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# XtendLan<sup>®</sup>

## OTDRHD-xVB

(Optical Time Domain Reflectometer)

User's Manual



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## Foreword

Thank you for buying our OTDRHD-xVB (optical time domain reflectometer).

This User's Manual introduces the necessary information of OTDRHD-xVB about its function, operating steps, precautions and correct operation and maintenance as well as its troubleshooting guide and technical support and service related information.

For correct operation, please read this User's Manual before use and properly keep it for future reference.

## Prompt

Content of this User's Manual is subject to change with performance and function promotion of the instrument without prior notice. Pictures in this User's Manual may differ from those displayed on the instrument.

We will try our best to make content of this User's Manual perfect. For any questions or errors in this User's Manual, please contact us or our dealers.

## Check the items packed

Before unpacking and using the instrument, check whether all the parts on the list below are available. For any nonconforming, missing or worn parts, contact us or our dealers as soon as possible.

No.	Name	Quantity
1	Main unit of OTDRHD-xVB	1 pcs
2	FC connector, ST connector and SC connector	1 pcs (respectively)
3	User' s Manual	1 copy
4	USB data cable	1 pcs
5	Software CD	1 pcs
7	Power adapter	1 pcs
8	Cleaning cotton swab	1 bag
9	Portable backpack	1 pcs
10	Certificate of quality	1 pcs

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## Safety instructions

For safe and effective use, please operate following the safety instructions herein.

### Safety signs used in this User' s Manual:

**WARNING!**

It is a **warning sign** for dangers. It reminds users of paying attention to a process, operating method or similar situation. A failure in operating correctly or obeying rules may result in personal injuries. Do not start the next step before you have fully understood and met the warning condition designated.

**CAUTION!**

It is a **caution sign** for dangers. It reminds users of paying attention to a process, operating method or similar situation. A failure in operating correctly or obeying rules may result in partial or complete damage or destruction of the instrument. Do not start the next step before you have fully understood and met the warning condition designated.

**NOTE**

It is a **prompt sign** for giving the information useful for operation and maintenance of the instrument.

**For personal safety of the operator, please obey the following precautions.**

**WARNING!**

**Use the power adapter correctly.**

Use the power adapter provided with the instrument only.

**Do not look straight into the laser.**

Laser beams are highly harmful for eyes, so avoid direct contact between naked eyes and the light directly emitted by the laser, the light reflected by the mirror, or the light coming in contact with eyes without specific eye shields.

**Do not use the instrument in a place with inflammable or explosive gases.**

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Use the instrument in legal safe places. Do not use it in places with inflammable or explosive gases or steam.

**Do not dismantle the shell.**

Only our maintenance personnel can dismantle the instrument shell. To avoid electric shocks, do not open the instrument shell and have it repaired by the qualified professionals authorized by us only. To avoid fires and electric shocks, do not expose the instrument in rain or humid places.

**Do not throw the instrument or impose a too large force on it.**

The instrument has an LCD. Do not throw it or impose too large force on it. If the LCD is violently collided, it may fracture and have liquid leakage. If there is liquid leakage, do not touch the LCD.

**Fit the optical port dust cap.**

After use, fit the optical port dust cap.

**In measurement and communication**

In an optical fiber measurement by the instrument, there should be no operating light in the optical fiber, otherwise the measurement result will be inaccurate or even result in permanent damage of the instrument.

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# 1 Product introduction

## 1.1 Product overview

Optical fiber communication is becoming an important pillar of the modern communication network, presenting increasingly stricter requirements for the construction, tests and maintenance of optical fiber links. As a product especially designed for the routine maintenance, fault finding and urgent repair of optical fiber links by engineers and designers, PalmOTDR provides a completely new application mode for optical fiber communication network testing through its original design. Compared with conventional OTDR products, it is smaller and more convenient in use. It is widely used in the construction, testing, maintenance and urgent repair of optical fiber communication systems, the development, production and testing of optical fiber fibers and cables, etc.

With a handheld structure, the instrument is small, light and portable. It displays event information on its TFT color display and can save data. Through a USB interface, it can upload test data to a PC for later processing, saving and printing.



## Performance features

- ◇ Palm type ensuring a light weight and easy carrying; shock and drop resistant sheath suitable for field measurements and on-site measurements
- ◇ Simple and user-friendly key design: In key operation, hotkey function, quick locating and event analysis points are integrated.
- ◇ Three-second starting: A measurement can be done immediately after start.
- ◇ Intelligent testing: It ensures simple operation and great functions.
- ◇ Optical alarming function: The incoming light at the optical port can be automatically tested and protected.
- ◇ Optional large-capacity SD card for the system: It can save 1 000 test waveforms at most.
- ◇ Low power consumption design: The product can be powered by a lithium battery or a dry battery.
- ◇ Simple operation and interfaces: Complicated trainings are not needed.
- ◇ VFL (visual fault locating) function
- ◇ Special supporting software: OTDR Viewer that can analyze and edit curves through PCs.

## Range of application

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Construction and maintenance of telecommunication projects

Construction and maintenance of CATV projects

Generic cabling system

Production and research of optical devices

Other optical fiber projects

## 1.2 Technical data

Technical specification ①	
Model	OTDRHD-xVB
Wavelength (nm)	1310/1550
Dynamic range (dB) ②	28/26 or 32/30
Pulse width (ns)	5/20/50/100/200/500/1000/2000/5000/10000/20000
Event dead zone (m) ③	3
Attenuation dead zone (m) ③	10
Linearity (dB/dB)	±0.05
Loss threshold (dB)	0.01
Loss resolution (dB)	0.01
Sampling resolution (m)	0.15~5
Sampling point	24K
Uncertainty of distance (m) ④	$\pm (1m+0.005\% \times \text{distance} + \text{sample interval})$
Distance range (Km)	1~120
Curve saving capacity	1000 pcs
Measuring duration	5s, 15s, 30s, 1min, 2min and 3min

General specification	
Dimensions (H×W×D)	210×112×67
Weight	1kg
Temperature	Operating temperature: 0℃~50℃
	Storage temperature: -20℃~60℃
Relative humidity	0%~95% (non-condensing)
Power supply	Lithium battery; continual operating time ≥8h (with optical ordinary dry batteries)

Interface type	
Optical interface	FC (ST/SC)/PC
Data interface	USB interface and SD card interface

Optional function modules	
VFL module	Wavelength: 650nm Maximum measuring distance: 5Km
stabilized light source module ⑤	Wavelength (±20nm): The same as the operating wavelength of OTDR

Remarks:

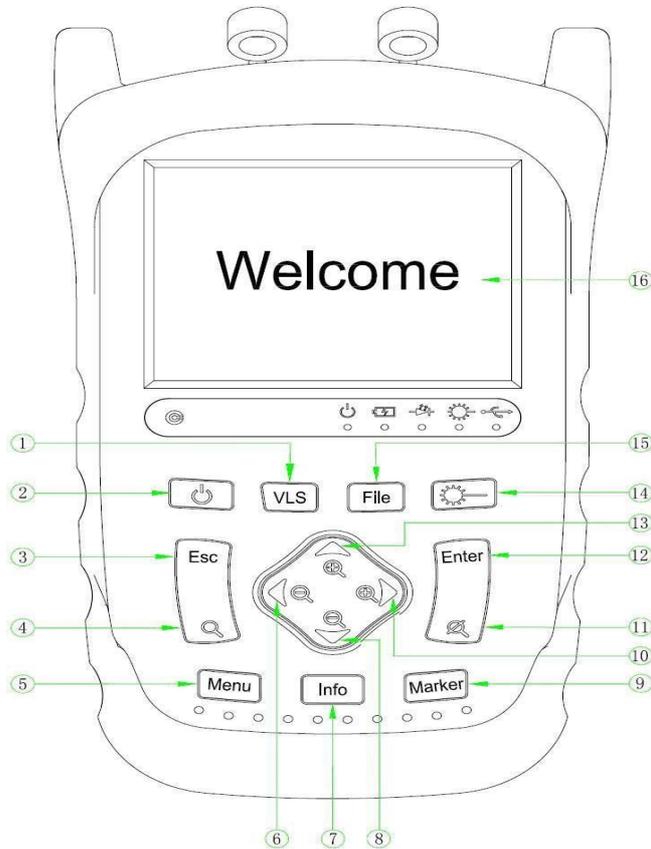
- 
- ① The technical data describe the guaranteed performance of the instrument in the measurements based on typical PC connectors. They are not based on the uncertainty due to the optical fiber index of refraction.
  - ② The dynamic range (SNR) of 1 is measured based on the maximum pulse width and a mean time of 3 minutes.
  - ③ Dead zone measurement conditions: The reflection strength is smaller than -45dB; the pulse width is 10ns for event dead zone measuring, or 50ns for attenuation dead zone measuring.
  - ④ The uncertainty due to the index of refraction is not considered.
  - ⑤ The stabilized light source and the CuteOTDR share an optical port and have the same operating wavelength.

