



AV6416 Palm-OTDR

User Guide

The 41st Institute of China Electronics Technology Group Corporation

Preamble

Thank you for using AV6416 Palm-OTDR of the 41st Institute of China Electronics Technology Group Corporation (the 41st Institute of CETC)! Please read this guide carefully.

Product maintenance agreements and other customer assistance agreements are available for The 41st Institute of CETC. For any assistance, contact us.

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Notices and Warranty

This guide is the first edition of AV6416 Palm -OTDR. The version number is AV2.761.0054SS.

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Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. The 41st Institute of CETC assumes no liability for the customer's failure to comply with these requirements.

ENVIRONMENTAL CONDITIONS

Refer to the specifications tables for operating and storage environment.

BEFORE APPLYING POWER

Refer to the specifications tables for the voltage. Verify that the product is set to match the available voltage, and all safety precautions are taken.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

DO NOT REMOVE THE INSTRUMENT COVER

Operating personnel must not remove instrument covers, other than as explained in this guide. Component replacement and internal adjustments must be made only by qualified service personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Warning ! : The Warning! sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury or damage to the product. Do not proceed beyond a Warning! sign until the indicated conditions are fully understood and met.

Caution! : The Caution! sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a Caution! sign until the indicated conditions are fully understood and met.

Note! : Refers to any information regarding the operation of the product which should not be overlooked.

Warning !

General Safety Information

➤ AC/DC Adapter/Charger

The following voltage requirements must be met: 15V to 20V, 2.5A, positive core. Use of higher voltages may damage the product.

The adapter accepts from 100V to 240V, 50Hz to 60Hz.

➤ Battery

Your battery has passed safety test. For the best results, wipe the battery with a soft dry cloth if it becomes dirty.

- Use lithium battery. Use of other batteries may damage the product and compromise the user's safety.
- Do not disassemble or attempt to open the battery under any circumstances.
- The battery can explode, leak or catch fire if heated or exposed to fire or high temperatures.
- Do not short circuit the battery by directly connecting the metal terminals. Be certain that no metal objects such as coins, paper clips and so on touch the terminals.
- Do not drop the battery or subject it to mechanical shock.

➤ Laser Safety

- The Laser safety is : Class 1 laser product : 21 CFR 1040.10 or Class 3A Laser Product : IEC 60825-1 : Ed. 2:2001. Invisible laser radiatum may be encountered at the OTDR 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.
- Do not install or terminate fibers while a laser source is active.
- To avoid serious eye injury, never look directly into the optical outputs of fiber optic network equipment, test equipment, patch cords, or test jumpers, and ensure that your eyes are protected at all times.

➤ **OTDR Safety**

Never connect a fiber carrying any kind of signal to the OTDR port. This could result in permanent damage to the OTDR, make sure that all fibers under test are inactive at the time of and during connection.

Caution!

Caution

➤ **AC/DC Adapter/Charger**

- Battery recharge is automatic when the AC/DC adapter/charger is connected.
- The AC/DC adapter/charger provided with this product is specifically designed to work with AV6416 Palm-OTDR. Please use the AC/DC adapter/charger that supplied by the 41st Institute of CETC. Use of another type of AC/DC adapter can damage the instrument.

➤ **Battery**

- Do not insert the battery while operating the instrument.
- If your battery is new or has been in storage for a long time, you may need to charge it two or three times to achieve optimum performance levels.
- For the best battery performance and accuracy of the fuel gauge , completely discharge the battery, then make a complete fast charge cycle(non-operating), and completely discharge the battery again.

You must ensure that the charging cycle is not interrupted by a battery discharge, and the discharge cycle is not interrupted by battery charging.

- It is best if you charge the battery at a limited and controlled temperature(5°C to 45°C) . It is normal for the battery to become warm during charging or after use.
- Remove your battery from the AV6416 Palm-OTDR when not in use. Store at room temperature and in a dry place for optimal performance.
- A charged battery will gradually lose its charge if left in storage. It is therefore better if you top-off charge before use.
- It is good practise to recharge the battery every 2-3 months during storage.
- Storage temperature range (the storage time is longer than six monthes) is : -20°C to 45°C. Storage temperature range(the storage time is shorter than or up to six monthes) is : -20°C to 60°C.

- The time of charging should not too long, otherwise, the battery may be damaged.
- The battery should not be discharge excess, otherwise, the battery may be damaged.

➤ **LCD**

- Don't pollute touchscreen with any organic compound or organic contaminant such as heptane, ethanol, toluene, cellosolve acetate, hydrochloric acid, motor oil, diesel fule etc.
- Don't use any sharp device to press the touchscreen.
- Clean the touchscreen with a soft, non-abrasive cloth dampened with glass cleaner.

➤ **OTDR**

- Never connect a fiber carrying any kind of signal to the OTDR port. This could result in permanent damage to the OTDR, make sure that all fibers under test are inactive at the time of and during connection.
- You must clean the fiber end-face before inserting connector, you also must clean the connector end-face of OTDR, otherwise, it will reduce the performance of product and measurements become inaccurate and non-repeatable.

Transportation and Storage

- Pack the product in the original packing material when shipping.
- Before use this instrument, make sure that the type of OTDR is AV6416 Palm-OTDR, and the instrument has not evident physical damage, and it meets specifications.
- Store the product in a clean and dry area. If the unit is stored at a temperature over the range of specified, let the unit reach specified operating temperature before turning it on. The temperatures for the AV6416 Palm-OTDR are given in the table below.

| | Operating Temperature | Storage Temperature | Humidity |
|-----------------------------|--------------------------|------------------------|-----------------|
| All System (except battery) | 0°C to 40°C | -20°C to 60°C | 5% to 95% |
| Battery charging | 5°C to 45°C | | No Condensation |

- Protect the instrument from temperature extremes and changes in temperature that may cause condensation within it.
- Remove your battery from the AV6416 Palm-OTDR when not in use. It is good practise to recharge the battery every 2-3 months during storage.

Calibration

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 instrument maintenance. You should determine the adequate calibration interval for your instrument according to your accuracy requirement. Under normal use, recommends calibrating your instrument **every year**.

Maintenance And Warranty

- The 41st Institute of CETC warrants this instrument against defects in material and workmanship for **18 months (except battery and optical connector etc.)** from the date of original shipment, **battery for 3 months** from the date of original shipment. **But USB-Disk and presents are not covered by this warranty.**
- **The warranty can become null and void if :**
 - the instrument has been tampered with, repaired, or worked upon by unauthorized individuals or non-41st personnel.
 - Case screws or seals, other than those specified in this guid, have been removed.
 - the case has been opened, other than as explained in this guid.
 - the instrument serial number has been altered, erased or removed.
 - the instrument 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 the 41st Institute of CETC be liable for special, incidental, or consequential damages.

- The 41st Institute of CETC shall not be liable for damages resulting from the use of the purchased product, nor shall be responsible for any failure in the performance of other items to which the purchased product is connected or the operation of any system of which the purchased product may be a part.
- The 41st Institute of CETC shall not be liable for damages resulting from improper usage or unauthorized modification of the product, its accompanying accessories and software.
- The 41st Institute of CETC reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligation to make changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps and batteries used with this product are not covered by this warranty.

Caution!

If the instrument must be returned to the 41st Institute of CETC, Please caution:

- If the instrument has internal storage data files, do a backup of your data before sending the instrument for repairs.
- Pack the equipment in its original shipping material.
- Be sure to write a tag showing owner, return address, telephone and the type of service required.
- If you do not have the original shipping box, you must use an appropriate shock absorbing material, otherwise the instrument can be damaged, and the warranty can become null and void.

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Chapter 1 Summarize

1 Feature Overview

AV6416 Palm-OTDR is new Optical Time Domain Reflectometer with integrated VFL(visual fault locator). AV6416 Palm-OTDR feature handheld, compact, lightweight, long battery life and easy-to-use. It supports auto test, manual averaging, manual real time and dead zone test mode. Besides, the AV6416 Palm-OTDR can save and transfer the measurement data to PC. The AV6416 Palm-OTDR has become the indispensable and ideal tools for fiber networks construction, daily check and maintenance in FTTx .

Features:

- Test can be started by pressing a single key.
- 2.5m extra-short event dead zone
- Advanced anti-reflection LCD, screen optimized for outdoor use.
- USB ports(host and client): transfer and print data trace.
- Visual fault locator to inspect fibers.
- Lithium rechargeable battery support over 10 hours.
- Memory for 500 OTDR traces and possible data transfer to a computer.
- Support auto test, manual averaging, manual real time and dead zone test mode.
- Online help function.

2 Composition

2.1 Standard composition

The standard composition of the AV6416 OTDR is shown in Table 1-1.

Table 1-1 AV6416 OTDR Standard Composition

| Item | Name | Number |
|----------------------|--------------------------|--------|
| Mainframe | AV6416 OTDR | 1 |
| Standard Accessories | Power Adapter | 1 |
| | Power Line | 1 |
| | User Guide | 1 |
| | CD (Simulation Software) | 1 |
| | Fiber Adapter(FC、SC、ST) | 1 |
| | Plastic Case | 1 |

2.2 Optical Units

The Optical Units of AV6416 OTDR are shown in Table 1-2.

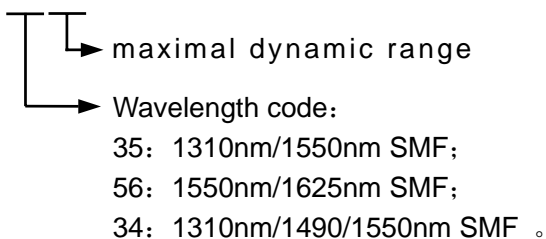
Table 1-2 Optical Units

| Type | Wavelength (SMF) | Dynamic range (SNR=1) ^a |
|-------------|-----------------------------|------------------------------------|
| AV6416-3528 | 1310/1550nm \pm 20nm | 28/26 dB |
| AV6416-5626 | 1550/1625nm \pm 20nm | 26/24 dB |
| AV6416-3428 | 1310/1490/1550nm \pm 20nm | 28/24/26 dB |

Note!

- a. Typical dynamic range using 10 μ s pulse with a three-minute average at SNR = 1.

AV6416-XXXX



2.3 Options

The options of AV6416 OTDR are shown in Table 1-3.

Table 1-3 The Options of AV6416 OTDR

| Item And Type | Explain |
|-------------------|---------------------------------------|
| USB Disk | Save data and transmitting data to PC |
| Fiber Tail (SMF) | |
| Transmission Line | Use for ActiveSync |
| FC-ST Fiber Tail | |
| FC-SC Fiber Tail | |
| FC-APC Fiber Tail | |

Note!

(1) The Optical units and options of AV6416 OTDR are subject to change without notice. For any assistance, contact us.

(2) Conventions used in this manual:

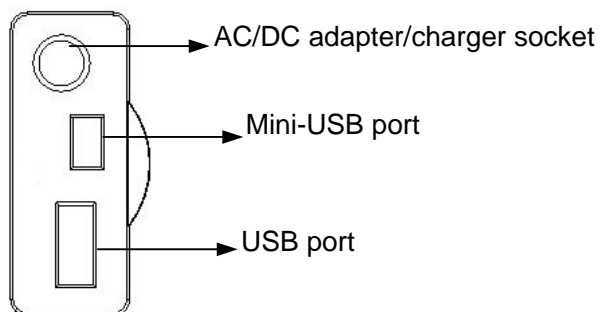
Menu Button are indicated by small capitals enclosed by square brackets, for example [File],[Trace].

Menu Item are indicated by italics, black , for example ***Test Item, Test Mode.***

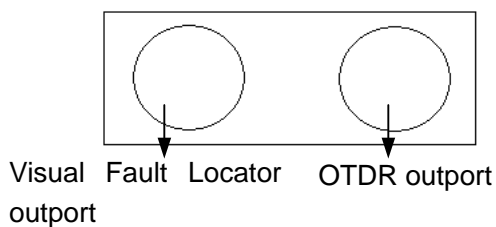
Panel Keys are indicated by picture , for example ◀, ⏻.

