OTDR

AXS-100 Series

USER GUIDE

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Trademarks

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Units of Measurement

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

Patents

EXFO's Universal Interface is protected by US patent 6,612,750.

Version number: 2.0.2

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Certification Information

F.C.C. Information

Electronic test equipment is exempt from Part 15 compliance (FCC) in the United States. However, compliance verification tests are systematically performed on most EXFO equipment.

C E Information

Electronic test equipment is subject to the EMC Directive in the European Union. The EN61326 standard prescribes both emission and immunity requirements for laboratory, measurement, and control equipment.
This unit has undergone extensive testing according to the European Union Directive and Standards.

EXFO

DECLARATION OF CONFORMITY

Application of Council Directive(s):	73/23/EEC - The Low Voltage Directive
	89/336/EEC - The EMC Directive
Manufacturer's Name:	EXFO ELECTRO-OPTICAL ENG.
Manufacturer's Address:	400 Godin Avenue, Quebec (Quebec)
	Canada G1M 2K2
	(418) 683-0211
Equipment Type/Environment:	Industrial Scientific Equipment
Trade Name/Model No.:	AXS-100 Series (100 / 110) Handheld OTDR

Standard(s) to which Conformity is Declared:

EN 55022: 1998/ A2: 2003	**Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.**
EN 60825-1:1994 / A2: 2001	**Safety of laser products – Part 1: Equipment classifications, requirements, and user's guide**
EN 61326:1997/ A3: 2003	**Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements**

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards.

Manufacturer

Signature:

Full Name:	Stephen Bull, E. Eng
Position:	Vice-President Research and Development
Address:	400 Godin Avenue, Quebec (Quebec) Canada
Date:	April 23, 2007

1 *Introducing the AXS-100 Series OTDR*

The AXS-100 Series OTDR is a compact handheld OTDR optimized for access/FTTx network testing. The unit can be equipped with optional power meter, visual fault locator (VFL), and fiber inspection probe.

Main Features

➤ Test can be started by pressing a single key

➤ Possible to test with acquisition duration as short as 5 seconds

➤ One or two OTDR ports (singlemode, multimode or filtered wavelength)

➤ Screen optimized for outdoor use

➤ USB ports (host and client)

➤ FTTx software package (optional): macrobend, fault finder, and pass/fail indicators

➤ Network testing (ping and trace route)

Shoulder strap eyelet

RJ-45 connector

AC adapter/charger connector

Battery charge status LEDs (one per battery)

Stand

Display

Keypad

Visual fault locator port and soft cap

Power meter detector port

Singlemode OTDR port

Infrared port (for printer)

On some models only:

Singlemode OTDR port for in-service testing

OR

Multimode OTDR port

Inspection probe connector

USB host port (for data transfer using memory drive)

USB client port (for data transfer via ActiveSync)

Note: *Ports and connectors on your unit may differ from the illustration.*

Other test utilities:

➤ Visual fault locator to inspect or identify fibers (optional)

➤ Video fiber inspection probe (optional)

➤ Power meter (optional)

Safety label and serial number
(under the stand)

Quick reference labels

Battery compartment
(two rechargeable batteries)

Other useful characteristics:

➤ Customizable test thresholds with visual pass/fail analysis

➤ Memory for 500 OTDR traces and possible data transfer to a computer

➤ Energy-saving features: automatic backlight or unit shutdown

➤ Multilingual graphical user interface

➤ Comprehensive online help available from each function and Quick Reference labels affixed to back of unit

➤ Data post-processing: You can install the OTDR Viewer software (provided on the installation CD) on a computer to view and analyze OTDR traces. You can access more features such as

    ➤ customized printout

    ➤ batch printing

    ➤ conversion of traces to many formats such as Telcordia or ASCII.

Power Sources

The unit operates with the following power sources:

➤ AC adapter/charger (connected to standard power outlet—indoor use only). Compatible car outlet adapter available upon request

➤ Two Lithium-Ion rechargeable batteries (automatically take over if you disconnect the AC adapter/charger). Battery recharge is automatic when the AC adapter/charger is connected.

Typical Applications

You can use the OTDR for several applications, such as:

➤ Short-link testing

➤ Service activation

➤ Fault finder

➤ Troubleshooting (dark and live fibers)

OTDR Basic Principles

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

The OTDR calculates distances as follows:

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

where

    c = speed of light in a vacuum (2.998×10^8 m/s)

    t   = time delay from the launch of the pulse to the reception of the pulse

    n = index of refraction of the fiber under test (as specified by the manufacturer)

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

➤ Rayleigh scattering occurs when a pulse travels down the fiber and small variations in the material, such as variations and discontinuities in the index of refraction, cause light to be scattered in all directions. However, the phenomenon of small amounts of light being reflected directly back toward the transmitter is called backscattering.

➤ Fresnel reflections occur when the light traveling down the fiber encounters abrupt changes in material density that may occur at connections or breaks where an air gap exists. A very large quantity of light is reflected, as compared with the Rayleigh scattering. The strength of the reflection depends on the degree of change in the index of refraction.
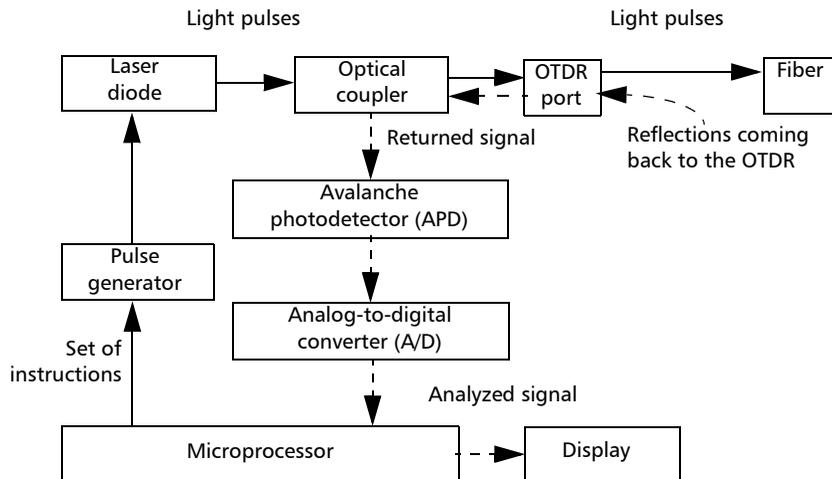
When the full trace is displayed, each point represents an average of many sampling points. You will have to zoom to see each point (see *Using Zoom Controls* on page 54).

Conventions

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

WARNING

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

CAUTION

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

CAUTION

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

IMPORTANT

Refers to information about this product you should not overlook.

2 *Safety Information*

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

> ## WARNING
>
> **Use of controls, adjustments and procedures for operation and maintenance other than those specified herein may result in hazardous radiation exposure.**

Laser Safety Information (Units without VFL)

Your instrument is a Class 1M laser product in compliance with standards IEC 60825-1 Amendment 2: 2001 and 21 CFR 1040.10. Invisible laser radiation may be encountered at the output port.

The product is safe under reasonably foreseeable conditions of operation but it may be hazardous if you use optics within a diverging or collimated beam. *Do not view directly with optical instruments.*

IEC 60825-1 : 2001   21 CFR 1040.10
**LASER RADIATION
DO NOT VIEW DIRECTLY
WITH OPTICAL INSTRUMENTS
CLASS 1M LASER PRODUCT**
λ: 800-1200 nm, PW ≤ 1 μsec, Ppk ≤ 300 mW , Pavg ≤ 0.6 mW
λ: 1200-1700 nm, PW ≤ 20 μsec, Ppk ≤ 160 mW , Pavg ≤ 1.6 mW

QST572B

Affixed to back
(under the stand)

Laser Safety Information (Units with VFL)

Your instrument is a Class 3R laser product in compliance with standards IEC 60825-1 Amendment 2: 2001 and 21 CFR 1040.10. It is potentially harmful in direct intrabeam viewing.

The following label(s) indicate that the product contains a Class 3R source:

Affixed to back
(under the stand)

Indicated on
connector panel

Electrical Safety Information

The AC adapter/charger provided with this unit (14.4 W/9 V) is specifically designed to work with your AXS-100 Series OTDR.

WARNING

Use the AC adapter/charger indoors only.

Any other AC adapter/charger or power source (e.g., car outlet) must output at least 12 W.

3 *Getting Started with Your OTDR*

Turning the Unit On and Off

When you turn the unit on, you may use it immediately under normal conditions.

When the unit is turned off, it keeps the following parameters in its internal memory:

➤ Test parameters

➤ User-defined thresholds

➤ Regional, LCD, and energy-saving settings

➤ Saved test results

> **IMPORTANT**
>
> **If you remove batteries (and the AC adapter/charger is disconnected), the unit will turn off *without saving the above elements*.**

There are two ways to turn off the AXS-100 Series OTDR

➤ *Suspend*: the next time you turn your unit on, you will quickly return to your work environment.

➤ *Shutdown*: completely cuts power to the unit; the unit will perform a complete restart routine the next time you use it. You should perform a shutdown if you do not intend to use your unit for a week or more.

To turn the unit on:

Press ⏻. The unit initializes for a few seconds and displays the **OTDR Parameters** pane.

To enter the suspend mode:

Hold down the ⏻ key for about two seconds. Release the key as soon as you hear a beep.

To perform a shutdown:

Hold down the ⏻ key for about five seconds. You will hear a first beep; release the key after you hear a second beep.

Using Menus and Keypad

You can access optical tools from the keypad or menu. Menu options may differ depending on your unit configuration.

Status Bar

Utility name (OTDR, File Manager, VFL, etc.)

Trace name

VFL status (on/off)

OTDR status (active/not active)

OTDR - POSITION 100 NS 1.trc ▮VFL ▮OTDR

Battery status and AC adapter/charger status

Keypad

To activate the function displayed directly above

To scroll through available functions

To cancel/exit current function

To access the main menu

To start (or stop) an acquisition

To move around, select items, and change parameters

To adjust brightness (four levels)

To access help about current function

To turn unit on/off

To access main features:

1. Press the Menu key.

2. Use the arrows to select a feature and press Enter.

To activate F1/F2 functions:

1. Use the left/right function arrows (on each side of the F1/F2 keys) to make the desired function or parameter visible.

2. Press the F1 or F2 key located just below.

To access and modify on-screen parameters:

1. Use the arrows to select an on-screen item (list, keyboard, check box, etc.).

2. Press Enter to activate or open it.

To enter text or numbers with an on-screen keyboard:

➤ Use the left/right function arrows (on each side of the F1/F2 keys) to move the cursor in the text.

➤ Use the up/down and left/right arrows to select a character, and then press Enter to add it.

➤ Press **OK** (F1 key) to accept the element, and then hide the keyboard.

Enter

4 *Customizing Your OTDR*

Selecting the Distance Units

There are three distance units available: meters, miles, and kilofeet.

Note: *The attenuation values are always expressed in dB per kilometers.*

To select distance units:

1. Press Menu, select **Setup** > **Unit**, and then press Enter.

2. Use the left/right function arrows until you see **Regional Settings**, and then press **F2** to display the pane.

3. Press Enter to open the **Distance unit** list.

4. With the current distance unit highlighted, use the up/down arrows to select the desired unit, and then press Enter to activate it.
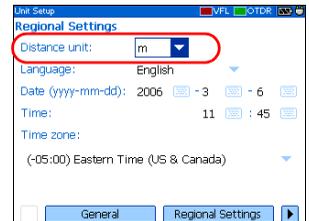
Selecting the Language of Operation

You may display the user interface in one of the available languages (default is English). If other languages become available in the future, you could access them by replacing the unit software (see *Upgrading the AXS-100 Series OTDR Software* on page 100). Values are kept in memory when you turn the unit off.

To select a new interface language:

1. Press Menu, select **Setup** > **Unit**, and then press Enter.

2. Use the left/right function arrows until you see **Regional Settings,** and then display the pane (F1/F2 key).

3. Use the up/down arrows to select the **Language** list, and then press Enter to open it.

4. With the current language highlighted, use the up/down arrows to select the desired language, and then press Enter to activate it.

    Once you have modified the language, you will be prompted to restart your unit.

Setting the Date and Time

When saving results, the unit also saves the corresponding date and time.

You must enter the date according to the year-month-day format and the time according to the 24-hour format.

You can also modify the time zone.

To set the date and time:

1. Press Menu, select **Setup** > **Unit**, and then press Enter.

2. Use the left/right function arrows until you see **Regional Settings**, and then display the pane (F1/F2 key).

3. Use the arrows to select any of the date or time settings, and then press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

4. Enter the new value and press **OK** (F1/F2 key).

To modify the time zone:

1. Press Menu, select **Setup** > **Unit**, and then press Enter.

2. Use the left/right function arrows until you see **Regional Settings**, and then display the pane (F1/F2 key).

3. Use the arrows to select the **Time zone** list, and then press Enter to open it.

4. With the current time zone highlighted, use the up/down arrows to select the desired time zone, and then press Enter to activate it.

Adjusting the Brightness

To fit your work environment, you may adjust the LCD brightness. Values are kept in memory when you turn the unit off.

To adjust the display brightness:

Press the ☀ key repeatedly to switch between brightness levels (0-3-6-9).

OR

1. Press Menu, select **Setup** > **Unit**, and then press Enter.

2. If necessary, use the left/right function arrows until you see **General**, and then display the pane (F1/F2 key).

   By default, the **Brightness** slider is selected.

3. Use the left/right arrows to adjust the brightness level.
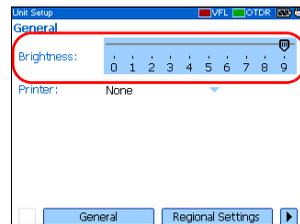
Selecting a Printer

To print reports, you must configure the printer first. Your unit supports the *Printek 2"* printer only and communicates with it via the infrared port located on the top panel.