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## 2 Diagram of panel

### 2.1 Control panel

#### 2.1.1 Schematic diagram of control panel



#### 2.1.2 Functions

##### 2.1.2.1 Single keys

No.	Key/area	Function
1	VLS	Turning on or off the visible red light (CW/1Hz)
2		Starting or stopping the instrument: Long press it for 3 seconds to start or stop it
3	ESC	Exiting from the current menu or cancelling the current operation
4		Second function key (compound key)
5	Menu	Opening or exiting from a menu

No.	Key/area	Function
6		Leftward direction key: Making the mobile marker move left
7	Info	Displaying the trace parameter information
8		Downward direction key: Making the mobile marker move down
9	Marker	Switching between posts A and B (it is possibly marked as "A-B")
10		Rightward direction key: Making the mobile marker move right
11		Global trace display
12	Enter	A confirmation key
13		Upward direction key: Making the mobile marker move up
14		Enabling or disabling the measurement mode
15	File	Opening or closing the file menu
16	Display area	Display area of LCD

### 2.1.2.2 Key combinations

Key combinations are mainly used for quick operations such as zoom-in or zoom-out in curve analysis.

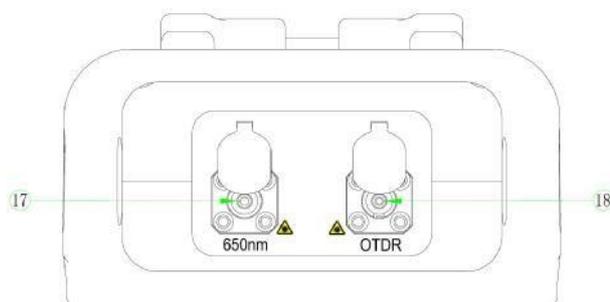
No.	Key combination	Function
1	 + 	Latitudinal zoom-out of trace
2	 + 	Longitudinal zoom-out of trace
3	 + 	Latitudinal zoom-in of trace

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4		Longitudinal zoom-in of trace
5		Global display of trace

## 2.2 Top interfaces

### 2.2.1 Schematic diagram



No.	Interface	Function
17	Red light outlet	A red light outlet with a settable output frequency (CW/1Hz)
18	OTDR interface	Used as an internal light source outlet for OTDR function measurements

#### (1) Dust cap

The instrument delivered has a dust cap. In addition to the purpose of keeping the connectors from particle substances, the dust cap is mainly used for protecting end faces of the optical fiber connectors and avoiding damage of the optical fiber connectors because of damage of their end faces. It can be removed in installation, tests and operation only.

#### (2) Optical fiber connector

According to the standard configuration, the optical fiber connectors of the instrument include an FC connector, an SC connector and an ST connector. See Fig. 2.2.1.



FC connector    SC connector    ST connector

Fig.2.2.1 Connectors

**CAUTION!**

Do not damage the optical fiber connectors or their end faces when replacing them.

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The FC connector, SC connector and ST connector may be connected with optical fibers with an FC adapter, an SC adapter and an ST adapter, respectively. See Fig.2.2.2.



FC-adapter optical fiber SC-adapter optical fiber ST-adapter optical fiber

Fig. 2.2.2

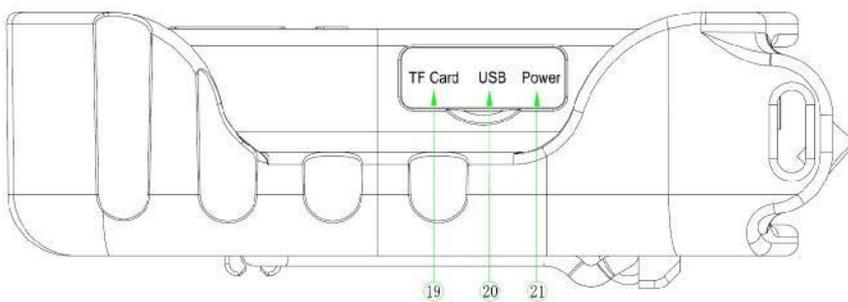
**CAUTION!**

The light-passing parts of the optical fibers have extremely small diameters and the measurement accuracy will be affected by tiny dirt on the optical fiber connectors, it is therefore necessary to clean the optical fiber connectors and test their end faces before a test.

The optical fiber connectors may be cleaned by ordinary industrial alcohol and the cleaning cotton swabs (standard accessories). Stretch a cleaning cotton swab with industrial alcohol into the port of an optical fiber connector, turn it gently and repeat the operation with another clean and dry cleaning cotton swab.

## 2.3 Side interfaces

### 2.3.1 Schematic diagram



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### 2.3.2 Functions

No.	Interface	Function
19	Memory card interface	Inserting a memory card
20	USB communication interface	A communication interface between the instrument and a PC
21	Power interface	Connecting a standard power adapter

Notes:

1. Power interface: 12VDC@2A
2. USB interface: For unloading the testing traces in the instrument obtained through real-time measurements to a PC for analysis and processing with the help of the supporting PC data analysis software
3. Memory card interface: A plug-in interface for the TF card

**CAUTION!**

The TF card is a standard accessory. It is not suggested to pull, insert or replace it.

### 2.4 LED indicators

No.	Indicator	Function
1		Equipment starting
2		Battery charging
3		Visible light source enabling
4		OTDR measurement
5		USB data transmission

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## 3 Basic knowledge of OTDR

### 3.1 Principle of OTDR

OTDR (Optical Time Domain Reflectometer) is a test instrument representing optical fiber transmission characteristics. It is mainly used for testing the attenuation of whole optical fiber links and providing the length related attenuation details. In details, it detects, locates and measures the events (events refer to the defects due to welding, connectors or bending in optical fiber links. Their transmission characteristic changes can be measured) in any positions on optical fiber links. Thanks to its non-destructive testing, one-end access and intuitional and quick characteristics, it is now a necessary instrument in the production, construction and maintenance of optical fibers and cables.

Due to the defects and component heterogeneity of optical fibers, the optical pulses transmitted in optical fibers have Rayleigh scattering. Some light is scattered along the direction opposites to the pulses. This is called Rayleigh backscattering. The backscattered light provides the length related attenuation details.

The distance related information is obtained through time information (this is origin of the time domain of the OTDR). Fresnel Reflection exists at boundary of the two transmission mediums with different indexes of inflection (such as the connecting or breaking positions of connectors or machines, or the ends of optical fibers). Through this phenomenon, the OTDR locates the discontinuous points in the length directions of optical fibers. The reflection strength depends on the difference between the flatness and index of reflection of the bounding surface.

The OTDR outputs an optical pulse for entering the optical fiber connected and promptly receives both the backscattering power from the optical pulse and the reflection of events. A trace chart acquired is displayed on the display. The vertical coordinate is the backscattering power (dB) and the horizontal coordinate is the optical fiber distance.

### 3.2 Basic definitions and classification of events

#### 3.2.1 Event

In the optical fiber field, events refer to the abnormal points of optical fibers resulting in any loss or reflecting power sudden changes (except for their normal scattering), including losses such as connection, bending, cracks and fracture.

The event points on the display are abnormal points of the optical fiber making a trace deviate from the straight line.

Events mainly include initiating events, reflection events, attenuation events and ending events.

Types and icons of events:

No.	Symbol	Meaning
1		Initiating terminal of the measured optical fiber
2		Reflection events/compound events

No.	Symbol	Meaning
3	↵	Attenuation events
4	↶	Gain events
5	┆	Ending terminal of the measured optical fiber

### 3.2.1.1 Reflection event

When some pulse energy is reflected (such as on a connector), a reflection event happens. In the trace, a reflection event generates a spike.

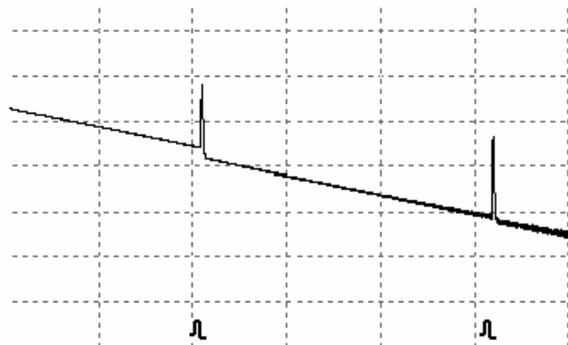


Fig. 3.2.1.2

### 3.2.1.2 Non-reflection event

A non-reflection event happens in a part of the optical fiber with some loss and without light reflection. In the trace, it generates a power fall down.

