Nitrotel Manufacturing
Low Voltage Products & Fiber Optic

Optical Time Domain Reflectometer

User Manual

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Catalogue

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1. Basic Information

1.1 Warning

User Manual clarifies the establishment and termination of rights and obligations of the Company and the user in terms of product quality assurance liability and after-sales services. Please read this manual carefully before you use products of our company.

1.2 Safety Information

1.2.1 Laser Safety Information

Warning

Please never install or terminate optical fiber when light source is in active state. Never peep at the load signal optical fiber to protect your eyes at all time.

1.2.2 Electrical Appliance Safety Information

If there is need to make sure outage of equipment are outage thoroughly, please pull up the power line and take out the battery.

Warning

- External power source can only be used indoors.
- Places that equipment positioned should have free circulation of surrounding atmospheres.
- Any electric tools used near inflammable gas or in smoke can produce great threaten to safety.
- To avoid electric shock, equipment can't be operated if there is any damage at any surface part (top cover, face plate etc.).
- Only authorized personnel can perform electrified debugging, maintenance or repair to running equipment.
- Please don't replace any assembly if cable and battery have been connected.
- Even the power supply has been switched off, the capacitance in equipment still might be electrified.

Equipment Rated Value		
Temperature	Operating Temperature	0°C to 50°C (32°F to 122°F)
	Storage temperature	-40°C to 60°C (-32°F to 128°F)
Relative Humidity	Equipment	0% to 80%, no condensation
	Power supply adapter	0% to 80%, no condensation
Power Supply	Rated value	100V to 240V (50Hz/60Hz); maximum input current: 2 A

Table 1.2 Equipment Rated Value

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2 Introduction to Optical Fiber Comprehensive Tester

Optical fiber comprehensive tester is the basic instrument for physical layer tests of optical fibers and optical cables. It can comprehensively judge internal situations of optical fibers, including the optical time domain reflectometer, the optical power meter, the light source, the visible light source, the system management and the file management. Among them, the optical power meter and the light source are optional items.

2.1 Optical Time-domain Reflectometer

Optical time domain reflectometer (hereinafter referred to as “OTDR”) can provide the inside view of the optical fiber and can calculate the length, attenuation values, breakaway point, total return loss and fusion point, connection point and total loss.

2.1.1 Fundamental Principles of OTDR

OTDR sends the short pulse of light into the optical fiber. Due to the interrupt factors such as connector, weld point, bending and faultage, light scattering happens in the optical fiber. OTDR will immediately detect and analyze the signal of backward scattering. It can also measure the signal strength according to special time intervals and use signal strength to express features of events.

OTDR uses the following formula to calculate the distance:

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

In which: c = velocity of light in vacuum (2.998 x 108 m/s); t = time delay between the emission of pulse and the receipt of pulse; n= refractive index of optical fiber in test (appointed by the manufacturer)

OTDR uses the function of Rayleigh scattering and Fresnel reflection to measure the optical fiber conditions, but the power of Fresnel reflection is thousands of times of the backward scattering power. When the pulse is transmitted downwards along the optical fiber, and some small changes in the materials (such as changes and discontinuity in reflectivity) cause the light to scatter in all directions, the Rayleigh scattering will occur. However, the phenomenon that a small amount of light directly reflects back to the transmitter is called as backward scattering. When the light transmitted downwards along the optical fiber accouters sudden changes in material density, it will have Fresnel reflection, changes in material densitymay occur in the joint point or breaking point of the gap. Compared with Rayleigh scattering, Fresnel reflection will reflect a considerable amount of light. The reflection strength depends on the change degree of the refractive index.

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2.2 Event map

The event map function can be tested with one click. Automatic link sensing technology identifies the link, and the simple and intuitive visual view of optical fiber events can intuitively and accurately test the end-to-end loss, return loss, distance, events and other information.

2.3 Visible Light Source

Visible light source (VLS) can discover breakout points of short-distance optical fiber links or large loss points conveniently and quickly so that maintenance personnel can take measures in time, which can help save time.

2.4 Optical Power Meter (optional)

Optical power meter is mainly used to measure the absolute optical power or the relative loss of optical power passing through a section of optical fiber. By measuring the absolute power of the transmitter or optical network, the optical power meter can evaluate the performance of optical devices. If the optical power meter can be used together with the stable light sources, it will be able to measure the connection loss and check the continuity and help evaluate transmission quality of the optical fiber links.

2.5 Light Source (optional)

Light source can provide stable optical signals, and it can be used together with other instruments to measure system indicators.

2.6 Cable test (optional)

The cable test can identify the cable sequence and cable length; It can automatically detect and identify the remote module, automatically identify the short circuit and open circuit of network cable, and simply determine the distance of open circuit.

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2.7 Optical fiber end face detection (optional)

Fiber end detector can quickly check whether there are dust, sweat, scratches and other dirt on the fiber end of fiber jumper or pigtail insert.

2.8 Light (optional)

Lighting function a simple lighting, used for passive room lighting.

2.9 Internet of things platform (optional)

Device remote management settings and data upload settings

2.10 Equipment maintenance

Self check function of equipment and calibration function of OTDR.

2.11 System Management

File management is mainly used to upload and delete OTDR test files.

2.12 System Management

System management is mainly used to manage language settings, time settings, screen brightness and system upgrading of the instruments.

3 Introduction to Optical Fiber Comprehensive Tester

The optical fiber comprehensive tester integrates optical time domain reflectometer, event map, optical power meter (optional), light source (optional), visual light source, network cable test, end detection and lighting, which can test the performance characteristics of optical fiber physical layer and network cable physical characteristics; Among them, OTDR has excellent blind area and first-class dynamic range. There are five models to choose from, which can better meet your specific OTDR testing needs. Combined with visual fault, it can ensure the whole process of optical fiber fault detection; Network cable test can complete the identification of network cable sequence and the detection of network cable length, and can roughly detect the location of network cable breakage.

Optical fiber comprehensive tester is an OTDR series designed on the basis of the tablet computer and the smart phone. OTDR has simple and quick operation interfaces and 7-inch enhanced capacitance touch screen. It can provide an unprecedented user experience without special training. OTDR is compact and light, easy to carry and durable, so it is more suitable for outdoor environments.

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3.1 Main Functions

3.1.1 Characteristics

- Accurate, fast, reliable and easy to operate.
- 12 kinds of multi-function integration
- The 7-inch outdoor enhanced capacitance touch screen provides simple, vivid and friendly operation interfaces. With intelligent one-button operation, it can test related functions as long as it is opened.

3.1.1.1 OTDR Characteristics

- It can magnify and shrink test traces manually.
- OTDR optimizes mode tests:
  - For network activation: High speed test mode
  - For network maintenance: Precise test mode
- OTDR provides many kinds of dynamic ranges and wavelength combinations
- OTDR can test double wavelengths and intuitively observe macro bending points of the optical cable.
- OTDR has many test modes: average mode; real-time mode; real time converting average mode; average mode+ real-time mode.
- OTDR has route light alarm function which can protect optical devices to the utmost extent.
- OTDR has optical module self-check function which can automatically detect performance and state of optical modules.
- OTDR has Chinese and English input functions as well as friendly input interfaces which can completely simulate input mode of mobile phones. It also has the auto-save function.
- It can build U Disc folders and ensure classified storage of different optical cables.
  - Various measurement modes

OTDR provides the following measurement modes:

- Automatic mode: automatically calculate the length of the optical fiber, set sampling parameters, obtain curves and display the event list and curves obtained.
- Average mode: Provide all tools for intact OTDR measurement; users can control all measurement parameters.
- Real-time mode: Measure the optical fiber in real time; compare the results with reference curves previously obtained and analyzed, which can save your time when you measure large quantities of optical fibers.

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- High sampling resolution: Trace distance obtained by this mode has higher precision.
- Post-processing of data

The trace management software attached in random U disk of OTDR installed in your computer can be used to check and analyze the curve, so you do not need to use OTDR.

You can also use more functions, such as:

- Customized printout
- Batch print
- Convert the curve to Telcordia format

3.1.1.2 System features

- The large-capacity lithium-ion battery has overcurrent, over temperature, over pressure protection function and its working time is longer than 10 hours.
- The external power supply interface has input high voltage protection which can prevent high voltage input from burning the instrument.
- Super-large storage space: U Disc can be connected to the USB interface to expand the storage space of 160GB.
- The meter software can be upgraded remotely.
-

3.2 Introduction to Instrument Frame

3.2.1 Introduction to Display Interface

Figure 3.2.2: Homepage interface

3.2.1.1 OTDR Interface

3.2.2.1.1 OTDR Display Interface
Click OTDR interface, which is shown as follows (refer to the following figure).

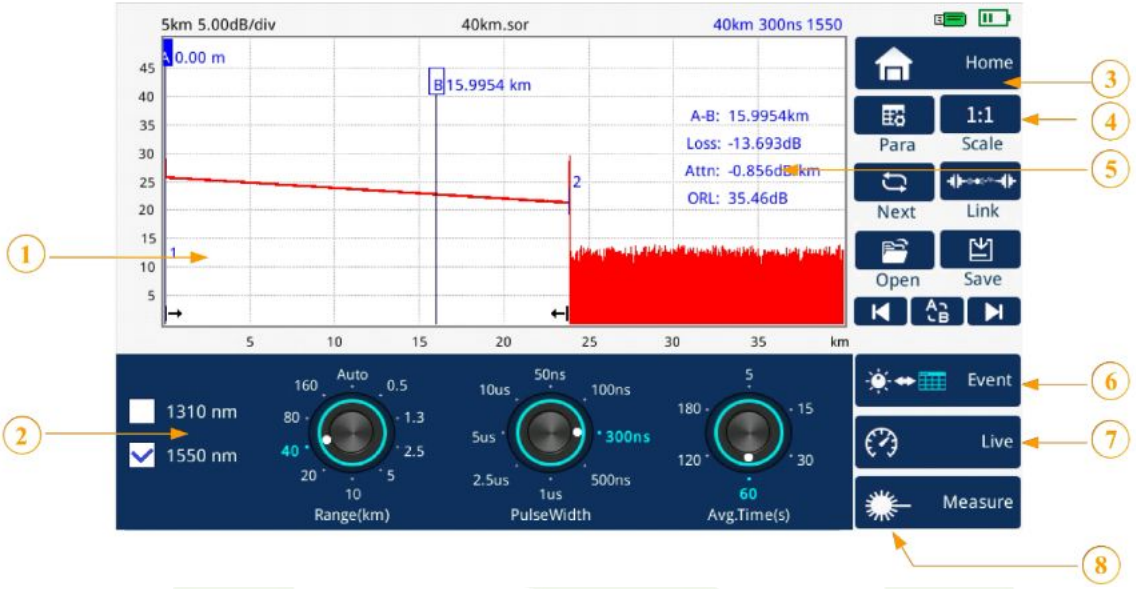

Figure 3.2.2.1.1: OTDR interface

1. Test curve display area (the horizontal axis shows the distance, and the vertical axis shows dB)
2. Measurement parameters (wavelength, distance range, pulse width and accumulative time duration) and test event list.
3. Return “home page”
4. OTDR keys
5. Information list of AB Benchmarks
6. Convert test parameters and test results.
7. Real time testing
8. Average test

3.2.1.1.2 Introduction to Functions of OTDR Keys

No	Icon	Functions	Remarks
1	Para	OTDR test parameter: optical fiber parameter, analysis parameter, optical fiber length unit, test mode.	Wavelength, pulse width, distance range and average time are set here.
2	1:1 Scale	Test image restoration 1:1	
3	Next	Test dual wavelength test in switching wavelength test curve and test results image restoration 1:1	
4	Link	Analysis chart of optical fiber link	
5	Open	Open it to see test curves saved.	
6	Save	Save the current test curve.	Select “quick save” mode in “parameters” and only name the file appearing for the first time; if “save” pops up again after that, just save the file directly.
7		The current benchmark moves to the left	
8	A B	AB benchmark exchange	
9		The current benchmark moves to the right	