3 Description of the AV6416 OTDR

3.1 Right Panel



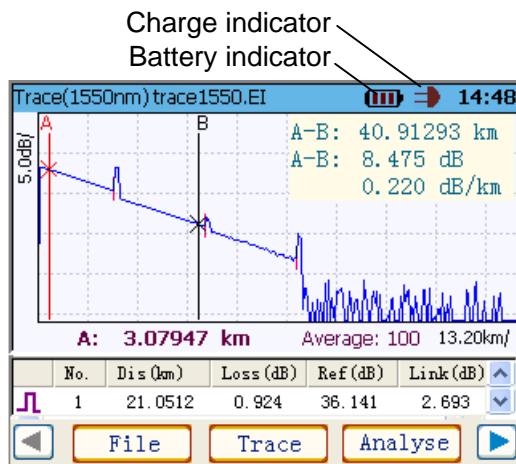
3.2 Top Panel



4 About Battery

AV6416 OTDR use lithium battery. Use of other batteries may damage the product and compromise the user's safety.

➤ Battery indicator and Charge indicator:



Battery indicator:

- : the capability of battery is over 80%. When the lamp of power key is green, the battery is full charged.
- : the capability of battery is less than 80%.
- : the capability of battery is less than 55%.
- : the capability of battery is less than 5%. When it is blinking, the capability of battery will empty. If battery is empty, the instrument will auto turn-off.

Charge indicator:

- : the AC/DC adapter/charger is connected. Battery recharge is automatic when the AC/DC adapter /charger is connected, the lamp of power key is red.

➤ Charging the Battery :

It is able to charge the battery operating or non-operating.

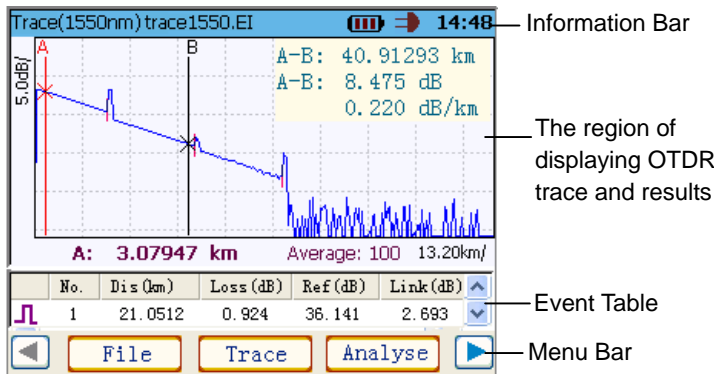
- (1) It is best if you charge the battery at a limited and controlled temperature(5°C to 45°C). It is normal for the battery to become warm during charging or after use.
- (2) Charge is typically performed non-operating in 6 hours.
- (3) Charge is typically performed operating in 8 hours.
- (4) The time of charging should not too long, otherwise, the battery may be damaged.

Caution! For more information about battery, see **General Safety Information** and **Caution**.

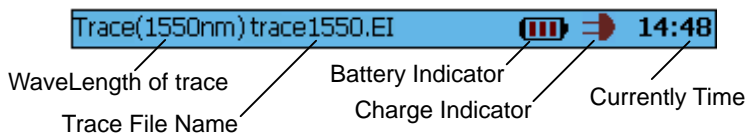
Chapter 2 The Applications Screen

1 Applications Screen

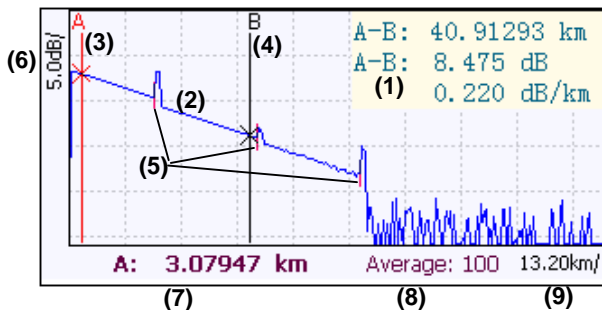
When you turn the AV6416 OTDR on, the screen is main operating interface, see the following figure.



1.1 Information Bar



1.2 The region of displaying trace and results





(1) : Measurement Results. The contents of displaying are correspond to **Test Item**.



(2) : Measurement Trace or Trace of Data File.

(3) : Cursor A. (The color of active cursor is read, You can move it by ◀ or ▶.)





- (4) : Cursor B.
- (5) : the sign of event.
- (6) : the scale of horizontally (km/ or m/).
- (7) : the distance between the Active-Cursor to origin(the OTDR' output), display "****.***** km".
- (8) : the average counts. (Only in manual average mode or dead zone test mode, it will be displayed)
- (9) : the scale of vertically (dB/).

1.3 Event Table

If there aren't events, Event Table is empty. You can observe every event by  or .

| | No. | Dis (km) | Loss (dB) | Ref (dB) | Link (dB) | |
|---|-----|----------|-----------|----------|-----------|---|
|  | 1 | 21.0512 | 0.924 | 36.141 | 2.693 |  |

 : the type of event.

-  : Reflection Event
-  : Down Event
-  : Up Event
-  : End of the fiber

No. : the Number of event.

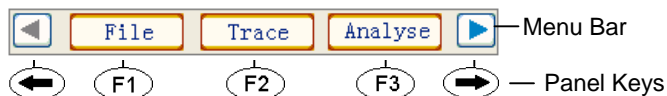
Dis(km) : the distance between this event to origin(the OTDR' output).





Loss(dB) : the loss in dB for this event




Ref(dB) : the reflectance measured at this event .



Link(dB) : the link loss from to origin(the OTDR's output) to this event.

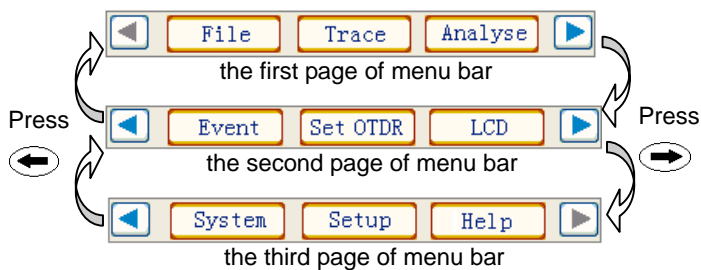
1.4 Menu Bar



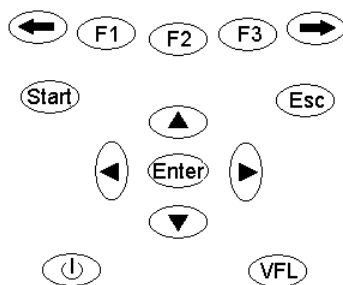
,  : left function arrow and right function arrow Correspond to menu button  and menu button . Press it to scroll through available functions.

, ,  : menu keys . Press it to activate the functions displayed directly above menu key.

There are three page menu buttons on main menu bar, see the following figure. You can press  to page-up menu, and press  to page-down menu.



2 Panel Key



← : To page-up menu.

→ : To page-down menu.

F1, F2, F3 : To active the function displayed directly above.

Start : To start (or stop) an acquisition.

Note!

- (1) AV6416 OTDR supports auto test, manual averaging, manual real time and dead zone test mode.
- (2) The test mode can be set in **SetOtdr** sub-menu.

Esc : To stop test, cancel / exit current function, or return previous menu.


←, → : To move active cursor, select character button, change parameters and page-up or page-down files/events in files/events list window.


▲, ▼ : To move trace up/down, select character button, move cursor bar up/down in files/events list window and zoom in/out trace.

Enter : To set active-cursor, input character on character button, mark tag * to file and enter current function.

Note!

- (1) The color of active cursor is red, the color of non-active cursor is black.
- (2) Only tagged files can be copied to target disk.

: Visual fault locator. When laser of OTDR is closed, press down this key about 4 seconds, the lamp of key is turn on, the VFL port emits visible laser radiation, now, the mode is continuous . Press this key again, now, the mode is blinking. Then press this key again, the VFL is closed and the lamp of key is turn off.

 : Power key. Press down this key about 4 senconds to turn on/off this instrument.

Chapter 3 Using the AV6416 OTDR

1 Testing Fiber

To test fiber, you have to :

- Select the test wavelength
- Set test mode and test parameters
- Clean and connect fiber
- Press **Start**
- In auto test mode, the OTDR will auto analyse data and give event table. In manual real-time mode and manual average mode, you can get event table by **Analyse**.
- View event table or measure results manually.

Caution! Never connect a fiber carrying any kind of signal to the OTDR port. This could result in permanent damage to the OTDR, make sure that all fibers under test are inactive at the time of and during connection.

Note! In auto test mode, the OTDR will auto stop test after getting fiber trace. In manual real-time mode, dead zone mode and manual average mode, you can press **Start** one more time or press **Esc** to stop test.

1.1 About Test Mode and Test Parameters

You can set preferences such as:

➤ **Mode:**

- ✧ **Auto:** Auto Mode. The OTDR will automatically set measurement condition, and scan the trace, then OTDR will automatically analyzes the trace and make the event table.
- ✧ **Real-Time:** Manual Real-Time mode. Set measurement condition(range, pulsewidth, att etc.) manually, then OTDR scan the trace real-time. Used to immediately view sudden changes in the fiber under test. In this mode, the trace SNR is lower than in average mode and the trace is not averaged, but refreshed, until you press **Start** again or press **Esc**.

- ✧ **Average:** Manual Average mode. Set measurement condition (range, pulsewidth, att etc.) manually, then OTDR scan the trace in average mode. Used to improve the trace SNR. In this mode, the detection of low-level events is enhanced and acquisitions are averaged for up to value of time (see following) or until you press **Start** again or press **Esc**.
- ✧ **Dead Zone:** In this mode, the dead zone is minimum, but the distance span to be tested is also minimum.

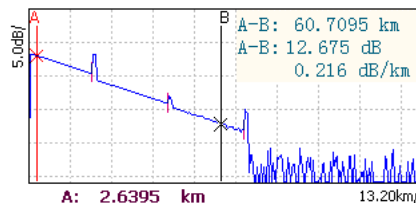
➤ **Times:**

The average counts of auto test or manual average mode or dead zone mode. Generally, longer times generates cleaner traces (this is especially true with long- distance traces), because, as the average count increases, more of the noise is averaged out. This averaging increases the signal-to-noise ratio and the OTDR's ability to detect small events. The value of count is 10 to 100 in auto test mode. The value of count is 1 to 4000 in manual average mode.

➤ **Item:**

Select item to measure splice loss, reflectance, and fiber section attenuation.

- ✧ **Loss:** To measure fiber section attenuation. After you set two markers (marker A and marker B) on trace, the distance between marker A to marker B, the loss from marker A to marker B and the attenuation of this fiber section will be displayed in the region of results. See the following figure.

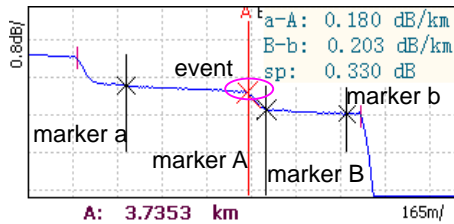


A-B: 4.39924 km : the distance between A to B

A-B: 1.508 dB : the loss from A to B

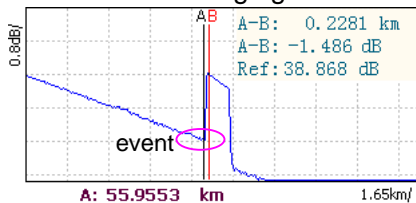
0.332 dB/km : the attenuation of this fiber section

- ✧ **Splice:** To measure splice loss of event. After you set four markers (marker a, marker A, marker B and marker b) on trace, the attenuation of fiber section before event, the attenuation of fiber section after event and the splice loss of this event will be displayed in the region of results. See the following figure.