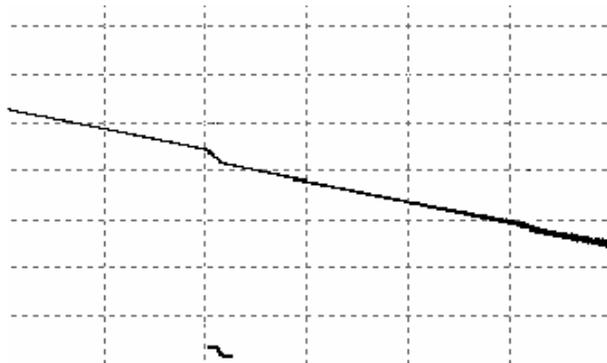


Fig. 3.2.1.3

### 3.2.1.3 Detecting event

The OTDR emits an optical fiber for entering the optical fiber to be measured and immediately begins to receive the optical signal sent back and calculate the “event” distance in the optical fiber. The further the “event” distance, the longer the time the reflected light needing to reach the OTDR will be. The “event” distance can be calculated based on the time of event receiving.

By means of trace detection of the reflected signal, the optical transmission characteristics of the optical fiber, the connectors and the connectors can be determined.

### 3.3 Application of measurement

The OTDR displays the power of the return signal relative to the distance. Based on this information, the key characteristics of an optical fiber link can be determined.

#### 3.3.1 Content of measurement

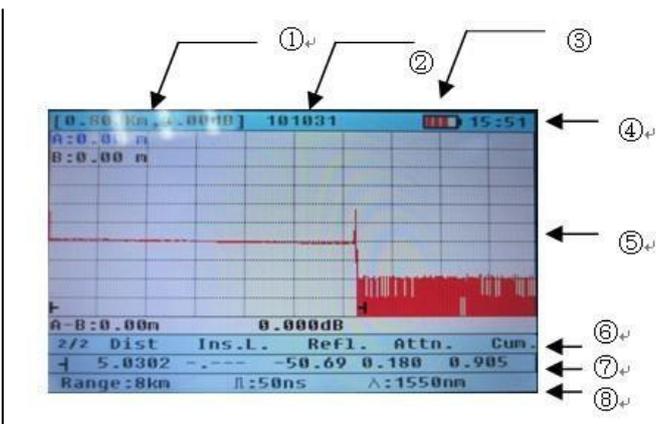
- Positions (distances) of events on the optical fiber link: ends or fracturing positions of the optical fiber link
- Optical fiber attenuation coefficient of the optical fiber link
- Loss of each event (such as an optical connector), or the total end-to-end loss on the optical fiber link
- Reflection amplitude (or level) of an event (such as a connector)

#### 3.3.2 Trace analysis

Trace analysis is a full automatic process. The trace locates:

- Reflection events generated by connections or mechanical connectors
- Non-reflection events (usually welding connectors)
- Ending terminal of the optical fiber: The OTDR detects ending terminal of the optical fiber by scanning the first loss event larger than the ending threshold.
- Event list: Types, losses, reflection and distances of the events are all listed by means of calculation.

### 3.4 Trace window



① Each horizontal grid refers to a kilogram value; each vertical grid refers to a dB value.

User cannot change the zoom-in and zoom-out of the trace window.

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② Name of the trace file

A newly measured trace has no file name, but a file name may be set for it when it is saved (see the file saving setup). After a saved file is opened, the file name of the trace will be displayed.

③ Remaining battery capacity

④ Current time

⑤ Trace window

Through the trace window, the measured traces can be displayed and show the characteristics of the optical fiber link.

⑥ Information about markers A and B

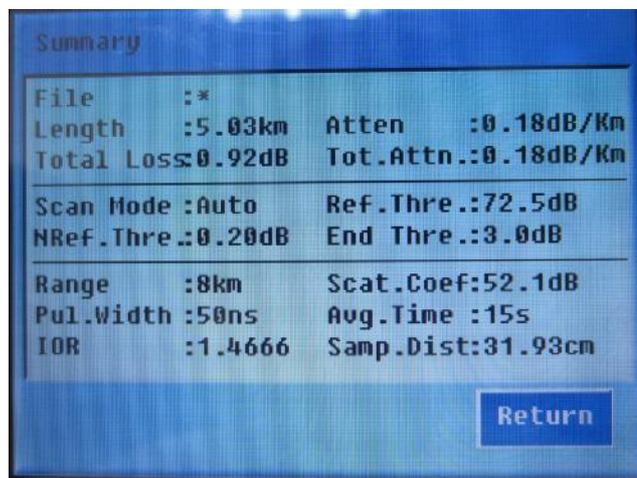
It includes their distance, losses and attenuation coefficients.

⑦ Event list

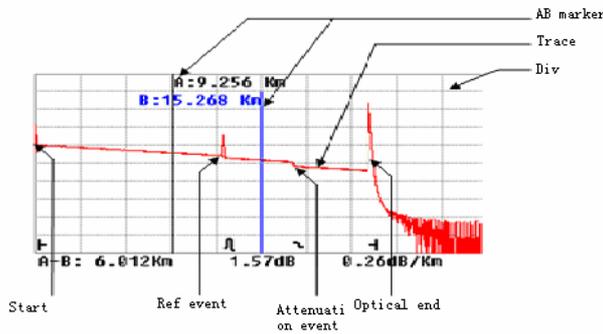
⑧ Current trace parameters

The instrument displays the measurement range, the measured wavelength and the measured pulse width only.

Press the “Info” key to enter the “Summary Info” box for the detailed information.



### 3.5 Trace window



Marker instruction: Marker number + distance between the marker and initial position of the measured optical fiber

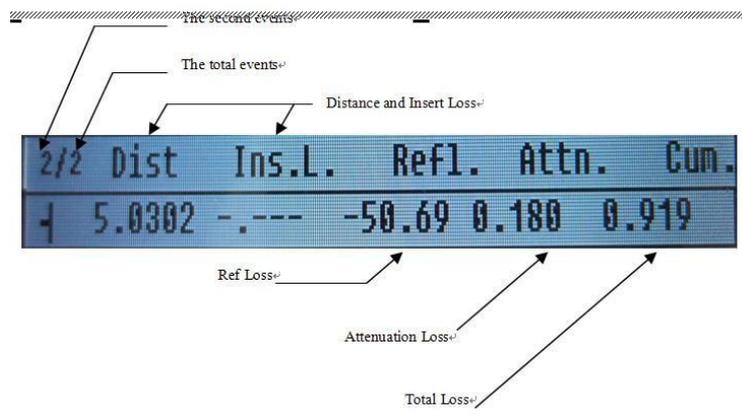
e.g. B:15.268km

**【Operate】** Switching between markers A and B

Marker switching: Press the “Marker” key. Markers A and B will switch automatically after that and the chosen marker will become blue.

Marker operation: Press the “” and the “” key to move markers. Instruction: When marker A or B is moved, the marker information bar will change.

### 3.6 Event list



**【Operate】** View the event list.

Press the “” key or the “” key to view each event.

