	x

HR OSA Module

Typical values, at 25°C, unless specified otherwise.

Module	EOSA610B
Wavelength Acquisition Range	190.7-196.65 THz (1524.498 - 1572.063 nm)
Absolute uncertainty of frequency (wavelength)[1,2]	±370 MHz (±3pm)
Frequency (wavelength) resolution	300 MHz (2.4pm)
Minimum signal separation	2 GHz (16 pm)
Input power range (in 300 MHz bandwidth)[3]	-65 to +10dBm
Noise floor	-84 dBm
Max. safe total input power[4]	+17dBm
Close-in dynamic range	> 40 dB at ±8pm (±1 GHz) > 50 dB at ±16pm (±2 GHz)
Spurious-free dynamic range	> 45 dB
Absolute uncertainty of power level[1,2,5]	±0.5 dB
Display resolution	0.01 dB
Return loss	> 50 dB
Measurement time[6]	min 1.0 s
Measurement statistics	Delta wavelength, delta power, delta OSNR

1. Over the entire frequency range.
2. Average of 5 consecutive sweeps. Coarse mode disabled.
3. Power of unmodulated single-frequency laser or peak power of modulated signal in 300MHz optical bandwidth
4. Total power of all input signals
5. At -20 dBm input power
6. Over 50 GHz sweep range, no averaging

Dimensions and weight

- Weight: approx. 500 g (1.1 lbs)
- Dimensions: 213 x 124 x 32 mm (8.38 x 4.88 x 1.26 in)

ODM Modules

Typical values, at 25°C, unless otherwise specified.

Chromatic Dispersion (E81CD/E81DISPAP)[1]	**80km G652**	**10km G655**
Wavelength Acquisition Range	1260 - 1640 nm	
Wavelength Uncertainty	+/- 0.1 nm	
Minimum length	1 km	
Dynamic Range	45 dB 55 dB[2]	
Zero dispersion wavelength uncertainty	+/- 1.5 nm	
Zero dispersion wavelength repeatability[3]	0.1 nm	
Dispersion Uncertainty [4, 5]	+/- 0.05 ps/nm.km	+/- 0.1 ps/nm.km
Dispersion Repeatability [3, 4]	0.005ps/nm.km	
Slope at Zero Wavelength Repeatability [3]	0.5%	0.1%
Measurement Time	From 40s to 80s	

1. With Broadband Source module E81BBS2A unless specified
2. With handheld Broadband Source OBS550 in High Dynamic mode
3. Repeatibility refers to the typical one-sigma standard deviation value, obtained for system cycling over 20 measurements
4. 1530-1570nm band
5. Excluding reference fiber uncertainties

Polarization Mode Dispersion[1]	**E81DISPAP**	**E81PMD**
Dynamic Range[2]	58 dB 65 dB[3]	58 dB
PMD Measurement range[4]	0.08 to 130 ps	
PMD Type B uncertainty [5, 6]	+/- 0.02 ps +/- 2% PMD	
PMD Repeatability [5, 6]	0.025 ps	
Measurement Time [7]	16 seconds, independant of PMD value	6 seconds, independant of PMD value

1. With Broadband Source module E81BBS2A unless specified
2. With averaging
3. With handheld Broadband Source OBS550 in High Dynamic mode
4. Up to 60ps in strong mode coupling
5. Weak coupling for 0.1 ps to 60 ps PMD range, up to 35 dB Total Loss
6. Traceable to NPL standard
7. Minimum value without averaging

Attenuation Profile (E81DISPAP)[1]	
Dynamic Range[2]	55 dB 60 dB[3]
Measurement Uncertainty (80 km fiber G652)	+/-0.006dB/km @1310nm +/-0.003dB/km @1550nm +/-0.004dB/km @1625nm
Measurement Time [4]	6 seconds

1. With Broadband Source module E81BBS2A unless specified
2. With averaging
3. With handheld Broadband Source OBS550 in High Dynamic mode
4. Minimum value without averaging

ODM MR Modules

Typical values, at 25°C, unless otherwise specified.