If you want to print on a network printer or if you want to print other type of reports, you must transfer the desired files on a computer on which ToolBox 6 (or later), FastReporter or OTDR Viewer is installed.

To select a printer:

1. Press Menu, select **Setup** > **Unit**, and then press Enter.

2. If necessary, use the left/right function arrows until you see **General**, and then display the pane (F1/F2 key).

3. Use the up/down arrows to select the **Printer** list, and then press Enter to open it.

4. With the current printer highlighted, use the up/down arrows to select the desired printer, and then press Enter to activate it.
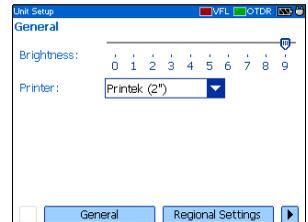
Configuring the Power Management Settings

When you do not use the unit for a while, the display may be dimmed to save power.

You can set idle durations for AC adapter/charger and battery operation. The unit goes in suspend mode after the specified duration has expired (see *Turning the Unit On and Off* on page 11).

Values are kept in memory when you turn the unit off.

Note: *When the backlight is dimmed, the unit operation is not interrupted. Press any key to return to normal operation.*

To configure the power management settings:

1. Press Menu, select **Setup** > **Unit**, and then press Enter.

2. Use the left/right function arrows until you see **Power**, and then display the pane (F1/F2 key).

*3.* Use the up/down arrows to go to the **Turn off backlight** or **Turn off unit** section.

4. Use the up/down arrows to select the battery or AC adapter/charger duration list, and then press Enter to open the list.

5. With the current duration highlighted, use the up/down arrows to select the desired duration (or **Never**), and then press Enter to confirm.
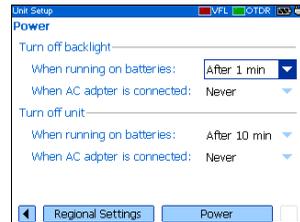
5 *Setting Up Your OTDR*

Installing the EXFO Universal Interface (EUI)

The EUI fixed baseplate is available for connectors with angled (APC) or non-angled (UPC) polishing. A green border around the baseplate indicates that it is for APC-type connectors, as shown below:

Green border indicates APC option

Bare metal (or blue border) indicates UPC option
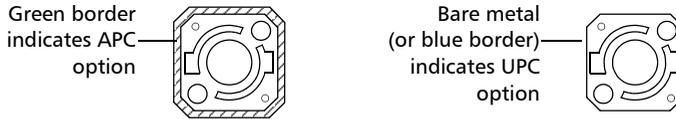
To install an EUI connector adapter onto the EUI baseplate:

1. Hold the EUI connector adapter so the dust cap opens downwards.
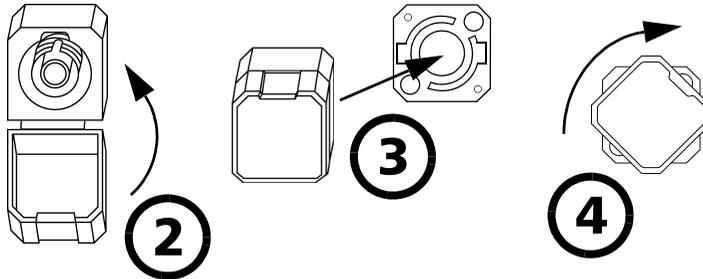
2. Close the dust cap in order to hold the connector adapter more firmly.

3. Insert the connector adapter into the baseplate.

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

Cleaning and Connecting Optical Fibers

> ## IMPORTANT
> **To ensure maximum power and to avoid erroneous readings:**
>
> ➤ **Always clean fiber ends as explained below before inserting them into the port. EXFO is not responsible for damage or errors caused by bad fiber cleaning or handling.**
>
> ➤ **Ensure that your patchcord has appropriate connectors. Joining mismatched connectors will damage the ferrules.**

To connect the fiber-optic cable to the port:

1. Clean the fiber ends as follows:

   1a. Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol.

   1b. Use compressed air to dry completely.

   1c. Visually inspect the fiber end to ensure its cleanliness.

2. Carefully align the connector and port to prevent the fiber end from touching the outside of the port or rubbing against other surfaces. If your connector features a key, ensure that it is fully fitted into the port's corresponding notch.

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

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

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

Setting General OTDR Parameters

You can set preferences such as:

➤ Grid: You can display or hide the grid appearing on the graph's background. By default, the grid is displayed.

➤ Zoom and markers: You can display or hide the zoom controls as well as the markers appearing on the graph.

➤ Reference file: You can enable or disable the selection of a reference trace. A reference trace is used to compare fibers of a same cable, monitor fiber deterioration, or compare fibers before and after installation. This trace appears in red on the graph.

➤ **Summary** pane (available only with the optional FTTx software package): By default, the **Summary** pane is automatically displayed as soon as an acquisition is complete. You can disable this automatic display (you can always access it via the **Summary** button from the OTDR pane.)

➤ Event (fiber) sections: You can display or hide event (fiber) sections in the **Events** pane, depending on the types of values you want to view. If you display event sections, the **Events** pane will include section length and section attenuation.

For example, by hiding the event (fiber) sections, you can obtain the running total of connector and splice losses instead of having a loss value for the entire link. Information on event sections is also available from the **Trace** pane, in the events table located just below the graph.

To set the general OTDR parameters:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Display the **General** pane (F1/F2 key).

3. Use the up/down arrows to highlight the desired item, and then press Enter to select it.

You can press Enter one more time to clear the boxes.

To revert to the factory-default settings:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. From the **General** pane, use the arrows to select **Default**, and then press Enter to confirm.

Setting the Acquisition Parameters

You can set parameters such as IOR (group index), backscatter, and helix factor. You can also enable or disable the first connector check.

Setting the IOR, Backscatter and Helix Factor

Your unit contains default IOR (group index), backscatter and helix factor values that you can modify if they do not suit your testing needs. You should set the IOR (group index), backscatter, and helix factor before performing tests in order to apply them to all newly acquired traces.

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

➤ The (Rayleigh) backscatter value represents the amount of backscatter in a particular fiber. The backscatter is used in the calculation of ORL and reflectance, and it can usually be obtained from the cable manufacturer.

➤ The helix factor takes into account the difference between the length of the cable and the length of the fiber inside the cable; it does not vary with wavelengths.

The length of the OTDR distance axis is always equivalent to the physical length of the cable (not the fiber).

To set the IOR, backscatter, and helix factor parameters:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Display the **Acquisition** pane (F1/F2 key).

3. Use the up/down arrows to select the wavelength box, and then press Enter to open it.

4. Select the wavelength for which you want to modify parameters. Press Enter to confirm your choice.

5. Use the arrows to select any of the settings, and then press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).
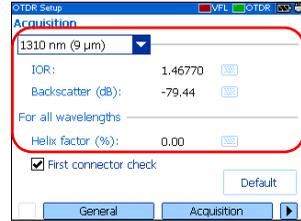
> # !
> # IMPORTANT
>
> **Change the default backscatter *only* if you have values provided by the fiber manufacturer. If you set this parameter incorrectly, your reflectance measurements will be inaccurate.**

6. Enter the new value and press **OK** (F1/F2 key).

   As you enter the value, the application indicates the minimum or maximum value allowed.

Enabling or Disabling the First Connector Check

The first connector check feature is used to verify that the fibers are properly connected to the OTDR. It verifies the injection level and the reflectance of the first connector. It displays a message when a unusually high loss or reflectance occur at the first connection.

You enable or disable this feature for all wavelengths at a time.

To enable or disable the first connector check:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Display the **Acquisition** pane (F1/F2 key).

3. Use the up/down arrows to highlight **First connector check,** and then press Enter to select it.
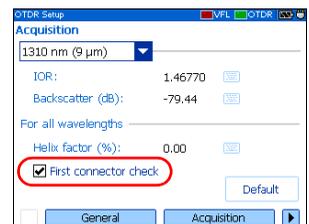
You can press Enter one more time to clear the box.

Reverting to Factory-Default Acquisition Settings

You can revert to factory settings at any time. The IOR (group index), backscatter, and helix factor will be reset and the *first connector check* feature will be disabled.

To revert to factory-default settings:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. From the **Acquisition** pane, use the arrows to select **Default**, and then press Enter.

3. When the application prompts you, answer **Yes** (F1/F2 key).

Setting Analysis Parameters

➤ To define the actual fiber span start, you can set the *launch fiber length*.

When you perform tests with your unit, you connect a launch fiber between your unit and the fiber under test. This is why, by default, the fiber span includes the launch fiber.

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

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

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

  ➤ *Splice loss threshold*: To display or hide small non-reflective events.

  ➤ *Reflectance threshold*: To hide false reflective events generated by noise, transform non-harmful reflective events into loss events, or detect reflective events that could be harmful to network and other fiber-optic equipment.

  ➤ *End-of-fiber threshold*: To stop the analysis as soon as an important loss event occurs; for example, an event that could compromise signal transmission to the end of a network.

To set analysis parameters:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Display the **Analysis** pane (F1/F2 key).

3. Use the arrows to select any of the settings, and then press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

4. Enter the new value and press **OK** (F1/F2 key).

   As you enter the value, the application indicates the minimum or maximum value allowed.

To revert to the factory-default settings:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. From the **Acquisition** pane, use the arrows to select **Default**, and then press Enter.

Setting Pass/Fail Thresholds

Note: *This function is available only with the optional FTTx software package.*

You can enable and set pass/fail threshold parameters for your tests.

You can define thresholds to specify acceptable values (in dB) for splice loss, connector loss, reflectance, span loss and span ORL, and this, for each wavelength.

Each time a measurement exceeds a threshold, the result appears in white on a red background in the **Summary** pane preceded by the word "FAIL", also in red. Values appearing in the event table will also be displayed in white on a red background.

To set pass/fail thresholds:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Pass/Fail Thresholds**, and then display the pane (F1/F2 key).

3. Press Enter to open the wavelength list.

4. Use the up/down arrows to select the desired wavelength. Press Enter to confirm your choice.

5. Use the up/down arrows to highlight the desired threshold name.

If necessary, press Enter to select the check box. If you clear the check box, the application will not use the threshold.

6. Use the arrows to highlight the threshold value, and then press Enter to display the on-screen keyboard (for details about keyboards, see *Using Menus and Keypad* on page 13).

7. Set the threshold.

As you enter the value, the application indicates the minimum or maximum value allowed.

8. Press **OK** (F1/F2 key) to hide the keyboard.

To revert to the factory-default settings:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. From the **Pass/Fail Thresholds** pane, use the arrows to select **Default**, and then press Enter.

3. When the application prompts you, answer **Yes** (F1/F2 key).

Setting Macrobend Parameters

Note: *This function is available only with the optional FTTx software package.*

Your unit can locate macrobends by comparing the loss values measured at a certain location, for a certain wavelength (e.g., 1310 nm) with the loss values measured at the corresponding location, but for a greater wavelength (e.g., 1550 nm).

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

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

AND

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

You can also disable macrobend detection.

Note: *Macrobend detection is only possible with singlemode wavelengths.*

To set macrobend parameters:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Display the **Macrobend** pane (F1/F2 key).

3. If necessary, press Enter to select the **Display macrobend** check box.

   If you clear the check box, the application will not detect macrobends.

4. Press Enter to open the **Wavelengths** list.

5. Use the up/down arrows to select the desired wavelengths. Press Enter to confirm your choice.

6. Use the arrows to highlight the **Delta (dB)** value, and then press Enter to display the on-screen keyboard (for details about keyboards, see *Using Menus and Keypad* on page 13).

7. Set the delta (loss difference) value.
   As you enter the value, the application indicates the minimum or maximum value allowed.

8. Press **OK** (F1/F2 key) to hide the keyboard.

Setting Storage Parameters

Each time you save a trace, the unit suggests a file name based on autonaming settings. After saving a result, the unit prepares the next file name by incrementing the suffix.

File names: maximum of 20 characters for prefix and 3 digits for suffix.

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

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

To set the autonaming scheme:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Storage**, and then display the pane (F1/F2 key).

3. Use the up/down arrows to select **File name prefix** or **File name suffix**.

4. Press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

5. Enter the name (prefix) or number (suffix), and then press **OK** (F1/F2 key) to hide the keyboard.
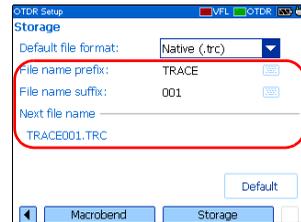
To set the file format:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Storage**, and then display the pane (F1/F2 key).

3. Use the arrows to select **Default file format**, and then press Enter to open the list.

4. Use the up/down arrows to select the desired format, and then press Enter to confirm.
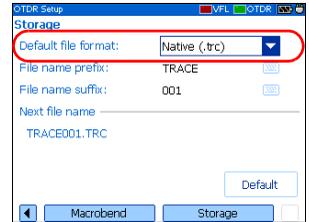
To revert to the factory-default for file format and autonaming scheme:

1. Press Menu, select **Setup** > **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Storage**, and then display the pane (F1/F2 key).

3. Use the up/down arrows to select **Default,** and then press Enter to confirm.

6 Testing Fibers

The OTDR offers different test modes:

➤ Auto: sets all test parameters, performs tests at the specified wavelengths, and provides complete results.

➤ Fault finder: rapidly locates fiber ends and displays length of the fiber under test. This function is available only with the optional FTTx software package.

➤ Manual (advanced): offers all the tools you need to perform complete OTDR tests and measurements manually and gives you control over all test parameters.

➤ Real time: enables to view sudden changes in the fiber link. In this mode, trace is refreshed instead of averaged.

You can start a test from any pane by pressing the **FASTRACE** key. The unit will use the current parameters. You can stop a test by pressing the **FASTRACE** key one more time.

Your unit may be equipped with two OTDR ports:

➤ OTDR SM port: singlemode port to perform conventional OTDR tests on *dark* fibers.