- a-A: 0.200 dB/km : the attenuation of fiber section **before** event.
- B-b: 0.202 dB/km : the attenuation of fiber section **after** event.
- sp: 0.525 dB : the splice loss of this event.

✧ **Reflect:** To measure reflectance of event. After you set two markers(marker A and marker B), the distance between marker A to marker B, the loss from marker A to marker B and the reflectance of this event will be displayed in region of results. See the following figure.



- A-B: 0.02444 km : the distance between A to B
- A-B: -7.668 dB : the loss from A to B
- Ref: 42.042 dB : the reflectance of this event

➤ **WL: (WaveLength)**

To select the wavelength you want for testing.

➤ **Range: (km)**

Used to set the length of the fiber span to be tested. The values of range are: 4km, 8km, 16km, 32km, 64km, 128km, 256km.

Caution!

It should be increased to a value greater than the fiber length (best twice than the fiber length).

➤ **Pulse: (ns)**

Used to set the pulse width for the test. A longer pulse width travels further down the fiber, but results in less resolution. A shorter pulse width provides higher resolution, but less distance. The available distance ranges and pulse widths depend on your OTDR model. In addition, not all pulse widths are compatible or available with all distance ranges.

➤ **Att.: (dB)**

Used to set attenuation of signal. If value of Att. is minimum, i.e. 0 dB, the distance span to be tested is maximal, but near the fiber is saturation. If value of Att. is maximal, i.e. 10 dB, the distance span to be tested is minimum, but can get smaller dead zone. The values of attenuation are 0dB, 5dB and 10 dB.

➤ **IOR: (index of refraction)**

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 measurement associated with distance(event position, attenuation of fiber section, total length, etc). The IOR is a fiber characteristic that can be obtained through the cable or fiber manufacturer. It should be verified before each test. You can enter any IOR value between 1.0 and 2.0 inclusively.

Caution! If you set IOR incorrectly, your distance measurements will be inaccurate.

➤ **Helix: (helix factor)**

The helix factor takes into consideration the difference between the length of cable and the length of the fiber inside the cable. It must be between 0.8 to 1.0. It can be obtained through the cable manufacturer.

Caution! If you set Helix incorrectly, your distance measurements will be inaccurate.

Note! You should set the IOR and helix factors before performing tests; however, you can also set them at a later time.



➤ **Thresh. (dB): the threshold value of event**

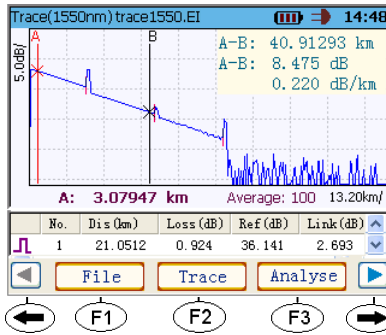
A fault is an optical event that passes a specified threshold. You can set the threshold of event.


Note! After analyze the trace, Only events whose splice loss exceed the threshold of event will be listed in event table.

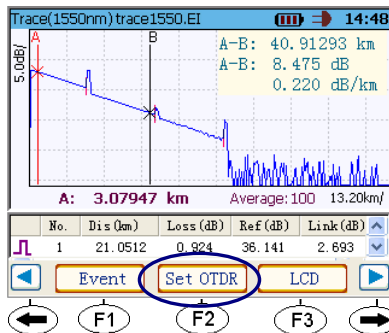
1.2 Setting Test Mode and Test Parameters


Note! Only when you stop test, you can set test mode and test parameters .

In the main screen, press  and then press , The *OTDR Setup* screen appears. See the following figure.

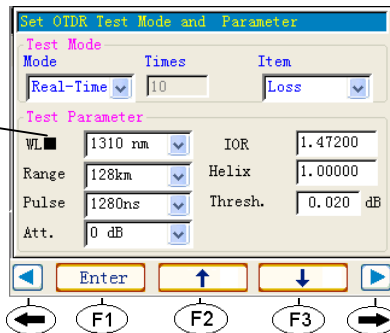


press 







press , the *OTDR Setup* screen appears. See follow figure.






quadrature cursor














the *OTDR Setup* screen

1.2.1 Set Test Mode

- Use / or / to move quadrature cursor , until move it to **Mode** item.












- Use  or  to select test mode(Auto, Real- Time or Average or dead zone).
- Press  or  to confirm and save setting.
- Press  to cancel setting.


1.2.2 Set Average Times

- Use / or / to move quadrate cursor , until move it to **Times** item.
- Use / to change times in step 1. Use /  to chang times in step 10.
- Press  or  to confirm and save setting.
- Press  to cancel setting.












- Note!** (1) The value of times is between 1 to 4000 in manual average mode.
 (2) The value of times is between 10 to 100 in autotest mode.

1.2.3 Set Measure Item

- Use / or / to move quadrate cursor , until move it to **Item** item.
- Use / or / to select measure item(Loss, Reflect or Splice).
- Press  or  to confirm and save setting.
- Press  to cancel setting.

- Note!** (1) There are two markers (marker A and marker B) when you meaure attenuation of fiber section or reflectance.
 (2) There are four markers(marker a, marker A, marker B and marker b) when you measure splice loss.
 (3) If one marker is moved near another, both will move together. A marker may disapper from the trace after you zoom in. It may be recalled by selecting a missing marker with  in main screen.

1.2.4 Set Test WaveLength

- Use / or / to move quadrate cursor , until move it to **WL** item.
- Use / or / to select WaveLength.
- Press  or  to confirm and save setting.
- Press  to cancel setting.

1.2.5 Set Test Range

- Use ◀/▶ or (F2)/(F3) to move quadrate cursor , until move it to **Range** item.
- Use ▲/▼ or ◀/▶ to select Range.
- Press (Enter) or (F1) to confirm and save setting.
- Press (Esc) to cancel setting.

- Note!** (1) The values of range are 4km, 8km, 16km, 32km, 64km, 128km, 256km.
- (2) It should be increased to a value greater than the fiber length (best twice than the fiber length).

1.2.6 Set Test Pulse

- Use ◀/▶ or (F2)/(F3) to move quadrate cursor , until move it to **Range** item.
- Use ▲/▼ or ◀/▶ to select Pulse Width.
- Press (Enter) or (F1) to confirm and save setting.
- Press (Esc) to cancel setting.

- Note!** (1) Not all pulse widths are compatible or available with all distance ranges.
- (2) A longer pulse width travels further down the fiber, but results in less resolution. A shorter pulse width provides higher resolution, but less distance.

1.2.7 Set Test Attenuation

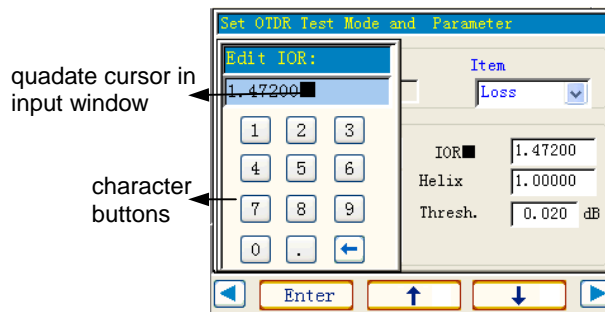
- Use ◀/▶ or (F2)/(F3) to move quadrate cursor , until move it to **Attenuation** item.
- Use ▲/▼ or ◀/▶ to select Attenuation.
- Press (Enter) or (F1) to confirm and save setting.
- Press (Esc) to cancel setting.

Note!

- (1) When other measure conditions are same, if the value of Att. is 0 dB, then the distance span to be tested is maximal, but near the fiber is saturation .
- (2) When other measure conditions are same, if the value of Att. is 10 dB, then you will get smaller dead zone, but the trace SNR is lower and the distance span to be tested is minimum.
- (3) You should select appropriate value of Att. in manual average mode and manual real-time mode.

1.2.8 Set IOR

- Use / or / to move quadrate cursor , until move it to **IOR** item. The IOR Setup screen appears. See the following figure.



- Use / or / to select character button.
- Press to input character of character button at place of quadrate cursor in input window.
- Press to confirm and save setting.
- Press to cancel setting.

Note!

If selected button is , after press , it will delete character before quadrate cursor in input window.

Caution!

Having the proper IOR is **crucial** for all OTDR measurement associated with distance(event position, attenuation of fiber section, total length, etc).

1.2.9 Set Helix Factor

- Use **←/→** or **F2/F3** to move quadrate cursor , until move it to **Helix** item. The Helix Setup screen appears, same as IOR Setup screen.
- Use **▲/▼** or **◀/▶** to select character button.
- Press **Enter** to input character of character button at place of quadrate cursor in input window.
- Press **F1** to confirm and save setting.
- Press **Esc** to cancel setting.

1.2.10 Set Threshold Of Event

- Use **←/→** or **F2/F3** to move quadrate cursor , until move it to **Thresh.** item. The Threshold Setup screen appears, same as IOR Setup screen.
- Use **▲/▼** or **◀/▶** to select character button.
- Press **Enter** to input character of character button at place of quadrate cursor in input window.
- Press **F1** to confirm and save setting.
- Press **Esc** to cancel setting.

- Note!**
- (1) After analyze the trace, Only events whose splice loss exceed the threshold of event will be listed in event table.
 - (2) The value of threshold is between 0.01 to 30.00.

1.3 Cleaning and Connecting Optical Fibers

- Caution!** **To ensure maximum power and to avoid erroneous readings:**
- **Always clean fiber ends as explained below before inserting them into the port. The 41st Institute of CETC is not responsible for damage or errors caused by bad fiber cleaning or handling.**
 - **Ensure that your connectors has appropriate connectors of OTDR. Joining mismatched connectors will damage the ferrules.**
 - Clean the fiber ends as follows:
 - ✧ Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol.
 - ✧ Use compressed air to dry completely.
 - ✧ Visually inspect the fiber end to ensure its cleanliness.

- 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.
- 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.

1.4 Testing Fiber


















The AV6416 OTDR offers different test modes:

- **Auto:** Auto sets test parameters, performs tests at the specified wavelength, and provides results by event table.
- **Manual Real-Time:** Sets all test parameters manually, enables to view sudden changes in the fiber link. In this mode, trace is refreshed instead of averaged.
- **Manual Average:** Sets all test parameters manually. This mode used to improve the trace SNR.
- **Dead Zone:** In this mode, Range is 4km, Pulse width is 10ns and Att. is 10dB. Now, the dead zone is minimum, but the distance span to be tested is also minimum.

- Caution!**
- **Never connect a live fiber to the OTDR port. This could result in permanent damage to the OTDR, make sure that all fibers under test are inactive at the time of and during connection.**
 - **To avoid serious eye injury, never look directly into the optical outputs of fiber optic network equipment, test equipment, patch cords, or test jumpers, and ensure that your eyes are protected at all times.**





















1.4.1 Testing In Auto Mode

The application will automatically evaluate the best settings according to the fiber link currently connect to the instrument.

- Clean the connectors properly (See 1.3 *Cleaning and Connecting Optical Fibers* on page 29).
- Press  (corresponding to ) in the first menu of main screen, then press  (corresponding to **SetOTDR**) into OTDR Setup screen.
- Use / or / to move quadrate cursor , until move it to **Mode**. Select **Auto**.
- Use  /  or  /  to move quadrate cursor, and Use / or  /  to select **Wavelength, Times, IOR, Helix** and **Threshold** .
- Press  to confirm and save setting.
- Press  to start the acquisition.
After getting fiber trace, the OTDR will auto stop test and give event table.

1.4.2 Testing In Manual Real-Time/Average

The application will test under measurement parameters manually.

