Komshine

enabling today,inspiring tomorrow

QX55 Series OTDR

QX55-S & QX55-P

MANUAL

Master OTDR

OTDR · OPM · SLS · VFL · FIP · RJ45

www.komshine.com

Preorder

Safety instructions

When using the product, you must pay attention to the following safety measures. Failure to adopt these safe operation methods or follow the specific warnings described elsewhere in this manual will violate the safety standards of product design, manufacture and use. Our company will not take any responsibility for the consequences caused by customers' violation of these requirements.

1. Working environment

The maximum relative humidity is 95% and the ambient temperature is -10~50℃.

Before turning on the power supply, make sure that the product is set to the matching power supply voltage, that appropriate insurance is installed, and that all safety measures are taken.

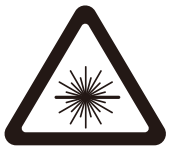
2. Do not operate in an explosive environment.

Do not use this product in the presence of flammable gas or smoke.

3. Do not remove the protective jacket of the instrument.

User must not remove the instrument cover or replace the internal components. If necessary, please contact our maintenance personnel.

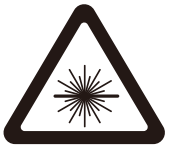
Safety terms in this manual



A warning symbol indicates danger. It prompts the user to pay attention to a certain process, an operation method or the like. Failure to operate correctly or follow the rules may cause personal injury. Do not proceed to the next step until you fully understand and meet the pointed warning conditions.

A caution symbol indicates danger. It draws the user's attention to a certain process, this operation method or the like. If you can't operate correctly or follow the rules, the instrument may be partially or completely damaged or destroyed. Don't continue to the next step until you understand and meet the pointed caution conditions safely.

The symbol gives information that is helpful for the use and maintenance of the instrument.



Warning items

Optical Time-Domain Reflectometer (OTDR) is a laser device, so users should always avoid looking directly at the laser output port. Users can't observe the output port of the light source with a microscope, magnifying glass and other equipment. The energy of the laser beam gathers on the retina, which will cause permanent damage to the eyes.

- When measuring optical fiber with OTDR, there must be no working light in the measured optical fiber (except PON function). Otherwise, the measurement results will be inaccurate.
- When measuring optical fiber with OTDR, the optical interface must ensure good contact. Otherwise, the measurement results will be inaccurate.

Matters that need attention

Battery:

The power supply battery of OTDR of Komshine is rechargeable li-polymer. If you don't use the instrument for a long time, please charge the battery before using it. If the instrument is idle for more than 2 months, you should charge it in time to keep the battery power. Do not charge the battery for more than 8 hours; Do not remove the battery without permission; Please keep the battery away from the fire source and strong heat; Do not open or damage the battery; Do not touch the electrolyte of the battery, so as not to hurt your eyes and corrode your skin and clothes.

External power supply:

OTDR supports external power supply, and the power supply requirement is DC12V/2.5A

Attention to laser radiation:

During the measurement of the optical fiber system, attention should be paid to avoid the eyes facing the open-circuit optical fiber, optical fiber interface, optical fiber connection point and other light sources, or the eyes will contact the transmitting laser and be hurt.

1. When the optical time domain reflectometer works, don't look directly at the laser output port;
2. After using the optical time domain reflectometer, please cover the dust cap of the optical port;
3. Do not look directly at the unconnected end of the optical fiber under test. If possible, point the unconnected end of the optical fiber to a non-reflective object.

Content

I. Overview

1. Contents of this manual

First of all, thank you for choosing our products. Please read this manual carefully before using it, especially the warning and attention information, so as to avoid injury to your body or instrument due to wrong operation.This manual mainly contains the common operation and maintenance information of the instrument, as well as troubleshooting guide and various information about obtaining technology and service.All the instruments have gone through strict inspection and quality control process before leaving the factory.

2. Unpacking inspection of products

This product is packed and consigned according to the standard assembly and shipping procedures. When receiving the instrument, please check the product list according to the packing list and check the appearance quality of the product, and find out the possible physical damage of the product in the process of shipping.In case of packaging damage, please keep the original packaging materials and immediately inform the freight company and the supplier agent of the product to solve the problem properly.In the product packaging, along with the instrument, there should also be some attached articles and related manuals. Please refer to the packing list for details. If you find that the materials in the box are not complete, please contact the agent responsible for your supply to solve the problem. If necessary, you can also contact us directly by email.

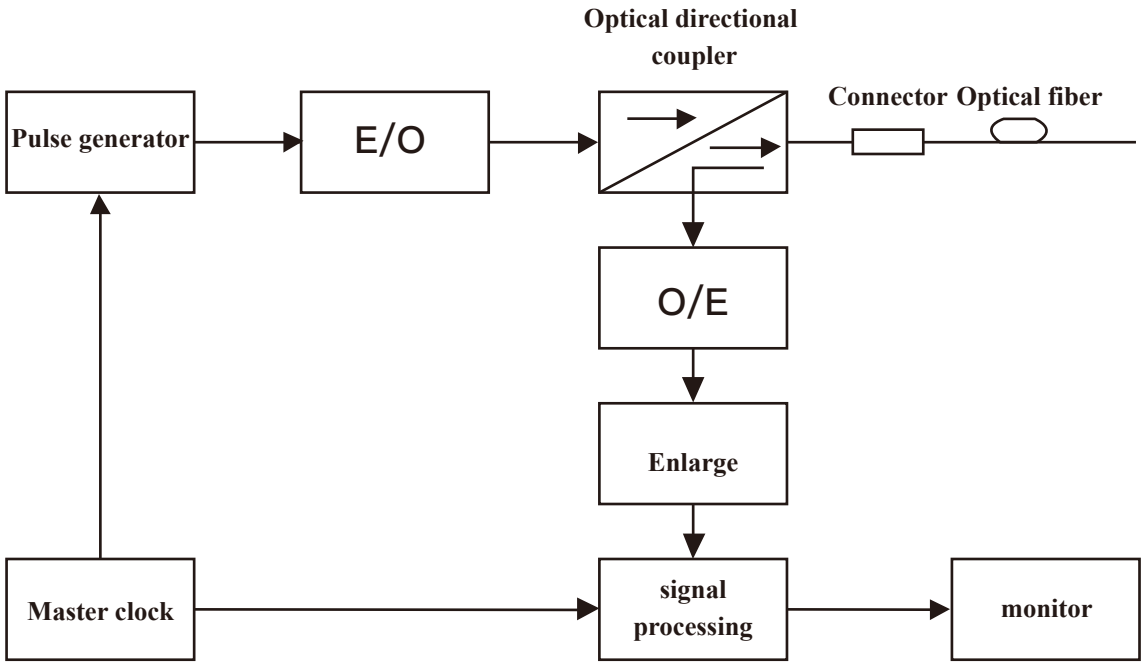
3. Product introduction

Our OTDR is a reliable instrument for measuring optical fiber characteristics.This series of products are small, light and easy to operate. It adopts ergonomic shape design and high-definition LCD screen, and has a data storage function. These data can be analyzed by PC software, and the optical fiber transmission quality can be analyzed, and the post-processing, archiving and printing of measurement results can be realized.In particular, you can see the characteristics of the optical fiber link and the distribution of the optical fiber through the measurement of the optical fiber link and the image characteristics.You can use it to periodically check whether the link meets the specifications.In order

to record the optical fiber transmission quality, it is necessary to measure the optical path, total loss, loss of all joints and connectors.By looking at the "event points" in the optical fiber, the installation and maintenance personnel point out these irregularities in the optical fiber, locate their positions, and measure the attenuation between them, as well as the resulting loss and attenuation uniformity.In a word, OTDR is a necessary tool for the production, installation and maintenance of optical fiber and optical cable.

4. Principle introduction

OTDR uses its laser light source to send a beam of optical pulse to the measured optical fiber. The optical signal reflected back to the OTDR will be reflected on the optical fiber itself and each characteristic point. The reflected optical signal is coupled to the OTDR receiver through directional coupling, and converted into an electrical signal here. Then, through a series of signal processing means, the situation of the whole optical fiber link is displayed.As shown in the figure below:



5. Features of the product:

1) Basic functions of OTDR:

a.Measure the length of optical cable and optical fiber;

b.Determine the location of optical cable and optical fiber fault point and breakpoint;

c.Describe the loss distribution curve of optical cable and optical fiber;

d.The attenuation coefficient of optical cable and optical fiber is measured;

e.Measure the loss between optical cable and optical fiber;

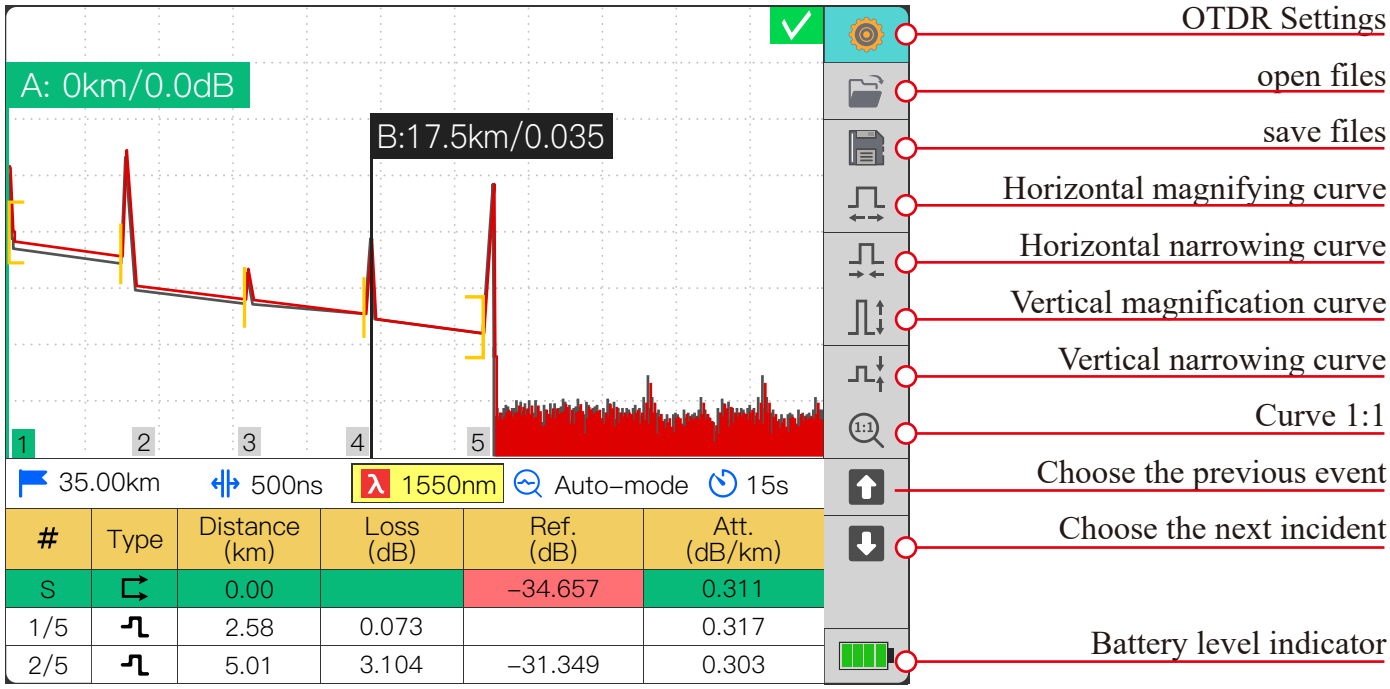
f.Measure the insertion loss of optical cable and optical fiber connector;

g.Measure the reflection intensity of optical fiber and optical fiber reflection events;

h.The link map shows the status of the fiber link.

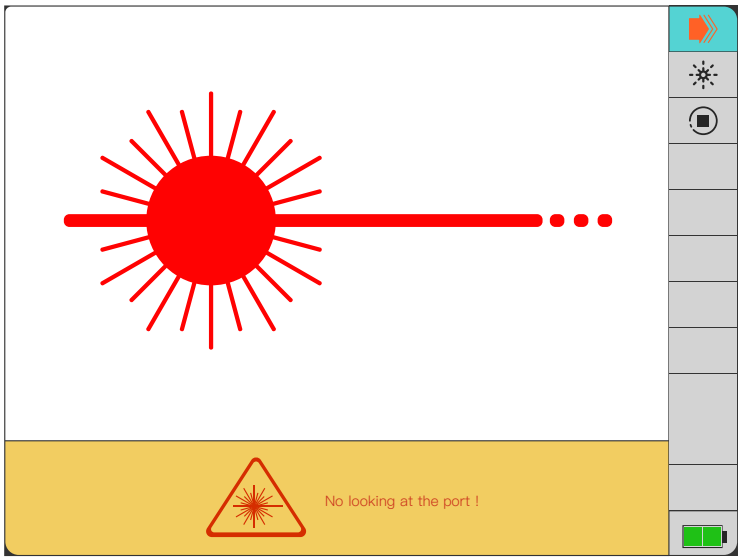
Trace Display Window_Menu List

Select a function with up and down navigation keys,
press the [ENTER] key to enter the operating interface

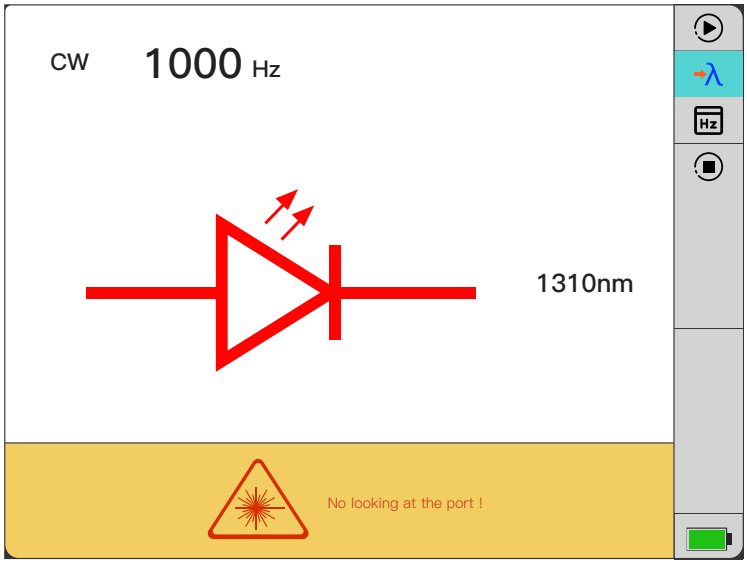


2) Other incidental functions:

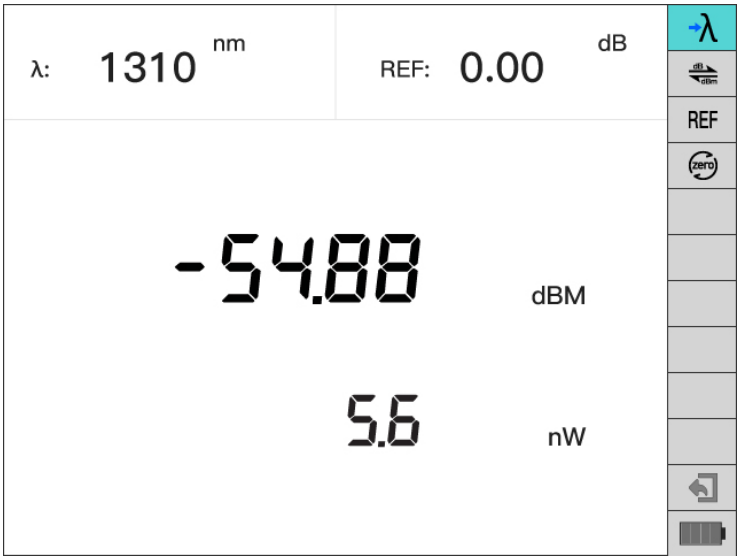
a. VFL function: 650 ± 20nm light source is used for this function, and visual light source is provided for optical fiber fault location by means of visualization, the visible light source emits red light visible to human eyes, which can be detected in the blind area of optical fiber test direct fault (breakpoint) location, and can also be used for core comparison in multi-core optical cable. Support Two working modes: constant light and 2Hz flashing.



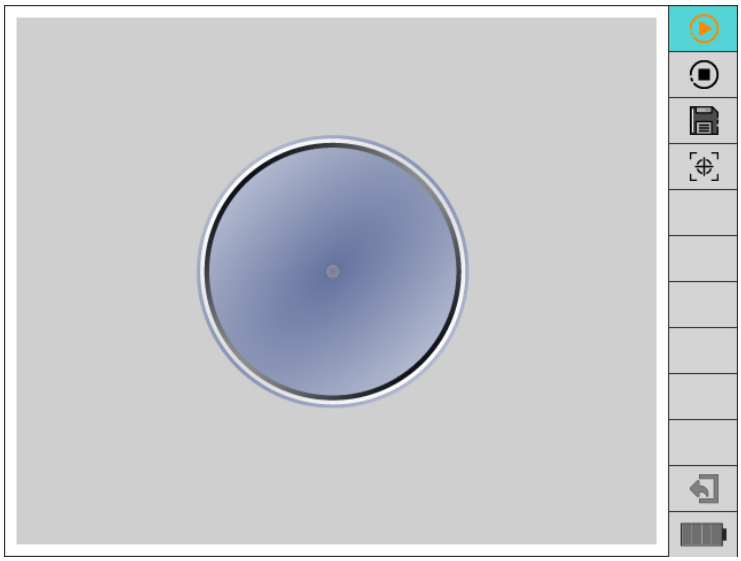
b. SLS function: This function supports two kinds of light sources of 1310/1550nm and multiple modulation modes.



c. OPM function: This function is used to measure the power of the light source, and supports the measurement of optical power of multiple wavelengths.

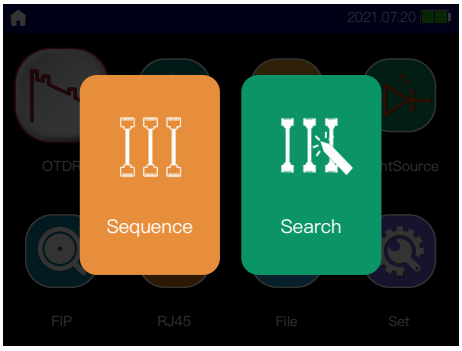


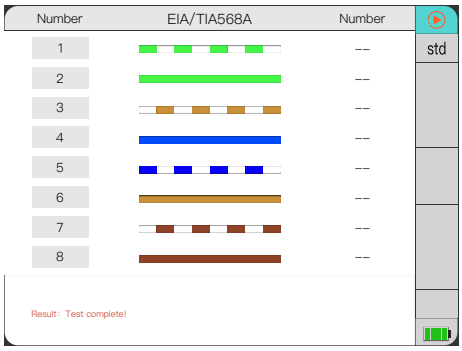
d. FIP function: This function is used to detect the cutting quality of optical fiber end face and its cleanliness; Connect the end face tester through USB interface, and support the center amplification function.

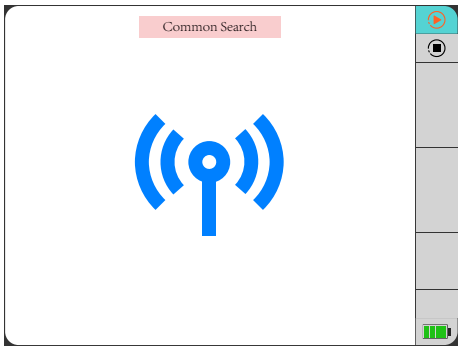


e. Flashlight function: This function provides a guarantee for the normal use of the instrument under the condition of insufficient lighting conditions;

f. RJ45 function: This function is divided into two functions: line searching and line alignment. The alignment is to test whether the line sequence of the network cable is correct and whether it is accessible; The line search function is to find the target network cable among multiple network cables.







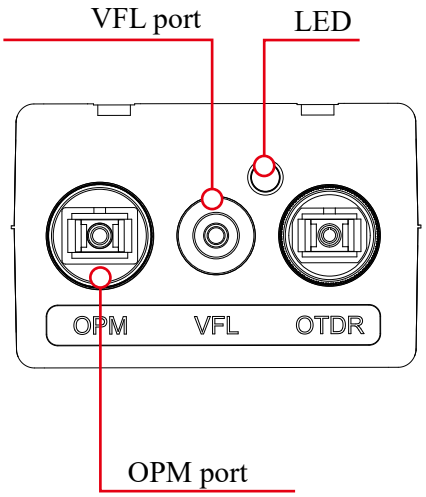
3) Other features:

- 3.5-inch HD display, easy operation with multiple buttons;
- Small size and lightweight;
- Graphical display of trace data, easy to operate;
- Trace storage function;
- USB interface;
- Humanized upper computer software, which edits, backs up and archives the measurement data;
- External power input: input voltage 12V, input current ≤ 2.5A; Battery powered.