3.2.2.2 Event map

Figure3.2.2.2Event map

3.2.2.3 Optical Power Meter (click to enter)

Figure 3.2.2.3 Optical power meter

3.2.2.4 Visible Light Source (click to enter)

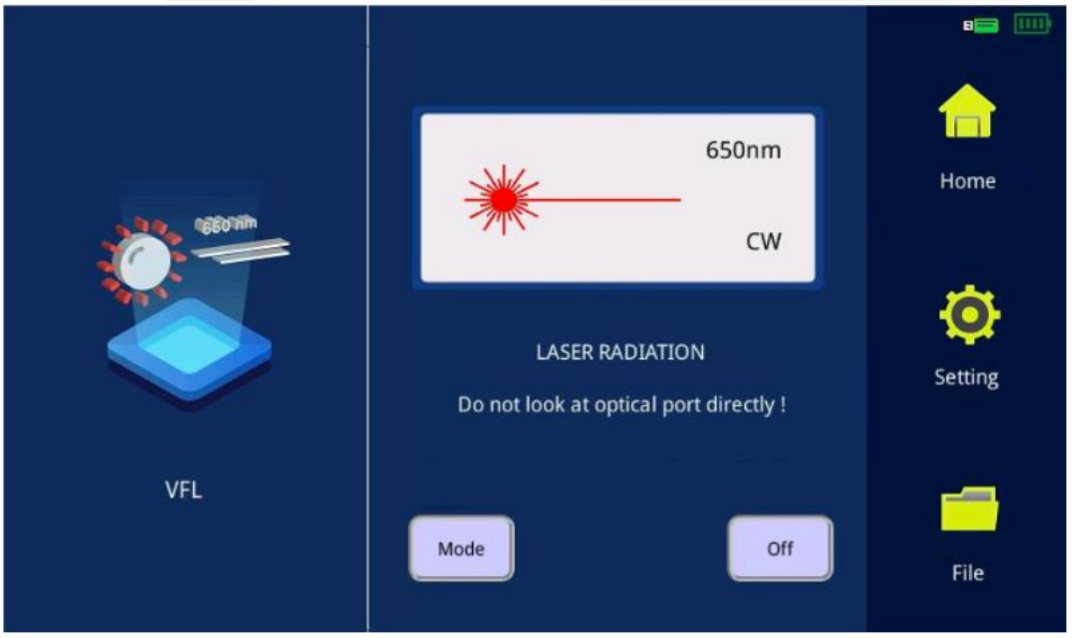

Figure 3.2.2.4 Visible Light Source (click to enter)

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3.2.2.5 Light Source (click to enter)

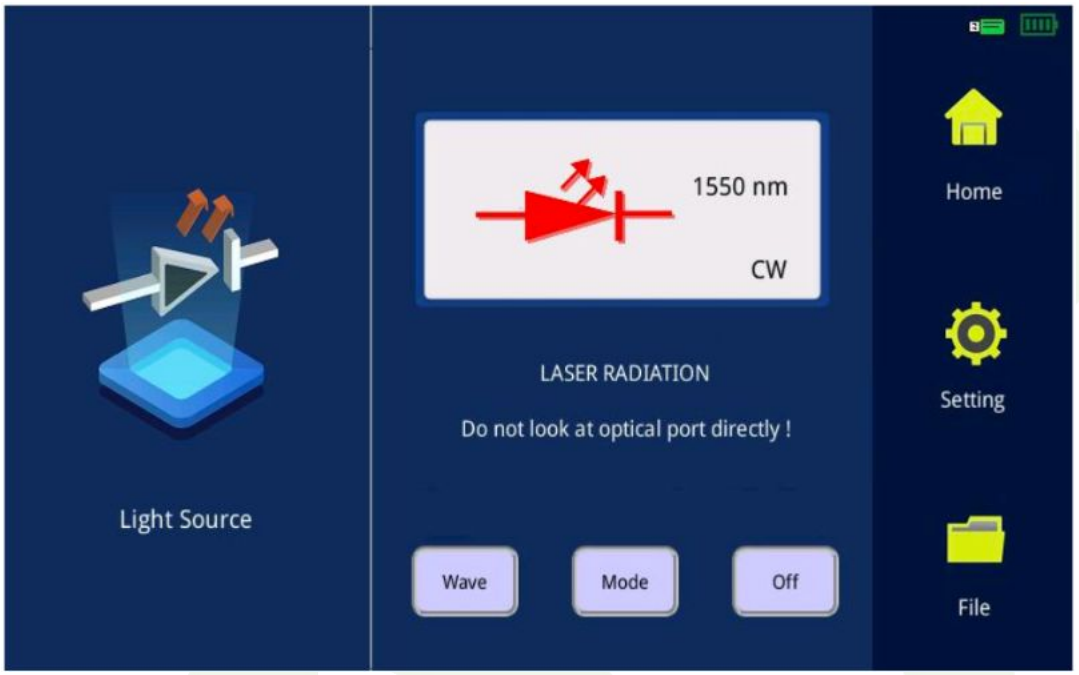

Figure 3.2.2.5 Light Source

Remarks: Light source interface is the same with that of OTDR interface

3.2.6 Cable test

Figure 3.2.6 Cable test

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3.2.2.7 Equipment Maintenance

3.2.2.8 File Management (click to enter)

File management is mainly used to manage files stored, to delete files and send files to U Disc.

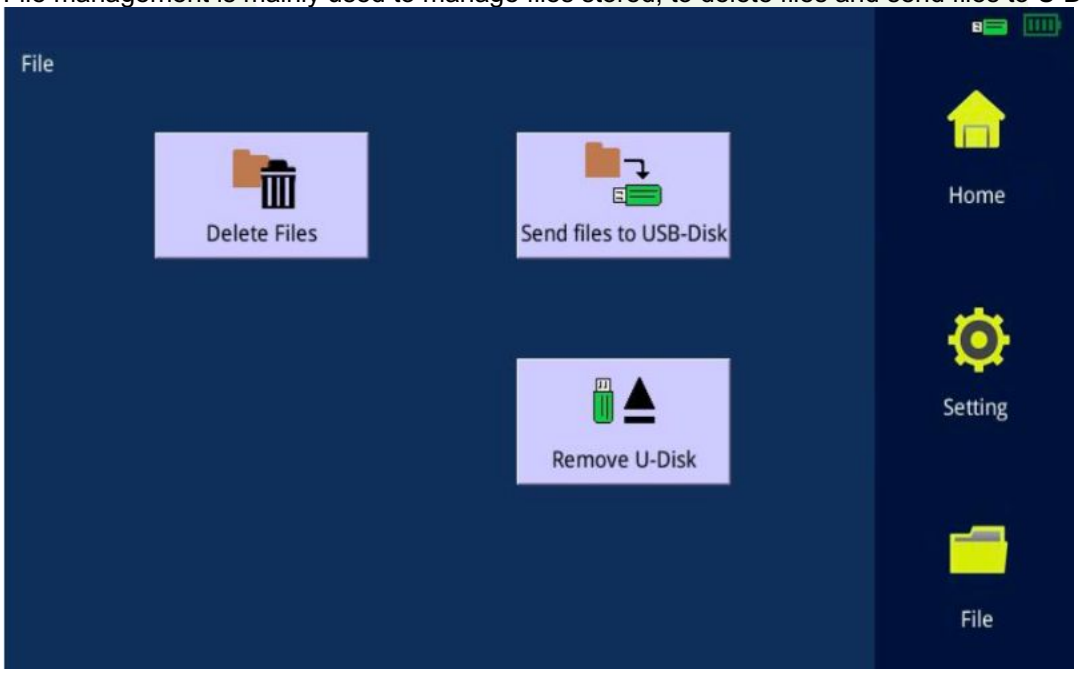

Figure 3.2.2.8 File management

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3.2.2.8.1 Delete Files

Single click “delete files” to enter the interface to delete files; single click it to select files to be deleted.

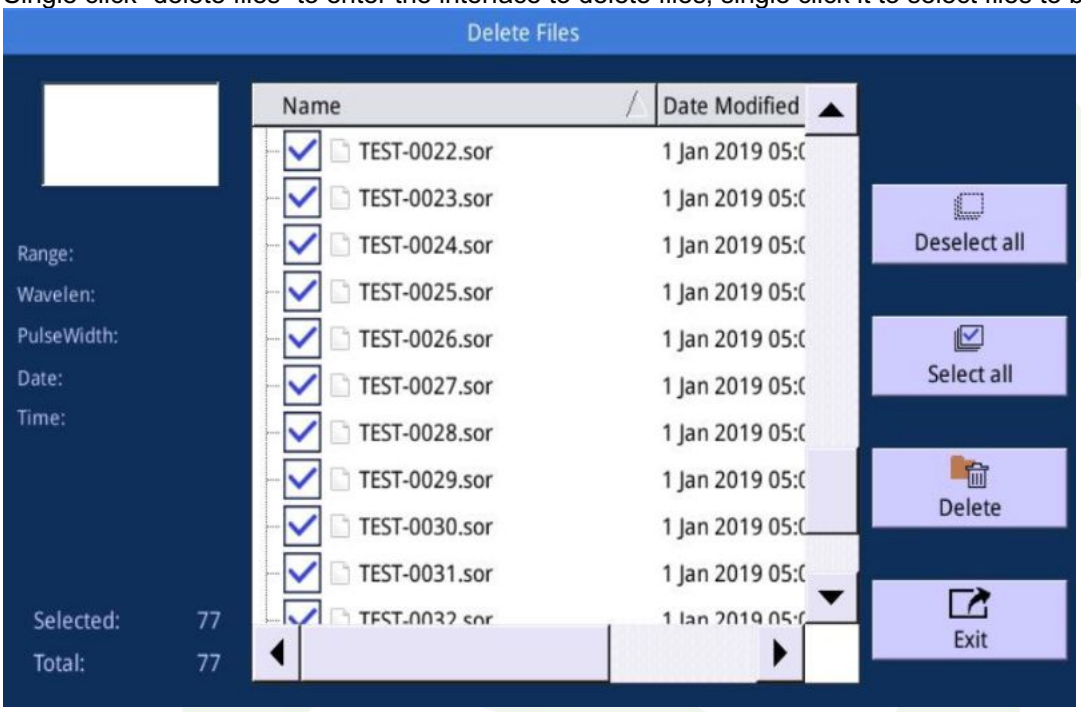
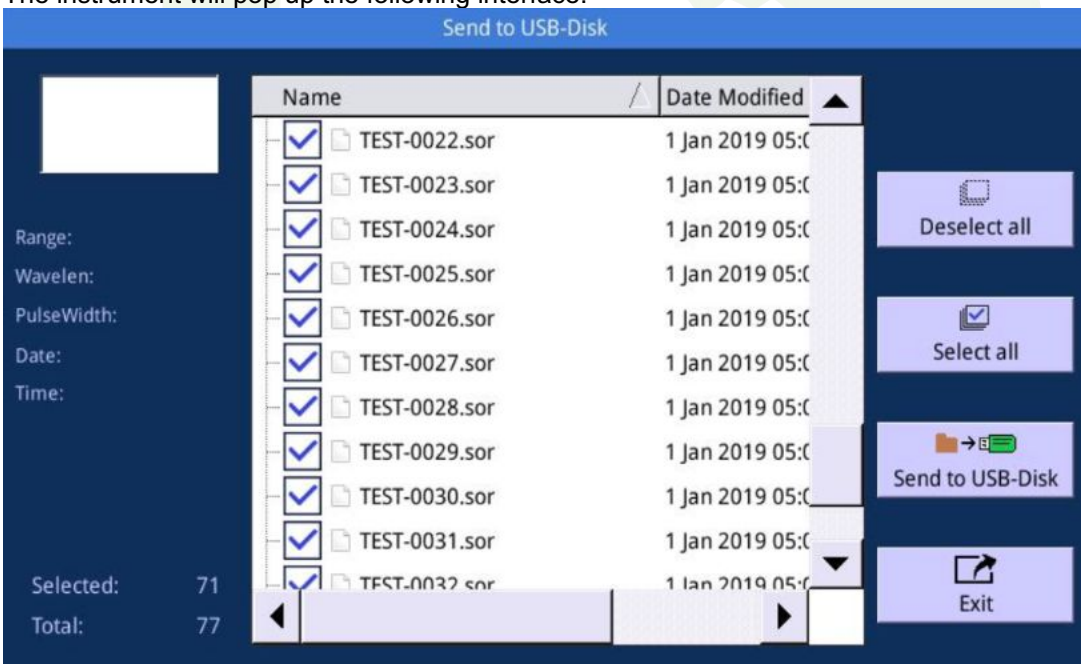