- Clean the connectors properly (See 1.3 *Cleaning and Connecting Optical Fibers* on page 29).
- Press  (corresponding to ) in the first menu of main screen, then press  (corresponding to **SetOTDR**) into OTDR Setup screen.
- Use / or / to move quadrate cursor , until move it to **Mode**. Select **Real-Time or Average**.
- Use  /  or  /  to move quadrate cursor, and Use / or  /  to select **Wavelength, Times, Range, Pulse, Att., IOR, Helix** and **Threshold**.
- Press  to confirm and save setting.
- Press  to start the acquisition.
- Press  again or press  to stop test. Under manual average mode, the OTDR will stop test when average times is up to the value of **Times**.
- Press  (corresponding to **Analyse**) in the first menu of main screen, then the AV6416 OTDR will analyze trace data automatically and give event table.
- You can set markers manually to measure loss, length and attenuation of fiber section (explained below).

1.5 Analyze Trace and View Event Table

➤ Auto Test :

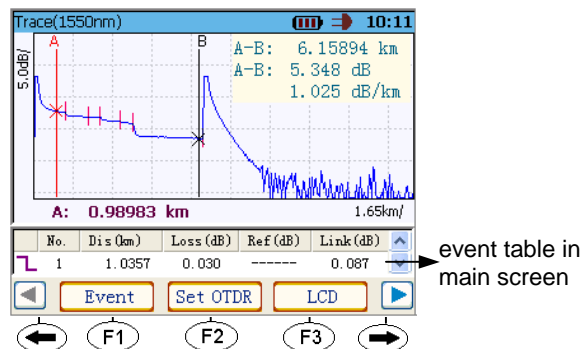
The AV6416 OTDR will analyze trace data automatically and give event table after getting acquisition.

➤ Manul Real-Time and Manual Average :

- ✧ press **F3** (corresponding to **Analyze**) in the first menu of main screen, then the AV6416 OTDR will analyze trace data automatically and give event table.
- ✧ Select **Item** in *OTDR Setup* screen (see *Item* on page 16 and *Set Measure Item* on page 23). Set markers manually to measure loss, length, reflectance and attenuation of fiber section etc.

1.5.1 Event Table in Main Screen

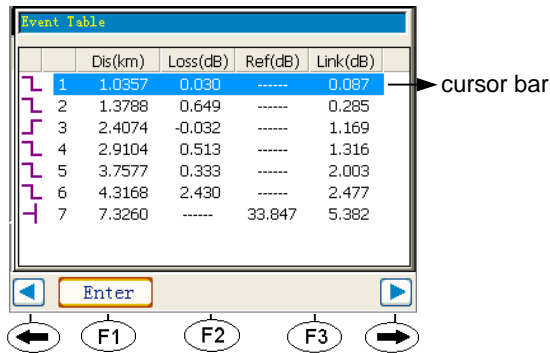
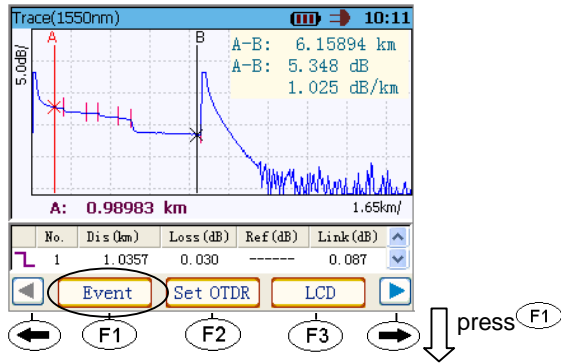
In main screen , press **▲** / **▼** to view every event in event table. See the following figure.



1.5.2 Event Table Screen

After analyze trace, you can view events in *Event Table Screen*. (If there are not events, Event Table is empty.)

- press **→** (corresponding to **▶**) in the first menu of main screen, then press **F1** (corresponding to **Event**) , the *Event Table* screen appears. All events will be displayed in this screen. See the following figure.
- press **▲**/**▼** to move up or move down cursor bar.
- press **▶** / **◀** to page up or page down .
- press **F1** or **Enter** or **Esc** to exit Event Table screen.



Note! : Reflection Event : Down Event
 : Up Event : End of the fiber

No. : the Number of event.

Dis(km) : the distance between this event to origin(the OTDR' output).

Loss(dB) : the loss in dB for this event

Ref(dB) : the reflectance measured at this event .

Link(dB) : the link loss from to origin(the OTDR's output) to this event.

1.6 Troubleshooting

➤ **There are not fiber trace on the screen**

If the trace on the screen only has reflex crest, but hasn't linear trace of fiber.

Please :

- ✧ Ensure that your connectors has appropriate connectors of OTDR.
- ✧ Ensure the connector of OTDR is OK.
- ✧ Ensure you have cleaned the fiber end and connect before test.
- ✧ Use VFL function to check the near section of fiber, ensure there are not heavy loss.
- ✧ Please change test mode and measurement parameters, then test fiber again. Example select manual average mode and add the value of Average Times, or select longer pulse to improve the trace SNR.

➤ **There are heavy loss and reflection on fiber trace or the attenuation of fiber section is too big**

Please :

- ✧ Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol , ensure the fiber end cleanliness before test. (See *1.3 Cleaning and Connecting Optical Fibers* on page 29).
- ✧ Ensure the fiber-optic cable is adequate connected.
- ✧ Please select shorter pulse to get smaller dead zone, then test fiber again.
- ✧ Please select manual average and add average times to improve the trace SNR, then test fiber again.

➤ **The trace SNR is lower**

If the trace SNR is lower, some events will be losed after analyse and measurements become inaccurate and non-repeatable.

Please:

- ✧ Ensure you have cleanned the fiber end befor test (See *1.3 Cleaning and Connecting Optical Fibers* on page 29).
- ✧ Ensure the fiber-optic cable is adequate onnected.

- ✧ Add average times to improve trace SNR, then test fiber trace again.

➤ **The length of fiber is error**

Please:

- ✧ Ensure you have set the correct **IOR** and **Helix factor**.

2 Moving Cursor and Zooming Trace

2.1 Move Cursor

- In main screen, press ◀ / ▶ to move active cursor (red cursor) one point.
- In main screen, push down ◀ / ▶, after move active cursor (red cursor) ten points left or right in step 1 point, active cursor moves left or right in step 10 points. Until push up ◀ / ▶ to stop.

Note!

- (1) Only active cursor can be moved.
- (2) The active cursor is red, non-active cursor is black.
- (3) Active cursor moves with marker which placed on this cursor.

2.2 Set Active Cursor

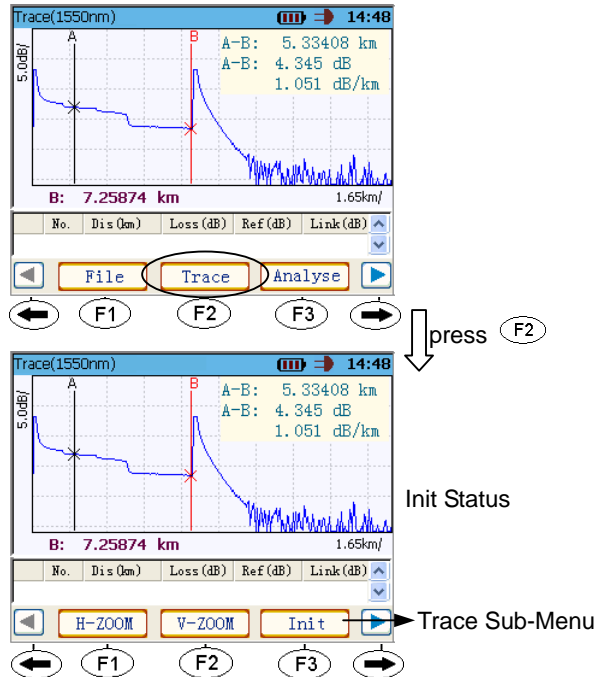
In main screen, press **Enter** to place active cursor to different marker.

2.3 Set Marker

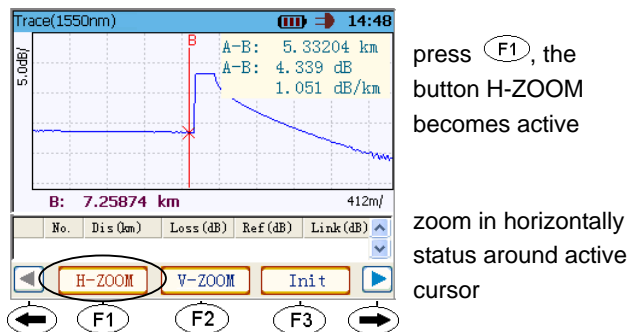
- Place active cursor to marker which you want to move.
- Move active cursor to place this marker to destination.

2.4 Zoom In and Zoom Out Trace Horizontally

- Press **F2** (corresponding to **Trace**) in the first menu of main screen, The *Trace Sub-Menu* appears on menu bar. See the following figure.



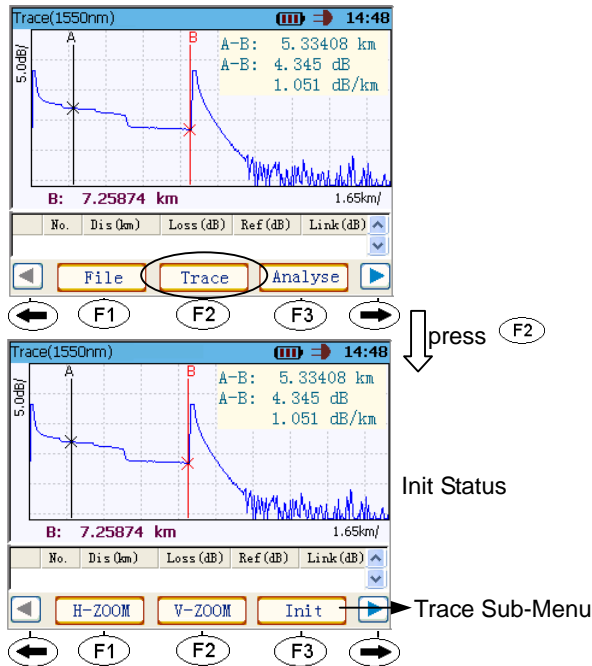
- Press **(F1)** (corresponding to **H-ZOOM**) in *Trace Sub -Menu*, the button **H-ZOOM** becomes active. Here, you can zoom in or zoom out trace horizontally around active cursor.



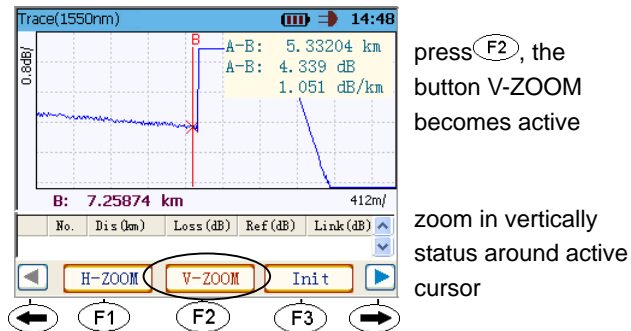
- Here, press **(▲)** to zoom in trace horizontally around active cursor.
- Here, press **(▼)** to zoom out trace horizontally around active cursor.
- Press **(◀) / (▶)** to move active cursor left or right.
- Here, press **(F1)** (corresponding to **H-ZOOM**) in *Trace Sub-Menu* again, the button **H-ZOOM** becomes non-active. Here, you can not zoom in or zoom out trace horizontally.

2.5 Zoom In and Zoom Out Trace Vertically

- Press **F2** (corresponding to **Trace**) in the first menu of main screen, The **Trace Sub-Menu** appears on menu bar. See the following figure.