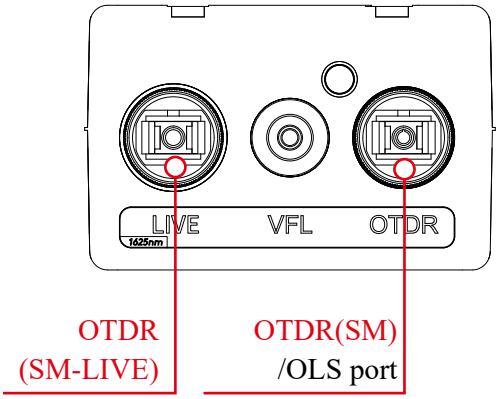
II. The basic operation

This chapter introduces the basic operation methods of the instrument, mainly including the description of the instrument keys and the use of common interfaces of the instrument. If you have any questions during the use, please contact the technical support staff of Komshine or our agent.

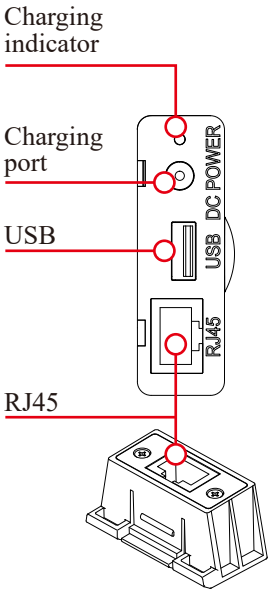
1. Description of instrument function interface



QX55-S port ▲



QX55-P port ▲



1) OTDR optical interface: SC/UPC optical connector is used, and the connector of FC/UPC or ST/UPC can be replaced; At the same time, the interface can also be used for the interface of light source function;

2) OPM interface: 2.5mm universal interface (When it's QX55-P model, it's SM-LIVE port);

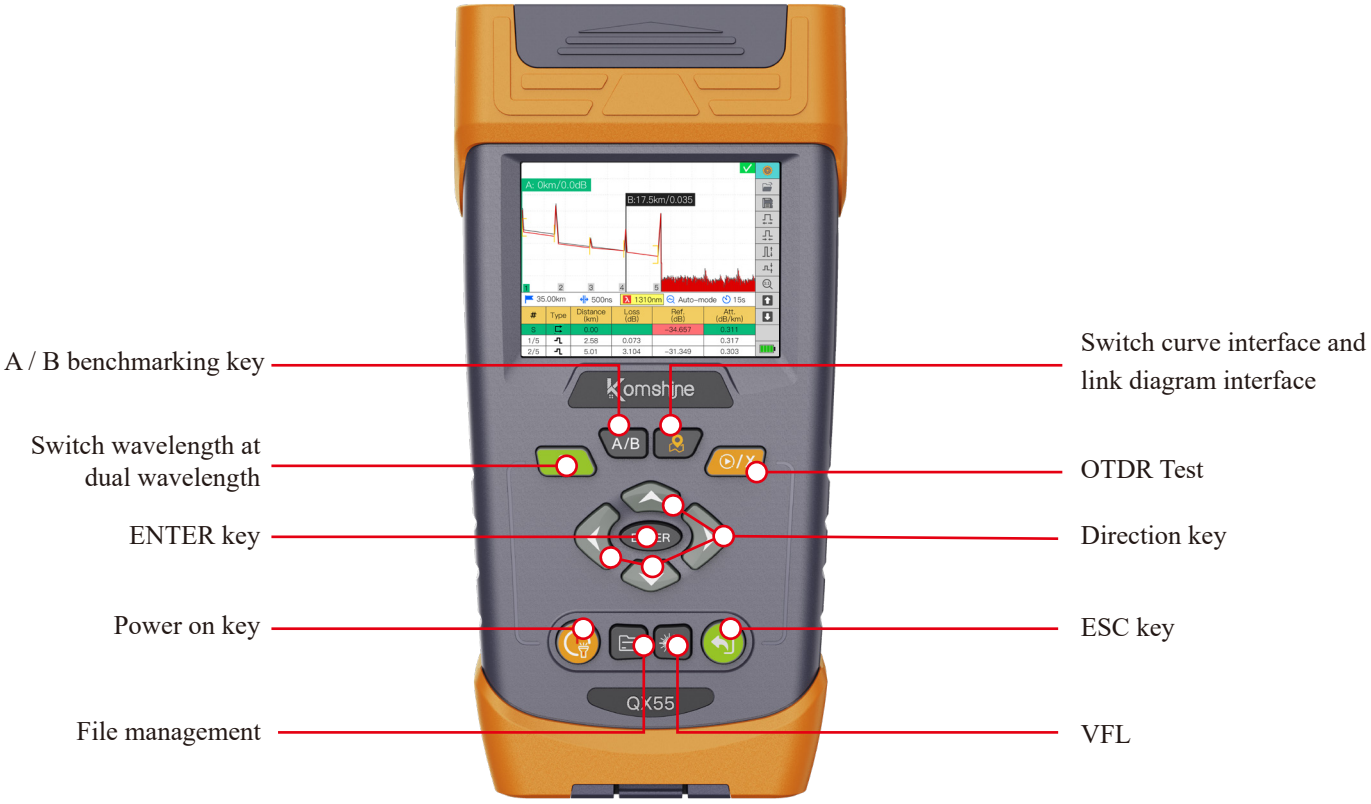
3) VFL interface: 2.5mm universal interface;

4) Power source: Adapter requirements: 12V, 2.5A;

5) Data transmission interface: USB 2.0 interface, can be used to export the data stored in the machine, can also be connected to the optical fiber end detector for fiber end detection;

6) Network interface: RJ45 standard interface, including 1 host and 1 remote external interface; It is mainly to carry out network line to line and find network cable.

2. Description of instrument keys



1）Enter the key λ

When testing optical fiber with dual wavelength, two curves will appear on the main interface of OTDR. At this time, the switching curve is carried out through λ , as shown in the figure below. The image before and after waveform switching is shown.The red curve is the current curve, and the grey curve is the curve to be analyzed.

2) Enter key ENTER

It is used to change the setting parameters, select the content of interest, and enable the corresponding functions.

3) Power on key

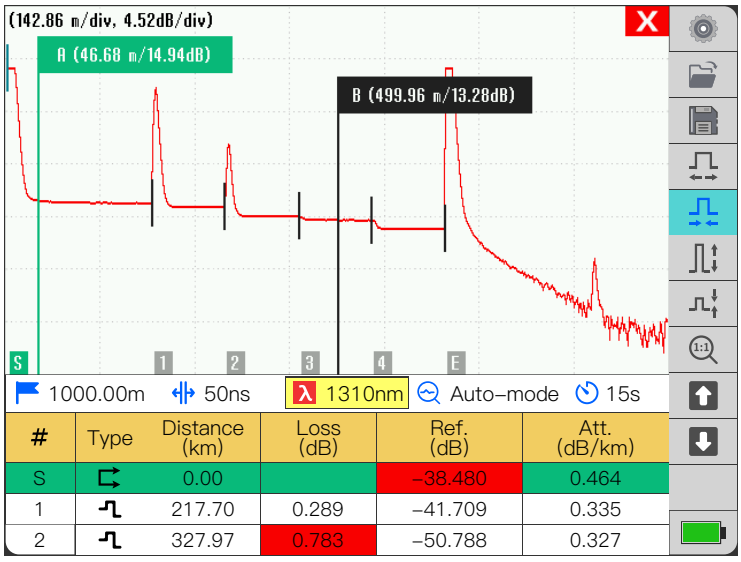
The power on key has two functions. Long press the button to realize the function of switch on and off;Press the button briefly to turn the flashlight on or off.Among them, the flashlight function can be turned on and off in each interface.

4) File management

The file management button can be realized in the main interface of the instrument. One key can enter the file management interface, and there is no need to control the direction key to enter the file management interface.

5) A/B benchmarking key A/B

In OTDR interface, it is used to switch a / b marking lines;When the marker line is active, the color is green, and the inactive state is gray;As shown in the figure below:



6) Switch button 

In OTDR interface, the key is used to switch between link map and test curve;When the current display is the test curve, press this button to display the link map; when the current display is the link map, press this button to display the test curve.

7) Start/ stop test 

This key is used to control the OTDR test;In particular, the OTDR test function can be realized by controlling the button in the OTDR setting interface.If you want to stop the test during the retest, press this button as well.

8) Direction key 

The key is mainly used for various menus in navigation instrument;Under the test curve of OTDR interface, the left and right buttons become the control keys of a / b benchmark;Under the link map of the OTDR interface, the left and right buttons become the control keys of the event map icon, that is, by controlling the left and right buttons, the events in the event list can be switched.

9) ESC key 

When operating the instrument, this button is used to cancel the current operation or return to the previous menu.In particular, long press the button to capture the interface of the current instrument and save it in the instrument.

10) Red light source switch key 

In addition to OTDR interface and stable light source interface, one-click access to red light source interface can be realized.

3. Battery charging

1) Electric quantity display

When the machine is turned on, we can see the battery information in the upper right corner of the machine:

 The battery power is ≤5%, which is in a very low state. If the battery is not charged, it will be turned off soon;

 The battery power is < 20%, which is in a low power state;

 Battery capacity < 50%;

 The battery capacity is less than or equal to 85%, and the battery capacity is sufficient, so the instrument can be subjected to optical fiber measurement, software upgrade and other operations;

 Battery capacity > 85%;

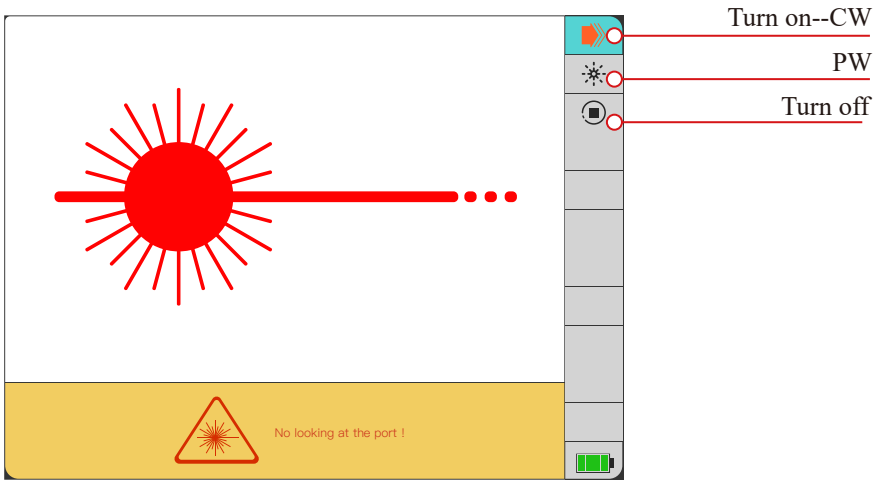
 Battery charging status.

2) Battery charging:

When charging the battery, charge it quickly, and then charge it slowly with trickle when the voltage reaches the predetermined value. Generally, the charging temperature of the battery is: 0~+45°C, which is suitable for indoor use. Exceeding the temperature range during charging will lead to unsatisfactory charging or battery damage, which will affect the battery life. The charging time of this battery is ≤4 hours; Do not charge the battery for more than 6 hours to prevent damage to the battery.

4. Operating VFL function:

This function is easy to use. Control the "up and down" direction keys, hold the cursor at the corresponding position, and then select the mode you want to set according to the prompt information in the following figure. As shown in the figure below:

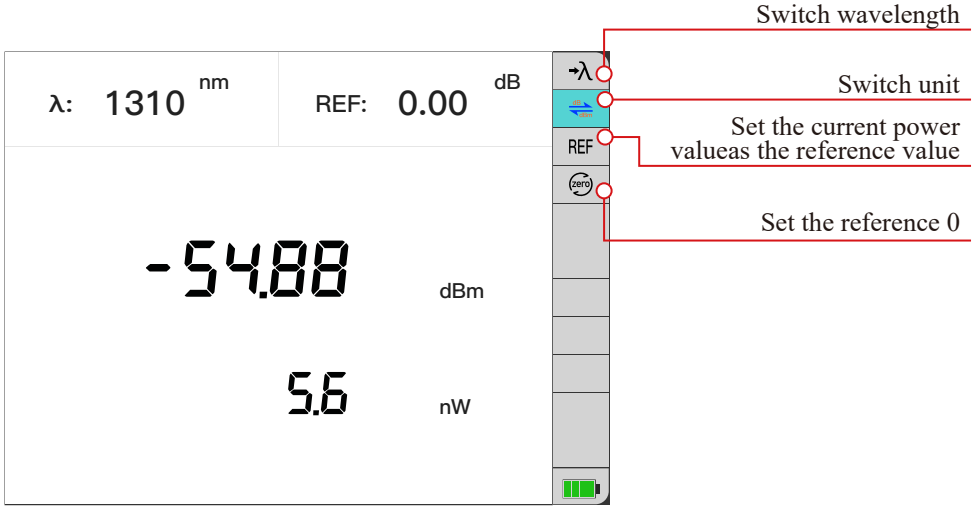


5. Operating OPM functions:

1)According to the frequency of the measured light source, press enter to switch the wavelength; Be sure to keep the measured wavelength consistent with the set wavelength, otherwise, the test results will be inaccurate;

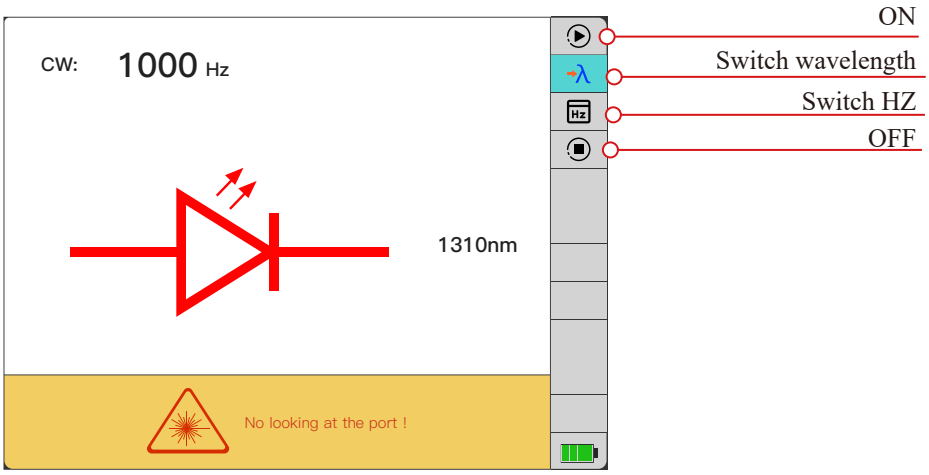
2)According to the user's requirements, the unit of power of the tested light source can be selected; Note that when the unit is dB, the displayed result is relative to the reference value;

3)Set the reference value or set the reference value to 0, which is convenient for users to view the test results.



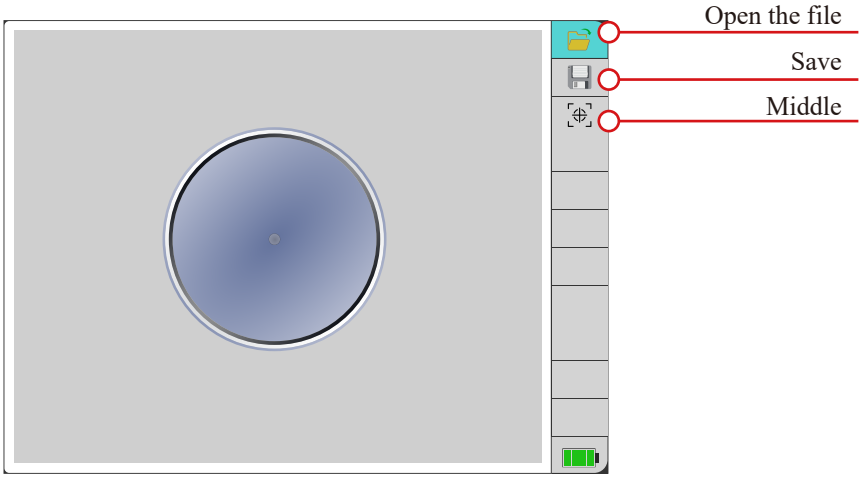
6. Operating SLS function:

The stable light source (SLS) function and OTDR function share one port. The SLS function supports stable light sources with 1310 and 1550 wavelengths, and the output power is above -10dBm. As shown in the figure below, note that wavelength switching and frequency switching can only be operated when the light source function is turned on; When the light source function is turned on, you can't look directly at the interface to prevent eye injury. The modulation frequencies supported by this function are 1kHz and 2kHz, where CW mode refers to continuous light-emitting mode.



7. Operating FIP function:

This function is a function of detecting the quality of optical fiber end face; Connect with our external products and end face tester through USB port; As shown in the figure below:



Among them, the open file button displays the saved optical fiber end face picture;

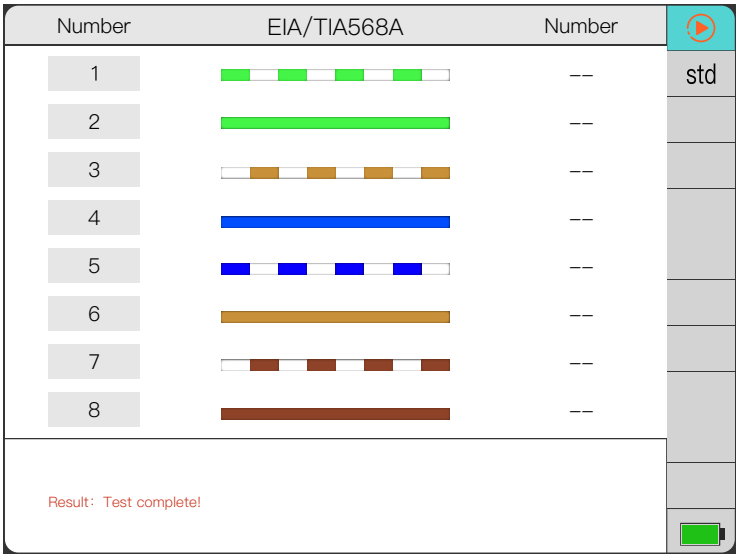
Saving refers to saving the picture of the optical fiber end face currently being tested;

Centering refers to placing the fiber end face in the center of the display area.

8. Operating RJ45 functions:

This function is mainly to carry out network line alignment and find network lines.