Figure 3.2.2.8.1 Delete files

3.2.2.8.2 Send Files to U Disc

1) Insert U Disc to USB port and the instrument will detect the U Disc. Single click “send files to U Disc”, The instrument will pop up the following interface:



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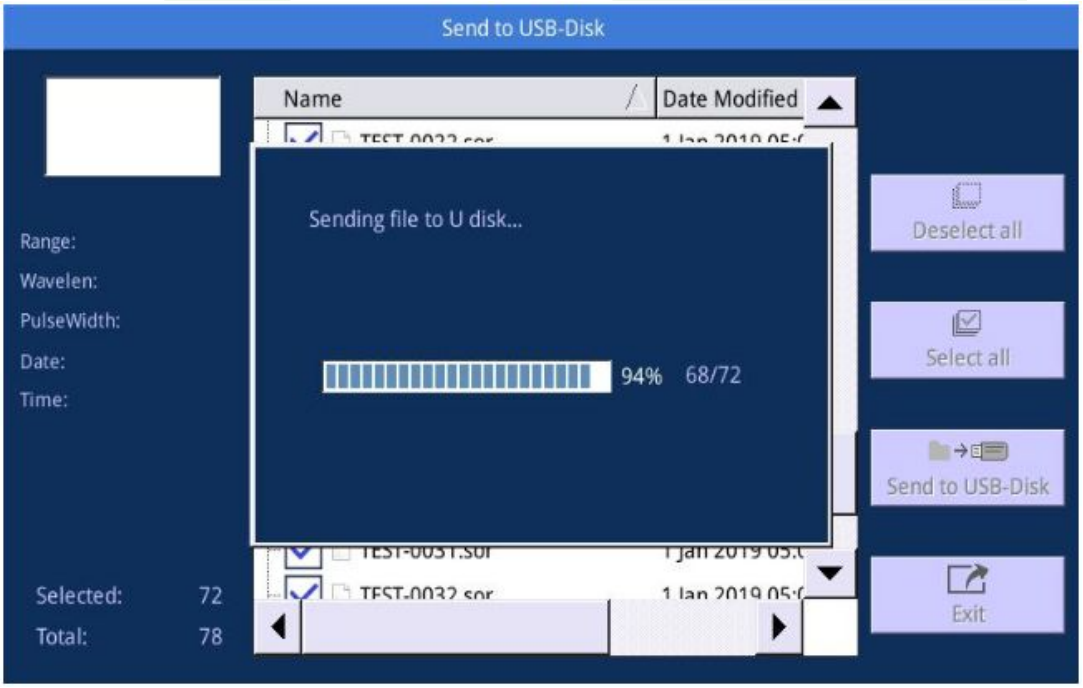
2）Select files to be uploaded to U Disc.

3）Create a folder for data to be uploaded to U Disc.

4）Click OK and the following interface will pop up. Click “OK”



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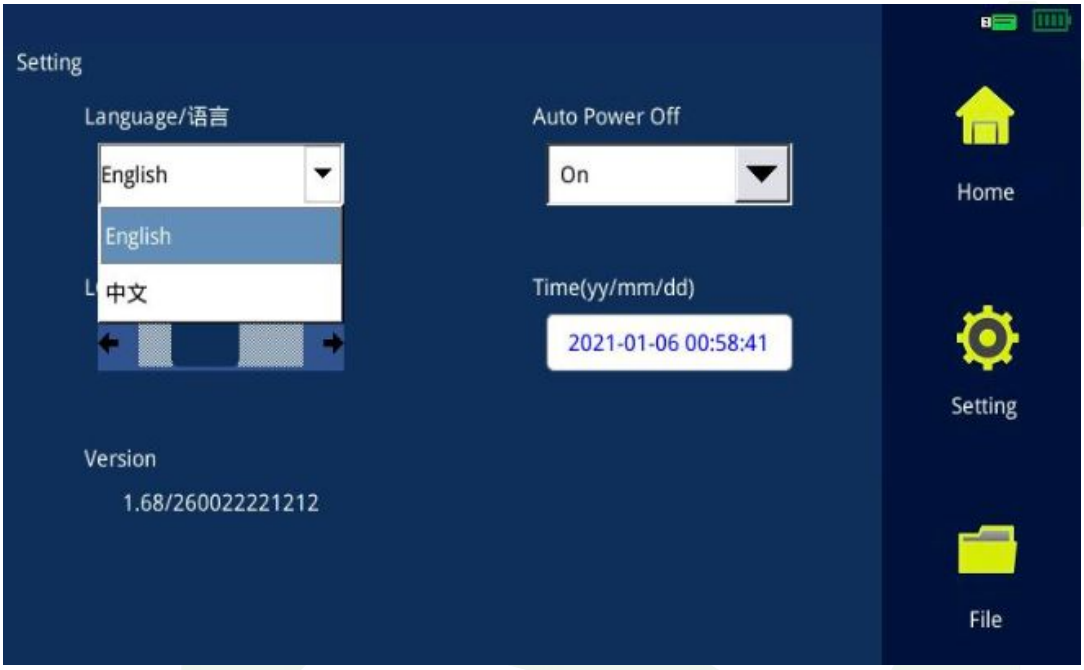
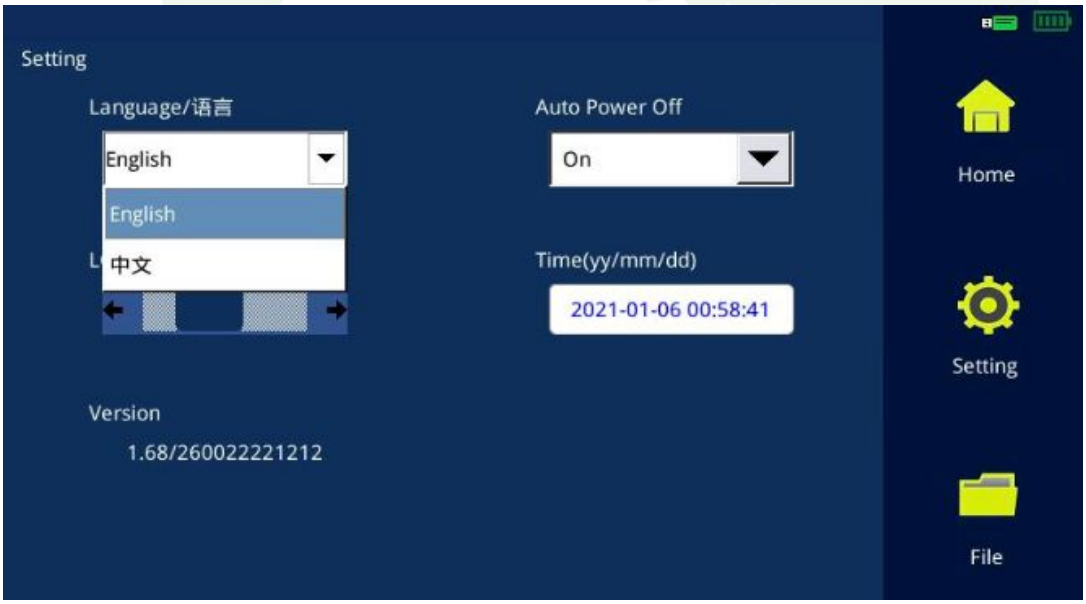
3.2.2.9 System Setting (click to enter)

System setting is used to set the entire operation platform, such as language setting, automatic shutdown function, time setting and display contrast setting.



3.2.2.9.1 Language Setting



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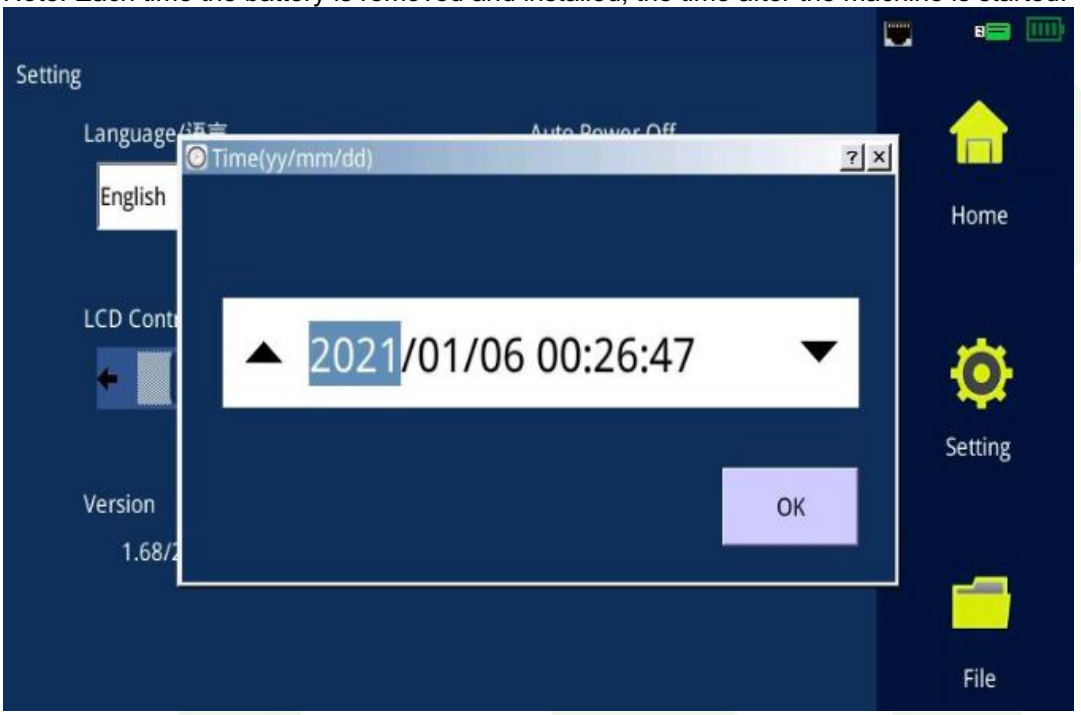
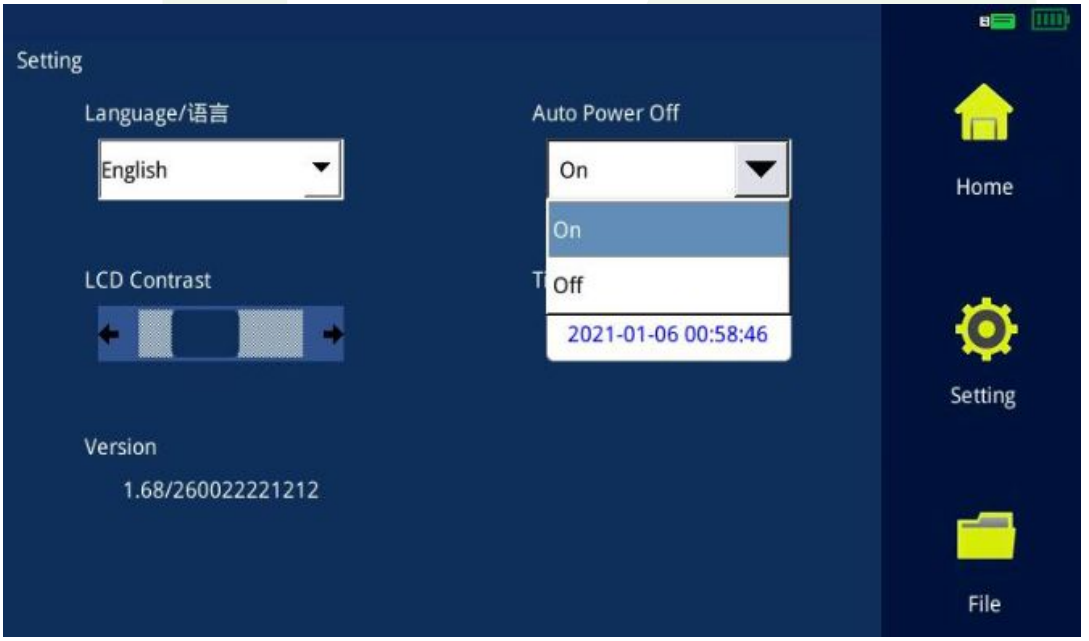
3.2.2.9.2 Time Setting

Note: Each time the battery is removed and installed, the time after the machine is started.