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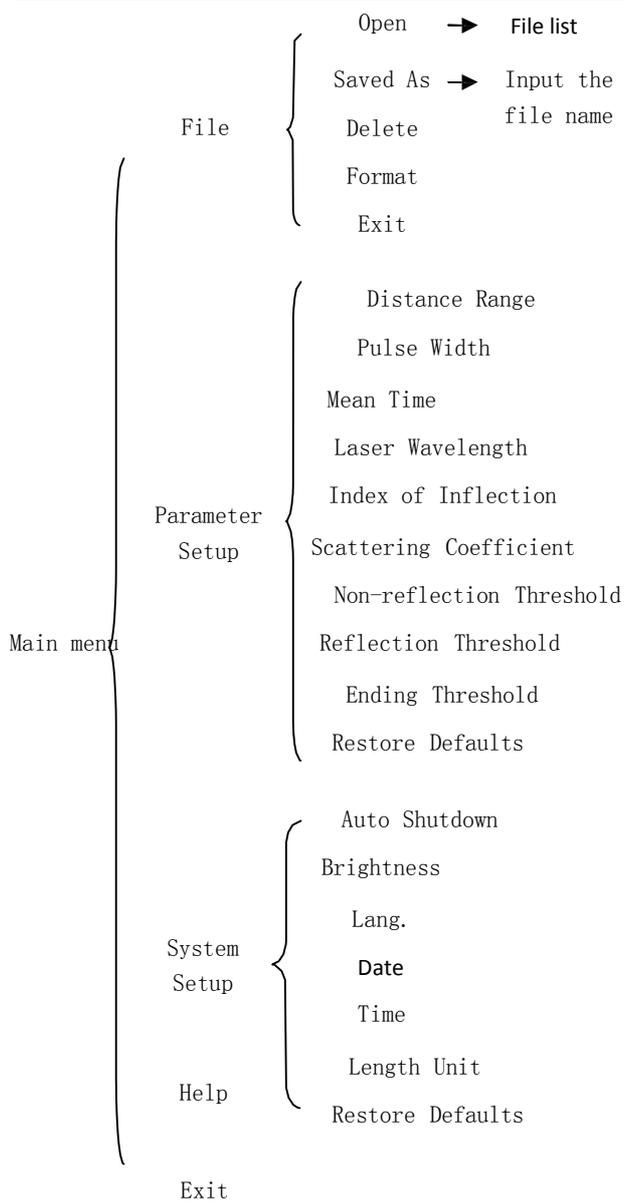
2/2	Dist	Ins.L.	Refl.	Attn.	Cum.
↑	0.0000	-.---	-41.61	-.---	-.---
↓	5.0302	-.---	-50.69	0.180	0.919

Press Enter to view the whole event list.

## **4 Directions for use**

### **4.1 Menu and parameter setup**

### **4.2 Menu overview of the instrument**



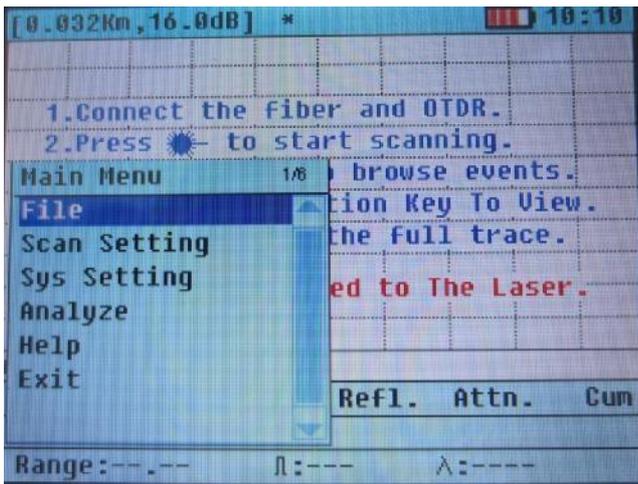
### 4.3 Definitions of the parameters used by the instrument

Scanning parameter	Definition
1. Distance Range	The corresponding optical fiber length of the whole trace
2. Pulse Width	Width of the laser pulse emitted by the OTDR to the optical fiber
3. Mean Time	Duration of one measurement
4. Laser Wavelength	Choosing the laser wavelength for measurements
5. Index of Reflection	Index of reflection of the optical fiber (it has an impact on the transmission speed in the optical fiber)

6. Scattering Coefficient	It has an impact on the backscattering power of light in the optical fiber
7. Non-reflection Threshold	The events with an insertion loss larger than this threshold will be in the event list.
8. Reflection Threshold	The reflection events with a reflection strength equal to or larger than this threshold will be in the event list.
9. Ending Threshold	The first event with an insertion loss equal to or larger than this threshold will be regarded as end of the optical fiber and all the events following it will be ignored.
10. Restore Defaults	Defaults set for the scanning parameters before delivery
<b>System parameter</b>	<b>Definition</b>
1. Auto Shutdown	Choosing between Shut, 10 min., 30 min. and 1 h
2. Brightness	Adjusting the LCD contrast
3. Lang.	Choosing between a Chinese interface and an English interface
4. Date	Date setup
5. Time	Time setup
6. Length Unit	Unit used in measurements by the instrument
7. Restore Defaults	Defaults set for the system parameters before delivery

### 4.3.1 Menu and submenus

The Menu includes File System, Parameter Setup, System Setup, Instrument Related Information, and Exit. See the figure below.



**【Operate】 Menu**

- Press the “Menu” key to enter the menu.
- Press ▲ and ▼ to choose the item to be set.
- Press Enter to confirm, or ESC or EXIT to exit.

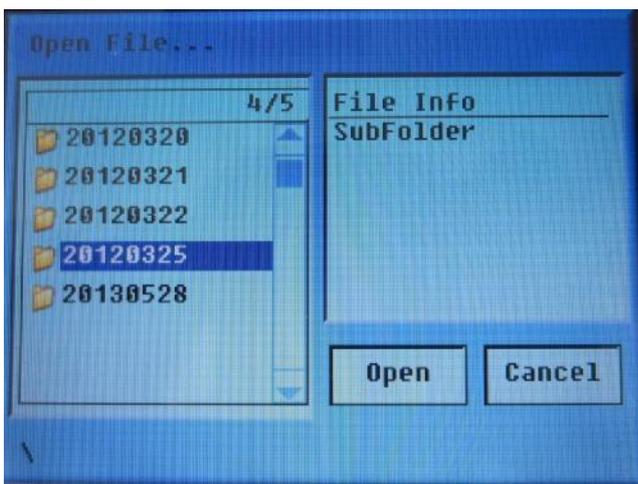
**4.3.1.1 File System**

File System includes Open, Saved As, Delete and Format. Enter it through the “File” submenu under “Menu”.

1. Open
  - 1.1 Open a file directory

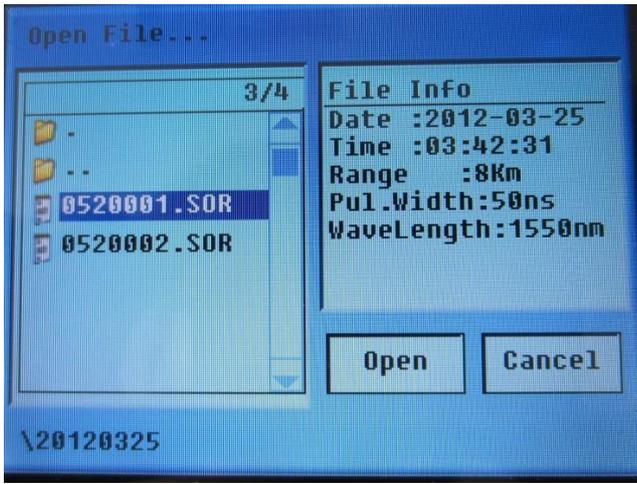
First, enter the first-level directory.

- Press ▲ and ▼ to choose the file folder.
- Press Enter to enter the second-level directory, or ESC or CANCEL to exit from the file system.



- 1.2 Open a file

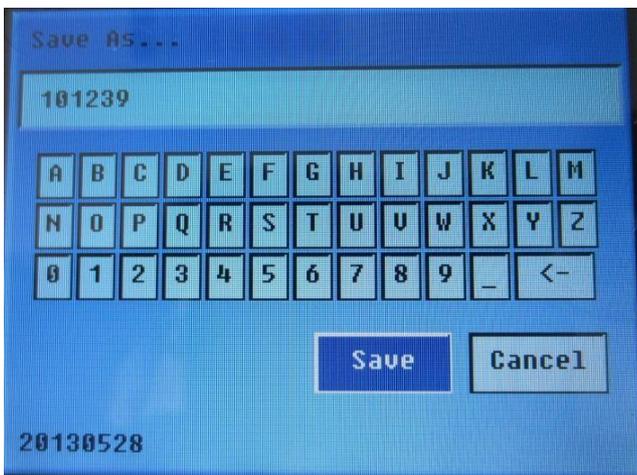
- Press ▲ and ▼ to choose the file to be opened.
- Press Enter to open the file, or ESC or CANCEL to exit from the file system.