1）Network cable sequencing function: This function is used to test the network cable sequence, as shown in the following figure:

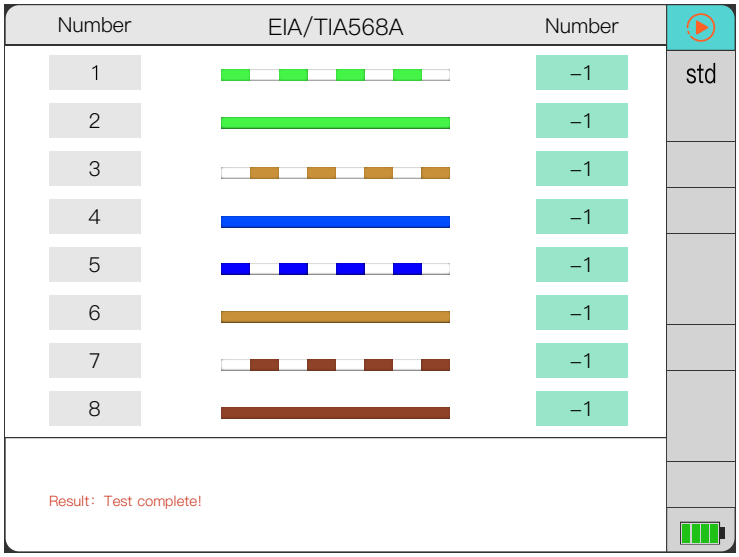


First, select the category of network cable, and use Class A or Class B standard;

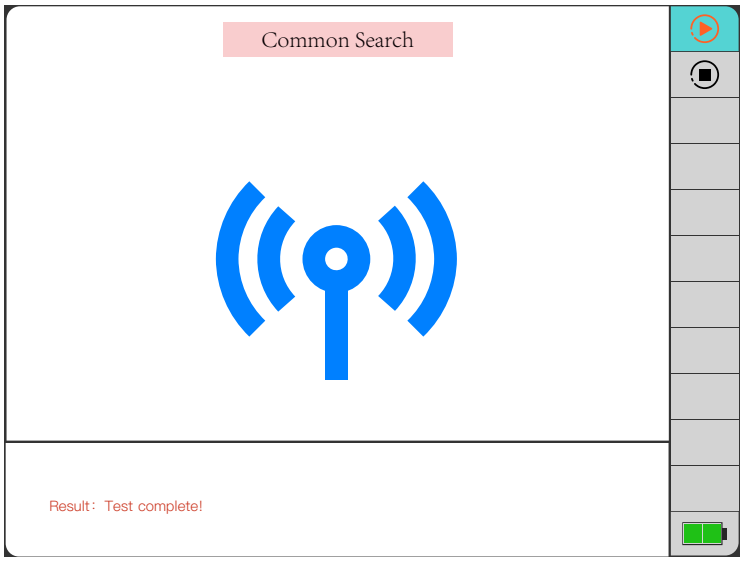
Secondly, one end of the network cable is connected to the network port of the instrument, and the other end is connected to the external network port;

Third, select the Start button and press the enter key to test;

Finally, if the network cable sequence is completely normal, the display result is as shown in the above figure, and the numbers in the right column are exactly the same as those in the left column; If there is a problem with the sequence of a network cable, the word "-1" will appear in the corresponding line, as shown in the following figure:



2）Network search function: This function is used to find the target network cable among multiple network cables, as shown in the following figure:



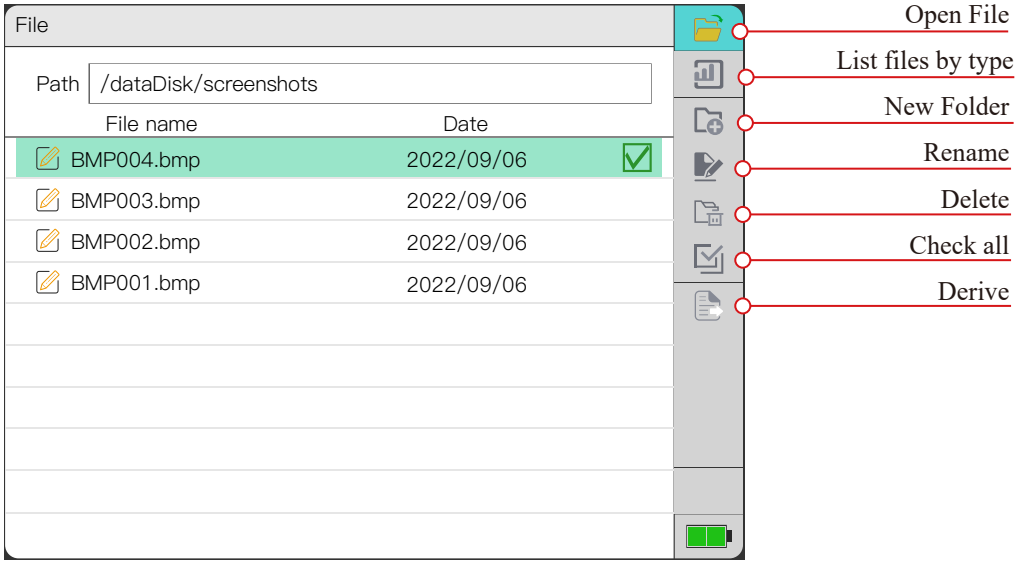
When using this function, you need to use external equipment network line finder;

First, connect one end of the network cable to RJ45 port of the instrument;

Secondly, turn on the external equipment network finder and get close to the network cable;

Finally, when the line finder is close to the desired network cable, the line finder will make a "beep, beep" sound.

9. Document management



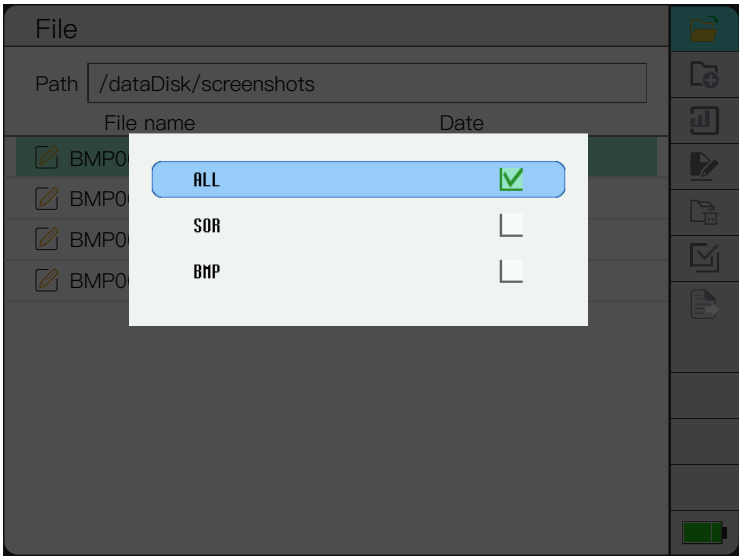
Function introduction of each option in file management function	
Open file	Open selected file
List files by type	This option is to display docs by types in the left display area, which can filter files. All, SOR and BMP are supported.
New Folder	This option is to create a new folder in the current directory and set the folder name.
Rename	This option is to modify the name of the selected file or folder.
Delete	Deleted files or folders
Check all	Select all files in the left display area to facilitate batch management of files.
Derive	Send the selected file to the external storage device connected through USB interface.

1) Opening file

This option is to open the selected file on the left side of the interface.

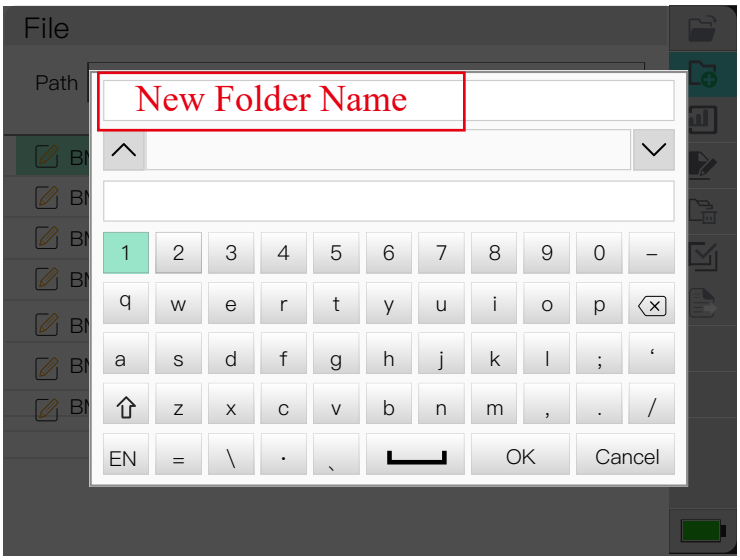
2) Type of files list

By setting different options, the corresponding files will be displayed in the left area; For example, if the sor option is selected, only folders and SOR files will be displayed in the file list on the left.



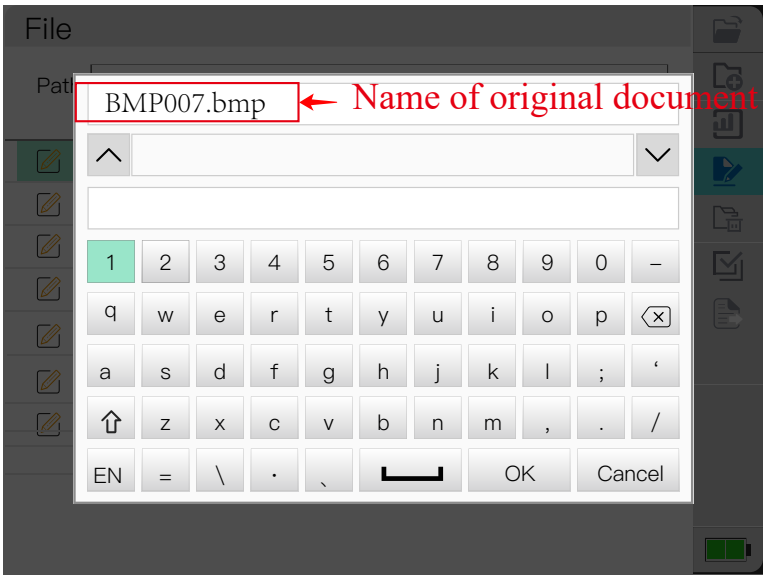
3) New Folder

Click this option, and the keyboard interface will pop up. Users can set the folder name according to their own needs. After inputting, click OK to return to the main interface of file management, and you can see the newly created folder in the left display area.



4) Rename

This option is to modify the name of the selected file or folder. Click this option, and a keyboard interface will pop up. The difference is that the name of the original file is displayed at the input of this interface, as shown in the figure below:

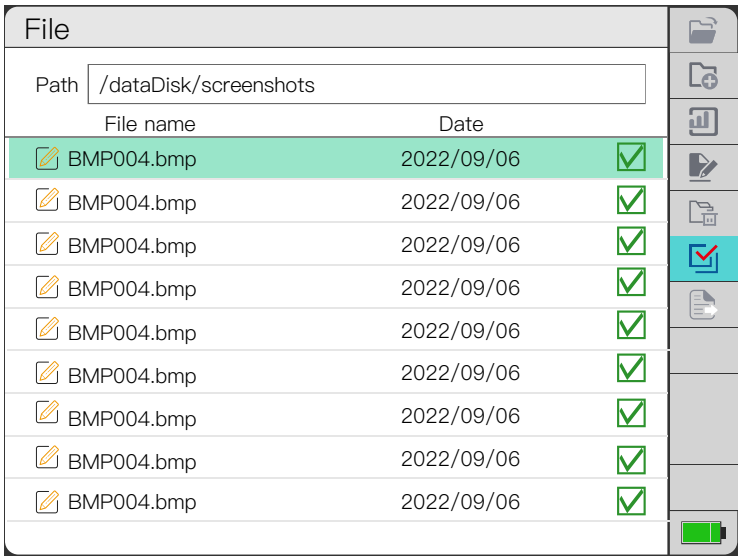


5) Delete

This option is to delete the selected file or folder. Clicking this button will prompt whether to delete the file or folder. Select OK to delete the selected file or folder. After deleting a file, it can't be retrieved, so you need to use this function carefully.

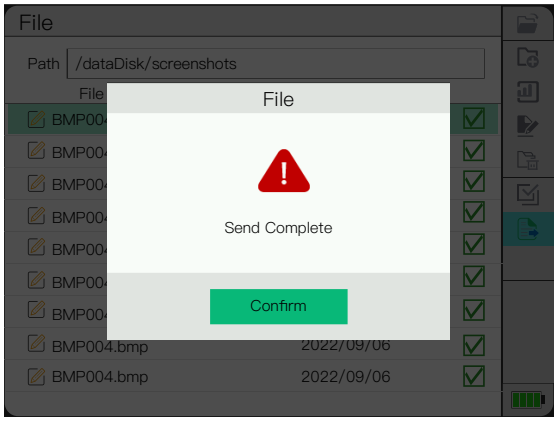
6) Check all

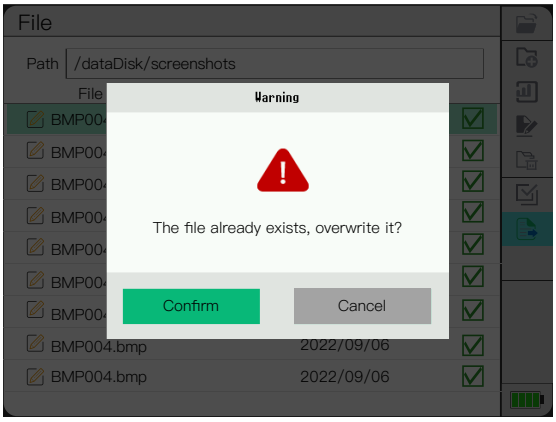
In order to manage files in batches, this option is set, that is, all files in the left display area are selected for deletion, export and other operations; When all files are selected, as shown in the figure below, a "√" will appear on the right side of the file name; Press this option again to cancel the selection of all.



7) Derive

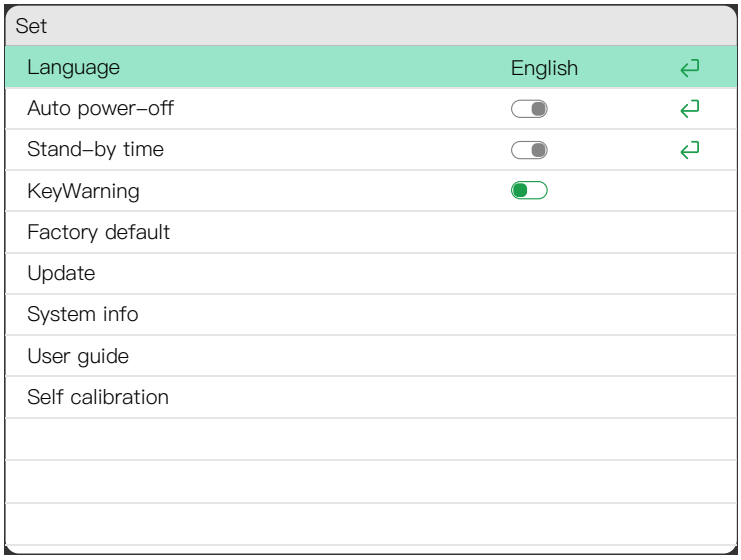
Send the selected file to the external storage device connected through USB interface; If the file is not in the external storage device, you will be prompted to send it. If the file to be sent already exists in the external storage device, the prompt "File already exists, do you want to overwrite it?" , click OK, and the files in the external storage device will be overwritten. As shown in the figure below:





10. System settings

Set the main interface of the system as shown in the figure below:



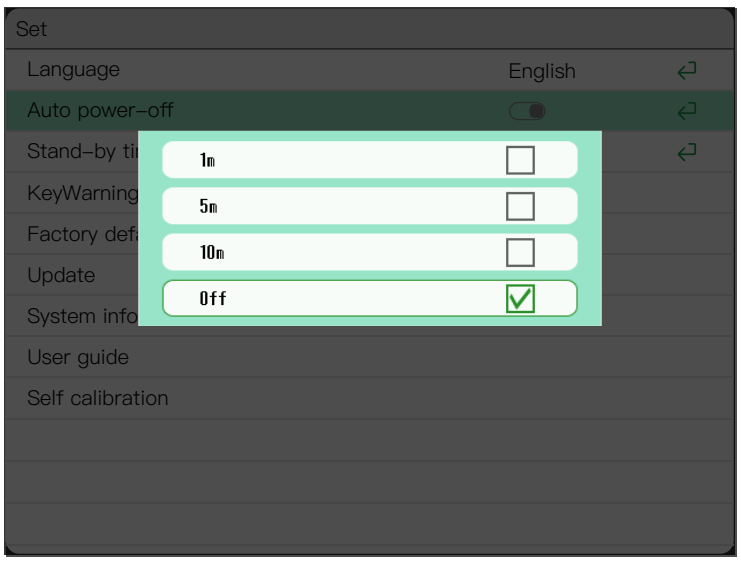
Function introduction of each option in file management function	
Language	Chinese, English, French, Portuguese, Thai, Russian, Korean and Spanish.
Auto power-off	Set the time when the instrument automatically shuts down when it is not in use.
Stand-by time	This option is to set the time for the instrument to shut down the screen without any operation.
Key Warning	Set whether to sound a prompt when pressing the key.
User guide	Check the quick guide of the instrument.
Factory default	Restore the parameters modified by the user to the factory default parameters.
Update	Update the software of the instrument.
System info	Check the serial number, product module name, software version number and date of the instrument.
Self-calibration	Automatic calibration of related parameters of the instrument

1) Language

Select the language, and press enter to display the interface shown above. Users can set the language according to their own needs; Use the up and down arrow keys to find the language to be set, and press enter to set it successfully. At present, the instrument supports eight languages: Chinese, English, French, Portuguese, Thai, Russian, Korean and Spanish.

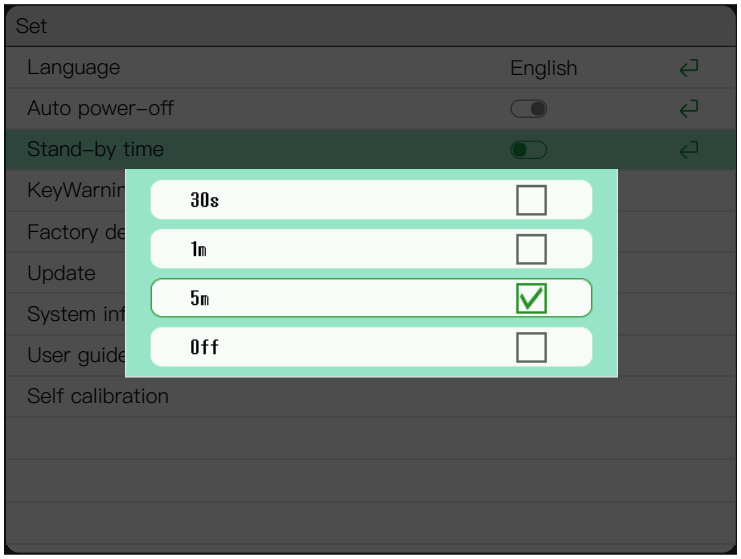
2) Automatic shut-down

This option is a setting to prevent users from forgetting to turn off the machine after using the instrument; Currently, 1 minute, 5 minutes, 10 minutes and off options are supported, as shown in the figure below; The instrument will automatically shut down according to the time set by the user; If the off option is set, it will not automatically shut down until the battery power of the instrument is exhausted.



3) Standby time

The standby time option refers to the automatic screen blanking according to the time set by the user without operating the instrument. This function effectively saves the power consumption of the instrument and prolongs the service life of the instrument. Especially when users use the instrument outdoors, it is inconvenient to charge, which greatly improves the working efficiency. Currently supported options are: 30 seconds, 1 minute, 5 minutes and off.



4) Keypad tone

Press the ENTER key to switch the switch, control the key or the prompt sound emitted by the instrument when the OTDR test is completed.

5) User guide

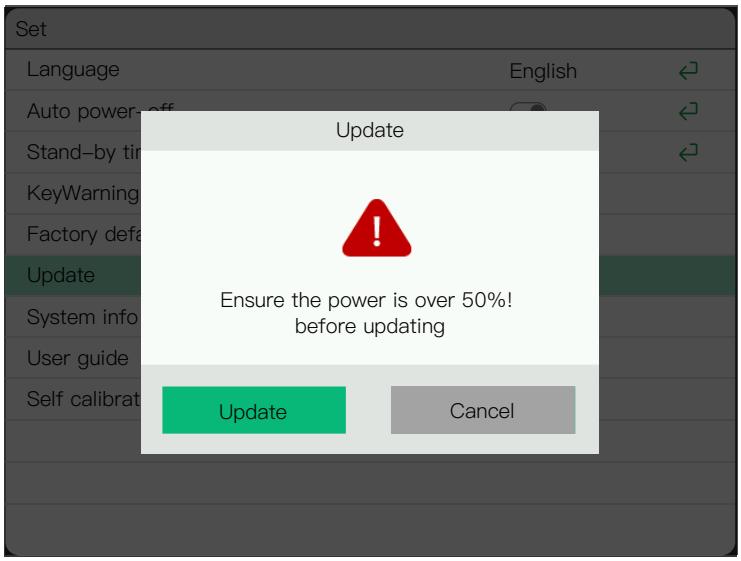
In this option, a quick guide of each function of the instrument is saved. When users use the instrument for the first time, they can view the contents of this option, which can enable customers to quickly master the usage of the instrument. As shown in the figure below:

6) Restore factory settings

During the user's use of the instrument, some parameters of the instrument may be calculated incorrectly or some functions may not be used due to some inadvertent misoperation. At this time, you don't need to worry, just find the option of restoring factory settings in the system settings interface, restore the instrument to its original factory state, and restart the test to get the correct results. As shown in the figure below:

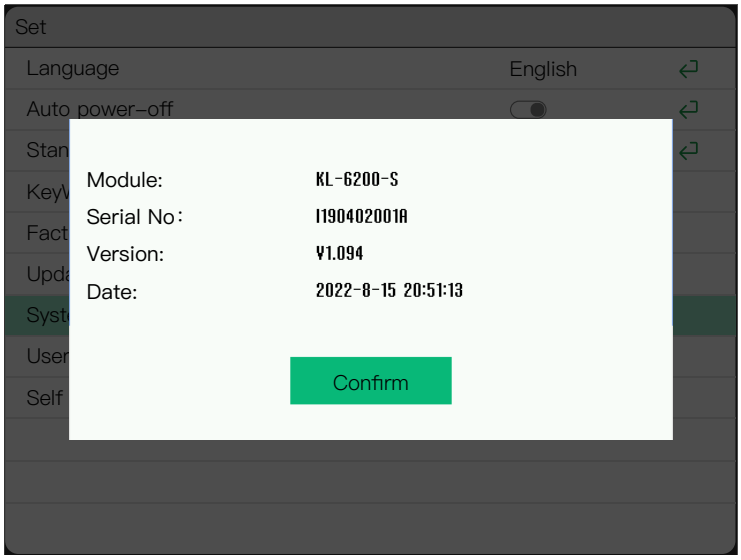
7) Upgrade

Komshine instruments will always maintain and upgrade their functions. This option provides customers with an upgraded interface. You only need to put the latest version of the software into the USB device to upgrade. The operation is easy to learn and very convenient. However, in order to prevent the unexpected situation in the process of upgrading, which leads to the failure of upgrading, we have made the battery power limit for software upgrading. The battery power must be greater than 50% before software upgrading. During the user's use, the software bugs, interactive problems, and instrument function upgrades raised can all be realized through this option. As shown in the following figure: When the option box is in the upgrade option, press the enter key, and the interface shown in the following figure will appear. Click the OK key to upgrade. Software upgrade usually takes 3~5 minutes. In the process of upgrading, please wait carefully and pay attention to keep the instrument in a powered state.