Chromatic Dispersion (E81MRDISPAP)[1]	**80km G652**	**10km G655**
Wavelength Acquisition Range	1435 - 1640 nm	
Wavelength Display Range	1260 - 1640 nm	
Wavelength Uncertainty	+/- 0.1 nm	
Minimum length	1 km	
Dynamic Range	33 dB	
Zero dispersion wavelength uncertainty	n/a	+/- 4.5 nm
Zero dispersion wavelength repeatability[2]	n/a	0.4 nm
Dispersion Uncertainty [3,4]	+/- 0.06 ps/nm.km	+/- 0.3 ps/nm.km
Dispersion Repeatability [2,3]	0.02 ps/nm.km	
Measurement Time	From 10s to 30s	

1. With Broadband Source wavelength type OBS500 (1460 - 1625 nm)
2. Repeatibility refers to the typical one-sigma standard deviation value, obtained for system cycling over 20 measurements
3. 1530-1570nm band
4. Excluding reference fiber uncertainties

Polarization Mode Dispersion (E81MRDISPAP)[1]	
Dynamic Range[2]	45 dB
PMD Measurement range[3]	0.08 to 130 ps
PMD Type B uncertainty [4, 5]	+/- 0.02 ps +/- 2% PMD
PMD Repeatability [4, 5]	0.025 ps
Measurement Time[6]	8 seconds, independent of PMD value

1. With Broadband Source wavelength type OBS500 (1460 - 1625 nm)
2. With averaging
3. Up to 60ps in strong mode coupling
4. Weak coupling for 0.1 ps to 60 ps PMD range, up to 35 dB Total Loss
5. Traceable to NPL standard
6. Minimum value without averaging

Attenuation Profile (E81MRDISPAP)[1]	
Dynamic Range	45 dB
Wavelength Uncertainty	+/-0.1 nm
Measurement uncertainty	+/-0.003dB/km @1550nm +/-0.004dB/km @1625nm
Measurement Time[2]	3 seconds

1. With Broadband Source wavelength type OBS500 (1460 - 1625 nm)
2. Measured with 80km G.652 fiber

High Resolution Dispersion test solution

Typical values, at 25°C, unless otherwise specified.

Optical Interfaces

- Applicable Fiber: SMF 9/125 µm
- Interchangeable optical connectors: FC, SC, DIN, LC

Polarization Mode Dispersion	
Dynamic Range [1,2]	48 dB
PMD measurement range [3]	0 to 18 ps
PMD absolute uncertainty [4,5]	+/- 0.02 ps +/- 2%

Polarization Mode Dispersion	
Measurement time [6]	From 30 s.

1. With Broadband Source module E81BBS1A in Corresponding mode
2. With Kit 1 (PMD only). Subtract 6 dB for Kit 2 (PMD / CD / AP)
3. With strong mode coupling
4. Strong mode coupling. 1500-1600nm measurement span. PMD < 10ps
5. Up to 35 dB attenuation
6. Without averaging

Attenuation profile (with kit 2)	
Dynamic Range [1,2]	45 dB
Wavelength Uncertainty	+/- 0.1 nm
Measurement Time [3]	3 seconds
Measurement uncertainty [4]: - at 1550 nm - at 1625 nm	 +/- 0.003 dB/km +/- 0.004 dB/km

1. With Broadband Source module E81BBS1A in Corresponding mode
2. With averaging
3. Without averaging
4. Measured with 80 km G.652 fiber