➤ OTDR MM port (optional): multimode port to perform conventional OTDR tests on *dark* fibers.

OR

➤ OTDR SM Live port (optional): singlemode port with a filtered wavelength to perform troubleshooting tests on *live* fibers.

Testing in Auto Mode

The application will automatically evaluate the best settings according to the fiber link currently connected to the unit (in less than 5 seconds).

Fiber characteristics are evaluated only once per session. Other fibers you connect to, within the same cable, will be tested with the same settings. When you start testing another link, you can reset these parameters if link's length changes, for instance.

If you intend to test at multimode wavelengths, carefully read *Launch Conditions for Multimode Measurements* on page 46.

To acquire traces in Auto mode:

1. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 22).

2. Connect a launch fiber between the device under test and the OTDR port. If necessary, set the launch fiber length (see *Setting Analysis Parameters* on page 28).

If your unit is equipped with two OTDR ports, ensure that you connect the fiber to the appropriate port (OTDR SM, OTDR MM, or OTDR SM Live for filtered wavelength), depending on the wavelength you intend to use.

CAUTION

Never connect a live fiber to the OTDR SM or OTDR MM port. Any incoming signal greater than –40 dBm will affect the OTDR acquisition. Any incoming signal greater than –20 dBm could damage your OTDR permanently.

3. Press Menu, select **OTDR**, and then press Enter.

4. Use the left/right function arrows until you see **Parameters**, and then display the pane (F1/F2 key).

5. Use the arrows to select the **OTDR mode** list, and then press Enter to open the list.

6. Use the up/down arrows to select **Auto**, and then press Enter to confirm.

7. If your unit supports singlemode and multimode wavelengths, under **Wavelength**, from the list, select the desired fiber type (for C fiber, select 50 μm and for D fiber, select 62.5 μm).

8. Use the arrows to select the desired wavelengths. Press Enter to confirm each selection.

9. Use the arrows to select the **Duration** list, and then press Enter to open it.

10. Use the up/down arrows to select the desired duration for the acquisition, and then press Enter to confirm.

11. Press *FASTRACE* to start the acquisition.
You can stop the acquisition at any time by pressing *FASTRACE* once again.

Testing in Fault Finder Mode

Note: *This function is available only with the optional FTTx software package.*

The application offers you a special testing feature to rapidly locate fiber ends. It also displays the length of the fiber under test.

The unit will determine the more appropriate wavelength (singlemode or multimode, depending on your test configuration). Duration of the acquisition is 45 seconds.

If you intend to test at multimode wavelengths, carefully read *Launch Conditions for Multimode Measurements* on page 46.

To acquire traces in Fault finder mode:

1. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 22).

2. Connect a launch fiber between the device under test and the OTDR port. If necessary, set the launch fiber length (see *Setting Analysis Parameters* on page 28).

If your unit is equipped with two OTDR ports, ensure that you connect the fiber to the appropriate port (OTDR SM, OTDR MM, or OTDR SM Live for filtered wavelength), depending on the wavelength you intend to use.

CAUTION

Never connect a live fiber to the OTDR SM or OTDR MM port. Any incoming signal greater than –40 dBm will affect the OTDR acquisition. Any incoming signal greater than –20 dBm could damage your OTDR permanently.

3. Press Menu, select **OTDR**, and then press Enter.

4. Use the left/right function arrows until you see **Parameters**, and then display the pane (F1/F2 key).

5. Use the arrows to select the **OTDR mode** list, and then press Enter to open it.

6. Use the up/down arrows to select **Fault finder**, and then press Enter to confirm.

7. If your unit supports singlemode and multimode wavelengths, under **Wavelength**, from the list, select the desired fiber type (for C fiber, select 50 μm and for D fiber, select 62.5 μm).

8. Press *FASTRACE* to start the acquisition.
    You can stop the acquisition at any time by pressing *FASTRACE* once again.

Testing in Manual (Advanced) Mode

You can set distance range, pulse, and duration of the acquisition in this mode.

Note: *Not all pulse widths are compatible with all wavelengths.*

If you intend to test at multimode wavelengths, carefully read *Launch Conditions for Multimode Measurements* on page 46.

To acquire traces in Manual (Advanced) mode:

1. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 22).

2. Connect a launch fiber between the device under test and the OTDR port. If necessary, set the launch fiber length (see *Setting Analysis Parameters* on page 28).

If your unit is equipped with two OTDR ports, ensure that you connect the fiber to the appropriate port (OTDR SM, OTDR MM, or OTDR SM Live for filtered wavelength), depending on the wavelength you intend to use.

> ## CAUTION
>
> **Never connect a live fiber to the OTDR SM or OTDR MM port. Any incoming signal greater than −40 dBm will affect the OTDR acquisition. Any incoming signal greater than −20 dBm could damage your OTDR permanently.**

3. Press Menu, select **OTDR**, and then press Enter.

4. Use the left/right function arrows until you see **Parameters**, and then display the pane (F1/F2 key).

5. Use the arrows to select the **OTDR mode** list, and then press Enter to open it.

6. Use the up/down arrows to select **Manual**, and then press Enter to confirm.

7. If your unit supports singlemode and multimode wavelengths, under **Wavelength**, from the list, select the desired fiber type (for C fiber, select 50 μm and for D fiber, select 62.5 μm).

8. Use the arrows to select the desired wavelengths. Press Enter to confirm each selection.

9. Use the arrows to select the **Range** list, and then press Enter to open the list.

10. Use the up/down arrows to select the desired distance range, and then press Enter to confirm.

11. Use the arrows to select the **Pulse** list and press Enter to open the list.

12. Use the up/down arrows to select the desired pulse, and then press Enter.

13. Use the arrows to select the **Duration** list, and then press Enter to open the list.

14. Use the up/down arrows to select the desired duration for the acquisition, and then press Enter to confirm.

15. Press *FasTrace* to start the acquisition.
You can stop the acquisition at any time by pressing *FasTrace* once again.

Monitoring Fiber in Real Time Mode

You can monitor fiber at one wavelength at a time.

You can switch from Real time mode to Manual mode at any time.

If you intend to test at multimode wavelengths, carefully read *Launch Conditions for Multimode Measurements* on page 46.

To monitor fiber in Real time mode:

1. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 22).

2. Connect a launch fiber between the device under test and the OTDR port. If necessary, set the launch fiber length (see *Setting Analysis Parameters* on page 28).

If your unit is equipped with two OTDR ports, ensure that you connect the fiber to the appropriate port (OTDR SM, OTDR MM, or OTDR SM Live for filtered wavelength), depending on the wavelength you intend to use.

CAUTION

Never connect a live fiber to the OTDR SM or OTDR MM port. Any incoming signal greater than –40 dBm will affect the OTDR acquisition. Any incoming signal greater than –20 dBm could damage your OTDR permanently.

3. Press Menu, select **OTDR**, and then press Enter.

4. Use the left/right function arrows until you see **Parameters** and display the pane (F1/F2 key).

5. Use the arrows to select the **OTDR mode** list and press Enter to open the list.

6. Use the up/down arrows to select **Real time**, and then press Enter to confirm.

7. If your unit supports singlemode and multimode wavelengths, under **Wavelength**, from the list, select the desired fiber type (for C fiber, select 50 μm and for D fiber, select 62.5 μm).

8. Use the arrows to select the desired wavelength. Press Enter to select it.

9. Use the arrows to select the **Range** list, and then press Enter to open the list.

10. Use the up/down arrows to select the desired distance range, and then press Enter to confirm.

11. Use the arrows to select the **Pulse** list, and then press Enter to open the list.

12. Use the up/down arrows to select the desired pulse, and then press Enter to confirm.

13. Press *FASTRACE* to start the acquisition.

To deactivate the Real time mode:

If you only want to stop monitoring, press *FASTRACE* once again.

OR

If you are ready to launch a test, proceed as follows:

1. Press Esc to exit the **Trace** pane.

2. In the displayed panel, open the **OTDR mode** list, and then select **Manual**.

Launch Conditions for Multimode Measurements

In a multimode fiber network, the attenuation of a signal is highly dependent on the mode distribution (or launch condition) of the source that emits this signal.

In the same way, the attenuation reading performed by any test instrument will also depend on the mode distribution of its light source.

A single light source cannot be conditioned for both 50 μm (50 MMF) and 62.5 μm (62.5 MMF) fibers at the same time:

➤ A source conditioned for 50 MMF testing will be under-filled for 62.5 MMF testing.

➤ A source conditioned for 62.5 MMF will be overfilled for 50 MMF testing.

TIA/EIA-455-34A (FOTP34, Method A2) is providing a target launch condition that is obtained when using an overfilled source followed by mandrel-wrap mode filter (five close-wound turns around a mandrel tool of a given diameter).

Your unit has been conditioned for 62.5 MMF testing. However, you can also test with 50 MMF fibers.

The table below gives information about tests with the 50 μm and 62.5 μm fibers.

Fiber type	Recommended mode filter	Remarks
50 μm	Perform a five-turn mandrel-wrap (wrapping the patchcord a minimum of five turns around the mandrel tool) on the patchcord connecting the OTDR to the fiber under test. As per FOTP-34: ➤ For fibers with 3 mm jacket: use a mandrel tool with a diameter of 25 mm. ➤ For fibers without jacket: use a mandrel tool with a diameter of 22 mm.	Nominal launch conditions are overfilled. Loss measurements can be slightly pessimistic (higher loss) when compared to loss measurements done with a 50 MMF source compliant to FOTP34, Method A2.
62.5 μm	No mode filter required.	Loss measurements similar to those obtained with a power meter and a source that is conditioned according to FOTP34, Method A2.

! **IMPORTANT**

If you test with 50 μm fibers, EXFO recommends that you use a mode filter (mandrel-wrap). Otherwise, you may obtain results with a 0.1 to 0.3 dB excess loss.

7 *Managing Test Results*

There are many ways to view the results:

➤ Summary pane

➤ Events pane

➤ Trace pane

➤ Trace Info. (trace information) pane

Summary Pane

This pane is displayed once the test is complete if you selected the corresponding feature (see *Setting General OTDR Parameters* on page 23). You can also select **Summary** (**F1**/**F2** keys).

Pass/Fail status of fiber under test ⌐   ⌐ Length of fiber under test

Tested wavelengths

Information on detected macrobends

You can select an item with the up/down arrows and press Enter to switch to **Trace** pane.

Events Pane

This pane shows the list of events found during the test.

You can select **Events** (F1/F2 keys) to display the pane.
Values appearing in white on a red background exceed the defined thresholds.

Wavelength of the displayed trace⌐

Use left/right arrows to switch between the different wavelengths

Event type (see *Description of Event Types* on page 117)

You can select an item with up/down arrows and press Enter to switch to **Trace** pane.

Trace Pane

You can select **Trace** (F1/F2 keys) to display the pane.
Reflectance and loss values appear in white on a red background when they exceed the defined thresholds

Wavelength of the displayed trace

Distance between span start and markers A and B

Relative power at markers A and B (use left/right arrows to move markers)

Loss difference between markers A and B

Distance between markers A and B

Reflectance value

Events (use up/down arrows to view them in turn)
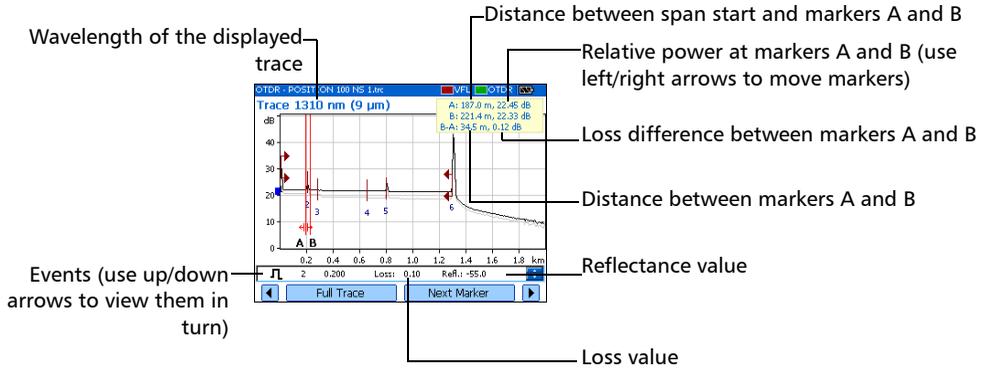
Loss value

Trace Info. Pane

After acquiring a trace, you might want to view details about the acquisition. You can also include information about the tested fiber and job or add comments. This information is saved along with the trace.

You can select **Trace Info.** (**F1**/**F2** keys) to display the pane.

To document results:

1. Once a trace has been acquired or reopened, press **Menu**, select **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Trace Info.**, then display the pane (F1/F2 key).

3. Use the arrows to select the item to modify. Modifiable items are followed by a keyboard icon.

4. Press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

5. Set the name/value, then press **OK** (F1/F2 key) to hide the keyboard.

Using Markers

You can use markers (A and B) to view the position and level of an event on a trace.

Note: *If you do not see the markers on your unit, they are probably hidden (see* Setting General OTDR Parameters *on page 23).*

To move a marker:

1. Press Menu, select **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Trace**, and then display the pane (F1/F2 key).

3. Use **Next Marker** (F1/F2 key) to select the marker to move.

4. Use the left and right arrows to move the marker along the trace.

   If a marker is moved too close to another, both will move together to ensure a minimum distance between them.

5. When you have finished, use the left/right function arrows until you see **Exit,** and then close the pane (F1/F2 key).
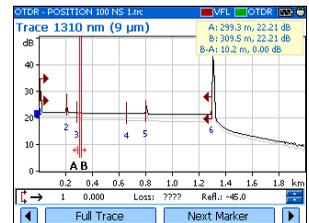
Using Zoom Controls

As soon as you select one of the zoom controls to change the scale of the graph, a magnifying glass icon appears. When the scale changes, the trace is always centered on the area surrounding the magnifying glass icon.