8) System information

The contents of the system information options in the following figure store some basic information of the instrument, including the model of the instrument module, the unique serial number of the instrument, the software version number and the software version date. As shown in the figure below:



9) Self-calibration

As shown in the figure below, this function is unique to our instrument. If the instrument is used for a long time, there may be some deviations. Just open the calibration interface as shown in the figure below, and click the OK button to automatically start self-calibration. Self-calibration has three contents:

a. Circuit self-calibration: the self-calibration function to prevent the instrument test from having problems due to the zero-point drift of the circuit voltage;

b. Optical path self-calibration: self-calibration to prevent the deviation of the length of the test optical fiber or optical cable due to the inaccurate position of 0 point of the curve;

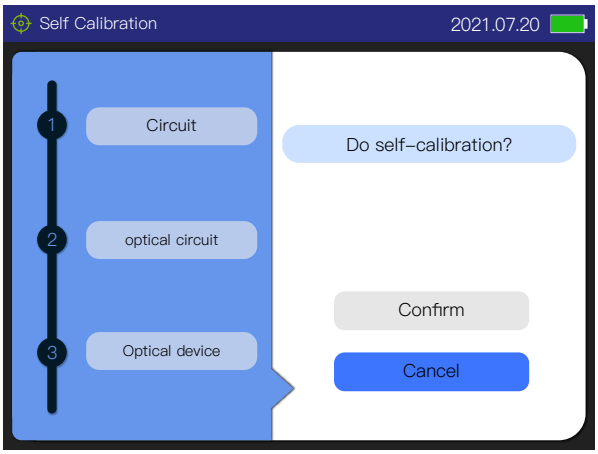
c. Self-calibration of optical devices: Self-calibration to prevent the deviation of the test results of the instrument or the degradation of the performance of the instrument due to the long service time of the optical devices.

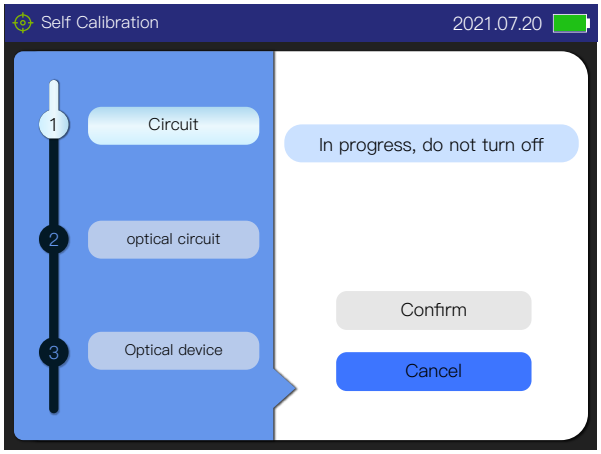
Matters needing attention:

a. During calibration, do not shut down or return, otherwise the calibration will definitely fail.

b. After the calibration, the instrument will be automatically restarted;

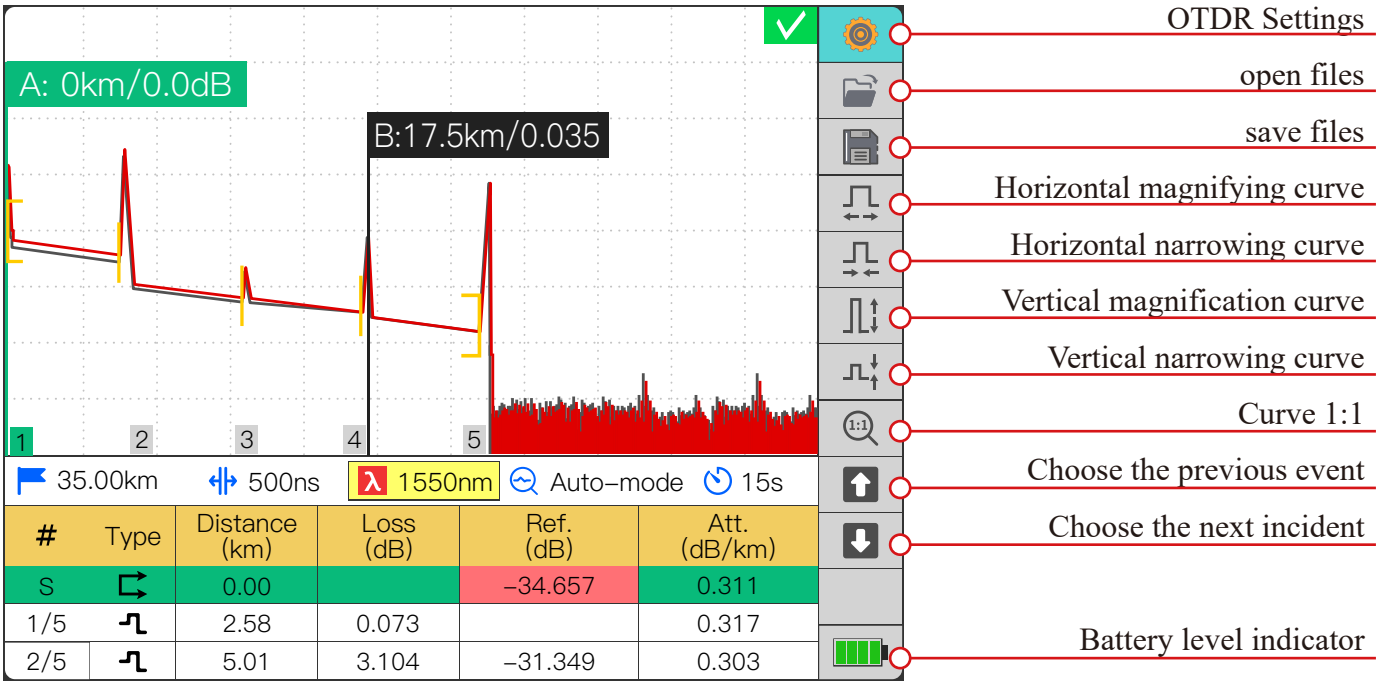
c. Generally, calibration takes 5~10 minutes, so you need to wait patiently. If the calibration time is longer than 10 minutes, it means that the calibration failed, and the instrument needs to be manually restarted and calibrated again.





III. Introduction of OTDR functions

This chapter introduces the basic operation method of OTDR, mainly including the operation method of OTDR, the description of various parameters and the introduction of functions.



As shown above, there are 10 options in the OTDR curve interface:

1) OTDR test settings; 2) Open the file;

3) Save the curve; 4) Horizontal amplification;

5) Horizontal reduction; 6) Vertical amplification;

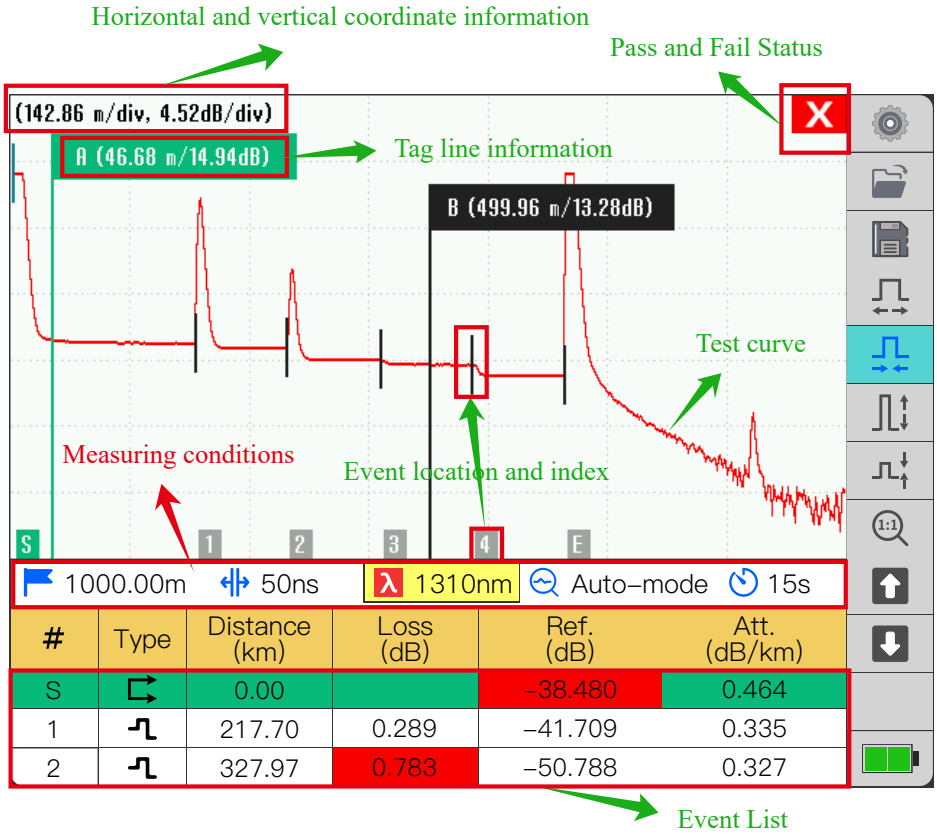
7) Vertical reduction; 8) 1:1 Curve display;

9) Select the event up; 10) Select the event down.

These 10 options can be switched by the up and down keys and enabled by the enter key. The measurement curve can be analyzed by operating the up, down, left and right direction keys, enter keys, and keys for switching wavelength, A/B benchmark, and optical fiber link representation.

1. Test information of the interface

The curve interface mainly analyzes the relevant information of the curve, as shown in the figure:



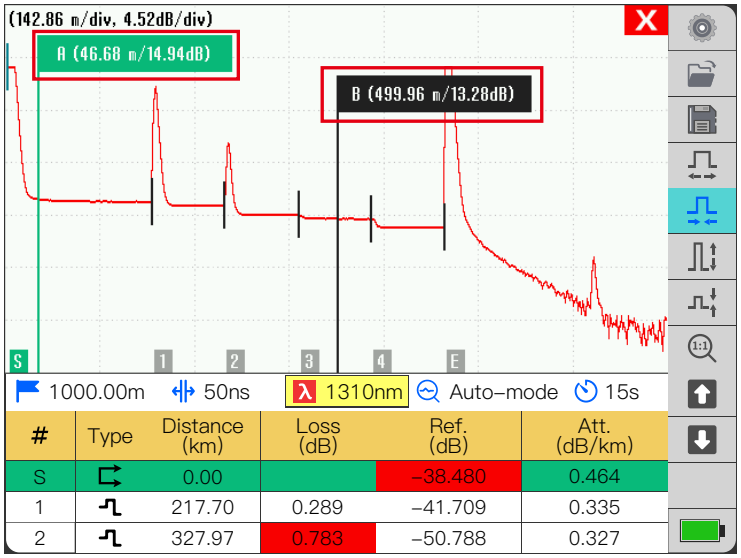
1）Marking line operation:

a. In the upper right corner of the marking line, the position of the current marking line and the power value of the curve at the marking line are displayed.

b. When mark line A is selected, as shown in the following figure, mark line A and its corresponding box in the upper right corner are displayed in green. At this time, you can control the left and right arrow keys to move mark line A; Unchecked marker lines are black.

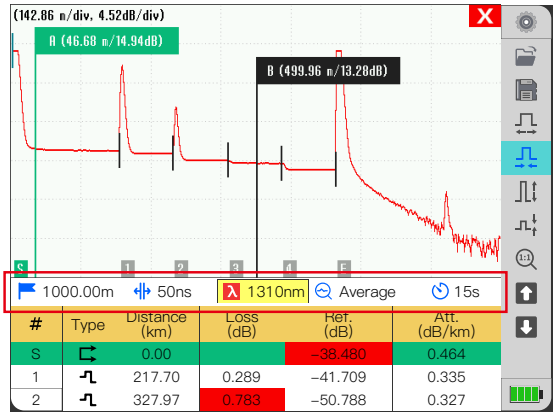
c. Use the mark line switch button to switch the A and B mark lines.

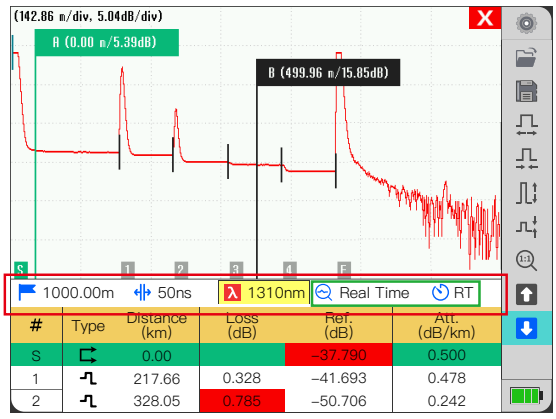
d. Control the movement of the marking line by operating the left and right direction keys; Press the left and right arrow keys to move the marker line quickly and continuously.



2）Test information:

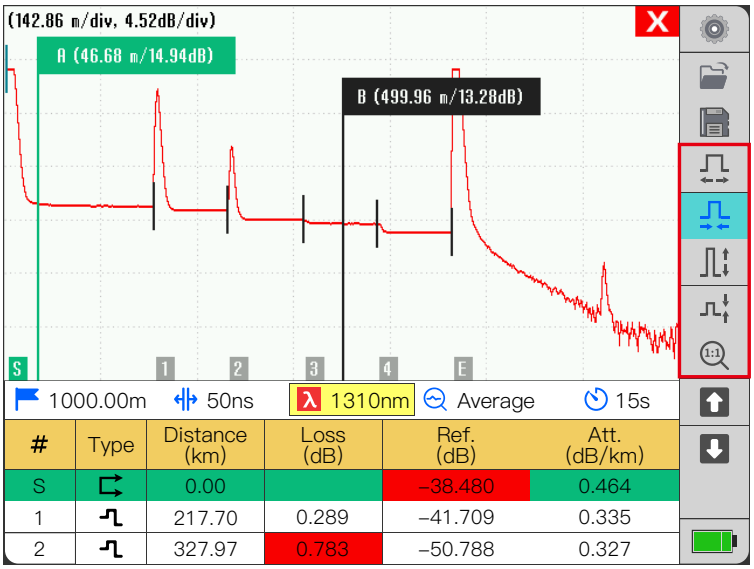
As shown in the figure below on the left, the red box is the test condition of the current curve: measuring range: 1000m; Pulse width: 50ns; The wavelength: 1310nm; Mode: average; Average duration: 15s; When other test conditions are set, this parameter will change with the set parameters; If the user sets the auto mode, the pulse width, range and average time actually used during the test will be displayed. When the real-time mode is selected, the average time displays RT, and other parameters and settings are the same; As shown in the figure below on the right.





3）Curve operation:

In order to facilitate users to view the details of the curve, in this interface, you can use the options on the right side of the curve to zoom in and out of the curve; Note that the reference point of zoom-in and zoom-out is the intersection of the curve and the selected mark line. As shown in the figure below:



#	Type	Distance (km)	Loss (dB)	Ref. (dB)	Att. (dB/km)
S		0.00		-38.480	0.464
1		217.70	0.289	-41.709	0.335
2		327.97	0.783	-50.788	0.327

Zoom in on the curve as follows:

a. Horizontal zoom in, when the cursor stays in this option, press enter to zoom in horizontally;

b. Zoom out horizontally. When the cursor stays in this option, press enter to zoom out horizontally;

c. Zoom in vertically. When the cursor stays in this option, press enter to zoom in vertically.

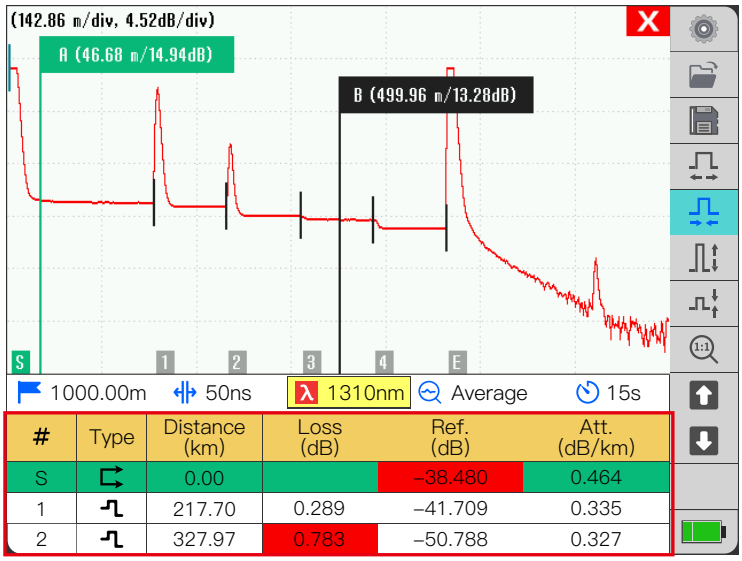
d. Zoom out vertically. When the cursor stays in this option, press enter to zoom out vertically;

e.1:1 mode, when the cursor stays in this option, press the enter key, and the curve will return to the minimum magnification state.

Note: When OTDR finishes the test task, the curve displayed on the interface is the most appropriate magnification state.

4）Event list:

The event list page is mainly for users to view the detailed information of all events in the whole optical fiber link, as shown below:



The event is displayed on the curve, and its position corresponds to the position of the proportional reduction of the current test link; The list of events shows how many events are in the current test link, and the specific information of each event. The event switching in the event list is realized by  in the right option.

 represents an upward selection event; When the cursor stays in this option, press the enter key, and the events in the event list will switch to the previous event;

 indicates an upward selection event; When the cursor stays in this option, press the enter key, and the event in the event list will switch to the next event;

Note: the event list can be switched circularly.