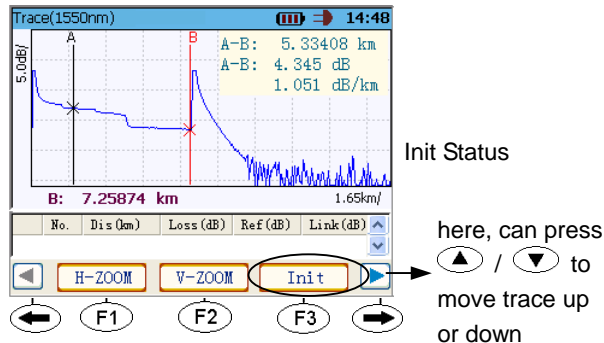
- Press **F2** (corresponding to **V-ZOOM**) in **Trace Sub -Menu**, the button **V-ZOOM** becomes active. Here, you can zoom in or zoom out trace vertically around active cursor.



- Here, press **▲** to zoom in trace vertically around active cursor.
- Here, press **▼** to zoom out trace vertically around active cursor.
- Press **◀** / **▶** to move active cursor left or right.
- Here, press **F2** (corresponding to **V-ZOOM**) in **Trace Sub-Menu** again, the button **V-ZOOM** becomes non-active. Here, you can not zoom in or zoom out trace vertically.

2.6 Init Trace

- Press **F2** (corresponding to **Trace**) in the first menu of main screen, The *Trace Sub-Menu* appears on menu bar. See the following figure.
- Here, press **F3** (corresponding to **Init**) to init trace. Button **H-ZOOM** and button **V-ZOOM** are all non-active at the same time.



2.7 Move Trace Up / Down

See above figure, In *Trace Sub-Menu*, when button **H-ZOOM** and button **V-ZOOM** are all non-active, you can press **▲** or **▼** to move trace up or down.

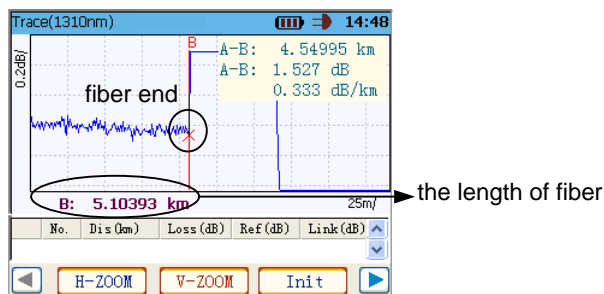
3 Measuring Length / Loss Of Fiber Manually

After a trace has been acquired or recalled from memory disk, you can zoom in and out of any event or trace segment to measure length, loss and attenuation of fiber section etc by placing markers manually.

3.1 Measure Length of Fiber









To measure the distance to an event or length of fiber:

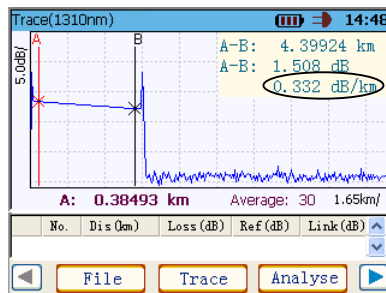
- Move current active cursor to an event or fiber end on trace.
- Zooms out trace horizontally enough and vertically enough (around active cursor).
- Move active cursor to event or fiber end closely.
- The distance of active cursor is the length from event to OTDR's output. See the following figure.



3.2 Measure Attenuation of Fiber Section (dB/km)

To measure attenuation of fiber section:









- Press  (corresponding to ) in the first menu of main screen, then press  (corresponding to **SetOTDR**) into OTDR Setup screen.
- Use / or / to move quadrate cursor , until move it to **Item**. Select **Loss**. Press  confirm and return. There are two markers(marker A and marker B) in main screen.
- Place marker A and marker B at any two points on the linear area of trace.
- Zoom in the trace and fine-turn the marker positioning if necessary. The distance of marker A to marker B must larger than 500m.
- Then you can get the attenuation of fiber section between marker A to marker B. (See the following figure)

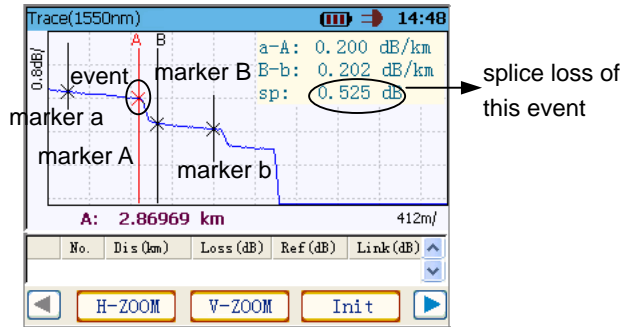


→ attenuation of fiber section between marker A to marker B

3.3 Measure Splice Loss

To measure the distance to an event:

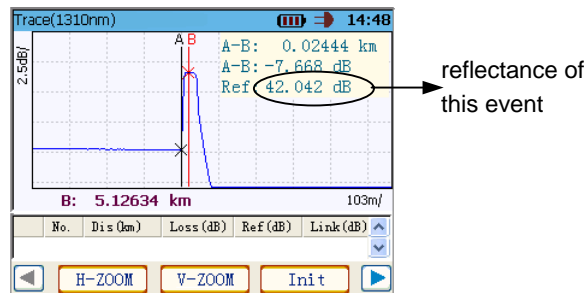
- Press  (corresponding to ) in the first menu of main screen, then press  (corresponding to **SetOTDR**) into OTDR Setup screen.
- Use / or / to move quadrate cursor , until move it to **Item**. Select **Splice**. Press  confirm and return. There are four markers in main screen.
- Zoom in the trace and position marker A at the **end** of the linear area **preceding** the event to be measured.
- Zoom in the trace and position marker a (small cursor before marker A) at the **beginning** of the linear area **preceding** the event to be measured.
- Zoom in and position marker B at the **beginning** of the linear area **following** the event to be measured.
- Zoom in and position marker b (small cursor after marker B) at the **end** of the linear area **following** the event to be measured.
- Then the splice loss of event is display on the screen. See the following figure.



3.4 Measure Reflectance

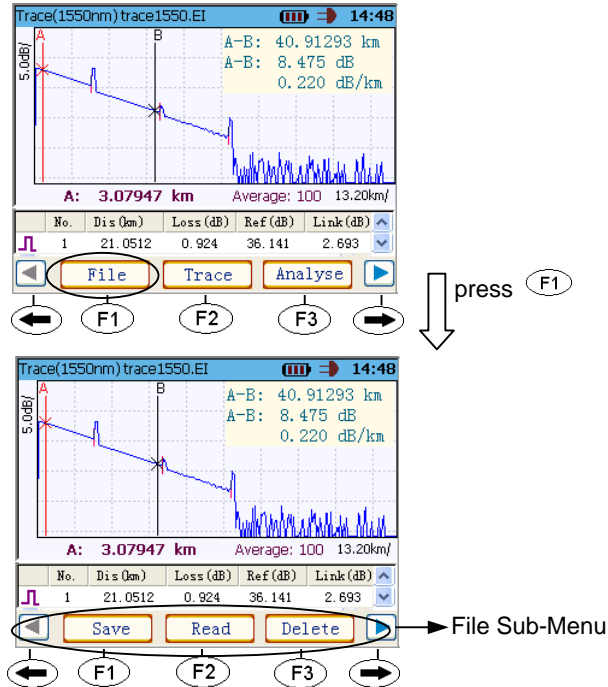
To measure reflectance:

- Press \rightarrow (corresponding to \rightarrow) in the first menu of main screen, then press $F2$ (corresponding to **SetOTDR**) into OTDR Setup screen.
- Use \leftarrow/\rightarrow or $F2/F3$ to move quadrate cursor , until move it to **Item**. Select **Reflect**. Press Enter confirm and return. There are two markers in main screen.
- Zoom in and position marker A at the end of the linear area preceding the event to be measured.
- Zoom in and position marker B at the top of the reflective event.
- Then you can get the reflectance of this event. See the following figure.



4 Managing Trace Files

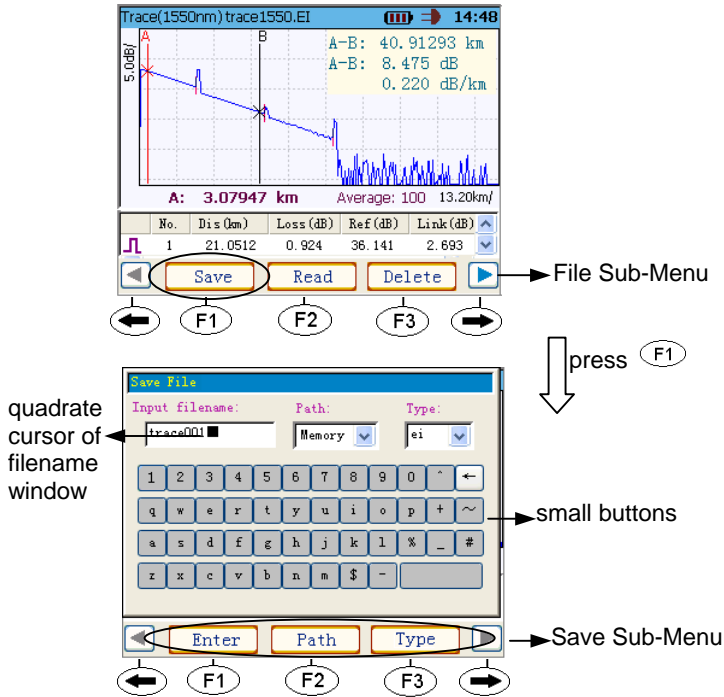
Press **F1** (corresponding to **File**) in the first menu of main screen, then *File Sub-Menu* appears on menu bar. See the following figure.



4.1 Storing a Trace File

To storing a trace file:

- Press **F1** (corresponding to **Save**) in *File Sub-Menu*. The *Save File* window appears. See the following figure.

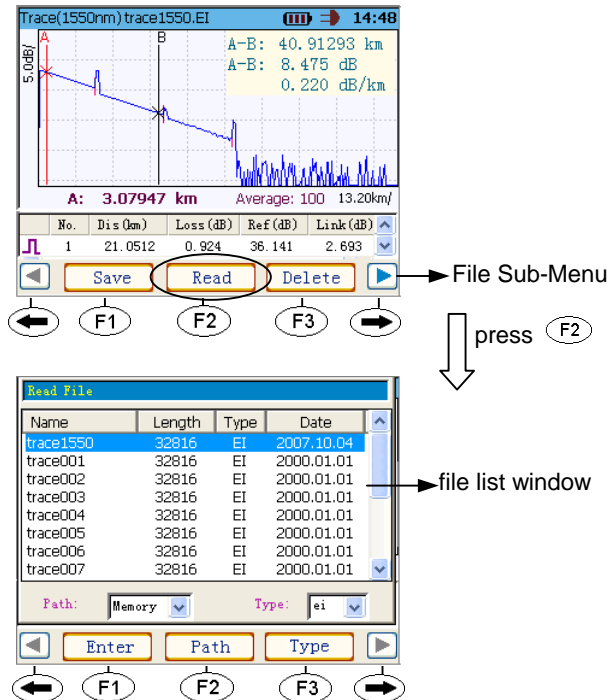


- Use \uparrow , \downarrow , \leftarrow , \rightarrow select small button.
- Press Enter to input character of small button to place of quadrate cursor. If the selected small button is \leftarrow , after press Enter , it will delete the character before quadrate cursor.
- Press F2 to select path of storage. You can select **memory** or **USB** disk.
- Press F3 to select type of storage file. You can select .EI (AV6416 EI Type) or .SOR (Bellcore Type).
- Press F1 to save file and return.
- Press Esc to cancel storage and return.

4.2 Recalling a Trace File

To recalling a trace file:

- Press **F2** (corresponding to **Read**) in **File Sub-Menu**. The **Read File** window appears. See the following figure.