Chromatic Dispersion (with kit 2)		
Wavelength Acquisition Range	1460 - 1640 nm	
Wavelength Uncertainty	+/- 0.1 nm	
Minimum length	1 km	
Dynamic Range [1,2]	33 dB	
Measurement Time	10s. to 30s.	
	80km G652	**10km G655**
Zero Dispersion wavelength uncertainty	n/a	+/- 4.5 nm
Zero Dispersion wavelength repeatability[3]	n/a	0.4 nm
Dispersion uncertainty [4, 5]	+/- 0.06 ps/nm.km	+/- 0.3 ps/nm.km
Dispersion repeatability[3, 4]	0.02 ps/nm.km	

1. With Broadband Source module E81BBS1A in Corresponding mode
2. Dynamic range obtained without PSM module. A typical extra budget loss of 1.25dB applies when passing through PSM
3. Repeatability refers to the typical one sigma standard deviation value, obtained for systems cycling of 20 measurements
4. 1530−1570 nm band

5. Excluding reference fiber uncertainties

Dimensions and weight

- Weight: 600 g (1.32lbs)
- Dimensions (w x h x d): 213 x 124 x 32 mm (8.36 x 4.88 x 1.26 in)

BBS Modules

Specifications, at 25°C, unless otherwise mentioned.

	81BBS2A
Wavelength range	1260 - 1640 nm
Minimum spectral density	-42 dBm / 0,1 nm [1]
Typical Output power	+12.5 dBm
Power consumption	10 Wh
Operating temperature range	-5 to +40°C
Laser Class	1M[2]

1. over 1260 - 1630 nm wavelength range, AP mode
2. Under the IEC 60825-1: 2014 international standard

Warning labels for the laser classes

Due to the reduced dimensions of the optical modules, it is not possible to attach the required warning labels to them. In line with the provisions of Article 7.1 of the IEC 60825-1:2014 standard, the laser class identification labels are shown below:

The user must take the necessary precautions concerning the optical output of the instrument and follow the manufacturer’s instructions.

Ref. standard	**IEC 60825-1: 2014**	**FDA21CFR§1040.10**
Class 1	CLASS 1 LASER PRODUCT	
Class 1M	LASER RADIATION DO NOT EXPOSE USERS OF TELESCOPIC OPTICS CLASS 1M LASER PRODUCT	

Ref. standard	IEC 60825-1: 2014	FDA21CFR§1040.10
Class 2		

Measurements on optical fibers are difficult to execute and the precision of the results obtained depends largely on the precautions taken by the user.

MTAU modules

Typical values, at 25°C, unless otherwise specified.

	81MTAU2	81MTAU4
Wavelength range	1260 - 1640 nm	
Insertion Loss (max)	1 dB	1.5 dB
Return Loss (max)	50 dB	
PDL[1] (max)	0.1 dB	
Repeatability[2] (max)	0.01 dB	

1. Polarization Dependent Loss
2. At constant temperature and polarization

Warning

Warning for 81PMD, UHD and VLR modules:

These are class A products. In a domestic environment, theses products may cause radio interference, in which case the user may be required to take adequate measures.

22

Options and accessories

This chapter describes all the accessories and options available with the MTS / T-BERD series.

NOTE

Product marking is based on the commercial reference excluding the first letter.
Example: Commercial reference E4146QUAD is identified 4146QUAD on the product.

The topics discussed in this chapter are as follows:

References of measurement modules

OTDR Modules

OTDR Module A Singlemode/Multimode	References
Multimode / Singlemode 850/1300 nm & 1310/1550 nm OTDR module A	E8146A
Multimode / Singlemode PENTA 850/1300 nm & 1310/1550/1625 nm OTDR module A	E8156A

OTDR Module A Multimode	References
High Resolution Multimode 850/1300nm OTDR AV Module	E8123AV