The list information is as follows:

a. Number: the event number, which is the number specified by OTDR application in sequence. Among them, the first event, also known as the start event, is represented by "S"; The last event, also known as the end event, is denoted by "E";

b. Type: The types of events are: group events, reflection events, non-reflection events, gain events, echo (ghost) events, start events, end events, analysis end events, continuous fiber events, etc. The significance of each event type, as shown in the figure below;

Icon	Event Type	Instruction
	Initial point	The start of the measured fiber
	End	The end of the measured fiber
	End the analysis	The current setting of pulse width is too small to analyze a complete fiber link
	Macro bending	Non-reflective loss event, which is usually caused by a small radius bend of the fiber
	Reflection	An event of significant loss and reflection, usually caused by a connection or mechanical joint
	Continuous events	The current set range is too small to analyze a complete fiber optic lin
	Gain	An event with significant loss but small or unmeasured reflection
	Non reflection	For events with "negative loss" characteristics, the true loss of events that may occur in the OTDR curve is approximately equal to the average loss measured from both ends of the measured fiber
	Return loss	It is a false reflection event caused by multiple reflections of the fiber end face

c. Distance: this distance is the length of the event from the start event, that is, the test point; It is the same as the unit set by the company user, and supports M, KM, FT, KFT and MILE;

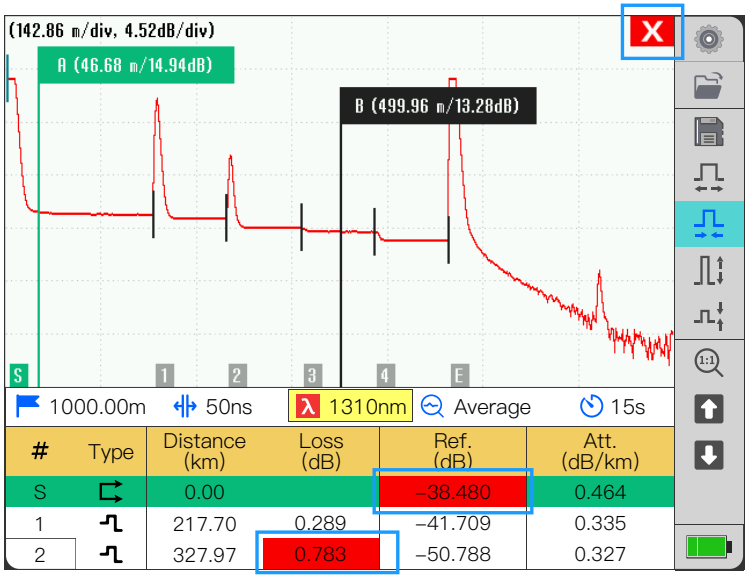
d. Loss: Event loss refers to the attenuation caused by light passing through the event point, in dB;

e. Reflectivity: The reflectivity of attenuation and gain events is actually the backscattering coefficient, which has no practical significance for discussion; Only the reflection event has reflectivity, which indicates the ratio of the reflected light quantity to the incident light quantity when the light passes through the joint, in dB;

f. Attenuation rate: refers to the energy of light lost per kilometer when the light propagates in the optical fiber after the incident, in dB/Km; Note that the unit of attenuation rate is always dB/Km, regardless of the distance display unit set by the user, which follows the standards of the optical fiber industry.

5）Pass and fail:

In the red box shown in the figure below, whether the measurement result is passed is judged according to the set threshold; These thresholds include reflectivity, loss, attenuation and other threshold settings; When the test result is greater than the set threshold, the background will be set to red in the event list; At this time, the test result shows no pass, which is indicated by ✗; On the contrary, when all the test results are less than the set threshold, the test results are displayed as passed, which is indicated by ✓.



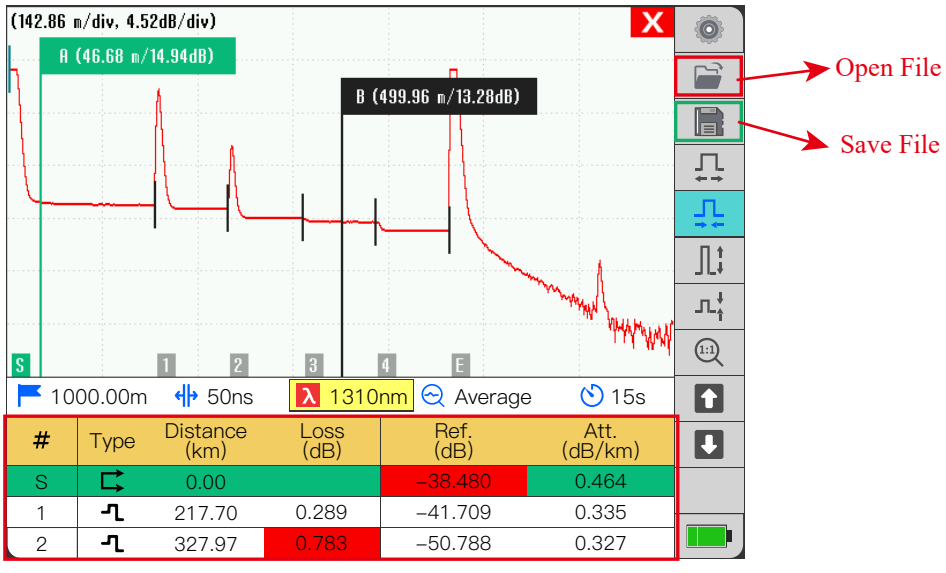
#	Type	Distance (km)	Loss (dB)	Ref. (dB)	Att. (dB/km)
S		0.00		-38.480	0.464
1		217.70	0.289	-41.709	0.335
2		327.97	0.783	-50.788	0.327

a.Pass: All test results did not exceed the set threshold;

b.Failed: At least one test result exceeds the set threshold.

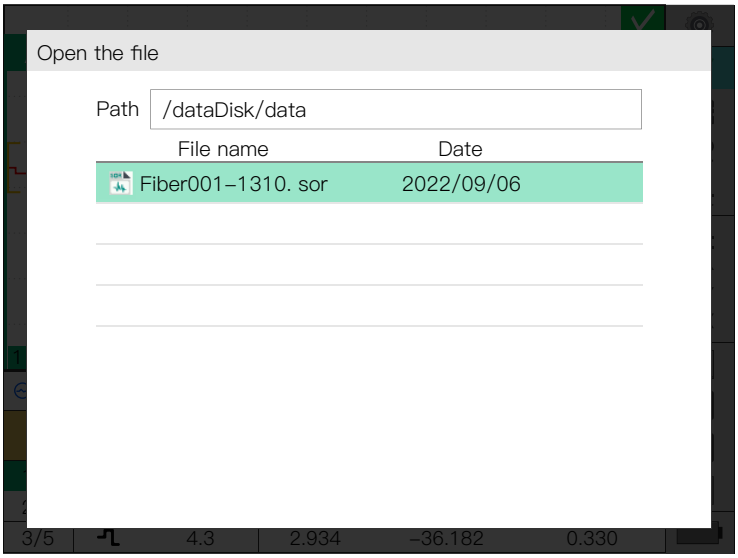
6）File operation:

The operation is mainly used to open or save OTDR curves. As shown in the figure below:

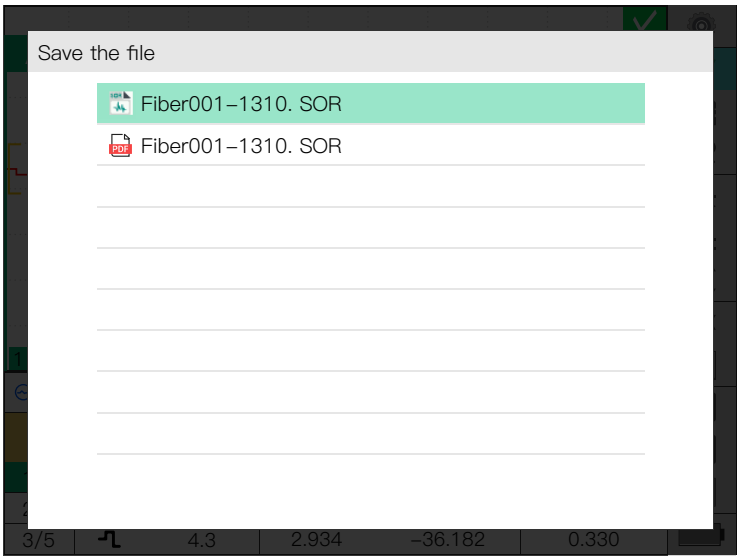


#	Type	Distance (km)	Loss (dB)	Ref. (dB)	Att. (dB/km)
S		0.00		-38.480	0.464
1		217.70	0.289	-41.709	0.335
2		327.97	0.783	-50.788	0.327

Open file: the file in the list can be opened by clicking the enter key, and the OTDR test curve corresponding to the current file will be displayed on the OTDR main interface.

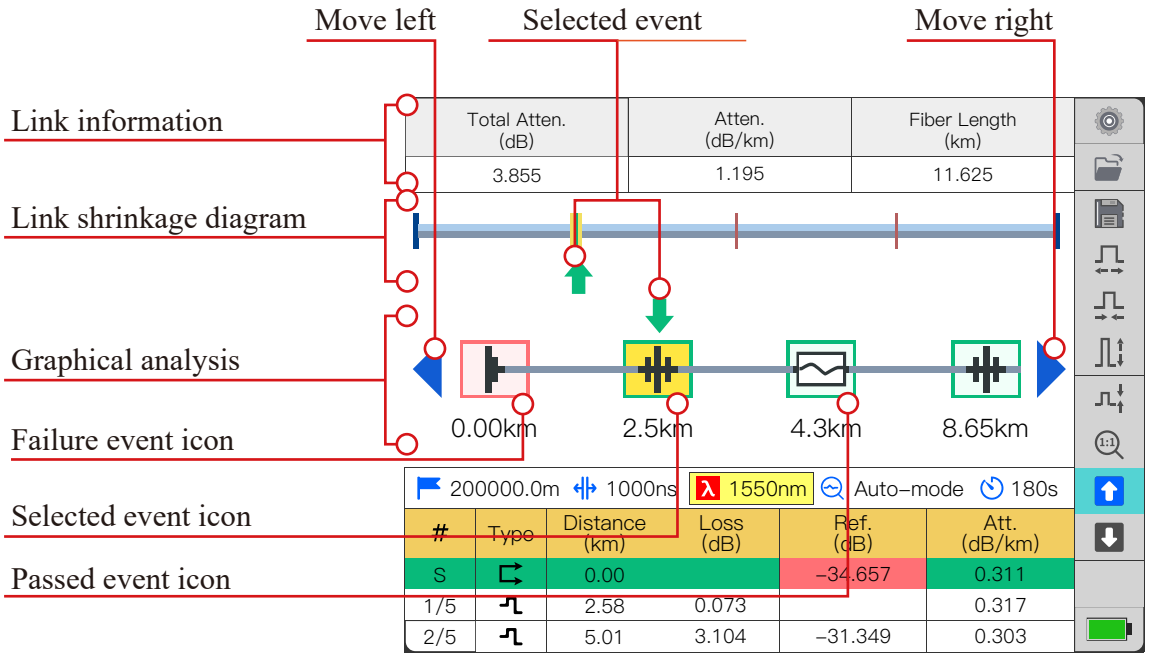


Save file: save the curve of current OTDR main interface test. Supports SOR and PDF files. Click enter to save, and the corresponding file will be saved to the set default path. If the file is saved successfully, the pop-up window of "Save the file successfully" will appear.



2. Link map page

On the OTDR curve interface, press  according to the optical fiber link representation to switch to the link map page. On this interface, the sequence of events is displayed from left to right. As shown in the figure below:



a. Each small box represents an event;

b. Each horizontal line connecting two boxes represents an optical fiber section;

c. Event spacing is described in equal proportion according to the percentage of the actual fiber length to the total link length;

d. The color of the event can display the status; Green means yes; Red indicates that at least one parameter failed;

e. Total attenuation, attenuation coefficient and fiber length show the results of the current curve;

f. Press the left and right direction keys to switch events, and switch events circularly;

g. During the dual-wavelength test, if there is a macro-bending event in the optical fiber link, the  icon will appear in the link map;

h. You can also switch events through the option. At this time, the events in the link map will also change. The operation mode of event switching is the same as the curve interface.

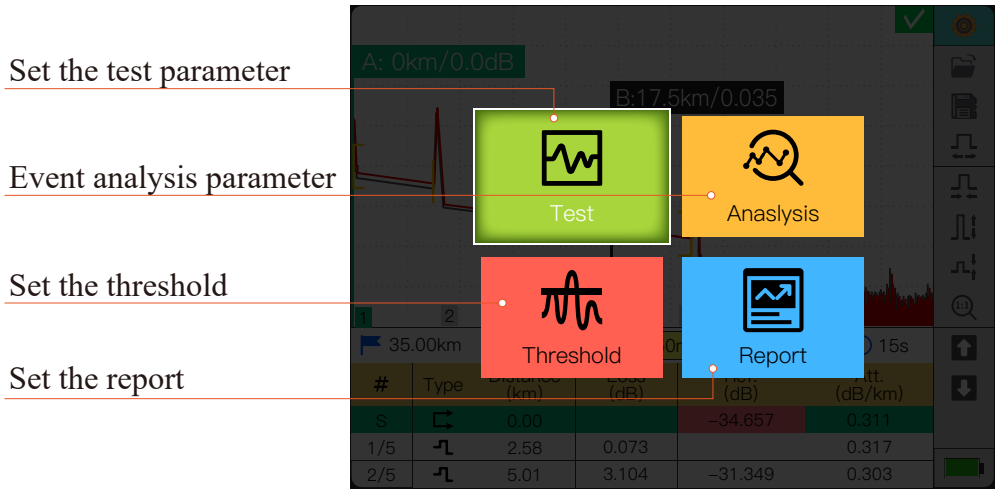
i. The meaning of the event icon in this interface is shown in the following figure:

Icon	Event Type	Instruction
	Initial point	The start of the measured fiber
	End	The end of the measured fiber
	End the analysis	The current setting of pulse width is too small to analyze a complete fiber link
	Macro bending	Non-reflective loss event, which is usually caused by a small radius bend of the fiber
	Reflection	An event of significant loss and reflection, usually caused by a connection or mechanical joint
	Continuous events	The current set range is too small to analyze a complete fiber optic lin
	Gain	An event with significant loss but small or unmeasured reflection
	Non reflection	For events with "negative loss" characteristics, the true loss of events that may occur in the OTDR curve is approximately equal to the average loss measured from both ends of the measured fiber
	Return loss	It is a false reflection event caused by multiple reflections of the fiber end face

3.Setup page

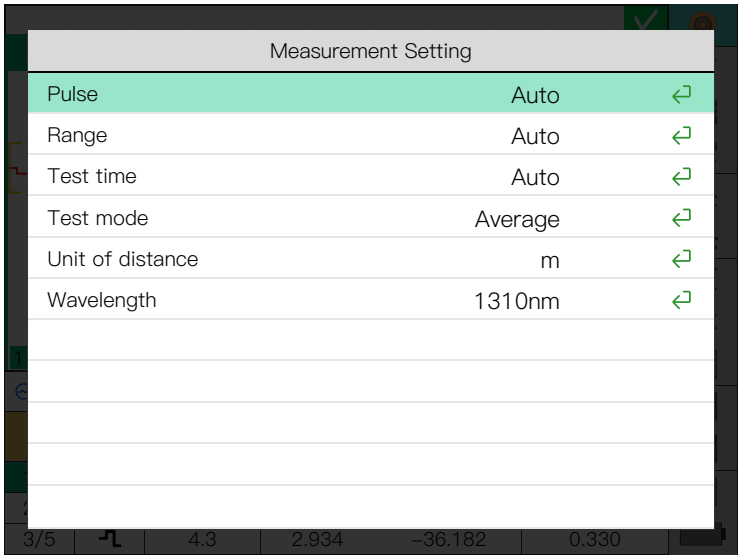
Before performing the test, relevant measurement settings must be made, as shown in the following figure: the setting of measurement conditions (pulse width, wavelength, range, real-time or average mode, test duration and distance display unit of curve interface), the setting of analysis parameters (refractive index, backscattering coefficient, excess length coefficient, injection fiber and receiving fiber), the threshold of passing or not and the setting of report content; The four settings can be switched left and right by navigation keys.

The setting can divided into 4 parts: Test, Analysis, Threshold and Report



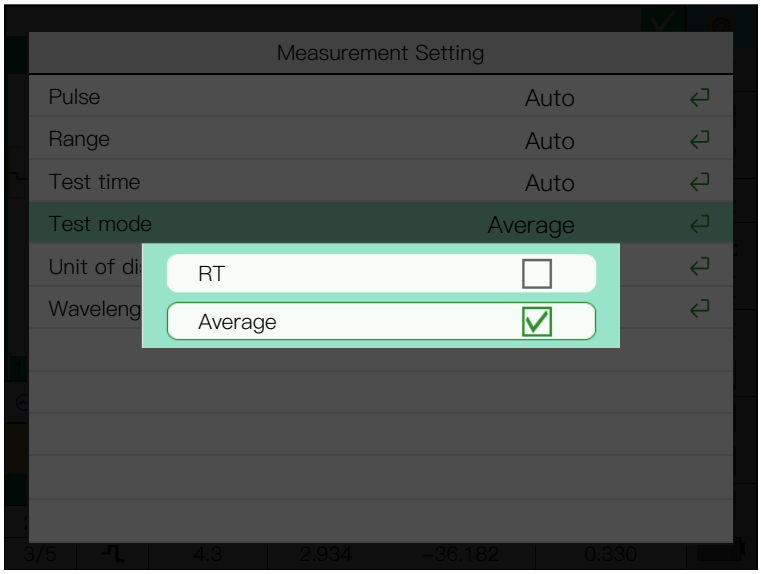
1）Test settings

For novices, or when they don't know the situation of optical fiber links, it is recommended to use Auto mode for testing. The instrument will intelligently set the optimal test conditions according to the actual situation of optical fiber links. If you want to conduct a special test, you can manually set the measurement conditions you want; The factory default settings are shown in the figure below:

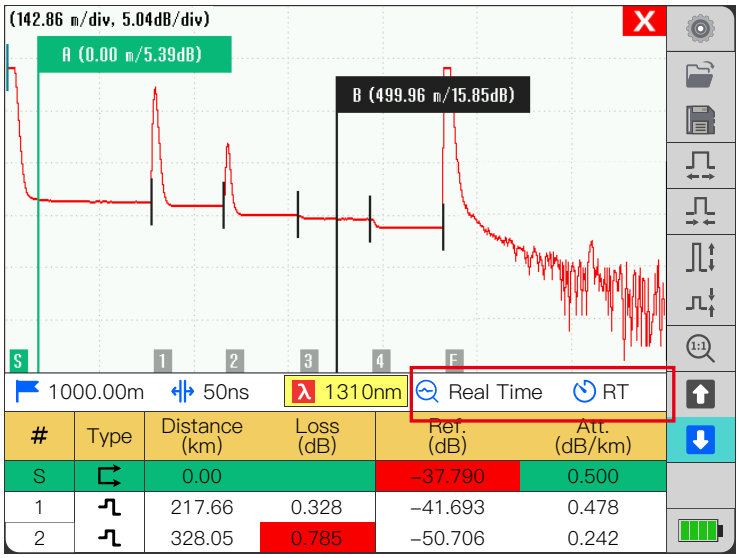


a. Measurement mode

Measurement modes are divided into real-time and average. When the cursor stays in the measurement mode, click the enter button, and a pop-up window as shown in the figure below will appear. Press the up and down buttons to select the real-time mode or the average mode.



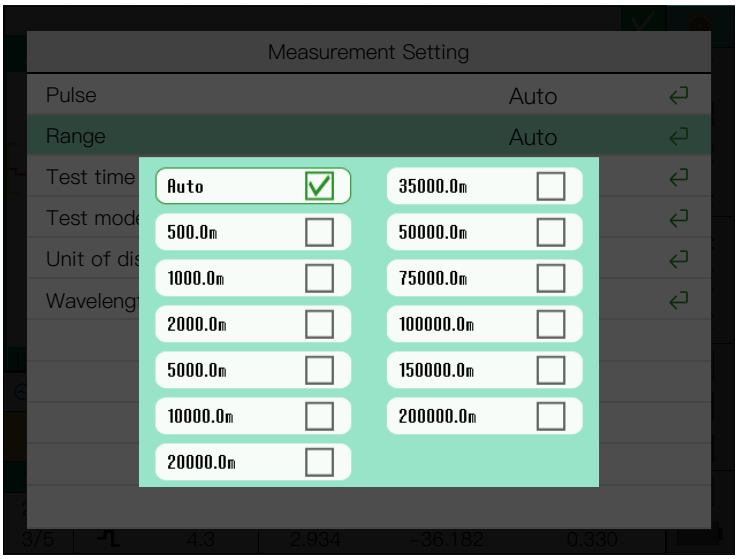
Real-time mode is used for real-time monitoring of links; At this time, the application program refreshes the measurement curve in real time without averaging, and the refresh frequency is 2~5Hz; Note that the real-time mode only supports one wavelength test. In real-time mode, the test duration is not displayed, and only two characters "RT" are displayed on the test interface. If you want to stop the test in real-time mode, you need to press the measurement button again. As shown in the figure below:



Average mode, OTDR test will use average mode to measure in order to obtain higher signal-to-noise ratio and higher small event detection ability; The average duration is set according to the needs of users. Generally, under the same test conditions, the longer the average duration, the better the signal-to-noise ratio will be. However, when the average duration is more than 3 minutes, the signal-to-noise ratio changes very little, so in the duration setting, the maximum is 3 minutes.