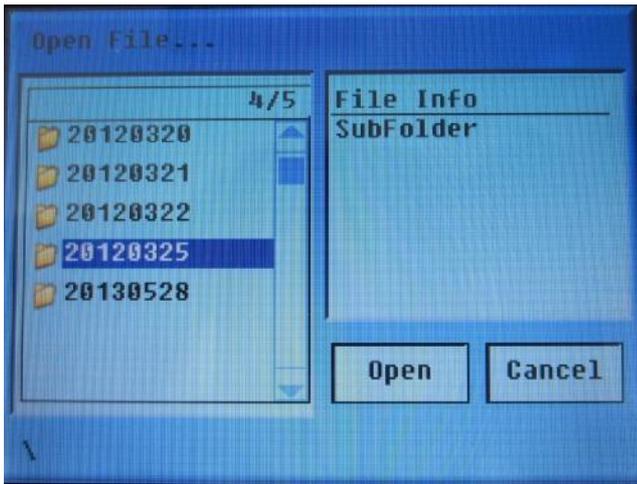
## 2. Saved as

Press the direction keys to move to the figures or letters. Press Enter and input the file name. If the file name is wrongly input, press “<—” to erase the wrong part. After the file name is input,

- Press the direction keys to move to the figures or letters. Press Enter and input relevant information. Press “<—” to erase the wrongly input part.
- After the file name is edited, press ESC. After that, the cursor will move the “Save”. Press Enter.

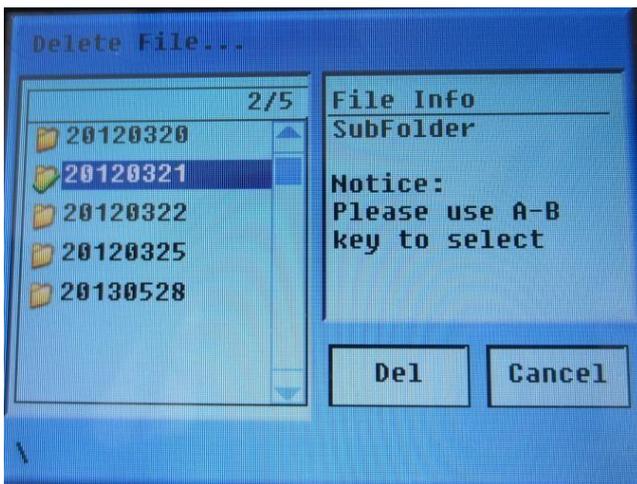


## 3. Delete



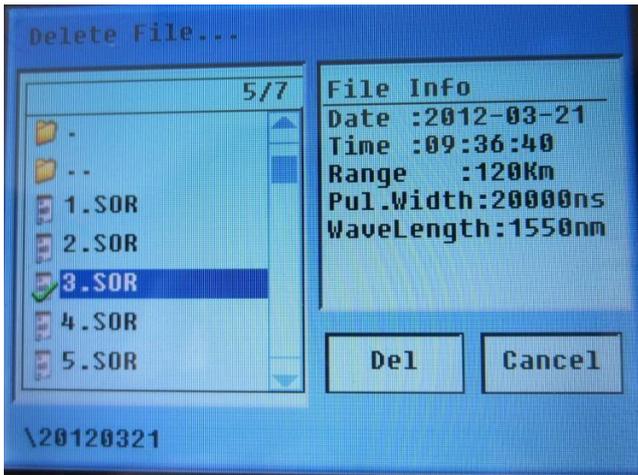
### 3.1 Delete a file folder

- Press ▲ and ▼. After that, the cursor will move to the file folder to be deleted and press MARKER for choosing.
- Press ESC. After that, the cursor will move to “Delete”. Press Enter.

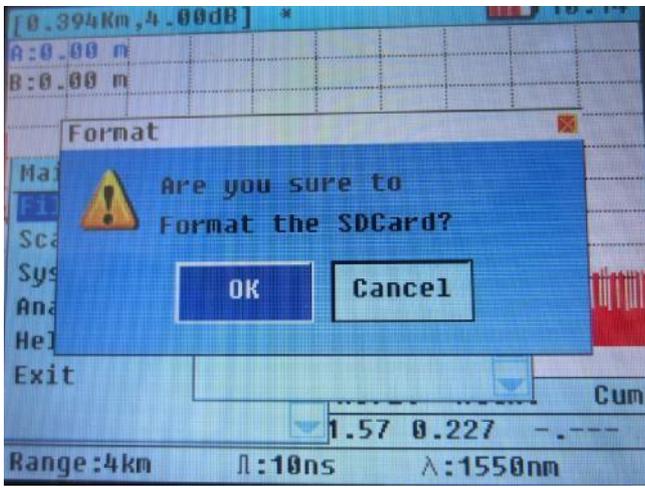


### 3.2 Delete a file

- Press ▲ and ▼. After that, the cursor will move to the file to be deleted and press MARKER (A-B) for choosing. This step may be repeated to choose multiple files.
- Press ESC. After that, the cursor will move to “Delete”. Press Enter.

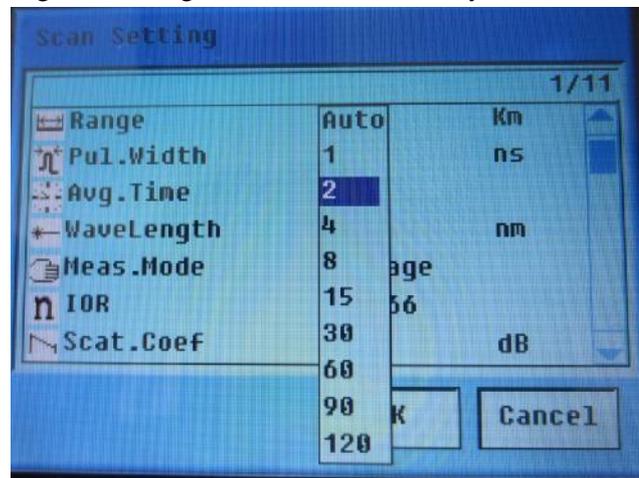


### 3.3 Format the SD card



#### 4.3.1.2 Set distance range

Usually, the corresponding predefined range in the setup of distance range is chosen in line with the actual optical fiber length to guarantee high measurement accuracy.



Setup of the “Distance Range” of the instrument: Auto, 1-120km

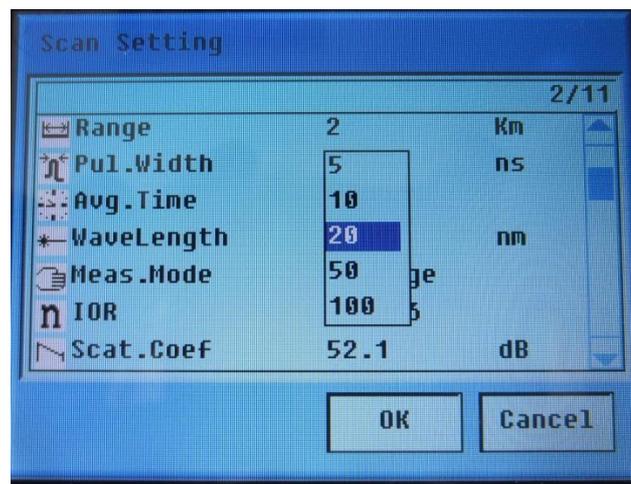
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### 【Operate】 Setup of distance range

Enter the Parameter Setup interface, choose the “Distance Range” parameter and press **▶** to switch to the parameter and Enter to pop up a pull-down menu. Press **▲** and **▼** to choose the item to be set and click Enter to confirm the parameter to be set.

#### 4.3.1.3 Set pulse width

The pulse width has an impact on the dynamic range and resolution of the measured trace. If a narrower pulse width is chosen, a higher range resolution and a smaller dead zone will be realized, but the dynamic range will have a loss; if a wider pulse width is chosen, a larger dynamic range and a longer optical fiber length will be realized, but the range resolution and the dead zone parameter will be both affected and user must make a choice between the dynamic range and the dead zone.

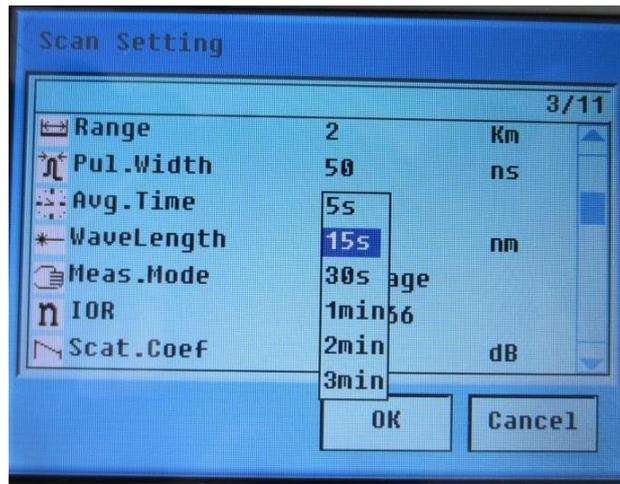


The “Setup of Pulse With” option has 11 predefined items in all, including 5ns, 10ns, 20ns, 50ns, 100ns, 200ns, 500ns, 1000ns, 5us, 10us and 20us. The setup is valid in the manual measurement mode only.