You can let the unit automatically adjust the zoom on the currently selected event or zoom in on or out of the graph using manual zoom. You can also return to the original graph scale.

Note: *If you do not see the zoom controls on your unit, they are probably hidden (see* Setting General OTDR Parameters *on page 23).*

To automatically zoom in on the selected event:

1. Press Menu, select **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Trace**, and then display the pane (F1/F2 key).

3. Press Enter to zoom in. Press Enter one more time to go to the second level of zoom.

   You can switch between the two levels of zoom by pressing Enter as needed.

To view specific portions of the graph:

1. Press Menu, select **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Trace**, and then display the pane (F1/F2 key).

3. Display the **Manual Zoom** pane (F1/F2 key).

4. Use the arrows to move the magnifying glass icon to the area where you want to adjust the zoom.
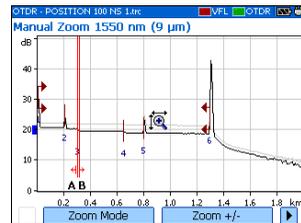
5. Select the zoom parameters.

➤ Press **Zoom Mode** (F1/F2 key) as many times as needed to select the desired type of zoom.

Zoom along horizontal axis only

Zoom along vertical axis only

Zoom along both axes

➤ Press **Zoom +/-** (F1/F2 key) to switch from zoom-in to zoom-out mode and vice versa.

6. Press Enter as many times as needed.

7. When you have finished,

➤ Use the left/right function arrows until you see **Exit,** then close the pane (F1/F2 key).

OR

➤ Press to close the pane.

To revert to the complete graph view:

1. From the **Trace** pane, use the left/right function arrows until you see **Full Trace**.

2. Press **Full Trace** (F1/F2 key) to revert to complete graph view.

Printing Test Results

With a *Printek 2"* printer, you can print results directly from the AXS-100 Series OTDR.

Note: *You cannot print ping or trace route test results from the AXS-100 Series OTDR.*

The unit communicates with the printer through its infrared port.

To print test results:

1. Select the printer (see *Selecting a Printer* on page 19).

2. Once a trace has been acquired or reopened, press Menu, select **OTDR**, and then press Enter.

3. Select **Print** (F1/F2 key).

Opening Trace Files

You can open a maximum of two files at a time: a main trace and a reference trace (if the corresponding feature is selected).

Your unit can display traces saved in native (.trc) and Bellcore (.sor) formats.

To open trace files:

1. Press Menu, select **OTDR**, and then press Enter.

2. Use the left/right function arrows until you see **Open**, then display the pane (F1/F2 key).

3. If you enabled the reference trace feature (see *Setting General OTDR Parameters* on page 23), use the up/down arrows to select the selection button corresponding to the desired trace. Press Enter to view the browser.

4. Use the up/down arrows to navigate in the list. Use the right arrow to open a folder. Highlight the desired file and press **Open** (F1/F2 key).

5. If you enabled the reference trace feature, repeat steps 3 and 4 with the other file.
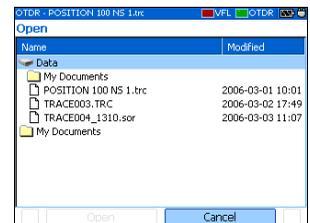
Saving Files

Each time you save a new file, the unit suggests a file name based on autonaming settings.

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

   For more information on storage settings, see *Setting Storage Parameters* on page 34.

➤ Image files: By default, images are saved in .jpg format, but you can configure your unit to save them in .bmp format.

   For more information on storage settings, see *Setting Storage Parameters for Images* on page 85.

➤ Ping files. For information on storage settings, see *Setting Storage Parameters for Ping Tests* on page 90.

➤ Trace route files. For more information on storage settings, see *Setting Storage Parameters for Trace Route Tests* on page 91.

To save files:

1. Use the left/right function arrows until you see **Save**, and then display the pane (F1/F2 key).

2. If you want to modify the storage location, proceed as follows:

> **2a.** Press the up arrow to access the file list.

> **2b.** Use the up/down arrows to highlight the desired folder.

> **2c.** Press Enter to transfer the new path to the box at the bottom of the screen.

3. If you want to modify the file name, press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

4. Enter the new name and press **OK** (F1/F2 key).
The unit will keep the last storage path defined.
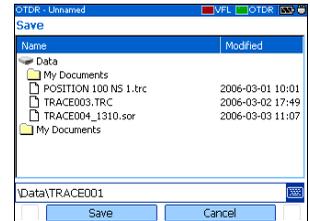
Each time you save a new file, the unit suggests a file name based on autonaming settings.

Checking Available Memory

You can save up to 500 OTDR traces in the unit's memory.

To view the available memory on your unit:

1. Press Menu, select **File Manager/Info. > File Manager**, and then press Enter.

2. Use the arrows to select either a storage medium or a folder to view both used space and free space.

Copying or Deleting Files and Folders

You can copy or delete folders or single files directly from your unit.

To copy files:

1. Press Menu, select **File Manager/Info. > File Manager**, and then press Enter.

2. Select the desired file or folder as follows:

   2a. Find the file or folder:

➤ Use the up/down arrows to navigate in the list.

➤ Use the right arrow to open a folder.

   2b. Highlight the desired file or folder and press Enter to select it.

3. Select **Copy Files** (F1/F2 key).

4. Paste the file or folder as follows:

   4a. Find the destination folder:

➤ Use the up/down arrows to navigate in the list of destination folders.

➤ Use the right arrow to open a folder.

   4b. Highlight the desired location and press either **OK** (F1/F2 key) or Enter to complete the process.
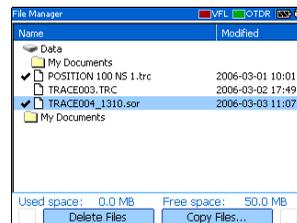
To delete files:

1. Press Menu, select **File Manager/Info. > File Manager**, and then press Enter.

2. Select the file or folder as follows:

    2a. Find the file or folder:

    ➤ Use the up/down arrows to navigate in the list.

    ➤ Use the right arrow to open a folder.

    2b. Highlight the desired file or folder and press Enter to select it.

3. Select **Delete Files** (F1/F2 key).

4. Answer **Yes** (F1/F2 key)to confirm the deletion.
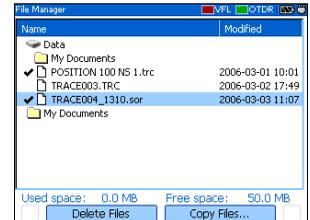
Transferring Results to a Computer

You can transfer files from your OTDR to a USB memory drive, or a computer. You can also transfer data from a storage device or from a computer to your OTDR.

Your OTDR is equipped with two types of USB ports:

➤ USB host port (type A connector) ▭ to connect USB memory drives

➤ USB secondary port (type B connector) ▭ to transfer data directly between your OTDR and a computer using a USB cable.

> **!** **IMPORTANT**
> **To avoid any problems and prevent malfunctioning, use only the USB drives approved by EXFO.**

To transfer files or folders between your unit and a USB memory drive:

1. Connect the USB memory drive to the USB host port.

2. Press Menu, select **File Manager/Info. > File Manager**, and then press Enter.

The list of available drives and folders should include the memory drive (**Removable Disk**).

You can now manage your files and folders as you wish.

Note: *You can connect a memory drive even while File Manager is open.*

▌ IMPORTANT
Transferred files are not automatically deleted from your unit.

3. When you have finished, simply remove the card or the memory drive.

To transfer files or folders between your unit and a computer:

IMPORTANT

You must install Microsoft ActiveSync on the computer you want to use with your OTDR. Otherwise, you will not be able to transfer data.

Before connecting your unit to a computer, you must install the required software on the computer. For more information on the installation, refer to the Release Notes on the installation CD.

1. If it is not already done, install Microsoft ActiveSync 4.1 or later (available from the installation CD). Follow the instructions given on the screen.

2. Connect the provided USB cable to the computer (type A end) and your unit (type B end).

Note: *The computer and your unit do n*ot need *to be off when you connect the cable.*

3. Once ActiveSync indicates that the computer and the OTDR are connected, right-click the ActiveSync icon then select **Explore** to access the files and folders stored on your OTDR.

OR

On the computer desktop, double-click **My Computer**. Double-click **Mobile Device** to access the files and folders stored on your unit.
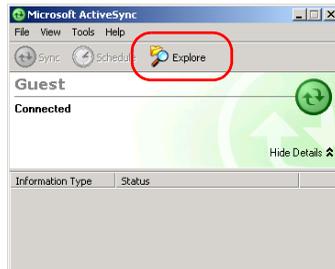
You can now manage your files and folders as you wish.

4. When you have finished, close the **Mobile Device** window and disconnect the USB cable.

8 *Using Your OTDR as a Light Source*

You can use your OTDR as a light source. The source signal uses the OTDR ports. This signal can be:

➤ continuous (constant power over the temperature range, but about 3 dB lower than maximum)

or

➤ modulated (270 Hz, 1 kHz or 2 kHz, 270 Hz blink, 1 kHz blink or 2 kHz blink).

Note: *When you switch wavelengths, the modulation remains the same.*

WARNING

When a source is active, its port emits invisible laser radiation. Avoid exposure and do not stare directly into the beam. Ensure that any unused port is properly protected with a cap.

Activating/Deactivating a Light Source

The **Power Meter** pane remains displayed when you use the source.

The source status is indicated with a LED in the status bar and with the **Active** indicator under the keypad.
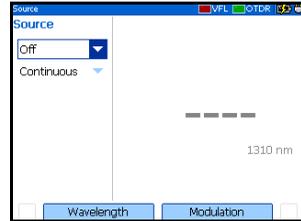
Note: *The **Active** indicator always shows the source, VFL or OTDR port status (even in FIP or idle mode).*

To activate the light source:

1. Connect the fiber under test to the source port (see *Cleaning and Connecting Optical Fibers* on page 22).

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

2. Press Menu, select **Source**, and then press Enter.

3. Press **Wavelength** (F1/F2 key) to activate each available source in turn.

OR

Use the arrows to open the wavelength/status list and select the desired wavelength.

To deactivate the light source:

Press **Wavelength** (F1/F2 key) until you get past the last source. The list displays **Off**.

OR

Use the arrows to open the wavelength list and select **Off**.

Modulating the Source Signal

When you turn the unit on, the signal is continuous (unmodulated) by default. When you switch wavelengths, the modulation remains the same. Modulation is indicated in the **Source** pane.

Available values are: Continuous, 270 Hz, 1 kHz, 2 kHz, 270 Hz blink, 1 kHz blink, or 2 kHz blink.

To change the signal modulation:

1. Activate the source if you want.

2. Press **Modulation** (F1/F2 key) to switch between available modulations.

   OR

   Use the arrows to open the list and select the desired modulation.
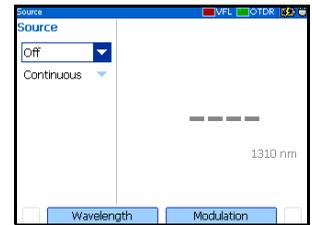
9 *Measuring Power or Loss*

The AXS-100 Series OTDR can be equipped with an optional optical power meter to measure absolute power (in dBm or W) or insertion loss (in dB). The power meter port is independent of the OTDR port(s).
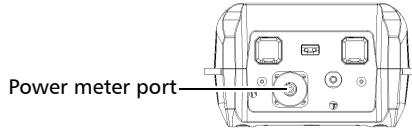
Power meter port

Measured power/loss

Open list or press **Wavelength** to switch between favorite wavelengths.

Press **Setup** to modify the list of favorite wavelengths.

Open list or press **W/dBm/dB** to display power (W or dBm) or loss (dB).

Press **Reference** to set new reference for loss measurement.

Defining the List of Favorite Wavelengths

You can put the wavelengths you want to use on a list of favorite wavelengths. Only wavelengths selected from this list are available for measurements.

By default, the list contains all the calibrated wavelengths: 850 nm, 1300 nm, 1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm.

Note: *The list must always contain at least one selected wavelength.*

To customize the list of favorite and selected wavelengths:

1. Press Menu, select **Setup** > **Power Meter**, and then press Enter.

OR

From the **Power Meter** pane, press **Setup** (F1/F2 key).

2. Using the up/down arrows, scroll through the list.

3. Press Enter to select/deselect the highlighted wavelength.

OR

Press **Select** (F1 key).

A check mark appears beside selected wavelengths.

4. Repeat these steps for other wavelengths as necessary.
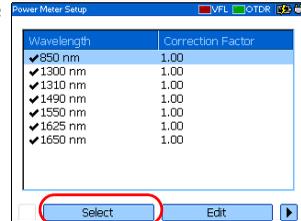
Setting a Power Correction Factor

You may apply a correction factor (CF) to the measured power to compensate for inaccuracies or drifts. You should change the CF after performing an offset nulling.

The power value after correction will correspond to:

$$\text{Power}_{\text{corrected}} = \text{Power}_{\text{measured}} \times CF$$

where:

$\text{Power}_{\text{corrected}}$ = the corrected power value

$\text{Power}_{\text{measured}}$ = the measured power value

CF = the correction factor

For each favorite wavelength, the CF is set to 1.00 at the factory, but allowed values range between 0.85 and 1.15.

To set a correction factor for one or more wavelengths:

1. Press Menu, select **Setup** > **Power Meter**, and then press Enter.

   OR

   From the **Power Meter** pane, press **Setup** (F1/F2 key).

2. Using the up/down arrows, scroll through the list to select the wavelength for which you want to modify the correction factor.

3. Press **Edit** (F1/F2 key).

4. Set the new value and press **OK** (F1 key).
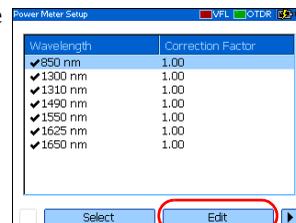
Reverting to Factory Settings

You can revert to factory settings at any time. The following items will be reset:

➤ Reference values

➤ Nulling values

➤ List of favorite wavelengths

➤ Correction factors (reset to 1)

To revert to the factory-default settings:

1. Press Menu and select **Setup** > **Power Meter**, and then press Enter.

OR

From the **Power Meter** pane, press **Setup** (F1/F2 key).