3.2.2.9.3Automatic Shutdown

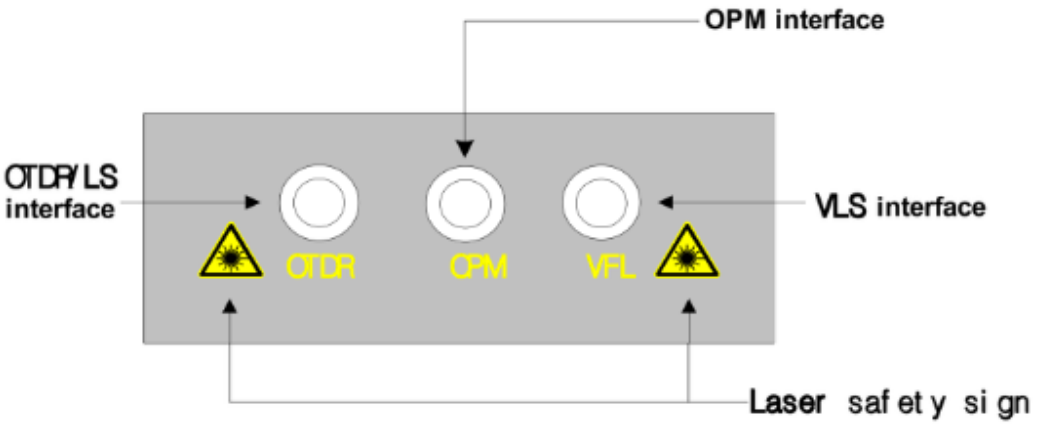


3.3. Introduction to LED

There are three LED indicator light on the equipment.

No.	Indicator light	Function
1		Start the device
2		Charge the battery
3		Start/close the visible light source

3.4 Introduction to Top Plates



Remarks: Optical power meter and light source (optional)

Warning

Please never install or terminate optical fiber when light source is in active state. Never peep at the load signal optical fiber to protect your eyes at all time.

4. OTDR Setting Parameters

Touch [parameter] to set related parameters: OTDR test parameter: optical fiber parameter; test curve analysis parameter, optical fiber length unit and test mode.

[Operation]Touch [parameter]:: 

- Press [parameter] to enter parameter menu, as shown in the figure.

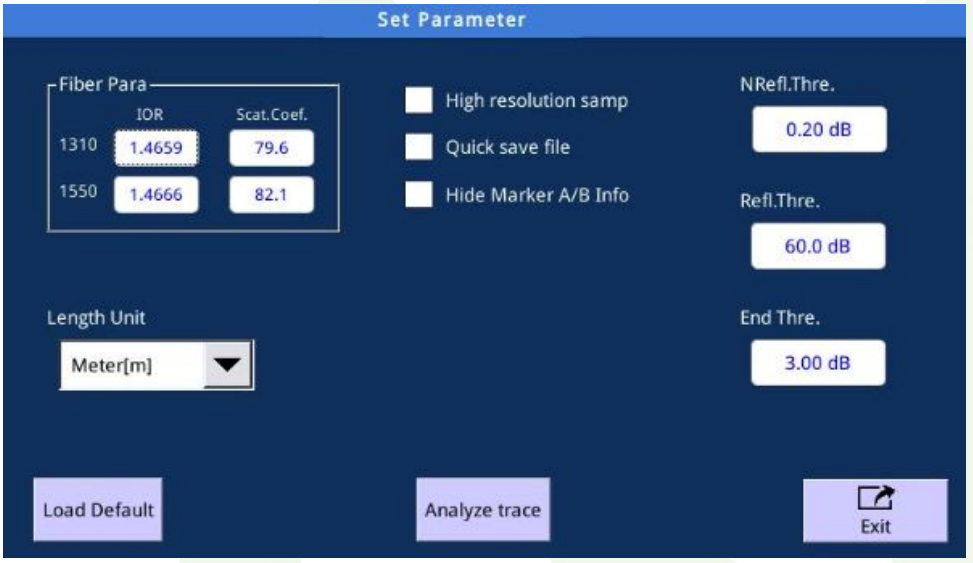


Figure 4.1 Setting parameter

- Optical fiber parameter: Intrinsic parameters of the optical fiber are provided by the optical cable manufacturer. If there are no such parameters, please do not change them, otherwise, test results may be affected.

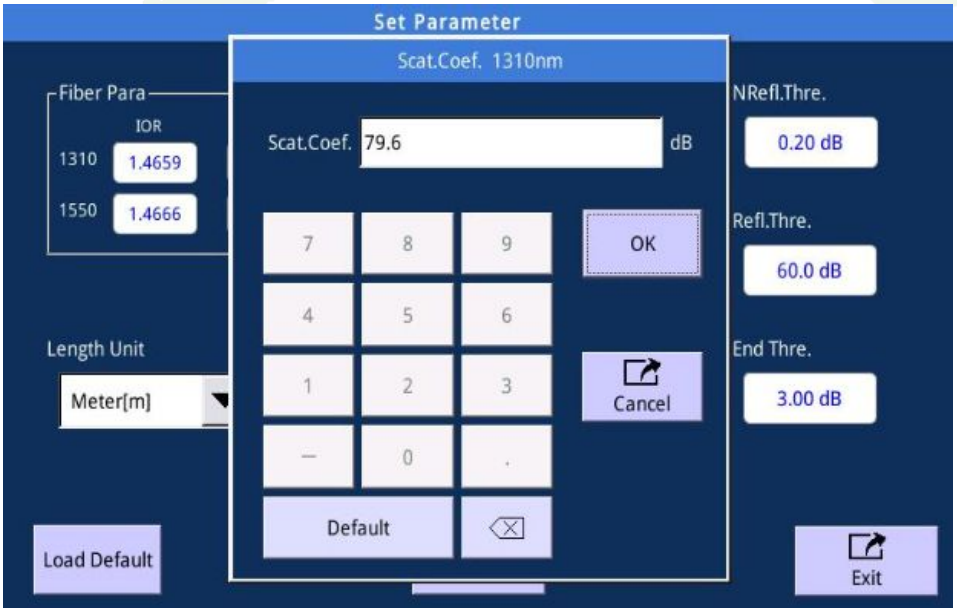


Figure 4.2 Set the back scattering coefficient

- Measurement mode: Average mode and real-time mode

In real-time mode, it can be changed to the average mode, but the average mode can not be changed to real-time mode.

In order to provide convenience for the final testing of the test users, under the average mode, the wavelength, distance range, pulse width and average time can be changed at any time during the test process. However, during the double wavelength test, the wavelength can not be changed.

- Length unit: Change OTDR test distance units
- Analysis parameter: Analysis tests include the non-reflection threshold, the reflection threshold and the termination threshold.

Non-reflection threshold is used to set threshold values of events with no reflection peak. It will be displayed if the value is larger than the setting threshold, otherwise, values will not be displayed.

Reflection threshold is used to set threshold values of events with reflection peak.

Termination threshold is used to set decision values of the termination point.

After curve tests are done, if event analysis is found to be incorrect, by opening the curve and you can set it again in “parameter”. Then, click “analyze the trace” to analyze it again.

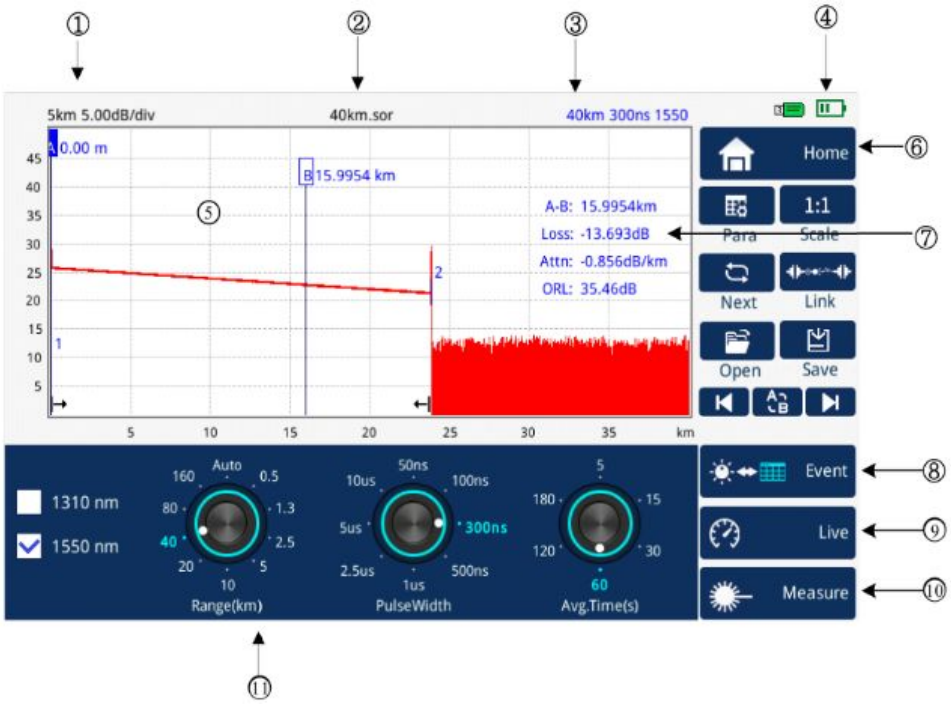
- High sampling resolution:
- Instrument sampling has two modes: high sampling resolution mode and quick sampling mode.

The general mode is the quick sampling mode.

After it is selected, the instrument will turn to the high sampling resolution mode. In this mode, the instrument has more sampling data and show clear internal details of optical fiber.

- Quick saving file: After this mode is selected, unless the file name has regulations, the file name will no longer pop up if it is otherwise saved. After the instrument is closed, if you want to renew name of the early file, you can open the last one of the early file names and then select quick saving file.
- Press [Exit] to exit the settings menu.

4.4 Trace Display



As shown in figure, the divisions of all functional areas of the main measuring interface are as follows:

① Miles of each grille in laterally; Number of dB of each grille longitudinally.

The values change with the zoom in and out of the trace windows.

②Trace file name

The current trace file name. If the trace is not saved, the trace name is displayed as [*].

③Current trace parameters

Measuring range, pulse width, laser wavelength.

④Battery energy, the dump energy of the battery.

⑤Trace window

Display the measuring trace; reflect the features of the optical fiber link through the trace.

⑥Back to main menu

⑦AB benchmark information

Distance, loss and attenuation coefficient and return loss between AB benchmarks

⑧It is used for parameter setting and event list conversion after testing

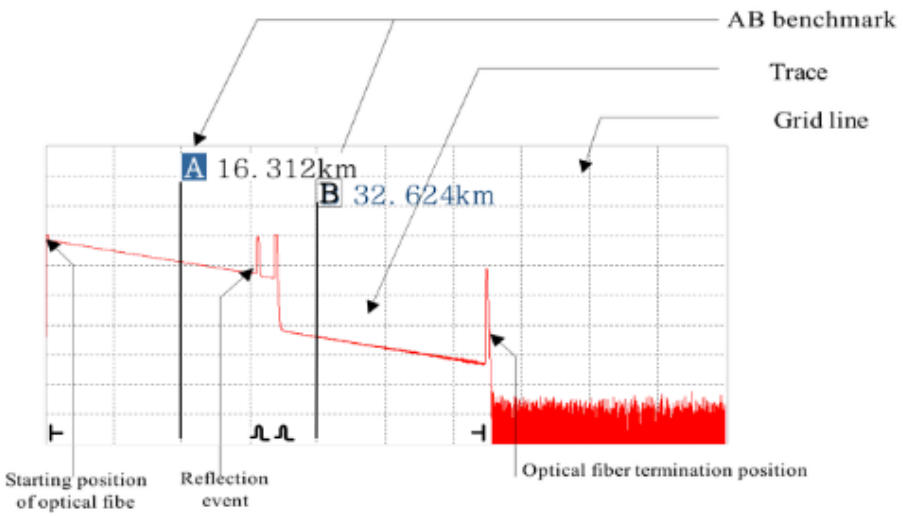
⑨ Real-time testing

⑩Average testing

- 11.Parameter setting and event list

Refer to 4.4.2 Detailed description

4.4.1 Trace window



<1> AB benchmark

Benchmark instruction: benchmark number + benchmark distance, the distance of the start position of the measured optical fiber, such as “B 32.624km”

[Operation] Switch AB benchmark

Benchmark switch: press [A/B] button and character of the selected benchmark is deepened. You can also touch corresponding benchmarks directly to switch them.