OTDR Module B	Reference
OTDR Module B 1310/1550 nm wavelengths with continuous wave light source and built-in power meter. optical connector must be specified	E8126B
OTDR Module B 1310/1550/1625 nm wavelengths with continuous wave light source and built-in power meter. optical connector must be specified	E8136B
OTDR Module B with filtered 1650 nm Raman compensated for in-service testing	E81165B
OTDR Module B 1310/1550 nm wavelengths with Fiber Complete function for bi-directional Insertion Loss and ORL testing. also includes continuous wave light source and built-in power meter. optical connector must be specified	E8126B-FCOMP
OTDR Module B 1310/1550/1625 nm wavelengths with Fiber Complete function for bi-directional Insertion Loss and ORL testing. also includes continuous wave light source and built-in power meter. optical connector must be specified	E8136B-FCOMP

OTDR Module C	Reference
OTDR Module C 1550 nm wavelength	E8115C

OTDR Module C	Reference
OTDR Module C 1310/1550 nm wavelengths with continuous wave light source and built-in power meter	E8126C
OTDR Module C 1625 nm wavelength filtered and Raman compensated, optical connector must be specified	E81162C
OTDR Module C 1650 nm wavelength filtered and Raman compensated, optical connector must be specified	E81165C
OTDR Module C 1310/1550/1625 nm wavelengths with continuous wave light source and built-in power meter, optical connector must be specified	E8136C
OTDR Module C 1550/1625 nm wavelengths with continuous wave light source and built-in power meter, optical connector must be specified	E8129C
OTDR Module C 1310/1550/1650 nm wavelengths with continuous wave light source and built-in power meter. 1650 nm wavelength is filtered and compensated for in-service testing, optical connector must be specified	E8138C-65
OTDR Module C 1310/1550 nm wavelengths with FiberComplete function for bi-directional Insertion Loss and ORL testing. also includes continuous wave light source and built-in power meter. optical connector must be specified	E8126C-FCOMP
OTDR Module C 1310/1550/1625 nm wavelengths with FiberComplete function for bi-directional Insertion Loss and ORL testing. also includes continuous wave light source and built-in power meter. optical connector must be specified	E8136C-FCOMP
OTDR Module C 1310/1490/1550 nm wavelengths with continuous wave light source and built-in power meter, optical connector must be specified	E8139C
OTDR Module C 1310/1490/1550 nm wavelengths with FiberComplete function for bi-directional Insertion Loss and ORL testing. also includes continuous wave light source and built-in power meter. optical connector must be specified	E8139C-FCOMP
OTDR Module C 1310/1550 nm wavelengths combining FiberComplete function for bi-directional Insertion Loss and ORL testing and SCL Broadband Source for CD/PMD/AP measurements. also includes continuous wave light source and built-in power meter. optical connector must be specified	E8126C-FCHAR

OTDR Module C	Reference
OTDR Module C 1310/1550/1625 nm wavelengths combining FiberComplete function for bi-directional Insertion Loss and ORL testing and SCL Broadband Source for CD/PMD/AP measurements. also includes continuous wave light source and built-in power meter. optical connector must be specified	E8136C-FCHAR

OTDR Module D	References
OTDR Module D 1550/1625nm. Optical connector must be specified	E8129D-62
OTDR Module D 1310/1550/1625nm. Includes continuous wave light source and built-in power meter. Optical connector must be specified	E8136D
OTDR Module D 1310/1550nm. Includes continuous wave light source and built-in power meter. Optical connector must be specified	E8126D
OTDR Module D with filtered 1650nm wavelength. Optical connector must be specified	E81165D
OTDR Module D with filtered 1625nm wavelength. Optical connector must be specified	E81162D
OTDR MODULE D 1550nm wavelength. Optical connector must be specified	E8115D

OTDR modules for calibration reports	Reference
OTDR plug-in for calibration ratios	E81OTDRCR

OTDR CWDM Modules

CWDM modules	References
4-Wavelengths CWDM OTDR 1551/1571/1591/1611 nm module with continuous wave light source	E8140OTDRCWDM1E
4-Wavelengths CWDM OTDR 1471/1491/1511/1531 nm module with continuous wave light source	E8140OTDRCWDM2E