2. Press **Factory Settings** (F1/F2 key).

3. Answer **Yes** to confirm.

Nulling Offsets

Temperature and humidity variations affect the performance of electronic circuits and optical detectors, which can offset measurement results. To compensate for this offset, the unit is equipped with an offset nulling function.

Your unit is designed not to require offset nulling under normal operation, but you should perform it whenever environmental conditions change significantly or when measuring very low power values.

> # ⚠ IMPORTANT
>
> **Light must not reach detectors when performing an offset nulling operation. Always use a protective screw cap. Do not use a soft rubber cover.**

Note: *When you start an offset nulling operation, all light sources on the unit are automatically deactivated.*

To perform an offset nulling operation:

1. Press Menu and select **Setup** > **Power Meter**, and then press Enter.

OR

From the **Power Meter** pane, press **Setup** (F1/F2 key).

2. Use the left/right function arrows until you see **Offset Nulling**, and then display the pane (F1/F2 key).

3. Screw the protective cap on the power meter port, and then press **OK**.

The offset nulling process takes a few seconds. If light is still detected, make sure that you are using an appropriate protective cap and that it is tightly screwed on the power meter port. Restart the nulling operation.
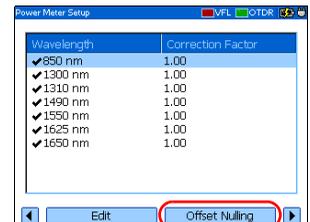
Referencing Your Power Meter to a Source

In reference mode, your unit displays the loss created by the fiber under test only, since it subtracts a reference value from the measured power.

In the figure, the reference value (-43.98 dBm) is subtracted from the actual power measured (-37.64 dBm).

Note: *The reference value you set for each wavelength remains in memory until a new one is set for the same wavelength, even when you turn the unit off.*

To reference the power meter to a source:

1. Press Menu, select **Power Meter**, and then press Enter.

2. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 22).

3. Using one of the following methods, connect a light source to the power meter port of your unit.

➤ A single reference patchcord
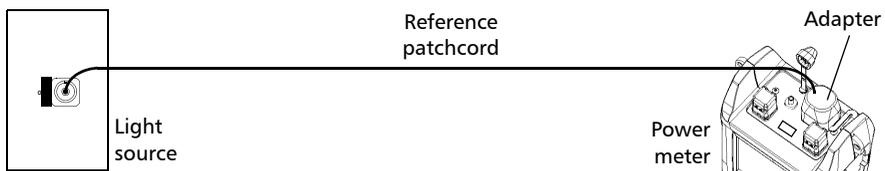
➤ Two reference patchcords and a bulkhead adapter
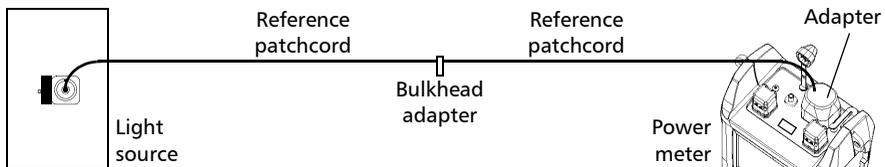
4. Activate the source at the desired wavelength.

5. Match the power meter wavelength with the source wavelength.

Press **Wavelength** (F1/F2 key) to switch between favorite wavelengths of your power meter (see *Defining the List of Favorite Wavelengths* on page 72).
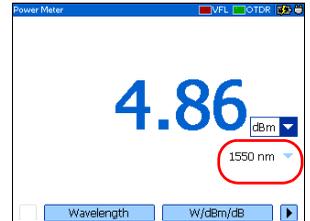
6. Press **W/dBm/dB** (F1/F2 key) until you get **dB** units to retrieve the last saved reference.

OR

Press **Reference** (F1/F2 key) to save the current power as the new reference.

Reference power appears (in dBm) and current loss is automatically switched to dB.
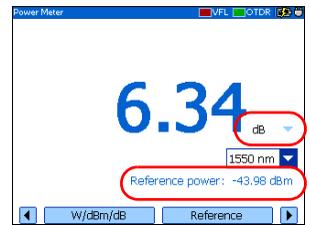
7. Repeat the procedure for each wavelength you want to reference.

Measuring Power or Loss

To measure power or loss:

1. If necessary, perform an offset nulling operation (see *Nulling Offsets* on page 75).

2. Press Menu, select **Power Meter**, and then press Enter.

3. Clean the connectors properly (see *Cleaning and Connecting Optical Fibers* on page 22).

4. For loss measurements, reference your power meter to a light source (see *Referencing Your Power Meter to a Source* on page 76), and then deactivate the light source.

5. If you have used a single reference patchcord, disconnect it from *the power meter port only*, and then connect a second reference patchcord to the power meter.

   OR

   If you have used two reference patchcords, disconnect both of them at the bulkhead.

6. Using bulkhead adapters, connect the fiber under test between the reference patchcords (one patchcord is already connected to source and the other is connected to power meter).
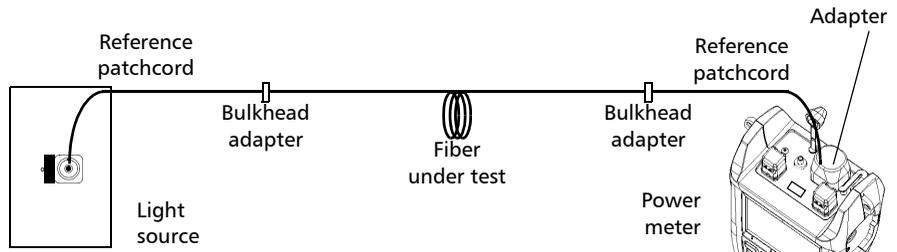
7. Activate the source at the desired wavelength.

8. Match the power meter wavelength with the source wavelength.

Press **Wavelength** (F1/F2 key) to switch between favorite wavelengths of your power meter (see *Defining the List of Favorite Wavelengths* on page 72).

9. Press **W/dBm/dB** (F1/F2 key) to select the desired power (W or dBm) or loss (dB) unit.

10. Repeat the procedure for other wavelengths.

10 *Identifying Fiber Faults Visually*

Note: *This feature is available only if your unit is equipped with a VFL port.*

The visual fault locator (VFL) helps you identify bends, faulty connectors, splices and other causes of signal loss.

From its dedicated port, the VFL emits a red signal which becomes visible at the location of a fault on the fiber. This signal can be continuous (the default) or blinking (1 Hz).

WARNING

When the VFL is active, the VFL port emits visible laser radiation. Avoid exposure and do not stare directly into the beam. Ensure that any unused port is properly protected with a cap.

➤ The VFL status is indicated with a LED in the status bar and with the **Active** indicator under the keypad.

Note: *The **Active** indicator always shows the VFL or OTDR status (even in idle mode).*

To activate the VFL and inspect a fiber:

1. Connect the fiber under test to the VFL port (see *Cleaning and Connecting Optical Fibers* on page 22).

2. Press Menu, select **VFL**, and then press Enter.

3. Press **VFL On/Off** (F1/F2 key) to activate the VFL (list displays **On**).

   OR

   Use the arrows to open the VFL status list and select **On**.

4. To switch between blinking (1 Hz) and continuous signals, press **Modulation** (F1/F2 key).

   OR

   Use the arrows to open the list and select the desired modulation.

5. Without looking directly into the beam, examine the fiber. If light is coming out of the rubber jacket or on the side of the ferrule, the fiber is defective.

6. Deactivate the VFL by pressing **VFL On/Off** (F1/F2 key).

11 *Inspecting Fibers with the FIP*

The fiber inspection probe (FIP) allows you to find dirty or damaged connectors by displaying an enlarged view of the connector surface.

The following common features of video fiber inspection probes are compatible with your unit:

➤ Magnification control: supports 200x, 400x, or other zoom factors.

➤ Focus control: allows you to fine-tune the display quality.

➤ You can save images (in .jpg or .bmp format).

For more information, refer to the user guide that came with your probe.

To access probe mode on your unit:

1. Connect the probe to the right side of the unit (8-pin port), using an adapter if necessary.

2. Press Menu, select **Probe**, and then press Enter.

Note: *You must connect the probe to your unit* before *accessing probe mode. Otherwise, the probe will not be recognized.*

3. If desired, adjust brightness and contrast (see *Adjusting Brightness and Contrast for the FIP* on page 84).

4. If desired, press **Save** to save the image displayed on screen in the selected file format.

To exit probe mode and return to the regular display:

Press or Menu, and select another option.

Adjusting Brightness and Contrast for the FIP

You can adjust brightness and contrast of the image displayed on screen.

1. Press Menu, select **Probe**, and press Enter.

2. Select **Display Settings** (F1/F2 key).

3. Use the up/down arrows to switch between brightness and contrast controls.

4. Use the left/right arrows to adjust level.

5. Confirm new settings with **OK** (F1 key).
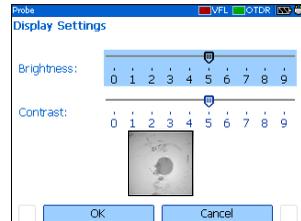
Setting Storage Parameters for Images

Each time you save an image, the unit suggests a file name based on autonaming settings. After saving a file, the unit prepares the next file name by incrementing the suffix.

File names: maximum 20 characters for prefix, 3 digits for number.

By default, traces are saved in .jpg format, but you can configure your unit to save them in .bmp format.

To set the probe image autonaming scheme:

1. Press Menu, select **Setup** > **Probe**, and then press Enter.

2. Use the arrows to select the file name prefix, or file name suffix.

3. Press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

4. Set the name/value, and then press **OK** (F1/F2 key) to hide the keyboard.
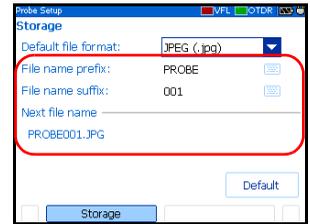
To set the file format:

1. Press Menu, select **Setup** > **Probe**, and then press Enter.

2. Use the arrows to select **Default file format**, and then press Enter to open the list.

3. Use the up/down arrows to select the desired format, and then press Enter to confirm.
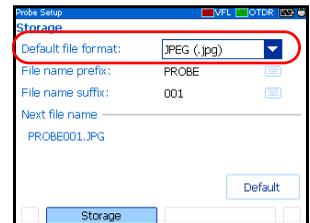
To revert the autonaming scheme and file format to the factory-default settings:

1. Press Menu, select **Setup** > **Probe**, and then press Enter.

2. From the **Storage** pane, use the arrows to select **Default,** and then press Enter to confirm.

12 *Testing Network Connections*

The two most common basic tests widely used in networking are the *ping* test and the *trace route* test. With these tests, you can ensure that IP packets travel as expected from a local host to a remote host and vice versa.

Performing a Ping Test

The ping test is a basic test that measures the average time it takes for a packet to reach the remote host. With this test, you can quickly verify that the remote host functions properly.

You can set the URL (IP address). Other parameters are predefined.

When the test is complete, you can save the results. Each time you save new results, the unit suggests a file name based on the ping autonaming settings.

For more information on ping storage settings, see *Setting Storage Parameters for Ping Tests* on page 90.

You can later open the generated text file (tab-delimited) directly into Microsoft Excel.

To perform a ping test:

1. Connect the network cable to the RJ-45 port located on the left panel of your unit.

2. Press Menu, select **Network Tests** > **Ping**, and then press Enter.

3. Enter the URL or IP address to reach as follows:

> **3a.** Press Enter to open the **Address** list.
>
> **3b.** Select an existing URL or IP address.
>
> > OR
>
> Select **New** to define a new address, and then press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

4. Select **Ping** (F1/F2 key).
You can stop a ping test at any time by pressing **Cancel**.

5. If desired, press **Save** to save the ping results in .txt format.

Performing a Trace Route Test

The trace route test is used to evaluate the average number of nodes that are required to reach the final host. It is often use to troubleshoot networks (identify routing problems or accesses blocked by firewalls).

You can enter a remote host address. Other parameters are predefined.

To perform a trace route test:

1. Connect the network cable to the RJ-45 port located on the left panel of your unit.

2. Press Menu, select **Network Tests** > **Trace Route**, and then press Enter.

3. Enter the address to reach as follows:

> **3a.** Press Enter to open the **Address** list.
>
> **3b.** Select an existing remote host address.
>
> OR
>
> Select **New** to define a new address and press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

4. Select **Trace Route** (F1 key).
You can stop a trace route test at any time by pressing **Cancel**.

5. If desired, press **Save** to save trace route results in the .txt format.

Setting Storage Parameters for Ping Tests

Each time you save ping results, the unit suggests a file name based on autonaming settings. After saving a result, the unit prepares the next file name by incrementing the suffix.

File names: maximum 20 characters for prefix, 3 digits for number.

Ping results are saved in text (.txt) format.

To set the ping autonaming scheme:

1. Press Menu, select **Setup** > **Ping**, and then press Enter.

2. Use the left/right function arrows until you see **Storage,** and then display the pane (F1/F2 key).

3. Use the arrows to select the file name prefix or file name suffix.

4. Press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

5. Set the name or value, and then press **OK** (F1/F2 key) to hide the keyboard.

To revert to the factory-default autonaming scheme:

1. Press Menu, select **Setup** > **Ping**, and then press Enter.

2. From the **Storage** pane, use the arrows to select **Default**, and then press Enter to confirm.

Setting Storage Parameters for Trace Route Tests

Each time you save trace route results, the unit suggests a file name based on autonaming settings. After saving a result, the unit prepares the next file name by incrementing the suffix.