Benchmark operation: Press [ ] and [ ] buttons to move the benchmark.

[Association instructions] Move AB benchmarks, [benchmark information] under the LED will subject to changes.

No	Type	Loc.(km)	Reflect(dB)	Loss(dB)	Attn.(dB/km)	Cum.Loss(dB)
1	Start	0.000	47.8			
2	End	23.832	41.0		0.187	4.45

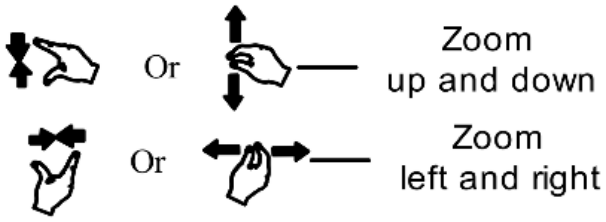
<2> Icon of event types

NO.	Icon	Fuctions	Remarks
1		Starting point of measured optical fiber	
2		Reflection event	
3		Loss event	
4		Gain event	Pseudo gain,One of the loss events
5		Optical fiber terminal under test	

<3> Zoom in or out the trace

Gesture operation is used to zoom in or out the instrument traces, which can improve user's sense of operability.

- Double finger operation: Zoom out/Zoom in



- Single finger operation:

a) Move the trace after it zooms out

b) Global display zone of the trace:

- Single finger operation: Single click this zone and the trace zoomed in or out will restore to be 1: 1.
- Three fingers operation: Use three fingers to click it, display zone of the trace will restore to be 1: 1.

4.4.2 Event List

The event list is located in the lower left area of the LED (The same area of the parameter setting. Please click " 

")

No	Type	Loc.(km)	Reflect(dB)	Loss(dB)	Attn.(dB/km)	Cum.Loss(dB)
1	Start	0.000	47.8			
2	End	23.832	41.0		0.187	4.45

[Operation]Check the event list

Press[ ] and [ ] button in the event list and leaf through each event.

[Association instructions] When leafing through the events, the benchmark moves toward to the event.

4.5 Set the Optical Time Domain Reflectometer

4.5.1 Cleaning and Connecting Optical Fiber

Important prompt

⇒ In order to get the maximum power and avoid false readings, please clean the terminals of the optical fiber according to the following instructions all the time, and then insert it into the port. We will take no responsibility for the damage or error caused by false cleaning or operation mode of optical fiber.

⇒ Please make sure the connected optical fiber has correct connector. Unmatched connector will damage the optical fiber and the instrument.

[Operation]Optical cables are connected with the terminals

Clean the optical fiber terminals according to the following operations:

- Use the lint-free swab dipped into isopropyl alcohol to wipe slightly the optical fiber terminal.
- Use compressed air to dry it completely.
- Visually check the optical fiber terminals to make sure it is clean.
- Carefully aim the connector to the port to prevent the terminal of optical fiber touching the external part of the terminal or have friction with other surfaces. If the interface of the connector has convex

shape fixed design, please make sure to insert correctly into the corresponding groove of the port when connecting.

- Push the connector in, make the optical cables fix at the correct position and guarantee sufficient contact. If the connector has screw bushing, please screw down the connector to fix the optical fiber at the correct position. Please never over-screw down the connector, or it will damage the optical fiber and the port.

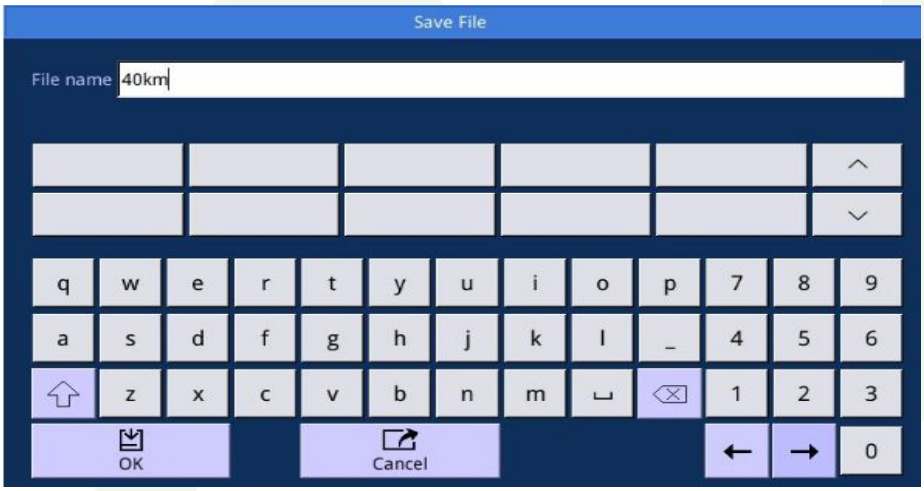
Note: If the optical fiber is not aligned completely and/or connected, it will have serious loss and reflection.

4.5.2 Trace Naming

After measuring the curve each time, press [Save] button on the right of the LED to save the measuring trace.

4.5.2.1[Operation] Trace naming.

⇒ Press [Save] to input file name of the trace.



⇒ Touch corresponding buttons to enter letters, numbers

⇒ Touching [→] and [←] buttons can move the cursor to the right or left

⇒ Touching control button [⇧] can alternate between the upper case and the lower case

⇒ If incorrect letter or number is input, touching [⌫] button can delete it.

⇒ Touching [En->中] button can switch Chinese and English input methods.

After finishing the input, press [OK] button to save the trace, or press [Cancel] to exit

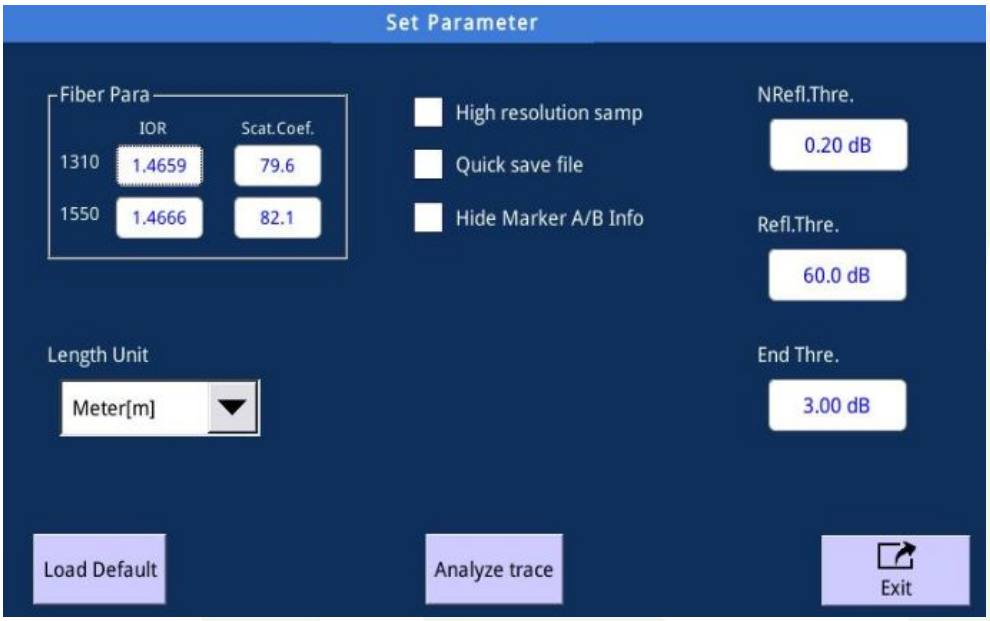
[Instructions]

- Every time the device is turned on, it shall reset the trace file name.
- [Automatic naming] After the setting of trace file name is finished at the same device start, it can automatically name the trace files. For example: if the first file is named as “aaa” when starting the device, when measuring the fiber next time, the trace name will automatically change to “aaa_001”

This function is convenient for measuring the ribbon optical fiber.

4.5.2.2 [Operation] Quick saving file

⇒ Press [parameter] button to set the menu.



⇒ Select “Quick saving file” and return to the test interface.

⇒ After the completion of the test, click “save file” and “file naming” interface will appear for the first time. Then, name the trace according to 4.5.2.1.

⇒ In subsequent testing processes, as long as “save” is pressed, the instrument will not pop up “file naming” interface and it will continue to name the file directly on the basis of the first naming.

4.6 Optical Fiber Test

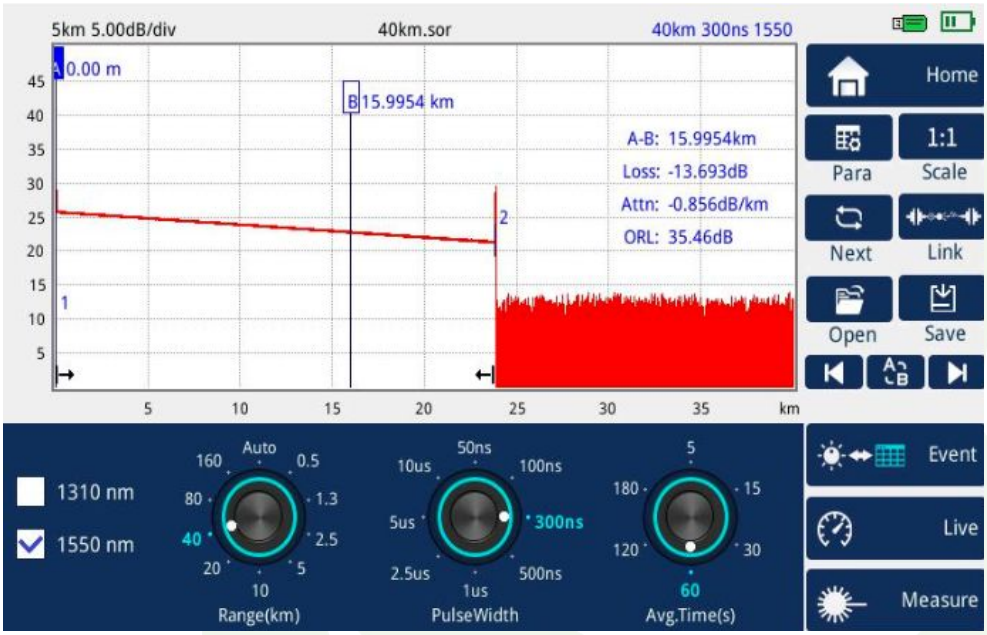


Figure 4.6 Optical fiber test setting interface

4.6.1 Setting Parameters before Test

Refer to Figure 4.1 to set parameters

1. Before optical fiber tests, the refraction index of optical fiber and the back scattering coefficient shall all be well set. If there is no optical fiber parameter, parameters provided by the instrument shall be used.

Note: Optical fiber index of refraction and back scattering coefficient will affect the test result.

2. Parameters provided by the instrument shall be analyzed before the test. If the test results are not good, they should be analyzed again after they are adjusted.
3. Selection of test modes: Select the average mode or the real-time mode.
4. Select appropriate units of distance
5. Determine whether you want to select “quick save”; just select it if necessary.