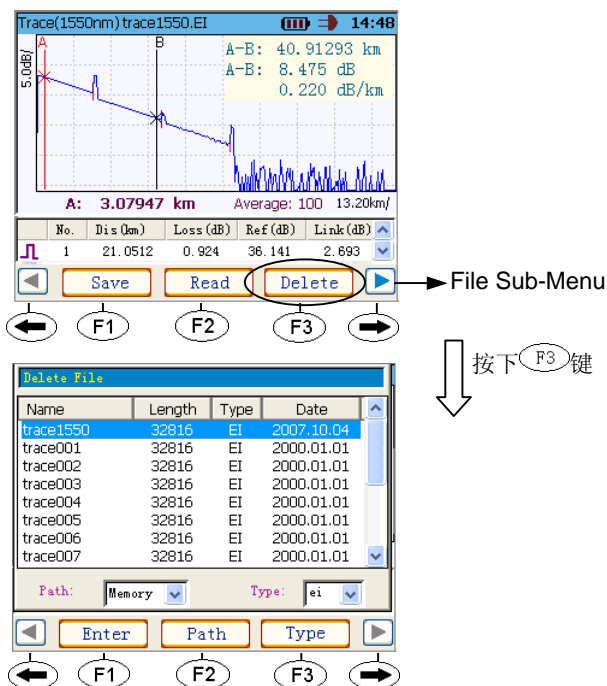


- Press **▲** or **▼** to move cursor bar to highlight trace file.
- Press **◀** or **▶** to page up or page down file list.
- Press **F2** to select path of recalling. You can select **memory** or **USB** disk.
- Press **F3** to select type of file. You can select **.EI** (AV6416 EI Type) or **.SOR** (Bellcore Type).
- Press **Enter** or **F1** to recall the trace file selected by cursor bar and return main screen. If recalling succeed, the trace in file will be displayed in main screen.
- Press **Esc** to cancel recalling and return.

4.3 Deleting a Trace File

To recalling a trace file:




- Press **F3** (corresponding to **Delete**) in **File Sub-Menu**. The **Delete File** window appears. See the following figure.

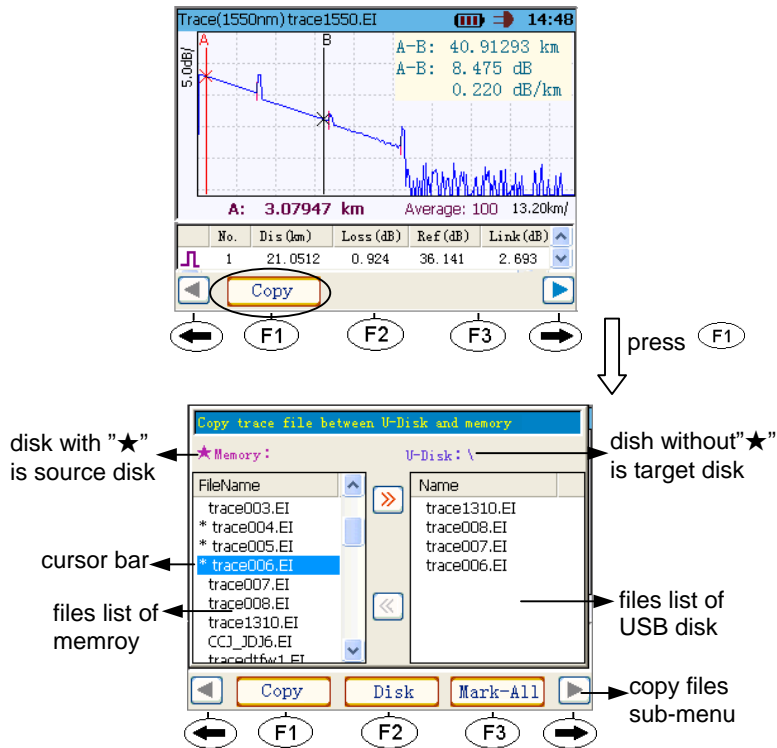


- Press **▲** or **▼** to move cursor bar to highlight trace file.
- Press **◀** or **▶** to page up or page down file list.
- Press **F2** to select path of recalling. You can select **memory** or **USB** disk.
- Press **F3** to select type of file. You can select **.EI** (AV6416 EI Type) or **.SOR** (Bellcore Type).
- Press **Enter** or **F1** to delete the trace file selected by cursor bar and return **Delete File** screen.
- Press **Esc** to cancel deleting and return.

4.4 Copy Trace Files Between Memory To USB


To copy trace files between memory to USB:


- Press  (corresponding to ) in *File Sub-Menu*. Then press  (corresponding to **Copy**), the *Copy File* window appears. See the following figure.



Source Disk:

There is "★" before disk name, at the same time, there is cursor bar in files list window.

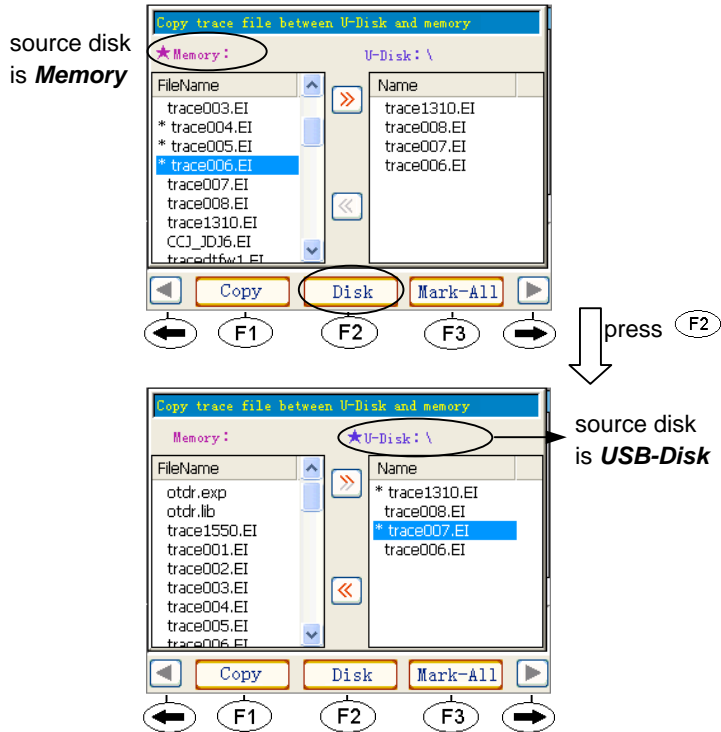
You can press  to place a tag(*) at file selected by cursor bar, only tagged files can be copied to target disk.

Press  (corresponding to **Disk**) in *Copy Sun-Menu* to select source disk (**Memroy** or **USB** disk).

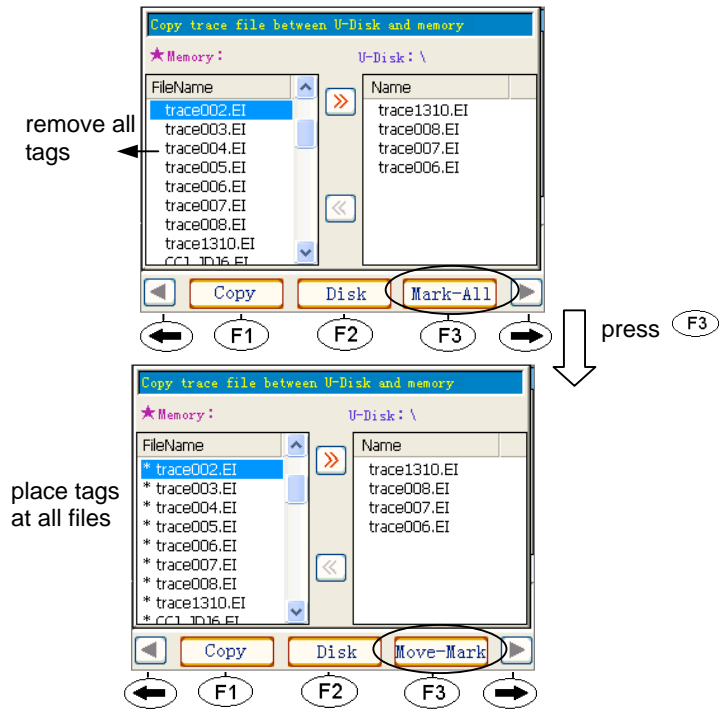
Target Disk:

There isn't "★" before disk name, at the same time, there also isn't cursor bar in files list window.

- Press **F1** (corresponding to **Copy**) to copy tagged files from source disk to target disk.
- Press **F2** (corresponding to **Disk**) to select source disk (**Memory** or **USB** disk).
- Press **Esc** to cancel copy and return. See the following figure.



- Press **▲** or **▼** to move cursor bar up or down.
 - Press **◀** or **▶** to page up or page down files.
 - Press **Enter** one time to place a tag(*) at file selected by cursor bar, press **Enter** again to remove a tag at file selected by cursor bar.
 - When button above **F3** directly reads **Mark-All**, press **F3** to place tag at all files of source disk, at the same time, this button reads **Move-Mark**.
 - When button above **F3** directly reads **Move-Mark**, press **F3** to remove all tags at files of source disk, at the same time, this button reads **Mark-All**.
- See the following figure.

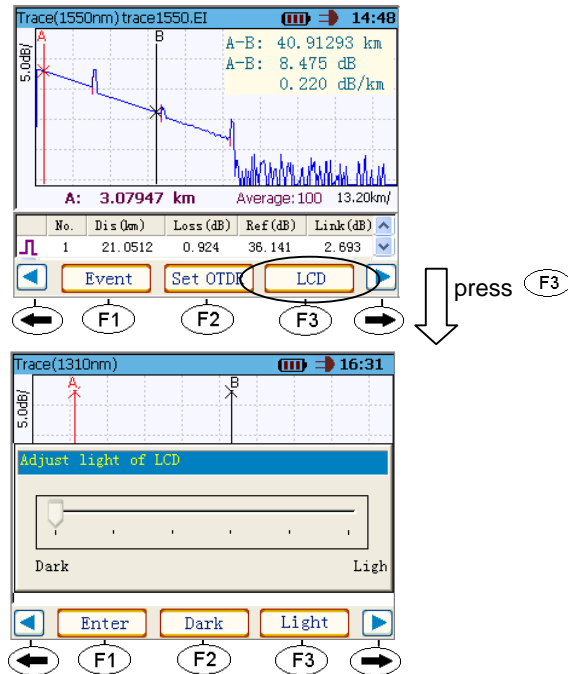


5 Adjusting the LCD Brightness

To fit your work environment, you may adjust the LCD brightness.








To Adjust the LCD brightness :

- Press **→** (corresponding to **▶**) in the first menu of main screen, then press **F3** (corresponding to **LCD**) into **LCD Brightness Adjust** screen. See the following figure.