File names: maximum 20 characters for prefix, 3 digits for number.

Trace route results are saved in text (.txt) format.

To set the trace route autonaming scheme:

1. Press Menu, select **Setup** > **Trace Route**, and then press Enter.

2. Use the left/right function arrows until you see **Storage** and display the pane (F1/F2 key).

3. Use the arrows to select the file name prefix, or file name suffix.

4. Press Enter to display the on-screen keyboard (for details about using keyboards, see *Using Menus and Keypad* on page 13).

5. Set the name or value, and then press **OK** (F1/F2 key) to hide the keyboard.
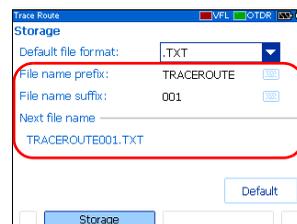
To revert to the factory-default autonaming scheme:

1. Press Menu, select **Setup** >**Trace Route**, and then press Enter.

2. From the **Storage** pane, use the arrows to select **Default**, and then press Enter to confirm.

13 *Maintenance*

To help ensure long, trouble-free operation:

➤ Always clean fiber-optic connectors before using them.

➤ Keep the unit free of dust.

➤ Clean the unit casing and front panel with a cloth slightly dampened with water.

➤ Store unit at room temperature in a clean and dry area. Keep the unit out of direct sunlight.

➤ Avoid high humidity or significant temperature fluctuations.

➤ Avoid unnecessary shocks and vibrations.

➤ If any liquids are spilled on or into the unit, turn off the power immediately and let the unit dry completely.

WARNING

Use of controls, adjustments and procedures for operation and maintenance other than those specified herein may result in hazardous radiation exposure.

Cleaning EUI Connectors

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

IMPORTANT

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

To clean EUI connectors:

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

Turn

Push

Pull
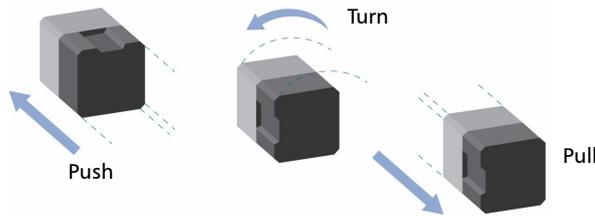
2. Moisten a 2.5 mm cleaning tip with *one drop* of isopropyl alcohol (alcohol may leave traces if used abundantly).

3. Slowly insert the cleaning tip into the EUI adapter until it comes out on the other side (a slow clockwise rotating movement may help).
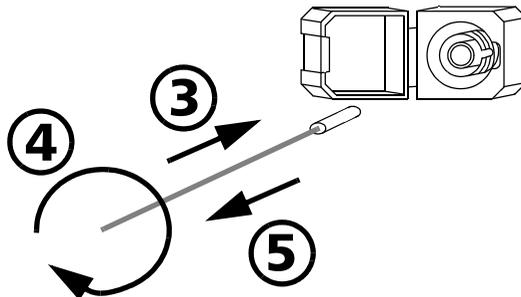
4. Gently turn the cleaning tip one full turn, then continue to turn as you withdraw it.

5. Repeat steps 3 to 4 with a dry cleaning tip.

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

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

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

IMPORTANT

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

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

6b. Gently wipe the connector and ferrule.

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

6d. Verify connector surface with a portable fiber-optic microscope (e.g., EXFO's FOMS) or fiber inspection probe (e.g., EXFO's FIP).

WARNING

Verifying the surface of the connector WHILE THE UNIT IS ACTIVE WILL result in permanent eye damage.

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

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

Cleaning Detector Ports

Regular cleaning of detectors will help maintain measurement accuracy.

> ## IMPORTANT
> **Always cover detectors with protective caps when unit is not in use.**

To clean detector ports:

1. Remove the protective cap and adapter (FOA) from the detector.

2. If the detector is dusty, blow dry with compressed air.

3. Being careful not to touch the soft end of the swab, moisten a cleaning tip with *only one drop* of isopropyl alcohol.

> ## IMPORTANT
> **Alcohol may leave traces if used abundantly. Do not use bottles that distribute too much alcohol at a time.**

4. While applying light pressure (to avoid breaking the detector window), gently rotate the cleaning tip on the detector window.

5. Repeat step 4 with a dry cleaning tip or blow dry with compressed air.

6. Discard the cleaning tips after one use.

Recharging Main Batteries

➤ The charge status of both batteries is shown on the **Unit Information** pane (press **Menu**, select **File Manager/Info. > Information**, and then press Enter).

➤ The unit also indicates the charge status with LEDs on its left side:
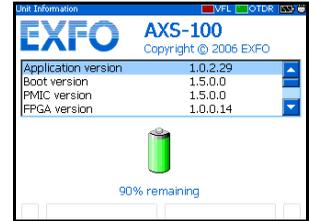
Status LED	Battery Charge Status
Green	Fully charged
Red	Charging
Yellow	Error

IMPORTANT

➤ **Batteries are not charged at the factory. Fully charge them (about 3 hours if unit is off) before using the unit for the first time.**

➤ **Batteries function and charge properly between 0 °C and 45 °C (32 °F and 113 °F). Batteries will not charge if the temperature is below -10 °C (14 °F) or above 45 °C (113 °F).**

➤ **Never store at temperatures above 60 °C (140 °F).**

➤ **Charge only with specified charger.**

To recharge the main batteries:

Connect the unit to a power outlet (or car outlet) using the AC adapter/charger. The charge cycle will start and end automatically.

Replacing Batteries

As soon as you remove the battery compartment door, the unit will turn itself off.

WARNING

Do not throw batteries into fire or water and do not short-circuit the batteries' electrical contact. Do not disassemble.

To replace main batteries:

1. Open the battery compartment door located at the back of the unit.

2. Lift the mobile part of the battery lock and turn it 90° clockwise.

   Battery lock

   The base of the battery lock will fit in the groove between the two batteries.

3. Replace both batteries, respecting the polarity.

4. Lift the mobile part of the battery lock and turn it 90° counterclockwise to secure the batteries in place.

   For optimum reliability, put the battery lock back in place, as shown in the figure above.

5. Close the battery compartment door; you cannot turn on the unit if the battery door is open.
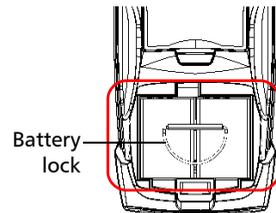
Recalibrating the Unit

Manufacturing and service center calibrations are based on the ISO/IEC 17025 Standard, which states that calibration documents must not contain a recommended calibration interval, unless this has been previously agreed upon with the customer.

Validity of specifications depends on operating conditions. For example, the calibration validity period can be longer or shorter depending on the intensity of use, environmental conditions and unit maintenance. You should determine the adequate calibration interval for your unit according to your accuracy requirements.

Under normal use, EXFO recommends calibrating your unit every year.

Note: *The FlexCare warranty program includes Calibration/Verification packages (see* Service and Repairs *on page 113).*

Upgrading the AXS-100 Series OTDR Software

The necessary software has been preinstalled and configured at the factory. However, you may have to upgrade the software when new versions become available.

For the upgrade, you will need:

➤ the installation CD (includes ActiveSync installation kit)

➤ a computer equipped with a USB port; Windows 2000 or Windows XP must be installed on the computer.

➤ an AXS-100 Series unit

➤ a USB cable

IMPORTANT

You must install Microsoft ActiveSync on the computer you want to use with your OTDR. Otherwise, you will not be able to upgrade the software.

Before connecting your unit to a computer, you must install the required software on the computer. For more information on the installation, refer to the Release Notes on the installation CD.

To upgrade the software:

1. Turn on the computer and insert the installation CD in the CD-ROM drive.

2. Follow the on-screen instructions. All the necessary components, including ActiveSync, will be installed on your computer.

3. Once the installation is complete, turn on the OTDR.

4. Connect the provided USB cable to the computer (type A end) and your OTDR (type B end). ActiveSync automatically opens and establishes the connection.

5. From the computer, on the Windows taskbar, click the **Start** button, and then go to **Programs** > EXFO > **Handheld Instrument Software Manager**.

6. Use **Add Programs** to install new versions and follow the on-screen instructions.

   For more information, refer to the online help of the **Handheld Instrument Software Manager** (from the **Help** menu).

7. When the installation is complete, disconnect the USB cable.

Recycling and Disposal (Applies to European Union Only)

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

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

➤ Unless otherwise noted in a separate agreement between EXFO and a customer, distributor or commercial partner, EXFO will cover costs related to the collection, treatment, recovery and disposal of end-of-lifecycle waste generated by electronic equipment introduced after August 13, 2005 to an European Union member state with legislation regarding Directive 2002/96/EC.

➤ Except for reasons of safety or environmental benefit, equipment manufactured by EXFO, under its brand name, is generally designed to facilitate dismantling and reclamation.

For complete recycling/disposal procedures and contact information, visit the EXFO Web site at www.exfo.com/recycle.

14 Troubleshooting

Solving Common Problems

The table below presents common problems and their solution.

Problem	Possible Cause	Solution
Impossible to turn on unit.	➤ You did not press ⏻ long enough. ➤ Main batteries discharged. ➤ Battery compartment door is open. ➤ One of the two batteries is missing. ➤ Weather too cold.	➤ Press ⏻ for 2 seconds. ➤ Charge batteries by connecting the AC adapter/charger. ➤ Close battery compartment door. ➤ Insert 2 batteries and replace battery compartment door.
The display is almost blank when you turn on the unit.	Brightness may need some adjustment.	Press ☼ to adjust brightness properly.
Batteries do not charge as expected.	➤ Temperature is too high. ➤ Battery is incorrectly connected.	➤ Ensure temperature is within specifications. ➤ Ensure battery is connected properly.
A battery status LED is yellow.	Battery is defective.	Contact EXFO or replace the battery.
The application displays a message indicating that a "Non-resolved fiber end" event has been found.	The fiber under test is too long.	Ensure that the fiber under test is shorter than the maximum length the OTDR can measure.

Problem	Possible Cause	Solution
During offset nulling, you get the following message: "Light detected during nulling."	Light reaches power meter detector.	Ensure protective caps are tightly screwed on power meter port and perform the nulling again. Do not use rubber cover.
The unit is not responding.		Shut down the unit by pressing ⏻ and holding it down. You will hear a first beep; release the key after you hear a second beep. Turn the unit on again to reset it.

Problem	Possible Cause	Solution
You no longer can view the OTDR application.		Shut down the unit by pressing ⏻ and holding it down.
		You will hear a first beep; release the key after you hear a second beep.
		Press simultaneously ⏻ , Esc and Menu, and hold them a few seconds until you see **Maintenance Mode** on the screen. It may take a few seconds before the maintenance menu appears.
		Use the up/down arrows to highlight **Restore System Disk**, and then press Enter.
		When the application prompts you to confirm deletion of all data, use the up/down arrows to highlight **Yes**, and then press Enter.
		Your unit will restart automatically when update is complete.

Problem	Possible Cause	Solution
The application displays a message indicating that a "live fiber error" occurred.	Light has been detected on the OTDR port during the acquisition or while you were monitoring a fiber in real-time mode.	Disconnect the fiber from the OTDR port. Press **OK** to close the message. Start another acquisition without any fiber connected to the OTDR. The message about live fiber error should not appear and the OTDR trace should look "normal". If you still see the message about live fiber error even if no fiber is connected to the OTDR, contact EXFO. Never connect a live fiber to the OTDR port. Any incoming signal greater than –40 dBm will affect the OTDR acquisition. Any incoming signal greater than –20 dBm could damage your OTDR permanently.

Obtaining Online Help

Context-sensitive help is conveniently available at all times to guide you through the use of your unit.

To obtain online help about the current function:

On the unit keypad, press the ? key.

To navigate in the online help:

➤ Use up/down arrows to scroll through help page.

➤ Use left/right arrows to switch between hyperlinks (underlined items) and press Enter to link to selected help page.

➤ Press **Next Page** to switch between available topics in sequence.

➤ Press **Help Menu** to display the main menu of help topics.

➤ On the unit keypad, press Esc to return to the pane.
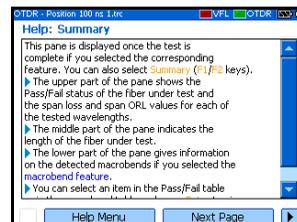
Finding Information on the EXFO Web Site

The EXFO Web site provides answers to frequently asked questions (FAQs) regarding the use of your AXS-100 Series OTDR.

To access FAQs:

1. Type http://www.exfo.com in your Internet browser.

2. Click on the **Support** tab.

3. Click on **FAQs** and follow the on-screen instructions. You will be given a list of questions pertaining to your subject.

The EXFO Web site also provides the product's most recent technical specifications.

Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact EXFO at one of the following numbers. The Technical Support Group is available to take your calls from Monday to Friday, 7:30 a.m. to 8:00 p.m. (Eastern Time in North America).

Technical Support Group

400 Godin Avenue	1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2	Tel.: 1 418 683-5498
CANADA	Fax: 1 418 683-9224
	support@exfo.com

To accelerate the process, please have information such as the name and the serial number (see the product identification label—an example is shown below), as well as a description of your problem, close at hand.
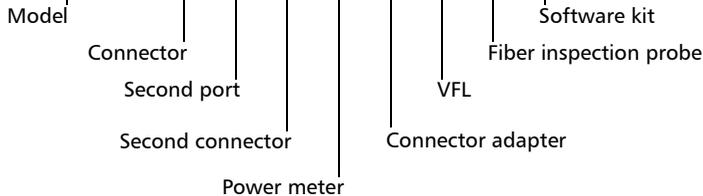
You may also be requested to provide the firmware or software version numbers.

To find out the firmware or software version numbers:

1. Press Menu, select **File Manager/Info. > Information**, and press Enter.

2. Press **About** (F1/F2 key).

Transportation

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

➤ Pack the unit in its original packing material when shipping.