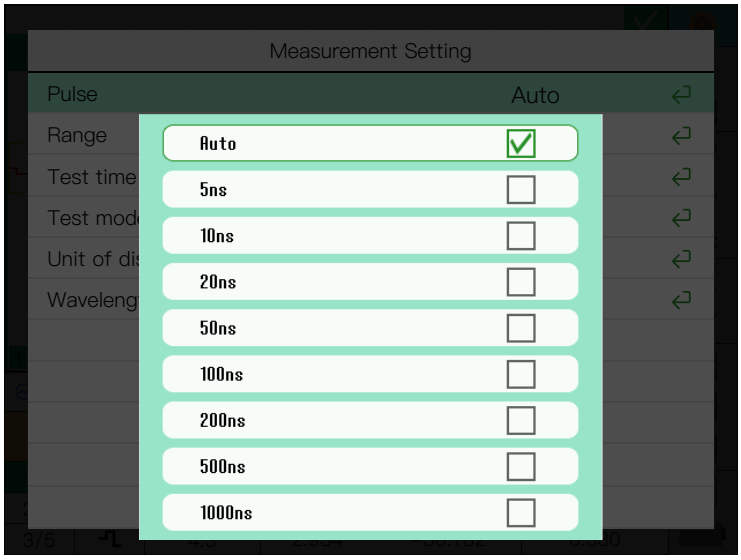
b.Measuring range

Is the length set by the user when OTDR tests the optical fiber; The required range is greater than 20% of the actual length of the optical fiber; Because the measuring range and resolution are closely related, the measuring range should not be too large when testing. It is recommended that the measuring range be within the range of 1.5~2.0 times of the length of the optical fiber. At present, the ranges (unit: km) supported by this OTDR are: Auto,0.5,1,2,5,10,20,35,50,75,100,150,200, a total of 12 range settings, in which Auto is the test time, and the instrument automatically sets the optimal range according to the fiber length (the automatically selected range is also within these 12 ranges). The selection of measuring range can be controlled by pressing up, down, left and right buttons; When the range to be set is found, press enter to set it successfully, and the pop-up window disappears, and the parameter setting interface will display the range set by the user. As shown in the figure below:



c. Pulse width

That is, the pulse width OTDR test is the pulse width of the emitted light; This parameter directly determines our measurement. Test results (signal-to-noise ratio, event resolution, etc.); Selecting narrow pulse width test can achieve higher range resolution and smaller blind area, but the signal-to-noise ratio of the curve will inevitably be damaged; On the contrary, wide pulse impulse can obtain high signal-to-noise ratio curve, test long distance optical fiber, but distance resolution and blindness. If the index is to be affected, the user must choose between dynamic range and blind area. When cursor stay in pulse width selection item, press the enter key will also appear a pop-up window as shown in the figure below.



Select the required pulse width by controlling the up and down direction buttons of pulse width, press the enter button to successfully set it, and exit the pop-up window.

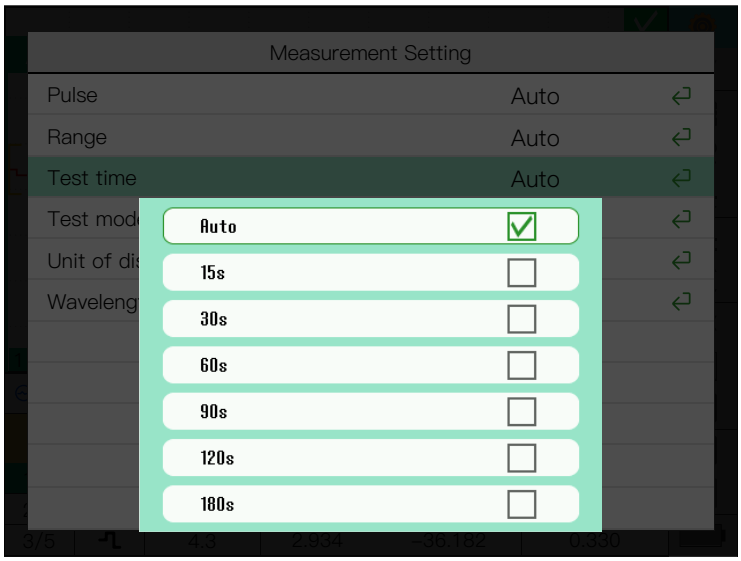
As can be seen from the above figure, the pulse width of this pop-up window is not complete. This is because when the measuring range is small, the large pulse width test is used, and the blind area is long, so the test result is of little significance. When designing the application program, the pulse width is limited by the measuring range, as shown in the following table:

Range (km)	Pulse (ns)									auto pulse(ns)
0.5	5	10	20	50	100	auto				20
1	5	10	20	50	100	200	auto			50
2	5	10	20	50	100	200	auto			100
5	5	10	20	50	100	200	500	auto		100
10	5	10	20	50	100	200	500	1000	auto	200
20	5	10	20	50	100	200	500	1000	auto	200
35	5	10	20	50	100	200	500	1000	auto	500
50	20	50	100	200	500	1000	2000	10000	auto	1000
75	20	50	100	200	500	1000	2000	10000	auto	2000
100	50	100	200	500	1000	2000	10000	20000	auto	10000
150	50	100	200	500	1000	2000	10000	20000	auto	20000
200	50	100	200	500	1000	2000	10000	20000	auto	20000

Note: If the pulse width is set by Auto, the actual pulse width may be different from the above table. This is because the automatic setting of pulse width is not only constrained by the range, but also affected by the actual fiber length and wavelength.

d. Test duration

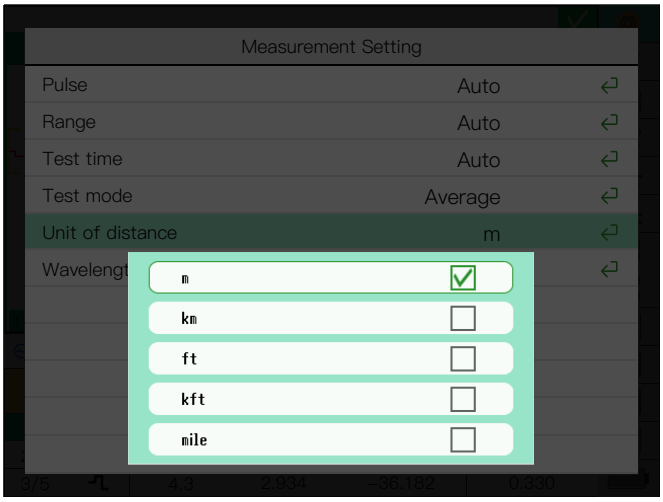
The measurement time directly affects the signal-to-noise ratio of the curve. The longer the measurement time, the higher the signal-to-noise ratio. You can take a large dynamic range, so try to measure long-distance optical fiber and view remote events.Choose a longer test duration.



As shown in the figure above, at present, the instrument supports six test time settings: Auto, 15s, 30s, 60s, 90s, 120s, 180s, and L, of which auto defaults to 15s.

e. Distance unit

Different countries and regions have different commonly used length units. In order to meet the needs of most customers, the distance units supported by this instrument are: M, KM, FT, KFT and MILE. As shown in the figure below:

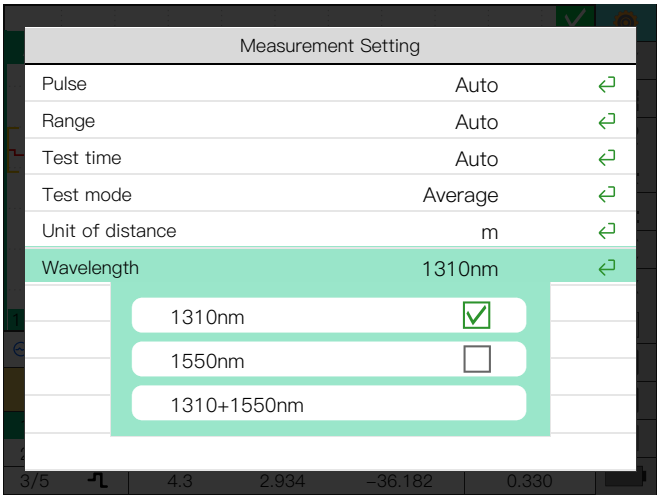


This pop-up window is operated in the same way as the pop-up window described above.

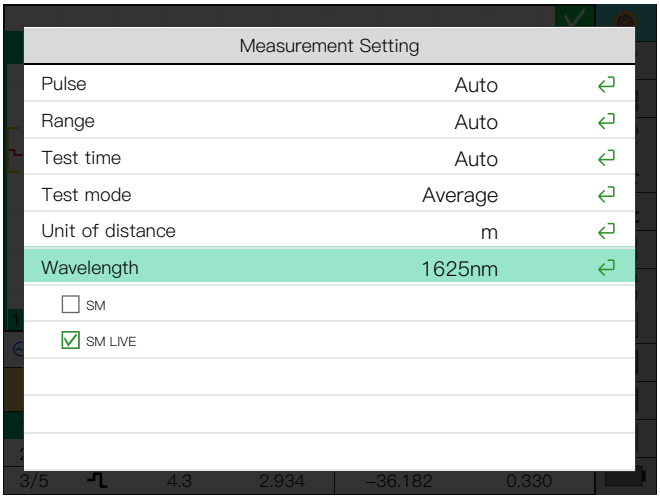
Note: In this instrument, no matter which distance unit is set, in the test results, the light the unit of attenuation coefficient of fiber section is dB/km, because it is more in line with the standards of optical fiber industry.

f. Wavelengths

The light used in OTDR is usually used for communication; It is used for single-mode fiber, and the wavelengths are 1310nm,1490nm and 1550nm. There are also light with wavelengths of 1300nm and 850nm for multimode fiber; There are also lights with wavelengths of 1625nm and 1650nm for online monitoring. Of course, there are some CWDM OTDR and DWDM OTDR, which have many wavelengths. This model supports light of 1310nm and 1550nm. The QX55-S support 1310nm and 1550nm, QX55-P support 1310nm, 1550nm and 1625nm. When the cursor stays at the wavelength option, press enter, and a pop-up window as shown in the figure below will appear; The wavelength is also selected by pressing the up and down buttons:

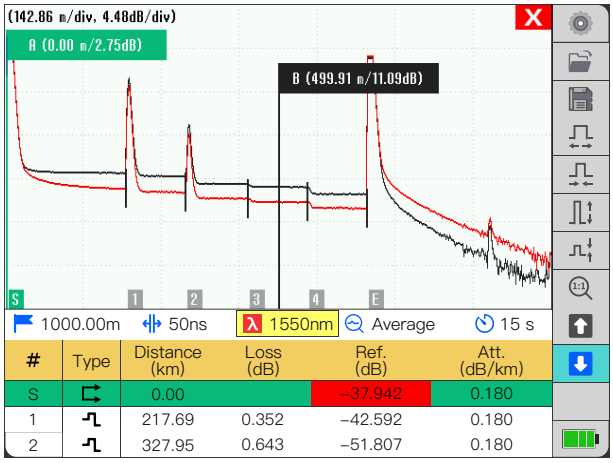


QX55-S ▲



QX55-P ▲

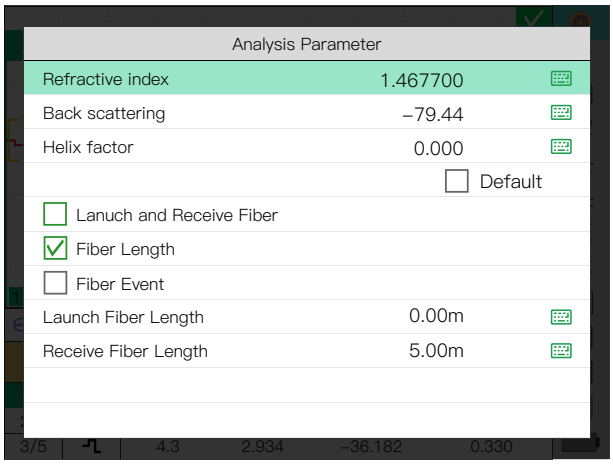
When the instrument leaves the factory, the default wavelength is 1310nm; Both QX55-S and QX55-P models support dual-wavelength test fiber links; When using dual-wavelength test, the first 1310nm light will be tested with 1550nm light after the test is completed. At this time, two test curves will appear on the OTDR interface, and the default current curve is the curve of the last wavelength test, that is, the red curve, as shown in the following figure:



Note: The macro-bending event will only appear during the dual-wavelength test, so you must use the dual-wavelength test if you want to test the macro-bending event. For QX55-P SM-LIVE mode, support online testing with 1625nm; The test mode has only one wavelength and cannot distinguish the macro bending event from the splicing loss. Only a curve displayed.

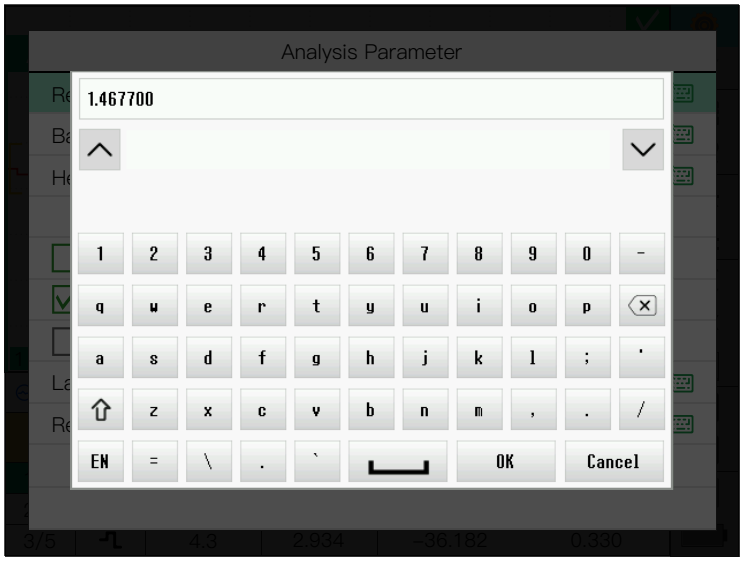
2) Analysis parameter setting

In this interface, you can set the refractive index (changing the fiber test length), backscattering coefficient (changing the link return loss and reflectivity of reflection events) and residual length coefficient (modifying this parameter will change the fiber test length; Generally, when testing the optical cable, refer to the coefficient set on the optical cable, and correctly use this parameter, so that you can accurately find the actual geographical location of the optical cable laying). In addition, for some reasons, it is necessary to add a section of optical fiber at the front or end of the tested optical fiber, so that the options of injection fiber and receiving fiber need to be set, so that the optical fiber link can be correctly analyzed. As shown in the figure below:



a. Refractive index

Refractive index, also known as group coefficient, is used to convert light propagation time into distance. For all OTDR measurements related to distance, such as event location, attenuation, segment length, total length, etc., the correct refractive index is crucial. Provided by optical cable manufacturer or optical fiber manufacturer. The refractive index can be set to any value between 1.0 and 2.0; When light with different wavelengths propagates in the same fiber, its refractive index is different. When leaving the factory, the default refractive index of light with a wavelength of 1310nm is 1.4677, and that of light with a wavelength of 1550nm is 1.468325. If you need to modify the value of refractive index, stop the cursor at the refractive index option, and then press enter to enter the keyboard input interface and modify the refractive index, as shown in the following figure:



In the dual-wavelength test, only one refractive index with a wavelength of 1310nm needs to be set, and the other one will automatically calculate its refractive index according to the refractive index of 1310nm, so as to prevent a big error in the test results of the two wavelengths.

b. Backscattering coefficient

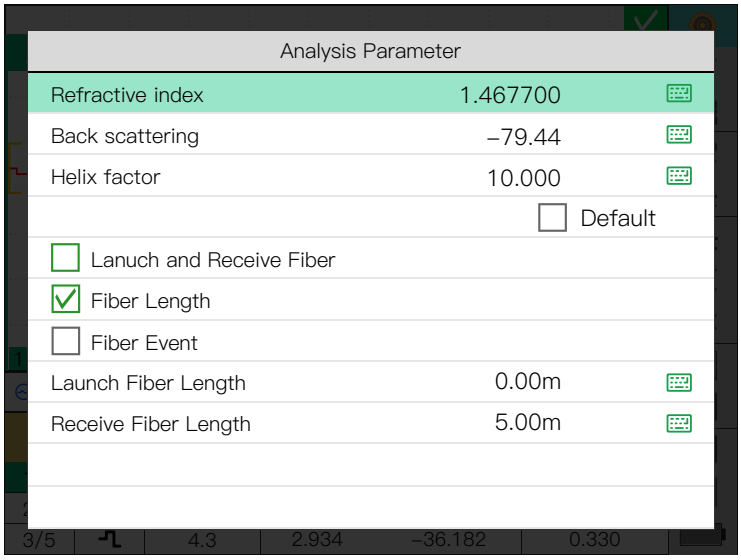
The backscattering coefficient used by this OTDR refers to the amount of Rayleigh backscattered light of a specific optical fiber. This parameter will affect the calculation results of return loss and reflectivity, and is generally provided by optical cable manufacturers. This parameter is also related to the wavelength. When propagating in the same fiber, the shorter the wavelength, the greater the scattering coefficient.

Generally, the application uses the default parameters of the program for calculation. Of course, users can also set their own Rayleigh backscattering coefficient; The method of setting is the same as that of setting refractive index.

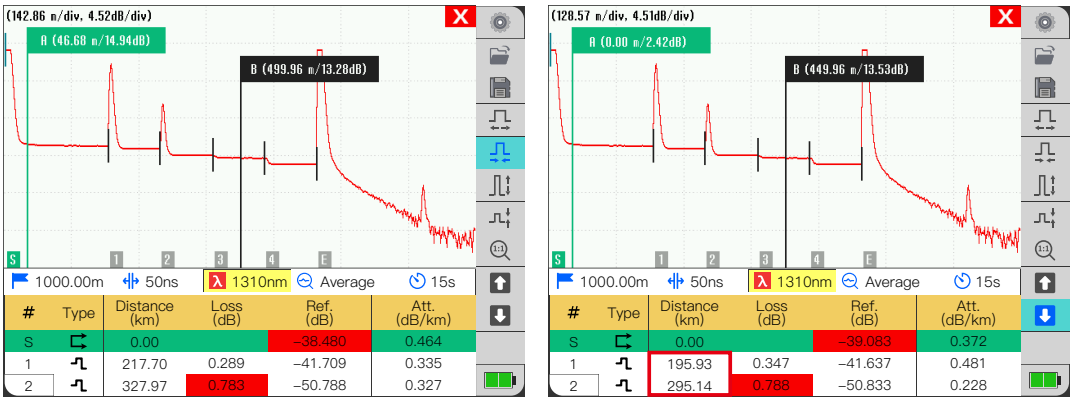
c. Coefficients of residual length

The length coefficient is the ratio of the length of the optical cable to the length of the optical fiber in the optical cable. Because the optical fiber in the optical cable is coiled on the cable core, the lengths of the optical fiber and the optical cable are different. When OTDR is used to test the length of the optical cable, the length of the optical fiber in the optical cable actually tested is not the actual length of the optical cable. However, by setting the parameter of excess length coefficient, the length on the OTDR distance axis can always be the same as the actual length of the optical cable, so that when the optical cable is laid or maintained, the construction position can be quickly found, which greatly reduces the difficulty in construction.

The coefficient of residual length is expressed as a percentage. For example, a redundancy coefficient of 10% means that the optical fiber is 10% longer than the optical cable. If the redundancy coefficient is set to 10%, the displayed length will be reduced by 10% based on the fiber length. As shown in the figure below:



The following two figures show the test results of the same test fiber with different residual length coefficients. The residual length coefficient in the left picture is 0.00%, and that in the right picture is 10.00%.



Note: The parameter is set to 10.000, and the application calculation is based on 10.000%.

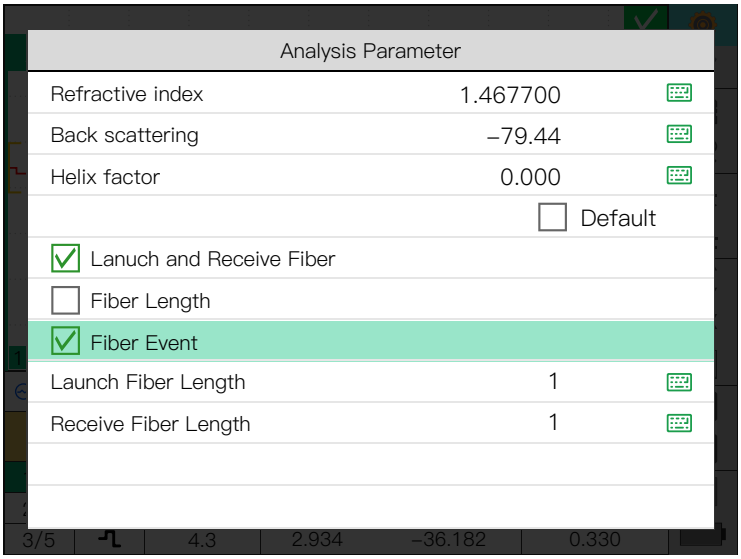
d. Injection fiber and receiving fiber

Injection fiber and receiving fiber refer to one end fiber added at the beginning and end of the tested fiber when OTDR tests the fiber. Its main function is to help users test the tested optical fiber; It is convenient to test the loss and reflectivity of the tested optical fiber joint; It is convenient for users to operate OTDR and the like in a suitable position.