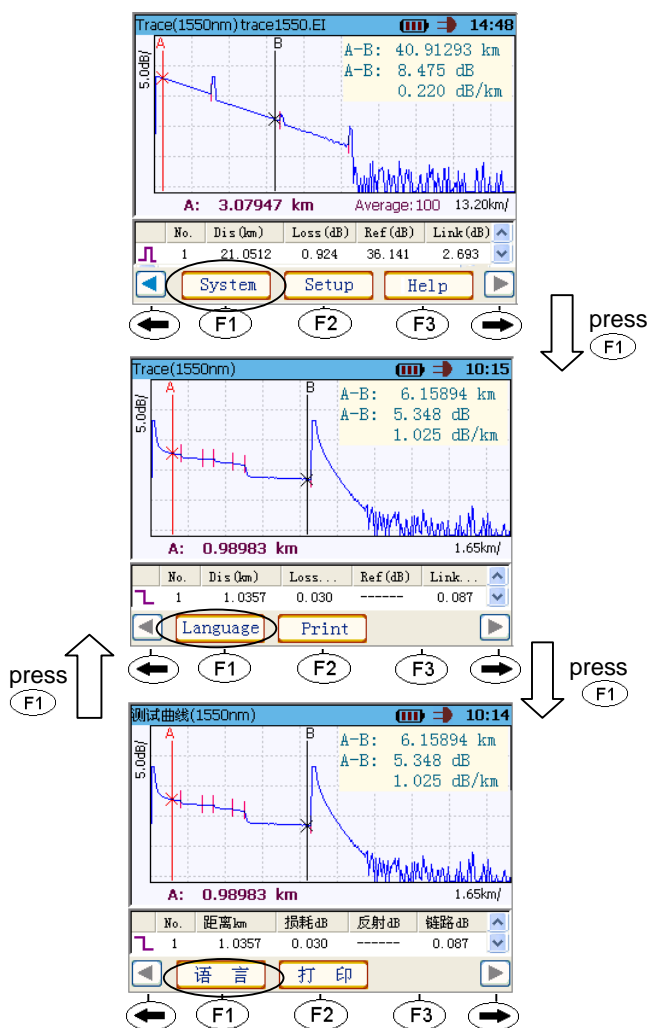


- Press **F2** (corresponding to **Dark**) to lower LCD brightness.
- Press **F3** (corresponding to **Light**) to light LCD brightness.
- Press **Enter** or **F1** to confirm and return.
- Press **Esc** to cancel and return.




6 Change Language

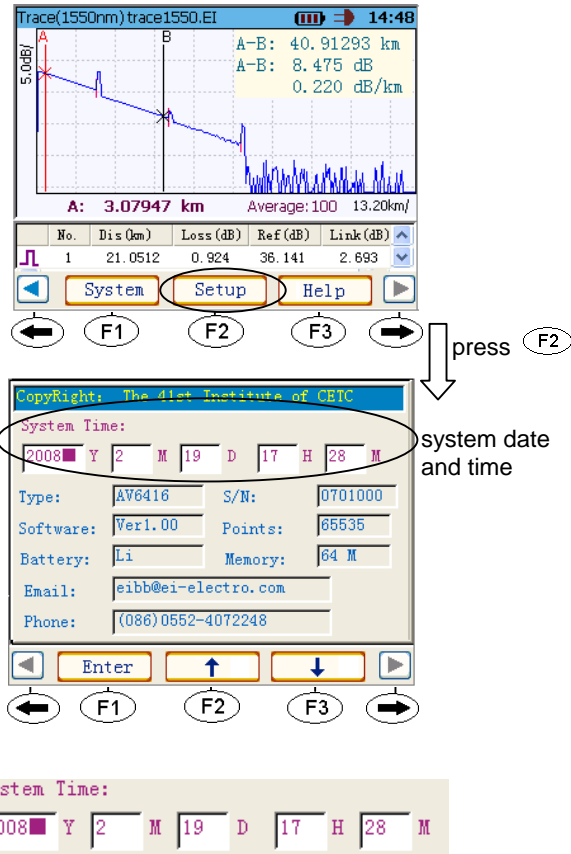
- Press  (corresponding to ) twice in the first menu of main screen, press  (corresponding to **System**) into *System Sub-Menu* screen.
- Press  (corresponding to **Language**), the language of interface changes **Simple Chinese**, at the same time, this button above  directly reads 语言.
- When the button above  directly reads “语言”, press , the language of interface changes **English**, at the same time, this button reads **Language**.










See the following figure.






7 Setting Date and Time

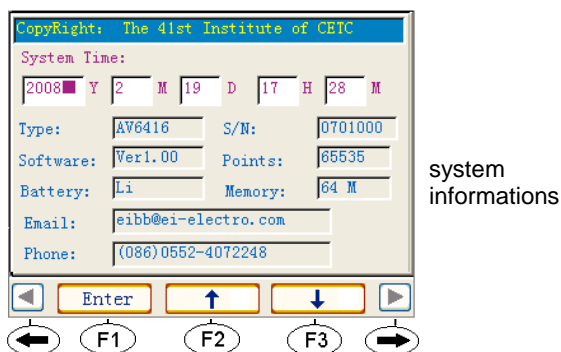
- Press  (corresponding to ) twice in the first menu of main screen, press  (corresponding to **Setup**) into *Information* screen. See the following figure.



- Press  /  to move quadrate cursor to different item.
- Press , ,  or  to modify value.
- Press  or  to confirm setting and return.
- Press  to cancel and return.









8 View System Informations

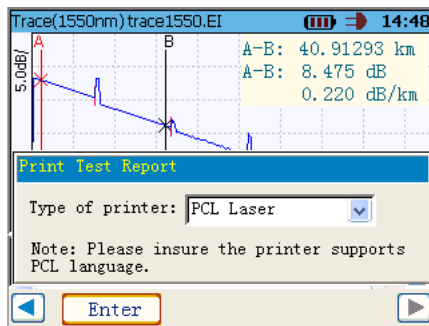
Press  (corresponding to ) twice in the first menu of main screen, press  (corresponding to **Setup**) into *Information* screen. See the following figure.



9 Printing Report

Caution! (1) The instrument only supports printers which support PCL language.
 (2) Suggest use OTDRVIEW to print reports.

- Please connect printer to USB port of instrument.
- Press  (corresponding to ) twice in the first menu of main screen, press  (corresponding to **System**) into *System Sub-Menu* screen.
- Press  (corresponding to **Print**), the *Print Screen* appears.
- Press  or  to select “PCL Laser” or “PCL Inkjet”.
- Press  (corresponding to **Enter**) or  to print report.



If printing is failing, Please do:

- Ensure printer supports PCL printer language.
- Ensure the printer cable is OK.
- Ensure the printer is OK.
- Suggest copy trace files to PC, then use OTDRVIEW to print reports.


10 Visual Fault Locator

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

- Press **Esc** to stop OTDR test.
- Connect the fiber under test to the VFL port.
- Press down **VFL** about 4 seconds. From its dedicated port, the VFL emits a red signal which becomes visible at the location of a fault on the fiber. Here, the signal is continuous.
- Press **VFL** again, the signal is blinking.
- Here, Press **VFL** again, the VFL is closed.

Caution! When the VFL is active, the VFL port emits visible laser radiation. Avoid exposure and do not stare directly into the beam.

11 Help

- Press **→** (corresponding to ) twice in the first menu of main screen.
- Press **F3** (corresponding to **Help**), the *Help Screen* appears. See the following figure.
- Press **F2** or **▲** to move up quadrate cursor or page up .
- Press **F3** or **▼** to move down quadrate cursor or page down.
- Press **Enter** to into sub-item window.
- Press **F1** or **Esc** to return previous window.

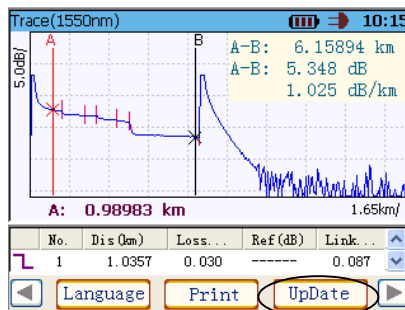
The first screenshot shows the main OTDR trace screen. At the bottom, the 'Help' button is circled in red. An arrow points to it with the text 'press F3'. Below the screen are navigation buttons: a left arrow, F1, F2, F3, and a right arrow.

The second screenshot shows the 'AV6416 OTDR Help Information' menu. A red square cursor is positioned over the 'About use of battery!' option. An arrow points to it with the text 'quadrate cursor'. Below the screen are navigation buttons: a left arrow, Return, F1, F2, F3, a right arrow, and a down arrow.

The third screenshot shows the 'About use of battery:' screen with a list of instructions. An arrow points to the screen with the text 'press Enter'. To the right of the screen, the text 'explain about battery' is written.

12 System Update

- Press (corresponding to) twice in the first menu of main screen, press (corresponding to **System**) into *System Sub-Menu* screen.

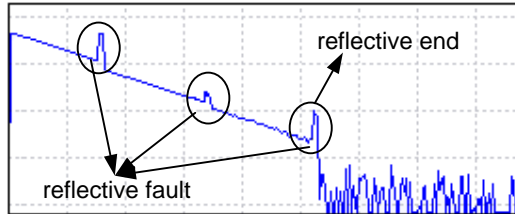


- Copy required files to root directory of USB disk.
- Connect USB disk to OTDR.
- Press **F3** (corresponding to **Update**), then press **Enter** into *update* window.
- Press **Enter**, then update files of AV6416 OTDR by USB disk.
- After update, you have to power up OTDR again.

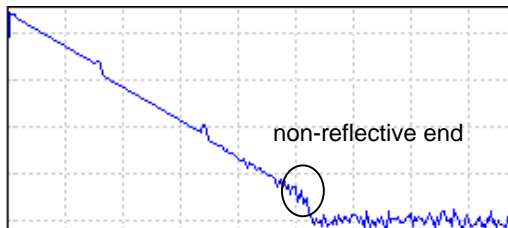
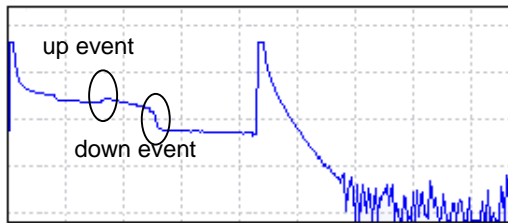
Chapter 4 Description of Event Types

Event type includes reflective event, non-reflective event etc..

Reflective event includes reflective fault, reflective end. See the follow figure.



Non-reflective event includes down event, up event and non-reflective end etc..



Chapter 5 Specifications

Specifications¹:

| Item | Content |
|--------------------------------|---|
| Optical output connector | FC-PC (standard) |
| Screen | 320x240 3.5-inch color LCD (Touchscreen) |
| Range (km) | 4、 8、 16、 32、 64、 128、 256 (SMF) |
| Pulse width (ns) | 10、 30、 80、 160、 320、 640、 1280、 2560、 10240 (SMF) |
| IOR | Adjust between 1.00000 to 2.00000 |
| Helix | Adjust between 0.80000 to 1.00000 |
| Resolution | Sampling resolution: 0.125m(max) Distance read-out resolution: 0.00001km Loss read-out resolution: 0.001dB |
| Distance accuracy ² | $\pm(1m + \text{sample spacing} + \text{measured distance} \times 0.03\%)$ |
| Loss accuracy | ± 0.02 dB/km (SMF) |
| Dynamic range ³ | 28 / 24 / 26 (1310/1490/1550) dB |
| Event dead zone ⁴ | 2.5m |
| VFL laser output power | 2mw |
| Sampling points | up to 65535 |
| Memory capacity | 500 traces (for .ei) |
| Language | Chinese、 English (can be selected) |
| Port | USB , Mini-USB |
| Power supply | AC/DC (AC100~240V, 50/60Hz), DC: 15~20V,2.5A Battery life is over 10 hours (Low lightness, not sampling). |
| Environmental | operation temperature: 0°C to 50°C; (Charging: 5°C to 45°C). Storage temperature: -20°C to 60°C (not Exclude Battery) Relative humidity: 5% to 95%RH(No Condensation) |
| Dimensions and weight | DxWxH: 215mm×100mm×60mm weight: about 1kg |

Note!

1. All specifications valid at 23 ± 2 with an FC/PC connector, unless otherwise specified.
2. Does not include uncertainty due to fiber index.
3. Typical dynamic range with longest pulse and more than 300 times averaging at SNR = 1.
4. Typical dead zone for singlemode reflectance below -45dB , using shortest pulse(10ns), maximal attenuation (10dB).