Press **▲** and **▼** to switch to the “pulse width” option and **▶** to switch to the parameter. Press Enter. A pull-down box menu will pop up after that. Press **▲** and **▼** to choose the item to be set and click Enter to confirm the parameter to be set.

#### 4.3.1.4 Set average time

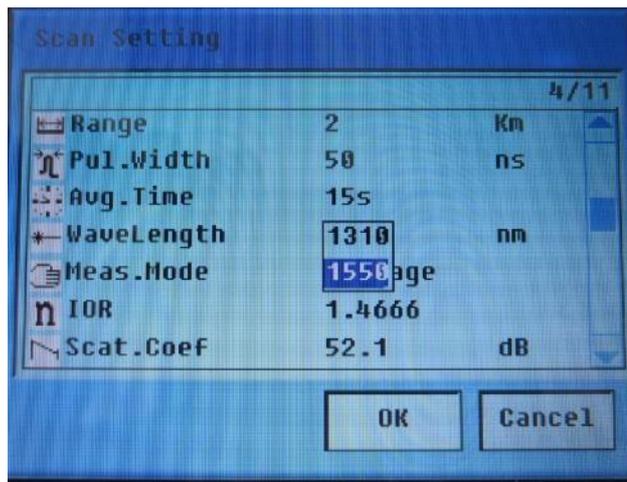
The average time has a direct bearing on the signal-to-noise ratio of the measured trace. A larger average time corresponds to a longer measuring duration, a higher signal-to-noise ratio and a larger dynamic range. Thus, choose the maximum average time as much as possible when measuring a long optical fiber or viewing a remote event.



The operating method is the same as that in 4.2.2.3.

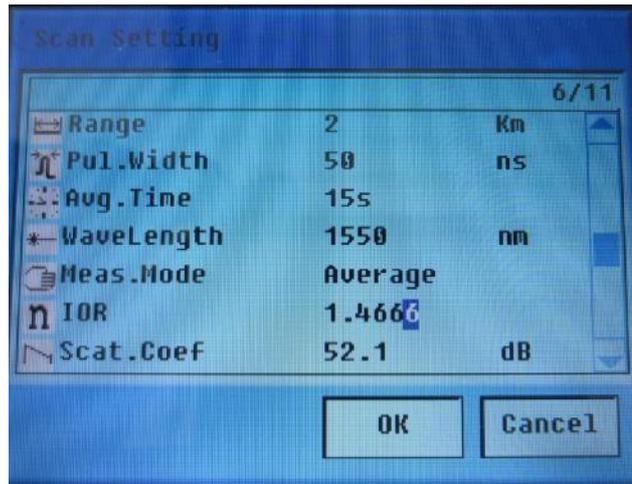
#### 4.3.1.5 Set laser wavelength

The OTDR with a dual-wavelength module has this option. The available wavelength (1310nm or 1550nm) depends on configuration of the module. The factory default of laser length is 1550nm. The operating method is the same as that in 4.2.2.3.



#### 4.3.1.6 Index of reflection

The index of reflection of the optical fiber influences the transmission speed of laser in the optical fiber, so an accurate measured distance is directly determined by an accurately set index of reflection. Generally speaking, this parameter is provided by the optical fiber manufacturer. It can be set to be any value between 1.0 and 2.0 and correct to four decimal places. Its factory default is 1.4666.



Press ▲ and ▼ to switch to the “Index of Reflection” option and ▶ to switch to the parameter value. Press <- or ▶ to choose the digits and then ▲ and ▼ to edit the values. Finally, press Enter to confirm the parameter to be set.

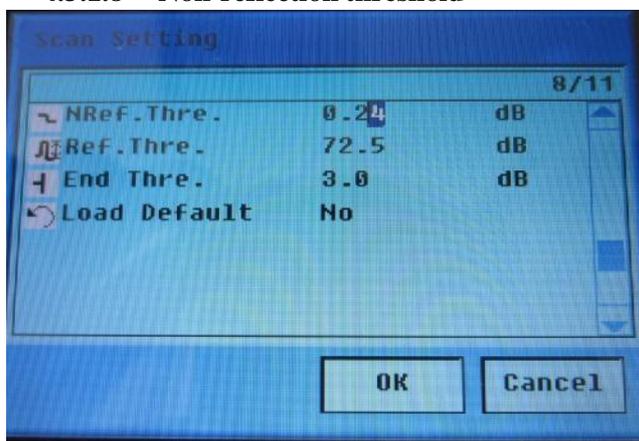
#### 4.3.1.7 Scattering coefficient

Setup of scattering coefficient: Optical fiber scattering coefficient determines value of the scattering power of light. Its setup influences calculation of the event reflection value. It is 52.1dB by default.



The operating method is the same as that in 4.2.2.6.

#### 4.3.1.8 Non-reflection threshold



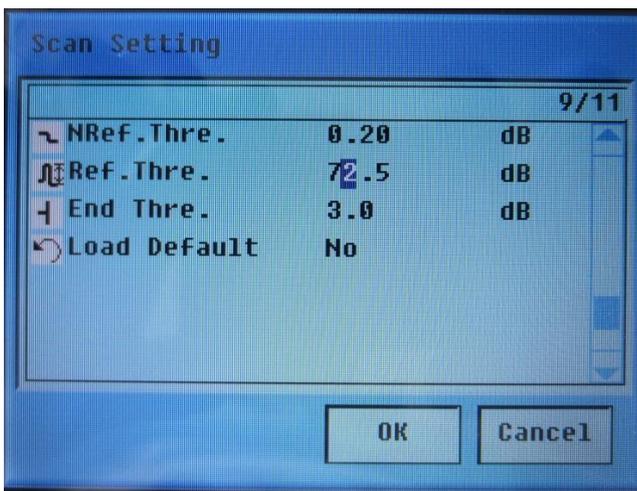
Setup of the non-reflection threshold has a direct bearing on the existence of insertion loss events in the event list. The loss events equal to or larger than the threshold are listed in the event list. It is 0.20dB by default.

The operating method is the same as that in 4.2.2.6.

#### 4.3.1.9 Reflection threshold

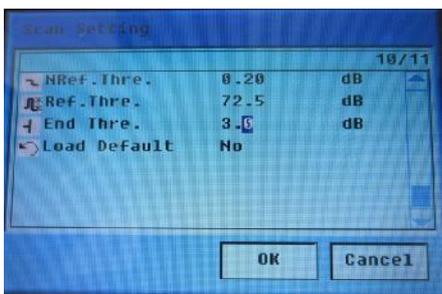
Setup of reflection threshold: It has a direct bearing on the existence of reflection events in the event list. Only the events with a reflection value equal to or larger than the threshold are listed in the event list. It is 60.50dB by default.

The operating method is the same as that in 4.2.2.6.



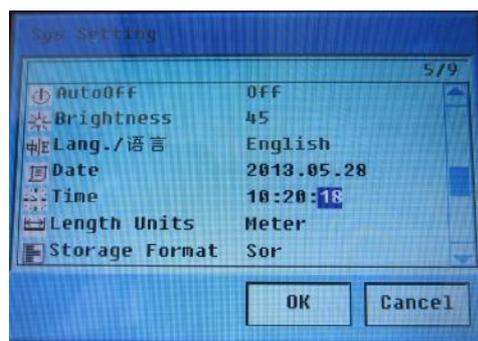
#### 4.3.1.10 Ending threshold

The operating method is the same as that in 4.2.2.6.



#### 4.3.1.11 Set time

The "Time Setup" menu is used for modifying the system time.



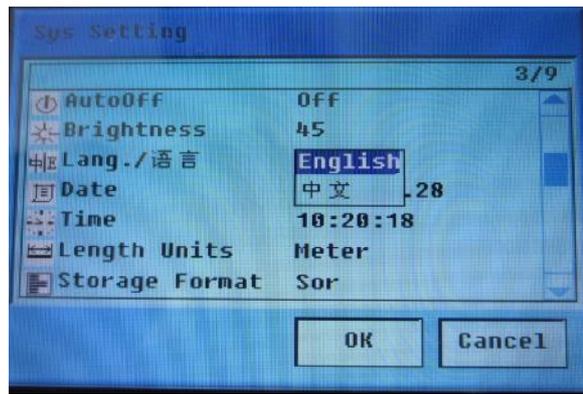
#### 4.3.1.12 Auto Shutdown

This function is mainly designed for saving the battery capacity. If this function is enabled and there is no operation in the set 10 minutes, 30 minutes or 1 hour, the instrument will shut down automatically (the factory default is 10 minutes after the instrument is started).