4.6.2 Measuring Optical Fiber in “Average” Mode

Test parameters of the instrument, including the wavelength, distance range, pulse width and average time, will be directly displayed on the interface. In the test process, if some parameter is found to be improper, you can directly click it to change the parameter with no need to stop the tests until proper parameters are set.

Figure 4.6.2 Test

To change other parameters, please go to the interface of corresponding “parameters” to change them. Tests can be changed in parameter setting process until you obtain ideal test results.

After the evaluation is done, the app will start to obtain traces. The trace displaying contents will be constantly updated.

[Operation] Measure the optical fiber under “average” mode

1) Correctly clean the optical joint and the optical connector

2) Connect the optical fiber to the OTDR port

Notes

There are three ports of OTDR, VFL and optical power meter on the instrument. Please connect to the OTDR port correctly.

Warning

Please never connect the optical fiber with light load signals to OTDR port. Any outsourced light signals will influence the OTDR measuring, and high-strength light signals may bring permanent damage to OTDR.

3) Touch [parameter] to set the optical fiber parameter.

⇒ Optical fiber parameters: The index of refraction and the back scattering coefficient

⇒ It can convert the measuring time to distance by utilizing the index of refraction (also referred to as group coefficient). Therefore, the knowledge related to the correct index of refraction is crucial to all OTDR measuring (event position, attenuation, regional length and total length etc.) related to the distance.

The index of refraction is provided by the manufacturers of optical cables or optical fibers.

The test application program establishes a default IOR value for each wavelength. User can set the IOR value of each applicable wavelength. Before each test, it shall check such information. The index of refraction can affect the accuracy of the measured distance.

Back scattering coefficient represents the backward scattering amount of the special optical fiber. The back scattering coefficient is used to calculate the event loss and the index of refraction, and this coefficient is generally obtained from the manufacturer of the optical cables. The test application program establishes a default coefficient for each wavelength. The user can set the back scattering coefficient of each applicable wavelength.

⇒ Set the non-reflection threshold, reflection threshold and the termination threshold

By utilizing the OTDR, it can set the pass/non-pass threshold parameters for the test.

Apply the set loss, refractive index and attenuation threshold to all events that can measure suchvalues. The setting of these thresholds allows to neglect the event with lower given value, or to make sure to detect all events (even though measuring very small events).

⇒ Select the test mode: Average test.

4) Set the measuring wavelength: Select the working wavelength of laser during the measurement. If wavelength is found to be improper within the average time, you can click to change it at random.

5) Set distance range: it corresponds to the distance range of the span of optical fiber to be measured determined based on the measured unit.

[Note] The change of distance range will change the applicable setting of the pulse width.

“Automatic” mode refers to tests done when the distance range is set to be automatic. In “automatic” mode, the instrument will automatically estimate the length of optical fiber, automatically set the length of optical fiber for further measurement and will then display the measurement results.

6) Set the average time: it corresponds to the duration of average time. In general, longer average time can create cleaner curves (especially to the long distance curves), that is because along with the lengthening of the average time, more noise will be averaged off. Such an averaging process can increase the Signal-to-Noise (SNR) and the ability of OTDR to detect small event.

7) Press [

] to start measurement; press [

] to stop operations at any time and analyze the trace in the measurement process.

Note: In measurement process, 4), 5) and 6) can be changed at any time.

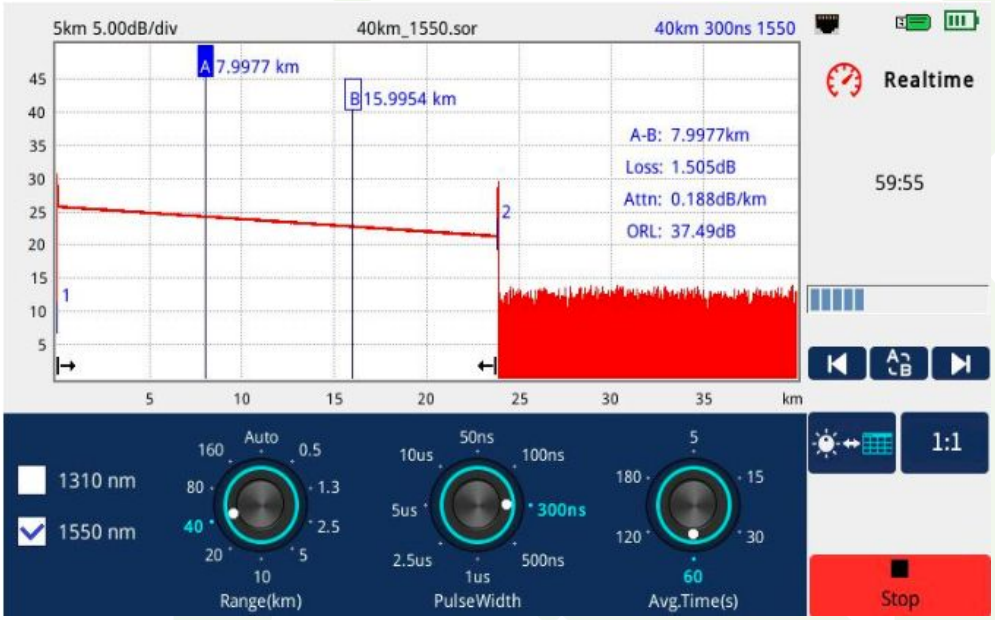
8) Press [Save] button to save the trace

Note

When saving the document, it shall prevent duplication of name. Otherwise, after the new document is saved, the original document will be replaced by the new document.

4.6.3 Measuring Optical Fiber in “Real-time” Mode

“Real-time” mode is used to look over immediately the change in the detected optical fiber. In such mode, the SNR of curves are lower and the curves are continuously refreshed, not averaged, until you press the “stop” key.



[Operations] Measure the optical fiber under “real-time” mode

1) Correctly clean the optical joint and the optical connector

2) Connect the optical fiber to OTDR port

Note

There are three ports of OTDR, VFL and optical power meter on the instrument. Please connect to the OTDR port correctly.

Warning

Please never connect the optical fiber with light load signals to OTDR port. Any outsourced light signals will influence the OTDR measuring, and high-strength light signals may bring permanent damage to OTDR.

3 Refer to details of “setting parameter” in 4.6; set the test mode for parameters as “real-time) mode”

4) Refer to 4.6 to set wavelength, distance range, pulse width and average time.

5) Press [

] to start measurement; press [

] again to stop the measurement and analyze the trace.

6) In the test process, the wavelength, distance range, pulse width and average time can be changed at any time according to the requirements.

7) Press [Save]button to save the trace

Note

When saving the document, it shall prevent duplication of name. Otherwise, after the new document is saved, the original document will be replaced by the new document.

4.6.4 Measuring Optical Fiber in "High Sampling Resolution" Mode

"High sampling resolution" mode is used to check the distance sampling resolution. In this mode, the distance resolution will be higher; if it is disabled, the measuring will be faster.

[Operation] Measure the optical fiber under "high sampling resolution" mode

1) Correctly clean the optical joint and the optical connector

2) Connect the optical fiber to OTDR port

Note

There are two ports of OTDR and VFL on the instrument, and please correctly connect to OTDR port

Warning

Please never connect the optical fiber with light load signals to OTDR port. Any outsourced light signals will influence the OTDR measuring, and high-strength light signals may bring permanent damage to OTDR.

3) Refer to details of "setting parameter" in 4.6; touch "high sampling resolution" to select "Start"

How to close high sampling resolution mode?

Touch [parameter] button and "high sampling resolution" to select "close"

4) Refer to 4.6 to set wavelength, distance range, pulse width and average time.

5) Press [

] to start measurement; press [

] again to stop the measurement and analyze the trace.

6) Press [Save] button to save the trace.

Note

During saving the document, it shall prevent duplication of name. Otherwise, after the new document is saved, the original document will be replaced by the new document.

4.7 Analyzing Traces and Events

4.7.1 Opening Trace Files

[Operation] Opening Trace Files

⇒ Press [Open] button in the touch button area and it shows file-opening interface.

⇒ Press [
] and [
] buttons to select the trace file

⇒ Press [
] button to open the trace file or press [Cancel] to cancel the operation

4.7.2 Trace Display and Event Table Description

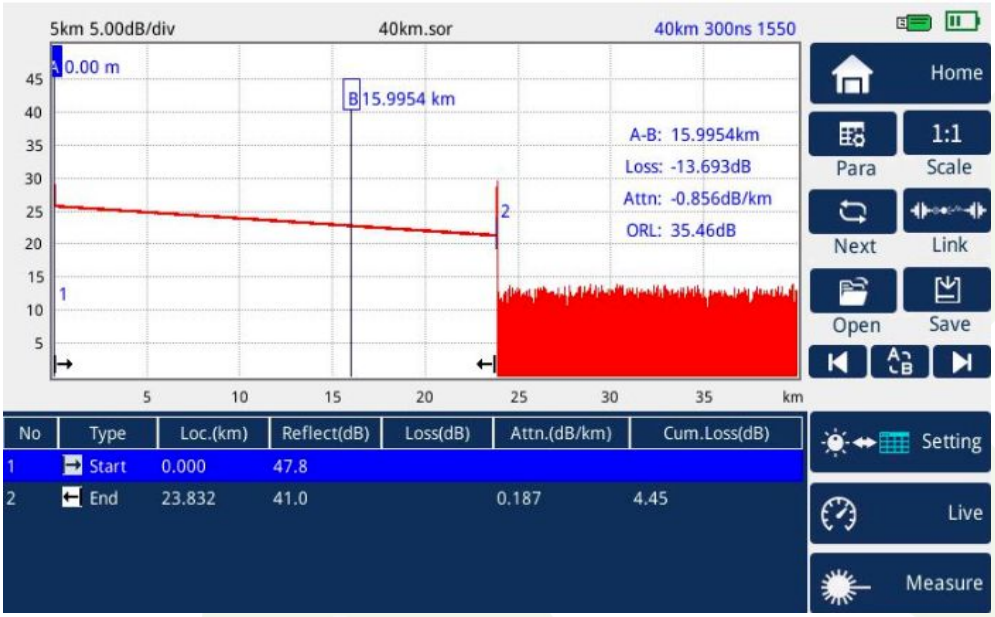


Figure 4.7.2 Trace Display

[Instruction]

For detail operations and instructions, refer to 4.4 Trace Display Interface

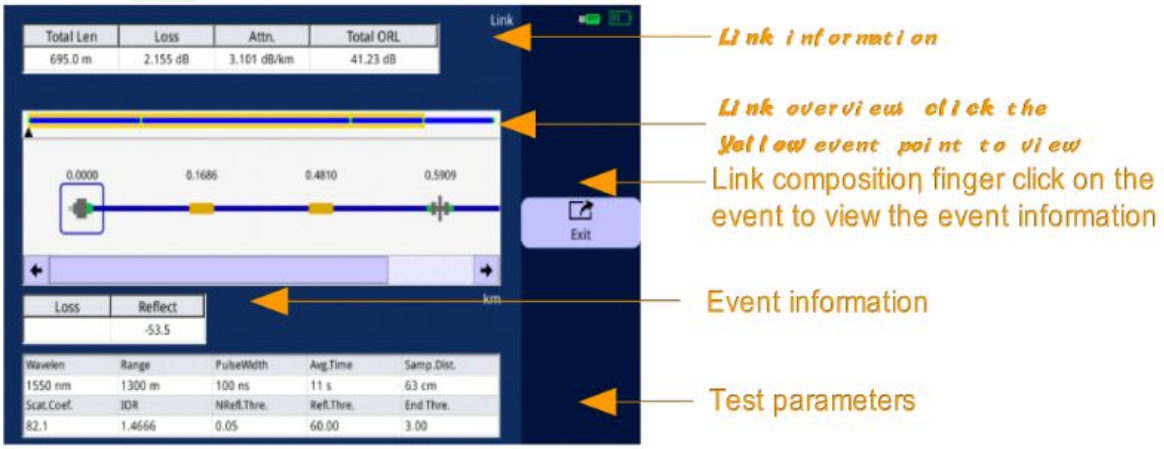
By pressing [ ] and [ ] buttons on the right of the event list, you can check each event in the event list. When you change the event, the benchmarks will automatically move to current event.