CWDM modules	References
2-Wavelengths CWDM OTDR 1431/1451 nm module with continuous wave light source	E8140OTDRCWDM3E
4-Wavelengths CWDM OTDR 1351/1371/1391/1411 nm module with continuous wave light source	E8140OTDRCWDM4E
4-Wavelengths CWDM OTDR 1271/1291/1311/1331 nm module with continuous wave light source	E8140OTDRCWDM5E

PMD / I-PMD / HR OSA Modules

PMD modules	References
PMD Plug-in Band S+C+L	E81PMD
In-Service PMD Test Module with In-Band DGD/OSNR and Long Term PMD analysis	E81IPMD

HR OSA module	Reference
High Resolution Optical Spectrum Analyzer Module with Extended C-Band	EOSA610B

PMD accessories	References
Polarization Scrambler Module	E81PSM
Optical variable polarizer (not necessary for 81XXX plug-ins)	EOVP-15
Broadband source for PMD, AP and CD measurements	EOBS550

ODM Modules

ODM modules[1]	References
Combined long range CD, PMD & AP measurement-1260/1640 nm	E81DISPAP
Long Range Chromatic Dispersion Module - 1260 - 1640 nm	E81CD

1. To be used with a broadband source.

ODM MR Modules

ODM modules	Reference
ODM MR Medium Range module[1]	E81MRDISPAP

1. To be used with a Broadband Source: EOBS500 / E81BBS1A/E81BBS2A

BBS Modules

BBS modules	References
BroadBand Source module for PMD, Long Range CD and ATT Profile measurement, 1260-1640nm	E81BBS2A
SCL-Band BroadBand Source plug-in Module for standard PMD, Low PMD and Low Range CD measurements	E81BBS1A

MTAU Modules

MTAU modules	Reference
Multi Test Access Unit for 4 test modules[1]	E81MTAU4

1. Connector type must be specified.

User manual references

User manuals for MTS/T-BERD modules	References
User manual for modules, 8100 series (French)	E8100M01
User manual for modules, 8100 series (English)	E8100M02

User manuals for MTS/T-BERD modules	References
User manual for modules, 8100 series (German)	E8100M03

References of optical connectors and adapters

Front Panel interchangeable Optical connectors for Multi-mode SRL OTDR	References
Universal PC Connector with FC adapter	EUNIPCFCMM
Universal PC Connector with SC adapter	EUNIPCSCMM
Universal PC Connector with ST adapter	EUNIPCSTMM
Universal PC Connector with DIN adapter	EUNIPCDINMM

Front Panel interchangeable Optical Connectors for Single-mode OTDR and ODM Modules[1]	References
Universal PC Connector with FC adapter	EUNIPCFC
Universal PC Connector with SC adapter	EUNIPCSC
Universal PC Connector with ST adapter	EUNIPCST
Universal PC Connector with DIN adapter	EUNIPCDIN
Universal PC Connector with LC adapter	EUNIPCLC
Universal APC Connector for SM only with FC adapter	EUNIAPCFC
Universal APC Connector for SM only with SC adapter	EUNIAPCSC
Universal APC Connector for SM only with ST adapter	EUNIAPCST
Universal APC Connector for SM only with DIN adapter	EUNIAPCDIN
Universal APC Connector for SM only with LC adapter	EUNIAPCLC

1. A connector (fixed or universal) must be specified at time of order of the plug-in

Additional Adapters for Universal Connectors[1]	References
Universal FC Adapter	EUFCAD
Universal SC Adapter	EUSCAD
Universal ST Adapter	EUSTAD
Universal DIN Adapter	EUDINAD
Universal LC adapter	EULCAD

1. Interchangeable in the field

References of result processing software[1]

	References
Optical Fiber Trace software	EOFS100
Optical Fiber Trace software (5 licences)	EOFS1005L
Optical Fiber Trace software (site licence)	EOFS100SL
FiberTrace software - update	EOFS100UP
Optical Fiber Cable software	EOFS200
Optical Fiber Cable software (5 licences)	EOFS2005L
Optical Fiber Cable software (site licence)	EOFS200SL

1.Free software updates on the Web (but without user manual)

A

RoHS Information

This appendix describes the RoHS (Restriction of Hazardous Substances) information, which are mandatory requirements from China.