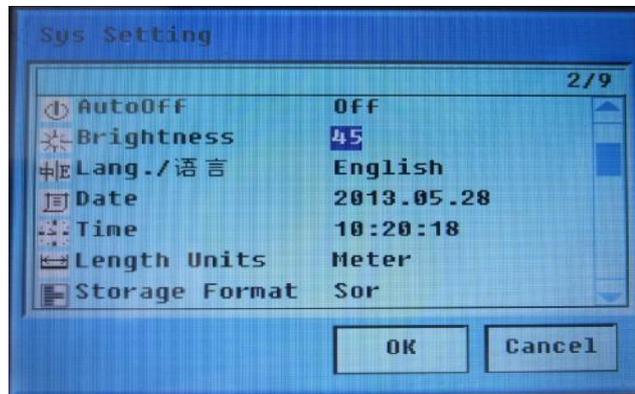
#### 4.3.1.13 Set language

The instrument provides Chinese and English for its interfaces. The factory default is English.



#### 4.3.1.14 Backlight brightness

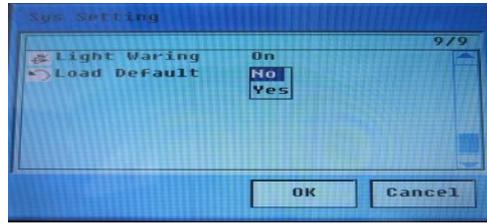
The backlight brightness of the LCD has been adjusted before product delivery. It can be reset by user to adapt to his visual habits.



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#### 4.3.1.15 Restore defaults

Restore parameters of the OTDR to factory defaults. These parameters include Distance range, pulse width, mean time, index of reflection, non-reflection threshold, reflection threshold, scattering coefficient, auto shutdown, and backlight brightness.



### 4.4 Measurement instruction

If you are not familiar with the precautions of the instrument before a measurement, refer to the precautions in this User's Manual in operation for safety.

#### 4.4.1 Power on

Make sure the battery has been installed or the power adapter has been inserted and there is no light entering the optical port of the instrument. Press  for 3 seconds to start. After that, a startup interface will appear.

#### 4.4.2 Connect an optical fiber

Connect the optical fiber with the optical port of the CuteOTDR by aligning with the locating hole and tightening the thread.

Connector cleaning: Clean the optical fiber connectors and inspect whether they are FC or PC connectors; connect the optical fiber with the instrument.

##### 4.4.2.1 Measure an optical fiber in the Auto mode

In the Auto mode, the instrument will automatically estimate the optical fiber length, set the sampling parameters, acquire curves and display the acquired curves.

The following parameters can be set directly in the Auto mode.

Testing Wavelength, Mean Time, Index of Reflection, Scattering Coefficient, Non-reflection Threshold, Reflection Threshold, and Ending Threshold

Of all the other parameters, the application will execute the ones defined in the Manual mode (except for those always to be analyzed after measurements).

In the Auto mode, the application will automatically set the sampling parameters to be optimal values according to condition of the optical fiber link currently connected with the instrument.

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### 4.4.3 Measure

Choose Auto behind Distance Range and hold. In the startup interface, press  to start a measurement. The waiting time may differ with the specific parameters and mode. The interface will then display contents such as the measurement progress and the measurement stage. After the measurement, a result display interface will appear automatically. Press  at any time in the measurement can stop measuring and analyze the trace.

#### 4.4.3.1 Measure an optical fiber in the Manual mode

In the Manual mode, user sets the designated measurement parameters manually. After that, the instrument will quickly and purposefully display the scanning results for use by professional users.

The parameters needing to be set include:

Distance Range: Set a Km value larger than the actual length.

Index of Reflection: Set the index of reflection of the optical fiber to be measured.

Pulse Width: A narrower pulse width can guarantee better detection of near or short-distance events; however, long-distance events cannot be acquired due to a too weak signal. A wider pulse width guarantee better detection of long-distance events; however, event detection may fail in near places due to signal saturation. Thus, the pulse width should be flexibly chosen in actual measurements.

Measuring Duration: The larger the measuring duration, the higher the signal-to-noise ratio; however, the waiting time will be longer. Thus, a longer measuring duration is recommended.

Non-reflection Threshold: The attenuation events or false gain events larger than this threshold will be detected.

Reflection Threshold: The reflection events larger than this threshold will be detected.

Scattering Coefficient: Set the scattering coefficient of the optical fiber to be measured. This parameter has an impact on calculation of the index of reflection.

Ending Threshold: The first event with an insertion loss equal to or larger than this threshold will be regarded as end of the optical fiber and all the events following it will be ignored.

Parameters can be set through menus of the instrument. If the optical fiber parameters are not clearly defined, the factory defaults of the instrument may be used directly; however, this will result in larger errors of the measurement results.

### 4.4.4 Measure

Set and hold all the parameters. In the startup interface, press  to start a measurement. The waiting time may differ with the specific parameters and mode. The interface will then display contents such as the measurement progress and the measurement stage. After the measurement, a result display interface will appear automatically. Press  at any time in the measurement can stop measuring and analyze the trace.

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#### 4.4.5 Save

After a measurement, user may enter the result saving interface directly by pressing hotkey **File**.

#### 4.4.6 Upload data to PC

1. Connect the CuteOTDR and the USB interface of a PC through a USB cable.
2. Start the CuteOTDR.
3. Copy the curve content on the TF card.

**CAUTION!**

The USB interface can realize hot plugging, but the PC must follow the USB operation specification and a USB drive must be correctly installed; make sure the hardware has safely ejected before unplugging the USB cable, otherwise there will be a data loss.

#### 4.4.7 Visual optical fault locating

The instrument can realize visual optical fault locating. The output wavelength and frequency are 650nm and CW/1Hz, respectively.

Operating steps: Connect an optical fiber with the red light output interface. CW red light and 1KHz red light will be output after VLS is pressed for the first and second time, respectively, and red light output will be disabled after the key is pressed for the third time.

### 4.5 Mode of power supply

The instrument is chargeable. In normal conditions, its lithium battery can work continually for about 8 hours.

The charging status is displayed above the main menu.

The charging status can be indicated through the LED on the panel of the instrument too.

The lithium battery has four statuses, including full capacity, more than half capacity, half capacity and insufficient capacity. In the case of insufficient capacity, charge promptly.

The instrument can be powered by lithium battery or a power adapter.

#### 4.5.1 Power supply by a lithium battery

When the instrument is powered by a lithium battery, there is a battery capacity icon on top left of the LCD.

**CAUTION!**

If the instrument is not used in a long time, charge it every three months.

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Charge with the designated power adapter only.

## 4.5.2 Power supply by a power adapter

After the battery is exhausted, connect it with a power adapter. A power adapter icon  ) will appear on top right of the LCD. If a power adapter is used while the battery is still high and on the instrument, the instrument will be powered by the power adapter first.

**CAUTION!**

Use the power adapter provided with the instrument. The power adapters of other types may result in instrument damage.

## 4.6 Power off

**Auto shutdown:** If the power saving mode (namely the auto shutdown event) is chosen, the instrument will be powered off automatically after the set auto shutdown time is reached, no matter the instrument is powered by a battery or a power adapter and no matter whether there is key operation in the period.

**Manual shutdown:** If  is long pressed in any condition, the instrument will shut down automatically.

## 4.7 Computer aided analysis software

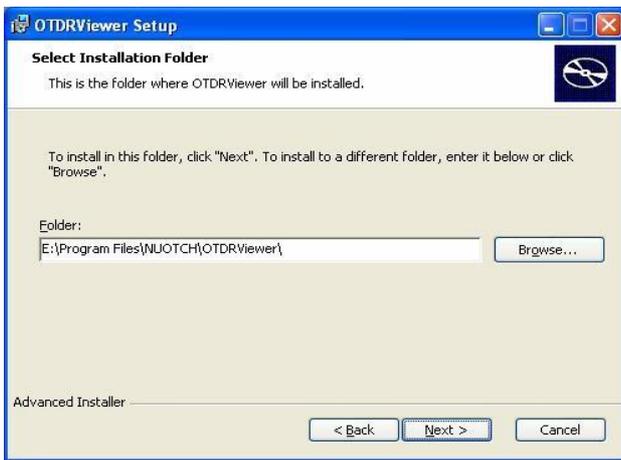
### 4.7.1 Installation of bundled software

Run the CD provided with the instrument, enter the “OTDRViewer” directory and double click the “SetupOTDRViewer.msi” setup file to run it. The application is installed as below.