Addendum A Cleaning Optical Devices

Please Note:

- Always clean optical connectors before using them.
- Clean the fiber end before test.
- Keep the instrument free of dust.
- Regular cleaning of optical connectors will help maintain measurement accuracy.
- Always cover connectors with protective caps when instrument is not in use. Be careful when replacing dust caps after use. DO not press the bottom of the cap onto the fiber too hard, as any dust in the cap can scratch or pollute your fiber surface.

It is important to clean optical devices:

- In transmission links optical fiber cores are very small size in diameter. Dust and other particles, however, can range from tenths to hundredths of microns in diameter. Their comparative size means that they can cover a part of the end of a fiber core, and as a result will reduce the performance of your system.
- Furthermore, the power density may burn dust into the fiber and cause additional damage. If this happens, measurements become inaccurate and non-repeatable.

Please follow the following safety rules:

- Make sure that you disable all sources when you are cleaning any optical interfaces.
- Under no circumstances look into the end of an optical device attached to optical outputs when the device is operational. The laser radiation is not visible to the human eye, but it can seriously damage your eyesight.
- Do not install parts or perform any unauthorized modification to optical devices.

Standard Cleaning Equipment

- ✧ Isopropyl alcohol
- ✧ Cotton swabs
- ✧ Soft tissues
- ✧ Compressed air

Isopropyl alcohol:

If you use isopropyl alcohol to clean your optical device, do not immediately dry the surface with compressed air (except when you are cleaning very sensitive optical devices). This is because the dust and the dirt is solved and will leave behind filmy deposits after the alcohol is evaporated. You should therefore first remove the alcohol and the dust with a soft tissue, and then use compressed air to blow away any remaining filaments.

Do not use any other solvents, as some may damage plastic materials and claddings. To avoid damage, only use isopropyl alcohol.

Cotton swabs:

Enusre that you use natural cotton swabs. Foam swabs will open leave behind filmy deposits after cleaning.

Use care when cleaning, and avoid pressing too hard onto your optical device with the swab. Too much pressure may scratch the surface, and could cause your device to become misaligned. It is advisable to rub rently over the surface using only a small circular movement.

Swabs should be used straight out of the packet, and never used twice. This is because dust and dirt in the atmosphere, or from a first cleaning, may collect on your swab and scratch the surface of your optical device.

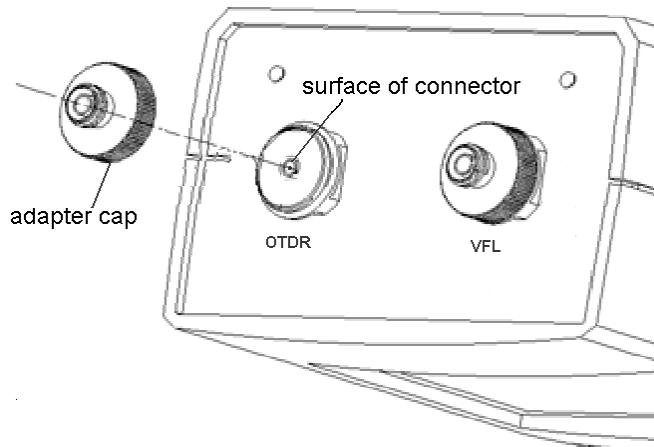
Compressed air:

It is essential that your compressed air is free of dust, water and oil. Only use clean, dry air. If not, this can lead to filmy deposits or scratches on the surface of your connector. This will reduce the performance of your transimission system.

When spraying compressed air, hold the can upright. If the can is held at a slant, propellant could escape and dirty your optical device. First spray into the air, as the initial stream of compressed air could contain some condensation or propellant. Such condensation leaves behind a filmy deposit.

To clean connectors :

- Turn off power.
- Remove the adapter cap from the outputs of instrument to expose the connector baseplate and ferrule.



- Clean the connectors by rubbing a new cotton-swab with isopropyl alcohol over the surface using a small circular movement.
- Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.
- Blow away any remaining lint with compressed air.
- After clean, put adapter cap back onto the connector.

Caution! Being careful not to touch the soft end of the swab, moisten a cleaning tip with only one drop of isopropyl alcohol. Alcohol may leave traces if used abundantly. Do not use bottles that distribute too much alcohol at a time.

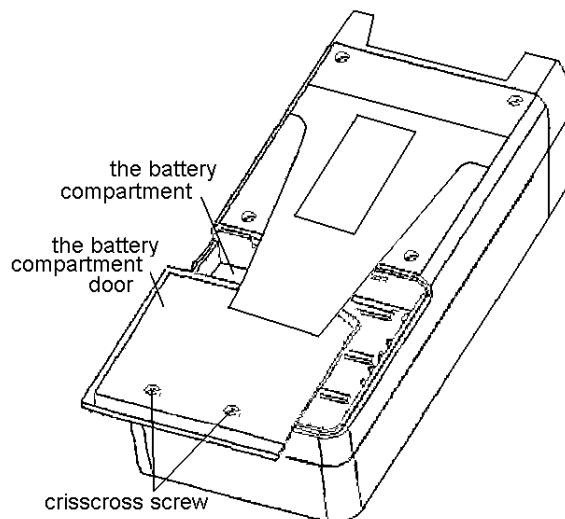
Addendum B Maintenance of Battery and Replacing Battery

Please Note :

- If your battery is new or has been in storage for a long time, you may need to charge it two or three times to achieve optimum performance levels.
- It is best if you charge the battery at a limited and controlled temperature(5 °C to 45°C).
- Remove your battery from the AV6416 OTDR when not in use. Store at room temperature, and in a dry place for optimal performance.
- A charged battery will gradually lose its charge if left in storage. It is therefore better if you top-off the charge before use.
- It is good practise to recharge the battery every 2-3 months during storage.
- The time of charging should not too long, otherwise, the battery may be damaged.
- The battery should not be discharge excess, otherwise, the battery may be damaged.

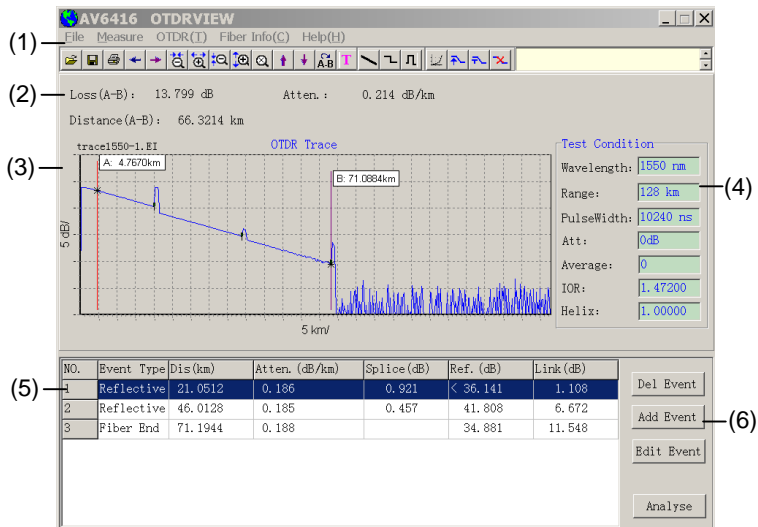
To replacing battery:

- Before you remove the battery, you must turn off the AV6416 OTDR.
- Remove two screws on the battery compartment door using located at the back of the instrument with small crisscross screwdriver, and open the battery compartment door.
- Replace the battery.
- Close the battery compartment door, fix two of the crisscross screw back to the battery compartment door .



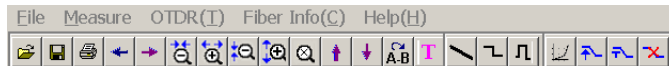
Addendum C AV6416 OTDRVIEW

The interface of AV6416 OTDRVIEW



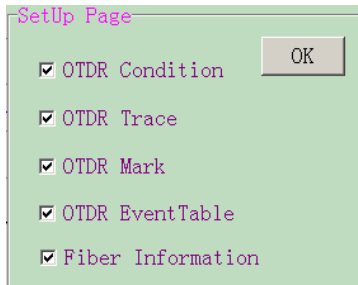
- (1): Menus and shortcut button
- (2): Measurement results
- (3): Trace and cursor etc.
- (4): Test Condition
- (5): Event Table
- (6): Analyse and Eedit buttons


Shortcut Button














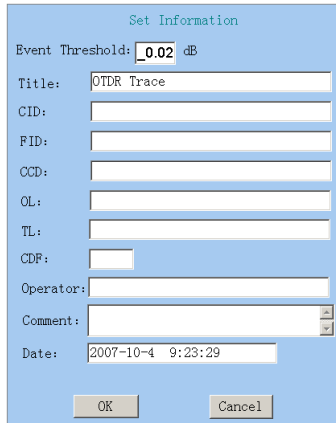
- : Open data file.
- : Save data file.
- : Print test report.


Press **【File】** — **【Set Page】** to set contents of report, See follow figure:




Then press  or press **【File】 — 【Print】** to print test report.

- : Move cursor left. (The active cursor is red.)
- : Move cursor right.
- : Zoom out horizontal (around active cursor) .
- : Zoom in horizontal (around active cursor) .
- : Zoom out vertical . (around active cursor)
- : Zoom in vertical . (around active cursor)
- : Init trace.
- : Move up trace.
- : Move down trace.
- : change active cursor.
- : Edit event threshold, cable informations etc.




: measure loss of fiber.


Loss(A-B): 13.799 dB Atten.: 0.214 dB/km
 Distance(A-B): 66.3214 km

: measure splice loss.

| | | | | |
|----------------|-----------|---------|------------------|------------------|
| Loss(A-B): | 2.164 dB | Atten.: | 0.185 dB/km(a-A) | 0.185 dB/km(B-b) |
| Distance(A-B): | 6.6314 km | Splice: | 0.934 dB | |

: measure reflectance.

| | | | |
|----------------|-----------|------|-----------|
| Loss(A-B): | 2.164 dB | | |
| Distance(A-B): | 1.0361 km | Ref: | 36.849 dB |

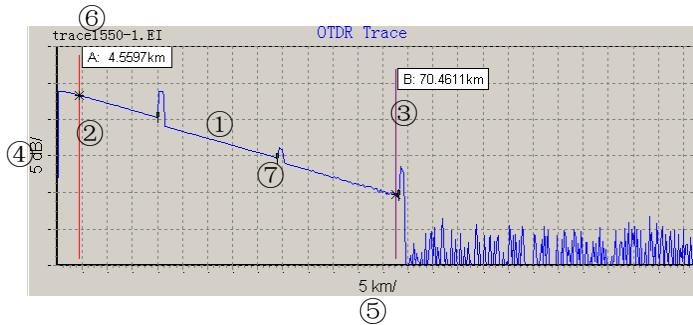
: Analyse trace data.

: Add Event.

: Edit Event.

: Delete Event.

Trace and Cursor etc



- ①: Trace
- ②: Cursor A
- ③: Cursor B
- ④: Vertical scale(dB/)
- ⑤: Horizontal scale (km/ or m/)
- ⑥: Name of file
- ⑦: Event points

Analyse and Edit buttons

Analyse : Analyse trace data.

Del Event : Delete event.

Add Event : Add event. You can set type of event and distance of event.

| | | | |
|------------|------------|-------------|---------------|
| Prev Event | | Add Event | |
| Type: | Reflective | Event Num: | 3 |
| Dis(km): | 46.0128 | Event Type: | NonReflective |
| Next Event | | Dis(km): | |
| Type: | Fiber End | | |
| Dis(km): | 71.1944 | | |
| | | OK | Cancel |

Edit Event: Edit event. You can edit typr of event and distance of event.

| | | | |
|------------|------------|-------------|------------|
| Prev Event | | Edit Event | |
| Type: | Reflective | Event Num: | 2 |
| Dis(km): | 21.0512 | Event Type: | Reflective |
| Next Event | | Dis(km): | |
| Type: | Fiber End | 46.0128 | |
| Dis(km): | 71.1944 | | |
| | | OK | Cancel |