The RoHS directive consists in the restriction on the use of certain hazardous substances in electrical or electronic equipment sold or used in the European Union, after July 1, 2006. These substances are: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers.

The following chapters are described:

Concerned products: 8100 V2 modules series

Nb 8000 V2 series

"China RoHS"

电子信息产品污染控制管理办法
（信息产业部第 39 号）

此附录提供"China RoHS"要求的产品环境使用期限和有毒有害物质名称及含量。此附录适用于主机和它的附件。

产品名称：XXXXXX

环保使用期限

此标识标注在主要产品上表示此产品或它的附件中含有有毒有害物质 （详细信息见下表）

标志中间的数字代表至生产日期起的环保最大使用年限。正常使用情况下，有毒有害物质不会发生突变或外泄。这个期限不适用消耗品，例如电池。

正常的操作情况请参考产品的使用手册
生产日期请参考产品的校准证明正本

有毒有害物质名称及含量表识格式

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉(Cd)	六价铬(CR^{6+})	多溴联苯(PBB)	多溴二苯醚 (PBDE)
主机	O	O	O	O	O	O
印刷电路板	X	O	O	O	O	O
内部布线	O	O	O	O	O	O
显示屏	O	O	O	O	O	O
键盘	O	O	O	O	O	O
电池	O	O	O	O	O	O
电源单元	O	O	O	O	O	O
机电部件	O	O	O	O	O	O
硬盘	O	O	O	O	O	O
光模块	O	O	O	O	O	O
金属外壳部件和夹具	O	O	O	O	O	O
塑料外壳部件	O	O	O	O	O	O
标签	O	O	O	O	O	O
附件	O	O	O	O	O	O
外部电缆和适配器	O	O	O	O	O	O
光驱	O	O	O	O	O	O
操作手册和印刷资料	O	O	O	O	O	O
软包和硬包	O	O	O	O	O	O
其他附件	O	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006

Concerned products: OTDR 8100 V2 Modules Series

8115UHD, 8123MM, 8126UHD, 8129UHD, 8136UHD

"China RoHS"

电子信息产品污染控制管理办法
（信息产业部第 39 号）

此附录提供"China RoHS"要求的产品环境使用期限和有毒有害物质名称及含量。此附录适用于主机和它的附件。

产品名称：XXXXXX

环保使用期限

此标识标注在主要产品上表示此产品或它的附件中含有有毒有害物质（详细信息见下表）

标志中间的数字代表至生产日期起的环保最大使用年限。正常使用情况下，有毒有害物质不会发生突变或外泄。这个期限不适用消耗品，例如电池。

正常的操作情况请参考产品的使用手册
生产日期请参考产品的校准证明正本

有毒有害物质名称及含量表识格式

	有毒有害物质或元素					
部件名称	铅 (Pb)	汞 (Hg)	镉(Cd)	六价铬(CR^{6+})	多溴联苯(PBB)	多溴二苯醚 (PBDE)
主机	O	O	O	O	O	O
印刷电路板	X	O	O	O	O	O
内部布线	O	O	O	O	O	O
显示屏	O	O	O	O	O	O
键盘	O	O	O	O	O	O
电池	O	O	O	O	O	O
电源单元	O	O	O	O	O	O
机电部件	O	O	O	O	O	O
硬盘	O	O	O	O	O	O
光模块	O	O	O	O	O	O
金属外壳部件和夹具	O	O	O	O	O	O
塑料外壳部件	O	O	O	O	O	O
标签	O	O	O	O	O	O
附件	O	O	O	O	O	O
外部电缆和适配器	O	O	O	O	O	O
光驱	O	O	O	O	O	O
操作手册和印刷资料	O	O	O	O	O	O
软包和硬包	O	O	O	O	O	O
其他附件	O	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006