4.7.3 Positioning Event in Trace Display and Event List

Under the interface of Figure 4.10.2, you can press [ ] and [ ] buttons to check each event in the event list.

4.7.4 Link Information

Press [Link] button on the right of LED to display the current detailed trace information.



4.7.5 Amplifying or Shrink Trace

By touching the capacitive screen, the trace can be enlarged or reduced in the gesture operation curve area.

[Operation] Rapidly check the event

⇒ Press the up and down button on the right side of the event table to quickly find the event you want to

view in the event table. Click and select the event. At this time, the ruler has moved to the event position.

By touching the capacitive screen, the trace can be enlarged or reduced in the gesture operation curve area.

4.8 Analyzing Result Manually

4.8.1 Acquiring Event Distance

OTDR test application program automatically calculate the event position and display this distance in the event list. It can also manually retrieve the event position and the distance between events and it can also display different associated power readings.

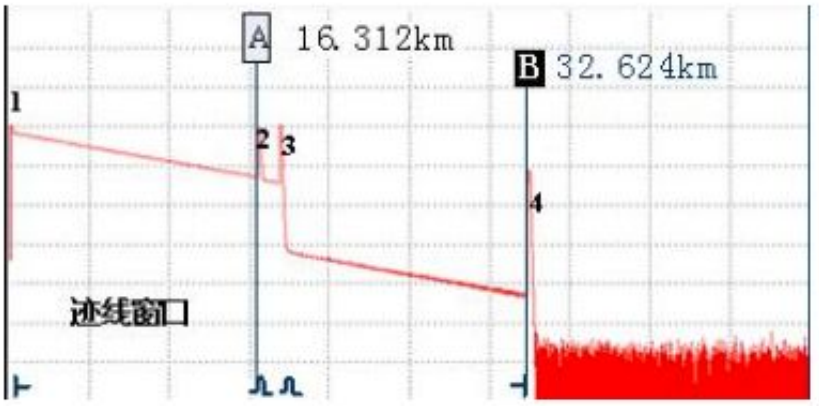


Figure 4.8.1 Acquiring Event Distance

[Operation]

⇒ Press [←] and [→] buttons to move the benchmark, as shown in Figure 4.11.1. First, move benchmark A to the position of event 2.

⇒ Press [A/B] button and switch to benchmark B. Move benchmark B to position 4;

At this time, the information list of benchmarks AB contains all information between AB, including the distance between two events represented by benchmarks A and B. For details, refer to 4.4.1 <1> AB Benchmarks.

4.8.2 Acquiring Event Loss

The event loss (unit: dB) is calculated by measuring the decrease of signal level in the Rayleigh back scattering (RBS) caused by the event. The event loss can be caused by reflection and non-reflection events.

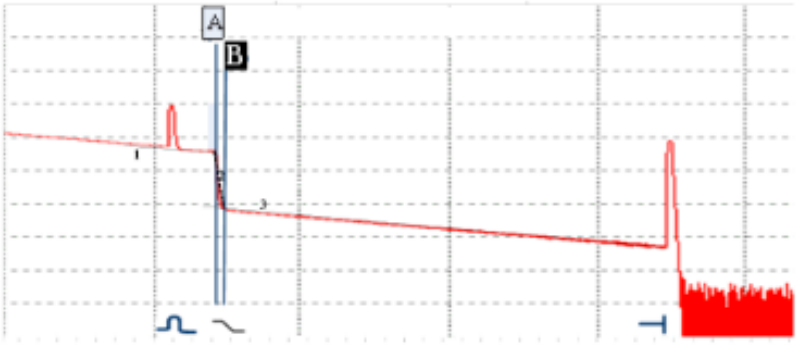


Figure 4.8.2 Acquiring Event Loss

[Operation]

⇒ Press [ ] and [ ] buttons to move the benchmark, as shown in Figure 4.11.2. First, move benchmark A to the point of intersection of straight line 1 and broken line 2.

⇒ Press [A/B] button and switch to benchmark B. Move benchmark B to the point of intersection of straight line 3 and broken line 2;

⇒ At this time, the information list of benchmarks AB displays the event loss.

4.8.3 Acquiring Attenuation

The attenuation measurement of two points can get the attenuation of Rayleigh backward scattering level that can be obtained the same as calculating the distance between the two selected points (unit: dB/km). Only use these two points to calculate and there is no average value.

[Operation]

⇒ Under the trace interface, move the benchmark A to the position of any point

⇒ Press [A/B] button and move benchmark B to any point.

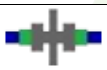
At this time, the information list of benchmarks AB displays the attenuation between benchmarks AB.

4.9 Event map

The event map has the function of one click test, which can quickly and accurately analyze the internal situation in the optical fiber; The distance, attenuation and reflection of the event point are analyzed in detail.

4.9.1 Event map test result interface

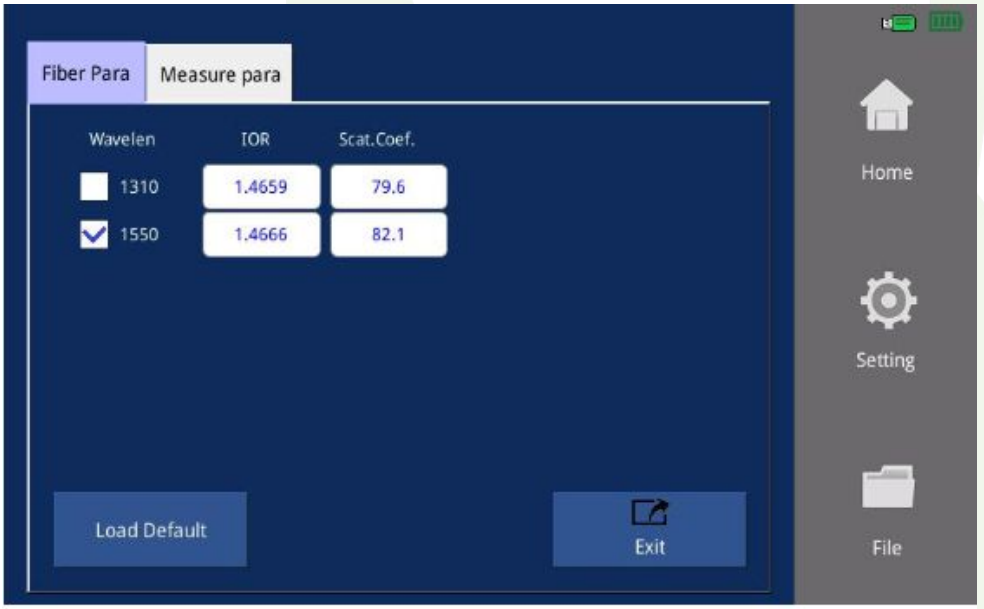
- ① Global display of the tested fiber: Triangle symbol indicates the current event point, and the event point is marked with green.
- (2) graphical display of optical fiber and event points in optical fiber: you can directly click the event points, and the attribute characteristics of the event points: insertion loss and reflection are displayed in (3)

Symbol	Meaning	Remarks
	Start event	It generally refers to the starting point of the measured optical fiber
	Start event reflection too large	1. Aerial survey 2. The measured optical fiber connector does not match the instrument connector 3. Ceramic core of flange 4. The optical fiber connector is dirty 5. The inner joint of the instrument is seriously worn
	LOSS event	Generally, it is a welding loss event
	Reflection event	It generally refers to the connection of flange plate
	Macro bend event	The macro bending loss is too large
	Reflection event too large	Generally, it is caused by poor connection of flange plate, such as unclean optical connector, mismatch of optical connector, etc
	End event	Generally refers to the end of the optical fiber under test

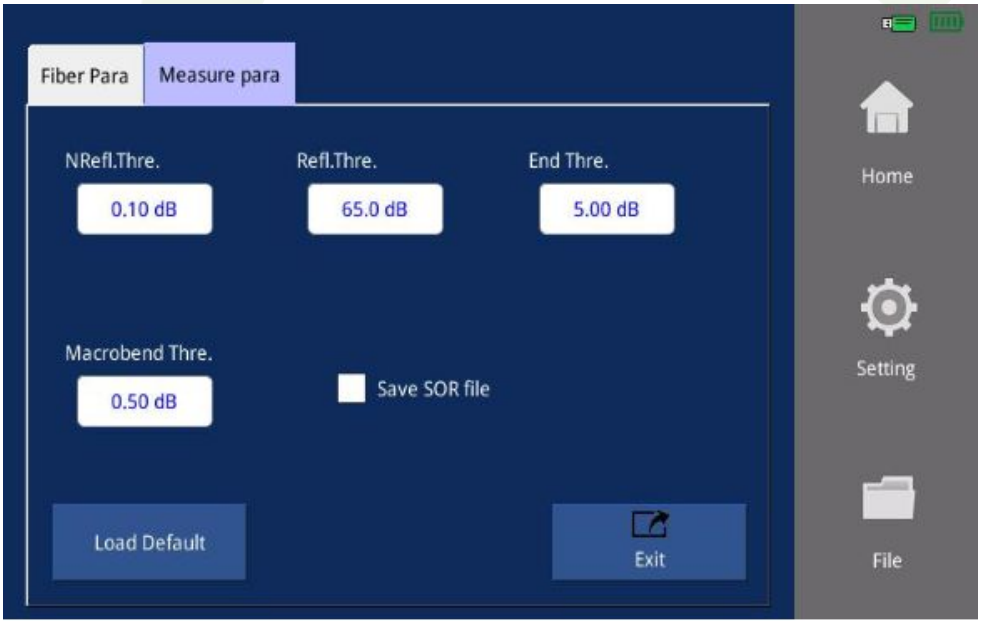
- ③ Select the attribute features of the current event point: insertion loss and reflection
- ④ Test results of tested fiber

4.9.2 Event map setting

4.9.2.1 Optical fiber parameter setting: mainly set the refractive index and dispersion coefficient of the optical fiber



4.9.2.2 Test parameter setting



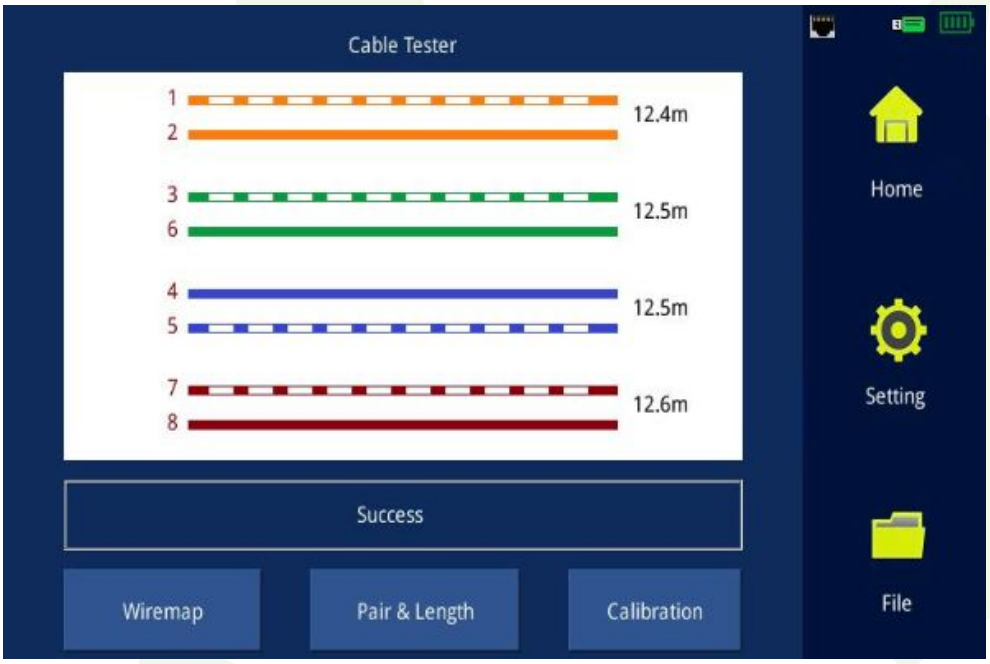
Note: macro bend threshold and save curve format are added to the test parameters.