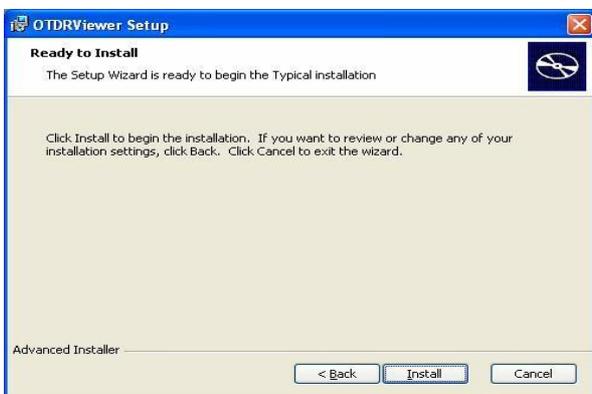
1. Installation of application



Click “Next” to start application installation.



Click to browse and choose the installation path (the default directory is recommended) and click “Next” to continue.

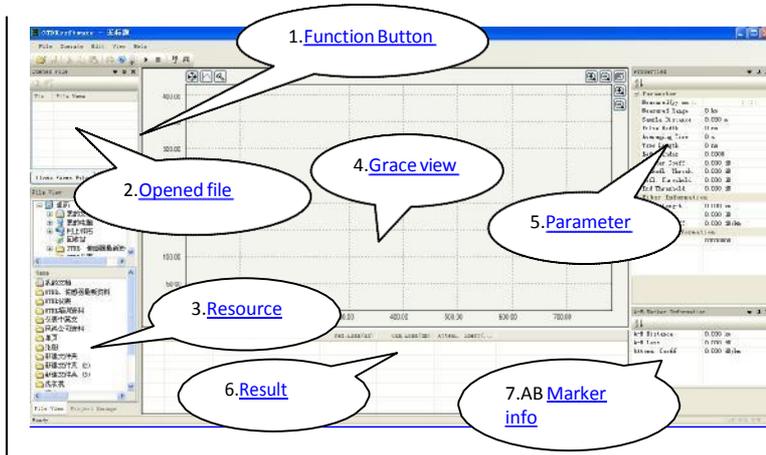


Click “Install” to copy the setup file to the installation directory. After that, an interface reminding completion of installation will pop up. Click “Finish” to end the installation.

## 4.7.2 Use of OTDRViewer software

### 1. Function

The OTDRViewer software is bundled software of the instrument. It can be used for reading the data acquired by the instrument and displaying data curves and information. Through it, user can realize more intuitional data validation and analysis. Schematic diagram and function of the main interface of the program are briefly introduced below.



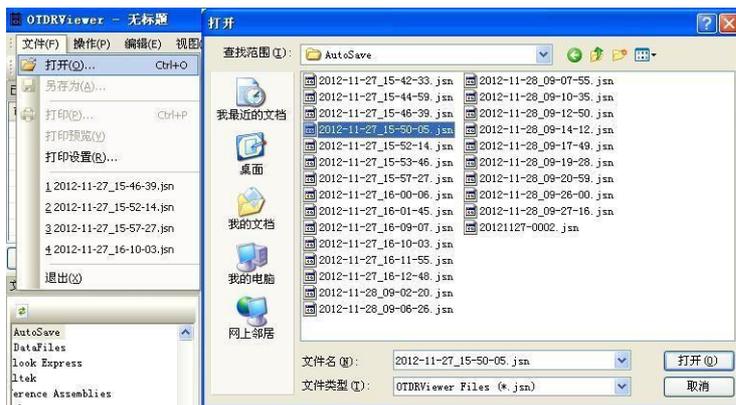
**Functions of Views of the Main Interface**

No.	Functional area	Function
1	Function button	For OTDR measurements
2	List of the Opened Files	For displaying the opened files. Click the “List Item” to activate (thickened) and display the corresponding curves in views. The cross can capture coordinate information.
3	Resource Browsing	For browsing resources. Directory choosing can be done for easy browsing of all the files under a directory.
4	Curve View	For displaying the data curves of the opened files. The X coordinate is the distance value; the Y coordinate is the dB value.

5	Data Parameter	For displaying the configuration information in data acquisition by the instrument
6	Analysis Result	For displaying the analysis result of the instrument
7	AB Label	The AB label is made up of two mobile locating lines with adjustable positions. This field displays the information of AB in a dynamic way.

## 2. Method to open a file

Method A: Open a single file through the relevant menu.



Click the “File” menu at top left of the interface and then the “Open” option. A file select box as in the right part of the figure above will pop up after that. Choose the needed file and click “Open”.

Method B: Open a whole directory.

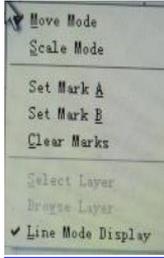
There are two list boxes at lower left of the schematic diagram of the main interface above. The upper tree-like list box is for path choosing and the lower list box displays content of the corresponding path. After the software is opened, there is a default opening path. To choose another path, move the horizontal scroll bar of the tree-like list box left and the vertical scroll bar up to return to the root directory for choosing again. A directory can be unfolded or folded through the “+” symbol.

The data file(s) contained in the chosen directory (if any) will appear in the list below. Double click the list item to open it (them).

## 3. Operation of data curve view

Curve views are the main tool for manual data analysis. Skilled use of curve views guarantees quicker and more perfect understanding of data characteristics. Some fast operations of curve views are introduced below.

No.	Function	Operation
1	Show All	Double click any position of the view.
2	Operating mode switching	<p>There is an operating mode switching button on top left of the curve view. The current icon shows the corresponding current operating mode.</p> 
3	X-coordinate zooming in the “mobile mode”	Move the mouse to the needed position and roll the mouse wheel up to zoom in or down to zoom out.
4	Curve moving in the “mobile mode”	At any position of the curve view, press the left key of the mouse and move the mouse.
5	Zooming in the “zoom mode”	Press the left key, move the mouse to choose the needed position from the pull-down box for and zooming in. Double click the “Show All” function to view the detail of each position of the curve quickly.
6	Curve moving in the “zoom mode”	Move the mouse to the data cable position. When there is a small square at center of the cross coordinates, press the left key and move the mouse at the same time.
7	AB label locating	Click the event list. The instrument will obtain the focus automatically and realize dragging

		through the mouse.
8	Direct A/B label locating	<p>Move the mouse to the position needing to be located. Click the right key of the mouse to pop up the following menu. An A label and a B label can be set or removed.</p> 

## 5 Additional instructions

### 5.1 Common fault

Fault	Possible cause	Troubleshooting
The LCD does not display.	<ol style="list-style-type: none"> <li>The power supply is not connected; or</li> <li>The battery is low.</li> </ol>	<ol style="list-style-type: none"> <li>Press ; or</li> <li>Change the battery.</li> </ol>
The measurement result is wrong.	<ol style="list-style-type: none"> <li>The optical fiber connectors are dirty; or</li> <li>The optical fiber is wrongly connected.</li> </ol>	<ol style="list-style-type: none"> <li>Clean the optical fiber connectors; or</li> <li>Connect the optical fiber again.</li> </ol>

### 5.2 Maintenance

4.2.1 Frequently clean end face of the sensor to keep it clean and from grease and other pollutants. Do not use dirty or non-standard optical fiber adapter connector or insert an end face with a poor polished surface, otherwise end face of the sensor will be damaged and the performance of the whole system will be very poor.

4.2.2 Use one kind of optical fiber adapter as much as possible.

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4.2.3 After the instrument is used, fit the dust cap over it immediately to keep the end face clean and avoid measurement errors due to dust as a result of long-term exposure to air.

4.2.4 Plug and unplug the optical fiber adapter connector carefully to avoid scratches of the port.

4.2.5 Clean the optical fiber adapter connector regularly. Wipe gently along the circumferential direction with special cleaning cotton swabs.

### 5.3 Quality guarantee

**We suggest you not repair the instrument by yourself.**

5.3.1 The instrument enjoys a warranty period of 12 months following its delivery date.

The warranty period is 12 months following its delivery date. For any quality problems of the instrument in this period, we will repair or exchange it for you. In any cases, our responsibility shall not exceed purchasing price of the instrument.

5.3.2 If a fault arising out of use of the instrument cannot be solved with the troubleshooting methods given for common faults, do not open the shell by yourself but contact our Marketing Department or local agent.

5.3.3 We shall repair or exchange the instrument with any quality problems due to defects in production for free on the condition that the instrument is normally used.

The warranty service is not suitable for the problems or faults caused by the following

factors: 1.Unauthorized repair or refitting for the instrument;

2. Improper or careless use, accidents, etc.