Concerned products: OTDR VLR 8100 V2 Modules Series

8118 VLR(38/49), 8138 VLR49, 8148 VLR38

"China RoHS"

电子信息产品污染控制管理办法
（信息产业部第 39 号）

此附录提供"China RoHS"要求的产品环境使用期限和有毒有害物质名称及含量。此附录适用于主机和它的附件。

产品名称：XXXXXX

环保使用期限

此标识标注在主要产品上表示此产品或它的附件中含有有毒有害物质 （详细信息见下表）

标志中间的数字代表至生产日期起的环保最大使用年限。正常使用情况下，有毒有害物质不会发生突变或外泄。这个期限不适用消耗品，例如电池。

正常的操作情况请参考产品的使用手册
生产日期请参考产品的校准证明正本

有毒有害物质名称及含量表识格式

部件名称	**有毒有害物质或元素**					
	铅 (Pb)	汞 (Hg)	镉(Cd)	六价铬(CR^{6+})	多溴联苯(PBB)	多溴二苯醚 (PBDE)
主机	O	O	O	O	O	O
印刷电路板	O	O	O	O	O	O
内部布线	O	O	O	O	O	O
显示屏	O	O	O	O	O	O
键盘	O	O	O	O	O	O
电池	O	O	O	O	O	O
电源单元	O	O	O	O	O	O
机电部件	O	O	O	O	O	O
硬盘	O	O	O	O	O	O
光模块	X	O	O	O	O	O
金属外壳部件和夹具	O	O	O	O	O	O
塑料外壳部件	O	O	O	O	O	O
标签	O	O	O	O	O	O
附件	O	O	O	O	O	O
外部电缆和适配器	O	O	O	O	O	O
光驱	O	O	O	O	O	O
操作手册和印刷资料	O	O	O	O	O	O
软包和硬包	O	O	O	O	O	O
其他附件	O	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006.

Concerned products: PMD 8100 V2 Modules Series

81PMD

"China RoHS"

电子信息产品污染控制管理办法
（信息产业部第 39 号）

此附录提供"China RoHS"要求的产品环境使用期限和有毒有害物质名称及含量。此附录适用于主机和它的附件。

产品名称：XXXXXX

环保使用期限

此标识标注在主要产品上表示此产品或它的附件中含有有毒有害物质（详细信息见下表）

标志中间的数字代表至生产日期起的环保最大使用年限。正常使用情况下，有毒有害物质不会发生突变或外泄。这个期限不适用消耗品，例如电池。

正常的操作情况请参考产品的使用手册
生产日期请参考产品的校准证明正本

有毒有害物质名称及含量表识格式

	有毒有害物质或元素					
部件名称	铅 (Pb)	汞 (Hg)	镉(Cd)	六价铬(CR^{6+})	多溴联苯(PBB)	多溴二苯醚 (PBDE)
主机	O	O	O	O	O	O
印刷电路板	X	O	O	O	O	O
内部布线	O	O	O	O	O	O
显示屏	O	O	O	O	O	O
键盘	O	O	O	O	O	O
电池	O	O	O	O	O	O
电源单元	O	O	O	O	O	O
机电部件	O	O	O	O	O	O
硬盘	O	O	O	O	O	O
光模块	X	O	O	O	O	O
金属外壳部件和夹具	O	O	O	O	O	O
塑料外壳部件	O	O	O	O	O	O
标签	O	O	O	O	O	O
附件	O	O	O	O	O	O
外部电缆和适配器	O	O	O	O	O	O
光驱	O	O	O	O	O	O
操作手册和印刷资料	O	O	O	O	O	O
软包和硬包	O	O	O	O	O	O
其他附件	O	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006.
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006.

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English

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