➤ Avoid high humidity or large temperature fluctuations.

➤ Keep the unit out of direct sunlight.

➤ Avoid unnecessary shock and vibration.

15 *Warranty*

General Information

EXFO Electro-Optical Engineering Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period of one year from the date of original shipment. EXFO also warrants that this equipment will meet applicable specifications under normal use.

During the warranty period, EXFO will, at its discretion, repair, replace, or issue credit for any defective product, as well as verify and adjust the product free of charge should the equipment need to be repaired or if the original calibration is erroneous. If the equipment is sent back for verification of calibration during the warranty period and found to meet all published specifications, EXFO will charge standard calibration fees.

> # **IMPORTANT**
> **The warranty can become null and void if:**
>
> ➤ **unit has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel.**
>
> ➤ **warranty sticker has been removed.**
>
> ➤ **case screws, other than those specified in this guide, have been removed.**
>
> ➤ **case has been opened, other than as explained in this guide.**
>
> ➤ **unit serial number has been altered, erased, or removed.**
>
> ➤ **unit has been misused, neglected, or damaged by accident.**

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

Liability

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

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

Exclusions

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

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

IMPORTANT

EXFO will charge a fee for replacing optical connectors that were damaged due to misuse or bad cleaning.

Certification

EXFO certifies that this equipment met its published specifications at the time of shipment from the factory.

Service and Repairs

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

To send any equipment for service or repair:

1. Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 114). Support personnel will determine if the equipment requires service, repair, or calibration.

2. If equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) number and provide an address for return.

3. If possible, back up your data before sending the unit for repair.

4. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.

5. Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the RMA number on the shipping slip. *EXFO will refuse and return any package that does not bear an RMA number.*

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

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

Routine recalibration is not included in any of the warranty plans. Since calibrations/verifications are not covered by the basic or extended warranties, you may elect to purchase FlexCare Calibration/Verification Packages for a definite period of time. Contact an authorized service center (see *EXFO Service Centers Worldwide* on page 114).

EXFO Service Centers Worldwide

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

EXFO Headquarters Service Center

400 Godin Avenue	1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2	Tel.: 1 418 683-5498
CANADA	Fax: 1 418 683-9224
	quebec.service@exfo.com

EXFO Europe Service Center

Omega Enterprise Park, Electron Way	Tel.: +44 2380 246810
Chandlers Ford, Hampshire S053 4SE	Fax: +44 2380 246801
ENGLAND	europe.service@exfo.com

EXFO China Service Center/
Beijing OSIC

Beijing New Century Hotel	Tel.: +86 (10) 6849 2738
Office Tower, Room 1754-1755	Fax: +86 (10) 6849 2662
No. 6 Southern Capital Gym Road	beijing.service@exfo.com
Beijing 100044	
P. R. CHINA	

A Technical Specifications

> **IMPORTANT**
>
> The following technical specifications can change without notice. The information presented in this section is provided as a reference only. To obtain this product's most recent technical specifications, visit the EXFO Web site at *www.exfo.com*.

Technical Specifications

SPECIFICATIONS [a]	AXS-100	AXS-110
Wavelength (nm)	1310/1550/1625	850/1300/1310/1550
Dynamic range [b] (dB)	29/28/28 (1310/1550/1625)	24/25/32/30 (850/1300/1310/1550)
Pulse width (ns)	10, 30, 100, 275, 1000, 2500, 10 000	Multimode: 5, 10, 30, 100, 275, 1000 Singlemode: 5, 10, 30, 100, 275, 1000, 2500, 10 000
Event dead zone [c] (m)	2.5	0.8
Attenuation dead zone [c] (m)	11/12/12	3.5/4.5/4/4.5
Launch conditions [d]		Class CPR 1 or 2
Linearity (dB/dB)	± 0.05	± 0.03
Loss threshold (dB)	0.05	0.01
Loss resolution (dB)	0.01	0.01
Sampling resolution (m)	0.16 to 5	Multimode: 0.08 to 2.5 Singlemode: 0.08 to 5.0
Sampling points	Up to 30 000	Up to 64 000
Distance uncertainty [e] (m)	± (1 + 0.005 % x distance + sampling resolution)	± (0.75 + 0.0025 % x distance + sampling resolution)
Distance range (km)	0.65 to 160	Multimode: 0.1 to 40 Singlemode: 0.65 to 260
Typical real-time refresh (Hz)	2	4
Memory capacity	500 traces	500 traces
Measurement time	User-defined	User-defined
Stable source output power [f] (dBm)	−9	Multimode: −1.5 Singlemode: -6.5
Visual fault locator (optional)	Laser, 650 nm ± 10 nm CW Typical P_{out} in 62.5/125 μm: 3 dBm (2 mW)	Laser, 650 nm ± 10 nm CW Typical P_{out} in 62.5/125 μm: 3 dBm (2 mW)

OPTIONAL POWER METER [g]	
Calibrated wavelengths (nm)	850, 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610, 1625
Power range (dBm)	26 to −64 (GeX 2 mm)
Uncertainty	±5 % ± 0.4 nW (up to 5 dBm)
Display resolution (dB)	0.01 (−54 dBm to P_{max}) 0.1 (−54 dBm to −64 dBm) 1 (−64 dBm to min)
Automatic offset nulling range [h]	Maximum power to −38 dBm
Tone detection (Hz)	270/1000/2000

GENERAL SPECIFICATIONS		
Size (H x W x D)		250 mm x 125 mm x 75 mm (9 $^7/_8$ in x 4 $^{15}/_{16}$ in x 3 in)
Weight		1 kg (2.2 lb)
Temperature	operating	−18 °C to 50 °C (14 °F to 122 °F)
	storage	−40 °C to 70 °C (−40 °F to 158 °F)
Relative humidity		0 % to 95 % non-condensing
Power		Li-ion batteries 8 hours of continuous operation as per Bellcore TR-NWT-001138
Warranty (years)		1

Notes

a. All specifications valid at 23 °C ± 2 °C (73.4 °F ± 3.6 °F) with an FC/PC connector, unless otherwise specified.
b. Typical dynamic range with longest pulse and three-minute averaging at SNR = 1. Multimode dynamic range is specified for 62.5 μm fiber; a 3 dB reduction is seen when testing 50 μm fiber.
c. Typical dead zone for multimode reflectance below − 35 dB and singlemode reflectance below −45 dB, using shortest pulse.
d. For multimode port, controlled launch conditions allow 50 μm and 62.5 μm multimode fiber testing.
e. Does not include uncertainty due to fiber index.
f. Typical output power is given at 1300 nm for multimode output and 1550 nm for singlemode output.
g. At 23 °C ± 1 °C, 1550 nm and with FC connector. With OTDR in idle mode, battery operated.
h. For ± 0.05 dB, from 18 °C to 28 °C.

B Description of Event Types

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

➤ Each type of event has its own symbol.

➤ Each type of event is represented by a graph of a fiber trace, which illustrates the power reflected back toward the source as a function of distance.

➤ An arrow points to the location of the event type in the trace.

➤ Most graphs show one complete trace; that is, an entire acquisition range.

➤ Some graphs show only a portion of the entire range to view events of interest more closely.

Span Start

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

Span End

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

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

Continuous Fiber --··
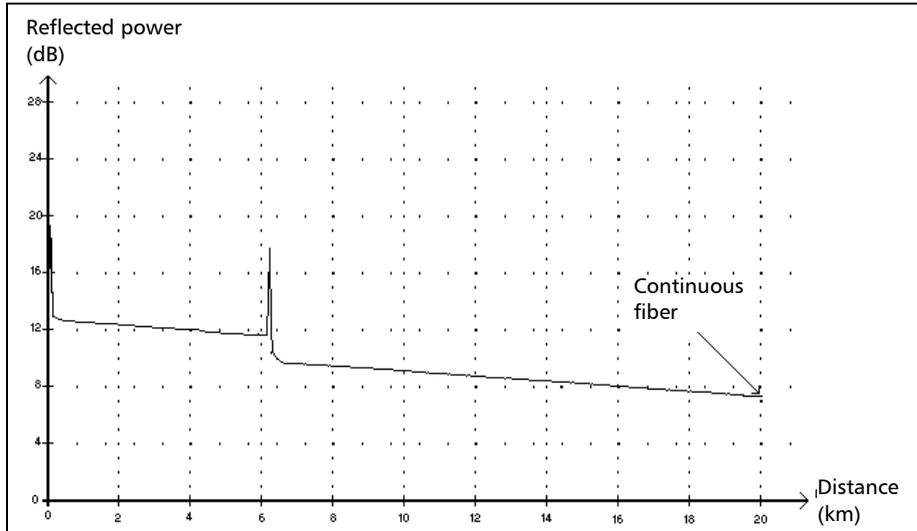
This event indicates that the selected acquisition range was shorter than the fiber length.

➤ The fiber end was not detected because the analysis process ended before reaching the end of the fiber.

➤ The acquisition distance range should therefore be increased to a value greater than the fiber length.

➤ There is no loss or reflectance specified for continuous fiber events.

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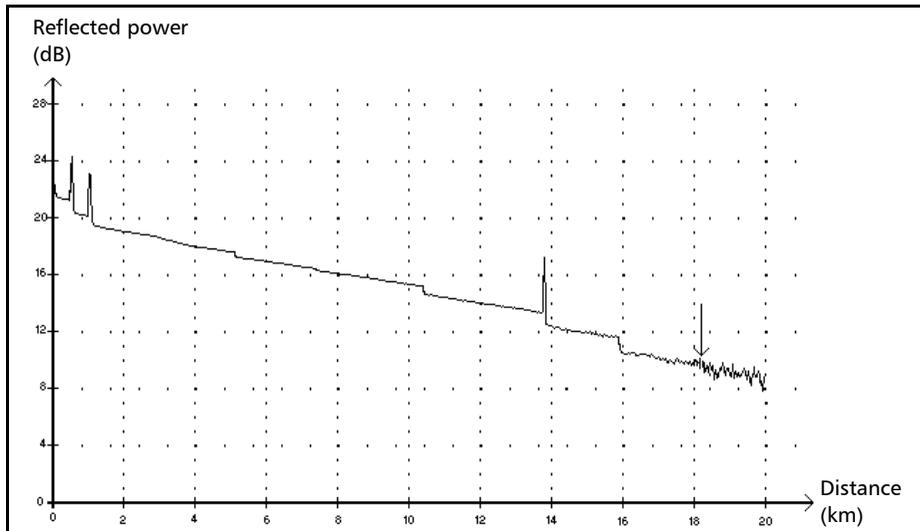
This event indicates that the pulse width used did not provide enough dynamic range to get to the end of the fiber.

➤ The analysis ended before reaching the end of the fiber because the signal-to-noise ratio was too low.

➤ The pulse width should therefore be increased so the signal reaches the end of the fiber with a sufficient signal-to-noise ratio.

➤ There is no loss or reflectance specified for end-of-analysis events.

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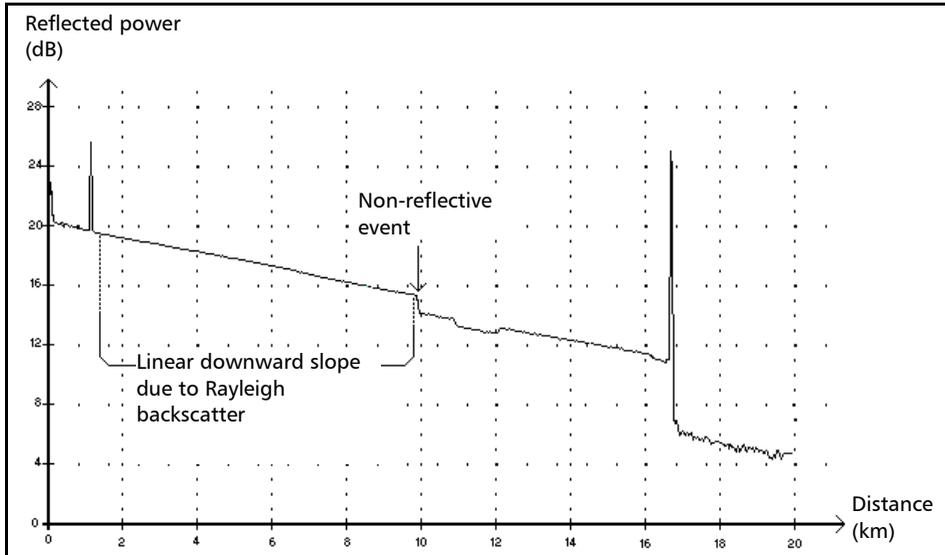
This event is characterized by a sudden decrease in the Rayleigh backscatter signal level. It appears as a discontinuity in the downward slope of the trace signal.

➤ This event is often caused by splices, macrobends, or microbends in the fiber.

➤ A loss value is specified for non-reflective events. There is no reflectance specified for this type of event.

➤ If you set thresholds, the application indicates a non-reflective fault in the events table, whenever a value exceeds the loss threshold (see *Setting Pass/Fail Thresholds* on page 30).

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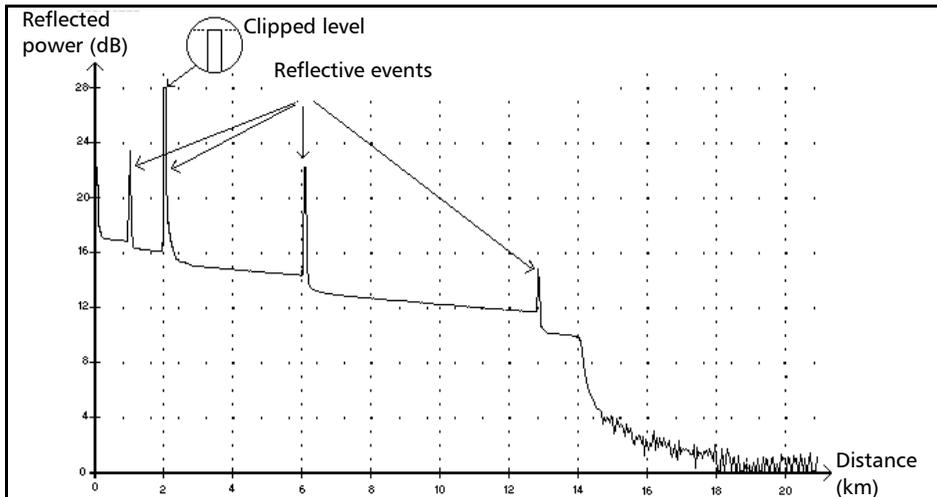
Reflective faults appear as spikes in the fiber trace. They are caused by an abrupt discontinuity in the index of refraction.