When injecting optical fiber is used for OTDR testing, a section of optical fiber is injected into the interface of the instrument, and then the tested optical fiber is connected; The receiving optical fiber is a section of optical fiber connected to the end of the tested optical fiber.

The injection fiber and the receiving fiber can be set separately.

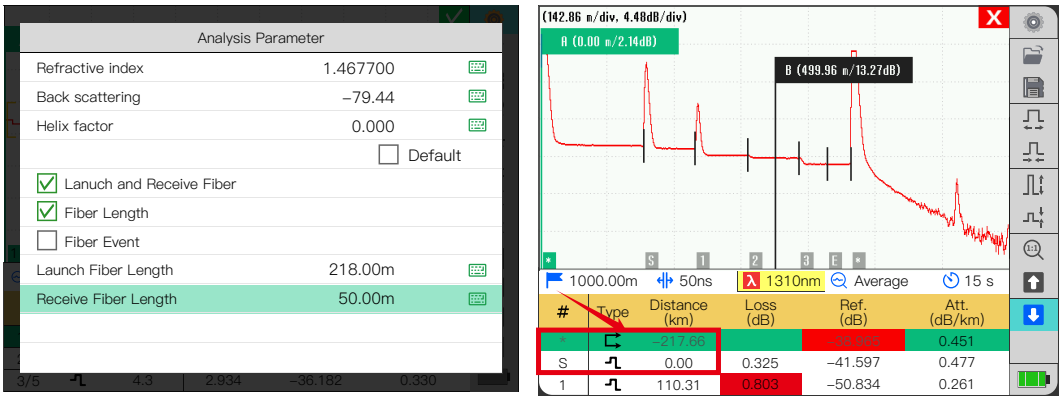
There are two ways to set the injection fiber and the receiving fiber: by fiber length and by event. Only when the main switch of the injection fiber and the receiving fiber is selected can you choose which way to set the injection fiber and the receiving fiber, otherwise the injection fiber and the receiving fiber will not work. As shown in the figure below:



Setting the injection fiber and the receiving fiber according to the fiber length: If the user already knows the length of the injection fiber and the receiving fiber, he can set the injection fiber and the receiving fiber according to the fiber length.

When setting the injection fiber according to the fiber length, if the set length is the same as the actual fiber length, the measured incident point at this length will be set as the starting point of the span; If the set length is different from the actual fiber length, an event will be added at the set length, and the added event point will be set as the span start point.

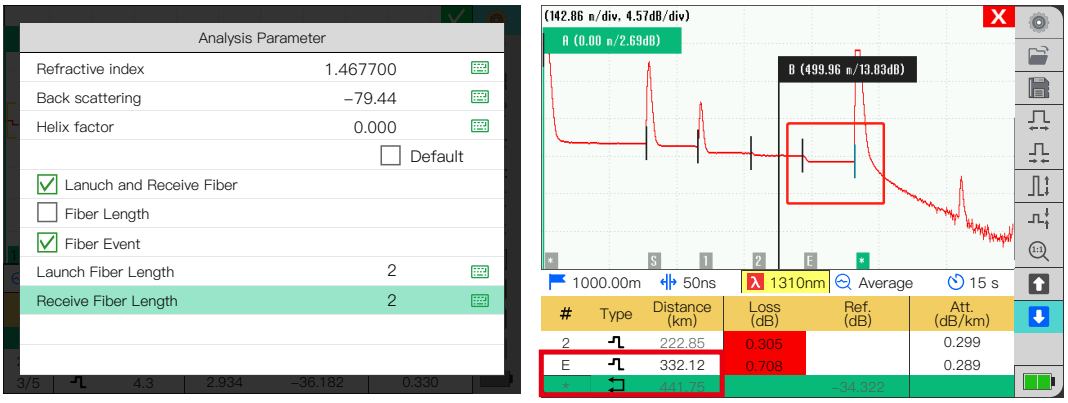
When setting the receiving fiber according to the fiber length, the operation logic is the same as setting the injection fiber, and it will be set at the appropriate position as the end point of the span. As shown in the figure below:



Note: If the set injection fiber and receiving fiber are near the incident, the incident point will be set as the injection fiber incident point or the receiving fiber incident point.

Set the injection fiber and the reception fiber according to the event: if the user does not know the injection fiber and the reception fiber the length of the fiber, you can set the injection fiber and the receiving fiber according to the event.

When setting the injection fiber according to the event length, the default is the first event (at the interface of the instrument event) is the starting point of the span, and the last event (end point) is the end point of the span; If the user injection fiber and receiving fiber are used, and there are multiple optical fibers, the phase should be set according to the number of optical fiber segments. The number of events should be; As shown in the figure below:

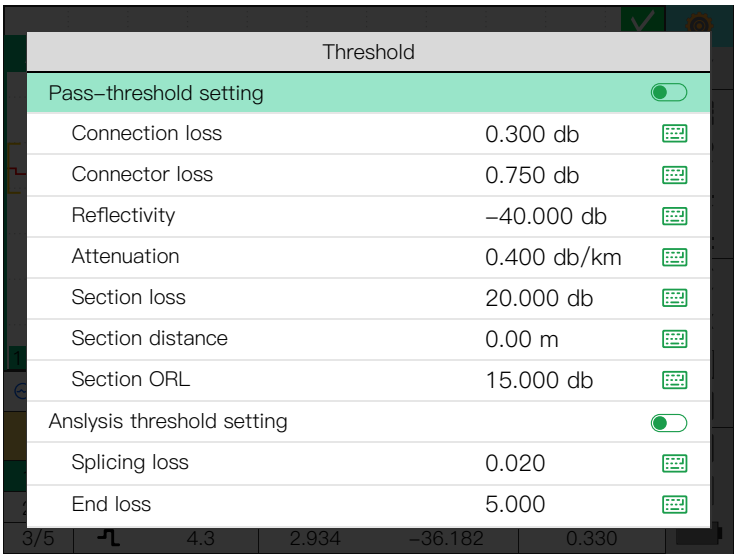


Note: After the injection fiber is set, the positions of the incident points before the start of the span are all negative, and the start of the span is at 0 o'clock.

3) Setting threshold

In the threshold setting interface, you can set your criteria for judging optical fiber links. Among them, the option of "curve passing threshold setting" is to judge whether some test results can meet the set threshold in the optical fiber link, and judge the link state according to the test results. "Welding Loss" in "Setting Analysis Threshold" is a judgment event. When the threshold of welding event is less than the set threshold, it will not be displayed in the event list. "Fiber end loss" refers to judging the event as the fiber end (which may not be the real fiber end) when the event loss is greater than the set threshold. "Curve Pass Threshold Setting" and "Analysis Threshold Setting", these two options can only take effect when selected, otherwise the set threshold will not work.

As shown in the figure below:



Curve through threshold setting

a. Splicing loss

The joint loss threshold is the threshold for judging the state of small non-reflection events; General welding events, bending, Curved event loss is relatively small, so this threshold setting is small; If the loss of non-reflective events is found to exceed. If the threshold is exceeded, it is generally considered that the welding is not good, or the bending radian is large, so maintenance is needed; Users can enter the keyboard interface to modify this parameter according to their own needs.

b. Connector loss

Connector loss is generally aimed at reflection events; Generally, the connector loss is large, so this threshold value set is generally larger than the joint loss value.

c. Reflectivity

The reflectivity threshold setting is mainly used to judge whether the reflection event in the optical fiber link will be harmful. To the network or other optical fiber devices.

d. Weaken

The attenuation threshold setting refers to the attenuation of the optical fiber section. The unit has nothing to do with the unit set by the instrument. It is always dB/km.

e. Span loss

The span loss threshold is used to judge the total loss value of the tested optical fiber link, that is, the span starting point and the sum of all event losses and segment losses between the endpoints of a segment.

f. Span length

The span length refers to the length between the start and end of the span.

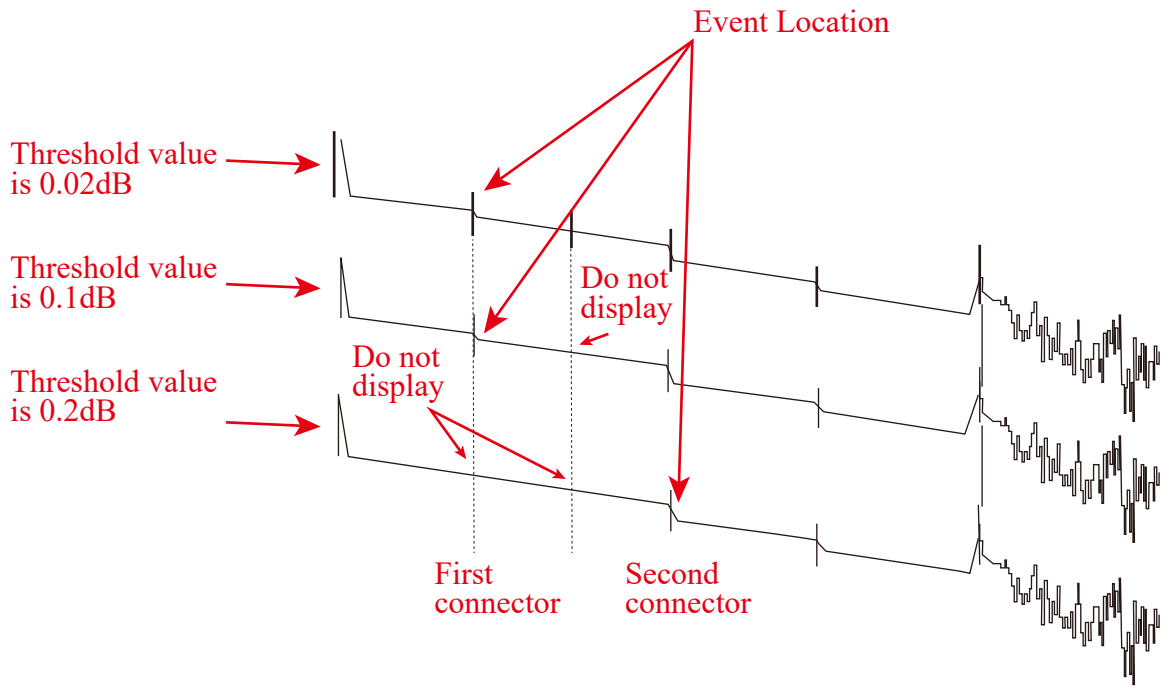
g. Trans-ORL

The cross-section ORL refers to the optical return loss before the start and end of the cross-section, that is, the optical fiber. In the system, the total effect of multiple reflection events and scattering events between the start point and the end point of the span.

Set the analysis threshold

a. Welding loss

Setting the analysis threshold can help users eliminate some known ones with small measurement loss events; Of course, in order to comprehensively analyze the events on the optical fiber link, the threshold can also be set to a small value, At this point, all events can be displayed in the event list. As shown in the figure below, set different thresholds and test them. On the test curve, the display of events shows different results.



① The threshold is 0.02dB

When the threshold is set to 0.02dB, one event will be displayed at each of the two welding points.

② The threshold is 0.1dB.

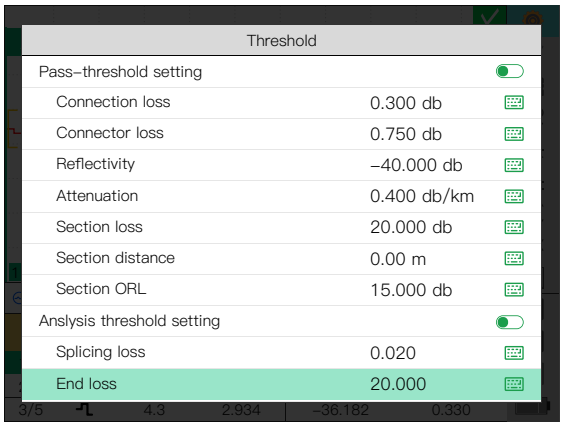
When the threshold is set to 0.1dB, the loss of the second welding point is less than 0.1 dB, so only the first welding point is displayed.

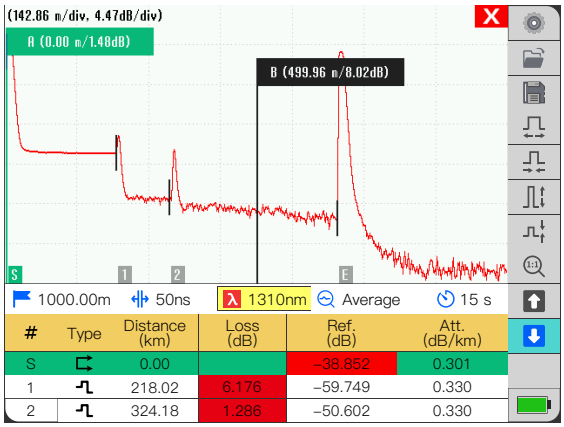
③ The threshold is 0.2dB

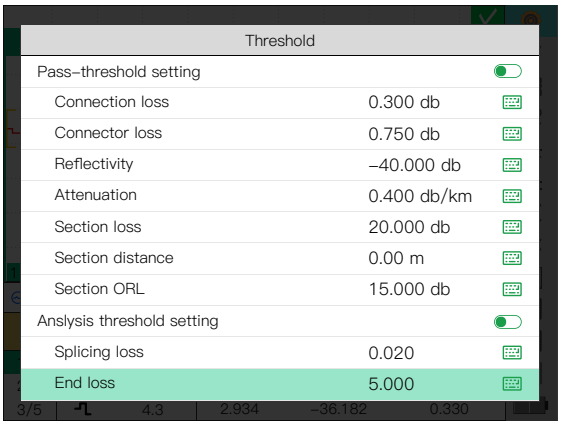
When the threshold is set to 0.2 dB, the loss of both welding points is less than 0.2 dB, so neither welding point is displayed.

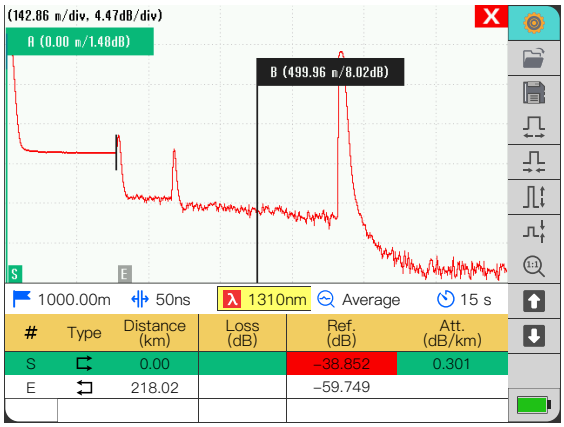
b. Optical fiber end loss

The fiber end loss threshold is used to stop the analysis immediately when serious event loss occurs (for example, the location where the event that may endanger the network signal transmission occurs). When the event loss in the optical fiber link is greater than the set end threshold, the event will be set as the end, and the event information after the event will not be displayed. When the instrument leaves the factory, the default value of the terminal threshold is 5.00dB. As shown in the figure below, different terminal thresholds, the same test result, find different terminal positions, and the loss of intermediate events is 6.2dB. When the set end threshold is 5dB, the application defines the event as the end of the span.



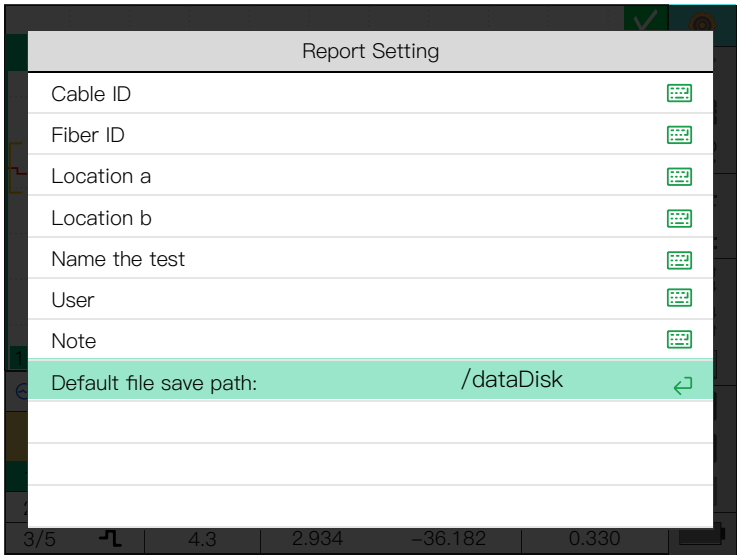






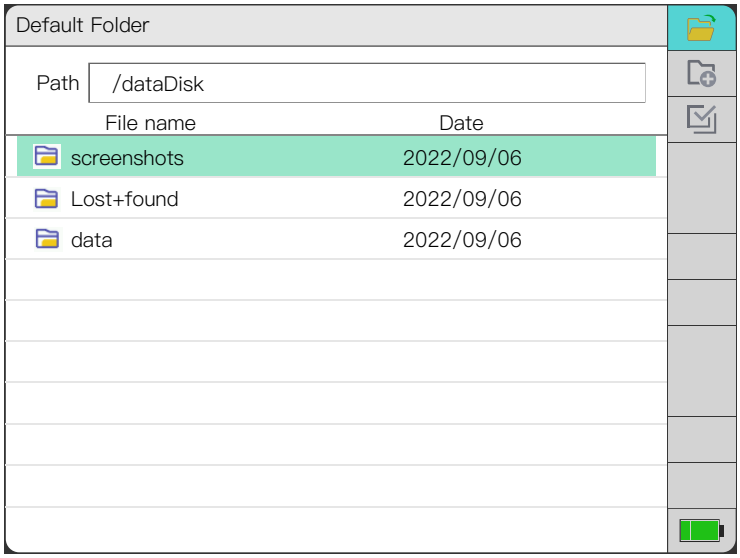
4) Report settings

In the report setting interface, the content in the PDF report is mainly set when the PDF report is generated. The main settings are as shown in the figure below:

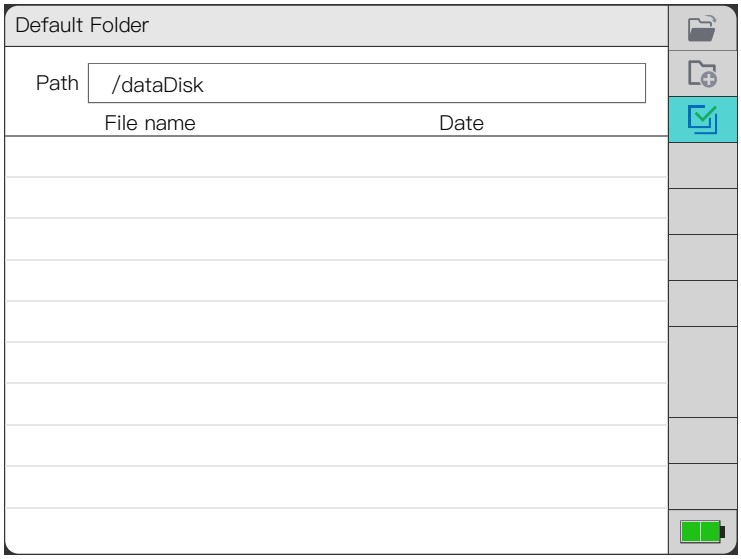


Default file saving path settings:

a. Move the cursor to the last line of "File Default Save Path" and click enter, and the interface shown in the following figure will appear;

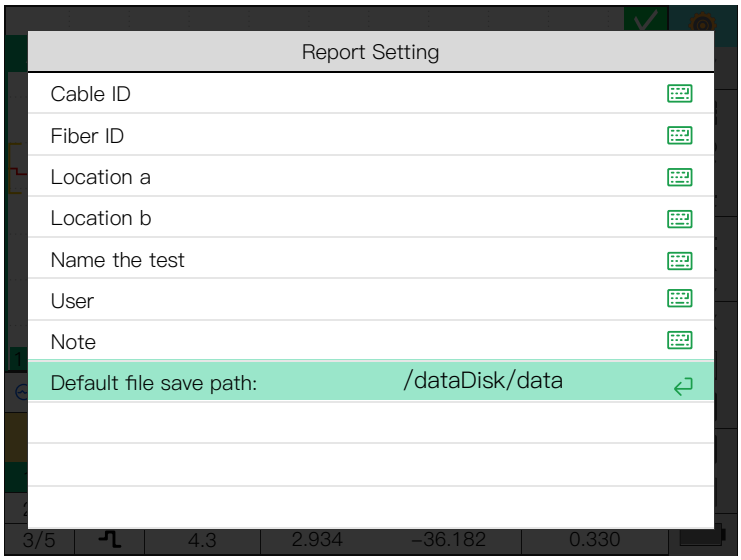


b. Press the left arrow key to move the cursor to the left side of the display interface and enter the target folder; As shown in the figure below:



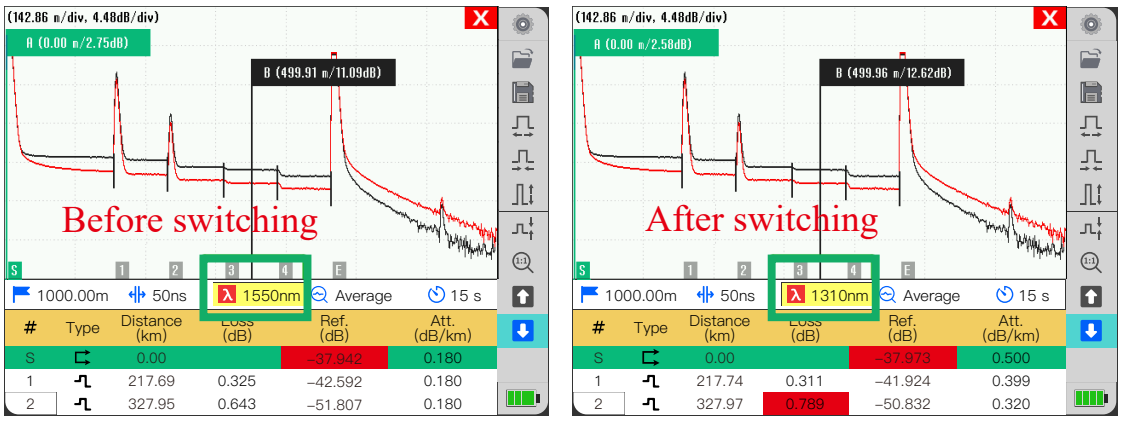
c. Press the right arrow key to move the cursor to the right side of the display interface and stay at the  icon;

d. Click enter, the setting is successful, and you will return to the report setting interface. As shown in the figure below:



4. Wavelength switching

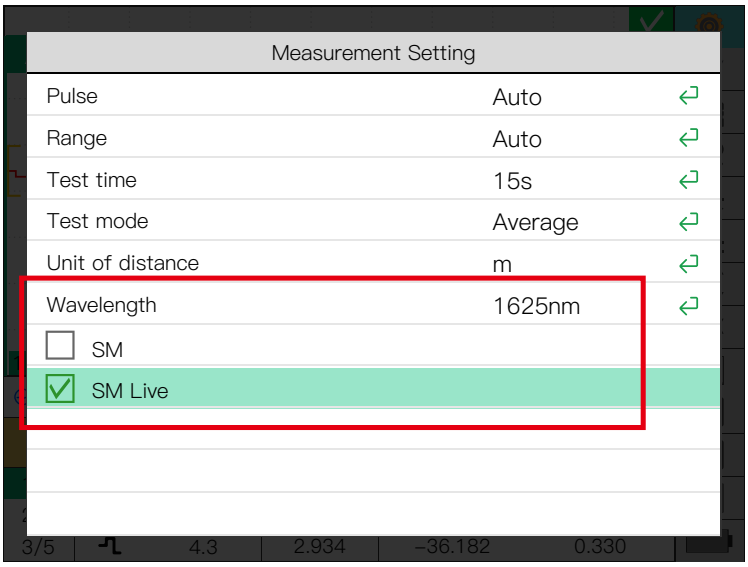
When using dual-wavelength test fiber, two curves will appear on OTDR main interface. At this time, the curves are switched by λ key, as shown in the following figure, the images before and after waveform switching. The red curve is the current curve and the gray curve is the curve to be analyzed.



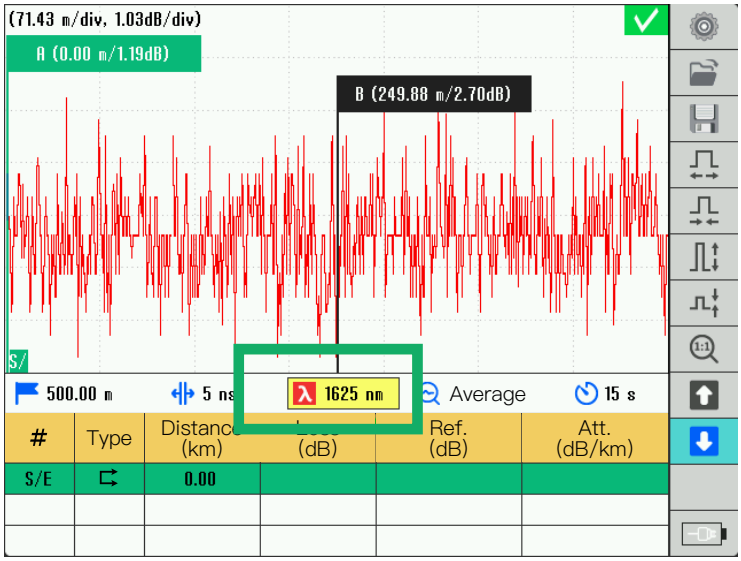
5. Introduction of PON function

This function is only supported on QX55-P instruments, if it is not available on QX55-S instruments. When the instrument has PON function, there will be a filter in the internal optical path of the instrument, so this function supports OTDR online testing. This function is not compatible with the optical interface used at 1310/1550nm, so the corresponding interface will also change. The interface of optical power meter is changed to the interface of PON function, as shown in the following figure:

In the setting interface of OTDR, in the test setting, there is an additional SM Live option in the wavelength setting option. When this option is selected, the wavelength is switched to 1625nm, as shown in the following figure:



When using the 1625nm wavelength test, the wavelength switching function fails, as shown in the following figure:



Annex

A. Event type description

This section describes all possible event types in the event table generated by the application. Different event types are represented by different symbols.

Start event

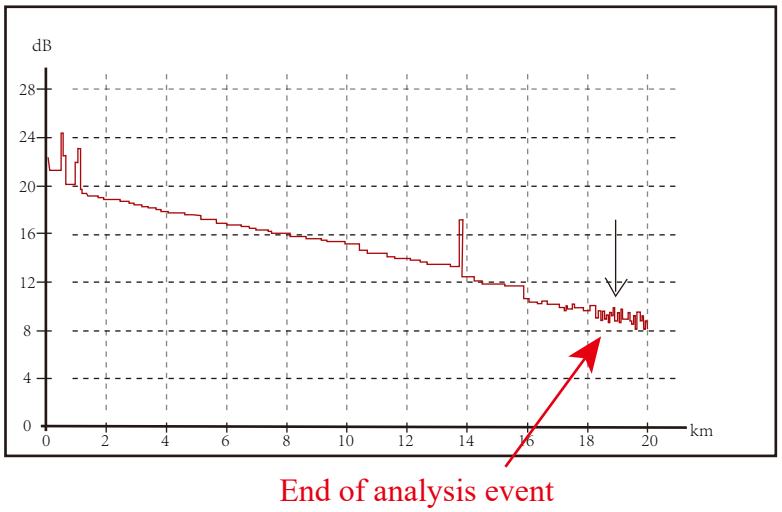
The "start event" on the curve is the event that marks the beginning of the fiber span. By default, the "Start Event" is located at the first event of the tested fiber (usually the interface location of OTDR). Users can also set other events as the starting point of the span to focus on the analysis of the corresponding span.

End event

The "end event" on the curve is the event that marks the end of the fiber span. By default, the "end event" is located on the last event of the tested fiber, which is called the fiber end event. Users can also set other events as the end points of spans to focus on the analysis of corresponding spans.

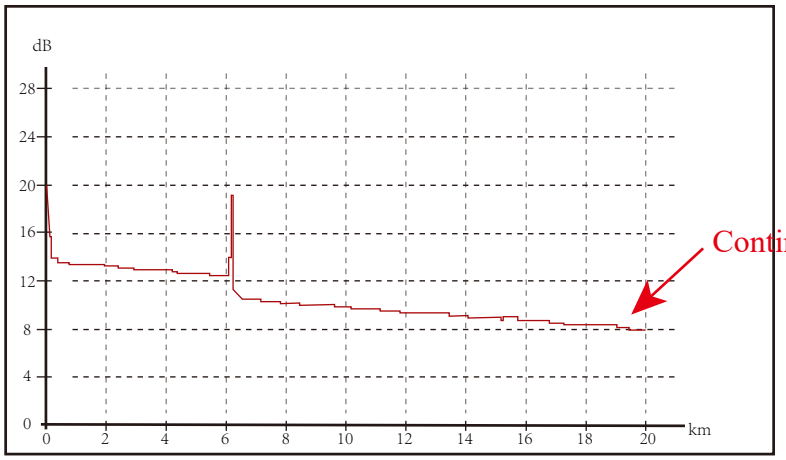
End of analysis event

This kind of event indicates that the used pulse width provides insufficient dynamic range, and the analysis process does not reach the end of the optical fiber. Because the signal-to-noise ratio is too low, the analysis process ends before it reaches the end of the optical fiber. The pulse width should be increased to ensure that the signal-to-noise ratio is high enough when the signal reaches the end of the optical fiber. The application does not display the loss value and reflectivity of the analysis end event. As shown in the figure below:



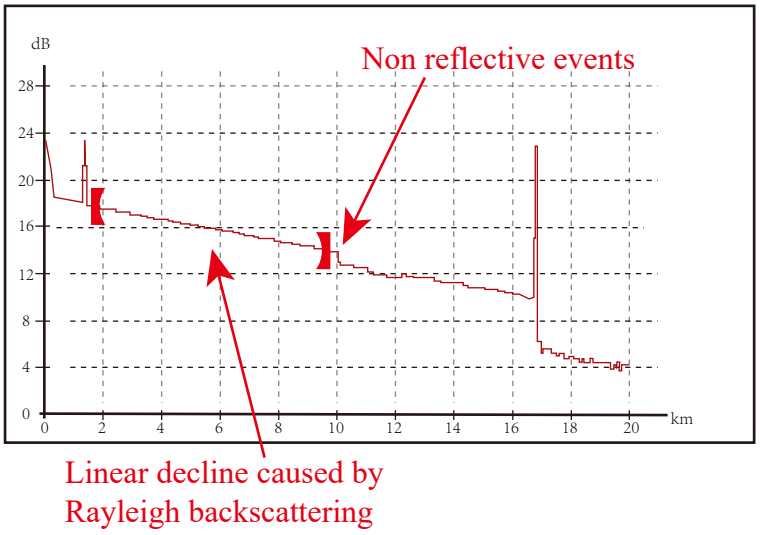
Continuous Fiber Event

This event indicates that the selected data acquisition range is shorter than the optical fiber. Since the analysis process was finished before the end of the fiber, the end of the fiber was not detected. The distance range of data acquisition should be increased to make it larger than the length of optical fiber. The application program does not display the loss value and reflectivity of continuous fiber events. As shown in the figure below:



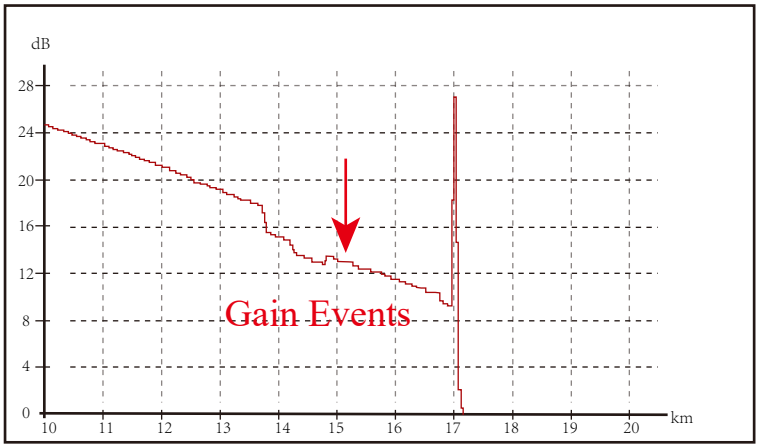
Non-reflective event

This kind of event is characterized by the sudden decrease of Rayleigh backscattering signal level, which shows the discontinuous slope of curve signal. Such events are usually caused by splices, macro bends or micro bends in optical fibers. The application will display the loss value of non-reflective events, but not the reflectivity. If the threshold is set, once a certain value exceeds the loss threshold, the application will indicate the non-reflective event in the event table. As shown in the figure below:



Gain

This event indicates the joint with obvious gain, which is caused by the splicing of two optical fibers with different backscattering characteristics (backscattering coefficient and backscattering capture coefficient). As shown in the figure below:

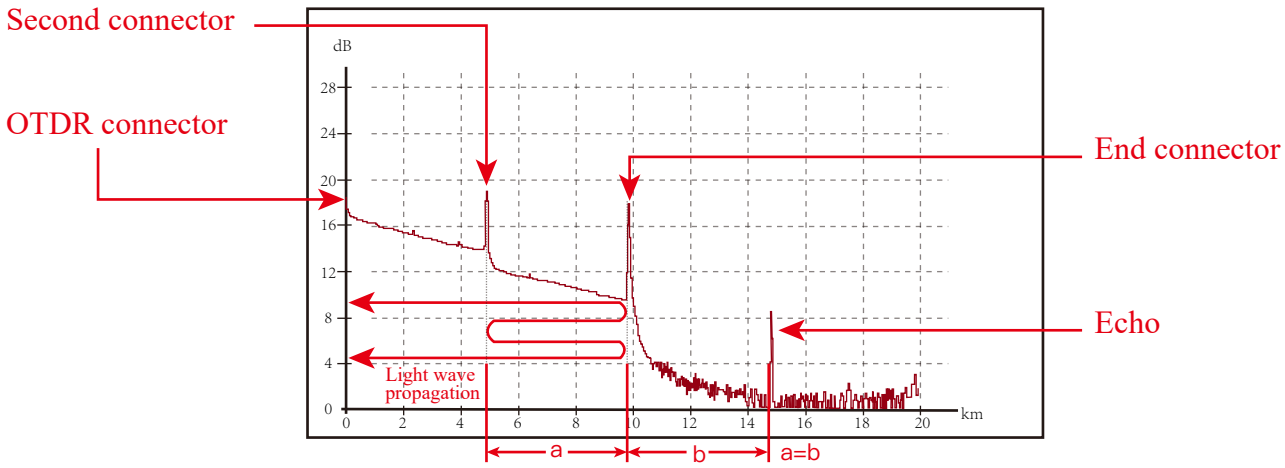


The reflection event

The reflection event appears as a spike in the fiber curve. They are caused by a sudden change in refractive index. The reflection event will cause most of the energy initially injected into the fiber to be reflected back to the light source. The reflection indicates that there may be connectors, mechanical joints or even poor welding joints or cracks. Applications usually display the loss value and reflectivity of reflection events. When the reflection peak reaches the maximum level, its peak will be cut off due to saturation of the detector. Therefore, the blind zone (the shortest distance between this event and the next detectable event or event whose attenuation can be measured) will increase. If the threshold is set, once a certain value exceeds the threshold of reflectivity or connector loss, the application will indicate that there is a reflection fault in the event table. As shown in the figure below:

Echo event

It indicates the false reflection event caused by multiple reflections of the echo at the end face of the optical fiber. Echo events are usually called ghost events. The distance between the echo event and the front end face is equal to the distance between the two end faces forming the echo. As shown in the figure below, the distance between the second connector and the end connector is equal to the distance between the end connector and the echo.



B. Maintenance and calibration instructions

1. Maintenance of battery

The battery used in this instrument is a polymer lithium rechargeable battery:

The following points should be paid attention to in battery maintenance:

1) It's best to store the instrument (including battery) at room temperature (15℃ to 30℃) and place it in a dry place to get the best performance.

2) If the meter is not used for a long time, it is best to charge the battery every other month.

3) Do not charge the battery for a long time (more than eight hours) to prevent permanent damage to the battery.

2. Optical interface cleaning

The optical fiber port of the instrument must be kept clean, and the optical port should be wiped regularly with special alcohol. Please cover the dust cap after the instrument is used, and keep it dustproof and clean. In addition, the flange connector should be cleaned regularly.

3. Calibrate

The calibration interface is provided inside the instrument. If the user finds that the test results are inaccurate or unusable during use, please open the calibration interface to calibrate the OTDR-related content.

C. Warranty terms

1. Warranty policy

1) Free warranty will be implemented within 3 years from the date of delivery.

2) Standard fittings or wearing parts, if there are material or process problems, will be guaranteed free of charge within 1 year from the date of delivery.

3) If it is confirmed that there is a problem with the product during the warranty period, it will be responsible for the domestic transportation of the product.

4) Due to the user's problems or those not covered by the warranty period, the user will be responsible for the transportation (receiving and sending) of the products, and all related customs, taxes, duties, insurance, etc.

5) How to send the equipment to our company, our company will send it back in the same way after maintenance (for example, air, express, land, etc.). All equipment must be confirmed to have a valid serial number before repair, and clearly marked on the repair package.

2. Warranty restrictions

1) In this warranty, our company is only responsible for repairing or replacing the defective parts, and returning the repaired or replaced parts and products to the buyer.

2) The warranty scope does not include: damage caused by misoperation or overuse; Accidents; Wet water; Use any unauthorized accessories; Unauthorized modification of products; Carry out maintenance and modification in unauthorized places; Improper use of electricity/power supply; Power failure; Falling products; Damage caused by not operating and maintaining the equipment according to the manufacturer's recommendations; Damage or loss in transit; Theft; Damage caused by negligence; Man-made destruction; Force majeure factors caused by environment and other conditions.

3) The warranty does not apply to the case where the serial number of any product or part is altered, defaced, or deleted. The company will charge a certain maintenance fee for the repaired equipment whose cause of failure cannot be determined.

3. Disclaimer and prohibition clause

The above warranty terms can replace other express or default warranty agreements. In addition to the above listed terms, this agreement shall not apply to any statutory or implied warranty terms without other guarantees and merchantability or for specific purposes. As mentioned above, the buyer acknowledges that Komshine is the only exclusive after-sales service organization, providing service for repairing or replacing defective parts. The Buyer confirms that there are no other additional after-sales service terms (including but not limited to direct or indirect loss of profits, loss of sales, loss of personal or property or other direct or indirect losses). The only after-sales service objective of this agreement is to provide the buyer with the repair and replacement of the defective parts in the above agreement.

The product will not be guaranteed if it encounters the following situations: the parts are removed from the original position or the damage caused by careless misoperation; Encounter fire, flood, lightning strike or be placed in corrosive environment; Dismantling, modifying products or tearing up warranty labels without permission; Damage caused by improper power supply; Or damage caused by the buyer's failure to follow the installation instructions.

4. Warranty policy for discontinued products

For any product planned to be discontinued, we will issue a discontinuation announcement before the discontinuation date. On the official stop selling date, the product will be deleted from the price list and official website, and will no longer be sold. The announcement of the suspension of production will also include the deadline for the maintenance of this product (3 years from the date of suspension).

Maintenance of discontinued products will only be provided to customers who have purchased a maintenance contract, or cover the previous contract with a new one before the expiration of the previous one.

If there are other questions, you can contact the after-sales staff for specific details. You can also visit the company website to browse the latest information.

Company website:www.komshine.com

D. Technical index information of OTDR

OTDR Specifications		
Model	QX55-S	QX55-P
Wavelength (nm)	1310/1550	PON 1310/1550/1625 (built-in filter)
Dynamic range (dB)	32/30	32/30/28
Number of optical port	1	2
Applicable fiber	SM (ITU-T G.652)	
Distance range (km)	0.5,1,2,5,10,20,35,50,75,100,150,200	
Pulse width (ns)	5,10,20,50,100,200,500,1000,2000,10000,20000	
Event dead zone*1 (m)	1	
Attenuation dead zone*2 (m)	3.5	
Number of sampling points	Max80000	
Sampling resolution	Min 0.04m	
Distance measurement accuracy	±(0.75 m + Measurement distance × 2 × 10−5 + Sampling resolution)	
Loss measurement accuracy	±0.03 dB	
Return loss measurement accuracy	±2 dB	