4.10 Network cable test

Cable test can test cable sequence and cable length respectively.

4.10.1 The function of testing network cable sequence is as follows:

- Automatically identify whether the remote module is connected
- Automatically identify whether the network line sequence is correct, and remind the wrong line sequence
- Reminder of short circuit and open circuit function of network cable sequence



4.10.2 Network cable length:

The most important classification of network cable specifications is related to the thickness of core conductor. For example, super five types of network cables are generally divided into three specifications of 0.4/0.45/0.5, and six types of network cables are generally divided into 0.52/0.56/0.58. Because of the price competition in the market, the actual core of network cable of different manufacturers and brands is different, so the measurement of network cable length must be calibrated

The cable length can be calculated accurately only after calibration; Additional functions such as cable length break, through this function can also calculate the distance of cable breakpoint

4.10.2.1 Network line calibration:

Before testing the length of network cable, calibrate the tested network cable first. This is because there are many kinds of network cables. Different kinds of network cables have different performance indexes, which need to be calibrated before the length of the current network cable can be correctly tested.

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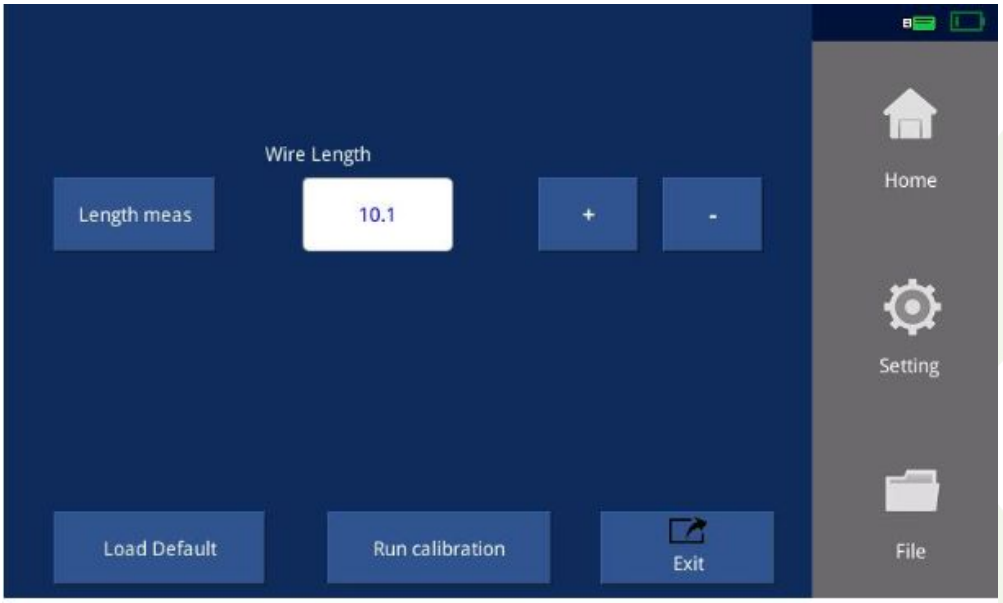
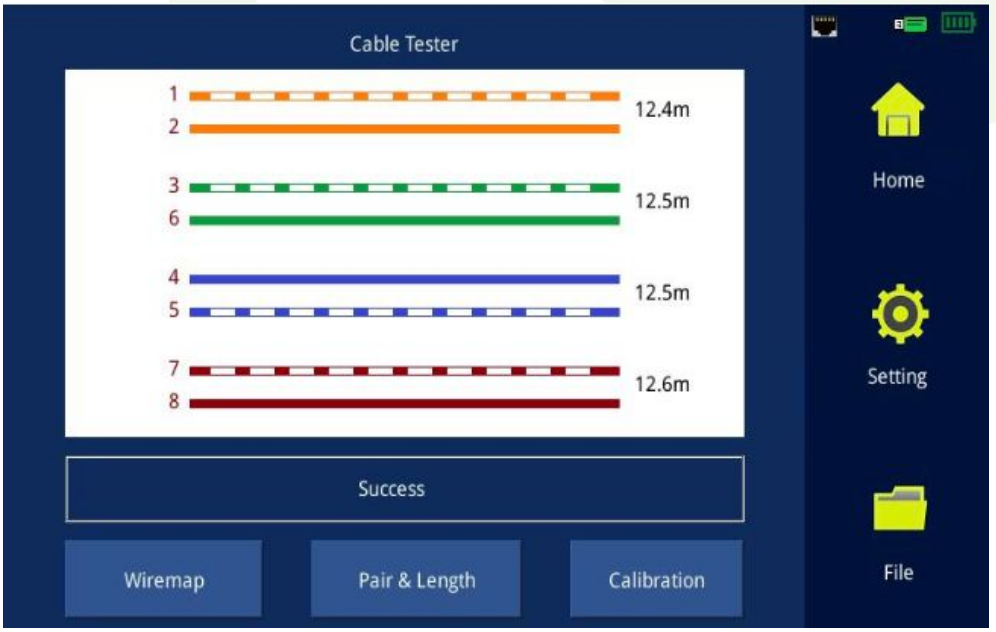


Steps:

1. Make a network cable of known length
2. Insert one thousand and press to perform calibration.

4.10.2.2 Cable length test:

Connect the tested network cable and press the test key of "line pair length"



5 Equipment Maintenance

5.1 Equipment Routine Maintenance

In order to ensure the long-term and accurate operation:

- ⇒ Before using, clean the connector of optical fiber all the time;
- ⇒ Revent the equipment from dust.
- ⇒ Please use cotton cloth slightly dipped with water to clean the casing and the front panel.
- ⇒ Put the equipment in clean and dry place under room temperature.
- ⇒ Prevent the sunshine shooting directly at the equipment.
- ⇒ Prevent over high humidity or prominent temperature changes.
- ⇒ Avoid unnecessary striking and vibration.
- ⇒ In case of any liquid splashing on the surface of the equipment or permeating into the internal, please immediately shut off the power supply and wait for the equipment to dry completely.

Warning

It is forbidden to turn the machine on when the optical fiber connector is being cleaned; and the eyes are prevented from directly aiming at the interface.

5.2 Charging the Lithium-ion Battery

In normal conditions, the lithium-ion battery can be in service continuously for about 10 hours.

- ⇒ The charging status is displayed on the top of the main menu.
- ⇒ The equipment can also indicate the battery charging status through the LED on the upper right panel under the power-on state.

Notes

- ⇒ When the battery leaves the factory, all parameters have been set.
- ⇒ Lithium-ion battery has no memory effect, it can be charged at any time. But the lithium-ion battery must be prevented from over discharge. Over discharge will lead to irreversible capacity loss.

When the instrument reminds that the battery is low, it's time to recharge the battery.

- ⇒ ¬ The charging time for the battery depends on various factors, such as the type of battery and the ambient temperature and so on.
- ⇒ For daily use, the lithium battery that has been fully charged should be placed for half an hour before it is used. The battery shall be used after its performance comes stable, otherwise, the battery performance will be affected.
- ⇒ If the instrument is left unused for long time, be sure to charge the battery to 50% ~ 80% of the capacity, then remove the battery and store it in a cool and dry place. In order to prevent the battery from low power and irreversible capacity loss caused by long-time storage and self-discharge, it's better to recharge it every three months.
- ⇒ The self-discharge of the lithium-ion battery is affected by ambient temperature and humidity.

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High temperature and wet temperature will accelerate the self-discharge of the battery. It is recommended to store the battery in a dry environment between 0℃ to 20℃. Never put the battery under the environment with temperature exceeding 60 °C.

⇒ Use the correct, appointed charger to charge the battery.

⇒ Use designated charger to connect the equipment to the socket of power supply. The charging process will automatically start and stop.

Note: When the battery is used to supply power, if users press, the instrument will not be able to be started normally (the LCD lights up and shuts down). This may be caused by low battery capacity. Please charge it for a while with the charger to return it to normal. Its failure to work after it is fully charged may be caused by the ageing of battery. Under that situation, please change the battery.

Warning

Do not throw the battery into fire or water, and do not make the electrodes of the battery short circuit. Dismounting the battery is forbidden.

5.3 Recalibrating Equipment

For OTDR equipment, the company suggests to return to the factory for calibration once a year.

6 Fault Diagnosis

6.1 Frequently Asked Questions

Problems	Reasons	Resolutions
The equipment cannot be charged	The battery power is used up	⇒Charge the battery ⇒Replace to battery fully charged ⇒Connect the equipment to the external power supply through AC adapter / charger
	The equipment is not connected to the external power supply	Connect the equipment to the external power supply through AC adapter/charger.
	The external power supply has been pull up	Make sure the two terminals of the external power supply have been plugged in
The equipment screen becomes black	The battery power is used up and the equipment has been shut down	⇒ Charge the battery ⇒ Replace to battery fully charged ⇒ Connect the equipment to the external power supply through AC adapter/charger
Characters on the screen is vague	The setting of brightness is not right	Adjust the brightness
The operating time of equipment is shortened.	The battery may be used up	Replace the battery
	The battery is not fully charged	Charge the battery
Application program displays an information, indicating it has found the evento “optical fiber terminals not to be distinguished”	The tested optical fiber is too long	Make sure the length of the tested optical fiber is less than the maximum length that OTDR can measure.

6.2 Transportation

When transporting the equipment, the temperature shall be maintained within the specified range. Improper operation may damage the equipment during the transportation.

It is suggested to abide by the following steps to reduce the possibility of equipment damage to the minimum:

- ⇒ It is suggested to abide by the following steps to reduce the possibility of equipment damage to the minimum:
- ⇒ Prevent humidity being too high or temperature variations being too big.
- ⇒ Prevent the sunshine shooting directly at the equipment.
- ⇒ Prevent unnecessary striking and vibration.

7 Guarantee

7.1 General Information

The company guarantees to perform the warranty for defects caused by materials or process within one year since the initial delivery date of the equipment. The company simultaneously guarantees the equipment complies with the applicable specifications under normal application conditions.

During the warranty period, the company will have right to determine to repair, replace or issue the credit card for any products having problems. The warranty also applicable to verify and adjust free to the products need repair, or perform verification and adjustment again to the products whose original calibration has something wrong. If the equipment is sent back for scale calibration within the warranty period, and is found it complies with all the issued specifications, the company will charge standard calibration fees.

Note

In case of the following cases, the warranty will be invalid:

- ⇒ The equipment is damaged due to the repair or treatment by the unauthorized personnel or technician not from the company.
- ⇒ The warranty label is torn off.
- ⇒ The chassis screws are not specified by the manual is moved away.
- ⇒ The chassis is opened not according to the instructions of the manual.
- ⇒ The equipment number has ever been modified, wiped off or moved.
- ⇒ The equipment has ever been damaged due to improper use, negligence or accident.

The warranty declaration will replace all the other definite statement, connotative or legal warranty declaration, which includes but not be limited to the suggestive warranty declaration for the commodity sales and commodity adaptability established for special purposes. In any cases, the company will not undertake the responsibilities for special fault s, accidents or various damages thus caused.

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7.2 Responsibilities

The company will not undertake the responsibilities for damage caused by using the products and will also not undertake the responsibilities for any performance failure caused by other equipment the product is connected to or any system operation in which the product may be a part.

The company will not undertake the responsibilities for the damage of the equipment, accessories and the software caused by improper use or modification without being authorized.

7.3 Exceptions

The company reserves the right to change the design and the installation structures of various products at any time and undertakes no obligations to modify for the purchased products required by the users.

Various accessories, including but not limited to the fuse, indicator light, battery and universal interface (EUI) etc. are not within the warranty scope.

In case of the following cases, the warranty will become invalid: improper use or installation, normal wear and fracture, contingency, illegal operation, negligence, fire, flooding, lightning or other natural accidents, reasons beyond the products or other reasons beyond the control of the company.

Important prompt

The replacement of optical connector that is damaged due to improper use or harmful cleaning will be charged for fees.

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