➤ Reflective events cause a significant portion of the energy initially launched into the fiber to be reflected back toward the source.

➤ Reflective events may indicate the presence of connectors, mechanical splices, or even poor-quality fusion splices or cracks.

➤ A loss and a reflectance value are normally specified for reflective events.

➤ When the reflective spike reaches the maximum level, its top may be clipped due to the saturation of the detector. As a result, the dead zone—or minimum distance for making a detection or attenuation measurement between this event and a second nearby—may be increased.

➤ If you set thresholds, the application indicates a reflective fault in the events table, whenever a value exceeds reflectance or connector loss threshold(s) (see *Setting Pass/Fail Thresholds* on page 30).
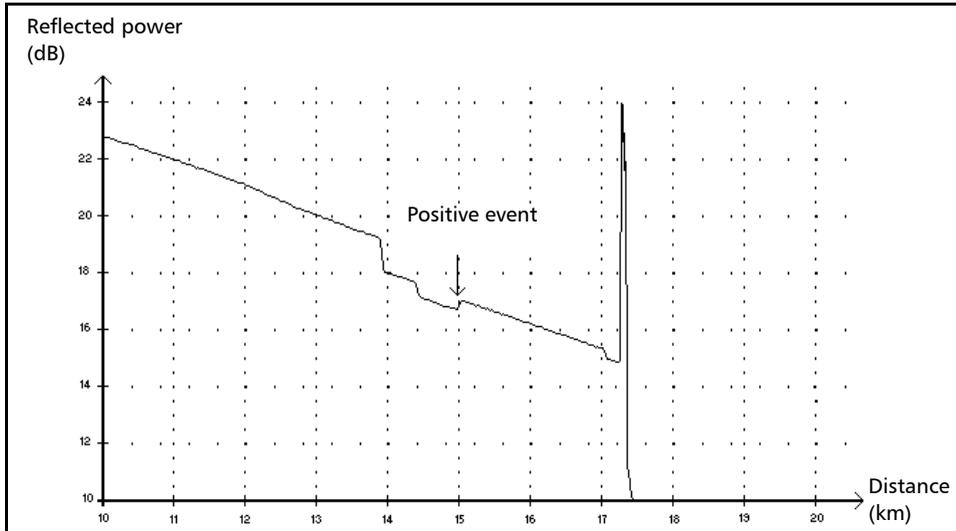
Positive Event ⌐

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

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

➤ The true loss has to be measured by performing bidirectional fiber measurements and bidirectional analysis.

Launch Level →
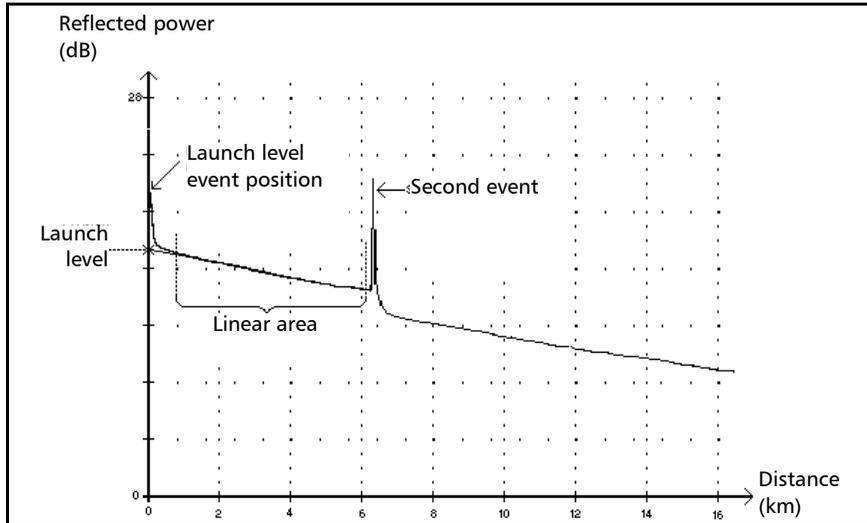
This event indicates the level of the signal launched into the fiber.

➤ The figure above shows how the launch level is measured.

A straight line is plotted using least-square approximation to fit all trace points in the linear area between the first and second detected events.

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

The crossing point indicates the launch level.

➤ <<<< in the events table indicates that the launch level is too low.
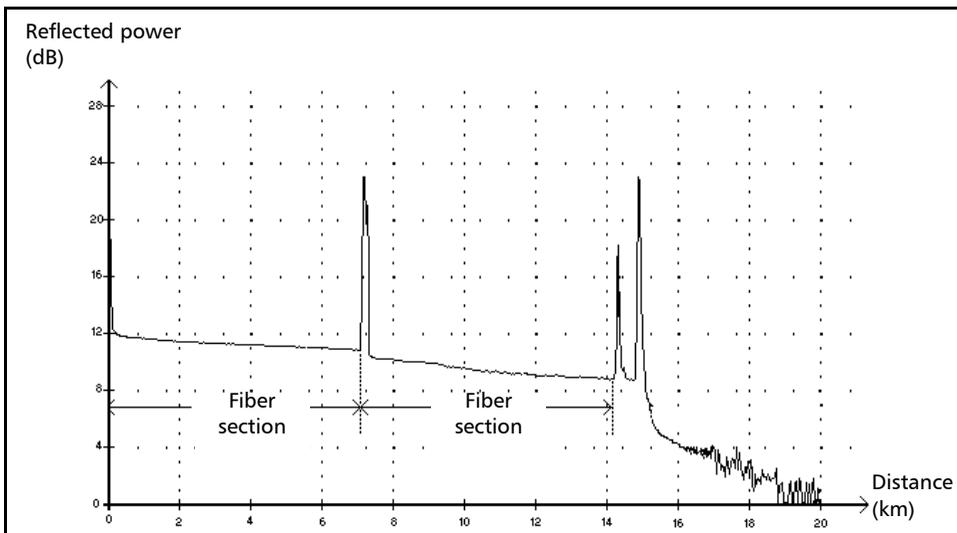
Fiber Section ⊢⊣

This symbol denotes a fiber section with no event.

➤ The sum of all fiber sections contained in an entire fiber trace equals the total fiber length. Detected events are distinct—even if they cover more than one point on the trace.

➤ A loss value is specified for fiber section events. No reflectance is specified for this type of event.

➤ Each fiber section has its own length, attenuation and loss value.

Merged Reflective Event Σ
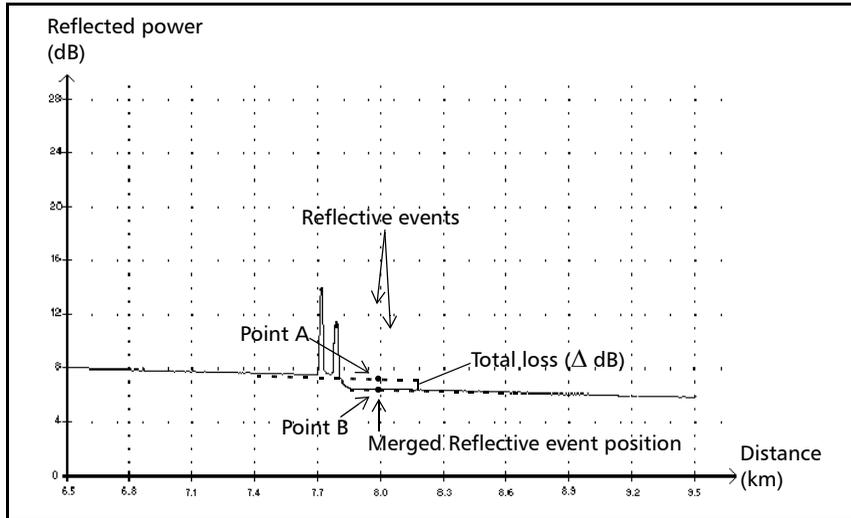
This symbol denotes a reflective event combined with one or more other reflective events. It also indicates the total loss produced by the merged reflective events following it in the events table.

➤ A Merged Reflective Event is composed of reflective events. Only the Merged Reflective Event is displayed in the events table, not the reflective subevents composing it.

➤ Reflective events may indicate the presence of connectors, mechanical splices, or poor-quality fusion splices or cracks.

➤ A reflectance value is specified for all merged reflective events and indicates the maximum reflectance for the merged event. A reflectance value, corresponding to the highest reflectance value among all subevents composing the Merged Reflective Event, is also displayed.

➤ The total loss (Δ dB) produced by the events is measured by plotting two straight lines.

    ➤ The first line is plotted by fitting, through least-square approximation, trace points in the linear area preceding the first event.

    ➤ The second line is plotted by fitting, through least-square approximation, trace points in the linear area following the second event. If there were more than two merged events, this line would be plotted in the linear area following the last merged event. This line is then projected toward the first merged event.

    ➤ The total loss (Δ dB) equals the power difference between the point where the first event begins (point A) and the point on the projected straight line located just below the first event (point B).

    ➤ No loss value can be specified for the subevents.

Echo �
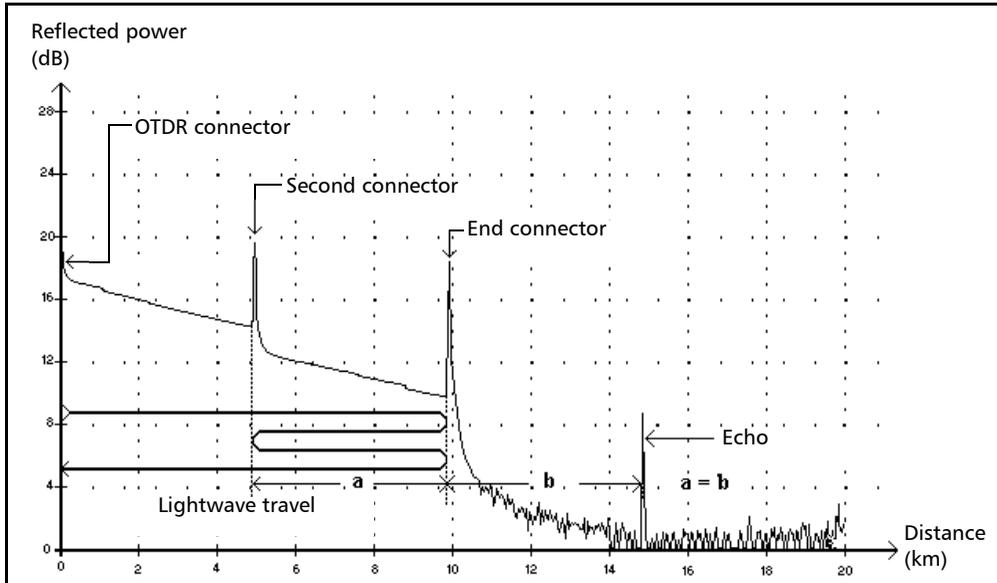
This symbol indicates that an echo has been detected after the end of the fiber.

➤ In the example above, the launched pulse travels up to the end connector and is reflected back toward the OTDR. Then, it reaches the second connector and is reflected again toward the end connector. It is then reflected back to the OTDR.

➤ The application interprets this new reflection as an echo because of its characteristics (reflectance and particular position with respect to other reflections).

➤ The distance between the second connector reflection and the end connector reflection is equal to the distance between the end connector reflection and the echo.

➤ There is no loss specified for echo events.

Reflective Event (Possible Echo) 🎚

Reflected power (dB)

OTDR connector

Second connector

← Third connector

── Reflective event (possible echo)

a ─── b ─── a = b

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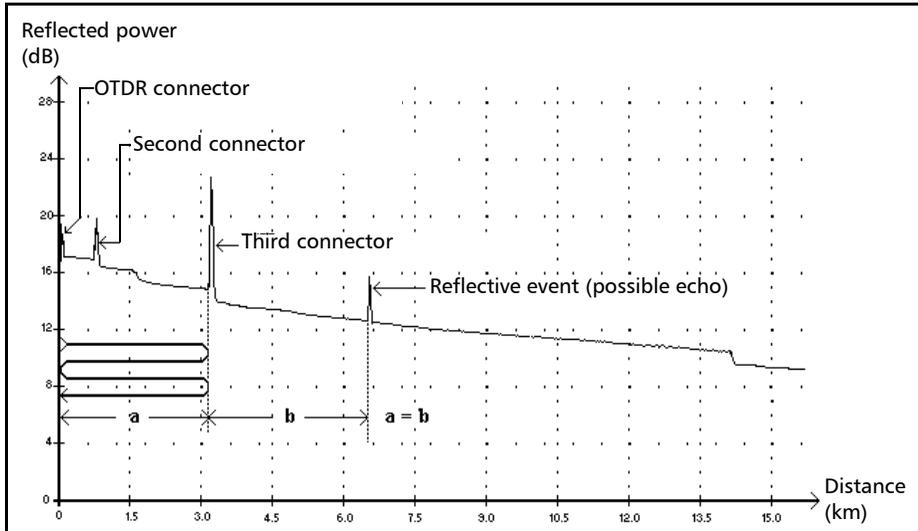
This symbol indicates a reflective event that can be a real reflection or an echo produced by another stronger reflection located closer to the source.

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

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

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

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EXPERTISE REACHING OUT